



Neil Brenner and Nikos Katsikis

OPERATIONAL LANDSCAPES



HINTERLANDS OF THE CAPITALOCENE

Neil Brenner and
Nikos Katsikis,
Map visualisation of
the US Corn Belt,
2018

Capital-intensive, highly industrialised and densely equipped landscapes of cash-crop monocultures dominate the Corn Belt, where more than 80 per cent of all land (depicted in black) is dedicated to the cultivation of corn and soya beans. The zone is configured among 1-mile (1.6-km) tiles within a Jeffersonian grid pattern. This permits the maximally efficient operation of agro-industrial machinery. Beneath this terrestrial surface is an extensive subterranean drainage system that supports soil tilling. Data source: USDA National Agricultural Statistics Service Cropland Data Layer (2018), published crop-specific data layer, available at <https://nassgeodata.gmu.edu/CropScape/>.

In recent decades, the field of urban studies has neglected the question of the hinterland: the city's complex, changing relations to the diverse non-city landscapes that support urban life. **Neil Brenner and Nikos Katsikis** of the Urban Theory Lab at the Harvard Graduate School of Design argue that this 'hinterland question' remains essential, but must also be radically reimagined under contemporary conditions.

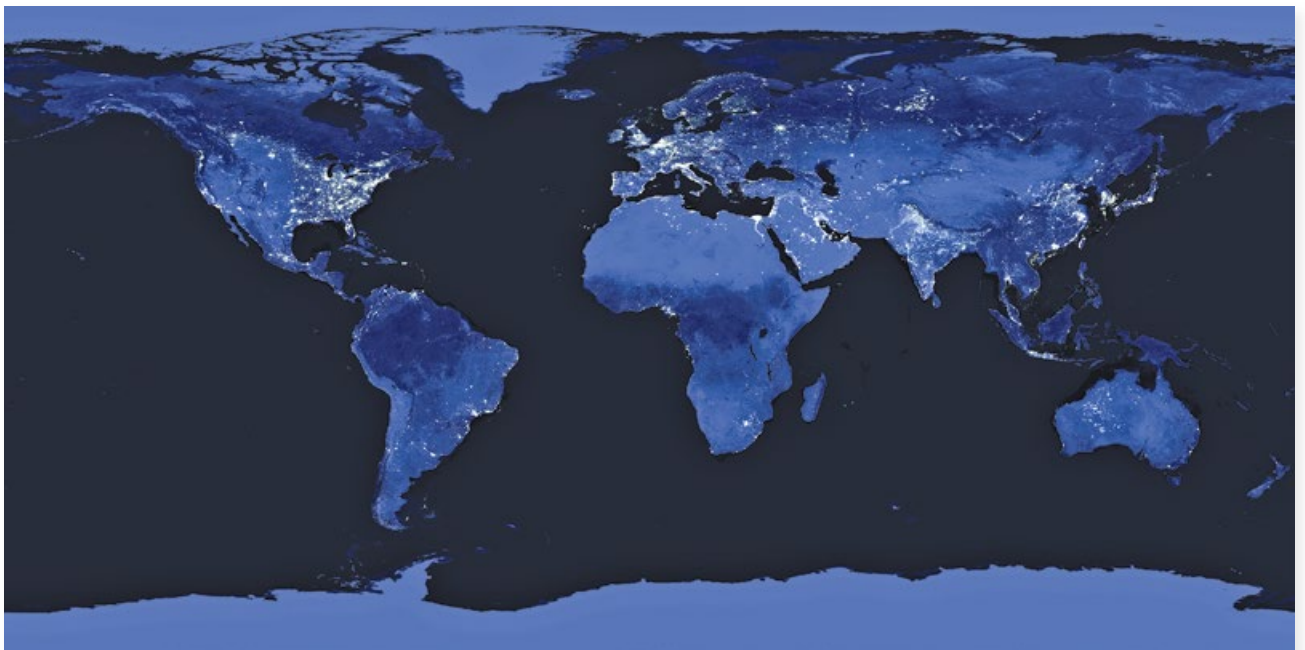
NASA 'Nighttime Lights of the world' visualisation, 2010

Few images have had a greater impact on contemporary metanarratives of global urbanisation than the 'nighttime lights of the world' series, initially synthesised during the 1990s in the National Geophysical Data Center (NGDC) in Boulder, Colorado, and subsequently improved through NASA's remote sensing networks. Data source: VIIRS DNB Nighttime Lights Composites, NOAA National Center for Environmental Information (NCEI).

What role do spaces beyond the city play in urbanisation, and how are they transformed through this process? City-building is a process of sociospatial concentration, but its preconditions and consequences are not confined to the city's immediate environs. The term 'hinterland' is used here to demarcate the variegated non-city spaces that are swept into the maelstrom of urbanisation, whether as supply zones, impact zones, sacrifice zones, logistics corridors or otherwise. Such spaces include diverse types of settlements (towns, villages, hamlets), land-use configurations (industrial, agrarian, extractive, energetic, logistical) and ecologies (terrestrial, oceanic, subterranean, atmospheric). We refer to explorations of such spaces, and their role in urbanisation processes, as engagements with 'the hinterland question'. Across the urban social sciences and design disciplines, the hinterland question is today considered secondary or even irrelevant to the study of urbanisation; the city, its dense socioeconomic networks and its powerful agglomeration economies occupy centre stage. In the age of planetary urbanisation, this position is untenable: city/hinterland relations lie at the heart of the contemporary urban problematic. And yet, these relations are today undergoing mutations that necessitate not only a repositioning of the hinterland question into the core of urban research and practice, but its radical reconceptualisation.

Cities Without Hinterlands?

