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14

BEYOND THE OPERATIONAL LANDSCAPE

Nikos Katsikis

At the beginning of the 21st century, more than 70% of planetary landscapes had been transformed by anthropogenic processes.[1] I argue that to a significant degree, these transformations reflect intensifying processes of globalised, capitalist urbanisation, linked to the accelerated social and ecological crises of today. Yet, the "urban" landscapes of cities, and other forms of large and dense human settlements, cover no more than 3–4% of the planetary land surface.[2]

The rest of the 70% of anthropogenic landscapes consists mostly of agricultural areas, grazing and forestry zones, resource extraction sites, and the transport corridors that tie them together through road and rail transportation networks.

These landscapes of primary production, circulation and waste disposal are predominantly configured to support urban life, the production and reproduction of social and economic life in the planet's dense and large settlements (Brenner and Schmid 2015; Brenner 2014). They are the metabolic "hinterlands" of planetary urbanisation. Over the past two centuries, through successive waves of capitalist development and capitalist urbanisation, these landscapes have been increasingly globalised, specialised and embedded in the capitalist search for profit. They have become "operational landscapes": landscapes configured towards the extraction of profit through the exploitation of human natures, and the appropriation of more than-human-natures (Katsikis 2016, 2018; Brenner and Katsikis 2020). Operational landscapes are profit landscapes, forms of territorial organisation in which social and ecological value is collectively produced, through the spatial articulation of social, technical and ecological systems, but to a significant extent privately appropriated. This contribution critically examines the "operational landscape mode of production" as the basis of social and ecological inequality and environmental degradation, and explores what would be the trajectories along which an alternative configuration of a planetary urban metabolism could be envisioned.

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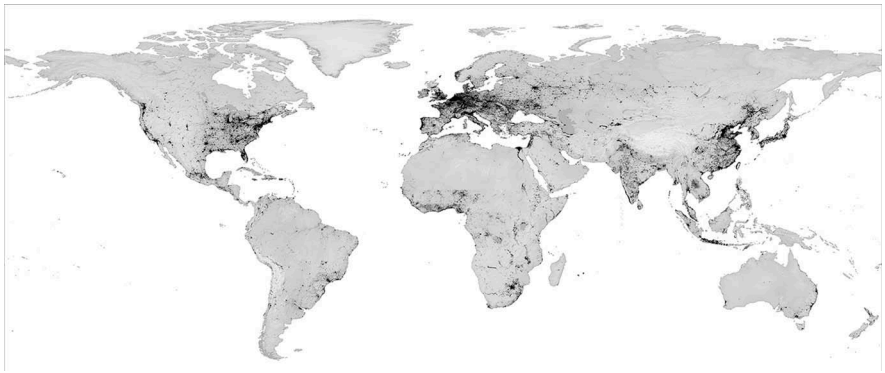

FIGURE 14.1 The planetary footprint of Human Settlements in 2023: GHS-SMOD R2023A - GHS settlement layers, application of the Degree of Urbanisation methodology (stage I) to GHS-POP R2023A and GHS-BUILT-S R2023A, multitemporal (1975–2030) European Commission, Joint Research Centre (JRC)).
Source: Schiavina, Melchiorri, and Pesaresi (2023).

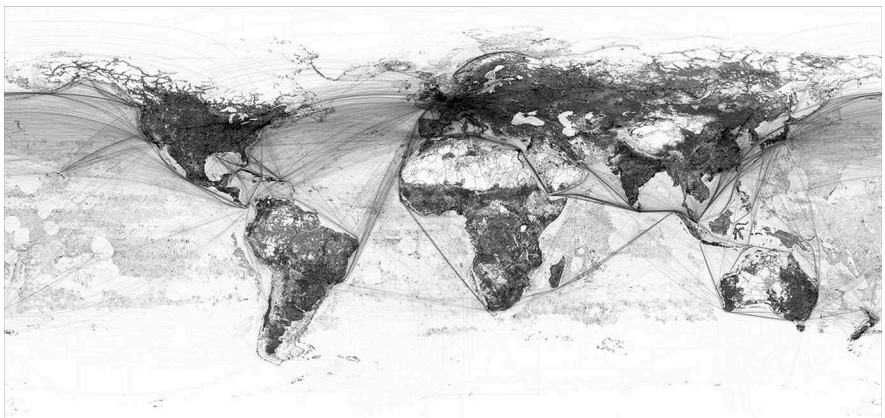

FIGURE 14.2 The anthropogenic operationalisation of the planet at the beginning of the 21st century.
Source: European Commission Joint Research Centre, 2023, Global Human Settlement Layer; Haberl. "A comprehensive global 5min resolution land-use dataset for the year 2000 consistent with national census data." *Journal of Land Use Science* 2 (3), 191–224; Vector Map Level 0 (VMap0) dataset released by the National Imagery and Mapping Agency (NIMA), 1997; Open Flights; Global Fishing Watch.

