HARVARD UNIVERSITY
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THESIS ACCEPTANCE CERTIFICATE

The undersigned, appointed by the Doctor of Design Program, have examined a dissertation entitled

From Hinterland to Hinterglobe: Urbanization as Geographical Organization

Presented by

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candidate for the Doctor of Design degree and hereby certify that it is worthy of acceptance.

Signature _____

Professor Neil Brenner

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Professor Hashim Sarkis

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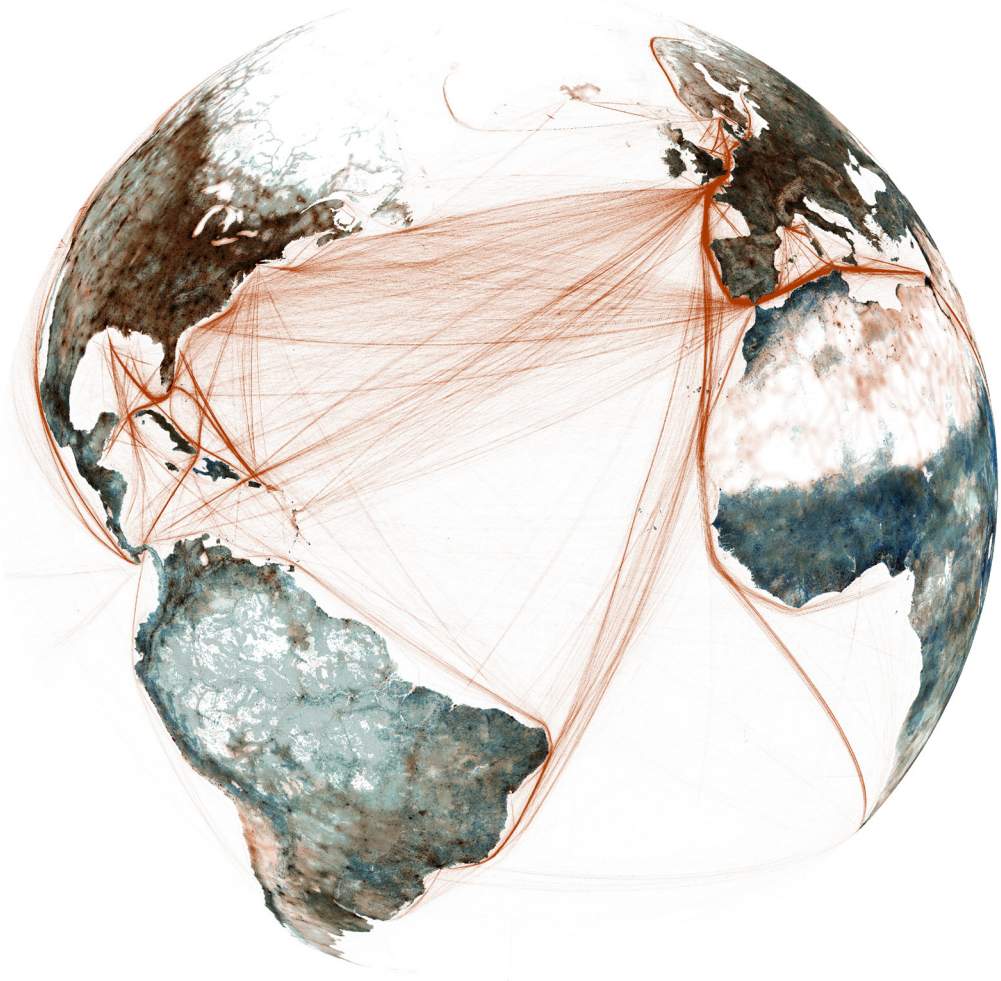
Professor Pierre Bélanger

Date: 2 – 1 – 16

FROM HINTERLAND TO HINTERGLOBE

URBANIZATION AS GEOGRAPHICAL ORGANIZATION



SUBMITTED BY

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ABSTRACT

From Hinterland to Hinterglobe investigates urbanization as a mode of generalized geographical organization in which agglomerations, although covering no more than 3% of the total land surface, are connected to the reconfiguration of most of the 70% of the planetary terrain currently used.

Urbanization has always been characterized by a condition of biogeographical interdependency between areas of concentration of population and economic activity, and extensive areas of primary production, circulation and waste disposal. Historically confined at the regional scale, what has been conceptualized as a relationship between cities and their hinterlands, is becoming increasingly elusive to define under conditions of globalized urbanization: On the one hand, agglomerations densify, diffuse and expand into unprecedented, increasingly continuous zones. On the other hand, through a thickening web of transport infrastructures, they become increasingly interwoven with the operationalization of multiscalar, increasingly discontinuous and specialized agricultural, forestry, grazing, energy and mineral extraction zones. The later constitute the majority of the used part of the earth's surface; yet they remain a 'terra incognita' to the study of urbanization.

Although various strands of scholarship have highlighted the multiscalar impact of urbanization on shaping global patterns of socio-economic development and environmental transformation, the question of the hinterland has remained deeply inscribed within a set of persistent dichotomies: From a demographic perspective, the dichotomy between densely populated 'urban' agglomerations and low density 'rural' hinterlands; from a land-use perspective, between densely built-up 'hardscapes' of agglomerations and thinly equipped 'softscapes' of hinterlands; from an economic perspective, between agglomerations as economic generators, and hinterlands as void of economic performance; and from an ecological perspective, between agglomerations as 'entropic black holes', and hinterlands as producers of ecological surplus.

Building upon the agenda of Planetary Urbanization, I critically revisit and deconstruct the concept of the hinterland aiming to transcend its associated dichotomies and limitations. I introduce the meta-categories of agglomeration landscapes and operational landscapes as landscapes of possible externalities associated with particular operations: Agglomeration landscapes are characterized by the presence of 'urban' and 'clustering' externalities; operational landscapes are mostly connected with 'locational' externalities.

I investigate how these externalities emerge out of, or are prohibited by, particular compositions of asymmetrically distributed, but largely continuous, elements of geographical organization (elements of the natural environment, elements of infrastructural equipment, demographic factors, institutional and regulatory frameworks). Instead of trying to delineate the particular hinterlands of cities, or chart the flows that connect them, I suggest that all processes of urbanization include the activation of a multitude of both agglomeration landscapes and operational landscapes. These are brought together through complex webs of commodity chains, reflecting the advanced division of labor that characterizes industrial and postindustrial societies. According to this framework, agglomeration landscapes are presented as the main locations for operations of the secondary and tertiary sectors of the economy, while operational landscapes for operations of the primary sector of the economy. In this way, I claim that, while urban economies have been only associated with the former, the economies of urbanization should be also stretched to include the latter.

In addition to introducing these novel categories, I also explore how they could be cartographically defined through the composite charting of the various geographical elements that constitute them. As a result, my research blends a theoretical apparatus, building upon theories of the social and ecological production of space under capitalism; with a cartographic and geostatistical apparatus, building upon a critical engagement with selected global geospatial datasets. Finally, as a means of exploring the capacities of these novel concepts, I attempt a historical overview of the development of urbanization as geographical organization over the past two centuries: I claim that as urbanization generalizes a condition of biogeographical interdependency, operational landscapes expand and specialize constructing a globalized shared assembly. Instrumentalized through global commodity chains, this planetary operational totality signals the shift from the universe of fragmented hinterlands, to the totality of the Hinterglobe: an alternative interpretation of the complete urbanization of the world.

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Nikos Katsikis
Cambridge MA | February 22 2016

INTRODUCTION: FROM CIVILIZATION TO ECUMENIZATION[1]

> We are not, as Anthropos has been many times in the past, in the process of transition from one stage of civilization to another; we are in the process of transition from civilization to ecumenization...[2]
>
> ...the city of today will be replaced by Ecumenopolis, and our civilization will be gradually transformed into ecumenization. If this trend continues, it will mean that no longer will the city alone have an impact on man's evolution through civilization, as in the past. The whole 'Ecumeni' will deliver such an impact.[3]
>
> Constantinos Doxiadis

It was in the late-sixties when the Greek architect and planner Constantinos Doxiadis was declaring that humanity was halfway through a 300 year long period of radical transformation that was about to challenge the nature of civilization itself. For more than a decade, Doxiadis had been laboriously recording and charting the increasingly continuous zones of agglomerations that were starting to form branches of what he anticipated as the inevitable city of the future: Ecumenopolis. Concluding a process that had started in the early 19th century, Doxiadis estimated that around the year 2100 the population of the earth would tend to stabilize at around 15 billion and its distribution would crystallize in a grid of density gradients (figure 01).[4] But this grid of density gradients was not only suggesting the organization of settlement areas around the world. It was rather the basis for the organization of a much wider area: The total area that humanity would utilize and manage in order to sustain its life on earth. This broader area corresponded to what Doxiadis defined as the 'real city':

> In actual fact, no city in the world exists on its own. Not even the smallest town of the past could exist within its own walls, or even within the limits of its own surrounding countryside, unless it was properly connected with villages round about, or even with distant villages if the connections were by sea. If such connections do not exist, then we are not talking about a city at all, but about a village within its surrounding fields...The real city is a system of human settlements covering a much greater area than we usually realize; a system of which the built-up part, which we usually call the city, is only very small in terms of area... When we talk of the system of human settlements, we are really talking about the system of our life... from a single shelter to a big city, from the built-up part of a village or a town to the forests from which people get their timber, from the settlements themselves to their system of interconnections across land and water.[5]

The definition of the 'real city' reveals urbanization as a condition of extensive geographical interdependency. Interdependency not only between various forms of settlements, but also between settlements and the multitude of areas utilized by humanity for its sustenance: Forests, fields and in general landscapes of primary production, systems of interconnection, etc. In the form of the Ecumenopolis, the organization of the human occupation of the earth corresponded to the organization of the 'real city' and vice versa; urbanization was the organizing principle of the human occupation of the planet, its terrain and its resources. As a result, Ecumenopolis was not referring to a geography of settlements, to an urban geography, but to the configuration of human life on the planet, to an all-inclusive human geography.

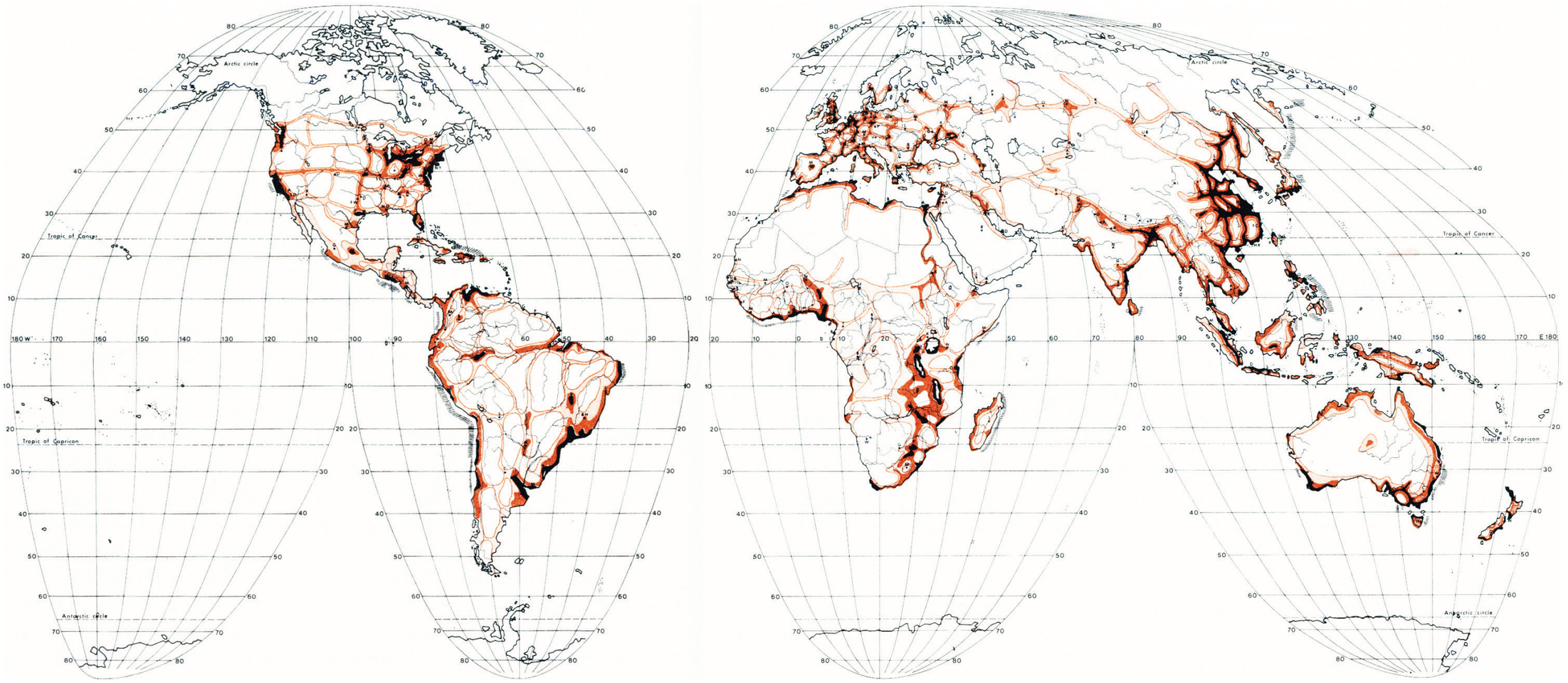


FIGURE 01: ECUMENOPOLIS OF 15 BILLION IN THE YEAR 2100.

The grid of population density gradients corresponds only to one aspect of the organization of the planetary terrain. The concentration of population along this linear pattern is connected to the reorganization of the rest of the used part of the planet that lies within and beyond this grid - the 'real city of Anthropos'.

According to Doxiadis, this unprecedented spatial configuration would be strong enough to decenter the city as the driver of the evolution of human civilization itself. Since urbanization would become a planetary condition, the whole environment that would be organized and used by humanity, and not just the city, would play a role in the cultural, economic, and political development of human societies. The condition of 'ecumenization' suggested the complete dissolution of dichotomies, like the city and the countryside, the urban and the natural, in favor of a condition of universal inhabitation without an outside, where eventually:

> ...there will no longer be some people inside and others outside: everybody will be inside the City of Anthropos.[6]

Around the same time, the French philosopher Henri Lefebvre was also struggling to conceptualize the same phenomenon, but from a quite different perspective.[7] In Doxiadis' Ecumenopolis, what was mostly important to address was the physical and ecological organization of space, which would accommodate the emergence of this new civilizational stage in the best possible way. The social, political and economic dimensions of Ecumenopolis remained rather unquestioned as part of a wishful thinking, which suggested that the severe challenges of coordinating the transition to ecumenization would eventually lead to more collaborative and equitable forms of development.[8] On the contrary, while Doxiadis focused on the physical configuration of Ecumenopolis, Lefebvre was mostly interested in the social and political transitions and challenges behind his famous hypothesis of 'the urban revolution':

> I'll begin with the following hypothesis: Society has been completely urbanized. This hypothesis implies a definition: An urban society is a society that results from a process of complete urbanization.[9]

Lefebvre suggested that the study of urban societies had for long been associated with the study of particular types of agglomerations, while the social relationships that were connected with them often transcended them.[10] These social relations, were highly interwoven with the dominant modes of production and as a result with subsequent waves of capitalist development. But most importantly, they were also directly connected with the patterns of population concentration and their transformations. Not unlike Doxiadis' interpretation of the 'real city', Lefebvre recognized the impact of agglomerations in shaping the modes of production beyond areas of high population density and as such, influencing broader sets of geographical interdependencies. As urbanization proliferated, these social relationships would create the premise for the emergence of a new type of urban society, which would start emerging after a critical point would have been passed. Lefebvre positioned this critical point on a simple, but powerful timeline that plotted the evolution of human societies along the development of the 'urban phenomenon' (figure 02).[11] The diagram positioned on the one end a condition of subsistence, that corresponded to a 0% state of urbanization, and on the other end, a state of 100%, complete urbanization. Between these two extremes, Lefebvre placed various historical instances of urbanization corresponding not only to particular types of settlements, but most importantly to particular modes of social and spatial organization of production unfolding around them. The transition from industrial modes of urbanization to a critical zone, signaled the generalization of the social conditions of production that were connected with urbanizations' state of generalized geographical interdependence across the entire world.

Four decades later, revisiting the work of Henri Lefebvre and his concept of 'complete urbanization', Brenner and Schmid started elaborating theoretically, conceptually and methodologically on the structures, contours, dimensions and development patterns of a condition of 'Planetary Urbanization'.[12] According to Brenner:

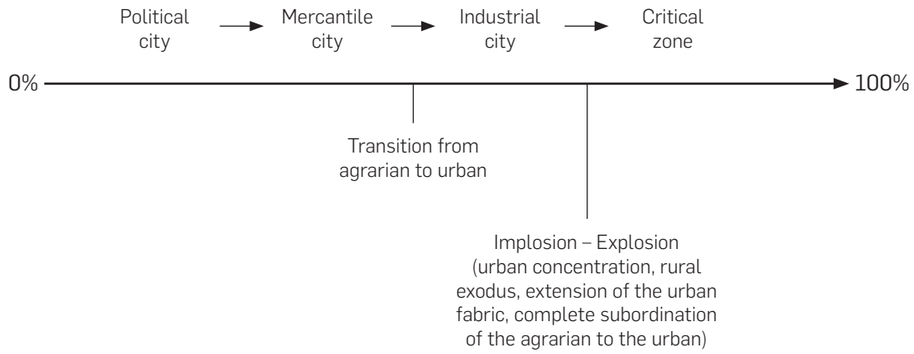


FIGURE 02: LEFEBVRE'S TIMELINE OF THE TRANSITION TO AN URBAN SOCIETY.
Urbanization can be interpreted as a continuous shift away from a condition of subsistence, towards a condition of generalized geographical interdependence, which also generalizes the dominant conditions of production and exchange.

> ...agglomerations form, expand, shrink, and morph continuously, but always via dense webs of relations to other places, territories, and scales, including to realms that are traditionally classified as being outside the urban condition. The latter include, for example, small- and medium- size towns and villages in peripheralized regions and agroindustrial zones, intercontinental transportation corridors, transoceanic shipping lanes, large- scale energy circuits and communications infrastructures, underground landscapes of resource extraction, satellite orbits, and even the biosphere itself. As conceived here, therefore, urbanization involves both concentration and extension: these moments are dialectically intertwined insofar as they simultaneously presuppose and counteract one another[13]

The paradigm of 'Planetary Urbanization' is invested both in the theoretical and epistemological redefinition of the urban as a condition that transcends the city, as well as in the establishment of conceptual and methodological toolkits that would allow for a systematic investigation of the generalized condition of urbanization 'without an outside'. Within this context, along the work of Henri Lefebvre, Doxiadis' approach is revealed as an additional precedent. Similarly to Doxiadis' suggestion to conceptualize the dimensions of the 'real city', Brenner suggests that:

> ...the conditions and trajectories of agglomerations (cities, city-regions, etc.) must be connected analytically to larger-scale processes of territorial reorganization, circulation (of labor, commodities, raw materials, nutrients, and energy), and resource extraction that ultimately encompass the space of the entire world[14]

This research emerges out of, and aims to contribute to, the emerging agenda of 'Planetary Urbanization'. In doing so it aims to bring together the propositions of Doxiadis and Lefebvre into a productive synthesis: The conditions of world urbanization cannot be understood without being positioned within the general question of the social and spatial organization of production, but also being considered in relation how they are connected to the physical configurations of the various geographies that constitute the 'real city'.

In a way, 'From Hinterland to Hinterglobe' is a response to the need for understanding the 'real' dimensions of urbanization. It suggests, and aims to unpack an understanding of urbanization as a mode of geographical organization of human life on the planet that extends beyond agglomeration zones. Geographical organization

is understood as the organization of human occupance upon the earth.[15] The term human occupance, borrowed from early twentieth century human geography, refers both to the utilization of space and to the physical presence upon space, presence in terms of the distribution of population and economic activities and in terms of the associated physical structures and infrastructures. Human occupance aims to grasp the patterns of both land cover and land use and decipher their associations.

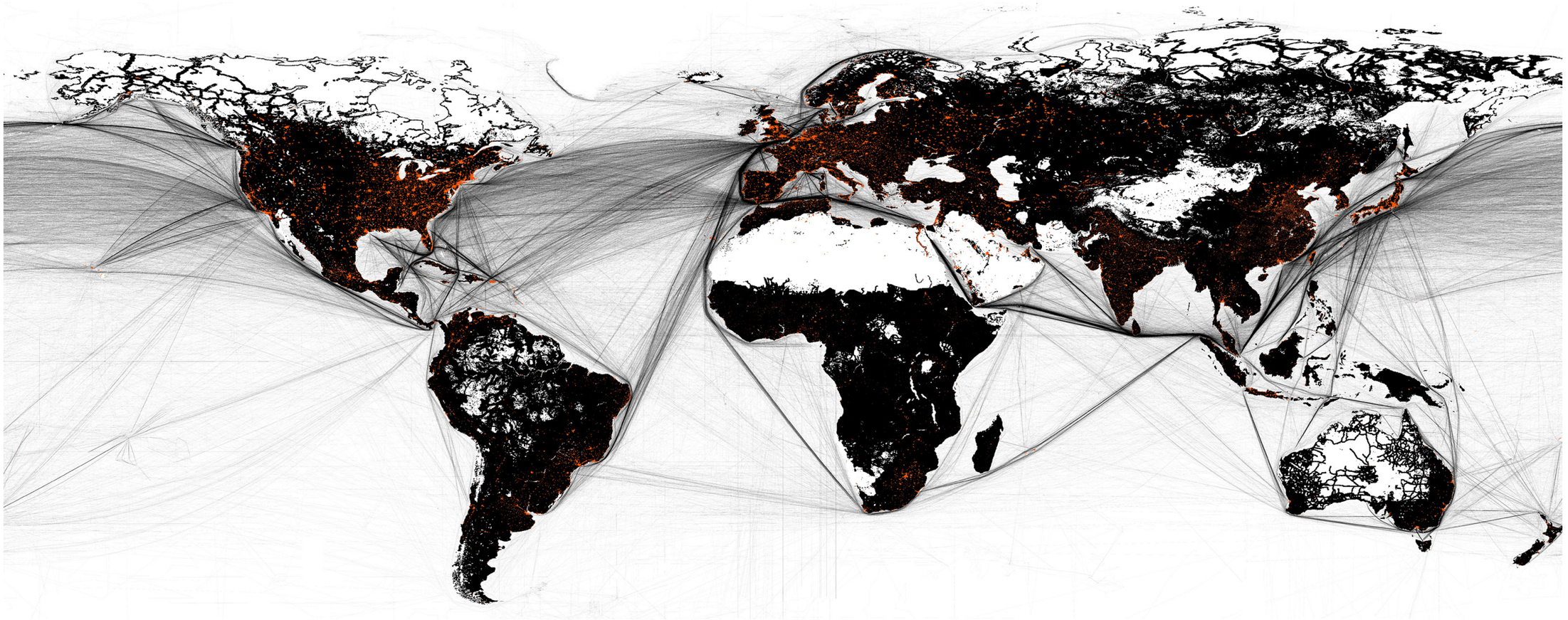
The organization of human occupance, the organization, of land use and land cover is of course directly connected to the social and spatial division of labor, to the social relations of production. Understanding urbanization as a form of geographical organization, means assigning to the process of urbanization a particular agency in shaping this condition of human occupance, an agency that both Doxiadis and Lefebvre seemed to imply in different ways. The main scope if this project can thus be summarized as follows:

- Urbanization is a condition of geographical organization connected to particular forms of social and spatial division of labor that emerge out of the concentration of population and economic activities, but are spread beyond it. What is the essence of urbanization, is not the condition of concentration per se, but rather the condition of geographical interdependency that emerges out of it.

- As urbanization becomes generalized and globalized, the condition of geographical interdependence tends to integrate the whole used area of the planet. Complete urbanization means complete geographical interdependency.

- How can this condition of geographical interdependency be conceptualized and charted? How can we conceive the contours of urbanization beyond agglomeration, eventually including the whole used area of the planet?

This question is summarized through the visualization in figure 03. The map presented is an impressionistic visualization highlighting in red the total area of the major agglomeration zones on the planet, as calculated by one of the most prominent contemporary gridded geospatial datasets.[16] These major agglomeration zones are plotted against a dark background that delineates the used part of the earth's surface. These landscapes include agricultural areas, grazing and forestry zones, as well as built up areas beyond dense settlements, road and rail transportation networks, as well as major marine and aviation routes.[17] The area occupied by the totality of all



MAJOR AGGLOMERATION ZONES

USED AREA

3.5% of used area (3.5 million km^2)

70% of total land area (102 million km^2)

FIGURE 03: MAJOR AGGLOMERATION ZONES (RED) AND THE USED PART OF THE PLANET (BLACK).

densely inhabited agglomeration zones, is no more than 3.5 million km^2. This might sound an impressive number. However compared to the more than 100 million km^2 of the used land which covers almost 70% of the planet, it is no more than 3%. The initial question of this research is how these obscure dark areas relate to the dense agglomeration zones and how this relationship can be conceptualized and charted.

One of the most influential concepts that has been utilized to address the relationship between agglomerations and a broader set of productive landscapes has been and continues to be the concept of the hinterland. The concept of the hinterland offers undoubtfully a convenient starting point and is introduced here as a lens for the study of urbanization as a condition of geographical organization. It should be highlighted then, that for the purposes of this study, the shift from hinterland to Hinterglobe, is considered as tool, in order to investigate urbanization as geographical organization beyond agglomeration, which is the ultimate explanandum.

Moreover, I argue that the concept of the hinterland is both helpful and problematic since it carries with it a set of limitations and blindspots, both conceptual and methodological: First of all, the concept of the hinterland presupposes the existence of certain predefined spatial categories: The agglomeration as a delineated entity which can be usually reduced to a node; the hinterland as a much more extensive and usually productive surface area. Moreover, the relation between the two is a linear relationship: No matter what is the vector, or hierarchy of this relationship, the one connects to the other through a one step process. The concept of the hinterland is vulnerable to several dichotomies such as the town / countryside, the urban / rural, the social / natural. In a way, this set of dichotomies is largely expressed though the map, with agglomerations delineated and separated from the broad and obscure pattern of hinterlands.

As a result, taking the concept of the hinterland as a starting point, my goal will be to critically interrogate it, deconstruct it into the elements that constitute it and reconstruct as part of a broader understanding of the geographies of urbanization. The ultimate scope of this research then, is to create the conceptual and methodological foundations upon which, the distinction this map suggests can be re-framed and transcended. But how has the 'metageography' that the map suggests been constructed? In fact, the fundamental importance of urbanization in the transformation of the globe is continuously being highlighted from several perspectives. These perspectives offer particular interpretations of the relationship between agglomerations and hinterlands, which can be broadly framed as demographic, land use, economic, and environmental. These interpretations form the basis of what could be characterized as a triad of dominant debates on globalized urbanization: The 'Urban Age' debate; the 'Global Cities' debate; and the 'Anthropocene' (or 'Urbanthropocene') debate. A synthesis of these interpretations is offered by the framing of the upcoming HABITAT III conference, a historical moment (since the UN Habitat conferences take place only once every 20 years), which is scheduled to take place in Quito in the fall of 2016. According to the framing of the conference, cities although covering no more than 2% of the total land area (land cover interpretation), host more than 55% of the world population (demographic interpretation), but are also are estimated to contribute 70% of world GDP (economic interpretation). On the other hand they absorb over 60% of the energy and generate more than 70% of greenhouse gas emissions and 70% of global waste (environmental interpretation).[18]

This combination of approaches is characterized by a series of contradictions that reveal their limitations: On the one hand, the urban age debate has been largely based upon a demographic interpretation of urbanization exemplified by the statistical studies of the United Nations according to which global population is distinguished into two broad categories – urban and rural. This established categorization has restricted the monitoring of the complex population dynamics by simplifying them as a movement across the urban – rural threshold, a threshold defined according to certain delineations of population density, land use types, built areas etc. The urban age debate has largely helped in the conceptual crystallization of two worlds: A world of high density urban agglomerations, delineated by specific boundaries; and the remaining rural world, a world of low density hinterlands.

The next two dominant paradigms are largely interwoven into this definition and although monitoring important actual trends, they end up being equally reductive in their understanding of urbanization. The first set of approaches has focused on the restructured economic role of cities in globalization. Two interweaving directions of research have dominated the interpretations of recent globalized forms of urbanization: The efforts to understand 'postmetropolitan' forms of agglomeration; and the efforts to define the new economic functions of cities and the accompanying forms of territorial organization in a postindustrial context of capitalist development. Within this effort to understand the nature and spatial morphologies of contemporary agglomeration forms, the emphasis has been to describe how agglomeration dynamics – and the associated agglomeration economies that characterized the dense urban centers, were now to be found across whole urbanized regions, reconstituted more through networks of centers rather than condensed centers. In a way, within this paradigm the region becomes the new unit of agglomeration.[19]

On the other hand, as the traditional urbanized regions in the west were becoming largely de-industrialized and the whole system of production was becoming increasingly horizontal during the second half of the twentieth century, the 'global cities' debate highlighted the emerging role of cities – or better selected cities – as commanding centers of the world economy. What characterized cities at the beginning of the 20th century then, was not their relation to their immediate surrounding areas, but rather their rank in this chain of command, a command that was taking place not only in persisting central business districts but also in 'new forms of centrality' that were reconstituted at a regional scale through polycentric structures, or even at the global scale over advanced information and communication technologies. As cities were increasingly studied as the locus of less and less 'material' processes, like management, finance, innovation the always obscure agglomeration externalities, like spillover effects, became a central theme in their positive economic appraisal.[20] At the same time however, their relation to the broader configurations of landscapes beyond them, remained largely unquestioned.

Exactly this extensive landscape transformation and the multiscalar impact of urbanization upon the planetary terrain became a major concern of environmental studies. However, driven by the dominant paradigm of sustainable development, most contemporary approaches that aspire to offer a synthetic and global appreciation of this relationship interpret it in a quite unilateral way. The paradigm of the Anthropocene, summarizes several of these approaches: It suggests that human activities have such a significant impact on the earth that they resemble geological forces. Within this context, while cities are recognized for their social and economic importance, they are also problematic due to their negative influence on the environment.[21] Concepts such as the 'urban ecological footprint', which tries to grasp the radiating ecological influence of cites, exemplifies this interpretation of urbanization as a condition that is happening 'somewhere', in a specific area called the city, and has several effects 'elsewhere' to the landscapes of waste disposal, extraction and agricultural exploitation, deforestation, even the oceans and atmospheric pollution.[22]

These dominant interpretations of urbanization, demographic and land use, economic and environmental, have never been able to really question the notion of the urban and allow it to be considered as an agent of broader geographical transformation: As economic interpretations focused more and more in deciphering the internal dynamics of agglomerations, or the relations between cities, the surrounding areas upon these urban economies were drawing upon for the organization of their production systems were remained unquestioned.

Indeed, in terms of this economic interpretation, cities has been highlighted as the locus of certain 'urban' economies: Operations of the secondary (manufacturing) and tertiary (services) sectors of the economy. As these 'urban' economies are receiving most of the attention, an additional set of transformations of what could be characterized as the primary sectors of the economy is being concealed, one that is mostly responsible for the reconfiguration of the majority of the used part of the planet, of the 'other' 66.5%: These economic sectors have long been distanced from the urban, and in fact have always been indicators for the 'absence' of urbanity. But since these configurations are part of the broader geographical interdependencies of urbanization, shouldn't they be considered as part of the process of urbanization? Not as part of 'urban economies of course, which indeed continue to characterize dense urban cores; but as part of the broader 'urbanization economies'. Conceiving the economic operations of urbanization in a way that can link them to these primary sectors of the economy is revealed as an additional major goal and challenge of this research.

Addressing this challenge could also contribute to a better understanding of the ecological 'function' of cities and their environmental 'performance': In a schematic way, the succession from primary, to secondary to tertiary operations, also signals a movement away from the 'land', from the ecosystemic capacities that are the basis for all material production on the planet. As a result, urban operations that are positioned at the edge of this chain, are already several steps away from the original processes of ecological accumulation. The process of extraction of ecological surplus, has been indeed highlighted be the ecological interpretations of urbanization. As already discussed however, since these processes have been considered as processes of an 'exterior' environment to the 'urban' they have never been productively considered as part of the urban process.

This striking contradiction between what could be conceptualized as cities as entropic black holes and cities as generators of economic development, reveals a highly problematic interpretation of urbanization in relation to the transformation of social and ecological value. It is argued that this connection can be productively re-conceptualized if operations of primary production are considered as part of the urbanization process, through the integration of the primary sectors of the economy to the extended 'urbanization economies'.

But this effort, would ultimately require much broader intellectual and conceptual re-interpretations of the relationship between the social and natural worlds. Eventually, understanding urbanization a geographical organization through the concept

of the hinterland, requires dealing with a series of conceptual and intellectual challenges. Within the paradigm of Planetary Urbanization, the critical investigation of the persistent concept of the hinterland, is part of the overall effort to construct a dialectical process of the relationship between agglomerations and a broader set of productive territories that will be able to escape unproductive dichotomies like the town / country, the urban / rural, the urban / natural.

In order to start grasping these complex configurations in a dialectical way, Brenner and Schmid have introduced the categories of 'concentrated' and 'extended' urbanization.[23] These categories do not constitute opposing, or mutually exclusive analytical categories or spatial units. On the contrary, as it is understood here, they refer to mutually constructed dialectical processes that connect sociospatial configurations in densely inhabited and densely built areas of intense economic activity (concentrated urbanization), with sociospatial configurations in extensive landscapes of production, extraction, disposal and circulation that could include even very remote areas, like deserts the atmosphere or the oceans themselves (extended urbanization). This research intends to build upon these categories in developing an alternative conceptualization of the planetary landscapes of urbanization. What are the demographic, economic, ecological and geographical configurations that characterize concentrated and extended urbanization? How can this initial conceptualization of the urbanization process be more thoroughly investigated and connected with the way particular operations connect to particular configurations on the ground, within and beyond agglomerations?

This project aims to develop a series of alternative conceptual and cartographic categories of geographical organization that will be able to challenge persistent dichotomies and offer a way to connect urbanization with the broader processes of transformation of the earth's surface. These categories are introduced as part of a continuous conceptual and cartographic exploration and not as an end product: They are means of investigating the complexities of urbanization, and not ends in substituting the existing categories with new rigid definitions. In sum:

- Urbanization as a condition of geographical organization can be conceptualized as a constant interplay between agglomeration landscapes, operational landscapes, and their hybridizations. These composite geographies of urbanization are landscapes of possibilities for the emergence of externalities, associated with the location of particular operations: Agglomeration landscapes are characterized by the presence of urban and clustering externalities, while operational landscapes are mostly connected to locational externalities. According to this framework, agglomeration landscapes are the primary locations for the operation of activities that belong to the secondary and tertiary sectors of the economy, while operational landscapes are mostly connected to operations that belong to the primary sector of the economy.