Prior to the 1970s, the field of urban studies devoted extensive attention to the role of non-city landscapes in the urbanisation process. From Johann Heinrich von Thünen's early 19th-century model of the relationship between an isolated city and land-use differentiation in its agrarian hinterland, through the early 20th-century writings of Patrick Geddes, Lewis Mumford and Benton MacKaye on ecological regionalism, up through post-Second World War explorations of central place hierarchies and polarised regional development, city/hinterland relations were widely regarded as constitutive dimensions of the urban problematic.¹



During the last half-century, the hinterland has largely disappeared from urban theoretical discourse, or has been relegated to mere background status. Under conditions of accelerated geo-economic integration, splintering national economies, the rollout of neoliberal austerity programmes, cascading social, financial and ecological crises, and proliferating local growth initiatives, cities are increasingly viewed as self-propelled economic engines. Within this post-1980s approach to the urban question, the major emphasis is on the internal preconditions, dynamics and consequences of agglomeration. Urbanisation is understood as city growth *tout court* – in effect, as *cityisation* – rather than as a process that is actively supported by non-city spaces.²

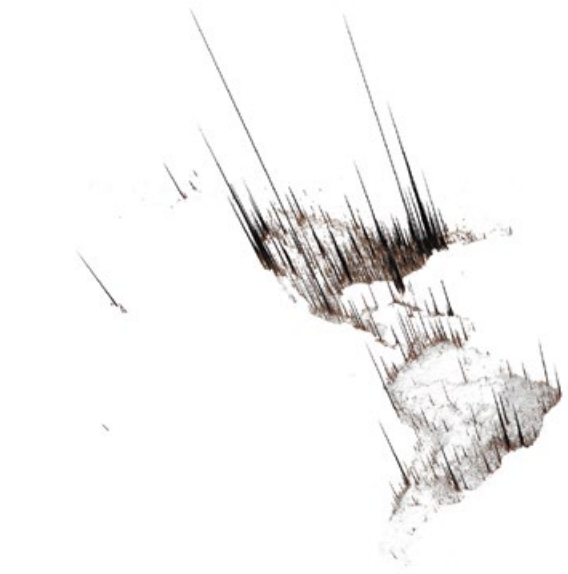
The empty, desolate and isolated condition to which the planet's hinterlands are thereby consigned is starkly illustrated in the image of the world's night-time lights, in which brightness is treated as a proxy for cityness. This excision of the hinterland's role in urbanisation is even more starkly spatialised in the influential concept of the 'spiky world' developed by urbanist Richard Florida.³ Here, cities are viewed as the nodal concentration points of global GDP. In both visualisations, non-city spaces appear as barren, depopulated, shapeless voids.

While the roots of this conceptualisation predate the 1970s, it was consolidated into a broadly shared episteme of urban studies following the erosion of Fordist-Keynesian, national-developmental capitalism. Debates on industrial clusters in the 1980s, global cities in the 1990s, postcolonial cities in the 2000s, and more recent assertions of a majority-urban world or 'urban age' represent but variations on an underlying vision of cities without hinterlands.

Counterpoint: Metabolic Urbanisation

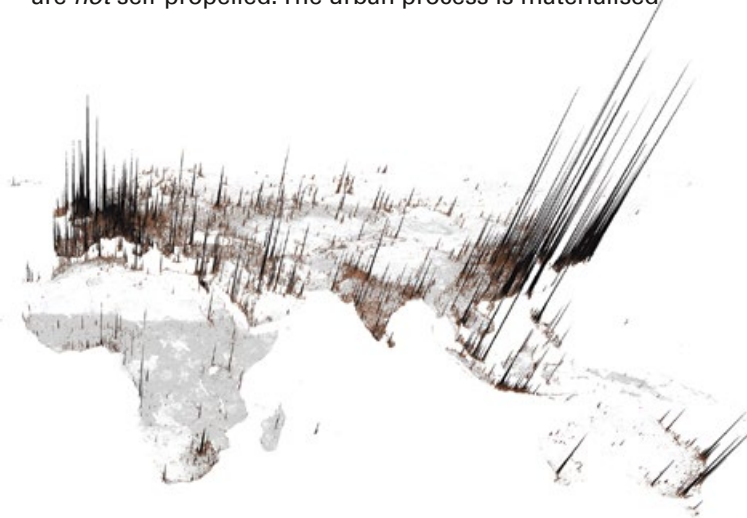
The major contemporary counterpoints to this hegemonic, city-centric approach to urban studies are associated with various streams of urban ecological thought. Despite their otherwise divergent agendas, these dissident approaches conceive urbanisation as a sociometabolic process. From this point of view, cities are supported by diverse metabolic inputs (labour, materials, fuel, water and food) and engender a range of metabolic byproducts (waste, pollution, carbon), the vast majority of which are produced within and, eventually, absorbed back into non-city zones. Such approaches articulate a multiscalar understanding of urbanisation that encompasses not only cities and metropolitan regions, but extended landscapes of primary commodity production, logistics and waste management. Metabolic approaches to urbanisation thus seek to connect the dynamics of agglomeration to a panoply of non-city geographies – for instance, of land enclosure, population displacement, deforestation, industrial agriculture, extraction, energetics, logistics, waste processing and ecological load displacement. The most significant streams of this literature include, among others, historical investigations of city/hinterland relations, such as William Cronon's study of Chicago and the US Midwest in *Nature's Metropolis*, or Gray Brechin's investigation of urbanising California in *Imperial San Francisco*; approaches to materials flow analysis by Marina Fischer-Kowalski, Helmut Haberl and their colleagues in the Institute of Social Ecology at Klagenfurt University; the investigation of 'teleconnections' through which land-use transformations in cities impact land-use change elsewhere developed by Karen Seto and her colleagues at Yale University; and the analysis of urban ecological footprints developed by William Rees and his colleagues at the University of British Columbia.⁴