Urbanisation as geo-metabolic interdependency

How does urbanisation shape planetary landscapes and planetary life? Urbanisation is often reduced to the process of concentration of people in cities and

the resulting growth and expansion of these large and dense settlements themselves.[3] But if considered at a more abstract level, urbanisation can be conceived as a particular pattern of geographical organisation connected to the specific forms of social and spatial division of labour that emerge out of the concentration of population and economic activities in dense settlements (Bairoch 1988). This pattern is not only reduced to the structure and patterns of settlements but also to the ways they relate to the broader, more-than-city landscapes that support their metabolism (Barles and Knoll 2019). What I propose here is that the essence of urbanisation is not the condition of concentration per se, but rather the condition of bio-geographical interdependency that emerges out of it (Katsikis 2016). The more people concentrate in dense areas of inhabitation, the more these spatial configurations depend upon a wide web of primary production landscapes to fulfil their metabolic needs. In a sense, and following this conceptualisation, urbanisation can be considered as the opposite condition of subsistent forms of inhabitation: it is a mode of geographical organisation that is deeply linked with the thickening of a state of bio-geographical interdependency between a multitude of landscapes across scales. Thus, the pattern through which urbanisation organises geography is not just the spatial distribution of cities, but also the pattern and spatial distribution of the operational landscapes of primary production, circulation and waste disposal that enables them.

As urbanisation becomes generalised and globalised, the condition of bio-geographical interdependency tends to integrate the whole used area of the planet, leading into more and more specialised and polarised patterns of social and spatial division of labour and work (Lefebvre 2003; Jacobs 2016). This geographical configuration is also connected to the increasingly thickening and expanding fabric of urbanisation, which does not only include the densely built areas of agglomeration zones, but also extends to the soft and hard structures and infrastructures that equip the planetary matrix of operational landscapes (Katsikis 2018). The more fixed capital is embedded into this planetary urbanisation fabric, the more sclerotic it becomes, crystalising in certain forms and configurations that reflect, but also restrict, the associated patterns of bio-geographical interdependency (Harvey 2001).

This pattern of bio-geographical organisation connected to urbanisation is also resulting in a particular pattern of geographical organisation of social and ecological "value". And while, from an economic perspective, cities are often considered "economic engines" (Glaeser 2011; Jacobs 2016), the core economic zones where most economic activities are clustered and more interactions happen (resulting in high GDP), from an ecological perspective, cities can be conceived as "ecological black holes" (Rees and Wackernagel 2008). The laws of thermodynamics suggest that all human activity on earth, as well as the activity of the rest of the living organisms is sustained entirely through low entropy from energy that is produced externally to the ecosystem of the planet (the sun), flows in and becomes transformed through biophysical processes, like

photosynthesis. As a result, it could be inferred that all economy is consumption of ecological value produced either on a daily basis, or over millions of years, like fossil fuels (Baccini and Brunner 2023). And while economically speaking, value can be produced at any point in the processing of a product (activities mostly concentrated in cities), from an ecological perspective, any type of production of physical artifacts is actually a consumption of energy and resources (Barles 2019). For agglomerations, which are the major centres of human activity, this means a rather particular interpretation: cities are consumption points, sustained by the ecological value produced by the worldwide web of operational landscapes, which are in turn developed and transformed by capital means developed through cities, in a dialectically interdependent process that largely organises geography and life on the planet. Under capitalist urbanisation, this relationship takes a particular form, one that is guided not by the search for just, efficient, and balanced forms of production and distribution of ecological value, but rather by the search for profit (Brenner and Katsikis 2020). Operational landscapes are revealed as more-than-city, more-than-human, profit landscapes, through which the reproduction of material life is deeply interwoven with the production and reproduction of surplus value.