- Externalities emerge out of particular combinations of elements of geographical organization that include: Elements of the natural environment, elements of physical equipment in the form of fixed capital, demographic factors, institutional frameworks and the characteristics of economic actors. These elements can be continuous across operational landscapes and agglomeration landscapes, but their particular configurations allow them to present different possibilities for different operations. As a result agglomeration and operational landscapes are not static or absolute, but always constituted through particular operations.

- In contrast to the spatial conceptualizations of continuous and discontinuous hinterlands, I suggest that agglomeration and operational landscapes are always operating across continuums: When different landscapes of production are connected even across great distances, these connections involve the activation of intermediate operational or agglomeration landscapes as transport and communication systems are part of them. The assemblies of agglomeration landscapes and operational landscapes can be unfolded through the operations of commodity chains. With the further specialization of the division of labor, commodity chains are revealed as complex meshes that interweave numerous landscapes. As such, the question of the city-hinterland as a one-to-one linear connection is dissolved.

- Most importantly, this research interrogates how these categories are constituted under conditions of capitalist urbanization. I claim that the landscapes of possibilities that agglomeration and operational landscapes suggest, are translated into capitalism's overall profit landscape. Their configuration is interwoven with the interplay between locational and technological advantage.

- In addition to introducing these novel categories of geographical organization as a starting point for re-onceptualizing the urban, I also explore how they could be cartographically defined through the combinatory mapping of the

various geographical elements that constitute them. Alongside the conceptual and methodological investigation then, I unfold an additional cartographic exploration. As a result my research tries to blend both a theoretical apparatus, which deals with the condition of social production in relation to certain geographic configurations; and a geostatistical apparatus which tries to explore how these configurations relate to specific questions of land use, equipment and density.

- Furthermore, these categories, both cartographically and conceptually defined, allow me to revisit persistent questions of geographical determinism in a contemporary way: While in the early stages of capitalist development a set of geographical determinants had to do with the locational specificities of resources, with the development of the productive forces under capitalism and the associated technological advancements, these have been partly dissolved into the thickening fabric of equipment that has been slowly covering he surface of the earth. However, these geographical determinants have not disappeared, but rather reconstituted in much more complicated ways: I claim that the continuous question of the agency of the physical configuration of the environment can be addressed through the spatial and conceptual categories that I define: Agglomeration landscapes and operational landscapes suggest only certain possibilities, while they restrict others through their sclerotic nature.

- Finally I attempt a historical overview of the reconfiguration of these novel composite geographies of urbanization: I claim that as operational landscapes expand and specialize in order to achieve economies of scale, their planetary globalized totality tends to constitute a Hinterglobe. The Hinterglobe is the assembly of operational landscapes that is shared by a set of global operations. The construction of the Hinterglobe extablishes an alternative intpretation of complete urbanization: While agglomeration landscapes can continue to be reconstituted through the reshuffling of the concentrations of population and economic activities in dense zones, the expansion of operational landscapes across scales is defined by the totality of the part of the planet that can be used.

Methodologically this work is characterized by an effort to establish a synergy between the rich conceptual and theoretical framework that has been established by critical geography scholarship addressing within a historical-materialist perspective

questions of geographical organization; and the increasing capacity of geospatial information that is being introduced through the proliferation of geographic information systems and the construction of geospatial datasets. In fact, my research is an effort to critically instrumentalize this promising toolkit that has, until now, mostly been developed within environmental studies. I am convinced that there is a huge potential in bringing together the powerful theoretical interpretations that explain the social production of space under capitalism, with the capacity to produce new geospatial categorizations, investigations and representations that are exploring how these often abstract concepts could be more directly connected to patterns of the physical configuration of space.

Throughout the project, and in order to help consolidate the complexities that underlie the organization of world urbanization, I introduce and use Von Thünen's model of the isolated state as a conceptual device. The model summarizes the relationship between a city and its hinterland in a generic way. I argue that through Von Thünen's microcosm, the majority of the elements of geographical organization can be roughly outlined: The exchange between town and country and the associated specialization of land use and labor; the asymmetries of the natural geography; the asymmetries in the modification of natural geography through the various forms of equipment; and finally, the geographical extents of exchange. Unlike Von Thünen's simple model where these elements are either treated in isolation, or linearly interrelated, I claim that all these elements are actually co-produced. Understanding how these elements are co-produced, promises to allow for a novel understanding of urbanization as geographical organization beyond agglomeration. As a result I carry this model throughout most of this project as a conceptual compass, a reference that allows for these elements to be unpacked and observed at different scales, but also for associated disciplinary challenges to be presented.

The structure of this work could be characterized as an interplay between agglomeration and used earth on the one side, and between conceptual and cartographic experimentation on the other side. The project is structured in three parts, each with a separate introduction to the topic discussed:

- The first part could be considered as an effort to investigate how the map in figure 03 is constructed as such: The two chapters work in two different directions that eventually meet through the hinterland question: From the category of the urban outwards towards the world; and from the category of the world, or better its used part, inwards towards the city. The first task

reveals how conceptualizations of the urban have been largely detached from the question of the hinterland and positions the question of reconnecting them within the paradigm of planetary urbanization. The second chapter starts with the conceptualization of the used part of the planet, the Ecumene, and tries to investigate how the urban has been positioned within it as a rather limited part. In doing so, this chapter also offers a first interpretation of the composition of the dark area of the map. The dichotomy of the map is thus unpacked. Can it be challenged?

- The second part of the project deals exactly with why this challenge has been so difficult to address productively. The goal of the chapter is to reveal a series of disciplinary and intellectual challenges in efforts that tried to deal with the question of the hinterland. The challenges are grouped in two sets: One set broadly dealing with challenges emerging out of the disconnect of society and nature, natural and social sciences. It presents how different functional interpretations of the hinterland have been restricted under economic and ecologic interpretations. The first two chapters aim to trace the emergence of what I already described as a paradoxical tension between cities as generators and cities as entropic black holes. In the third chapter, I address challenges that emerge out of the limitations of persistent spatial models in understanding the spatial configuration and associations of the city – hinterland relation. I frame this challenge as a tension between uniform and functional regions, or as a limitation of particular spatial conceptualizations to address both the physical configuration of particular surfaces and areas, and their associations across discontinuous spaces through networks. The question of the relation between form and function, and especially function at a distance, and how it has been mostly addressed as the (problematic) relation between surfaces and networks, becomes crucial. I examine this tension through a selected number of key examples, both contemporary and historical.

- Finally, the last part is where I mostly develop my thesis. Building upon a series of conceptual and geostatistical tools, I try to deconstruct the map of islands of agglomerations within a dark sea of hinterlands, and reconstruct it according to the novel categories of the composite geographies of urbanization that I introduce. The first chapter, unpacks a series of key theoretical concepts in relation to the social and ecological production of space. I assemble elements of these concepts into the new categorizations of agglomeration landscapes and operational landscapes. I develop this framework conceptually in the second chapter and cartographically in the third chapter of this last part. After having established my framework of agglomeration landscapes and operational landscapes, in the fourth chapter of the last part, I enrich it with additional theoretical concepts that allow to explore how the various geographically configurations I propose are assembled in the construction of increasingly complex and globalized configurations. I turn to certain key determinants of globalization, that include infrastructural convergence, commodification and the reorganization of production systems through commodity chains, and I try to integrate them into my framework.

- In the concluding part of the work, I offer an experimental application of this conceptual and cartographic framework through an attempt to reconstruct a short history of urbanization over the past 200 years. This effort should be seen mostly as an experiment, a way to test how the constructed categories allow for an alternative interpretation of the major transitions that have shaped world urbanization over the past centuries. It is an effort to apply the specific lens and check its potentials and blindspots, rather to derive any conclusions. Still, certain useful observations can be already made regarding an alternative appreciation of urbanization as geographical organization. I claim that as urbanization generalizes a condition of biogeographical interdependency, operational landscapes expand and specialize constructing a globalized shared assembly. Instrumentalized through global commodity chains, this planetary operational totality signals the shift from the universe of fragmented hinterlands, to the totality of the Hinterglobe: an alternative interpretation of the complete urbanization of the world.

PART 01

BETWEEN THE CITY AND THE ECUMENE: THE HINTERLAND?

INTRODUCTION TO PART 01: THE MICROCOSM OF THE ISOLATED STATE

CHAPTER 01: FROM THE ISOLATED STATE TO THE WORLD THÜNEN TOWN

- ASTY AND CHORA
- URBS AND AGER
- FROM CITY-STATES TO CITIES IN STATES
- THE EMERGENCE OF THE WORLD THÜNEN TOWN
- GLOBALIZATIONS WITHOUT THE GLOBE
- PLANETARY URBANIZATION AND THE HINTERLAND CHALLENGE

CHAPTER 02: FROM THE ECUMENE TO THE GEOGRAPHICAL ENVIRONMENT

- THE CONCEPT OF THE ECUMENE
- THE CONCEPT OF THE GEOGRAPHIC ENVIRONMENT
- THE COMPOSITION OF THE GEOGRAPHIC ENVIRONMENT
- URBANIZATION AND THE GEOGRAPHIC ENVIRONMENT
- THE CHANGING DIMENSIONS OF THE GEOGRAPHIC ENVIRONMENT

INTRODUCTION TO PART 01:
THE MICROCOSM OF THE ISOLATED STATE

> Imagine a very large town, at the center of a fertile plain which is crossed by no navigable river or canal. Throughout the plain the soil is capable of cultivation and of the same fertility. Far from the town, the plain turns into an uncultivated wilderness which cuts off all communication between this state and the outside world. There are no other towns on the plain. The central town must therefore supply the rural areas with all manufactured products, and in return it will obtain all its provisions from the surrounding countryside. The mines that provide the State with salt and metals are near the central town which, as it is the only one, we shall in the future call simply "The Town".[24]

This is how the German economic geographer Johann Heinrich Von Thünen opens his famous treatise on "The Isolated State", a work that offers us one of the most prototypical models of the relationship between city and hinterland. We can follow Fernand Braudel's suggestion and take a moment to "salute en passant the need economists always feel to depart from the real world, the better to understand it."[25] It is exactly this carefully formulated abstraction that allows me to make a series of observations unfolding the main elements that I will address in the rest of this work. As a means of introduction, the importance of von Thünen's model does not lie in its potential analytic validation or even in the influence upon subsequent economic models, although proving a surprisingly persistent reference.[26] These are elements that I will discuss in chapter 03. It is rather in the very particular microcosm it suggests: A generic, but complete, specialized pattern of self – sufficient geographical organization, bound and structured around a nodal agglomeration. This organization directly reflects a particular (and quite archaic) social and spatial division of labor that constructs a complete unit: The town is dependent upon the hinterland for its supply in food, construction materials and energy and the hinterland is dependent upon the town for the provision of manufactures and services.

Developed during the early 19th century, Von Thünen's model aimed to model the optimal organization of agricultural land around a single settlement. In a nutshell, his model was based on a combined calculation of production cost per unit of area, land rent and most importantly transport costs to the market (the agglomeration), as well as specific limitations of certain products like perishability (in a pre-refrigeration age). The resulting spatial configuration is a series of concentric rings surrounding the town, the sole center of exchange (figure 04):

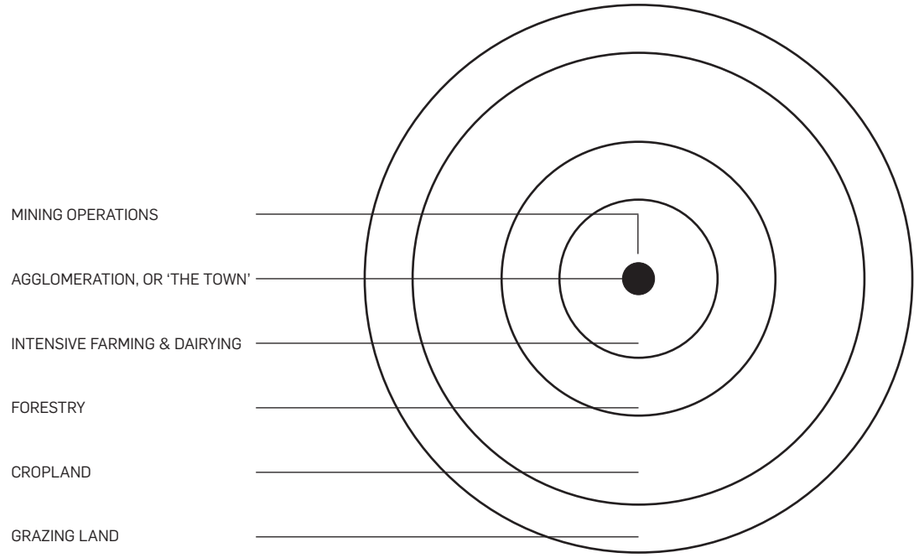


FIGURE 04: VON THÜNEN'S MICROCOSM OF THE ISOLATED STATE.
The agricultural production around a single town is organized in a series of concentric rings that reflect decreasing land rents and increasing transport costs according to the distance from the town which is the center of commodity exchange.

Closest to the town, lies a zone of intensive agriculture where farmers produce perishable goods such as dairy products and vegetables. Quite interestingly the second ring is a zone of forestry, since wood was at the time still the main fuel and construction material and certainly heavy and difficult to transport. The third ring is dedicated to extensive agriculture of crops like wheat, corn and potatoes. Further out, lies the last zone of pasture for the grazing of animals, which eventually becomes financially unsustainable and turns into a wilderness that also prevents all potential exchange with other towns or areas.[27] This 'frontier' defines a closed but 'complete', subsistent system, which even predicts for the existence of mines necessary for the provision of metals and salt (important for food preservation and storage at the time) which are 'close to the town' in order not to disturb the concnetric land use pattern.

Von Thünen's model offers a complete and simple model of geographical organization where a simple division of labor is reflected upon a simple pattern of specialized areas

of production. Even more revealing however, are the observations that can be made out of the elements that are deliberately excluded from the model. According to the introductory passage, the basic assumptions exclude: the asymmetries associated with the specificities of natural geography (the flat terrain and quality of the soil); transportation networks (navigable rivers and canals as water transport was the main means of transport at the time); and of course any possibility of external trade. In terms of Von Thünen's methodology, the elements that are excluded can always be reintroduced as factors that deform the 'regular' organization of space that is based on the cost distance calculations. In this way however, although they become factors of the organization of space, they remain external to its production: Their agency is not generative, but rather deformative.

Despite the obvious limitations, the generic structure of the model allows an initial foregrounding of a particular interpretation of urbanization: Urbanization is a mode of geographical organization. Mediated through transportation, the condition of exchange between an agglomeration and its supply and service hinterland results in a particular form of geographical organization through the social and spatial division of labor. Agglomeration and hinterland are two sides of the same coin connected through exchange, which is again only meaningful through, and dependent upon, the specialization of the human occupation of the earth. In the development of this interdependent condition, the concentration of population is central, but not the sole factor. As Max Weber points out, since in the city, the population is concentrated (in terms of dimension and density), it has to be supplied with, at the least, food, energy and building materials, from outside.[28] The functional interrelationship of the city to its hinterland becomes a political one connected to the specific political-administrative apparatus, which controls the population and the relations between the people in it, and those beyond it that control the supply of necessary goods. Along the same lines, Bairoch defines the city as part of a broader set of interdependencies which are inherent in the nature of urbanism:

> ...we define the city in the truest sense, supposing to a specialization of activities leading to this specific feature of all human concentrations: that such concentrations are incapable of sustaining themselves and require the support of the inhabitants of neighboring regions. This is precisely the distinctive mark of urbanism[29]

I argue that through the various effects and interdependencies associated with the concentration of population and economic activities, urbanization can be conceived as

the basis for the overall geographical organization of the material life on the planet. To paraphrase Harris and Ullman, within this context cities and agglomerations in general, are nothing more and nothing less than the focal point in the occupation and utilization of the whole planetary terrain.[30]

Moreover, I argue that through Von Thünen's microcosm, the majority of the elements that constitute this geographical organization can be roughly outlined: The exchange between town and country and the associated specialization of land use and labor; the asymmetries of natural geography; the asymmetries in the modification of natural geography through the various forms of equipment; and finally, the geographical extents of exchange. Unlike Von Thünen's simple model where these elements are either treated in isolation, or linearly interrelated, I claim that all these elements are actually co-produced. Understanding how these elements are co-produced, promises to allow for a novel understanding of urbanization as geographical organization beyond agglomeration. Unfortunately, the investigation of their interrelations has proven extremely challenging to unpack and interpret in a dialectical way.

In fact, Von Thünen's model, its abstractions and its assumptions, also showcase several disciplinary challenges, dichotomies and blind-spots that have restricted the study of geographical organization over the past two centuries: The disconnect of social and natural space; the spatial conceptualization of cities (as nodes) and regions (as surfaces); the effects of transportation in spatial configurations (and technological developments in general); and most importantly the question of how all the above are connected to dominant systems of social production. In the following parts of this work, I will try to unpack several of these challenges (in the second part) and finally try to establish the pillars through which an understanding of this general condition of urbanization as geographical organization can be constructed (in the third part).

Before embarking upon this investigation however, the full potential of Von Thünen's microcosm can be unleashed through a thought experiment: The generic nature of the model allows it to be stretched across various scales. In fact, seminal scholars like William Cronon and Fernand Braudel, have based their conceptual experiments into reconstructions of Von Thünen's microcosm: In Cronon's work, Von Thünen's town is the city of Chicago and the isolated state expands across the Midwest and eventually beyond, to the Canadian lumber zone and to the transatlantic markets.[31] In Braudel's historical-geographical investigation of the development of capitalism since the 16th century, the microcosm unfolds around the European core to include the developing periphery of the mercantile and colonial worlds.[32]

In this research, the initial thought experiment suggests that the Isolated State is a micrographic conceptualization of the nothing less than the entire world: The town of the model, corresponds to the universe of agglomeration areas, while the hinterland of the model corresponds to the totality of productive landscapes. But if the world Thünen town can be roughly described as the global system of agglomerations, stretching the specialized landscapes of production means investigating the composition of almost the totality of the used part of the planet. This total area used by humanity has been historically associated with the concept of the Ecumene. As a result, while the first chapter of this part will discuss the changing relations between cities and hinterlands in the transition to what has been described as the 'World Thünen Town' and beyond, the second chapter will investigate the changing concept of the Ecumene. What is suggested could be interpreted as movement from two opposite ends: The first, from the agglomerations outwards, towards the creation of hinterlands; and the second from the totality of the used part of the planet inwards, from the Ecumene towards the agglomerations. How can be the Ecumene be conceived through the process of urbanization, and how is urbanization positioned within the Ecumene? Can the concept of the hinterland help us understand how the one relates to the other?

CHAPTER 01:
FROM THE ISOLATED STATE TO THE WORLD THÜNEN TOWN

ASTY AND CHORA

One of the most striking elements of Von Thünen's microcosm, is that the dimensions of the functional relation of the city and its hinterland, are completely overlapping with the administrative boundaries of the state. Perhaps the closest approximation and at the same time one of the most influential models of the city-hinterland as a complete and independent unit of socio-spatial organization is the ancient Greek 'polis', or as it came to be known the ancient Greek 'city-state'. As a result, the polis offers an excellent starting point for this investigation. It is important to note, that both the city and the polis, as contemporary terms, have come to refer to a particular type of settlement (in general terms a large and dense concentration of population, built space and economic activity). In their initial formulation however, these concepts aimed to grasp forms of broader sociospatial organization of which the actual settlement (in general an agglomeration of considerable size), was only one part, the other being a largely regional hinterland: A more sparsely populated zone of mostly primary production directly interconnected with the central settlement.

The fact that the term 'city-state' is a compound one, reveals the limitations of the contemporary use of the term city.[33] The 'polis' was in fact closer to the scale of a region which was organized around a central settlement. The densely inhabited central settlement which was also often walled, and as such easily defined in space, was called 'asty', a term that literally referred to the physical configuration of a large agglomeration, which closely corresponds to the contemporary use of the term city. However, the 'polis' also included a much larger territory around the central settlement, the 'chora': The 'chora', literally meaning the 'land', consisted mostly of agricultural land, but also of other smaller settlements – 'komes' – and several establishments like farms, storehouses, small workshops, mines, places of worship and graveyards and of course other types of land equipment, like road networks and irrigation works.

We can conceptualize the 'asty' and 'chora' as a city and its hinterland, while the much broader 'polis' that encapsulated both as the overall social and political association of the citizens that occupied them. However, while 'asty' and 'chora' were geographically very distinct entities, the 'polis' was not at all characterized by a town / country type opposition. In fact the spatial division of labor was much more blurred. Citizens that lived in the 'asty' were often farmers, or had farmland in the 'chora',

while many workshops were located outside the 'asty' in smaller settlements. At the same time, the configuration of the territorial economy was also overlapping with a form of territorial governance that included both 'asty' and 'chora' under common citizenship, law and participation. As a coordinated territorial system of town and country, the overall aim of the 'polis', at least in its idealized form, was to achieve self-sufficiency, or 'autarky'. The idea of 'autarky', was directly interconnected with social and territorial interdependency. The question of interdependency as the basis of autarky, at first sight a paradoxical one, lies at the heart of the question of urbanization, as autarky here does not suggest a primitive subsistence economy, but a rather specialized economy in which a fundamental aspect is the exchange between city and hinterland.

Still even while the Greek 'polis' were driven by the ideology of 'autarky', rarely did they succeed self-sufficiency.[34] On the contrary, the high levels of population concentration and the associated intensification of the production and consumption of social surplus due to the social division of labor, as well as the highly asymmetrical geographical environment around the Mediterranean, created what has been described as an international division of labor where "in one place the object was wholesale production of wine and oil, in another foodstuffs were procured in exchange for manufactured articles."[35] A system of long distance food imports (and especially grain) extended the hinterlands of the Greek 'polis' to Pontus and above all North Africa and especially Egypt.

Within this context, Bairoch estimates that up to 40% of the population living in the 'asty' was dependent upon grain imports beyond the immediate 'chora', while an earlier study by Herbert Backe estimates that only one third of the population of the Greek 'polis' could be sustained through their immediate hinterlands.[36] In other words, even in this archetypal model of the city-hinterland, the biogeographicaly functional hinterland of the 'polis' did not overlap with its political boundary.[37] It could be argued that overall, the notion of 'autarky', was more of an ideology related to a certain view of political economy, which considered trade as a potential threat to the stability of social and political order, and less an actual bio-geographical necessity.[38]

URBS AND AGER

On the antipode of this model lies of course the archetypal mega-city of the ancient world: Rome. As Rome was developing into arguably the first global city, the roman world was transforming from a system of city-states, into a hierarchically structured imperium. Quite similarly to the Greek 'asty' and 'chora', the geography of the Roman urbanization consisted of a patchwork of 'urbs' and surrounding 'ager' (literally meaning 'fields'). The 'urbs', root of the world urbanization, referred to the built up, dense settlement space, often surrounded by walls, while the 'ager' to the surrounding hinterland, that was mostly agricultural and could include smaller settlements and establishments – most notably 'vilas' (farmsteads). As the Greek 'polis' included both asty and 'chora' into a socio-political association, the Roman 'urbs' and 'ager' were connected under the 'civitas' which could take several forms (municipia, coloniae).

With the development of the empire, both 'urbs' and 'ager' would become harder and harder to define while the role of 'civitas' as a socio-spatial unit would eventually dissolve. The case of Rome offers a lucid example of a city that was both building and being built by its hinterland, in such a close association that eventually it would be impossible to discriminate the two – the city from the Imperium. During the reign of Augustus (1st century BC) Rome had a population between 800 thousand and 1.2 million.[39] As the immediate hinterland of Rome was increasingly covered by the sprawling fabric, the extensive 'urbs' of the capital, its true supply hinterland was extending to the edges of the empire: The city literally grew together with the Imperium, which at its greater extend in 117AD covered around 5 million km^2, and had an overall population of over 50 million people. It is worth exploring briefly the complex interrelationship between Rome and this vast hinterland, perhaps the first 'global hinterland' in the western world. Overall, the Roman Empire benefited greatly from an intensification of connectivity, which allowed the generalization of trade and the emergence of specialized regions of exchange. And while the whole system of roman roads comprised of more than 400 thousand km, most of the trade continued to take place across the Mediterranean sea since maritime transport was more than 50 times cheaper than land transportation.[40]

Within this context, Rome mobilized a huge and complicated system of grain supply to deliver more than 400 thousand tones each year to the city.[41] This supply consisting mostly of tributes from the agriculturally specialized areas of Sicily, N. Africa and especially Egypt, was coordinated through a highly centralized bureaucracy. More than 2000 ships were mobilized for the operation that due to the seasonal patterns of grain cultivation only occurred a few times in the summer, with the food supply for the whole city being stored and transported across the Tiber. This operation was of course depended upon the subordination of the fertile territories of the south to the empire, however it lead to a more generalized regional specialization as Rome was not the only mega-city of the era that was depended upon long distance trade for its supply: Alexandria, Carthage and later Constantinople would also set up

complex networks to ensure their supplies within this vast territory and drew their resources from numerous regions that were becoming increasingly specialized by their productive role.[42] With the great intensification of exchange the Roman world introduced perhaps for the first time an extensive and multi-scalar assembly of regional and interregional specialized production landscapes that were developing in sync with the great asymmetries in the population distribution and the biogeographical interdependencies it introduced.

FROM CITY-STATES TO CITIES IN STATES

With the fall of the Roman Empire, cities continued to be functionally connected with a broad system of hinterlands for their supply, however their socio-political organization was largely distinct from that of their surrounding territory, and as Braudel suggests there were literally two worlds: inside, and outside the city gates.[43] Although cities continued being functionally interconnected with their rural surroundings and the provisions of food and supplies continued being a central administrative concern, within this context of separation of town and country, the term city came to refer only to the Greek 'asty' or the Roman 'urbs', to the densely populated, built-up agglomeration. This functional interdependency and eventually dominance of the cities over their hinterlands according to Braudel came with the advent of the monetary economy: Although cities continued to be depended upon a wide range of territories for their subsistence, the enhancement of their traditional role as exchange centers through the control of the monetary economy, allowed them to be freed from the burden of developing their surrounding territories and thus made their political attachment less necessary.[44]

As a result, when the city-state would reappear as a territorial entity after the dissolution of the Roman Imperium in the West, it would be established upon a quite different association with its hinterlands: Perhaps the best example of this new 'attitude' is provided by one of the first city-states that emerged after the fall of the Roman empire: Venice. Venice was literally a city with no adjacent hinterland for most part of its development after the 5th century AD.[45] Its territories of supply were more of a naval network that was at first spread across the Adriatic and eventually across most of the Mediterranean basin. When the city decided to expand across the coast of the lagoon, it did it mostly for defensive reasons, and not for securing a supply hinterland. And although the Italian city-states that followed, especially after the 16th century, resembled more the Greek polis having a quite extensive territorial footprint around the central city, their relation to their hinterland as Braudel suggests was a very different one:

> Venice, Genoa and Amsterdam consumed grain, oil, salt, meat, etc., acquired through foreign trading: they received from the outside world the wood, raw materials and even a number of the manufactured products they used. It was of little concern to them by whom, or by what methods, archaic or modern, these goods were produced: they were content simply to accept them at the end of the trade circuit, wherever agents or local merchants had stocked them on their behalf. Most if not all of the primary sector on which such cities' subsistence and even their luxuries depended lay well outside their walls, and laboured on their behalf without their needing to be concerned in the economic and social problems of production.[46]

Even when cities had a certain concern for the agricultural development of their surrounding regions, that was not necessary in order to supply their concentrated population, but rather part of an exchange circuit that fostered regional specialization for the sake of profit making. As a result, the types of agriculture that developed in the vicinity of cities were the most profitable ones:

> ...an agricultural sector, where it existed, tended to go in for cash crops and was a natural focus for capitalist investment; it was neither by accident, nor on account of any special quality of the soil that Holland so quickly developed such an 'advanced' agricultural sector... Since Florence had to import food anyway, why not import Sicilian grain, and grow vines and olives on the hills of Tuscany?[47]

Braudel characterized this relationship between the last city-states and their hinterlands as a very 'modern' one, since it was characterized by the search for profit and not for self-sufficiency. Indeed, as I will try to show in the next parts, the condition of regional specialization of the globalized hinterlands today is largely driven by such concerns. For Braudel, the more city economies gained control over the monetary economy benefiting from their positions as centers of exchange, the more their access to multiple sources of supply freed them from the development of the primary sectors of the economy, which were both land intensive and geographically bound. In the discontents of this eventual detachment of the city from its hinterland, Braudel sees the importance and eventual success of the development of the territorial economy of the state. The main difference between the nodal economy of the city, and the territorial economy of the state, is exactly the connection to the primary sectors of the economy:

> What distinguishes, and indeed contrasts the nation-system and the city-system is their structural organization. The city-state avoids carrying the heavy burden of the so-called primary sector: The Stadtwirtschaft thus automatically avoided the 'agricultural economy' defined by Daniel Thorner as the stage to be gone through before any effective development can take place. The territorial states by contrast, as they grappled with their slow political and economic construction, long remained embedded in that agricultural economy which was so resistant to progress, as can be seen in so many Third World countries of today.[48]

It can be argued, that with the development of the nation states, the construction of the hinterland, although it is biogeographically connected to the urbanization process, becomes part of the territorial development of the state, in which cities are parts of. This creates one of the major problems in appreciating this fundamental relationship within the contemporary context: Agglomerations are indeed the focal points for the concentration of activities of the secondary and tertiary sectors of the economy, activities that, as I will discuss, benefit from the externalities of agglomeration, the economies of scale and the concentration of labor. However the process of urbanization necessary includes the development of complementary landscapes, which with the development of the national forms of territorial organization are understood more as part of processes of 'national development' and less as part of the process of urbanization. Returning to Braudel, the various projects of national development could be interpreted as having two goals: The development of the national hinterland – that is the balanced territorial development within the state, and most importantly, the development of a global hinterland, but this time of the state and not of the city.

Starting with the colonial era, scales and modes of urbanization, state building, national and urban hinterlands became largely interwoven, making the process of the construction of the hinterland rather obscure: What the city used to be for the development of its urban hinterland – a node, could now be the state for the development of its global hinterland – again a node with a globalized sphere of influence. This interchanging use of the concept of the hinterland as part of a generic 'core-periphery' model, highlights its generic nature, but also poses one of the major problems of deciphering its true structural role in the process of urbanization. In the core of the model there can be either cities, urbanized areas, whole states, or groups of states, and in the periphery regions, states and groups of states.

THE EMERGENCE OF THE WORLD THÜNEN TOWN

The stretching of Von Thünen's model in order to address the dual process of globalized urbanization and globalized hinterland construction, makes this interplay evident. Indeed, as Peter Hall notes in the introduction to the volume, already in the late 19th century the construction of a commercially extended global hinterland was long underway.[49] With the official 'closing' of the American frontier in 1890, the development of railways and steamships and the generalization of the gold standard after 1880, almost all the world could potentially become part of a unified global system of exchange. At the same time that the global hinterland was expanding, the diffusion of industrialization across Europe and the growth of a dense network of metropolitan centers and railway corridors was creating a thick core of almost continuously urbanized land. In 1942 Herbert Backe introduced the idea of a great world "Thünen Town", in order to describe the dimensions and also supply needs of "the conglomeration of people from industry, trade and transport" that formed a "core of dense settlement" along "South and Central England, South Belgium, western and central Germany, East and Central France" and whose demands for foodstuffs and industrial raw materials embraced by the beginning of the 20th century the whole world:[50]

> Nearly three-quarters of the world trade in grain, almost nine-tenths of the flax plant, nine-tenths of butter, three-quarters of the quantities of cheese, four fifths of wool and about three-quarters of the wood are absorbed by it. Hence it is evident without further ado that these groups of states account for the 'Thünensche Stadt.'[51]

By then Mecklenburg, and indeed all Germany, were well within an inner Thünen ring. This idea of a world "Thünen Town" or a "World Metropolis" as the historian John Schlebecker would later refer to:

> For several centuries political thinkers have been telling mankind that this is One World. And so it is. So much so that a world metropolis can be identified. Von Thünen's isolated state is the world. This is the only world that we are immediately concerned with... some places in the world have always been heavily urbanized in comparison with the rest of the world. These urbanized places can be considered to be a unit, or a metropolis. This view is something more than a useful fiction; it is based on reality... Already by the sixteenth century certain sections of Europe formed an aggregative metropolitan area. This metropolis included south- eastern England, the Lowlands, northern

> France, and several cities of the old Hanseatic League. When the English began to colonize America in the seventeenth century, these urbanized places were the metropolis of the European isolated state. In the nineteenth century the American seaboard joined this metropolis to form an Atlantic, or world metropolis. London and New York formed the axis of this metropolis. Around this world metropolis spread this isolated world of ours with its sub-metropolises and zones of agricultural activity[52]

This early description of the world "Thünen Town" and its global hinterland is highly aligned with the colonial model of exchange, between the developed and industrialized core and the underdeveloped, supplying periphery, which was already evident at the time. Since the sixties, the examination of this condition became the focus of dependency theories and world systems analysis mainly developed through Braudel and Wallerstein.[53] In Braudel's perspective Von Thünen's model of the isolated state is translated into a global system of distinct zones of influence structuring territorially every world economy into centers, intermediate regions - or semi-peripheries and, finally, peripheries according to their position in the global division of labor. While dependency and world systems theories have offered valuable insights in the processes of uneven development, they have been mostly anchored around the unit of the nation state and rather insensitive towards processes of urbanization.

At this point, a summary of the various metageographies that are suggested from these models could be useful, as a way to grasp the structural contours of this changing and rescaled interrelationship: Deep in the nature of the process of urbanization is the development of a set of production landscapes that operate complementary to the agglomeration. In the early examples of the city-states this landscape, the 'chora', or the 'ager', was rather geographically continuous around the central settlement and was supposed to provide to the concentrated population the means of subsistence. This model introduces a metageography of a nodal agglomeration surrounded by a continuous hinterland, which even if it never existed in reality, has persisted as a dominant model of the hinterland: This hinterland as a geographically contiguous area. The second example I discussed, that of Rome, due it its scale introduces a much larger circle around the nodal agglomeration. Still the geographical arrangement of specialized regions is geographically continuous and part of the same territory, the imperium. The metageography it introduces is not so different from the metageography of the city-state, but rather expanded. The next example I introduced – Venice and the 16th century city states, operates as a network of discontinuous, or dispersed hinterlands connected through long distance, and not regional trade.