The contemporary vibrancy of metabolic approaches to urbanisation underscores the continued centrality of hinterland questions to early 21st-century urban studies. These research traditions have contributed fundamental insights that unsettle the myopic narrowing of urban investigations to cities and intercity relations, while illuminating the myriad sociomaterial processes through which city development is supported by, and actively coevolves with, non-city spaces. Thus understood, cities are *not* self-propelled. The urban process is materialised



Neil Brenner and Nikos Katsikis, Visualisation representing cities and metropolitan regions as the 'spiky' concentration points for economic activities, 2010

Based on a disaggregation of national GDP data for the year 2010, this visualisation uses the approach popularised by Richard Florida in his article 'The World is Spiky' (*The Atlantic Monthly*, October 2005, pp 48–51). Hinterlands – the world's non-city spaces – are correspondingly represented as empty, barren and, by implication, economically marginal. Data source: UNEP – United Nations Environment Programme, 2012.

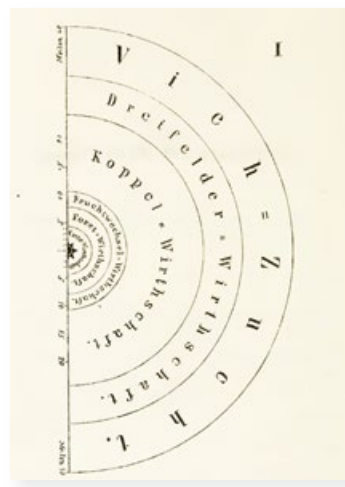


within city spaces while invariably exceeding them.⁵ City and non-city landscapes are thus dialectically co-produced under modern capitalism. The urban problematic can only be deciphered adequately through an approach that systematically connects them, at once in social, political, material, infrastructural and ecological terms.

The Hinterland Enigma

Despite its role in offering powerful scholarly counterpoints to the ideology of the self-propelled city, the bulk of contemporary urban ecological scholarship has confronted the hinterland question only indirectly. While studies of urban metabolism have exhaustively quantified the material and energetic flows that mediate city/hinterland relations, they have tended to bypass the question of how non-city spaces are reconfigured through these mediations. Consequently, the hinterland itself has remained something of a 'black box': metabolic flows move in and out, but what actually happens 'inside' the box, and how the latter has itself evolved, are not interrogated. The hinterland's internal political-economic operations, land-use matrices, property relations, spatiotemporal dynamics and socioecological crisis-tendencies thus remain enigmatic.

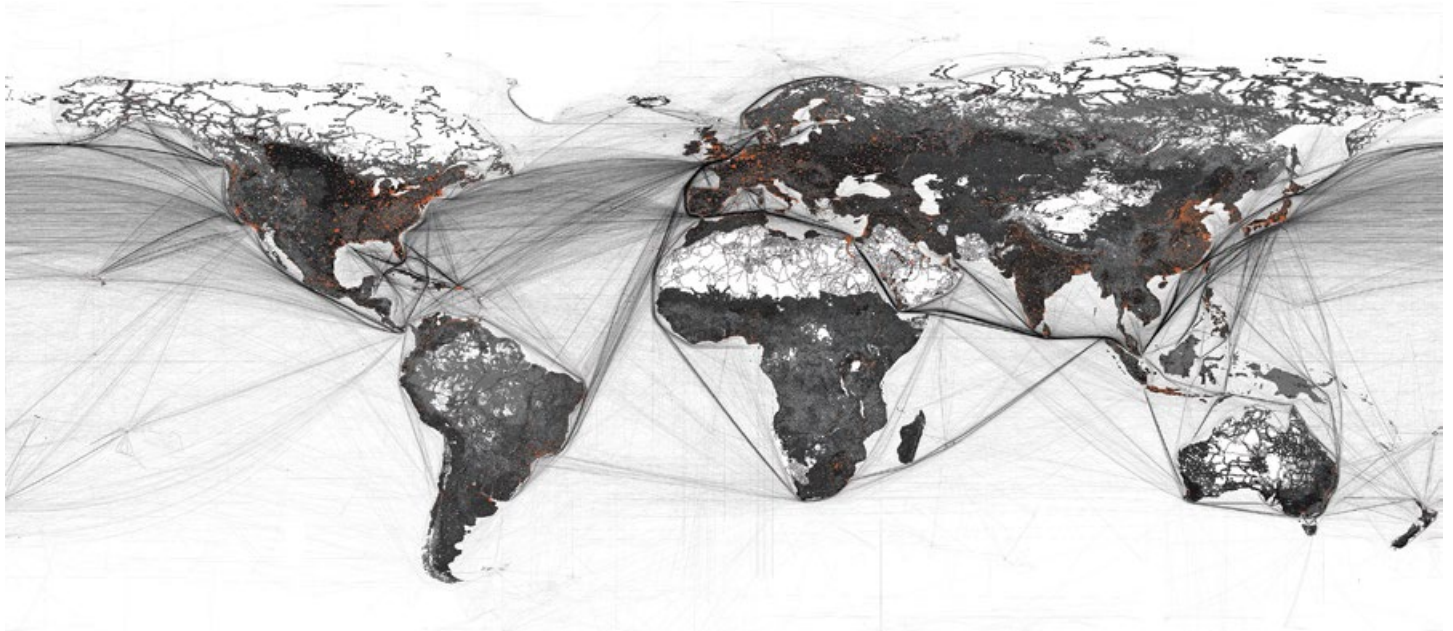
Many contemporary urban researchers appear to presuppose a conception of the hinterland that is derived from the mercantile period of capitalist development in which vonThünen constructed his famous account of the 'isolated state' (1826).⁶ Here, the hinterland is territorially contiguous with and directly linked to the city, which in turn serves as its market outlet and its manufacturing centre. Although commodity production is generalised, there is no structural impulsion to enhance labour productivity or to maximise crop yields. In this model, the non-city zone is, by definition, nonindustrial; land-use sorting occurs due to differential transport costs.