Landscape operationalisation and operational landscapes

Operational landscapes are the metabolic "hinterlands" of the Capitalocene, the landscapes that constitute the material basis of the urbanised geographies of planetary urbanisation. As operational landscapes are predominantly dedicated to the production and circulation of primary commodities, they are deeply interwoven with more-than-human systems. They are the terrains where nature becomes 'a universal means of production in the sense that it not only provides the subjects, objects, and instruments of production, but is also in its totality an appendage to the production process' (Smith 2008, p. 71). Nature is produced through the operationalisation of landscapes, but production across operational landscapes also happens through nature. Thus, operational landscapes play a central role in putting nature at work in the production and circulation of surplus value, as part of a capitalist world ecology (Moore 2015a, 2016).

The concept of the ecological surplus, introduced by Jason Moore, allows for a more precise investigation of this exact process (Moore 2015b). Central to the concept, is a distinction between labour and work, both of which are mobilised in the process of capitalist production. For Moore, capitalism does not only extract value out of the exploitation of paid work (wage labour), but also through unpaid work, work that is, for example, embedded in the process of reproduction of the labour force. What is important however, is that unpaid work is not restricted to humans: it can also refer to processes of the natural environment. For example, the growth of a plant, photosynthesis in general, geological processes that produce minerals, the water cycle, all require some kind of "work" to be performed, work that, when appropriated through the

production process, remains unpaid. Based on this conceptualisation, the ecological surplus is defined as the ratio of the actual capital investment in paid work (wage labour), fixed capital, and raw materials to the unpaid work that is mobilised through it from human and more-than-human agents.

The spatialisation of the struggle for the successful appropriation of this unpaid work is one of the core drivers of the multidimensional operationalisation of production and circulation landscapes across scales. Building upon Swyngedouw (1992), operational landscapes can be conceived as forms of "territorial organization" in which social, technical, and natural systems are spatially assembled constituting the basis of capitalist production. These territorial configurations are not passive (a mere reflection of systems of production) but serve as active agents, through the emergence of positive or negative externalities: the spatial convergence of territorial elements such as natural resources and conditions, the work of plants and animals, social investments in structures and infrastructures, regulatory, cultural and labour conditions, even the patterns of settlements, and the distributions of human and more-than-human densities, can lead to unplanned collective advantages or disadvantages. What is important to highlight is that while forms of territorial organisation are collectively produced, their positive externalities are mostly privately appropriated, while the negatives are often collectively mitigated, creating tensions leading to social and ecological inequality.

Resolving the geometabolic interdependencies of urbanisation in the Capitalocene is interwoven with the operationalisation of landscapes of primary production, circulation, and waste disposal, where evolving forms of territorial organisation become part of the broader striving to extract ecological surplus through the geographically specific spatial articulation of bundles of human and more-than-human work. As primary production is to a large degree grounded in the specificities of natural geographies and natural processes, the construction of operational landscapes of primary production can be conceptualised as a constant effort to extract ecological surplus across two frontiers: on the one hand, through the expansion of geographical frontiers, allowing access to areas of untapped resources; and on the other hand, through the conquest of the biochemical frontiers (such as through genetic engineering), allowing access to the processes of natural work, and thus its exploitation (Katsikis 2023).

The "frontier condition" can be conceptualised as a condition that allows the maximisation of ecological surplus, the appropriation of high amounts of unpaid work for relatively low amounts of capital investment, a condition however that for Moore cannot be sustained: as the capacity of nature to contribute free work to the system is exhausted, and negative externalities are generalised, the ecological surplus has the tendency to fall (Moore 2015b). Resource deposits are exhausted, soils cannot be replenished, forests are logged, all leading to the need to substitute the exhausted "productivity" of natural systems through capital investment, which decreases the amount of ecological

surplus and leads to pressure to reinvent novel bundles of cheap labour, food, energy, and raw materials, what Moore calls the "four cheaps" (Moore 2015b). The endless search for profit through the constant reconfiguration of bundles of the four cheaps that would allow for high degrees of ecological surplus constructs and reconstructs assemblages of operational landscapes of primary production and circulation across the planetary terrain.