These areas are not part of a geographical continuum and their development is not directly a concern of the agglomeration, although the exchange between the two definitely reshapes them. This last metageography is a metageography of dispersed, discontinuous hinterlands.

Finally, with the development of the city states, a set of dual operations is unfolded: The construction of a continuous and internal national hinterland; and in the case of the western colonial states, the development of a global dispersed hinterland. With urbanization in the form of expanding agglomerations still being a condition that mostly characterized the developed western world, the development status of the core was easily correlated with their urbanization status and the core periphery model could easily be expressed in the form of an industrialized core – raw material producing periphery. In a way, the relation of urbanization with processes of broader geographical re-organization was largely thought to correspond to what Peter Taylor characterizes as the centripetal metageography of industrial modernity:

> The pattern is extremely simple: there are just two regions, an industrial core with the rest of the world supplying its needs.[54]

GLOBALIZATIONS WITHOUT THE GLOBE

However, after the 70s, with the restructuring of industrial production networks and with the concentration of population in dense agglomerations happening mainly in the developing world, this last simplifying assumption of the urbanized and industrialized core and the resource supplying periphery seemed largely inadequate to describe the patterns of global development.[55] Within this context, cities resurfaced as crucial agents in the diffusion of globalization processes challenging the role of states. However, the discussion around cities in globalization in the late 20th century, evolved around quite different questions than the ones the development of the 'World Thünen Town' posed. These questions have largely focused around two themes, largely detaching the study of urbanization from the transformations of a wide array of globalized productive landscapes and limiting it to the study of the internal dynamics of agglomerations, and to the external relations of agglomerations with each other.

On the one hand there has been a growing interest in understanding the structure and spatiality of emergent agglomeration forms (diffuse, polycentric, edge cities).[56] On the other hand there has been an emphasis in understanding the influence of cities, and especially selected 'global cities' in the reorganization of the world economy and the structure of global city networks.[57] Since the early 60's when Jean Gottmann

used the term 'Megalopolis' in order to describe the continuous agglomeration forms that emerged along the East coast of the United States, numerous concepts and paradigms have been introduced in an effort to grasp agglomeration patterns that departed significantly from the monocentric, 'metropolitan' model that characterized the early 20th century and was largely associated with the Chicago school.[58] Terms like 'polycentric', diffuse, regional, corridor or 'edge cities' are indicative of the efforts to grasp these increasingly continuous, both physically and functionally, agglomeration forms.[59] As Soja successfully summarizes:

> Once steep density gradients from the center have begun to level off as peripheral agglomerations multiply and the dominance of the singular central city weakens (...) in what can best be described as a regional urbanization process.[60]

Following the diffusion of density gradients, the discussions on the various forms of regional urbanization processes, became interested in unpacking how agglomeration externalities that used to be only found in dense urban centers, were now spreading over broader and broader configurations and were covering whole regions. The spatial unit and concept of the region that used to refer to the adjacent continuous hinterlands of nodal agglomerations, in this postmetropolitan condition became themselves the new 'units' of agglomeration. Within this context, and as I will discuss in chapter 03, the dynamics of agglomerations were disconnected from the constitution of hinterlands, especially of hinterlands that hosted primary production landscapes.

At the same time, as the traditional urbanized regions in the west were becoming largely de-industrialized and the whole system of production was becoming increasingly horizontal, the 'global cities' debate highlighted the emerging role of cities – or better selected cities – as commanding centers in the world economy.[61] According to this influential debate, the 'flexible' globalization of processing and manufacturing industries, characterized by increased outsourcing, or relocation to areas with lower labor costs, and the increasing importance of logistics, was creating the need for increasingly sophisticated forms of centralized management. At the same time the financialization of the economy offered an additional boost to the tertiary economic sector of de-industrialized cities in the west. What characterized global cities at the beginning of the 20th century then, was not their relation to their immediate surrounding areas, but rather their relation to each other, and their rank in this chain of command, a command that was taking place not only in persisting central business districts, but also in 'new forms of centrality' that were reconstituted at a regional scale through polycentric structures, or even at the global scale over advanced networks of information and communication technologies (figure 05).[62]

An exemplary and systematically developed model if this paradigm is offered by the concept of the Hinterworld, introduced by Peter Taylor and the GaWC group.[63] The concept of the Hinterwolrd aims to describe the variations in the intensity of provision of advanced producer services by world cities across the world. Analyzing the interconnections between firms of the tertiary sector and through a series of very elaborate mappings, the GaWC group ranks world cities into arrays of magnitude and interconnection as 'alpha,' 'beta' or 'gamma' world cities, in order to define which global cities dominate world service linkages. Based on the varying intensity of the connections to other cities as part of these tertiary sector operations, the model defines the relational Hinterworlds of each city, as the sum of cities with which it interacts (figure 06).[64] Larger Hinterworlds mean a larger network of interconnections of higher intensity.

But what is really classified is not cities per se, but rather cities as locations for the operation of advanced producer services. And what is connected is again not cities, but rather advanced producer service firms located across the world. The Hinterworld of these cities are thus cities that host either branches of the same corporations, or offer to them complementary services, again as part of the tertiary sector of the economy. As a result, the Hinterworld model is a rather horizontal one that does not deal with the secondary, not to mention primary sectors of the economy that could potentially allow cities to be linked to much more land intensive processes of production and extraction. As a result, the Hinterworld is a Hinterworld of cities, or rather a Hinterworld of service firms located in cites, which of course are important for developing the conditions for attracting them.

The concept of the Hinterworld is exemplary in highlighting the need for the development of the concept of the Hinterglobe that is the task of this research: I deliberately selected the term 'globe' in order to refer to the much more material, geographical, physical and environmental conditions that characterize it in relation to the term 'world' that has a much more 'immaterial' and abstract connotation. The concept of the Hinterglobe does not aim to cancel the concept of the Hinterworld. On the contrary, the discussion on global cities, has been very useful in challenging the dominant mosaic metageography of nation states that obscured the importance of agglomeration dynamics in the structure of the world economy. However, it did so by overemphasizing the links between only major agglomerations, thus establishing

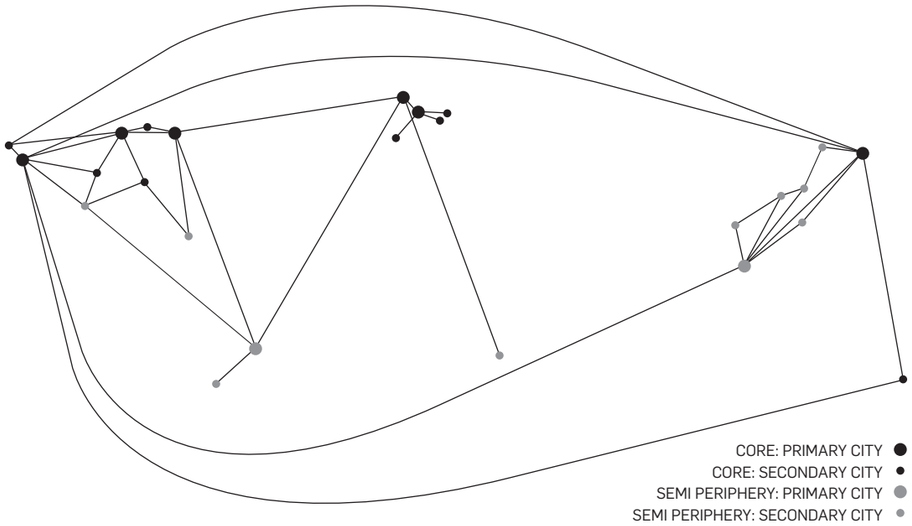


FIGURE 05: THE NETWORK OF WORLD CITIES ACCORDING TO FRIEDMANN, 1986.

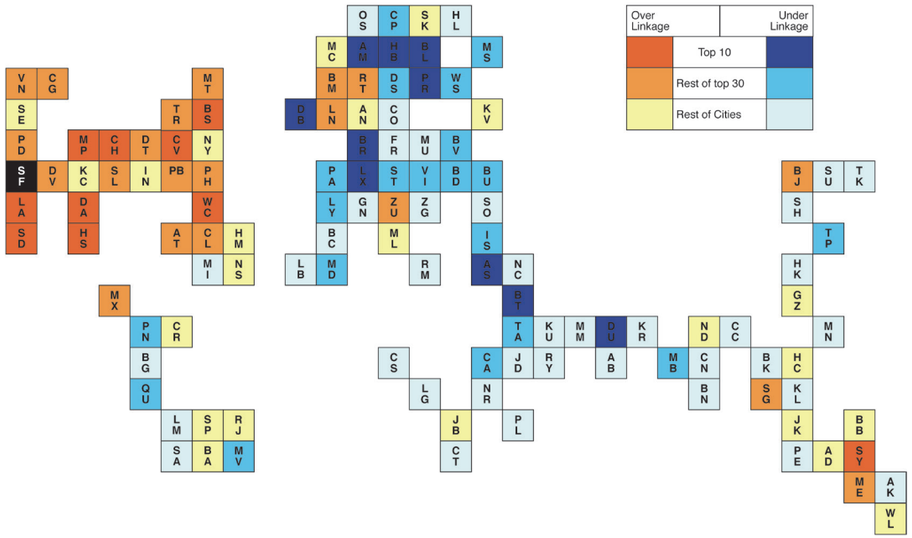


FIGURE 06: THE HINTERWORLD OF SAN FRANCISCO ACCORDING TO GAWC, 2005.

an equally problematic metageography of flows and networks. In contrast to the network metageography of the 16th century city-states, or the metageographies of the colonial era that connected cities and urbanized regions to a dispersed set of productive landscapes of resource extraction and agricultural production, the flows and networks highlighted by the global cities debate are only between cities, and especially between processes of the tertiary sectors of the economy located within these cities.[65]

This last metageography, can be characterized as a metageography of cities in globalization without the globe. One of the main efforts of this project then, is to reintroduce the globe in the debates of globalized urbanization, by offering an alternative narrative that does not only focus on the operations that happen within or between cites, but also on the operations that connect them to a variety of productive landscapes. In a similar line of critique, Timothy Luke has framed this call as the need to investigate the dynamics not only of a handful of 'Global Cities', but also the collective impact of 'global cities', the totality of settlements of various sizes, importance and economic performance around the world. Although the concept of the hinterland is not central to Luke's investigation, what he implies is the need for a more complete definition of the various levels of supply and service landscapes that are associated with the global patterns of agglomeration:

> As a planetary system of material production and consumption, these built environments constitute much of the world-wide webs of logistical flows which swamp over the conventional boundaries between the human and the natural with a new biopolitics of urbanism.(...) Immense logistical spaces, then, are always carved out beyond, beneath or behind the flows of urban existence. They help produce the permanent quarters of urban space, which fixes the conditions for quartering of city residents.[66]

The question of the Hinterglobe could be very well framed within this context. The question of the Hinterglobe requires the investigation not only of 'urban economies', economies which take place in cities, but of the broader variety of 'urbanization economies', economies that correspond to the broader social and spatial interdependencies associated with the formation of agglomerations, and which might operate in landscape that do not resemble cities at all. I argue that urbanization economies should very well expand to include operations of what is usually called primary sectors of the economy, operations that as I will discuss in the next chapter, make up the majority of the used part of the planet.

PLANETARY URBANIZATION AND THE HINTERLAND CHALLENGE

This proposition and overall problematique, is aligned with, building upon and aims to contribute to, the emerging agenda of 'Planetary Urbanization' introduced by Brenner and Schmidt.[67] Revisiting the work of Henri Lefebvre and his concept of 'complete urbanization', Brenner and Schmid have started elaborating theoretically, conceptually and methodologically on the structures, contours, dimensions and development patterns of a planetary condition in which:[68]

> ...agglomerations form, expand, shrink, and morph continuously, but always via dense webs of relations to other places, territories, and scales, including to realms that are traditionally classified as being outside the urban condition. The latter include, for example, small- and medium- size towns and villages in peripheralized regions and agroindustrial zones, intercontinental transportation corridors, transoceanic shipping lanes, large- scale energy circuits and communications infrastructures, underground landscapes of resource extraction, satellite orbits, and even the biosphere itself. As conceived here, therefore, urbanization involves both concentration and extension: these moments are dialectically intertwined insofar as they simultaneously presuppose and counteract one another[69]

The 'Planetary Urbanization' paradigm is invested both in the theoretical and the epistemological redefinition of the urban as a condition that transcends the city, as well as in the establishment of conceptual and methodological toolkits that would allow for a systematic investigation of a generalized condition of urbanization without an outside. As Brenner suggests:

> the conditions and trajectories of agglomerations (cities, city- regions, etc.) must be connected analytically to larger- scale processes of territorial reorganization, circulation (of labor, commodities, raw materials, nutrients, and energy), and resource extraction that ultimately encompass the space of the entire world[70]

The critical investigation of the persistent concept of the hinterland, and the associated exploration of the construction of the Hinterglobe, are thus meant to respond to this fundamental challenge. In particular, the challenge of investigating the hinterland within the context of 'Planetary Urbanization', is part of the overall effort to construct a dialectical process of the relationship between agglomerations and a broader set of productive territories that will be able to escape unproductive dichotomies like the town / country, the urban / rural, the social / natural. In order to start grasping these complex configurations in a dialectical way, Brenner and Schmid have introduced the categories of 'concentrated' and 'extended' urbanization.[71] These categories do not constitute opposing, or mutually exclusive analytical categories or spatial units. On the contrary, as it is understood here, they refer to mutually constructed dialectical processes that connect sociospatial configurations in densely inhabited and densely built areas of intense economic activity (concentrated urbanization), with sociospatial configurations in extensive landscapes of production, extraction, disposal and circulation that could include even very remote areas, like deserts the atmosphere or the oceans themselves (extended urbanization).

In many respects, the question of the hinterland is connected to the question of extended urbanization. However, as I will discuss in Part 02, most of the approaches aiming to define the interaction between agglomerations and hinterlands, as well as most of the spatial concepts that have been developed in this respect, have been challenged both by intellectual blindspots and by conceptual dichotomies, but most importantly, by the unprecedented complexity that characterizes this interrelation under recent conditions capitalist urbanization. In what follows I will try to present in a nutshell these challenges, which will be presented in detail in the last two chapters:

First of all, continuous agglomerations stretch across vast territories creating interregional patterns, generalizing and surpassing the megalopolitan phenomenon that Gottmann first studied. At the same time the diffusion and intensification of infrastructural networks is becoming more and more interwoven with processes of spatial reorganization. The intensity, power, spread and reach of technological developments has largely led to the pervasiveness of reliance on urban life on material and technological networks, while the duplicating, extending variety and density of networked infrastructures and the speed and sophistication of the more powerful and advanced infrastructures, are all rather unprecedented. The resulting social, spatial and technological interrelations, that mediate that city hinterland relationship, are thus reconstructed upon an extremely complex infrastructural landscape. And while agglomerations become more and more continuous and the infrastructural equipment of the earth's surface densifies, the resulting patterns of association and development of agglomerations and their broader productive landscapes are far from isotropic. Contrary to simplifying neoliberal aspirations of a flat world, what seems to best describe the contemporary urban condition is the selective connection of specialized landscapes of production across the world to the global circuits of capital accumulation and the resulting fragmentation and geographical disassociation of cities and hinterlands.

Most importantly, the management of the circulation system of exchange is increasingly consolidated to a few multinational corporations that aim to benefit from the reorganization of commodity trade. While up to the 18th century the cities were largely defining their hinterlands, either through controlling their surrounding regions, or through establishing long distance trade connections, with the development of the sovereign states their administrative power over their supplying territories were largely lost and absorbed into the national organization of territories. Within the contemporary context however, the territorial power of states is being challenged as it is increasingly interwoven with the operations of multinational corporations that strive to monopolize the production and distribution of food, energy, and raw materials.

The question of the hinterland then becomes extremely challenged: As planetary urbanization introduces a condition of generalized interdependency, distinct links between agglomerations and certain productive landscapes become increasingly blurred within a globalized metalogistical network that circulates huge quantities of materials and energy from places of extraction to places of processing, to places of consumption, to places of disposal and so on and so forth. The hinterland as a concept that connects linearly specific and delineated territories, seems to make less and less sense in a world where productive landscapes are concentrated and specialized as much as agglomeration landscapes and distribute their productive capacities in various destinations across multiple scales. The transition from hinterland to Hinterglobe, or even better from hinterlands to Hinterglobe, is a transition from a mosaic of linear connections, to a grid of generalized distribution. As a result, the question is how the Hinterglobe can be investigated and conceptualized as a whole. In order to approach this question, I now turn to concepts that aim to address the condition of the totality of the human use of the planet. I start with the concept of the Ecumene.

CHAPTER 02
FROM THE ECUMENE TO THE GEOGRAPHICAL ENVIRONMENT

THE CONCEPT OF THE ECUMENE

In the first chapter of this part, I discussed the concept of the ‘polis’ and suggested how it was initially refereeing to the organization of a broader environment around an agglomeration. As urbanization becomes a planetary condition, the organization of the broader environment that is developed through a condition of interdependency with complex agglomeration patterns, starts integrating the totality of the used part of the planet, which in human geography has been often addressed through the concept of the Ecumene.[72]

The concept of Ecumene is at least as old as the concept of the city itself. It is not particularly clear if its ancient use referred to the known, inhabited or habitable world, but as humanity continued spreading over the surface of the earth, these three eventually seemed to blend together.[73] With the development of the discipline of geography and the exploration of all habitable and inhabitable territories of the planet, with the official end of the era of discoveries at the beginning of the 20th century, the term gained considerable importance. The term came to describe the inhabited, or potentially habitable areas of the planet, a subsection of the known world, which corresponded to the whole globe. In fact, since the Ecumene actually referred to the used part of the planet, the areas activated and utilized by humanity, its ‘habitat’ at large, the description and explanation of the organization of the Ecumene became the main subject of the discipline of human geography at the end of 19th century and beginning of 20th century.

Unfortunately, reflecting the environmentally deterministic frameworks that in various forms characterized the discipline at least until the first half of the 20th century, most studies of the Ecumene were driven by two major factors: First of all, due to the effort to unpack the relationship between the natural environment and social systems, one major concern regarding the question of the Ecumene had been to define the habitable envelope, the areas of the earth’s surface where the natural environment presented the potential for settlement or use. For example, early efforts by Friedrich Ratzel or his disciple Helen Semple, aimed to showcase why the discussion on the Ecumene should not be limited to the actually used part of the world, but to the potentially used, trying to define the later.[74] This approach, foregrounded the need to delineate the Ecumene instead of defining its organizing principles. A second approach however that moved towards this direction, was equally problematic since

it was overly based upon the reproduction of the regional paradigm: As it will be further unpacked in the next part of the research, the human geography of the era was basically a geography of regions, accepting the unit of the culturally uniform region as the main building block of the inhabitation of the planet. Within this context, the organization of the Ecumene was the result of the composition of several regional units that largely reflected the modes of cultural adaptation and evolution based on the specific environmental conditions that characterized them.[75]

THE CONCEPT OF THE GEOGRAPHIC ENVIRONMENT

As a result, although the concept of the Ecumene was fundamental for early 20th century human geography, its development has not been particularly relevant for this study, especially because urbanization as an agenda remained in general a rather weak and unquestioned process for most human geographers of the time. A notable exception is offered by the geographer Jean Gottman.[76] Gottmann's interpretation combines a strong interest in the broad conceptualization of the human occupation of the earth and a particular interest in urbanization processes. It could be argued that in a way Gottmann was one of the first geographers that tried to explain the organization of the whole world through the dynamics of urbanization.

Less than ten years after the publication of his milestone work on the Megalopolis, Gottmann discussed in his inaugural lecture at the Oxford School of Geography the concept of the 'Geographic Environment' and the challenges of its renewal.[77] Gottmann's definition of the Geographical Environment was an interpretation of the concept of the Ecumene. Two elements are of particular importance from Gottmann's definition: The connection of the definition of the utilized area of the planet to a broadly defined notion of accessibility; and the effort to interpret the organizational principles of the geographical environment through the generalized condition of interdependency that is directly connected to the distribution of population in areas of high density, that connexts it with his earlier work on Megalopolis. Gottmann defined the geographic environment as:

> ...the concrete, material space accessible to human activity. To conform to this definition, every portion of geographical space does not need to be accessible to men bodily. But if man-controlled activities regularly occur in a portion of space, it is part of geographical concern. Thus, not only does newly discovered land come into the geographic environment, but any submarine or subterranean resource, such as an underground aquifer or an oil or gas deposit, which can be tapped through a system of pipes, is also part of the geographic environment even though men do not dive into such depths. Every new area to which men gain access is thus brought into the geographic environment: the geography of air transport developed as man began to fly; and for twenty years I have been holding that the moon would be brought into the scope of geographical study as soon as it became accessible to earthlings. The significance of accessibility implies that knowledge, technology, legislation, and politics largely determine and constantly modify the extent of the geographic environment and the relationships observed within it....[78]

From this definition it is interesting to highlight two elements: First of all, the geographic environment is defined through some sort of human activity. It is thus the directly or indirectly utilized space of humanity. We can safely assume that this would include the dense or sparse settlement areas, the landscapes of primary production, like agricultural and forestry areas, the transportation networks etc. However, Gottmann's emphasis on the indirect accessibility, allows his conception of the Ecumene to supersede the earth's surface and include all topographic, geologic, climatic and atmospheric elements that are indirectly accessed under human operations.

Equally important is the fact, that this direct or indirect accessibility is largely 'socially constructed': Within this process of construction, technological advancements, like for example novel transport and communication means, drilling platforms, rockets or satellites, submarines and submarine cables, are all interwoven with regulatory and economic frameworks, which are inherently political as they reflect social interests and goals. As Gottmann suggests, the geographic environment is not something static, an expanding envelope that is inscribed within a closed world model, but rather a dynamic and constantly modified set of possibilities.

Most importantly however, as Gottmann develops his concept of the geographical environment, he eventually connects it with the major challenge of his time, urbanization. Following his rationale, I will try to identify elements that will allow an understanding urbanization as a form of geographical organization. But before I get there, it is important to review the three sets of dialectical relationships that characterize the geographic environment according to Gottmann:

First of all it is continuous but partitioned, continuous referring to a condition of accessibility: This binarism of in-accessibility is a very important one, since for Gottmann it is continuously reconstructed through the interplay of socio-techno-

natural processes: The natural environment might offer degrees of accessibility (mountains, valleys, oceans, rivers), but these are continuously reconstructed through the application of technology (transportation networks) but also regulatory frameworks (for example borders). For Gottmann, the more contemporary technology cancels the natural partitioning engraved in the geographical environment creating a more symmetrical, 'flatter' landscape, the regulation of accessibility (though financial or administrative means) becomes increasingly important:

> with the progress of technology, exploration, and social and economic organization, as people learned how to overcome natural obstacles, the role of the man-made regulation of accessibility became essential in the partitioning of the geographic environment.[79]

I will return to this dialectic of the constant creation and recreation of symmetries and asymmetries in the last part. For now I turn to the second set, the one between the limits and the constant tendency towards expansion. While this point is rather self-explanatory, it is worth to understand again the limits of the geographical environment as the function of specific social and technical capacities. The fact that these capacities offer the possibility for constant expansion, does not mean that at any given moment in time the geographical environment in itself is not delineated as such. Much more interesting then is how Gottmann develops his final point, that the geographic environment is diversified but organized, with organization and diversification being actually part of a dialectical process, where again, natural asymmetries and inherited forms of geographical organization are reworked under the social and technological capacities and aspirations of each era:

> ...organization is ... a factor of diversification, as it expresses the fruit of an interplay of forces that start from varied bases and pursue different aims. Having inherited the natural variety of our planet, mankind has complicated the original picture, as successive generations have attempted to organize the environment, or at least parts of it, to fit purposes and ideologies emanating from numerous and competing sources.[80]

While this element of geographical organization could be the basis of the development of a robust theory of uneven development, this would not arrive until two decades later with Neil Smith's 'Uneven Development', to which I will return in the last part.[81] But while in Neil Smith's work as we will see the urban mostly a particular scale within the overall process of capitalist development, the interesting part about Gottmann's

discussion is that he foregrounds urbanization as one of the most important challenges differentiating the organizational patterns of our time. Gottmann's understanding of urbanization focuses on the emergence of areas of unprecedented population density, as exemplified by his major work, Megalopolis (figure 07). But the emergence of such agglomeration zones is connected with broader organizational shifts in the distribution of population, land use and developmental patterns:

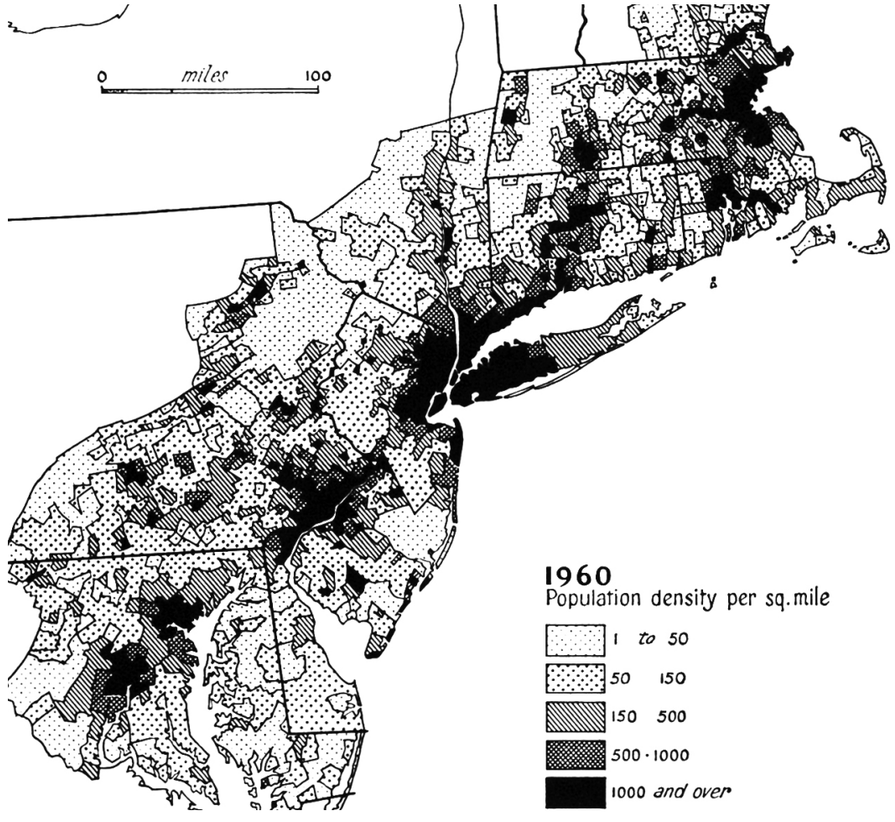


FIGURE 07: GOTTMANN'S MEGALOPOLIS.
The diffusion of densities along the major cities of the northeastern seaborne of the United States had already since the mid 20th century started creating a continuous agglomeration landscape.

> This picture hints at the enormous increase in the complexity of the organization of the environment inside and outside the areas of thick densities, required to provide for the needs of these enormous masses of dense settlement... the actual complementarity of these different categories of landscape and economies is now greater than ever. A new division of labour arises which creates more interdependence between regions, even those seemingly competing with each other, and between the various land uses within a given region. Areas of population concentration and high density of settlement and economic activity are necessarily more dependent than less crowded areas on the outside world for supplies, markets, and a variety of services...[82]

What Gottmann suggests is a condition of increasing interdependency that is directly connected with the emergence of the unprecedented zones of agglomerations that he and Doxiadis had been studying already from the early fifties. Gottmann implies that while high densities are generalized across larger and larger zones, there is an increasingly differentiation in relative terms between these zones and the low density zones of supply. This organization is thus achieved through the differentiation of the parts, parts that are becoming increasingly compartmentalized and specialized:

> What has been observed in the present points to greater contrasts between the various compartments of the geographic environment, to more diversity and new systems of partitioning, requiring more interdependence between the compartments in the organization of the whole.[83]

The differentiation could be attributed to an increasing specialization that is connected to the spatial division of labor, but also to an extensive scale of exchange, both within agglomeration zones, but also between agglomeration zones and their extended hinterlands. While this phenomenon, of the increasing dependence of the city upon the countryside for its subsistence, is for Gottmann a historically persistent one, what characterizes the contemporary condition is its generalization across the globe and its unprecedented scale, which is making the dynamics of urbanization a predominant element in the organization of the geographical environment. Returning to a quote from his earlier work on Megalopolis, the organization of the geographical environment seems to be connected to understanding the emergence of two new 'actors', two new forms of regions: The urbanized regions, and the specialized and industrialized primary production regions (figure 08 is in this way complementary to figure 07):

> The long-accepted opposition between town and country has therefore evolved toward a new opposition between urban regions, of which Megalopolis is certainly the most obvious and advanced case, and agricultural regions, the largest and most typical of which is found in the grain-growing Great Plains.[84]

Unfortunately, although Gottmann offered an exhaustive analysis of the Megalopolis, and recognized it as being directly connected to the development of a set of specialized production landscapes, he never managed to systematically unpack this connection beyond its theoretical framing in the discussion of the geographic environment. In a way this research and especially its last part, is a response to the need to finally explore in a balanced way these interconnected phenomena.

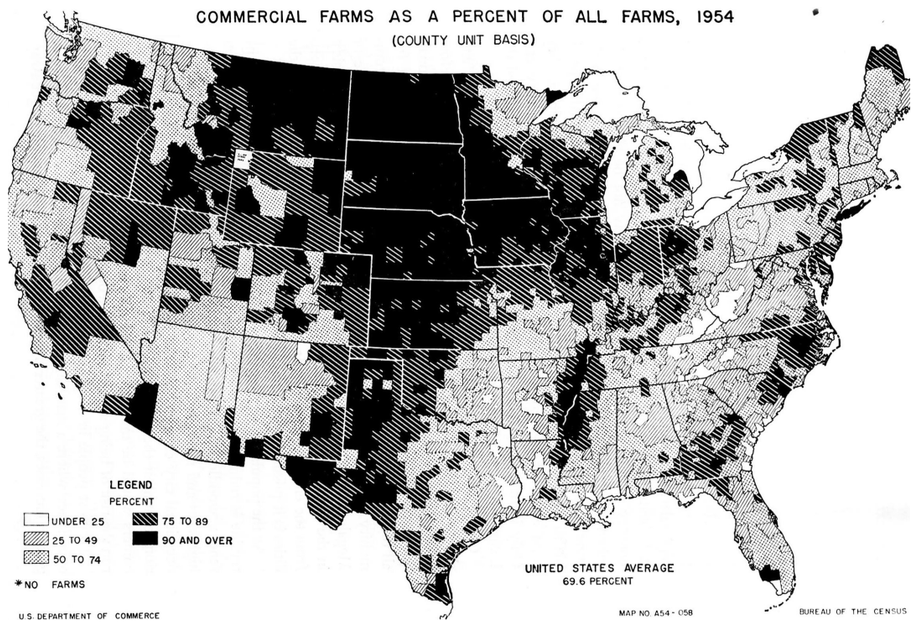


FIGURE 08: THE INDUSTRIALIZED AGRICULTURAL REGIONS ALONG THE GREAT PLAINS.
The specialization and industrialization of agricultural production had since the early 20th century started creating a series of intensive operational landscapes of primary production.

THE COMPOSITION OF THE GEOGRAPHIC ENVIRONMENT

As a first step towards understanding the organization of the geographic environment, it is useful to try and offer an overview of the various layers of human occupation that compose it. Over the past decades, the proliferation of geographic information systems, remote sensing and environmental modeling has offered a vast array of data regarding the utilization of the planetary terrain. Unfortunately, these data have been developed mostly as a response to the need for an environmental monitoring of the planet under concerns regarding environmental degradation. Since these datasets have been developed mostly from an environmental perspective, the question of urbanization has not been critically interrogated, but rather positioned within a broader understanding of the human impact upon the planet.[85] In this work, I will heavily utilize this rich geospatial information that has been generated, but I will try to gear it towards the study of urbanization as a form of geographical organization. As a first attempt, I build upon several of these geospatial datasets in order to construct a visual narrative and initial analysis of the conditions of human use of the planet, and also to initially position the way urbanization is interpreted within this context. As a result, this first attempt has a rather descriptive goal, it is an effort to draw through various indicators a portrait of the planet and the changing dimensions of its human occupation. I will attempt a more instrumental engagement with these datasets when I will develop my proposed spatial categorization of urbanization in the last part of this work (part 03).

in general, the composition of the geographic environment could be approached through two broad categories: Through the distribution of the human population on the earth – a demographic perspective; and through the patterns of land use and land cover associated with the activities of human population – a land use perspective broadly defined. I start with the latter:

The totality of the planetary surface is roughly estimated to be in the range of 510.072 million km^2, out of which of course only 148.94 million km^2 are land (figures 09-10). A very rough estimation of the breakdown of the used part of the planet in the year 2000 is offered by studies of the Institute of Social Ecology at Vienna and Klagenfurt.[86] According to these studies, the total used area of the planet is calculated to be around 102.19 million km^2 out of which the majority corresponds to 'productive landscapes': 15.2 million km^2 is cropland areas, 48.1 million km^2 grazing areas, 37.66 million km^2 areas potentially used for forestry and only 1.23 million km^2 corresponds to built-up surfaces. The relationship of these percentages is represented in the diagram in figure 11, while their geographical distribution across the earth's surface is shown in figures 12-15. Built up surfaces, do not only correspond to areas of dense settlement, but also to artificial structures and infrastructures beyond them. In fact a large amount of constructed surfaces corresponds to surface transportation infrastructures. Following Gottmann's suggestion that accessibility and not the actual physical imprint defines the extents of the geographic environment, a series of additional connectivity networks should be added to this classification: The major routes of marine transport that connect more than 4000 ports around the world, as well as the major air-routes of the world that connect more than 40000 airports around the world. Of course, although these routes might be rather 'immaterial', the 'grounded' bases of ports and airports are (important) parts of the constructed surfaces of the world. A combined map of all surface, air and marine transport systems is shown in figure 16.

The second attempt to define the dimensions of the Ecumene, is through the distribution of the population over the earth's surface. The asymmetries in the distribution of population constitute one of the most important steps in appreciating the process of urbanization. Unfortunately, the study of population distributions has been severely limited by a persistent urban-rural dichotomy and an effort to delineate these two categories as separate classes. I will return to this thorny problem in the immediate next section. Here I will try to deliberately avoid this classification, claiming that there is much more potential in observing the overall distribution and reshuffling of densities across the world in the form of density gradients, instead of excluding certain areas in favor of others.