Johann Heinrich von Thünen, Model of city/hinterland relations under mercantile capitalism, 1826

Published in his *Der isolierte Staat in Beziehung auf Landwirtschaft und Nationalökonomie* (Friedrich Perthes, Hamburg, 1826), vonThünen's model shaped many subsequent generations of scholarship in urban economic geography. However, except in a few limit-cases of continued, dense metabolic interchange between settlements and their immediately contiguous supply zones, its basic assumptions have been superseded through the forward-motion of capitalist industrialisation.

The point here is not to assert that contemporary urbanists self-consciously embrace vonThünen's conception of a contiguous, nonindustrial hinterland, but to suggest that some version of this 19th-century model continues to shape our collective imagination of non-city landscapes, which are thereby reduced to an amorphous 'ghost acreage' of 'emptied spaces, homogeneous blanks yet to be inscribed by human history'.⁷ As a result, scholars have only rarely sought to decipher the specific patterns and pathways through which hinterlands have been creatively destroyed since the 1850s, even though such transformations have been as far-reaching as those that are commonly ascribed to the crisis-riven remaking of cities' own built environments during the same period. Investigating such mutations will require new conceptualisations of city/hinterland matrices in relation to emergent geographies and ecologies of planetary urbanisation.⁸



Neil Brenner and Nikos Katsikis, Map visualisation juxtaposing a demarcation of the world's metropolitan agglomerations onto a rendering of the entire planet's total 'used area' at the beginning of the 21st century

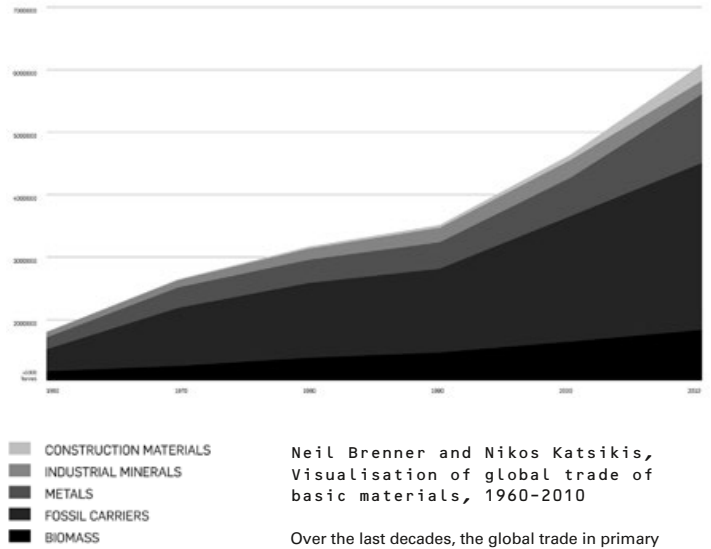
Metropolitan agglomerations are shown in red and the planet's 'used area' is shown in black and grey. Agglomeration zones constitute only a minuscule percentage of the planet's operationalised landscapes, which are mostly devoted to primary commodity production (agricultural cultivation, grazing, forestry), resource extraction, logistics and waste disposal. Data sources: European Commission Joint Research Center, 2016, Global Human Settlement Layer; K-H Erb, V Gaube, F Krausmann, C Plutzer, A Bondeau and H Haberl, 'A Comprehensive Global 5 Min Resolution Land-Use Dataset for the Year 2000 Consistent with National Census Data', *Journal of Land Use Science*, 2 (3), 2007, pp 191-224; and Vector Map Level 0 (VMaP0) dataset released by the National Imagery and Mapping Agency (NIMA), 1997.

Hinterlands of the Capitalocene

How, then, to conceptualise the role of hinterlands in supporting and buffering the metabolic dynamics, rifts and crisis-tendencies of urbanisation under capitalism? This challenge is, on the one hand, a conceptual one insofar as it requires us to rethink the very nature of hinterlands in the age of capital, or 'Capitalocene'.⁹ It is, equally, one that will require critical appropriations of newly available sources of geospatial data, which may offer a powerful basis for investigating the contemporary rearticulation of land uses, built and unbuilt environments, and political ecologies around the world.¹⁰