A generic scheme of operationalisation of primary production landscapes would see initial investments in surveying and transport to allow for expansion of geographical frontiers, which, as they are slowly exhausted, would lead to increased investment in mechanisation and inputs to sustain productivity. With their initial ecological surplus exhausted, these landscapes would then depend more and more on the appropriation of new frontiers elsewhere across the geographical and geochemical domain. For instance in agriculture, the exhaustion of the initial fertility of the soil, would be countered through mechanisation, or expansion over biochemical and geographical frontiers around certain inputs (fertilisers, pesticides, energy), with high ecological surpluses in energy production eventually sustaining a high input agricultural metabolism, which would sustain cheap food and cheap labour, and thus a multitude of other opportunities for appropriating ecological surplus elsewhere in the system (Katsikis 2023). As ecological surplus tends to fall, operational landscapes depend more and more on increased capitalisation and the effects of economies of scale which lead to regional specialisation and landscape homogenisation of vast territories.

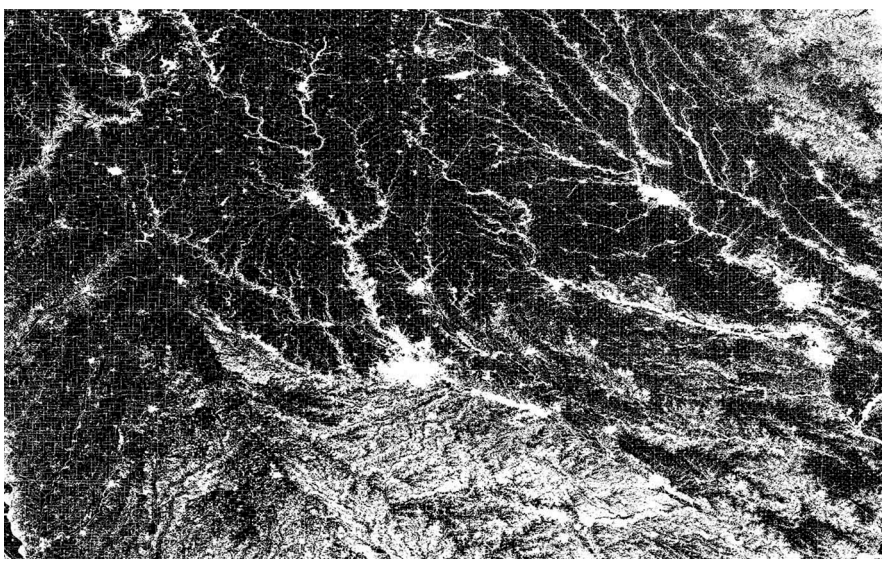

FIGURE 14.3 Corn and soybean monocultures in Iowa.
Source: Cropland Data Layer (CDL), hosted on CropScape, 2022, USDA.

The more these forms of territorial organisation become homogenised across the planet, the more interchangeable they are, turning productive landscapes from situated landscapes, to operational landscapes that can be connected and disconnected from the global system of commodity chains increasing the precarity of the local communities, and enhancing multiscalar patterns of socially and ecologically uneven development (Bergmann and Holmberg 2016).

With frontiers increasingly closing, and the capacities of more-than-human systems to contribute unpaid work diminishing, landscape operationalisation eventually leads to increased capitalisation: exhausted landscapes, that cannot reproduce themselves at the intensity and pace required by capitalist growth, and thus depend more and more, and eventually completely, on the injection of capital inputs. At their more "mature" state then, operational landscapes are landscapes that suffer from the exhaustion of potential further appropriation of bundles of ecological surplus, and are fully commodified and capitalised. Would this state of exhaustion suggest that the limits to capital lie at the complete saturation of ecological frontiers? Would it be possible to avoid and restore such a dramatic state of deterioration of ecological systems and the associated patterns of socio-ecological inequality?

Beyond the operational landscape

The operational landscape mode of production points to a dire future for the state of social and ecological reproduction. Transcending the operational landscape will depend upon the capacity of repurposing the planetary assemblage of the various devices of operationalisation towards primary production and circulation paradigms. That will be the result of planetary needs of human but also more than human agents, and not the search for endless growth and profit, and will construct collective forms of territorial organisation through which value can still be collectively harvested, and not privately appropriated. In recent years, an increasing number of alternative paradigms have been touching upon the question of transcending the operational landscape mode of production and its discontents, some more directly, and others only indirectly. In what follows I summarise three of the more influential ones, and explore their potential links to the hinterland question, and the alternatives to the operational landscape mode of production they seem to suggest.