At the beginning of the 20th century, the total population of the earth was calculated at around 6 billion. The distribution of this 6 billion across the earth's surface is shown in figure 17. The average density of this population over the entire land surface would be in the range of 40 people per km^2. Such a ratio however would make little sense since large parts of the earth's surface remain uninhabited. A more refined approach to the question would be to only examine the distribution of the population over all 'inhabited' areas, areas that are assigned even the slightest density of population (starting with 1 person per km^2). Such a calculation would lead to an inhabited area of 82 million km^2 (considerably lower than the total area of all sovereign states which is around 125 million km^2) and an average density of 74 persons per km^2. A set of further refinements however are needed in order to start understanding the relation between population concentrations and the land. The table in figure 18 attempts a general breakdown of population across various densities in order to showcase the striking unevenness in their distribution. In the year 2000, more than 80% of the population was leaving in densities of 100 people per km^2 or more, areas that covered no more

than 12% of the land's surface, while more than 55% of the population was living in areas with densities of 500 people per km^2 which covered no more than 3 million km^2, that is around 3% of the land's surface. Population densities of 1000 people per km^2 or more, similar to those of American suburbia, covered an area no larger than 2.5 million km^2, but corresponded to almost 40% of the world population. Finally, very high densities of more than 5000 people per km^2 covered no more than 0.1% of the earth's surface but hosted more than 12% of the total population.

Returning to the previous discussion on land use patterns, it becomes clear that the totality of the areas of dense population concentration, human settlements of various forms and sizes, constitute a rather small amount compared to the overall patterns of land use. The popular 'Urban Age' discourse has overemphasized how since 2010 more than 50% of the population lives in cities. However what is more striking to observe through this general study of density distributions, is perhaps the analogies between absolute population and absolute area sizes regarding settlements and other forms of human occupance. Seen in another way, the 10 million km^2 of land surface that corresponds to more than 100 people per km^2 (that correspond to the 85% of the world population) are connected to the reconfiguration of more than 100 million km^2 of used land. Even without the need to classify these demographic 'anomalies' that we can call agglomerations of various size in cities, towns and the like, the fact is that the population of the earth is rather concentrated to a small amount of the land's surface. Roughly for every 1 unit of settlement space, 10 more units are utilized 'elsewhere'.

URBANIZATION AND THE GEOGRAPHICAL ENVIRONMENT

Unfortunately, within this highly complicated and asymmetrical landscape of population distribution, studies of urbanization have invested immense amounts of time and energy in trying to delineate and eventually study only a particular section of population distributions. Over the past century, urbanization has mostly come to refer to a dual process of population concentration in densely inhabited and densely built areas and the associated geographical expansion of these areas. This approach is directly reflected upon the mainstream understanding of urbanization, as crystallized in the predominant UN studies on world urbanization and its prospects.[87] Interestingly, already in 1969, the first ever UN report on urbanization recognized the problems that the dynamics of population reshuffling posed for a fixed definition of the 'urban':

> in a fluid situation it is doubtful whether any detailed scheme can remain valid over an extended period of time. With the increase in number of urban attributes and their wider diffusion, it is doubtful that the historic twofold 'urban' and 'rural' distinction will retain its relevance much longer.[88]

It is quite striking then to note that more than fifty years later the urban / rural dichotomy has not only persisted, but has even become the basis of the celebration of an ''Urban Age', in an era that at least from a population distribution and land cover perspective, the boundaries between urban and rural are increasingly dissolved: In other words, since the built area and population distributions are presented in rather gradient forms, where can the line that distinguishes the urban from the non-urban be drawn? In my previous analysis I have structured the classification of population in rough classes (rather arbitrary defined) only for the sake of communicating my argument, that in fact what makes more sense to observe is the associations between these and other categories of land use. Where along this classification can the line be drawn to define the urban and rural? In most cases, urban areas have been associated with populations of at least 500 people/km2 and in most cases more than 1000 people/km2. But within the contemporary context, the delineation of urban areas, or cities, has become increasingly challenging with the diffusion of agglomerations.

The complexities of this situation is widely acknowledged. But yet, efforts to construct delineations of the 'urban' continue to proliferate. The map in figure 19, based on a dataset constructed by Columbia University's CIESIN, showcases one of the most elaborate approaches to delineate the 'extents' of the urban by delineating upon a population density gradient certain areas that conform to particular standards in relation to population density and land cover. The map of urban extents can be compared to the initial map of population density gradients developed by the same group (figure 17).[89]

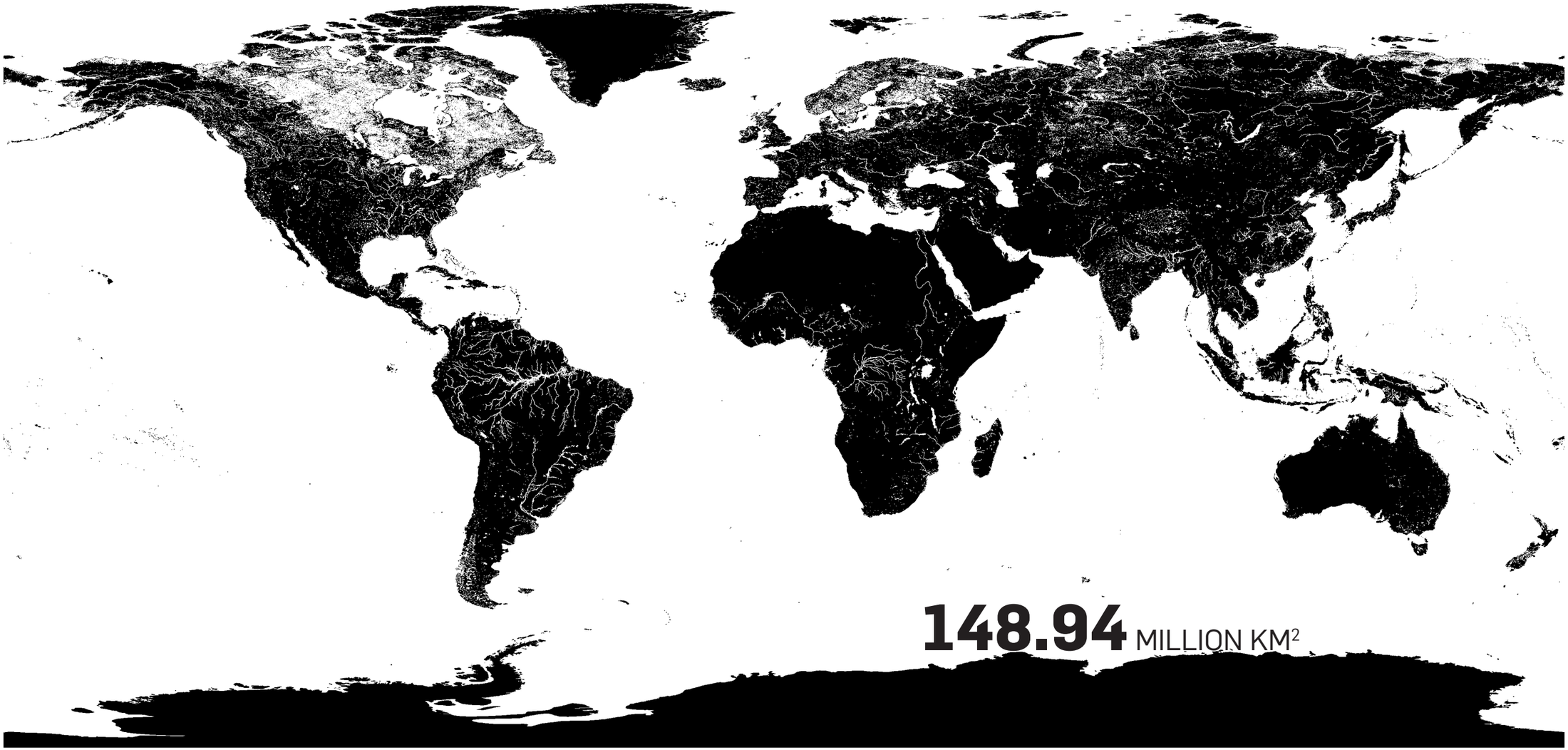
My intention here is not to address the specific methodological questions behind the construction of these classifications of the urban, but rather to highlight the persistence of a certain metageography of the urban that has restricted the broader appreciation of urbanization as a condition of generalized geographical organization. As part of my ongoing effort (together with Neil Brenner) to challenge existing metageographies of the urban, we have characterized it as the 'bounded city metageography'.[90] It is largely under this particular metgageography that urban areas have been detached from the rest of the fabric of the Ecumene, leading to the dichotomy which is highlighted in the introductory map I presented (figure 03): Urban areas are isolated patches within the 'terra incognita' of the used part of the planet.

THE CHANGING DIMENSIONS OF THE GEOGRAPHIC ENVIRONMENT

Within this context, the study of urban development is often limited to a single directionality: That of the expansion of these 'uraban extents'. Monitoring the development of urbanization thus means monitoring how these 'urban patches' extend, shrink and in general get reconfigured, and how their boundaries are reconstituted. A seminal and perhaps the most systematic example in this direction has been the attempt of Schlomo Angel and the Urban land Institute to put together an elaborate 'Atlas of Urban Expansion' that monitors the expansion of the sizes and forms of agglomerations (figure 20).[91] Following this interpretation of urbanization as the expansion of urban land, Angel and his team claim for the need to 'make room' for a planet of cities. But although this might be a meaningful proposition, it obscures the much larger dimensions of the urban condition: Making room for cities, for agglomerations, is only one part of the process of 'making room' for the several other operations of urbanization, operations that are connected to the construction of a globalized hinterland. In fact, the growth of agglomerations is probably one the least land consuming in terms of area, a case that has been often myopically addressed when monitoring the competition of urban land over other types of land. Although the expansion of urban land in one place might consume for example agricultural land, agricultural land might expand elsewhere and in even more explosive rates.

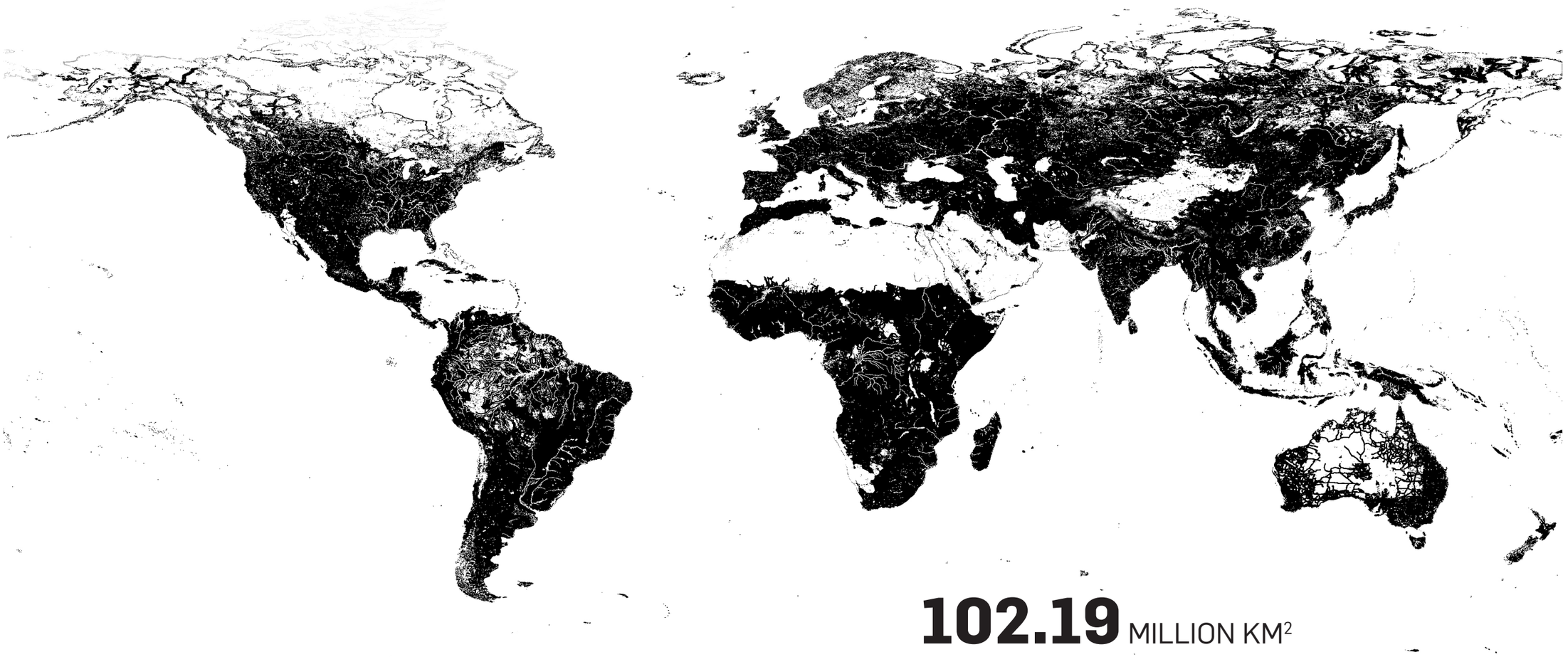
Concluding this short investigation, an additional series of maps and diagrams offers a rough overview of the historical development of urban areas in relation to the rest of the used parts of the planet, aiming to highlight exactly this complex interrelationship in the construction of the geographical organization: The diagram in figure 21 plots the evolution of urban areas in relation to the evolution of agricultural and grazing areas since the beginning of the 19th century. In 1800 when the combined areas of cities did not cover more than 30,000 km^2, agricultural and grazing areas were more than 9,500,000 km^2. In 1900, with industrialization and urbanization taking off, urban areas covered around 130,000 km^2, while agricultural and grazing areas almost 20,000,000 km^2. Finally in 2000, with agglomeration areas spreading over more than 550,000 km^2, agricultural areas were more than 15,000,000 km^2 and pastures more than 30,000,000 km^2. In addition, figure 22 shows the changing distribution of the population densities across the globe between 1900 and 2000, revealing the increasing concentration of population in areas of higher and higher densities.

This final overview, positions the question of this research within a historical perspective. I tried to present the distribution of a series of layers, already existing in Von Thünen's model: The agglomerations, the agricultural, grazing and forestry landscapes, the transportation systems. When possible in the last part I tried to also follow the composition of these elements over time, thus offering an overview of the changing dimensions of the Ecumene, or the geographic environment. However, as already noted, the efforts of this chapter have been largely descriptive, a way to present the main contours of the phenomenon that needs t be unpacked: The question of how urbanization processes relate these elements to operational configurations that correspond to specific geographical organizations. In order to address the connection of theses elements, in the second part of this project I turn to the investigation of selected models that tried to model what can be broadly referred as a 'city-hinterland' interelation.



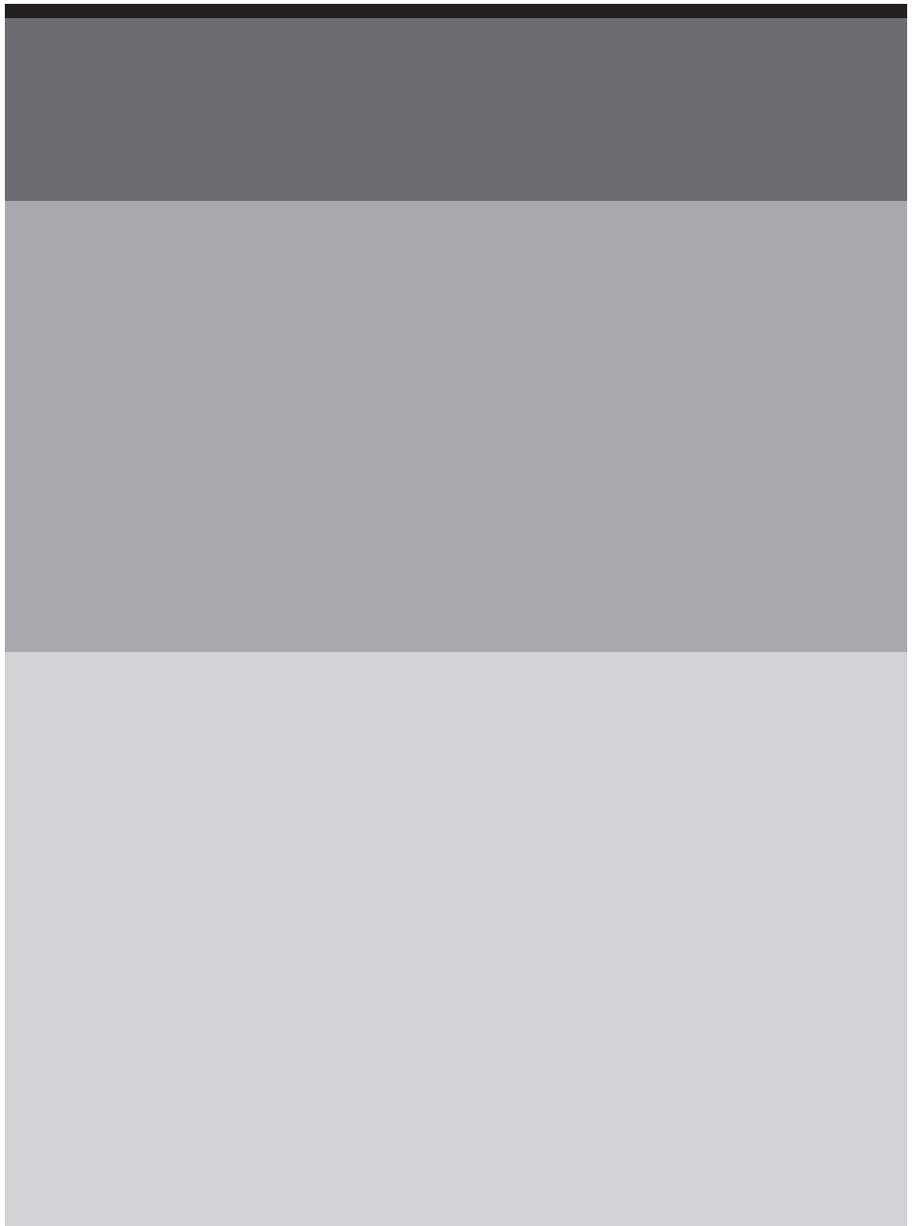
LAND SURFACE

FIGURE 09: THE TOTAL LAND SURFACE OF THE PLANET.



USED LAND

FIGURE 10: THE TOTAL USED SURFACE OF THE PLANET.



BUILT-UP	1,230,000 KM²	0.82% OF LAND SURFACE	1.2% OF USED SURFACE
CROPLAND	15,200,000 KM²	10.2% OF LAND SURFACE	14.9% OF USED SURFACE
FORESTRY	37,660,000 KM²	25.3% OF LAND SURFACE	36.9% OF USED SURFACE
GRAZING	48,100,000 KM²	32.3% OF LAND SURFACE	47% OF USED SURFACE

FIGURE 11: PERCENTAGES OF MAJOR LAND USE PATTERNS

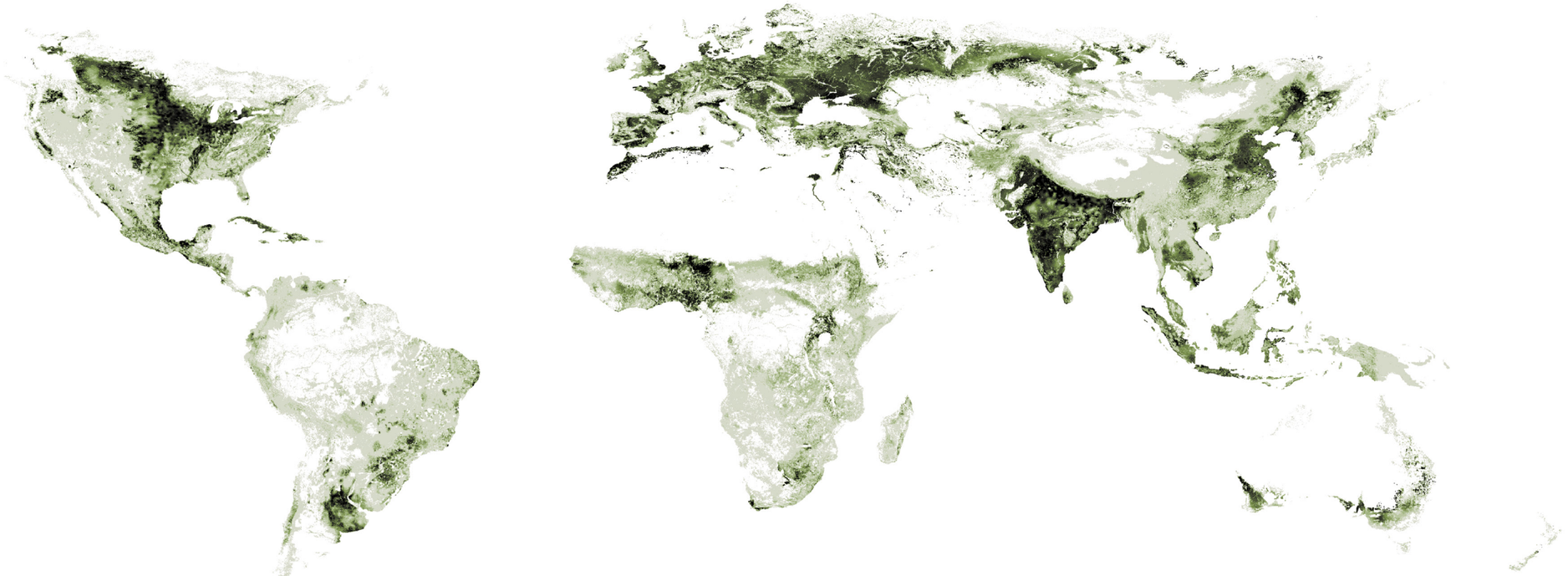


FIGURE 12: DISTRIBUTION AND DENSITY OF GLOBAL CROPLAND AREAS IN THE YEAR 2000.

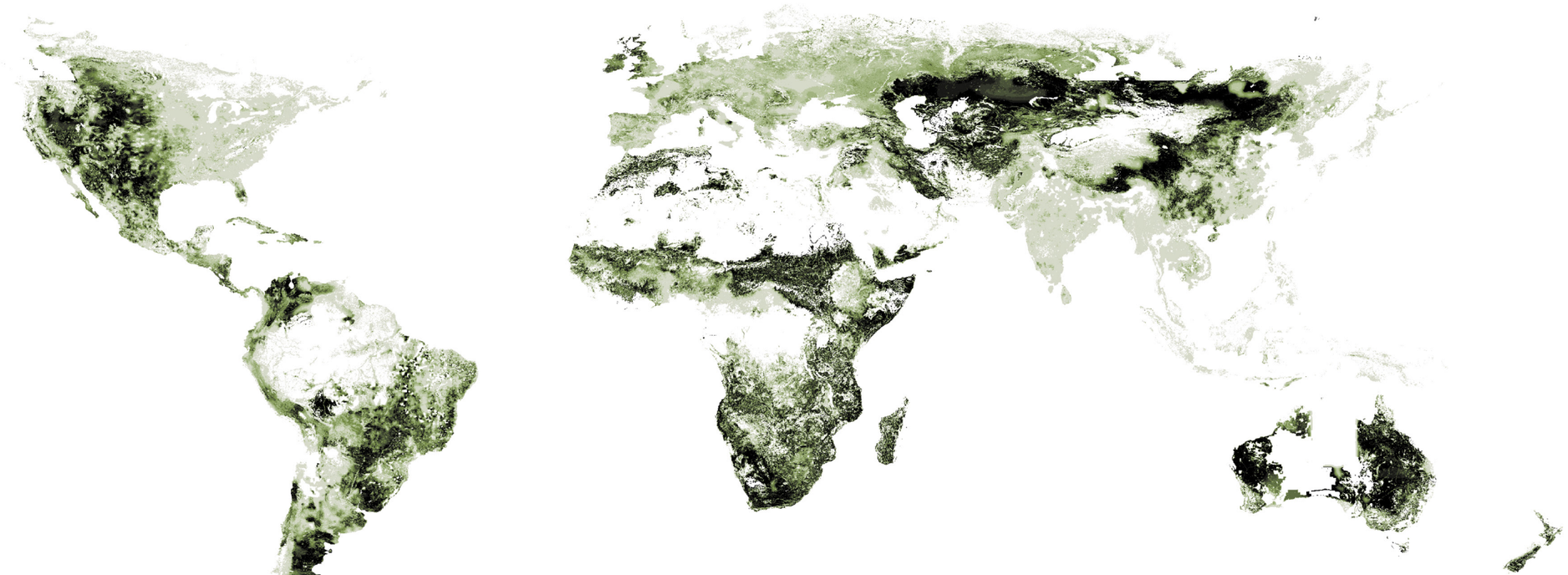


FIGURE 13: DISTRIBUTION AND DENSITY OF GLOBAL GRAZING AREAS IN THE YEAR 2000.

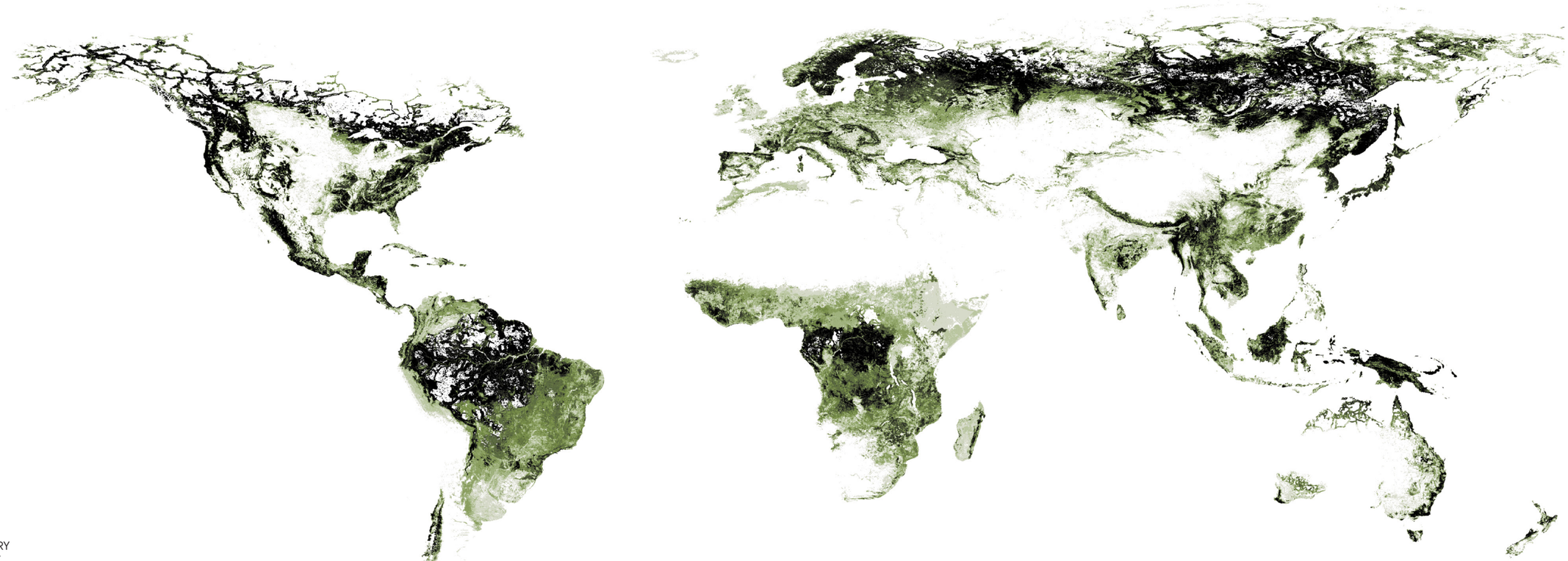


FIGURE 14: DISTRIBUTION AND DENSITY OF GLOBAL FORESTRY AREAS IN THE YEAR 2000.

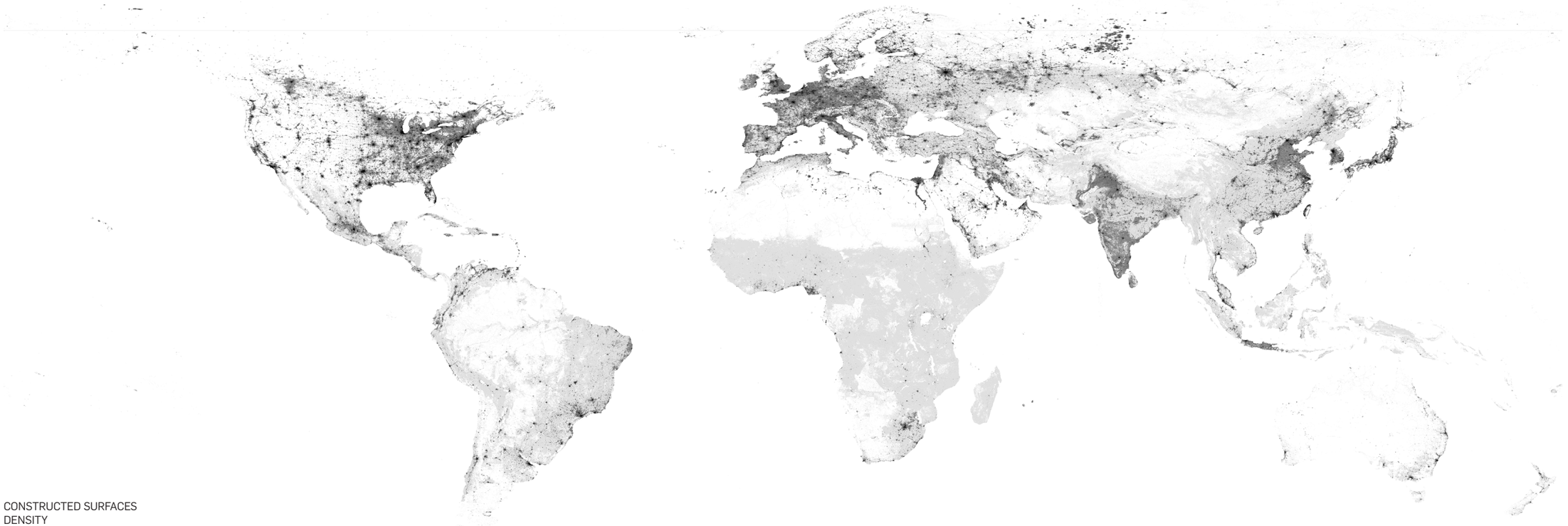


FIGURE 15: DISTRIBUTION AND DENSITY OF ARTIFICIALLY CONSTRUCTED AREAS IN THE YEAR 2000.

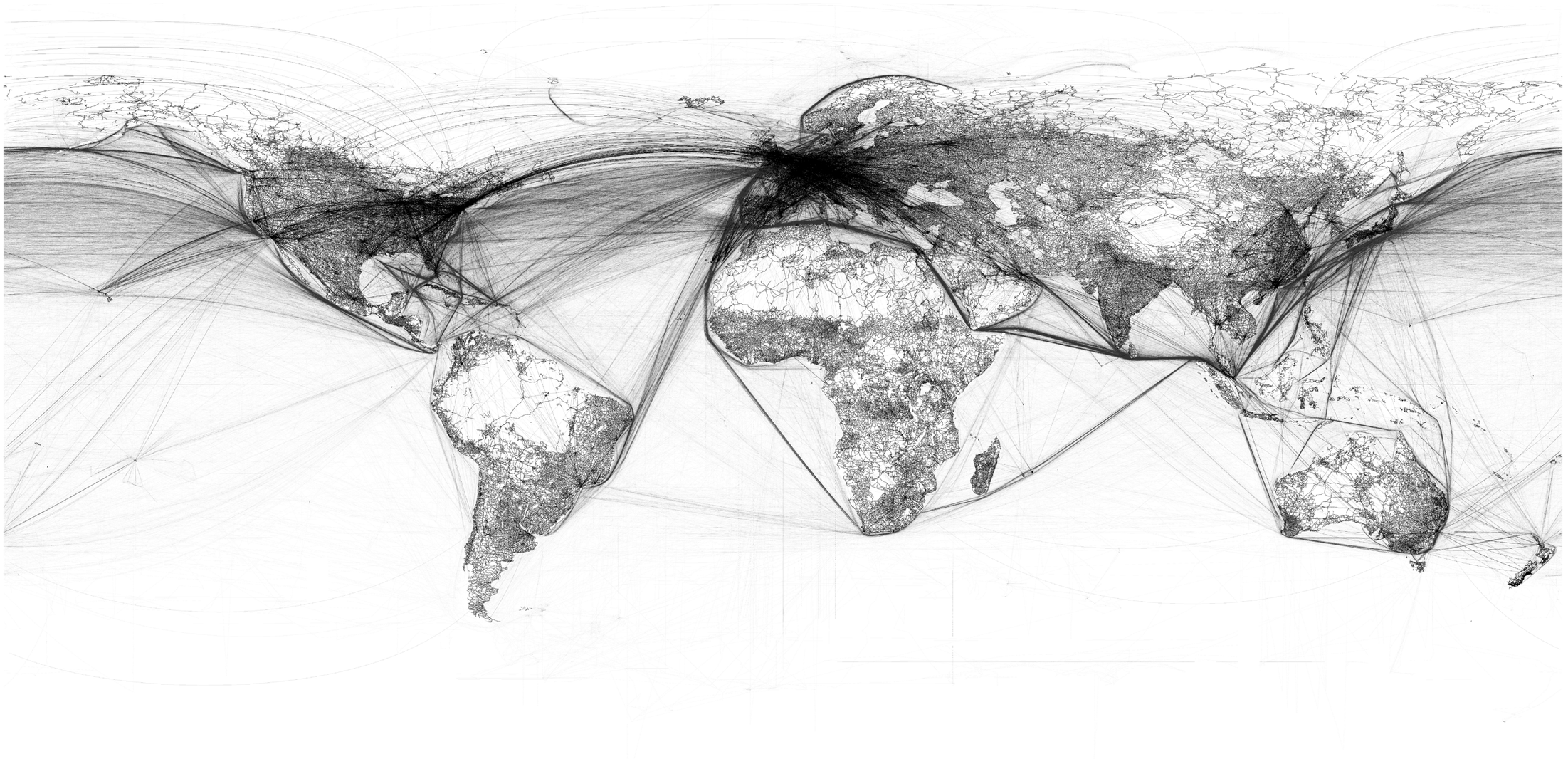


FIGURE 16: DISTRIBUTION OF MAJOR SURFACE (ROAD, RAIL), MARINE AND AVIATION NETWORKS.

FIGURE 17: DISTRIBUTION OF POPULATION DENSITIES IN THE YEAR 2000.