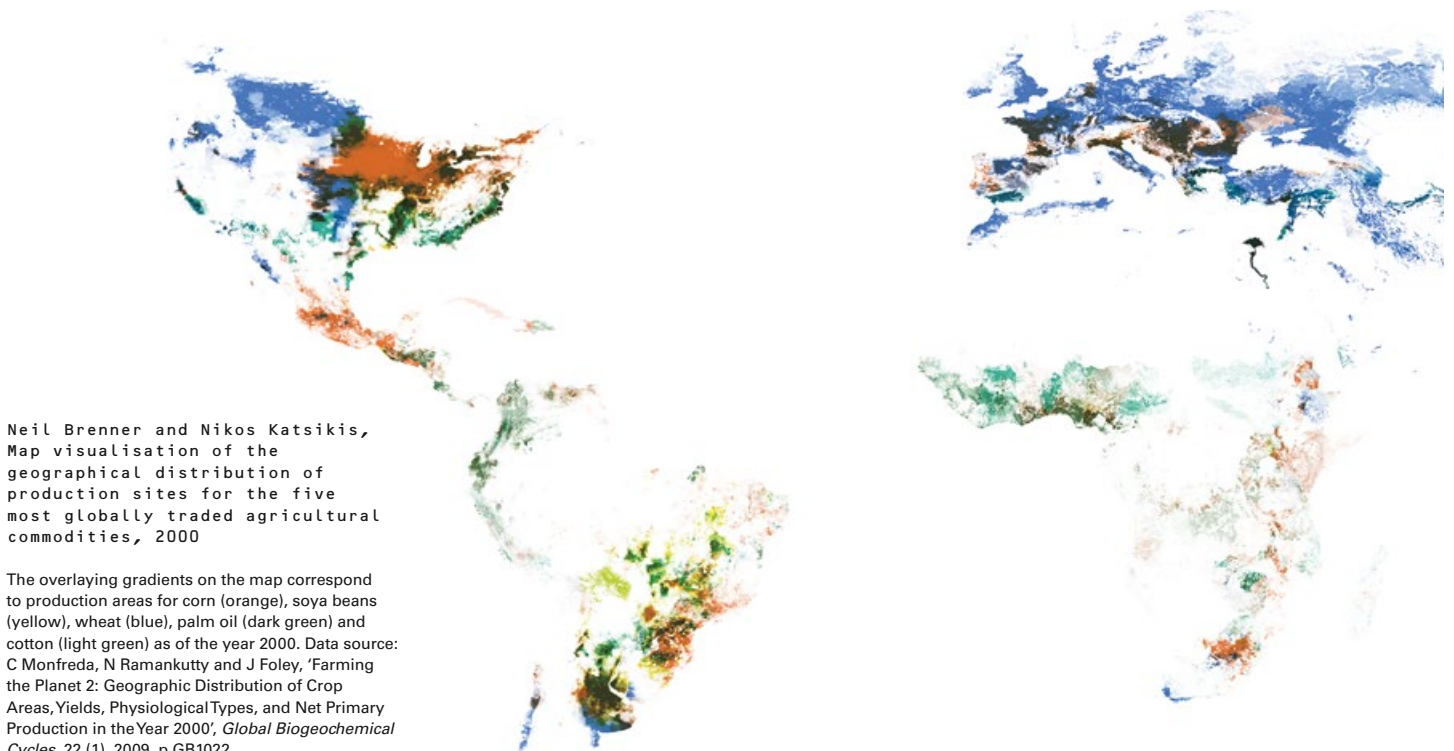
It is not sufficient to posit that such non-city 'outsides' are constitutively important for city-building processes, or to focus on measuring the role of such spaces as 'taps' and 'sinks' for the metabolic dynamics of capitalist urbanisation. While this vast planetary hinterland covers nearly 70 per cent of the earth's terrestrial surface, and is densely layered with productive, extractive, circulatory and informational infrastructure, it has remained an obscure background to the study of contemporary urbanisation. It is precisely in this sense that the 'black box' of the hinterland must be opened and systematically rearticulated to the central agendas of urban studies. What is required is a framework that can connect historically and geographically specific forms of city and non-city space as coproduced, coevolving moments within the combined, uneven, variegated and crisis-riven world-ecologies of capitalist urbanisation.

The development of such a framework requires systematic elaboration elsewhere. Here, it must suffice to offer some initial generalisations regarding four key mutations of city/hinterland relations that have been particularly pronounced during the last half-century. These relatively abstract propositions are not intended to foreclose more contextually embedded lines of enquiry, but to stimulate further reflection, investigation and debate regarding the restlessly churning dynamics of planetary urbanisation.



Neil Brenner and Nikos Katsikis, Visualisation of global trade of basic materials, 1960-2010

Over the last decades, the global trade in primary commodities – such as agricultural and forestry products (biomass), fossil fuels, industrial minerals, metals and construction materials – has increased more than threefold. This reflects the increasing globalisation of hinterland economies. Data source: F Krausmann, S Gingrich, N Eisenmenger, K-H Erb, H Haberl and M Fischer-Kowalski, 'Growth in Global Materials Use, GDP and Population During the 20th Century', *Ecological Economics*, 68 (10), 2009, pp 2696-705.



Neil Brenner and Nikos Katsikis, Map visualisation of the geographical distribution of production sites for the five most globally traded agricultural commodities, 2000

The overlaying gradients on the map correspond to production areas for corn (orange), soya beans (yellow), wheat (blue), palm oil (dark green) and cotton (light green) as of the year 2000. Data source: C Monfreda, N Ramankutty and J Foley, 'Farming the Planet 2: Geographic Distribution of Crop Areas, Yields, Physiological Types, and Net Primary Production in the Year 2000', *Global Biogeochemical Cycles*, 22 (1), 2009, p GB1022.

Distanciation and Infrastructuralisation

First, primary commodity production has been globalised and specialised, causing local, contiguous hinterlands to be enmeshed within specialised, export-oriented transnational production networks. Contiguous hinterlands remain important, but are no longer the norm, either in the older industrialised world or in most Southern megacities. This implosion-explosion of hinterland zones has been animated by capital's drive to increase labour productivity and extend interspatial connectivity, both of which entail the construction of large-scale infrastructural configurations.¹¹ While such strategies may temporarily boost profits, they also increase the organic composition of capital, as living labour is replaced by machinery, equipment and infrastructure. This leads to the precipitous decline of the non-city workforce ('depeasantisation'), accompanied by the social and cultural hollowing-out of rural regions, the establishment of robotised, monofunctional landscapes, and massive ecological devastation as parts of the countryside become 'sacrifice zones' for capital.