The first framework and most directly linked to the question of urban metabolism can be framed as the ecoregionalist, or bio-regionalist paradigm.[4] This paradigm reflects a long history of efforts to define and establish the socio-ecological region as the appropriate unit of urban life, as well as of planning interventions.[5] These approaches typically emphasise the need for a conscious alignment of human activities with the natural characteristics and ecological boundaries of regions (Fanfani and Ruiz 2020). The regional concept introduces a situated approach that seems to operate within a specific, constrained scale. The situatedness promotes the maintenance and restoration of ecological

systems (recognising the interdependence of all living things within a bioregion) and cultural systems (valuing the unique cultural and historical identities that arise from specific natural settings, advocating for the preservation of local traditions and knowledge), but most importantly suggests a need for increased self-sufficiency (self-reliance). Bio-regionalism encourages local communities to become self-sufficient in terms of food, energy, and resources, reducing reliance on external systems and fostering local economies (Rees 2012). This general direction, reflected also in several of the contemporary efforts to shorten supply chains and localise primary production systems, is also linked to efforts to "regionalize" decision-making processes, linking them more to the scale of the social and ecological functions within the region, and making them inclusive and participatory, involving local communities in managing their natural and cultural resources more directly (Carr 2004).

The second influential paradigm that challenges the operational landscape mode of production can be excavated from discussions around circular economy, and circularity in spatial development.[6] Within the context of urban development, the goal of circularity is to create a sustainable urban environment where resources are used efficiently, waste is minimised, and the value of materials is maximised over time. This approach contrasts with the linear economy model of operational landscapes, and promotes "circular R-strategies" (from Refuse, Rethink, Reduce to Reuse, Repair, Refurbish, Remanufacture, Repurpose and eventually Recycle, Recover) that aim to narrow, slow down, and close resource loops (Egger et al. 2024). So far, most approaches to circularity have emphasised more the question of material flows and resources and less their spatial dimensions (Furlan et. al. 2022). With resource efficiency highlighted as a major goal, emphasis is placed on the configuration of resource cycles with closed loops, promoting recycling, reusing, and repairing materials, as well as efficient designs that enhance resource efficiency, such as energy-efficient buildings, water recycling systems, and green infrastructures. The question of waste is also central, with strategies to reduce waste generation at the source, including better product design and consumption patterns and encouraging the transformation of waste into new products and materials, through upcycling (Amenta and Van Timmeren 2018). Circularity approaches are also aligned with the general transition towards renewable energy sources (solar, wind, and bioenergy), connected to improved energy efficiency in buildings, transportation, and infrastructure to reduce overall energy consumption. Integrating urban farming and local food production into regional development patterns is also aligned with circularity goals, reducing food miles and closing metabolic loops.

The third recent influential paradigm, pushes for a general alternative to the capitalist imperative of growth driven development, brings together strategies toward degrowth. Degrowth advocates for a planned reduction of production and consumption in order to reduce environmental impact and improve quality of life (D'Alisa et al. 2014; Kallis et al. 2020). Degrowth approaches recognise the finite nature of Earth's resources and the need to live within these limits,

and call for deliberate downscaling of production and consumption to reduce environmental pressures, while redistributing wealth and resources more equitably within and between societies. Recent work linking degrowth to urban development processes critique the ways in which traditional urban development fosters economic competition, reinforces land scarcity ideologies, and perpetuates zoned property rights (Savini 2021). Applying degrowth to urbanisation processes is presented as a viable alternative, emphasising the reduction of economic activity to lessen environmental impacts, decouple urban development from growth imperatives, and focusing instead on sustainability and well-being. For Savini, key dimensions of urban degrowth include concepts such as "polycentric autonomism", which advocates for a regional imaginary where cities are seen as networks of autonomous, yet interconnected, settlements; "finitude in development", which calls for recognising and respecting the ecological limits of urban growth; and "habitability", emphasising the importance of creating liveable, human-centric urban environments, beyond consumerism and materialism (Savini 2021). Degrowth also seems to suggest a strong emphasis on local, regional scales, rethinking land use in terms of its relationship to local economic circuits, and ensuring that urban development aligns with the environmental capacities of specific regions, without "outsourcing" metabolic needs and negative externalities. However, Krähmer (2022) challenges the degrowth tendency to unquestionably treat the "local" as inherently preferable, rejecting the "local trap" (Purcell 2006). Instead, he calls for acknowledging complex spatial entanglements and emphasises a "differentiated spatial lens" based on relational geography (drawing on Doreen Massey), recognising that local and global scales are co-constitutive, not opposed (Krähmer 2022, 2025).