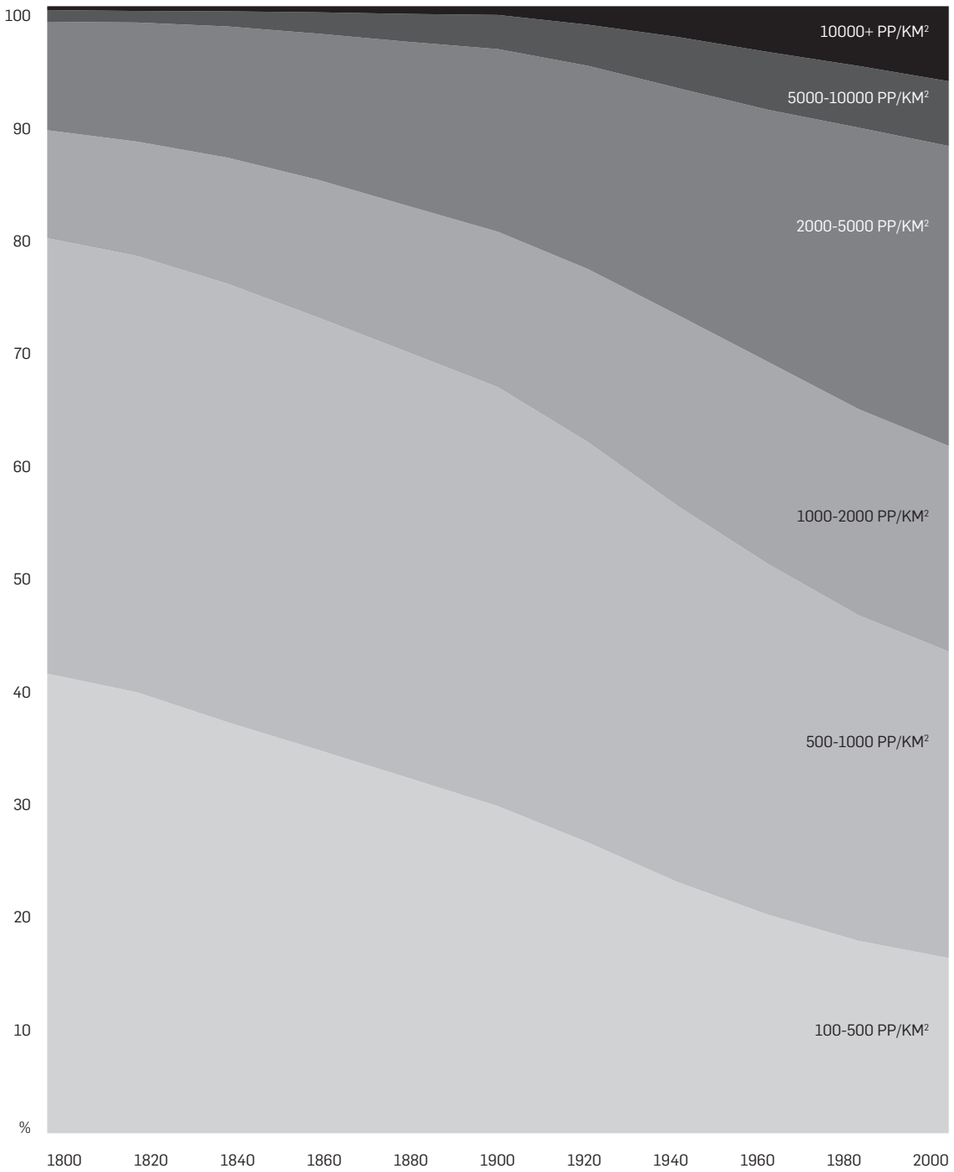


FIGURE 18: DISTRIBUTION OF WORLD POPULATION ACCORDING TO POPULATION DENSITIES 1800-2000.

DENSITY RANGE (PEOPLE / KM2)	AREA (KM2)	POPULATION	PERCENT OF TOTAL AREA (%)	PERCENT OF TOTAL POPULATION (%)
1-100	72686608.62	952949348	87.90	15.53
100-500	7405063.591	1667866937	8.95	27.19
500-1000	1608259.08	1118869492	1.94	18.24
1000-2000	660968.71	897773298	0.79	14.63
2000-5000	250970.663	734402069	0.30	11.97
5000-10000	51666.338	352560128	0.06	5.74
10000+	24722.064	408455319	0.02	6.66

DENSITY RANGE (PEOPLE / KM2)	AREA (KM2)	POPULATION	PERCENT OF TOTAL AREA (%)	PERCENT OF TOTAL POPULATION (%)
Density >100	10001650.45	5179927243	12.09	84.46
Density >500	2596586.855	3512060306	3.14	57.26
Density >1000	988327.775	2393190814	1.19	39.02
Density >2000	327359.065	1495417516	0.39	24.38
Density >5000	76388.402	761015447	0.09	12.40
Density >10000	24722.064	408455319	0.03	6.66

URBAN EXTENTS

FIGURE 19: DISTRIBUTION OF MAJOR AGGLOMERATION ZONES IN THE YEAR 2000.

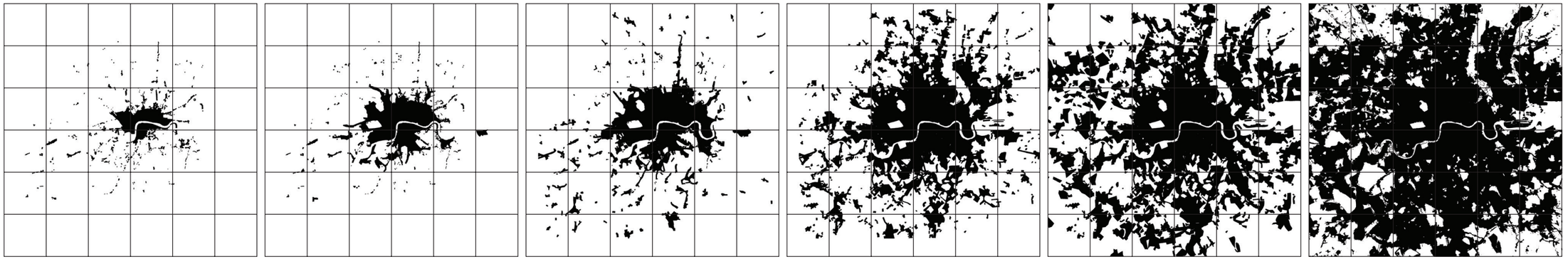
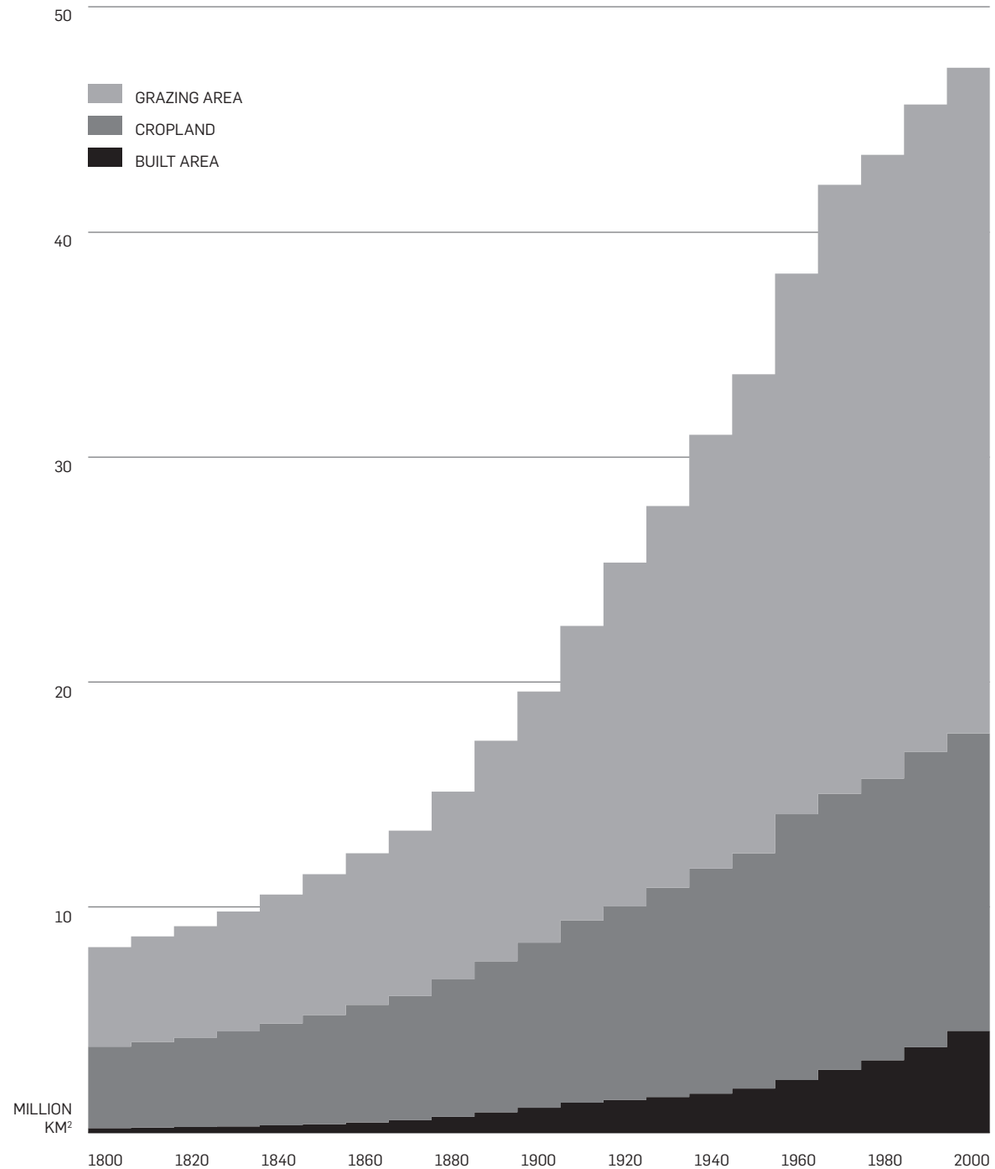


FIGURE 20: THE URBAN EXPANSION OF LONDON 1800-1960.



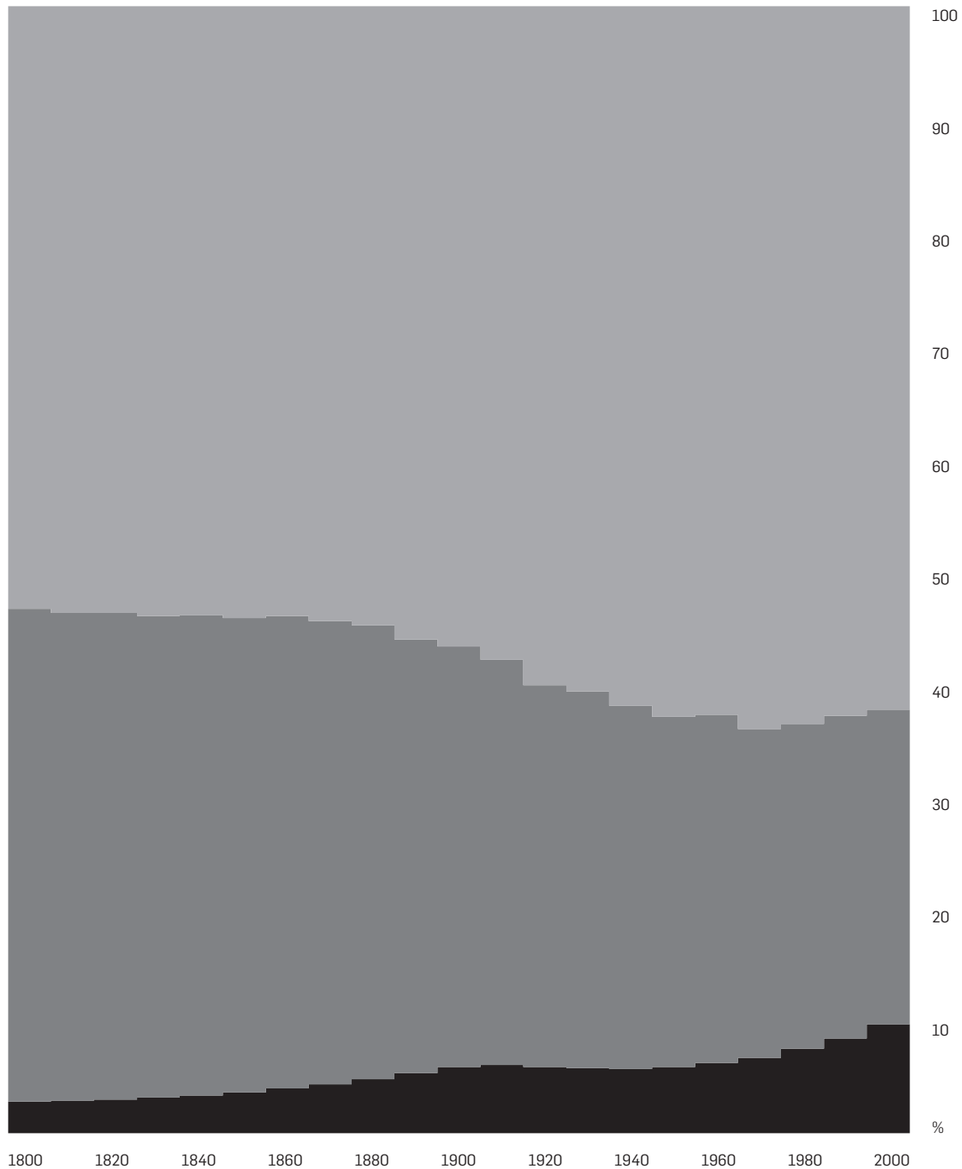


FIGURE 21: EXPANSION AND PERCENTAGES OF MAJOR LAND USE PATTERNS OF THE WORLD 1800-2000.

ENDNOTES TO INTRODUCTION AND PART 01

1 'From Civilization to Ecumenization' is the title of the last part of the last chapter of Constantinos Doxiadis' Ecumenopolis book. This dissertation can be very well conceived as an effort to build upon the legacy of his influential work, and this introduction as a tribute to this landmark project and publication. Doxiadis, C. and Papaioannou, J. *Ecumenopolis: The Inevitable City of the Future* (New York: Norton, 1974).

2 Doxiadis, C. "A Technique to Control Technique". *Main Currents in Modern Thought*, May-June (1966) vol. 22, 5.

3 Doxiadis and Papaioannou. *Ecumenopolis: The Inevitable City of the Future,* 393.

4 Ibid.

5 Ibid. 5.

6 Ibid. 40.

7 Lefebvre, H. *The urban revolution*, trans. Robert Bononno (Minnesota: University of Minnesota Press, 2003).

8 See in particular Chapter 42: "The New Balance" in Doxiadis and Papaioannou *Ecumenopolis: The Inevitable City of the Future*, 382-390.

9 Lefebvre. *The urban revolution*, 1.

10 Ibid.

11 Ibid. 15.

12 Ibid.

13 Brenner, N. "Theses on urbanization." *Public Culture* 25.1 69 (2013) 103.

14 Ibid.

15 For the concept of human occupance see: Whittlesey, D. "Sequent Occupance." *Annals of the Association of American Geographers*, Volume XIX, Sept. 1929, Number 2; Philbrick, A. "Principles of areal functional organization in regional human geography." *Economic Geography* (1957) 299-336; Sauer, C.O. *The agency of man on the earth*. (Chicago: University of Chicago Press, 1956); Sauer, C.O. "The morphology of landscape." *University of California publications in geography* 2.2 (1925): 19-53.

16 Center for International Earth Science Information Network - CIESIN - Columbia University, International Food Policy Research Institute - IFPRI, The World Bank, and Centro Internacional de Agricultura Tropical - CIAT. *Global Rural-Urban Mapping Project, Version 1 (GRUMPv1): Urban Extents Grid.* (Palisades, NY: NASA Socioeconomic Data and Applications Center, SEDAC, 2011).

17 Erb, K.H., Gaube, V., Krausmann, F., Plutzar, C., Bondeau, A. and Haberl, H. "A comprehensive global 5min resolution land-use dataset for the year 2000 consistent with national census data." *Journal of Land Use Science* 2(3), (2007) 191-224.

18 This is how UN Habitat frames the contemporary challenges of the urban context in search of the 'New Urban Agenda'. It is interesting to note that Doxiadis' eventual goal was to influence with his concepts and projects the definition of the problems of urbanization in preparation of the first UN Habitat, which happened in Vancouver in 1974. He died before managing to present his thesis in front of the general assembly. Unfortunately, more than forty years later, the definition of the problems of urbanization in preparation for the upcoming landmark third Habitat conference in history, has not been able to transcend the definition of the city and engage with the 'real city', as Doxiadis suggested. For a review of Doxiadis' ambitions to impact the actions of UN Habitat see: Pyla, P. "Planetary Home and Garden: Ekistics and Environmental-Developmental Politics." *Grey Room* 36 (2009) 6-35. For the current UN Habitat agenda see: https://www.habitat3.org/the-new-urban-agenda (accessed 2016/02/01)

19 See for example: Gottmann, J. *Megalopolis: the urbanized northeastern seaboard of the United States*. (Cambridge, MA: MIT Press, 1964); Soja, E.W. *Postmetropolis: critical studies of cities and regions*. (Oxford: Blackwell, 2000); Soja, E.W. "Regional urbanization and the end of the metropolis era," Gary Bridge and Sophie Watson (eds.) *The New Blackwell Companion to the City* (Cambridge, MA: Blackwell, 2010) 679-689; Soja, E.W. "On the Concept of Global City Regions." *ART-eFACT: Strategies of Resistance* 4 (2005).

20 See for example: Hall, P.G. and Pain, K. *The polycentric metropolis: learning from mega-city regions in Europe*. (London: Routledge, 2006); Garreau, J. *Edge cities: Life on the new*

frontier" (New York: Doubleday, 1991); Sassen, S. *The Global City: New York, London, Tokyo.* (Princeton: Princeton University Press, 2001). Sassen, S. *Cities in a world economy. Vol. 3.* (Thousand Oaks, CA: Pine Forge Press, 1994); Sassen, S. *Global Networks. Linked Cities* (New York: Routledge, 2002); Taylor, P. "Urban Hinterworlds: Geographies of Corporate Service Provision Under Conditions of Contemporary Globalisation." *Geography*, Vol. 86, No. 1 (2001) 51-60; Beaverstock, J. and Taylor, P. "World-City Network: A New Metageography?" *Annals of the association of American geographers* 90.1 (2000) 123-134.

21 Rees W. and Wackernagel, M. "Urban ecological footprints: why cities cannot be sustainable and why they are a key to sustainability." *Environmental impact assessment review* 16.4 (1996) 223-248; Crutzen, P. "Geology of mankind." *Nature* 415.6867 (2002) 23-23. Timothy Luke has recently coined the term 'Urbanthropocene' in order to highlight the influence of urbanization processes upon the transformation of the earth's surface and has also developed a critique of the concept of Antrhopocene. Luke, T.W. "Urbanism as Cyborganicity: Tracking the Materialities of the Anthropocene". Nikos Katsikis and Daniel Ibanez (eds.). *New Geographies 6: Grounding Metabolism* (Cambridge MA: Harvard University Press, 2014) 38-51.

22 See for example: Seto, K., Sánchez-Rodríguez, R. and Fragkias, M. "The new geography of contemporary urbanization and the environment." *Annual review of environment and resources* 35 (2010) 167-194; Thomas, E. et al. (eds.). *Urbanization, Biodiversity and Ecosystem Services: Challenges and Opportunities: A Global Assessment* (Springer, 2013).

23 Brenner, N. and Schmid, C. "Towards a new epistemology of the urban?." *City* 19.2-3 (2015) 151-182.

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PART 02

INTELLECTUAL CHALLENGES

TO A GEOGRAPHICAL INTERPRETATION OF URBANIZATION

INTRODUCTION TO PART 02:
TWO SETS OF 'TYRANNIES' IN GEOGRAPHIC THOUGHT

The goal of the second part of the project is to examine a series of seminal models that tried to address the hinterland question, broadly defined. The starting point of interrogating the concept of the hinterland has been its potential usefulness in conceptualizing urbanization as geographical organization beyond agglomeration. Since the concept of the hinterland refers both to a spatial unit, as well as to a functional connection, it could potentially help address both the transformations in the physical configuration of space, such as the modes of human occupance, as well as their connections across space. Moreover, since a major connection of hinterland processes can be characterized as processes directly connected to elements of the natural environment, the concept promises to help connect urbanization processes to processes of broader environmental transformation. Unfortunately, as I will discuss, the majority of the approaches to the hinterland question have been weakened by certain persistent 'tyrannies' that have characterized geographic thought for more than a century. These 'tyrannies' can be broadly framed as challenges in addressing two sets of relationships: The relationship between society and nature; and what could be framed as formal and functional relationships across space.

In general, it could be argued that until the early sixties human geography was still very invested in attempting classifications and offering descriptions of spatial configurations that tried to systematize the distribution of various phenomena upon the earth's surface. In fact, this interest in defining, charting and systematizing spatial categories was important because these were exactly assigned an agency in shaping social phenomena.[1] Unfortunately, invested in decoding the influence of the natural environment upon patterns of the human use of the earth, it was rather weak in grasping the socioeconomic complexities that were driving sociospatial organization, which seemed to be increasingly disassociated from the specificities of natural geography, especially due to the diffusion of technological developments. Locked within the boundaries of the region, these efforts failed to grasp the multiplicity of scales that characterized most urbanization processes.

As a result, under the growing influence of formal models coming from economic geography and, in particular, the tremendous impetus of location theory during the 1950s and 1960s, spatial relations were largely interpreted in functional, economic terms. During this time, the empirical, descriptive, site-based and historically specific approach of regional geography was largely superseded by efforts to develop a positivist, nomothetic spatial science that attempted to uncover the (supposedly) universal laws underlying spatial configurations.[2] As approaches to the functional organization of urbanization promised to grasp its planetary dimensions by analyzing and optimizing the locations of settlements and industries and the flows of capital, workers, resources and commodities, urbanization became increasingly detached from its organic synergy with natural geography, foregrounded by regional approaches. As a result, most of the models that tried to unpack the relationship between urbanization and geographical organization, were based in economic thought and offered an economic interpretation of space and the associated geographical transformations. Geography in terms of patterns of human occupance, configurations of land use and land cover, largely disappeared.

As a result, the city hinterland relationship was interpreted in functional terms as an economic interaction. In fact, the disappearance of the specificities of the geographical environment often appeared as an achievement in the effort to develop truly generalizable models. A second shift within these economic interpretations of the relationship between agglomerations and hinterlands added an additional layer of difficulties of understanding this relationship. This shift could be described as a transition from an interpretation of the hinterland as being a fundamental agent in shaping the agglomeration (the agglomeration being shaped by the surplus that is produced by the hinterland and in a way 'explains' the dimensions of agglomeration), to an interest in the internal dynamics of agglomerations and how agglomerations become the drivers of territorial transformation. As the later paradigm became more and more influential in the second part of the 20th century, the interest was increasingly channeled into understanding these internal dynamics of agglomeration and the relations of agglomerations with each other, rather than their relationship with surrounding or more distant hinterlands, which were after a while completely erased from the discussion of urbanization.

As the hinterland was disappearing from economic geography, it was reappearing in a very different, but still functional understanding of urbanization: An ecological one. It could be argued that the ecological appreciation of urbanization had quite an opposite viewpoint: Largely uninterested in the internal dynamics of agglomerations, which remained rather blackboxed, it was mostly invested in understanding the ecological effects of the concentration of population and economic activities in shaping broader patterns of resource and energy flows. The hinterland was thus reintroduced as a resource supply or waste disposal area, with a rather negative emphasis of urbanization as an agent of environmental degradation. This view was overly aligned with a final

shift in the intellectual episodes that tried to explain the vector between the society-environment interaction. These episodes can be summarized as follows: From the 1870s until the 1920s, human geography has been characterized by an effort to interpret how the environment was shaping various forms of social organization and human occupation of the earth. From the strong environmental determinism of the mid-19th century, when natural geography was thought to decisively shape patterns of sociospatial organization, to the possibilism of the second half of the 19th century and the Vidalian tradition that introduced a weaker agency of the natural environment in producing potential forms of settlement, environmental determinism quickly waned during the 20th century. Subsequently, the pervasive emphasis on the economic, cultural and behavioral dynamics of spatial relations privileged a multifaceted social determinism, in which sociospatial organization was generally considered to be independent of natural geography.[3] As Castree notes:

> Human geography was 'de-naturalized', a process that was equally apparent in the humanities and social sciences from which it drew its inspiration, while physical geography... was effectively 'de-socialized'.[4]

When the emphasis on the environment reappeared at the end of the 20th century, it was connected to social transformations through a completely reversed vector: This time it was not the environment that was shaping sociospatial organization, but rather, the development of human societies that was increasingly influencing (in a negative way) environmental systems. From the environmental determinism and the subsequent possibilism and eventual disconnect of the society - nature relations, the contemporary condition highlighted a 'social determinism', best expressed through the paradigm of the Anthropocene, a paradigm that highlights the agency of humanity in shaping the planetary surface. But, any attempt to define a vector of interaction reveals the major fallacy in the conception of this complex interrelationship: The fact that society and nature are considered as two separate entities, and need to be connected by some sort of device that explains how the one acts upon the other, while in fact and as I will discuss in the last part of the project, they are co-produced in a dialectical manner.

Finally, an additional set of challenges considers the spatial concepts that tried to engage with these issues: As already mentioned, the question of the hinterland is both a question of transformation of the earth's surface, and a question of relations. Two persistent spatial concepts have been constantly utilized in order to address this dual condition: The city as anode, the hinterland as a surface, and their connection as constituted through a network. As I will discuss, surfaces and networks, linear and areal spatial categories, have different advantages and disadvantages that are both necessary and problematic in the interpretation of geographical organization: Land use transformations correspond to areal conditions; but their associations across space correspond to linear network connections. Like the previous intellectual problems, this tension has also haunted interpretations of the hinterland.

In the rest of this second part, I will follow these shifts and try to unpack the interpretations of geographical organization they offer us while tracing their limitations and blindspots. In fact it could be argued that because of the disintegration of human geography into social and natural geography, since the early 20th century there has not been a truly 'geographical' interpretation of the human occupation of the earth: The dominant examples have either focused on an economic interpretation, or an ecological interpretation. While both of them offer very useful concepts, they are still lacking the connection to the transformation of the planetary terrain, a transformation that environmental sciences are currently exhaustively monitoring, but lack the tools to connect it to issues of sociospatial organization. It is this gap that I will eventually attempt to close in the last chapter. I start with the economic interpretation of space.

CHAPTER 03:
FUNCTIONAL INTERPRETATIONS OF THE HINTERLAND I: ECONOMIC

PROTO-INDUSTRIAL HINTERLANDS

I start the discussion of the economic interpretation of the hinterland with one of the first models that is 'hidden' inside Adam Smith's foundational work on the Wealth of Nations.[5] Writing in the 1770s, Smith's discussion of the relation between town and country is fundamental in his effort to present the emerging capitalist relations of market exchange as 'natural' and 'eternal' as possible. In this effort the emergence of the conditions of exchange almost correspond to a history of urban origins, with urbanization developing in a seamless parallel relationship with the expansion of free trade and the specialization of the social and spatial division of labor:

> The country supplies the town with the means of subsistence and the materials of manufacture. The town repays this supply by sending back a part of the manufactured produce to the inhabitants of the country. The town, in which there neither is nor can be any reproduction of substances, may very properly be said to gain its whole wealth and subsistence from the country. We must not, however, upon this account, imagine that the gain of the town is the loss of the country. The gains of both are mutual and reciprocal, and the division of labour is in this, as in all other cases, advantageous to all the different persons employed in the various occupations into which it is subdivided.[6]

The town develops due to the existence of an agricultural surplus produced by its resource hinterland, allowing artisans to settle in close proximity and thus take advantage of the externalities of agglomeration. These externalities include a first market for their products (as specialized artisans are also dependent on each other for the provision of goods and services) and the reduction in the costs of interaction. Supply and service hinterland first co-evolve in a complementary way "as the fertility of the land had given birth to the manufacture, so that progress of the manufacture re-acts upon the land, and increases still further its fertility." However, as the division of labor in the town evolves, the town starts to develop extended trade with more distant markets. Thus, while the town keeps getting all its surplus from its supply hinterland, the value it adds to the manufactures through the ever increasing division of labor allows it to extend its service hinterland beyond the surrounding countryside.

In Smith's model, the hinterland 'builds' the town in two ways: first it allows the subsistence of the population (supply hinterland) and second and most important it allows the further division of labor (service hinterland), which is only limited by the extend of this service hinterland (or market). Thus the development of the city is connected to the further development of trade and limited by the means of transport, but also by the possibilities of its supply hinterland. Transport and thus the access to a wider supply hinterland plays a seminal role:

> The inhabitants of a city, it is true, must always ultimately derive their subsistence, and the whole materials and means of their industry, from the country. But those of a city, situated near either the seacoast or the banks of a navigable river, are not necessarily confined to derive them from the country in their neighborhood. They have a much wider range, and may draw them from the most remote corners of the world, either in exchange for the manufactured produce of their own industry, or by performing the office of carriers between distant countries, and exchanging the produce of one for that of another. A city might in this manner grow up to great wealth and splendor, while not only the country in its neighborhood, but all those with which it traded, were in poverty and wretchedness.[7]

Smith's account of a 'hinterland-driven' urbanism, written in a period when the industrial revolution had still not taken off and the means of transport and subsistence did not differ very much from those of medieval societies, is very close to the typical histories of urban origins. In the classical accounts of Gordon Childe or Kingsley Davis and more recently Paul Bairoch, urbanization is preconditioned upon the technological developments that allow the generation and improvement of an agricultural surplus, but also the increasing efficiency of the equipment of the earth for irrigation and most importantly transportation.[8] Concentration and the growth of urban centers, is largely presented as a natural tendency limited by means of technological improvement in the expansion of the urban hinterland.

THE ORGANIC HINTERLANDS OF EARLY METROPOLITANISM

Probably the first and one of the most systematic efforts to interpret the evolution of the functional relationship of agglomerations and hinterlands along the lines that Adam Smith set, belongs to Norman Scott Grass.[9] Grass reconstructed a lengthy economic history of the world structured around a succession of types of agglomerations and their interdependencies to their broader economic territories. Following Adam Smith, Grass connects the evolution of economic progress with the advent of the specialization of labor and the expansion of markets, but is much more systematic in connecting the various stages to certain spatial units that all have a structure of core

and periphery. Moreover, Grass introduces the notion of the metropolitan economy that will prove highly influential. Grass recognized three stages of economic life which also corresponded to certain stages of geographical organization:

> If we cast our thought no farther back than the permanent settlement of clans and tribes, we see that there are three general stages which sum up much of the economic life of the times: village economy, town economy, and metropolitan economy. Each is a unit of production. Each has a centre of trade, though the importance of trade is, of course, not so great at first as later [...] In the progression from one stage to another we see not only a greater specialization, but a greater general division of labor, a larger surplus and store of goods, and more immunity from distress and famine. Structurally the village (generally) and the town and the metropolitan units always had each a nucleus with an area round about. Functionally town and metropolitan economy had a division of labor between the centre and the area that constituted the basis of economic efficiency and progress.[10]

For Grass, what differentiates the various types of agglomerations is not form, size or structure, but rather function. The village economy was still connected to agriculture, while the town economy to some sort of specialized trade, mainly with its surrounding hinterland, but also in a lesser degree to the 'outside'. Finally, the metropolitan phase of agglomeration is defined by an even greater specialization of labor, and most importantly, an even greater expansion of extended trade through the development of transport, industry and, above all, finance. Early enough, Grass creates an organic model of exchange where a nucleus and a regional hinterland work together to connect to similar units around the world. However, while they form a functionally integrated economic unit, they are not necessarily geographically continuous:

> the metropolis and its hinterland are integral parts of the metropolitan unit, but they are not constant in the areas, which they occupy.[11]

What is the overall importance of this scheme is the almost organic interdependence of all parts which collaborate to connect the metropolitan unit to other metropolitan units (figure 22). Thus, the two different kinds of trade that Grass defines, 'extended' (interegional) and 'hinterland' (local) are equally important as "the hinterland trade is the wheel of the machine; the extended trade the belt connecting the wheels."[12] Overall, for Grass the interdependence of metropolis and hinterland although not evident is undisputed:

> It is true that in studying this organization we are inclined to emphasize the great metropolitan center; but to forget the large dependent district would be fatal to a correct understanding of the subject. Perhaps, indeed, it is somewhat incorrect to speak of the area as dependent upon the center, for, though that is true, the center is also dependent upon the outlying area with its towns, villages, and scattered homesteads. Interdependence of the parts is really the key to the whole situation.[13]

The degree of this interdependency wanes with increasing distance from the nucleolus, depending upon the development of infrastructure networks. Grass emphasizes that this territorial condition of local and extended exchange requires a continuous and laborious infrastructural effort. Discussing the metropolitan development of London he notes:

> Soon practically all the important railroad lines focused on the metropolis. This meant that the hinterland was truly bound to the metropolis by bands of steel, the rails of the new roads. Contemporaneous with railroad construction came the building up of oversea traffic on a new and regular basis by means of the steamer. What was done for London's hinterland trade by the railroad was -done for its extended trade by the steamship.[14]

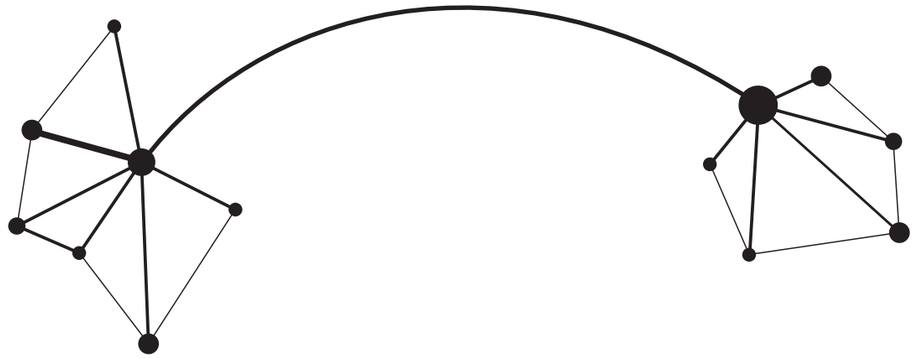

FIGURE 22: A DIAGRAMMATIC MODEL OF THE METROPOLITAN ECONOMY ACCORDING TO GRASS

This short overview of Grass' definition of the metropolitan economy is probably the most early and lucid example of an image of metropolitan organization the proved highly pervasive, persistent and influential:

> If we wish to visualize the whole metropolitan mechanism we have only to think of a web with the master spider in the centre.[15]

This view of the metropolitan unit as an 'organic' form of territorial organization was quite deliberate as Grass was trying to present the metropolitan unit as the natural way of organizing economic activity in space. Grass advocated against the return of mercantilist practices that characterized the early 20th century and went even further as to deny the nation state as a unit of economic organization, highlighting the need for allowing metropolitan systems to expand their reach.