Hinterlands of Hinterlands

Second, as they are embedded within global supply chains, hinterlands lose their articulation to specific zones of direct consumption, urban or otherwise. The linear directionality of von Thünen's classic model – in which each hinterland has 'its' city, and each city 'its' own hinterland – is thus no longer a reliable guide. The point is not simply that contemporary cities' hinterlands are more distanciated than previously, but that their operational logics, infrastructural configuration, metabolic relays and developmental dynamics have been qualitatively transformed. On the one hand, most of the world's most productive, specialised and export-oriented hinterlands circulate their outputs to a multitude of metropolitan agglomerations, or across the global metropolitan network as a whole. Just as importantly, many zones of primary commodity production are now most directly articulated not to major cities and metropolitan regions, but to other productive landscapes of cultivation, extraction, processing and distribution, which are in turn embedded and intermeshed within an intercontinental logistics space. This situation is exemplified in the monocrop soya-bean landscapes of Amazonia, whose outputs are mostly exported as cattle feed to Chinese livestock hinterlands; in the export of phosphate fertiliser from Central Florida to Brazilian agro-industrial hinterlands; or in the use of hydroelectric dams to power the extractive hinterlands of northern Chile.

From Formal to Real Subsumption

Third, most forms of primary commodity production have remained heavily contingent upon the extrahuman geographies of the earth system (for instance, soil and weather conditions, water availability, or resource deposits) which can only be modified through significant industrial investment (for instance, in fertiliser, greenhouses, irrigation systems and other sociotechnical 'fixes'). Historically, therefore, the industrial operationalisation of hinterland spaces has occurred through strategies to establish new resource frontiers and, as the latter are exhausted, through compensatory efforts to intensify techno-extractive logics.

In both moments of this process, new industrial infrastructures are established and intensively operationalised before being superseded through capital's restless sociotechnical dynamism. Many contemporary hinterlands, therefore, are no longer zones of mere 'formal subsumption' in which inherited socioecological resources are appropriated as commodities for external market exchange. Insofar as the geographies and ecologies of non-city zones have themselves been systematically redesigned in order to intensify and accelerate capital's turnover time, a 'real subsumption' of hinterland spaces appears to be under way.¹² In this manner, many erstwhile hinterlands, or parts thereof, are transformed into configurations of large-scale territorial-ecological machinery: mechanised assemblages of human and nonhuman infrastructure oriented towards capital accumulation within a planet-encompassing profit-matrix.

Metabolic Rifts and Cycles of Creative Destruction

Fourth, the proliferation of specialised, capital-intensive, infrastructurally elaborate and globally interdependent zones of primary commodity production reveals not only the ways in which inherited human and nonhuman landscapes have been commodified, but the progressive exhaustion of their capacity to contribute 'ecological surpluses' to sustain and stimulate the accumulation process.¹³ The proliferation of such metabolic rifts further accelerates capital's drive to mechanise hinterland geographies, at once through the substitution of manufactured inputs into the production process and through the construction of colossal techno-infrastructural configurations.¹⁴ The hinterlands of the Capitalocene are, therefore, chronically unstable.

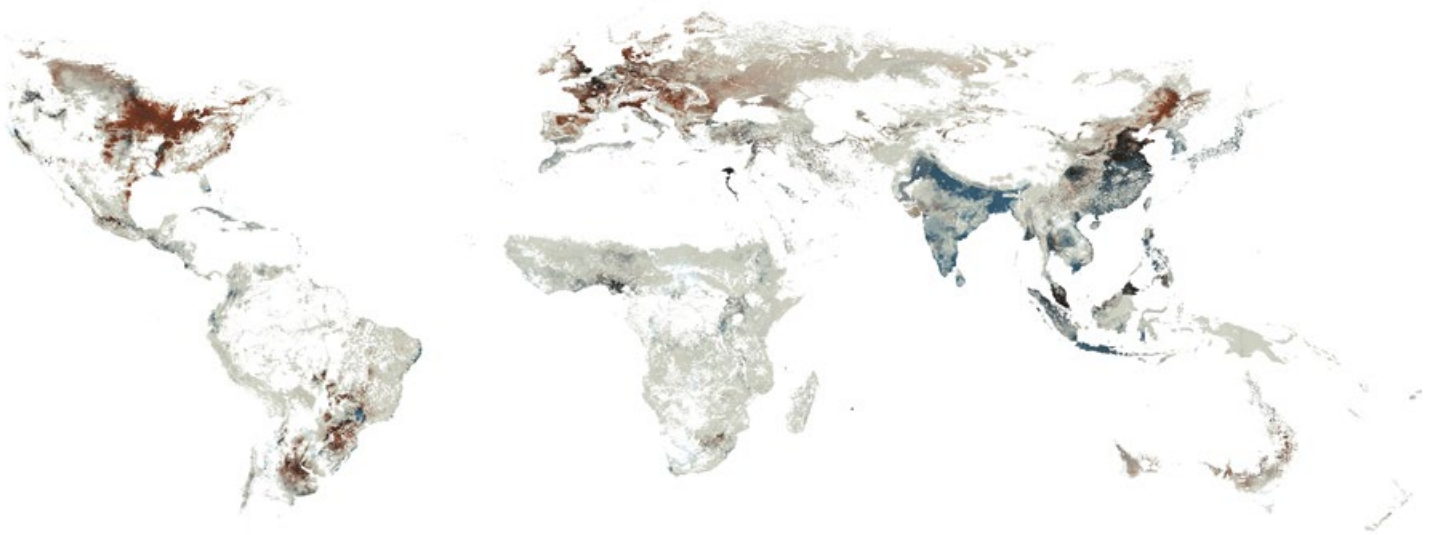
As ecological surpluses are exhausted, the resultant metabolic rifts severely destabilise prevalent regimes of accumulation. Consequently, established hinterland infrastructures are rendered obsolete, even though their sociotechnical capacities may have been only partially amortised. This leads to intense struggles over the choreography, form, social impacts, ecological costs and future pathways of landscape and territorial transformation.