With the exception of perhaps the first, ecoregionalist paradigm, which addresses directly, and "regionalizes", the hinterland question, the circularity and degrowth approaches introduce much broader guidelines along which to envision the future of urban metabolism and extended urbanisation. In examining how these three paradigms allow us to move beyond the operational landscape, four interlinked questions are key: 1) the question of scale; 2) the question of landscape specialisation; 3) the question of (in)-justice and (in)-equality in the production and distribution of ecological surplus; 4) and finally, what can be framed as a question of landscape inheritance, to which I will return in the closing section.

The three first questions are highly interwoven, and at the basis of the problematic conditions that characterise the way operational landscapes resolve processes of urban metabolism. The scale question can be broadly conceived as a question of the spatial dimensions of urban metabolism and is directly linked to the question of landscape specialisation (or homogenisation). The current state of urban metabolism, characterised by the generalisation of the operational landscape mode of production, is based on the large effects of economies of scale in the economic structure of primary production sectors, which in turn lead to regional specialisation and landscape homogenisation of vast territories.

These economies of scale can only be harnessed through large investments in transport and circulation infrastructure, that assemble a global mobility landscape that aims to overcome diseconomies of space (Bunker and Ciccantell 2003). In this way, these globally connected, specialised territories can be connected not only to each other, but also to the major concentrations of population and economic activity, circulating large quantities of ecological surplus and contributing in a critical manner to patterns of social and ecological inequality (Bergmann and Holmberg 2016): not only is value extracted out of operational landscapes and consumed elsewhere, but they are also left with negative social and ecological externalities of unsustainable modes of production. This summary would suggest that regional, metabolisms connecting diverse production regions in circular ways, avoiding metabolic rifts, could offer promising alternatives for transcending the operational landscape mode of urban metabolism. The concluding section of this chapter explores how this is, unfortunately, a much more complicated argument.

Extended alter-urbanisations

The scale question is revealed as a key question and lies at the core of ecoregional approaches, which aim to reduce the dependency of metabolic flows on global circuits and contain them as much as possible within a regional unit. In an extreme scenario, a self-sufficient urban region would need to have the necessary diversity of landscapes to accommodate the various metabolic needs of its settlements, and in the same way, its scale would have to reflect the scale of concentration of people and economic activities across its agglomeration zones. What would the scale of ecoregions need to be, given the existing size and pattern of agglomeration zones across the planet? And given the economic competition over land use, and the dramatic effects of economies of scale in primary production, how would the diversity of land uses be economically competitive under a profit-driven spatial development paradigm? It would be difficult to envision ecoregionalist paradigms emerging under globally competitive land use markets, and metabolic flow systems that prioritise the search for profit, and in the absence of regionally planned economies, that would allow even the least profitable land uses to be sustained as long as they are necessary for the metabolic reproduction of the regional system. Moreover, the mere localisation of metabolic flows does not in itself guarantee the fair production and redistribution of social and ecological value within the region. A quantitative change in scale, does not equal a qualitative change in metabolic relations, that might end up reinforcing patterns of uneven development within the ecoregion, while stabilising patterns of uneven development and amplifying geopolitical antagonisms between ecoregions and the flows that might remain between them. Finally, while the prospects of ecological governance are promising, the emphasis on delineating as much as possible regional border conditions, raises problematic biopolitical questions and reduces opportunities for multiscalar synergies.

Questioning the prominence of the local and regional scales as preconditions for transcending the operational landscape, this chapter aligns with Krähmer (2025) in arguing for non-extractive, multiscalar metabolisms, emphasising the qualitative conditions of production and circulation of metabolic flows, rather than their dimensions. Circularity approaches are much less directly explicit about the scale question, and the associated distribution and specialisation of land uses in general. Circularity suggests a benefit of smaller material circuits as this would also entail less demanding transport solutions, but is mostly focused on reducing environmental impacts through a reduced primary production activity, as more and more material needs would be gradually covered through reuse and recycle processes. While circularity approaches could definitely work within ecoregionalist paradigms, circularity as a paradigm does not seem to be inherently constrained at a specific scale, and as long as material loops can be closed, they could very well operate across multiscalar levels, even at the planetary scale. However, circularity approaches are more interested in the systemic integration of production, circulation and waste circuits, rather than the social and ecological conditions that underpin them. Moreover, while there is an emphasis in reducing the initial use of materials, circularity is not directly criticising the growth-oriented, profit-seeking paradigm that shapes the logic of contemporary urban metabolisms. Similar to the ecoregionalist critique, the promise of reconnecting metabolic rifts does not necessarily mean more than just distribution of social and ecological value, while at the same time the promised efficiencies are undermined by rebound effects (Jeavons' Paradox) and material and thermodynamic limits which suggest that full circularity is physically impossible (Corvellec et al. 2022).