VON THÜNEN'S MODEL OF THE AGRICULTURAL HINTERLAND

While economic in their nature, the aforementioned models of Adam Smith and Grass, are built into historical narratives that aim to explain the patterns of geographical organization based on the evolution of the exchange between city and hinterland. They did not constitute formal models of a mathematical nature, but rather conceptual models that tried to generalize and abstract the economic nature of sociospatial relationships. Having said that, it could be argued that Johannes Von Thünen's model of the Isolated State, which has served as a framing device for this study, was certainly the first 'formal' model of economic geography, aspiring to predict distributions of patterns of agricultural cultivation around a single agglomeration, or 'town'.[16]

The Von Thünen model is the first in a series of formal models that I will present that aimed to describe through mathematical modeling the distribution of activities in space: Von Thunen's model aims to offer an interpretation of the agricultural hinterland; Alfred Weber's model of the location of industries that will be presented next refers to an industrial hinterland;[17] Christaller's model that will be the third model to be presented introduces the notion of a service hinterland.[18] After discussing these three agglomeration-hinterland models that refer to the three basic sectors of the economy (primary, secondary, tertiary), I will introduce the shifts towards unpacking the internal dynamics of agglomeration that occurred during the middle sixties and will unpack how they related to postindustrial models urbanization.

As already discussed, Von Thünen's model of the isolated state is based on a series of abstractions and assumptions regarding the asymmetries of natural geography,

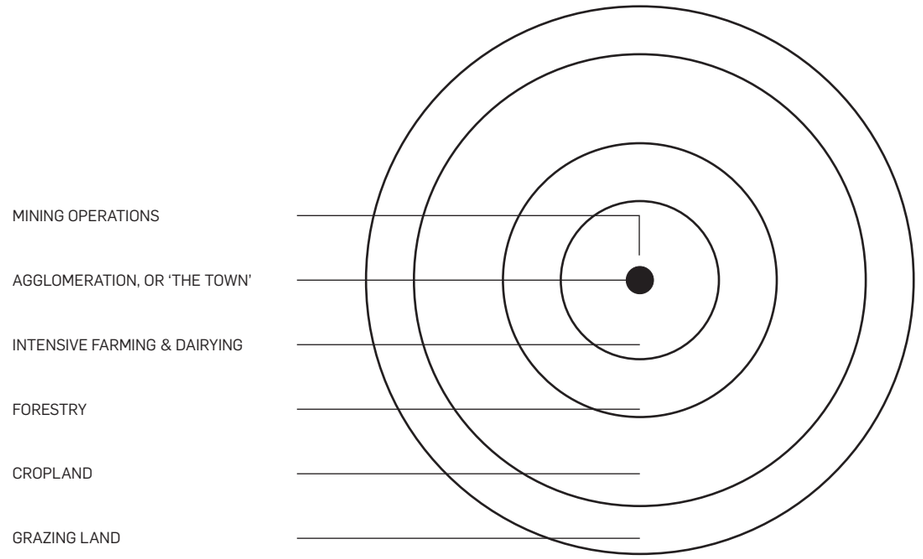

FIGURE 23: VON THÜNEN'S MODEL OF THE AGRICULTURAL HINTERLAND

the equipment of the ground and the extents of exchange. A combined calculation of production cost per unit of area, land rent and most importantly transport costs to the market, as well as specific limitations of certain products like perishability (in a pre-refrigeration age) leads to a series of concentric rings surrounding the town that is the sole center of exchange: Closest to town, lies a zone of intensive agriculture where farmers produce perishable goods such as dairy products and vegetables. Interestingly the second ring is a zone of forestry, since wood was at the time still the main fuel and construction material and certainly difficult to transport. The third ring is dedicated to extensive agriculture of crops like wheat, corn and potatoes. Furthest out, lays the last zone of pasture for the grazing of animals that becomes financially unsustainable after 50 German miles (370km) and turns into a wilderness that also prevents all potential exchange with other towns or areas. This 'frontier' defines a closed but 'complete' subsistent system, which even predicts for the existence of mines necessary for the provision of metals and salt (important for food preservation and storage at the time) which are close to the town in order not to disturb the territorial pattern.

Working from his experiment, Von Thünen implied a theory of agricultural history suggesting that the rings of the Isolated State present "a picture of one and the same country viewed over several succeeding centuries".[19] Agriculture was originally unspecialized, but with the growth of urban centers agricultural specialization led to the devise of specific patterns of land use.[20] Moreover, anticipating the development of railways, he expected that the state could stretch up to 577km and with associated decrease in freight costs to 1105km - truly blending the boundaries between regional and continental trade.

Von Thunen's model is perhaps one fo the few models that deals with the influence of an agglomeration in shaping the agricultural area around it through transport costs. It does not deal at all with the division of labor or land use within the agglomeration which is rather a 'black hole'. Moreover it does not even deal with the general division of labor between town and country: this is taken for granted. Rather it focuses on the division of labor and land use specialization solely in the areas of primary production – agriculture. What is more, the relationship between the size of the town and the area around it that supports it with its agricultural production, is not dealt with from a 'biogeographical' or 'metabolic' perspective. The question is not how much territory would be needed around the town to support its population. In fact the population of the town is not really brought up, it is just considered a 'very large town' which is capable of absorbing all the surplus of the countryside. All the dimensions of the model are defined by transport costs in combination with a common just wage that was the second concern of Von Thünen and which he was never really able to unpack thoroughly. This last issue as well as the problem of the zero accumulation, isolated landscape that the model suggests, will be taken up in the last chapter when I will discuss David Harvey's critique which has been the base of his theory of the spatial fix.[21]

WEBER'S MODEL OF THE INDUSTRIAL HINTERLAND

The model of the Isolated State has certainly been the first theoretical model of what became to be known as 'location theory'.[22] The economy to which it refers could be described as a proto-industrial economy, not that different from what Adam Smith suggested in his model. At the time that Von Thünen was writing his Isolated State however, large parts of Europe and the UK were already starting to be characterized by an increasing concentration of manufacturing industries which were starting to transform major cities of Western Europe into industrial agglomerations. Within this challenging context, Alfred Weber, tried to construct a theoretical model that would be able to explain the patterns of industrial locations, explain why industries were located and concentrated in specific areas.[23] As he stated:

> We seek a general theory of location; that is to say, we wish to resolve the seeming chaos of the local distribution of production into theoretically general rules. Such general rules would result only from the operation of locational factors of a general nature, if at all... Thus the first question is: Are there such general causes of location which concern every industry? And the next question is: Are there any special causes of orientation which concern only this or that industry, or this or that group of industries?[24]

Quite similarly to Von Thünen's model, Weber's model also included a series of simplifying assumptions like the fact that the industry had to be located in an isolated region (with no external influences, or external trade) in which transport costs were isotropic (and only connected to distance), that composed one market for a single commodity, and that labor concentrations, consumption centers and raw material locations were abstracted as nodes in an otherwise empty landscape. According to Weber, three sets of principles determined the location of industries: Transportation costs in relation to sources of materials and markets; potential labor 'distortions', meaning sources of cheaper labor that could justify higher transport costs; and finally 'agglomeration' and 'deglomeration' economies, that is the positive and negative effects – or externalities - of concentration.[25]

In his effort to classify further the factors that determine the location of industries, Weber offers us some additional distinctions, that for are purposes are much more interesting than the validity of his famous locational triangle that is presented diagrammatically in figure 23: First of all, and as the quote above stated, locational factors could be 'general' or 'special'. The general, included factors that were supposed to influence all industries, and were connected to the social domain and the functioning of the economy such as transportation, labor and land rent. On the other hand, the special ones included factors that influenced different industries in different ways – or not at all, and were mostly related to the specificities of natural geography, like the availability perishability and weight of raw materials, temperature and humidity, the availability of water etc. Moreover both general and special factors were classified according to their tendency to either distribute industries regionally, ('push' or 'pull' them towards specific locations); or according to their tendency to make industries 'agglomerate' (concentrate), or deglomerate (spread) over the industrial landscape:

> If industry is influenced by the cost of transportation or by geographical differences in the cost of labor, industry is drawn to points geographically quite

> definite, though changing their position as industry develops. The factors which operate thus are regional factors of location. If industry, however, is brought together at certain points by price reductions due to agglomeration itself, whether it be the more economical use of machinery or merely the advantage of being at a place where auxiliary trades are located; or if industry is driven from such congested places by the high rent; industry is agglomerated or spread within its geographical network according to certain general rules which are quite independent of geography. The factors which operate thus are agglomerative or deglomerative factors.[26]

Weber discussed thoroughly the importance of agglomerative / deglomerative, geographical and labor factors. However, the most influential part of his work, and the one he recognized as the most important, was the optimal location of industries according to the cost of transportation of raw materials to the manufacturing site and of finished products to the market. Weber introduced his famous locational diagram in order to sketch and solve the problem: The diagram sought for the optimal location of an industry which was depended upon the input of two locationally specific raw materials and a market, as the optimization of the distance of a point (corresponding to the industry) within a triangle whose three points were the raw material locations and the market.

Again here, the classification of raw materials gives as some important insights: Raw materials according to Weber were classified in those who could be considered generally ubiquitous (like water), and those that were considered locationally specific (like for example a precious metal). Obviously, the ones that were considered ubiquitous were left out of his model. And as this shifted the focus to the locationally specific ones, these were additionally classified according to what he defined as the 'material index' which played eventually a paramount role in the location of industries: According to Weber, what was important was not so much the weight of raw materials, but rather the ratio of the weight of the unprocessed, raw materials, to the weight of the finished product. This ratio revealed how much weight was 'lost' during the manufacturing process. But most importantly for Weber, it was the factor that pushed the location of the industry closer to the source of raw materials, or the market: If the material index was higher than one, location would tend to be closer to the sources of material. If it was lower, it would move closer to the market. Moreover, the model, is quite instructive for its effort to discriminate factors into 'geographic' and non geographic, but also in techno-natural, and socio-cultural:[27]

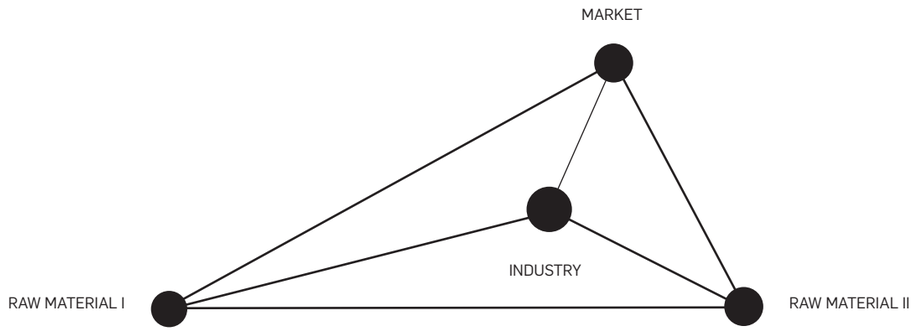

FIGURE 24: WEBER'S LOCATIONAL TRIANGLE AS A MODEL OF INDUSTRIAL HINTERLAND.

> The advantages which draw industries hither and thither may be given by nature. In that case they could be altered only by changes of these natural conditions, by the extent of the control of nature—in other words, by technical progress. They would be independent of the particular social and cultural circumstances; at least there would be no direct dependence... It is desirable to make a clear distinction between natural and social locational factors. ... For it is apparent that every aspect of locational factors which is not of a natural or technical, but of a social, character cannot be an object of pure theory which is to be independent of particular economic or social conditions. Such aspects must be left to empirical theory.[28]

Although oversimplifying and driven by the problematic assumptions of all neoclassical economic models regarding perfect competition, rationality and eventually zero accumulation, Weber's model offers a very instructive overview of the factors and geographical relations that are connected to manufacturing industries. His model could probably work quite well for describing the distributions of industries around the coal extraction zones of early industrial Europe, however as manufacturing became more horizontally organized and more mobile in search of cheaper labor inputs, and transportation more ubiquitous, the relevance of the model weakened.[29] However, in a way it is still powerful in suggesting an understanding of the dependencies of industries to the geographical specificities of resource extraction zones, especially regarding these industries with the higher 'material index' ratios. The type of hinterland it introduces is eventually geographically deterministic, since the location of raw materials – fixed in space – is the one defining the envelope

of possible locations. This geographical determinism would become less and less obvious to observe however, as most of the industries in the second half of the twentieth century would start including numerous links in the production and processing chain.[30]

CHRISTALLER'S MODEL OF THE SERVICE HINTERLAND

I have already discussed two influential models of two very different kinds of hinterland: An agricultural hinterland, and an industrial hinterland. The third, and perhaps the most influential model in explaining urban patterns, refers to a service hinterland – a consumption rather than supply area. I now turn to the Central Place model that the German geographer Walter Christaller developed in the early 1930s and published in 1933.[31] It is interesting to note that every model lies rather at the end of an era: Von Thünen's model discusses an agricultural economy at a time where industrialization was really taking off in western Europe; Weber discusses an industrial location model at a time were industrial metropolises were already starting to turn into service centers; finally Christaller discusses a model of hierarchical service centers that are based on the spatial arrangement of service areas around them at a time when these hierarchies were starting to be exploded.

Unlike the two previous models that started with a series of theoretical assumptions and after the development of theoretical models were tested through empirical evidence, Christaller's approach was quite the opposite: His theory is rather deductive since it was built upon the observations that he made by studying the patterns of central places in southern Germany. It is interesting to note that the area that Christaller was studying, was at the time and even is still today indeed characterized by a rather regular and homogeneous pattern of settlement. If Christaller had done his study a few hundred kilometers north, in the Rhine - Rurh valley, he would had to deal with a much more complex fabric of settlements, infrastructure systems, industrial establishments and resource extraction sites, very different than the landscape of this rather lightly industrialized area of Germany.

Christaller created a theoretical scheme that was purposefully detached from the 'physical' dimensions of settlements which he thought could be misleading: Population and area were not the indicative factors of the importance of a settlement; it was rather its 'centrality'. The definition of centrality and its disassociation from the biogeographical characteristics of agglomeration is one of the most interesting shifts that Christaller did in order to construct his theory:

> We do not look at the entire appearance of a town, but only at those definite characteristics which are decidedly important to the meaning of the town and the geography of settlements...The chief profession-or characteristic--of a town is to be the center of a region... Because this chief characteristic does not apply only to those settlements which we usually call towns-it applies also, for example, to most market spots-and because there are, on the other hand, towns which do not, or only in a very small measure, show this characteristic, we shall call those settlements which are mainly centers of regions, central settlements.[32]

The importance of a town then, is not so much connected to its population, or area, factors that can be defined in absolute terms, but rather to its degree of centrality, which can only be defined relatively, and in specifically in relation to a region, or even better to the rest of the settlements of a region. In order to understand how centrality for Christaller is not the same as agglomeration, it is interesting to also mention the settlements that Christaller defines as non-central, or dispersed:

> They include: (1) areally-bound ones -those settlements the inhabitants of which live on their agriculture activities, which are conditioned by the land area surrounding them; and (2) point-bound ones-those settlements the inhabitants of which make their living from resources found at specific locations. The latter are: first, the mining settlements which are very limited in space as compared to the agricultural possibilities of the land, and generally are more point-like in their location in the country; and second, all those settlements which are bound to certain points of the surface of the earth, i.e., bound at absolute points (not at relative ones as in the case of central places)-for instance, bridges and fords, border or custom places, and especially harbors. Very often, harbors simultaneously become central settlements, whereas mining settlements and health resorts are seldom central places... Other examples are settlements of workers who perform work in the home, and large industrial settlements, the locations of which are seldom determined according to any economic advantages such as transportation facilities or the labor supply.[33]

From this very detailed list it is very clear that Christaller is only interested in a very certain kind of centrality, a centrality that can be calculated as the relative difference in services offered from town to town within a region, and not based on the importance a settlement might acquire because of its inherent geographical or economic specificities. Christaller's centrality is a function of exchange and in fact of a very certain exchange: an exchange of what he calls 'central' goods, goods that

mostly refer to the services of the tertiary sector that cities typically offer (wholesale trade, banking, state administration, cultural, educational, spiritual etc). Each one of these goods has a certain range, which is literally a market, defined as how far someone would be willing to travel in order to obtain it, and the range of the goods defines the 'complementary region' of the central place. Thus:

> Those places which have central functions that extend over a larger region, in which other central places of less importance exist, are called central places of a higher order Those which have only local central importance for the immediate vicinity are called, correspondingly, central places of a lower and of the lowest order. Smaller places which usually have no central importance and which exercise fewer central functions are called auxiliary central places.[34]

As in the previous two models, what eventually defines the pattern of settlements is actually the pattern of markets according to a distance-optimization principle that distributes settlements in interlocking hexagons. According to Christaller's famous hexagonal rule, the higher the order of a central place the longer the range of the goods and the size of the complementary region (figure 25).

It is worth noting a few more things here: First of all, Christaller's economic landscape is a landscape that is constituted only of nodal settlements – or central places of various orders. The lower order corresponds to the 'hamlet' and the higher to the central town. It is obviously a simplified landscape, but it only considers were 'central' economic activities, or services are situated. There is no consideration of the productive landscape of any sort, as this is not part of the specific consideration of centrality.

Moreover, the exchange of services that happens within the region between the various central places is only unidirectional and structured strictly hierarchical: Central places of 3rd order obtain services from central places of 4rd order, those of 4th from those of 5th etc., while the settlements of the highest order do not really need to obtain any services since they already host everything. Central places of the same order also have no reason to exchange anything with each other. All this is of course valid for the services of tertiary sector that the model is only dealing with. Eventually, the meaning of settlement as a condition of biogeographical concentration is lost within this highly abstract economic landscape, and it is striking to note how Christaller recognizes this purposeful abstraction early on:

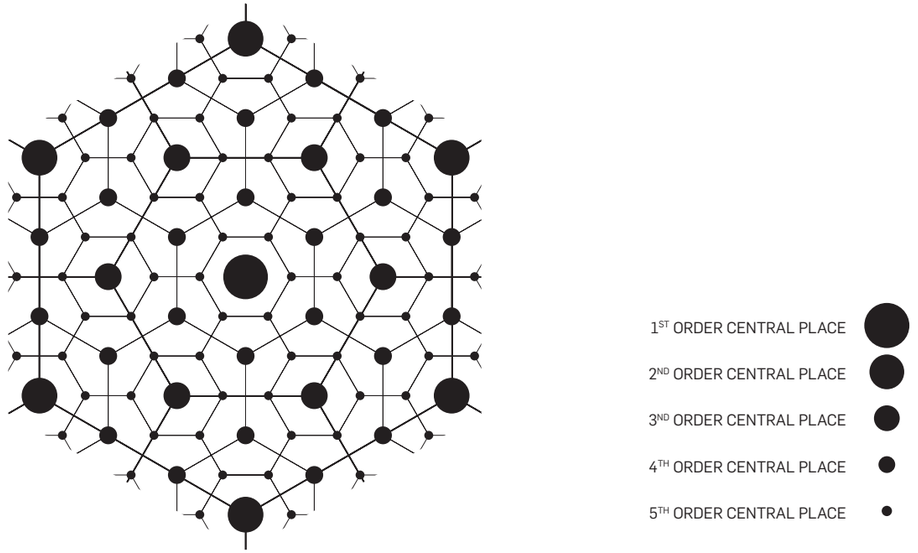

FIGURE 25: CHIRSTALLER'S HIERARCHY OF CENTRAL PLACES AS A MODEL OF SERVICE HINTERLAND.

> ...when we speak of central settlements, we shall have to avoid introducing a new meaning of town, for that would cause considerable confusion. We should go even further and substitute another term for settlement, in order to have greater precision of expression. The word settlement has many meanings, but it especially evokes a detailed picture of streets, houses, towers, and so on, which could veil the individual meaning of the facts important to us. We do not mean the multifold meaning of settlement, but rather only the localization of the functions of a center at the geometrical location of the settlement. We shall therefore speak of central places.[35]

In a way, it could be argued that Christaller's model is not really a model of settlement patterns, not to mention of urbanization patterns, but rather a very particular way of diagramming the structure of very specific economic activities in space that are indeed typical of urban areas. Nevertheless, besides its abstractions and limitations, it became one of the most influential models (especially in the post-war period) for describing in a systematic way the patterns of urban centers based on their service areas.[36] It also became extremely influential for the development of the concept of the

'functional' region that was in a way opposed to that of the uniform region that was the unit of analysis of traditional regional geography. This model will be discussed in the next chapter.

No matter how different, all the above models of economic interpretation that I discussed still focus on the existence of a resource producing region that somehow connects to the agglomeration. In a way the size or location of the agglomeration is directly depended upon the size and structure of the hinterland: The larger the hinterland the larger the agglomeration, like the economic development of the agglomeration is connected to this external process. Slowly after the sixties, this interpretation of the relation between agglomeration and hinterland would start to change. Instead of trying to unpack the dynamics of agglomerations through their 'external' connections, the interest would turn to interpreting the internal dynamics of agglomerations.

FROM HINTERLANDS TO GENERATIVE CITIES

Jane Jacobs presents one of the most interesting cases of urban thinkers that tried to develop a general theory of the economy based on the internal economic capacity of cities. Jacobs touches upon the importance of the 'generative' power of dense and often chaotic agglomerations in her critique of modernist planning as part of her influential work on The Death and Life of Great American Cities.[37] But this particular economic mechanism and the extension of its dynamics beyond the city, is more thoroughly developed in two subsequent publications, The Economy of Cities, and Cities and the Wealth of Nations.[38] It could be argued that Jacobs develops a city centered theory of economic development through which she aims to draw an alternative image of the world, that would go beyond the state-centric framework. What is particularly important in this work besides the re-centering of the agglomeration as the natural unit of the economy, is that Jacobs is not only interested in explaining the internal mechanism through which agglomerations grow and develop themselves, but also how these internal agglomeration forces are projected over a wider range of territories leading to their transformation.

In a way Jacobs is largely reversing the direction of the vector that connects the city with its hinterland: In most of the initial discussions on the economic role of cities, the agglomeration is developed out of the surplus generated in its immediate or broader hinterland. This conception is deeply rooted in the historic conception of urban development out of the extraction of agricultural surplus. Not surprisingly, Jacobs starts exactly from the urban origins aiming to develop an alternative history of urbanization in which the city creates agriculture based on its ability to generate and sustain endogenous growth, thus not only imposing a pressure upon the countryside to develop the means that will be able to offer the city population subsistence, but also being central for the development of agricultural technologies that are then exported back into the countryside.

In a nutshell, what offers the city the ability to generate endogenous growth is a process of finer and finer division of labor based on a nonlinear series of 'import replacement' events.[39] This deserves some unpacking: Cities are of course both producers, importers and exporters of goods and services. While initially exports are connected with the establishment of certain markets, the process that allows cities to grow is not really the effort to develop new markets, but rather to replace the imports that are associated with the production process of export oriented industries through the creation of 'new work'. What is important in this process is not so much that imports are reduced, but the potential of new 'internal' suppliers to develop into new exporters, creating of course the need for new imports, but also a growing export base, and most importantly a more refined division of labor. Jacobs insists that this division of labor is quite different than the classical interpretation of increasing specialization (established by Adam Smith), which is based on dividing certain tasks in order to gain efficiency. For Jacobs the new division of labor includes new work being added to previous work and not replacing it through a more refined restructuring (by breaking down for example one task - that now disappears - into two tasks). Moreover, this process is not linear in time nor continuous. There are periods when cities generate exports, when new imports are needed either to supply new production, or when they compensate for declining production that might be lost either through obsolescence, or through the migration of economic processes to other areas, and most of the times, periods when most of these processes happen at the same time.

But why is this mechanism particular to a city, or a dense agglomeration? For Jacobs, what is the key in producing the generative power of cities is the complexity and unpredictability that characterizes dense and diverse urban environments. The often unplanned, or fluctuating conditions in these environments continuously create new challenges and reveal new problems and opportunities, but also offer the best environment for their solution. Unplanned complexity allows for unpredictable combinations of various resources, agents and technologies to emerge, information to be indirectly diffused and spillover effects to take place. Overall they allow and often require innovation to emerge, innovation defined in its broader sense as the novel combination of resources and the application of social and technical means. The city

then, or better the successful city, becomes the epicenter of economic development. Jacobs goes as far as to reclassify the typical categories of settlements based not on size or function, but on the ability to generate new work:

> City: A settlement that consistently generates its economic growth from its own local economy...Stagnant city: A settlement that formerly grew as a city, but has stopped doing so...Town-A settlement that does not generate its growth from its own local economy and has never done so. The occasional export a town may have generated for itself has produced no consistent self-generating growth thereafter... Village-A smaller town.[40]

In this way, agglomeration is presented as a necessary, but not sufficient condition for the emergence of 'urban economies'. Cities, or even stagnant cities are, or used to be urban. Towns and villages are not, not because of their small size, but because of their economic 'behavior'. What is even more important, is that these generative effects of cities, shape up broader and broader territories and eventually define the national economy, which is defined as follows:

> While its accepted meaning, the sum of a nation's production of goods and services, is useful, the connotation of an amorphous sum is not... A national economy is the sum of a nation's city economies and the past and current secondary effects of city economies upon the economies of towns, villages, countrysides and wildernesses.[41]

How do cities shape these broader environments? This is of course the central question of this research. And Jacobs offers a useful attempt to classify the interdependency of cities with a number of regions that are also treated in terms of economic performance as a function of their relationship to cities:

Cities own regions, are the surrounding areas of agglomerations where urban economies are often 'exploded' in order to take advantage of lower land rents, less congested infrastructure etc. In a successful case they end up operating almost in the same way as cities do, thus expanding the scale in which the effects of successful agglomerations take place. Abandoned regions on the other hand are the result of an inverse process of implosion. They are these regions that are emptied out of their population and economic activities as they migrate to cities. More interesting and complex is Jacob's discussion on a broader set of secondary effects that cities can have on often more distant regions.

First of all, supply regions can be interpreted as the broader supply hinterland of cities. These are the regions responsible for the supply of the raw materials and processed inputs that the city needs to import in order to activate and sustain its producing mechanisms. For Jacobs, as long as these regions are incapable of developing their own internal growth mechanisms (through the nurturing of active cities), they remain incapable of generating their own growth and are directly depended to the supply needs of the importing cities for their development. These are regions that are often bound to the primary sectors of the economy, like resource extraction and agriculture.

A second set of regions with quite similar characteristics is the transplant regions. The major function of these regions is not connected to the exploitation of some specific resource, but rather is imported from the cities in the form of migrating production processes. These processes that are still directly connected to the economy of cities, are those that are less depended upon the social and infrastructural equipment of dense agglomerations and as such can be outsourced to regions that can often be quite distant. Jacob's characterizes transplant regions as 'industrialized supply regions' that are characterized by the same dependency to the city as supply regions, but are not based on the primary economic sectors but rather on manufacturing and industry. These agglomerations of branched out industries, often create a multi-doted landscape that can appear densely activated in terms of economic concentration, but these concentrations remain fragmented and unable to create the effects of agglomeration that characterize true urban economies. In sum, for Jacobs the city is the generator of a whole set of economic functions that engage a wide range of economic landscapes. However, there are still regions that are untouched by this process and its secondary effects. Jacobs characterizes these subsistence regions as regions that are bypassed by economic development:

> Economies that have previously served city markets or have sent out people to city jobs or have received city technology, city transplants or city money, can eventually lose those ties to cities. If they do, their people sink into lives of rural subsistence. But as they adjust to sheer subsistence, they shed or lose many former practices and skills.[42]

THE GENERALIZATION OF THE GENERATIVE EFFECTS OF AGGLOMERATIONS

In recent years, the interest in the work of Jane Jacobs has seen a revival. Together with the work of Alfred Marshal on industrial clusters, they have been key reference points in understanding agglomeration as an emergent process of internal forces that are taking advantage of externalities internal to the agglomeration itself.[43] The seminal

work of Scott, and in general the new regionalism approach to economic geography, has tried to unpack exactly these complex dynamics internal to agglomerations at a regional scale.[44] One of the main arguments has been that agglomeration forces that used to operate at the scale of the city, now operate at a multimodal regional scale making the whole region a unit of agglomeration. At the same time, research on the dynamics of intercity networks highlighted how agglomerations depend less and less on their relations to surrounding hinterlands, and increasingly upon dense interconnections to other agglomerations.[45] As a result, the interdependent relationship of agglomeration and hinterland, exemplified as a continuum through the regional concept, is weakened in favor of explanations favoring internally emergent agglomerating processes and network externalities in relation to other agglomerations.

In this chapter I examined various interpretations of the concept of the hinterland in economic geography and the way the functional relation of agglomerations to a broader set of territories has been interpreted from an economic perspective. It is important to summarize the shift we observed in the economic interpretation of the hinterland: An initial understanding of urbanization as a process of concentration of social surplus produced in the hinterland and consumed in, or exchanged through the city, gradually gave place to an understanding of the internal dynamics of agglomerations, to cities as 'economic engines'. This shift of interest to the internal dynamics of agglomerations, or at a wider extend to the networks between agglomerations, shifted the focus away from their relationship to their hinterlands, which in any case was becoming increasingly hard to grasp.

But overall, it could be argued that by the end of the 20th century, there was a positive overall appreciation of the economic dynamics of agglomerations: Following a general acceptance of Jacobs' arguments, cities were largely considered centers of innovation and generation of value and surplus. This interpretation is grasped lucidly in the map in figure 26, which highlights the rather widespread view of cities as 'spikes' in the economic landscape. The map shows the distribution of the world's GDP, and its spikes correspond of course to areas of high population density, especially exploded in the most affluent regions of the world. The map represents not only a particular interpretation of cities, as generators of economic value, but also inherits a particular notion for what value is. This notion is severely challenged by the second notion of value that I will present next. Understanding urbanization in relation to ecological and not economic value will offer a completely different instance of this map.

CHAPTER 04:
FUNCTIONAL INTERPRETATIONS OF THE HINTERLAND II: ECOLOGIC

CITIES AS ENTROPIC BLACK HOLES

While the hinterland disappeared as a concept and unit of analysis in economic geography after the 70s, it reappeared as a way to connect urbanization its broader environmental effects in environmental studies through what could be characterized as an ecological interpretation. While the various economic hinterlands that I discussed had as a starting point the investigation of the spatial organization of social systems, the various ecological hinterlands that I will discuss next have as a starting point the investigation of natural systems and the impact of urbanization on them. The following quote summarizes this point of view:

> Cities are the defining ecological phenomenon of the twenty-first century. While cities provide expanding economic opportunities in the new global economy, they are also big contributors to environmental disruption, both within and beyond their boundaries. How big a threat do cities pose to the global ecosystem?[46]

While driven from an environmental concern and interpretation, the various concepts and research frameworks that have been developed within a multitude of approaches that I am quite abruptly placing under the same roof, offer useful insights in the connection of urbanization and much broader geographies, reintroducing questions regarding the role of urbanization in the human organization of the planet that have been rather absent from urban studies. In a way they close a gap, but also by doing so coming from a very particular environmental point of view, they reinstate one of the main disciplinary problems that challenge the understanding of urbanization as a form of broader geographical organization. The great divide between the social and natural sciences, and in our case between human and natural geography.[47]

In what follows I will discuss a series of influential frameworks that have been established over the past decades in order to investigate the relationship between urbanization and the environment.[48] Although this investigation cannot be exhaustive, I have defined three distinct approaches: The first approach includes studies on the urban metabolism of cities. This approach is characterized by an emphasis on counting the flows of materials and energy that go in and out of cities and has a rather weak connection to geographical interpretation of land use patterns, location questions etc. A branch of this approach, territorial metabolism, aims to address this weakness by connecting the system of flows to specific configurations. A second and

very influential approach, that of the urban footprint, is part of the broader effort to define the ecological impact of human systems by quantifying it and translating it into easily comparable spatial measurements. The footprint approach is rather abstract since it is not referring to particular geographies, but rather to a calculated space in order to create an easily comparable reference. A third set of approaches focuses on investigating the transformation of land systems and is more focused on the interpretation of landscape patterns as a synthesis of social and ecological systems.[49]

Before I move forward to unpack these approaches, it is important to offer a broader framing of the ecological interpretation of urbanization. Similarly to the economic interpretation, the ecological interpretation of urbanization is a functional one: As economics is supposed to be the study of the allocation of resources and in general social value in human societies, ecology could be framed according to Rees as:

> the scientific study of the flows of energy and material resources through ecosystems and of the competitive and cooperative mechanisms that have evolved for the allocation of resources among different species…ecology and economics share not only the same semantic roots, but also much the same substantive focus. In fact, it could logically be argued that economics is really human ecology. Or rather, it should be.[50]

This is certainly a provocative suggestion. And in fact one that allows me to unpack several issues. The first is of course how an ecological approach to the hinterland would allow us to overcome the limitations of the economic models discussed above. Two things should be clear from the models that were presented in the previous chapter: First of all, a tendency towards a detachment from the physical specificities of geographic space through the construction of a relativized space. And second an overall absence of the physical properties of the 'products' circulated in this relative space through their substitution with pure economic value. Indeed, this abstract modeling, characteristic of formal economic models, creates a largely immaterial world. As Rees summarizes:

> The problem is that mainstream economics has deviated markedly from the theoretical foundations that support its sister discipline. Ecology has firm roots in the real world chemical and thermodynamics laws that are the universal regulators of all energy and material transformations in the organic world. Economics, by contrast, had abandoned its classical organic roots by the end of the nineteenth century. Neoclassical economics (currently enjoying a remarkably uncritical renaissance the world over) is firmly based on the methods and concepts of Newtonian analytic mechanics.[51]

Indeed, ecology is very successful in reintroducing the physical properties of materials and as such offers a valuable framework for this study. However as I will discuss, it also suffers from a number of abstractions and simplifications, and above all, while it introduces the physical properties of materials, it is not so successfully reintroducing the physical properties of space. As an overview, the ecologic interpretation of the hinterland can be summarized through the following points:[52]

First of all, ecologically speaking, the laws of thermodynamics suggest that all human activity on earth, as well as the activity of the rest of the living organisms is actually 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 actually a consumption of ecological value produced either on a daily basis, or over millions of years (like fossil fuels). And while economically speaking, value can be produced at any point in the processing of a product, from an ecological perspective, any type of production of physical artifacts is actually a consumption of energy and resources. As a result the operations of human societies are dependent completely upon these biophysical processes that are largely happening outside them.