Neil Brenner and Nikos Katsikis, Map visualisation of food, feed and biofuel cropland areas, 2000

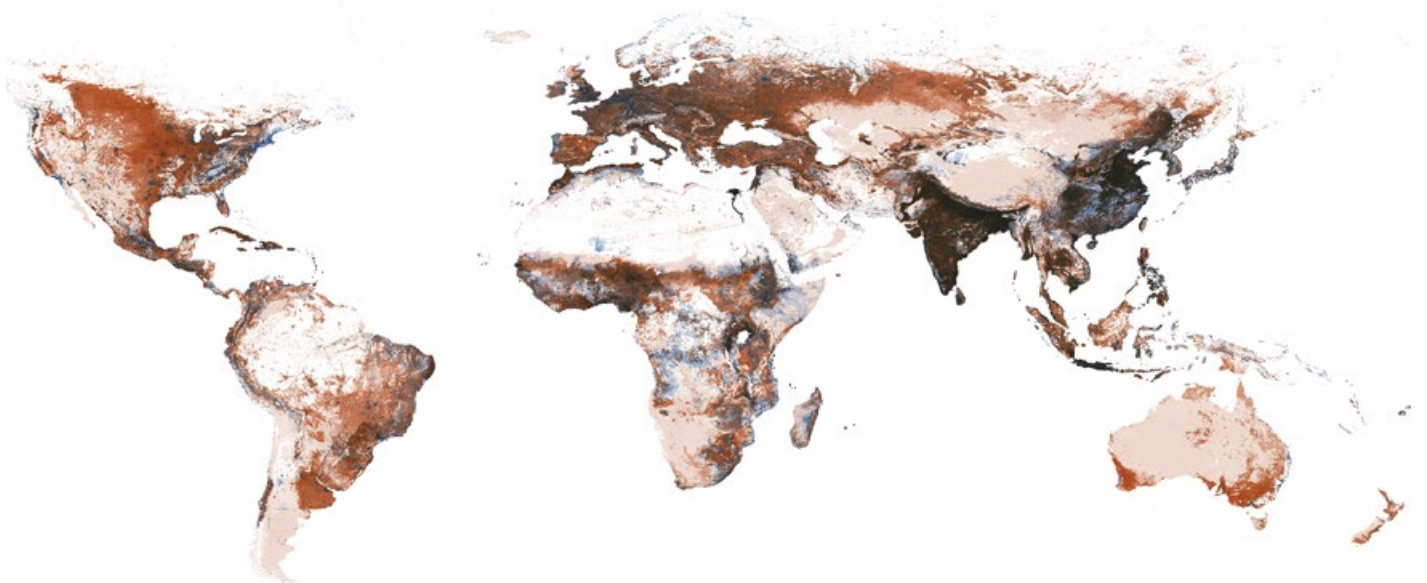
opposite top: The overlaying gradients on this composite map correspond to cropland areas dedicated to food production (blue) and to feed or non-food uses, such as energy and industrial inputs (red) as of the year 2000. Insofar as they supply specific industrial inputs to other hinterlands (for example, cattle feed to livestock production zones, or biofuel to the energy sector), the red zones represent hinterlands of hinterlands. Data source: E Cassidy, P West, J Gerber and J Foley, 'Redefining Agricultural Yields: From Tonnes to People Nourished Per Hectare', *Environmental Research Letters*, 8 (3), 2013, p 034015.

Neil Brenner and Nikos Katsikis, Map visualisation of population densities and expansion of agricultural production zones, 1800 and 2000

opposite middle and bottom: The overlaying gradients on this composite map depict worldwide population densities (blue) and the distribution of agricultural production zones (red) between the years 1800 (top) and 2000 (bottom). Data source: HYDE 3.1 Spatially Explicit Database of Human Induced Land Use Change Over the Past 12,000 Years (2011).



As ecological surpluses are exhausted, the resultant metabolic rifts severely destabilise prevalent regimes of accumulation

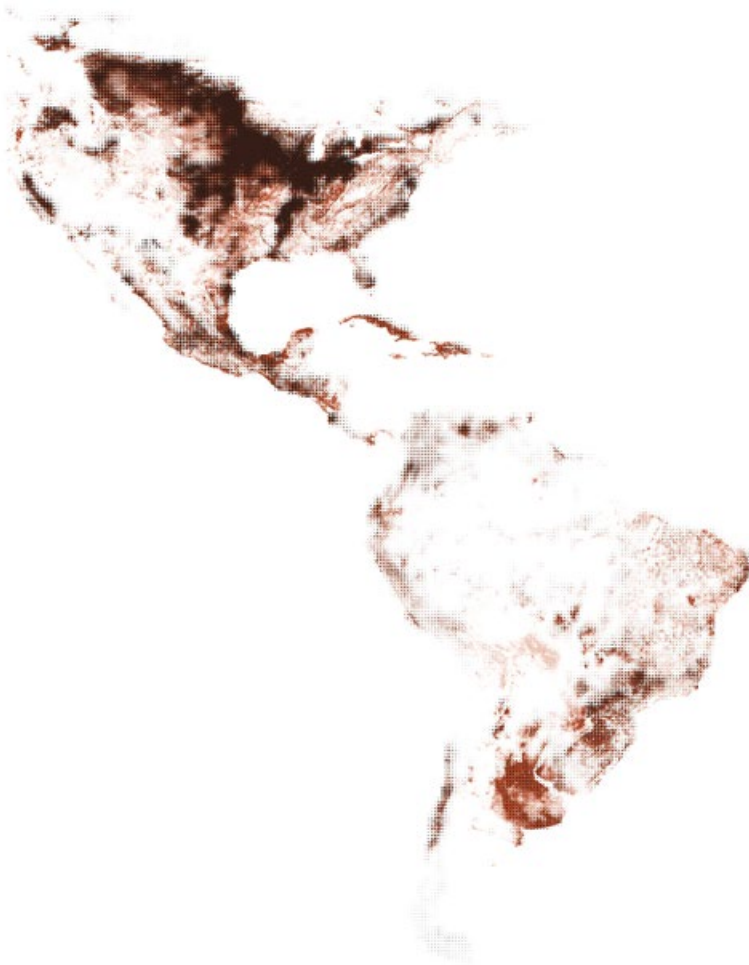


Will the violent, profit-driven illogics of planetary urbanisation continue to degrade, erode and destroy the fabric of social, political and ecological existence?