This chapter argues that the reorganisation of the material basis of urbanisation cannot continue to unfold through market mechanisms prioritising profit and growth, as they have largely failed to resolve the complexities of urban metabolism in just and sustainable ways, despite promises of efficiency and economic rationality. Degrowth approaches invite a radical departure from this problematic logic that has shaped the metabolic landscapes of extended urbanisation for more than two centuries. However, as degrowth puts the whole impetus of economic growth into question, the state of cities as economic engines or growth poles is also challenged, as is the justification of their ever-increasing footprints to sustain the positive effects of concentration. Urbanisation is in itself a growth machine, well aligned with the logic of expansion of capitalist development and its material basis. Although it would be unfair to label degrowth approaches as anti-urban, envisioning urbanisation processes through the degrowth lens would entail critically positioning the positive externalities of agglomeration economies within the broader socio-ecological systems that enable them. Degrowth approaches seem to be more in line with a broader vision of decentralised, polycentric, and smaller-scale settlement patterns, which could indeed be also more locally linked to diverse primary production landscapes. Yet, the global pattern of concentrated urbanisation

suggests a radically different image of still-increasing polarisation of population in very unevenly distributed agglomeration zones, with large megalopolitan formations still emerging especially in the Global South (Elmqvist et al. 2021; UNEP 2018).

Transcending the operational landscape mode of urban metabolism would have to accept and even embrace this inherited pattern and trend of urbanisation landscapes: on the one hand, an already articulated system of agglomeration landscapes often forming extensive megalopolitan zones, only to be expanded with the emergence of new megalopolitan formations in the Global South; on the other hand, a system of exhausted operational landscapes of primary production and circulation in need of repair and regeneration, and a wide network of primary production zones under pressure to be increasingly operationalised to support urban population needs. Transcending the operational landscape mode of urban metabolism is part of broader efforts to develop "alter-urbanisations", ways of inhabiting the planet in more inclusive, egalitarian and ecological ways (Brenner 2016, p. 221). With more than a quarter of human population already living in agglomeration zones of more than 1 million, it is difficult to imagine the generalisation of an ecoregionalist logic (UN Population Division 2025). Envisioning alternative forms of urban metabolisms would thus require a multiscalar, even planetary approach, in which elements of circularity and degrowth, can help develop a spatial conceptualisation of broader forms of territorial organisation. These forms should focus more on the qualitative conditions of production, and the terms of exchange, rather than their dimensions (material and spatial). This qualitative aspect makes the question of collective landscape futures central to rethinking equitable ways of sustaining a multiscalar state of bio-geographical interdependency, as landscapes and their articulation into synergetic assemblages can prove catalytic for exploring how the articulation of human and more-than-human work can become symbiotic, rather than extractive. The future of planetary metabolisms will thus be largely shaped by radical, innovative, novel forms of collective landscape assemblages.

Notes

1 While it is difficult to approximate precisely the anthropogenic impact upon the planetary terrain, one of the most elaborate studies on global land use data offered by researchers at the Institute of Social Ecology in Vienna offers that an estimate of roughly 100 million square kilometres is dedicated to urban land, cropland, grazing land and forestry (Erb et al. 2007).
2 Estimate based on high resolution data on human settlements by the Global Human Settlement Layer dataset (Schiavina et al. 2023).
3 For a critique see: Brenner, Neil, and Christian Schmid. "The 'Urban Age in Question", *International Journal of Urban and Regional Research* 38(3) (2014), pp. 731–755.
4 Among the various strands of contemporary regionalism, see: Fanfani and Ruiz (2020); Rees (2012); McGinnis (1999).
5 The ecoregionalist approach reflects a long history of regional thought, dating at least back to Patrick Geddes and Lewis Mumford. See: Geddes (1915); Mumford (1927).
6 For an overview see: Amenta et al. (2022); for critical takes see: Bassens et al. (2020); Savini, (2023).

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