For agglomerations, which are the major centers of human activity, this means a very particular interpretation: In a strikingly similar way to the early economic interpretations, cities are largely considered consumption points, sustained by the surplus produced by their hinterlands. In the economic interpretations, like these of Gras and Adam Smith, this surplus is a social surpass extracted through labor relations. For ecological thinking this surplus is an ecological surplus, produced through various organisms of the ecosystem and consumed by human activities (like agriculture). As the pioneer ecologist Howard Odum described in 1971:

> Great cities are planned and grow without any regard for the fact that they are parasites on the countryside which must somehow supply food, water, air, and degrade huge quantities of wastes[53]

The 'city as parasite' concept in Odum's interpretation has dominated the major ecological interpretation of agglomerations since the early 60s. In specific, as part

of the first systematic approaches to studying the ecological 'budget' of cities, Odum defined cities as heterotrophic ecosystems, heterotrophic referring to ecosystems that are incapable of producing enough energy to sustain themselves and are thus depended upon other ecosystems.[54] Along the same lines, Rees more recently described contemporary cities as 'entropic black holes' sweeping up the productivity of a vastly larger and increasingly global resource hinterland, or as 'human feedlots' that are depended upon a wider set of food production regimes for their sustenance.[55]

Now, there is probably nothing surprising with all this framing: Since the ecological approach monitors the planetary circulation of energy and materials, it should be rather expected that the major consumption points, or blackholes, would be those areas with the highest concentration of population and economic activities. On the contrary, supply hinterlands, areas of agricultural cultivation, forestry and in general primary production, is where ecological value is initially produced through ecosystem processes and eventually extracted. Nevertheless, all this perspective reintroduces an understanding of urbanization that was completely lost with the disappearance of the hinterland from economic development, by reintroducing the hinterland as the broader urban 'ecosystem':

> systems ecology focuses on the broader relationship between the human population, ecologically significant consumption, and the sustainability of essential energy and material flows. This reveals dimensions of the urban system that are invisible to conventional policy models including the total dependency of cities on the productivity of distant landscapes and their negative impacts on the very land that feeds them.[56]

THE METABOLISM OF CITIES

Scholars from a broad set of disciplines around ecology and environmental studies have taken up the project of charting, modeling and quantifying, how this interaction happens, an interaction that has broadly been conceptualized as the 'metabolism' of cities. While the concept of metabolism has been introduced to the study of human societies since the mid 19th century,[57] its systematic application to the study of cities has been popularized in the 1960's through Abel Wolman's article on the metabolism of cities.[58] Wolman described the metabolic requirements of a city as:

> all the materials and commodities needed to sustain the city's inhabitants at home, at work and at play. Over a period of time these requirements include even the construction materials needed to build and rebuild the city itself. The metabolic cycle is not completed until the wastes and residues of daily life have been removed and disposed of...[59]

The concept of urban metabolism has been utilized in order to unpack the ecological interdependencies of cities with the broader set of territories that support them. Scholars in urban metabolism studies have been challenged by the same questions that I have identified in the previous chapters in the construction of contemporary hinterlands. As Donaghy notes:

> While cities continue to cast a large environmental imprint on their regionally proximate environments, they are also exerting a stronger influence on the natural systems of more remote locations because of their growing interconnectedness and interdependence with other cities—in a word, globalization.[60]

This approach allows me to reconnect the functions of cities with the primary economic functions that have long been ignored by the economic interpretation of urbanization: The boundaries of the ecosystem of a city are not its administrative boundaries or the boundaries of its built up space or densely inhabited space. They include all these areas that are engaged directly or indirectly in accommodating the biochemical processes associated with the metabolic needs of cities. Areas of food production, resource extraction, water collection and disposal and of course their circulation, come under this broader framing of the urban ecosystem. However, the several methodologies that have been developed under the question of urban metabolism have been more invested into developing quantitative methodologies and indicators to count and map the material flows in and out of cities, rather than understanding how this broader exchange could allow a redefinition of the dimensions and various geographies of urbanization. In short, the city has not only remained unquestioned, but rather is here also treated as a node, a relatively black boxed one.

I turn now to examine the most influential methodologies that have been developed. Although the field is certainly vast and rapidly developing, we can observe two trends:[61] One trend is building upon previous methodologies and studies of industrial ecology and is interested in mapping the flows of materials and energy in and out of cities. The most influential methodology here is material flow analysis (MFA). The second direction, that often builds upon, or is combined with the analysis of material flows, is interested in translating metabolic needs into spatial proxies, that is in calculating, or tracking the spatial dimensions of the various hinterlands required for

the production or disposal of materials that are metabolized by urban systems. Within this framework lies the influential concept of the urban footprint, and the various and more territorially specific associated food, water etc. '-prints'.

FLOWS OF MATERIALS AND ENERGY

Following Wolman's original suggestion, over the past years there have been several studies trying to quantify and map the metabolism of cities by tracing the resource flows that move in and out of them.[62] It is important to note here that the whole idea of material and energy circulation can, and is, widely applied to several territorial scales, with the city being one of them. In the same way that studies track the metabolism of cities, they can also track the metabolism of regions or nations. The question of scale, and the definition of the system boundary in and out of which resources and waste are produced and flow, is thus a relative one and can be easily questioned, especially given the very diffuse form of contemporary agglomerations. Studies of urban metabolism have thus normally followed the administrative boundaries of urban territories in delineating their system boundary, or the various statistical and administrative constructs that have been created in order to grasp the dimensions of urban systems (metropolitan areas, greater urban areas etc). In any case a system boundary needs to be defined, one that separates the urban area from its broader ecosystem. Once the boundary is defined, the goal is to calculate the amount, in weight, volume, or energy equivalents of materials and energy flows that are exchanged between the urban area and the broader urban ecosystem. These include materials and energy produced within the boundary, but above all, materials and energy imported or exported outside the city.[63]

The number, categories and classifications of resources and the methodologies used vary, but tend to become more and more standardized.[64] In general the categories can include, from very basic ones like nutrients (as a general categorization of food), water, energy and construction materials like wood, cement, metals etc, as well as waste in the form of solid, water or atmospheric emissions to more specific categories of bulk materials embedded in various products and manufactures. These are normally grouped as biomass, fossil energy carriers, metals, and non-metallic minerals. Following the metabolism of these various categories and timescales of material process allows a rather radical re-conceptualization of the material constitution of urban environments: Products of urban metabolism are both those embedded in build structures and infrastructures, like construction materials, as well as those circulating at a daily or hourly basis within the urban environment, like food, water and waste. The diagram in figure 27 offers an example of the above material flow accounting scheme to the case of Paris: As the various indicators show, the accounting calculates all solid, gaseous, or liquid materials that circulate within the region with flows being categorized according to whether they are extracted domestically or are traded (both imports and exports).[65]

The whole scope of these approaches is the charting of flows that enter and exit the boundaries of the urban system, while little or no emphasis is given to their actual geographical sources, or to the spatial configuration of production and consumption patterns within the urban system or within the broader urban ecosystem. In fact, it could be argued that the dominance of this circulatory understanding of urban metabolism reveals a conscious methodological move that offers some robustness to the whole approach, since the geographical structure of the urban ecosystem of contemporary cities is fragmented and geographically discontinuous: The hinterland in this case is not constructed as a territory, or a set of discontinuous territories, but is rather implied as a linearized chain of material flows.

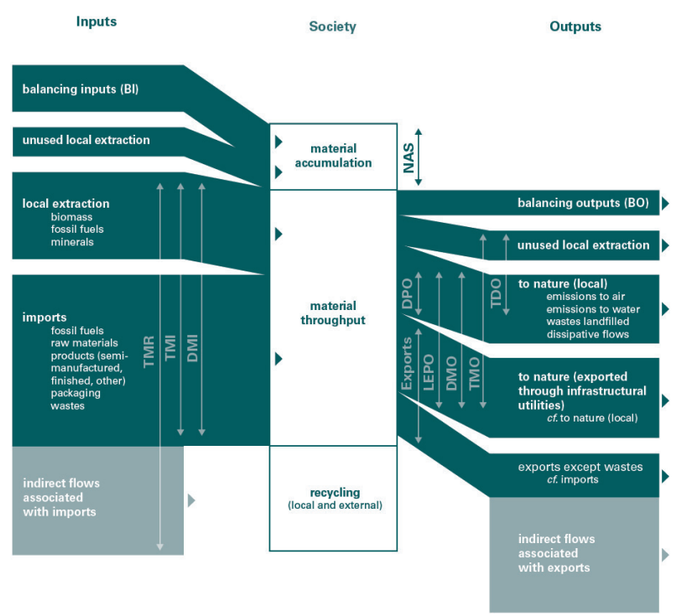

FIGURE 27: MATERIAL FLOW ANALYSIS OF PARIS METROPOLITAN REGION (ÎLE-DE-FRANCE), 2003.

THE URBAN FOOTPRINT

The various MFA approaches to the metabolism of cities, offer indeed systematic ways on monitoring resource flows that largely reveal the material balances of cities. However, although they indeed materialize the processes of urbanization beyond agglomerations, this materialization is completely non-spatial: The existence of a set of territories from which all these resources are produced imported or exported, is only implied but their spatial composition is completely obscured. Moreover, the various material flows measured have very different physical substances and measuring their weight, or volume offers not only a weak reference for comparison, but also no conceptual clue on how they correspond to physical configurations, or patterns. While through the monitoring of material flows, physical mater is indeed reintroduced into the functional study of urbanization, this study is again abstracted at a level that is hard to connect to the spatial configuration of urban systems. In short, the broader ecosystem upon which cities are depended upon, is implied as a spatial construct, but remains invisible. Matter and not space is the central concern of these approaches.

It is exactly upon this problematique that the very influential concept of the ecological footprint, and its specific version of the urban footprint that I will examine here, is based:[66] The premise behind the concept of the footprint is that all biophysical processes upon which human societies are based, require some space in order to take place. Introduced by Wackernabel and Rees, the concept builds upon the overarching idea of the 'carrying capacity', a very pervasive concept in ecological thinking of Malthusian origins, that refers to the environment's ability to sustain a certain population, or the maximum population that a certain environment can support without its productivity being permanently impaired. An environment's carrying capacity is conceived as its maximum persistently supportable load.[67]

As a result, the main idea behind the urban footprint approach is to calculate the equivalent space required for each metabolic process. This allows not only to directly 'spatialize' and in a way cognitively recognize the impact of every metabolic process, but also to check them against the carrying capacity of a certain region, country or the planet. In this way, the urban footprint approach aims to create a platform for easily comparing the impact of metabolic processes: The global hectare, the measurement of the ecological footprint indicator, is a unit very straightforward to comprehend in spatial imagination, as well as very easy to offer direct comparisons between the various resources. For example, conceiving the dimensions of 10 tons of CO2 with 10 tons of water makes little sense, while when both are 'translated' into the required hectares to produce or absorb, the comparison becomes very straightforward. Of course all this process requires certain abstractions, assumptions and simplifications. And above all it suggests that what is calculated is not the actual area of ecosystem services, but rather a hypothetical one, one corresponding to the measured population and material flows. In this way, the ecological footprint builds upon material flow analysis rather than cancels it out since it offers an additional step in the process of quantifying the implied supply and disposal hinterlands, into hypothetical areas.

In introducing the model of the urban footprint, and in a strikingly similar way with Von Thünen's abstractions of the Isolated State, the author invites us to consider a thought experiment in two steps. The first step is as follows (figure 28):

> imagine what would happen to any modern city as defined by its political boundaries if it were enclosed in a glass or plastic hemisphere completely closed to material flows...The population and economy contained by the capsule would have been cut off from both vital resources and essential waste sinks leaving it to starve and suffocate at the same time. In other words, the ecosystems contained within our imaginary human terrarium--and any real world city--would have insufficient carrying capacity to service the ecological load imposed by the contained population.[68]

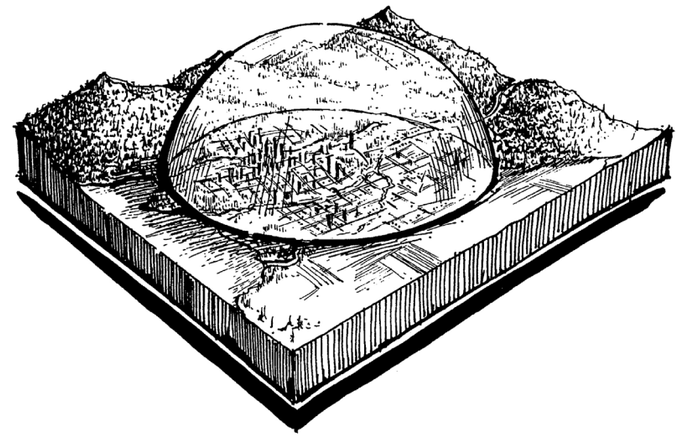

FIGURE 28: THE IMPOSSIBILITY OF THE CITY AS AN ISOLATED ECOSYSTEM ACCORDING TO REES.

The argument here is obviously that the city limits, in the ways they are normally defined, administrative, built up etc, do not correspond to its true metabolic limits, the urban ecosystem that, as already discussed, is necessary to support its functions. The second step then introduces the idea of the footprint:

> Assume that our experimental city is surrounded by a diverse landscape in which cropland and pasture, forests and watersheds - all the different ecologically productive land-types--are represented in proportion to their actual abundance on the Earth and that adequate fossil energy is available to support current levels of consumption using prevailing technology. Let's also assume our imaginary glass enclosure is elastically expandable. The question now becomes: How large would the hemisphere have to grow before the city at its center could sustain itself indefinitely and exclusively on the land and water ecosystems and the energy resources contained within the capsule? In other words, what is the total area of different ecosystem types needed continuously to supply the material demands of the people of our city as they go about their daily activities?[69]

All these areas then, are the urban footprint of the city, in a way its true ecological boundary. The method to calculate the footprint however, is not a direct one ,but a largely indirect one based mainly on population measures and a series of assumptions about the resources consumed and their transformation into productive areas required. Nevertheless, the urban footprint remains conceptually a very useful reference. Perhaps its biggest weakness from the standpoint of this study, is the abstract way in which it reintroduces the notion of a spatial hinterland. The footprint is just a theoretical measurement, a non-existent statistically constructed area based on the average productivity of land and resource flows. As a result it says almost nothing about the actual geographies that are operationalized in order to sustain urbanization, it just cross-compares their dimensions (figure 29).

FIGURE 29: THE URBAN ECOLOGICAL FOOTPRINT OF LONDON IN PERCENTAGES OF GIGA-HECTARES

MODELING THE ECOLOGICALLY PRODUCTIVE LANDSCAPES

I discussed already the notion of the city as an entropic black hole, one that is consuming ecological surplus produced elsewhere on the planetary terrain. Moreover, I criticized the footprint approach for only reintroducing the concept of the hinterland a statistical measurement, that does not correspond to actual production landscapes. Exactly the investigation of the particular patterns and ecological performance of these planetary productive landscapes is the subject of analysis of several indicators that aim to map the geographical distribution of the Human Appropriation of Net Primary Productivity.[70] This certainly requires some unpacking: Following the ecological interpretation of the origins and source of energy and material flows, we are eventually driven to the primary areas of all energy production that is eventually transformed and consumed on earth: The areas of photosynthesis that are responsible for the primary production of biomass:

> In the process of photosynthesis, plants absorb solar radiation and transform it into chemically stored energy (biomass). A part of the energy is used for the plant's metabolism, the remainder may either serve to build up biomass stocks of the ecosystem or end up in heterotrophic food chains; that is, it may nourish humans, animals, fungi or micro-organisms. The gross amount of chemically stored energy produced per unit of time, usually 1 year, is denoted as gross primary production (GPP). GPP minus plant respiration—i.e. the energy needed for the plant's metabolism—is called net primary production (NPP)... This process of ecological 'primary production' is area-dependent because photosynthesis depends on the area of the Earth that intercepts radiant solar energy.[71]

Thus according to this ecological interpretation, all energy on the planet initially comes from the land (and the oceans, which however remain unquestioned in these studies). The efforts of the HANPP approaches then, have been to examine how the transformation of this NPP productive areas on the planet from humanity can be quantified and mapped, and how it changes and disturbs patterns of metabolic flows. In order to calculate how the NPP is appropriated, meaning how it is used and modified by humanity, HANPP approaches are normally taking into consideration three major factors: The use and transformation of NPP producing landscapes, the distribution of population, and the trade in biomass, direct or indirect. Unfortunately, there has not been a standardized way of calculating HANPP, with several approaches over the past years using different definitions and leading to different methodologies and different empirical studies. On the other side, the differences among the definitions

and studies are also revealing in some respects. Two of the most important (and different) approaches come from the Centre for Ecological Analysis and Synthesis at Columbia University (CIESIN) and the Institute of Social Ecology in Klagenfurt and Vienna.

The CIESIN approach, has largely focused on the consumption patterns of NPP and has thus been more sensitive on the distributions of population.[72] The term appropriation here refers to the final consumption, not to the initial 'harvesting' from areas of biomass production. Indeed, cities in this map of HANPP, presented in figure 30, appear as the main consumers of NPP visualizing the aforementioned conception of cities as entropic black holes. This approach, is mostly directed towards were biomass is channeled to, not the actual conditions of its production in agricultural and other biomass extraction landscapes.

On the contrary, the Institute of Social Ecology approach calculates the HANPP based on where biomass is 'harvested' from, and thus 'removed' from the productive landscape.[73] As a result, this map of HANPP, presented in figure 31, offers an interpretation not only of land use transformation, but also of land use intensification: Since NPP is modified negatively when biomass production is eliminated by the construction of cities, hard surfaces etc, it is enhanced by investments in agricultural production that have as a result increased yields. As a result, HANPP could be both higher and lower than the initial NPP.

In sum, following these two definitions of 'appropriation' we can eventually see the areas where biomass is produced and harvested, and the areas where it is consumed. The associated maps are further presented together in figure 32 in a three-dimensional perspective, in order to highlight the contradiction between biomass consumption (top map) and biomass production (bottom map). The former correspond to the areas with the major population concentrations and metabolic needs - cities and agglomerations are presented as black holes of biomass consumption; the later to the areas of biomass production and extraction of biomass, agricultural areas, forestry zones etc - they are the generators of biomass.

Furthermore, it is revealing to compare this view of cities as black holes within the landscape of productive hinterlands, with the map in figure 26 which presents agglomerations as spikes of economic activity. Thus, the different economic and ecological interpretations of the functional relation of cities with the broader productive landscape is revealed as quite paradoxical: Cities are economic generators, but ecological black holes. Hinterlands are ecological engines but empty of economic production. This paradoxical relationship, showcases the need to appreciate more thoroughly both the social and the ecological conditions of production behind the development of geographical organization. I will investigate thoroughly this question in part 03.

URBAN LAND TELECONNECTIONS

Although HANPP approaches are useful for revealing the distribution of the ecologically producing landscapes, they do not have the capacity to monitor the flows that connect these landscapes of production to landscapes of consumption and vise-versa. Thus, questions of their associated transformations cannot be addressed. It is exactly this question of land use transformation, and especially of how 'urban' land uses connect to a multitude of landscape transformations beyond them, that is at the heart of the approach of 'Urban Land Teleconnections' (ULT) introduced by Karen Seto and her team.[74] Although also coming from an environmental studies perspective, the framing of Seto's agenda is strikingly aligned to this investigation:

> Urbanization and land change are two global processes with far-reaching consequences... contemporary urbanization and globalization processes make the identification of distinct urban versus hinterland areas nearly impossible... Transboundary and nonlocal impacts on land from urbanization can occur in multiple and distant locations. Conversely, urbanization processes in multiple locations can drive land change in one place, because numerous cities can simultaneously draw on resources in the same setting, such as rare earth elements that are geographically limited to a few locations.[75]

Unlike most land use research on urbanization that is limited to charting the expansion of 'urban land' (densely built up and densely populated landscapes), ULT suggests that what is important is to examine the impact of urban processes upon the transformation of often very distant landscapes that are part of the broader life support system of cities. The term 'teleconnections', borrowed from atmospheric science, is rather self-explanatory and aims to highlight exactly the need for developing a methodology of land use change interpretation that will be able to model how land parcels of different composition that are activated through the same 'urban' processes are influencing each other without being geographically contiguous:

> The urban land teleconnections (ULT) framework is a theoretical response to the need to advance current conceptualizations of urbanization and land

> that are increasingly inadequate to understand how changes in urban places affect nonurban places and vice versa. One of the central tenets of the ULT framework is to understand how changes in urban locations are linked to distant, and sometimes, multiple places through a complex set of processes... teleconnections can extend from short-distances such as the continuum between a central urban area and periurban areas to longer-distances such as those between places across nations or continents.[76]

A radically different and promising interpretation of urbanization is opened through this conceptualization: First of all, urbanization is not any more limited to a process that mostly transforms agricultural land, or natural landscapes into urban land by spreading out its dense built fabric. This is just one of the effects urbanization has upon the landscape, which as Seto discusses is not even the most 'land consuming'. What is more important to unpack is how urbanization is transforming the landscapes of its broader hinterland, a transformation that in this way becomes part of the urbanization process. The expansion of agricultural land for example in order to support the food consumption in growing agglomerations could be considered part of the process of urbanization, a radical reversal of the mainstream interpretation of urbanization as a consumer of agricultural land.

The goal of ULT, is to link specific urban processes to the transformation of specific places. On the one hand, it differs from previous approaches, like the urban footprint that refers to abstract space as a category of measurement, or HANPP which do not link the structure or performance of the different ecosystems with each other, but just describe their spatial distribution. On the other hand, it also complements them and builds upon them: ULT studies claim to integrate research on the metabolism of cities and a multitude of other intellectual and conceptual approaches that could potentially help link distant processes to each other, from world city systems theories, global commodity chains and global production networks, aiming to grasp all the financial, social, political and material dimensions of an arguably challenging question. In a way, this approach aims to define the specific location, nature and configuration of the various footprints of urbanization. Four major types of teleconnections are introduced as a methodological starting point for investigation (figure 33):

> The first type of teleconnection occurs when decisions in multiple urban places (e.g., manufacturing demand for mobile phone production) lead to land change in a limited number of distal sites (e.g., mining in the Congo). The second type of teleconnection occurs when processes within a single urban place (e.g., one city's switch to hydropower) lead to land change in many distal areas (e.g., flooding in multiple upstream communities). A third type of teleconnection occurs when urbanization processes in a single place (e.g., increase in urban population) leads to land change in one or more urban or periurban regions (e.g., land conversion for residential development). Last, a fourth major type is when urbanization processes in multiple locations (e.g., increase urban demand for energy) lead to multiple land impacts in distal and nearby places (e.g., CO2 uptake, appropriation of ecosystem services).[77]

Especially the last major type of teleconnections that Seto suggests is particularly relevant for the purposes of this research. However the ULT approach continues to be driven by the environmental perspective of the researchers: The ultimate goal is to investigate environmental impacts as they are 'transported' across scales.

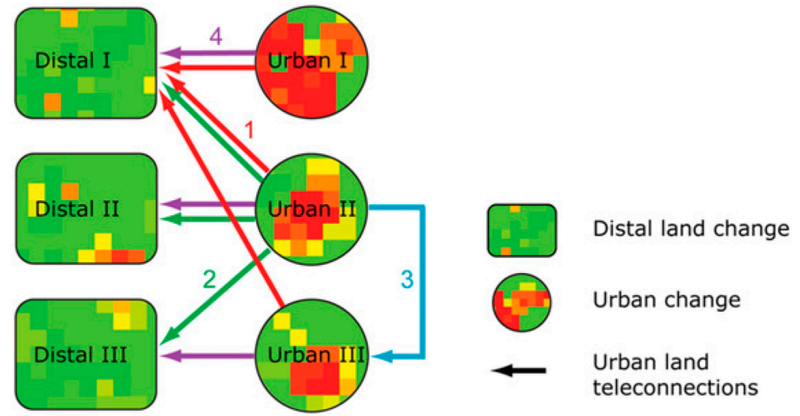

FIGURE 33: THE FOUR MAJOR TYPES OF THE URBAN LAND TELECONNECTIONS MODEL.

CHAPTER 05:
SPATIAL MODELS OF GEOGRAPHICAL ORGANIZATION

REGIONS

The approach of ULT is crucial for revealing one additional layer in the problem of the hinterland, besides the reductionist approach of simplifying the complexities of geographical organization to either economic or ecologic functional linkages. The problem revealed is a problem of spatial concepts and categories. In the ULT approach this problem is particularly evident as the framework aims to study the transformations of land use patterns, which is a very material, grounded transformation of a surface area. However, since the operations that might alter these land use patterns are 'teleconnected', their connections can only be conceived as linear linkages connecting the surfaces of land use transformation to other surfaces elsewhere. These two spatial categories, the areal unit for the conceptualization of an area, and the linear node and network linkage for the conceptualization of spatial connections at a distance, has been one of the persistent limitations in appreciating the relation between cities and hinterlands. As I will show, the transformation of these spatial categories has been directly connected to the models that I have already presented. I will frame this tension as a tension between two types of regions: A uniform, areal region; and a nodal, functional region constituted over a network.

The concept of the region has been one of the most fundamental and persistent bases for constructing spatial categorizations in geography. Although the region as a concept and method has had several different expressions, I claim here that overall, the concept of the region has restricted severely the necessary exploration that was needed in constructing spatial categories and concepts that would be able to grasp the complexities of the organization of the earth's surface imposed by globalized urbanization. Unpacking the intellectual history and the various manifestations of the regional concept and method is of course beyond the scope of this project. As a result, and in order to raise several of the issues that are associated with the next two chapters, I will approach the question through an exemplary case, presented though the work of Allen Philbrick.[78] Still, a few clarifications are needed in order to position Philbrick's unique approach more productively.

In a way the concept of the region embraces a methodological paradox: As already discussed, the subject of geography has been the understanding of the different patterns of human occupance over the whole used part of the planet, the whole Ecumene. In order to study the whole however, and although its unity has always been recognized, it had to be partitioned in 'meaningful' spatial units: regions. What is interesting to unpack, is how these units, were attempted to be defined as such. It could be argued that at least since Vidal and Ratzel, and with numerous variations, the concept of the region has been used to refer to a condition of homogeneity or cohesion over a particular area.[79] Homogeneity and cohesion refer to the two major ways of defining regional units. The one could be characterized as structural and the second as organizational, leading to the delineation of formal regions and functional regions respectively. The shift of focus from one type of regions to the other also describes rather successfully the intellectual shifts in geography from the beginning to mid-20th century.

UNIFORM REGIONS

On the one hand, formal regions are characterized by a uniformity of one, or several features across their area that also differentiate them from surrounding regions where this uniformity is not found.[80] The simplest category of formal regions is the single feature regions were the categorization is based on just one category which could be either 'natural' or 'cultural'. For example, landform regions could be defined based on relief, temperature regions could be defined based on same temperatures etc, while cultural regions could be defined in terms of a common land use (for example the cultivation of a specific crop), language (linguistic) etc. Multiple feature regions can be defined out of the combination of more than one natural or cultural features, as for example a climatic region being defined out of the combination of multiple natural features (temperature, humidity, rainfall etc).

The most interesting and challenging in its definition category of uniform, or formal regions is that of regions that are defined based on the amalgamation of physical and cultural variables. Multiple elements from both natural and cultural categories are interrelated and the question becomes how the specific uniformity of the region emerges out of this interaction. Here uniformity does not have to do with the same distribution of similar features: For example several different elements of human inhabitation could be considered together, settlements large or small, roads and infrastructures, cultivation systems etc. All these are brought together under a specific form of interaction with elements of the natural environment, which can also be multiple. What defines the uniformity of the region then is the specific interplay between the two categories of features (natural and cultural).

Since according to this framework natural and cultural elements are considered as different entities that interact, the struggle for defining the nature of this interaction has defined the various shifts in the assigned agency of nature that I already discussed:

From the environmental determinism of the early 19th century, when natural geography was thought to decisively shape patterns of sociospatial organization, to the possibilism of the second half of the 19th century and the Vidalian tradition that introduced a weaker agency of the natural environment in producing potential forms of settlement, environmental determinism quickly waned during the 20th century. Subsequently, the pervasive emphasis on the economic, cultural and behavioral dynamics of spatial relations privileged a multifaceted social determinism, in which sociospatial organization was generally considered to be independent of natural geography.[81] More recently, under the auspices of debates on sustainable development and the growing interest in the environmental consequences of urbanization, natural geography has resurfaced. This time, however, geography is no longer considered a shaping agent; on the contrary, it is thought to be itself shaped by the expanding and degrading activities of humanity.

Returning to the studies on uniform regions that dominated human geography until the mid-twentieth century, a typical study would then start overlaying elements of the natural environment (slope, hydrography etc) with elements of human occupation (land use patterns, systems of settlements, infrastructure networks etc), in search of the organic principles that defined how all these attributes were associated in a particular manner, which was specific to the area of study and differentiated it from surrounding regions.[82] The way these overlaid elements were 'compacted' in a specific area defined the structure but also function of the region. In sum, the uniform or formal region is a concept that is heavily based on elements of the physical configuration of space, interpreted as works of human culture imprinted upon the earth's surface in the form of a particular type on landscape which can be very well interpreted as a form of composite geography. The form of the uniform region emerges out of the interaction of natural and cultural features that are operating within the confines of the region, and as such it is in a way internally and vertically defined: The interaction between regions is important, but it is not what defines the nature or the differentiation between regions. Rather the contrary is the case: Because of regional differentiation, regions are somehow associated in bigger and bigger entities. These entities however are the result, rather than the driver of differentiation.

CHANGING CONCEPTS OF THE LANDSCAPE

The concept of the Landscape has been perhaps the most influential concept used to define the physical configuration of 'surface phenomena' that were largely considered as the materialization of the specific form of nature – society interplay, has been the concept of landscape. As Sauer noted:

> The term "landscape" is proposed to denote the unit concept of geography, to characterize the peculiarly geographic association of facts... Landscape is the English equivalent of the term German geographers are using largely, and strictly has the same meaning: a land shape, in which the process of shaping is by no means thought of as simply physical. It may be defined, therefore, as an area made up of a distinct association of forms, both physical and cultural.[83]

As a result, regions could be very well defined through the identification of particular forms of landscapes, and in fact the two concepts (homogeneous or formal region and landscape) were almost blended in terms of their conceptualization of areal differentiation. Different regions were characterized by different landscapes that were sculpted through the actions of a specific culture group under the possibilities framed by the natural environment:

> The cultural landscape is the geographic area in the final meaning (Chore). Its forms are all the works of man that characterize the landscape. Under this definition we are not concerned in geography with the energy, customs, or beliefs of man but with man's record upon the landscape. Forms of population are the phenomena of mass or density in general and of recurrent displacement, as seasonal migration. Housing includes the types of structures man builds and their grouping, either dispersed as in many rural districts, or agglomerated into villages or cities in varying plans. Forms of production are the types of land utilization for primary products, farms, forests, mines, and those negative areas which he has ignored.[84]

This initial definition of landscapes as part of a persistent tradition that was invested in their formal attributes, has been recently challenged by a set of approaches that invest upon the usefulness of the concept to blend social and natural processes. Instead of conceptualizing the landscape as a crystallized formation that can have certain boundaries that differentiate it from other landscapes, as well as certain shapes that characterize it, the contemporary utilization of the concept within the landscape, or infrastructural urbanism paradigms present the landscape as a continuum that is activated by numerous ecological and social process.[85] This conceptualization promises to integrate the formal, areal composition of the region with a more functional and organizational structure. This functional interpretation of the region has been traditionally defined as part of a the second major category of regional studies, that of the functional region.

FUNCTIONAL REGIONS

Functional regions are based on organizational cohesion rather than homogeneity of features. A functional region can be defined by the interactions and connections happening across its area in a dynamic, yet consistent way and is usually organized around one or multiple nodes. Two elements are of particular importance to the functional region: Nodality, and interconnectivity, which happens through circulation.[86] The node, or nodes of the region are the focus of the specific activity that characterizes it and do not have to be similar: On the contrary, their differentiation justifies the need to interconnect them and defines the resulting structure. At the same time, circulation is what allows the functional region to operate as a whole and can be interpreted as a means of circulation (transport, or communication). The functional region does not have to be conceived as a contiguous geographical entity. On the contrary: The nodality and interconnectivity of the region reduce its spatiality into a system of connections, rather than a surface of compacted elements.

According to this approach, an exemplary case of a functional region is the relation between a city and its hinterland: In the way we have interpreted this relation in the various examples mentioned, from Christaller's central places, to the studies on the metabolism of cities, to those of Urban Land Teleconnections, what is defined is an area within which, a particular function is unfolded, an area that can include several nodes interconnected by some kind of circulation, social or ecological. In the case of the hinterland question, the function is defined by the exchange between a city and a broader set of supply or service areas. For example in the case of Christaller the range of the various services provided by the city define a market, a set of interactions that can be interpreted as a functional regions. The city-hinterland relation constitutes a form of a functional region. In fact, if the formal region had been the focus of analysis of geographic studies until the 60s, the functional region became the main mode of interpretation of geographical organization in the second half of the 20th century.[87] Several studies started defining functional regions around cities that were usually interpreted as nodal points, with lines connecting them to commuting belts, service areas, manufacturing clusters etc.

It could be argued that the shift of interpretation from formal to functional regions, was aligned with major intellectual shifts in spatial thought, which occurred the first two decades after WWII during what was consequently labeled as the 'first quantitative revolution in geography'[88]. During this time, the empirical, descriptive, site-based and historically specific approach of regional geography was being superseded by efforts to develop a positivist, nomothetic spatial science that attempted to uncover the (supposedly) universal laws underlying spatial configurations. Indeed, the internally and vertically defined concept of the formal region, was unable to cope with the rapid and geographically discontinuous transformations, which were shaped more and more by the increasingly globalized capitalist system of circulation and the new, multi-scalar organization of production, and less by the site specific cultural specificities that were supposed to be shaped by the historical adaptation to geographical asymmetries.[89] The functional region ended up promoting a more abstract spatial modeling that promised to 'relativize' space and transcend the specificities of localities that seemed to matter less and less within a geographic landscape that was mostly shaped by 'pure' economic factors, like relative location, transport costs and the rational decisions of generic actors like firms, producers and consumers.

With the transition from the formal to the functional region, the study of human geography became more and more distanced from the social and geographical complexities and asymmetries introduced both by the anisotropic planetary terrain, and by the socio-political struggles that mediated the human association to the ground. On the one hand, the spatial structure of social systems was largely detached from the influence of the natural environment, or from historical dependencies, and was starting to be studied as a parallel, independent system which was driven by its own internal rules. The old and elusive question of human – environmental interaction was resolved as a 'Gordian knot' with their complete detachment. However, by largely reducing geographical organization into a network of interconnected nodes, the functional region was largely detached from the ground, by surface phenomena and their vertical associations.