For this reason, any contemporary approach to the hinterland question must consider the systemic vulnerabilities of those non-city spaces that have been forged to support the globalising, profit-maximising dynamics of supply-chain capitalism.

The Hinterland Question, Reframed

Under contemporary conditions, there is no singular hinterland of 'the' city. Instead, non-city productive landscapes have become more specialised, infrastructurally dense and industrially intensive, and they are intermeshed with one another through extended material, operational and informational linkages, as well as through their continuous but largely indirect exchanges with (strategic nodes within) the global metropolitan network. However, the operational landscapes of planetary urbanisation are hardly a stable foundation for territorial development, social reproduction or ecological security. Indeed, even as they support enhanced industrial productivity and the



accelerated, long-distance circulation of commodities, the hinterlands of the Capitalocene expose local territories and communities to increasing turbulence, risk and precarity, while systematically degrading the ecological preconditions of both human and nonhuman life.

How, and by whom, has this planetary urban fabric been forged? What are its social, political, institutional, regulatory and ecological preconditions? What are its major contradictions, crisis-tendencies and vulnerabilities? Can the massive sociotechnical capacities it has unleashed somehow be harnessed to support more just, democratic, nonviolent, culturally vibrant and ecologically sane forms of collective existence? Are there alternative forms of urbanisation, planetary or otherwise, and can their sociometabolic dynamics be reflexively designed, negotiated and institutionalised through political agency? Or will the violent, profit-driven illogics of planetary urbanisation continue to degrade, erode and destroy the fabric of social, political and ecological existence? These are among the most urgent dimensions of the hinterland question in the Capitalocene. ▫

Notes

1. For an overview see: Nikos Katsikis, *From Hinterland to Hinterglobe: Urbanization as Geographical Organization*, Doctor of Design (DDes) thesis, Graduate School of Design (GSD), Harvard University (Cambridge, MA), 2016.
2. Edward W Soja, *Postmetropolis*, Blackwell (Oxford), 2000.
3. Richard Florida, 'The World is Spiky', *The Atlantic Monthly*, October 2005, pp 48–51.
4. For overviews and detailed citations of these literatures, see Katsikis, *From Hinterland to Hinterglobe*, *op cit*.
5. See Henri Lefebvre, *The Urban Revolution* [1970], trans Robert Bononno, University of Minnesota Press (Minneapolis), 2003; and Neil Brenner (ed), *Implosions/Explosions: Towards a Study of Planetary Urbanization*, Jovis (Berlin), 2013.
6. Johann Heinrich von Thünen, *Von Thünen's Isolated State* [1826], trans Carla M Wartenberg, ed Peter Hall, Pergamon Press (Oxford), 1966.
7. Gavin Bridge, 'Resource Triumphalism: Postindustrial Narratives of Primary Commodity Production', *Environment and Planning A*, 33, 2001, p 2154.
8. See Neil Brenner and Christian Schmid, 'Towards a New Epistemology of the Urban?', *CITY*, 19 (2–3), 2015, pp 151–82; Katsikis, *From Hinterland to Hinterglobe*, *op cit*; and Brenner, *Implosions/Explosions*, *op cit*. These texts explain in more detail the specific conceptualisation of planetary urbanisation we are presupposing here.
9. On the 'Capitalocene', see Jason W Moore (ed), *Anthropocene or Capitalocene?*, PM Press (Oakland, CA), 2018.
10. Neil Brenner and Nikos Katsikis, *Is the World Urban? Towards a Critique of Geospatial Ideology*, Actar (Barcelona), forthcoming 2020.
11. David Harvey, *The Limits to Capital* [1982], Verso (London), 2018.
12. William Boyd, W Scott Prudham and Rachel A Shurman, 'Industrial Dynamics and the Problem of Nature', *Society and Natural Resources*, 14 (7), 2001, pp 555–70.
13. Jason W Moore, *Capitalism in the Web of Life*, Verso (London), 2015.
14. David Goodman, Bernardo Sorj and John Wilkinson, *From Farming to Biotechnology: A Theory of Agro-Industrial Development*, Blackwell (New York), 1987.



Neil Brenner and Nikos Katsikis,
Map visualisation of nitrogen fertiliser
use in relation to the distribution
of cropland areas worldwide,
2000

Since 1950, fertiliser use has increased ninefold, while total cropland area has expanded by less than 30 per cent. This composite map depicts annual levels and locations of nitrogen fertiliser use (black-dotted pattern) in relation to the global distribution of cropland zones (red gradient). Data sources: N Ramankutty, AT Evan, C Monfreda and JA Foley, *Global Agricultural Lands: Croplands, 2000*, SEDAC (Palisades, NY), 2010, and P Potter, N Ramankutty, EM Bennett and SD Donner, *Global Fertilizer and Manure, Version 1: Nitrogen Fertilizer Application*, SEDAC (Palisades, NY), 2012.