In sum, while formal regions are composed vertically, through the fusion of surface elements within an area, functional regions are composed horizontally, through the interconnection of nodal elements into a discontinuous surface. Accordingly, while formal regions are defined through surface concepts such as landscape, functional regions are interpreted through nodes and networks. Formal and functional regions have both advantages and limitations, but none could offer a synthetic approach to the process of geographical organization as it unfolded over the past two centuries. On the one hand, formal regions were strong in unpacking the vertical association of elements and the physical configurations of surface phenomena. Patterns of human occupance, expressed through variegated landscapes where natural and cultural elements are compacted offer a 'grounded' understanding of the earth's surface. However, the associations between formal regions remain weakly explained since all

the effort is in unpacking the dynamic processes defining them from within. On the other hand, functional regions are much stronger in explaining the interconnectivity of spatial patterns across space, but are rather weak in dealing with surface phenomena like land use patterns or the composite configuration of natural and cultural elements.

I argue that this persistent tyranny of the region, functional and formal, continues to create several obstacles in the understanding of how contemporary urbanization is connected to patterns of broader geographical transformation. As already discussed in the second chapter, cities are largely considered nodes in the global system of circulation, one that is unable to connect them further to the extensive configurations of the planetary terrain that are associated with the restructuring of their globalized hinterlands. It is this contradiction, between the landscape and the network, the formal and the functional region, a contradiction that corresponds to two different types of geography, which I will try to overcome in the remainder of this project.

FUNCTIONAL AREAL ORGANIZATION

First however, I will try to showcase how this contradiction unfolds through the work of Alen Philbrick.[90] Philbrick's work offers a unique case in understanding this contradiction, both because of its ambitious scope, and due to its systematic methodology that attempted to combine elements both from uniform and from functional regions in order to define and chart what he defines as 'principles of areal functional organization in regional human geography'.

Already in the early 50s, Philbrick realized that globalization was constructing an increasingly interdependent pattern of specialized regions. The specific areal features of human occupance that characterized each of these regions, very well described through the composition of formal regions in regional field studies, had to be somehow connected functionally across scales in order to construct an overarching hierarchical structure. The challenge would be to allow different regions to be conceived as part of the same network without losing their 'spatiality'. In short, Philbrick aspired to combine the characteristics of human occupance, an interpretation important in the construction of formal regions, with a topology of networks that would be hierarchically upscaled to cover the whole world. In Philbrick's model, units of human occupance, like for example houses, farms or agricultural areas, are connected with each other through what he identifies as either parallel, or nodal relationships:

> Individual interconnected areal units of occupance possess two kinds of areal relationship simultaneously. In one case it is the parallel relationship of similar-type units. In the other case it is a series of interconnections between unlike establishments focusing upon the core of a nodal area of functional organization.[91]

Philbrick starts with a very basic association of human occupance features, a farm made out of a series of cultivated fields, and a farmstead made out of a house and a barn (figure 34). The various plots of farmland are associated with each other through a parallel relationship since they are in a way uniform entities. But the farmland with the farmstead are connected through a nodal interrelationship. The farmstead is the focal point of the whole farm and as such it can be considered as the node, a hierarchically higher spatial element. These sets of relationships constitute the areal organization of the farm.

The next important step in Philbrick's model is that through a linear scale progression, parallel and nodal relationships become interchangeable: At the next level, the whole farm, including the farmland and the farmstead, is considered one unit. This farm is associated in a parallel way to a series of neighboring farms, with their own farmsteads and farmlands. The whole system of farms is now considered as a uniform establishment, which however could be connected in a nodal way to a small neighboring town. In this case the town would be the focal area, through which all activity would be channeled. But the town is itself the product of the combination of parallel and nodal relationships: Individual buildings connected through parallel relationships construct clusters of similar land uses, which are considered as nodal points connected again with each other in a parallel way etc. As Philbrick summarizes:

> Accompanying the scale progression from large to smaller an alternation of type of organization-homogeneous, nodal, homogeneous, nodal, is apparent. The map of any given type of establishment, such as that of the farm, shows first homogeneous fields, and then the nodality of the farm unit as a whole. The maps of parallel areal relationship of like establishments show the homogeneity of farms in a farm area, of homes in a residential area, of stores in a commercial district. The map of the village and parts of its service area portrays a larger nodal community unit of areal functional organization. Putting it another way, the nodal farm unit is composed of homogeneous fields; the homogeneous agricultural area is composed of nodal farm units; and the nodal town market area is composed of homogeneous agricultural-residential areas surrounding a homogeneous commercial core. The structure of each level or scale of the classification is definable in terms of the alternate type of relationship at the next larger scale.[92]

Philbrick constructs a system in which uniform areal units, are structured hierarchically under nodal elements, which then construct clusters of nodes, which are again conceived as uniform areal units connected under nodes of higher orders, and so on and so forth. Every time different 'orders' of functional areal organization are constructed that are only connected hierarchically – elements of one order can only be connected to elements of a higher order through the subsequent order etc. Systems of farmlands are connected to farmsteads, farmsteads are connected to each other as uniform entities and are structured under higher order nodal elements – towns. Clusters of agricultural towns, together with their associated systems of farmlands are then connected in a parallel way and structured hierarchically under higher order nodal elements – towns that can be considered as local centers. Clusters of regional centers are then connected under regional centers until the areal functional organization of the region is constructed, which then forms the base for sub-continental and eventually continental forms of areal functional organization (figure 35).

Philbrick eventually ends up borrowing from Christaller's model of central places. However, although abstracted in the form of interlocking networks, Philbrick's clusters of clusters carry with them the particular forms of human occupance, land use patterns, establishments and infrastructures that allow his model to lie between the relative space of economic abstractions of space, and the absolute space of the grounded geography of formal regions. Philbrick's conception of nodality does not refer to a despatialized network, but to whole surfaces of particular physical configurations of natural and social elements. In his model of the organization of the United states, clusters of cities and regional centers are not only connected to each other but also to regions of resource extraction, cultivation and grazing, which are considered uniform, but can be conceived as also made up of successions of parallel and nodal relationships. In this way, Philbrick merges the formal interpretation of uniform regions – for example agricultural regions, or mining regions defined in terms of their uniformity, with the organizational interpretation of functional regions: His interest does not lie in the differentiation of regions but rather in the structure of their interconnectivity.

After several orders of parallel and nodal organization, Philbrick attempts to chart the organization of the whole world (figure 36). Interestingly, the world is divided into two major parts: The subsistence world, which can be considered to operate in isolation and has its own internal functional areal organization; and the exchange world, with a much more complicated, intense and multiscalar structure of functional areal organization:

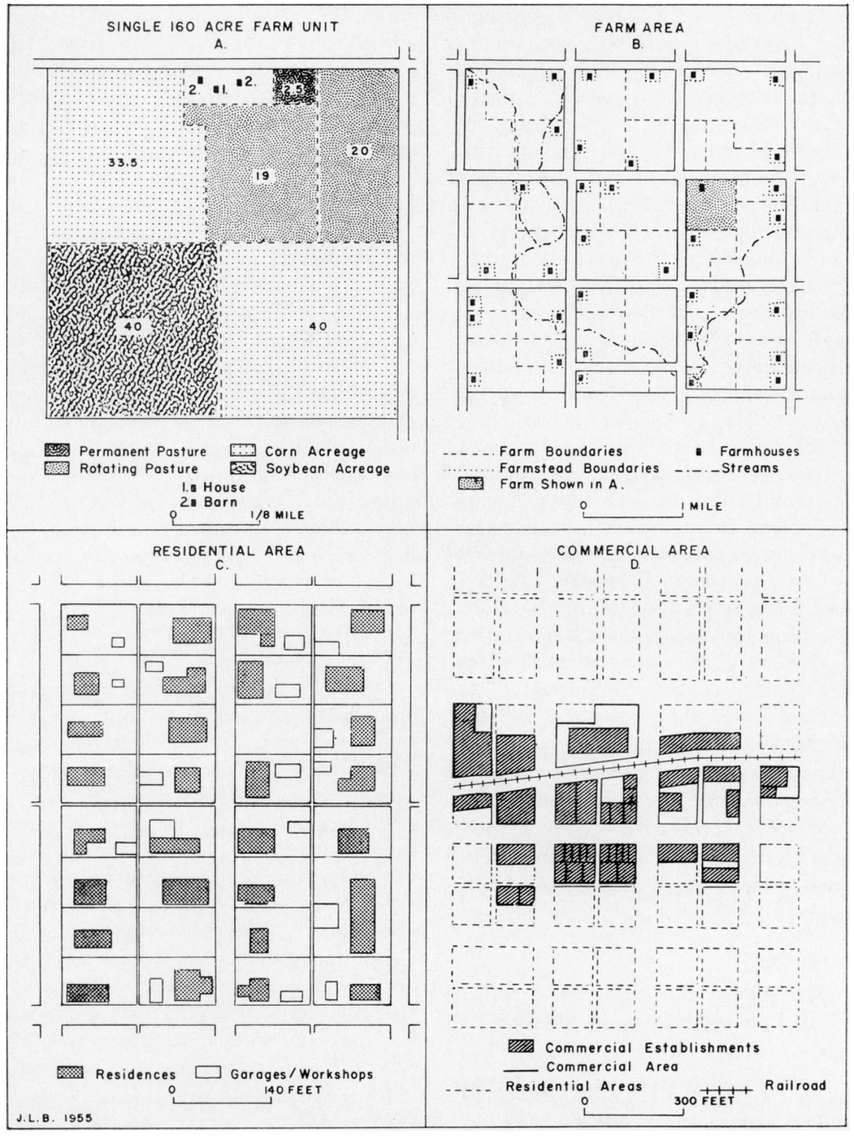

FIGURE 34: PHILBRICK'S FUNCTIONAL AREAL ORGANIZATION FROM THE FARMSTEAD TO THE TOWN.

Urban industrial areas are connected to cropland, rangeland, forestry and mining areas through major trade routes. Although generalized by their major element of uniformity, these extensive regions have their own internal multilevel organizations, which connect the global, to the plot of land of the farm, the town or the mine. Philbrick's novelty in blending elements of the configuration of landscapes, as found in field studies of uniform regions, with elements of functional organization, as found in studies of functional regions, allows to associate questions of human occupation (like land use patterns) across scales and thus address the great challenge that globalization presented to the understanding of geographical organization.

But although allowing the successive association of patterns of human occupance across scales, Philbrick's model is severely limited by the hierarchical structure of associations: Elements of one order are only connected to the previous or next. As a result, the interpretation of a pattern of human occupance at the level of the farm for example (a change in the export volume and the associated yield and patterns of cultivation), can only be explained through its connection to the town and then the local, regional, national center, as if this process is necessarily channeled through all this hierarchy of places. Nevertheless, Philbrick's model presents one of the most ambitious efforts to associate both the configuration of landscapes and processes across scales. His ambition to construct a model of the organization of the world is what both makes his effort appear rather oversimplifying, but at the same time useful in highlighting certain challenges. With the generalization of spatial interaction across sales, the question of revealing the associations behind the modification of landscapes becomes extremely challenging and a question that cannot be simply answered through the combination of landscapes and networks in the construction of larger and larger geographical associations.

SPATIAL CLASSIFICATIONS IN CONTEMPORARY ENVIRONMENTAL STUDIES

In recent years, and mostly under this environmental framework, studies of land use and land cover have proliferated, offering various interpretations and classifications of the various phenomena that are shaping the earth's surface. In a way, this trend has led to a return of the logic behind the uniform region, the construction of certain ways of classifying the earth's surface according to particular classifications that differentiate areal units from each other. In fact, my interpretation in the last part of the book will be to also investigate critically the possibility for creating an alternative classification of the urban. As a result it makes sense to examine briefly two of the most interesting examples that have been developed in order to construct alternative classifications, not of the urbanized, but of the 'anthropogenically altered' environment.

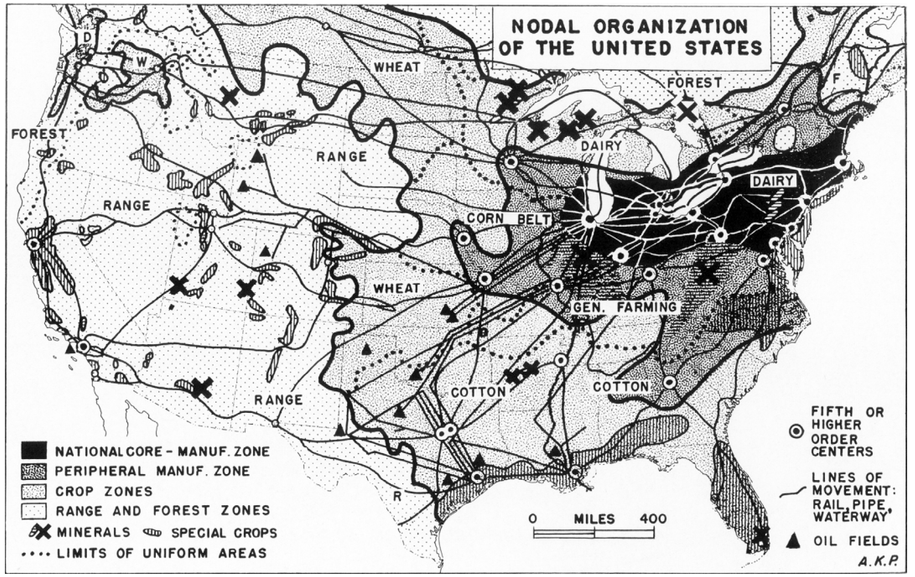

FIGURE 35: NODAL ORGANIZATION OF THE UNITED STATES.

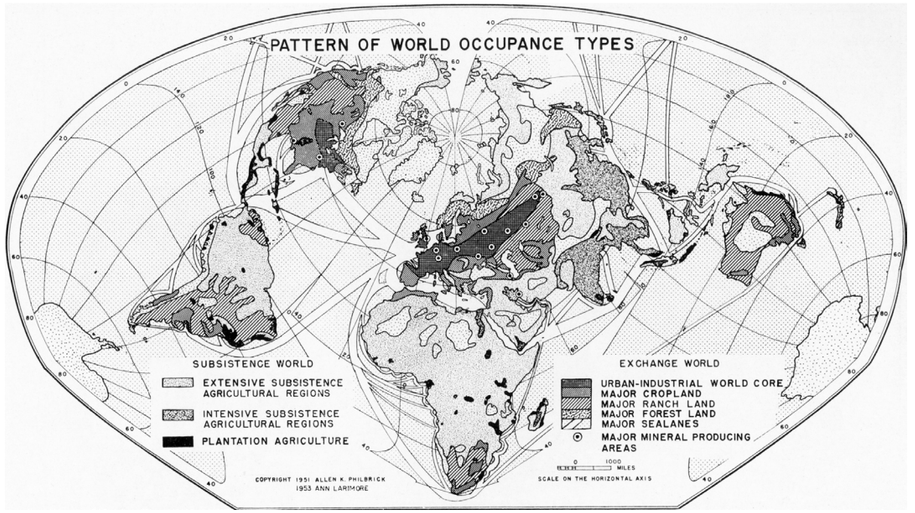

FIGURE 36: ORGANIZATION OF WORLD OCCUPANCE TYPES.

One of the most synthetic approaches in this direction is the 'Last of the Wild' project that was developed in 2008 at Columbia University's Earth and has resulted in a series of planetary indicators of environmental degradation.[93] Among these maps, a rather literal idea of the human footprint is introduced, quite different from the concept of the urban footprint that I discussed in the previous chapter: The map in figure 37 is derived from a technical procedure that assesses the environmental impact of various human activities as they are articulated across the earth's surface. Drawing upon a range of datasets on human settlements, transportation infrastructures, landscape transformations and energy infrastructures, the map classifies planetary space on a scale from 0 (minimal impact) to 100 (maximum impact). Predictably, urban zones are coded as the highest impact areas, whereas more remote locations are said to be largely devoid of human influence, or 'wild'. Although this approach offers a great insight into the dimensions of the used part of the planet, and as a result a contemporary interpretation of the Ecumene, it is largely problematic since it reproduces the society - nature dichotomy.

It is exactly this dichotomy that the Anthropogenic Biomes of the world project tries to overcome (figure 38). Introducing a quite radical (for ecologists) proposition, Ellis and Ramankutty suggest that in their search for defining, delineating and defending the 'natural', ecological thinking has rather ignored that the majority of the planet is composed by hybrid landscapes that are the result of the interaction between human and natural systems:

> the biosphere has long been depicted as being composed of natural biomes, perpetuating an outdated view of the world as "natural ecosystems with humans disturbing them"... Anthropogenic biomes tell a completely different story, one of "human systems, with natural ecosystems embedded within them"... Anthropogenic biomes clearly show the inextricable intermingling of human and natural systems almost everywhere on Earth's terrestrial surface, demonstrating that interactions between these systems can no longer be avoided in any substantial way.[94]

Accepting that pure nature is rather non-existent, allows the 'Anthropogenic Biomes' project to introduce much more synthetic categories of land cover that combine elements of both natural biomes, and their anthropogenic transformation. The project is in a way a response to the limitations of persistent categorizations of land use and land cove patterns. Although fueled by the recent proliferation in remote sensing and geospatial analysis, most land cover categorizations include only a limited number of classes to describe man made landscapes. These are often exhausted in the delineation of urban areas, as densely built up and densely populated zones, agricultural areas, and areas that are used for grazing. The rest of the land cover classes include long lists of different types of vegetation cover, as well as other natural elements like water, ice etc. These interpretations have little to say about the complex configurations of artificial and natural systems that construct most of the planetary terrain. It is exactly these patterns, or these 'mosaics' that the 'Anthropogenic Biomes' project aims to reveal by introducing a much more detailed classification. The map in figure 38 represents how the world is structured based on the 19 classes of 'Anthropogenic Biomes', or 'Anthromes', classes that are a result of geostatistical combination of the distribution of population density, land use patterns and natural vegetation patterns. Only three of the classes are characterized as pure wilderness, while the sixteen other categories mostly connect types and patterns of settlements with agricultural land use and rangelands.

The 'Anthromes' approach is an important reference for this project since it offers a precedent in constructing a synthetic land-use interpretation of the human occupation of the planet. However, the interest of the project is not to question inherited categories like the urban, or village, but rather to combine them with 'layers' of the natural environment, or its productive management (for example villages are associated with agriculture and can be rainfed, irrigated, rice villages etc). In the same way, the 'urban', remains unquestioned and is delineated based on the usual 'masking' of particular classes of population density and artificial land cover gradients. The urban, or dense settlement category, is the only one that is not broken down, or connected to any other elements that construct the rest of the rich categories of the Anthromes.

Moreover, while the authors are explicit in recognizing the dynamic nature of the interaction between social and natural processes, the Anthropomes project cannot escape the 'static' envelope of a land use classification system: The project is not geared into unpacking how these different mosaics are related to each other, but rather how they are distributed and configured spatially. Its dynamic dimension is focused on modeling the different configurations and sequences of Anthromes over time, and offers indeed a rich prehistory of the used part of the planet based on this alternative classification. In sum, Anthromes offer a radical and very useful starting point for re-classifying the hybrid fabric that is co-produced through the interaction of social and natural systems. The mosaics that are suggested however reveal too little about how they connect to, and transform each other, or how they transform into one another over time.

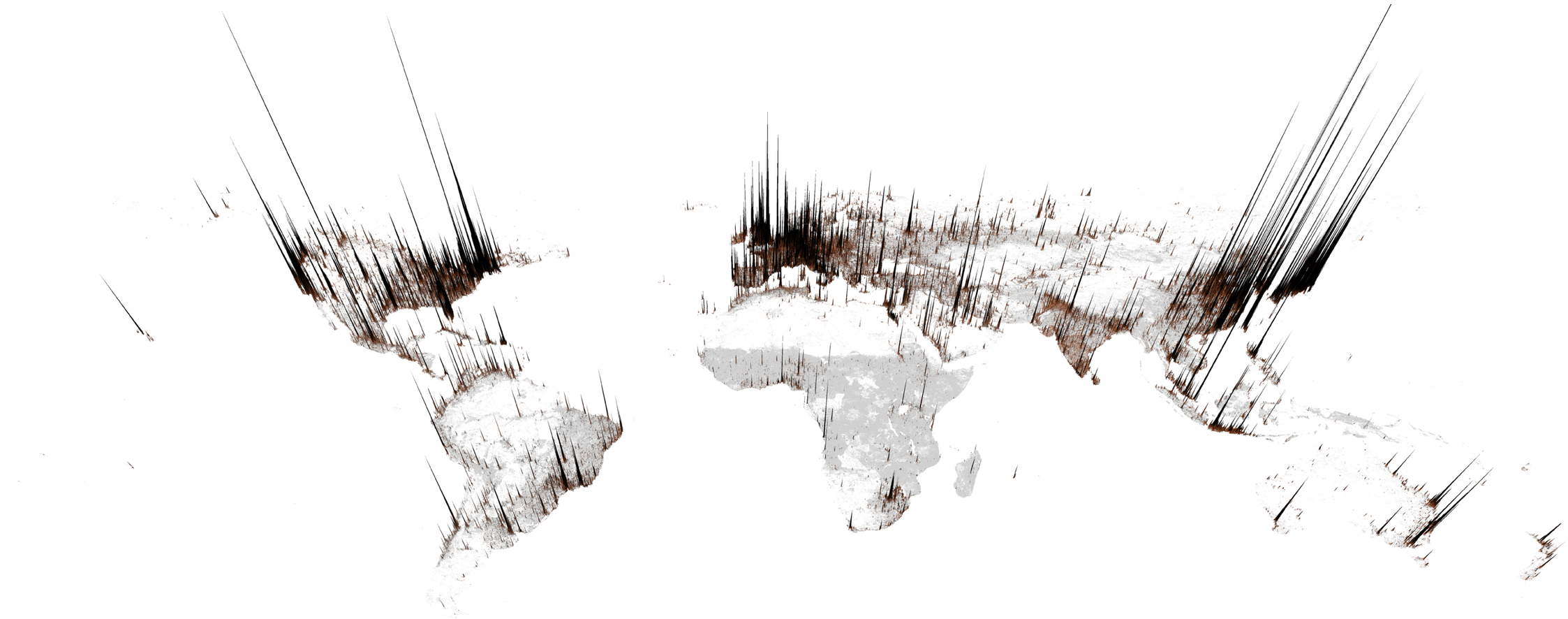

FIGURE 26: GEOSPATIAL DISTRIBUTION OF WORLD GDP IN A THREE DIMENSIONAL PERSPECTIVE.

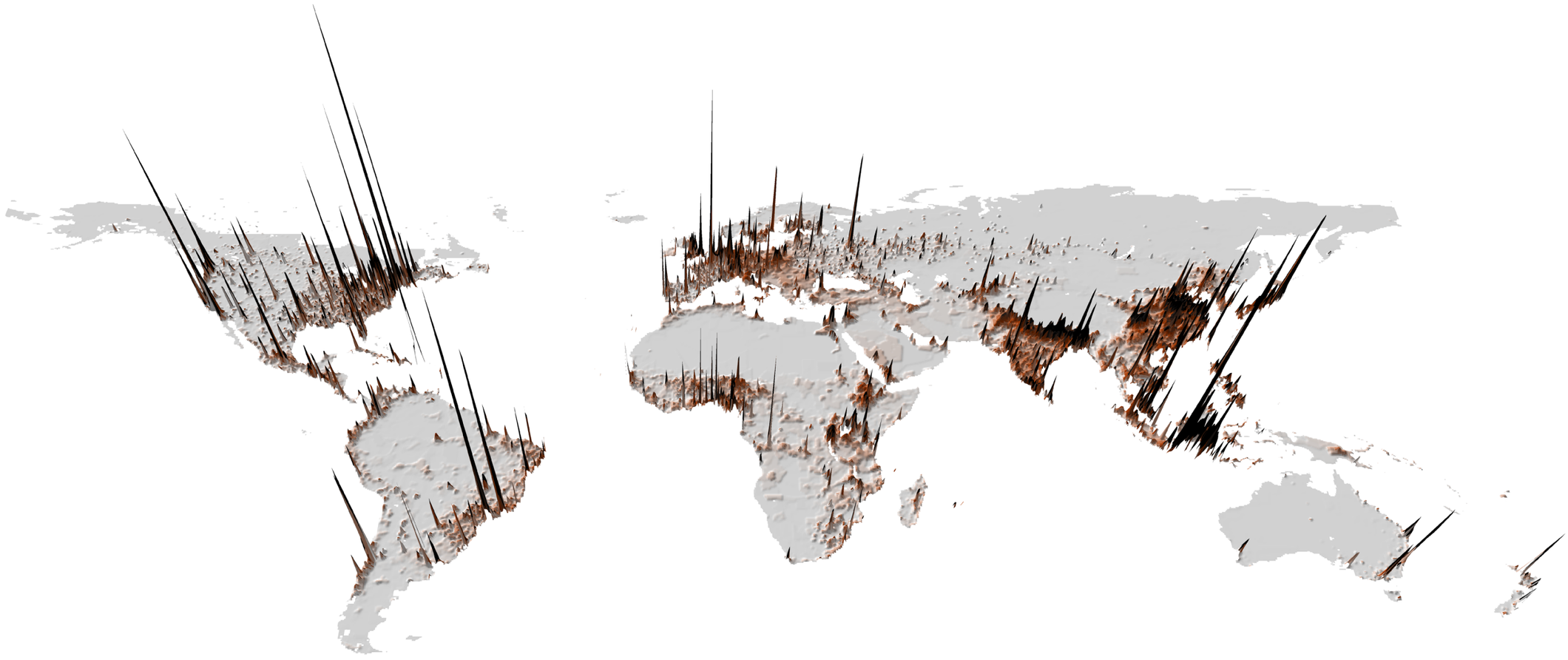

FIGURE 30: GEOSPATIAL DISTRIBUTION OF BIOMASS CONSUMPTION IN A THREE DIMENSIONAL PERSPECTIVE.

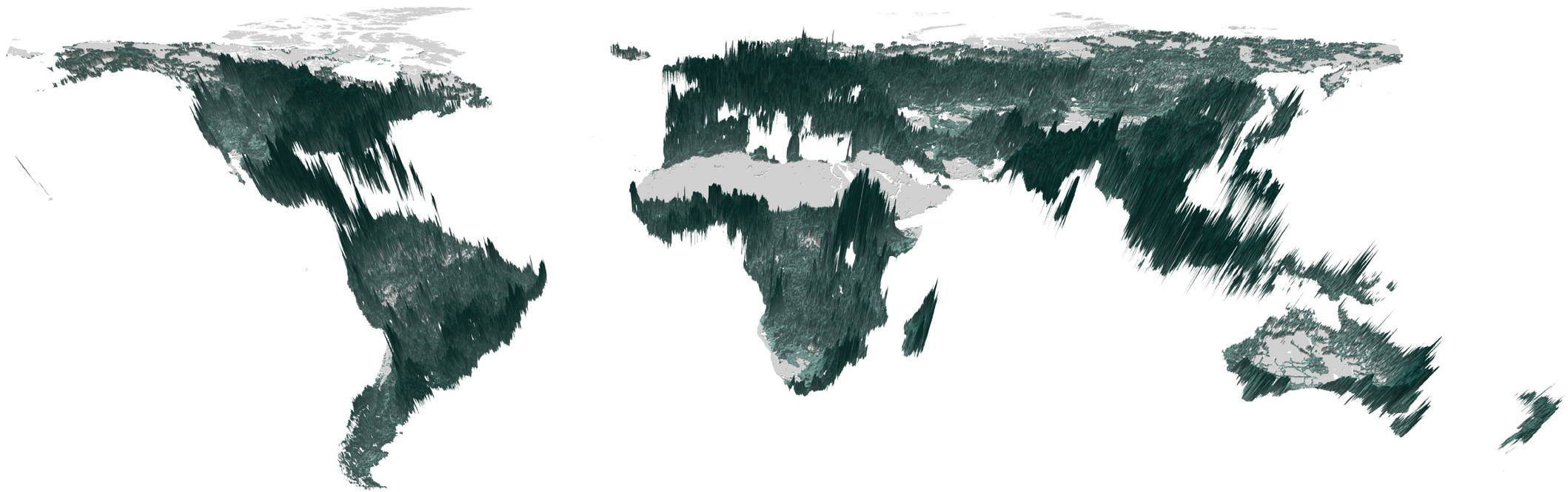

FIGURE 31: GEOSPATIAL DISTRIBUTION OF BIOMASS HARVESTING IN A THREE DIMENSIONAL PERSPECTIVE.

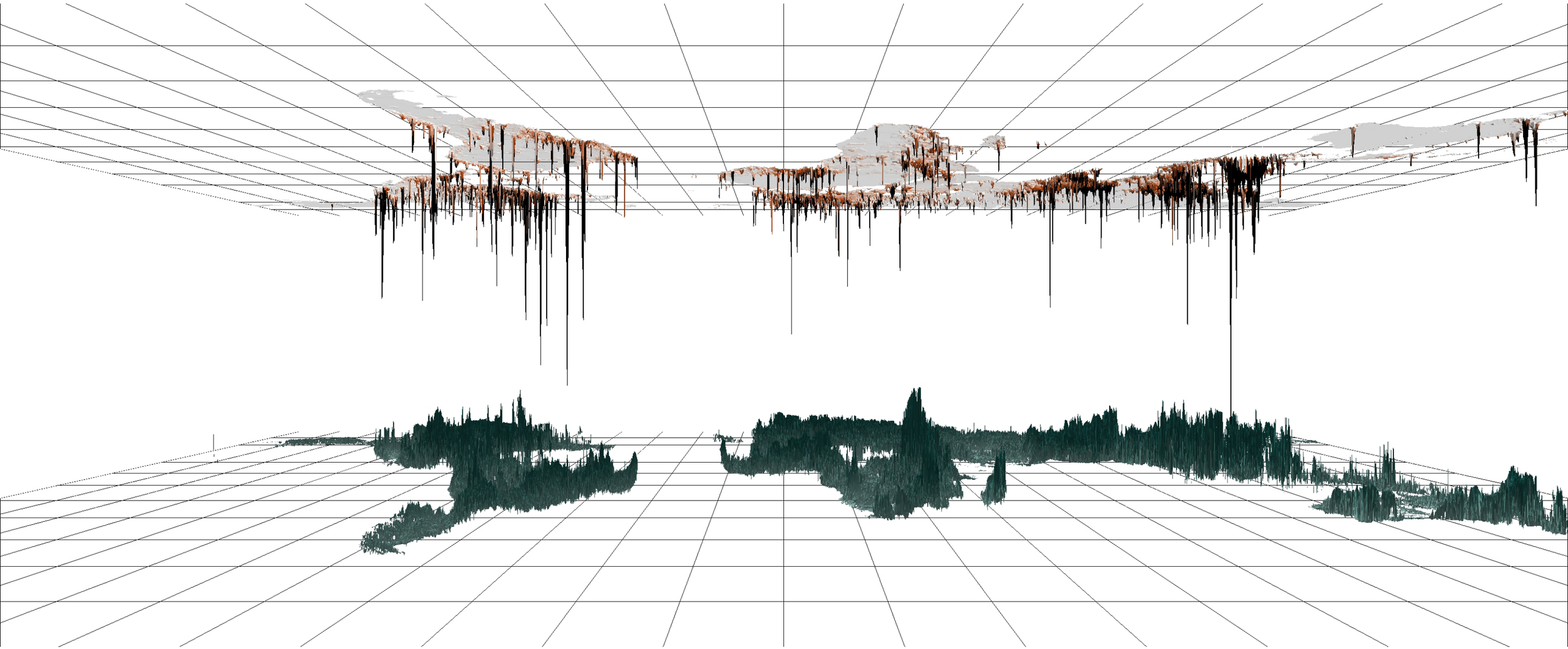

FIGURE 32: A 'CAVE' MODEL OF BIOMASS PRODUCTION AND CONSUMPTION LANDSCAPES IN THE YEAR 2000.

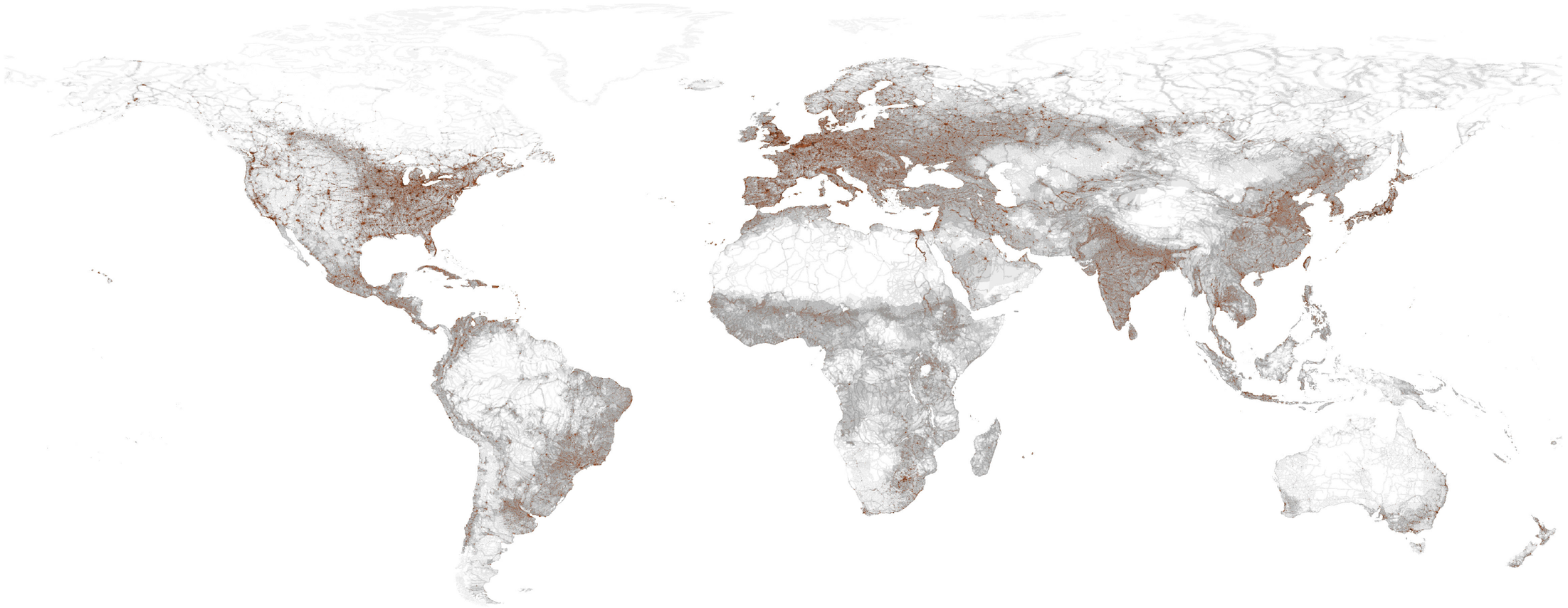

FIGURE 37: THE GLOBAL HUMAN INFLUENCE INDEX OF THE LAST OF THE WILD PROJECT, V.2, 2005.

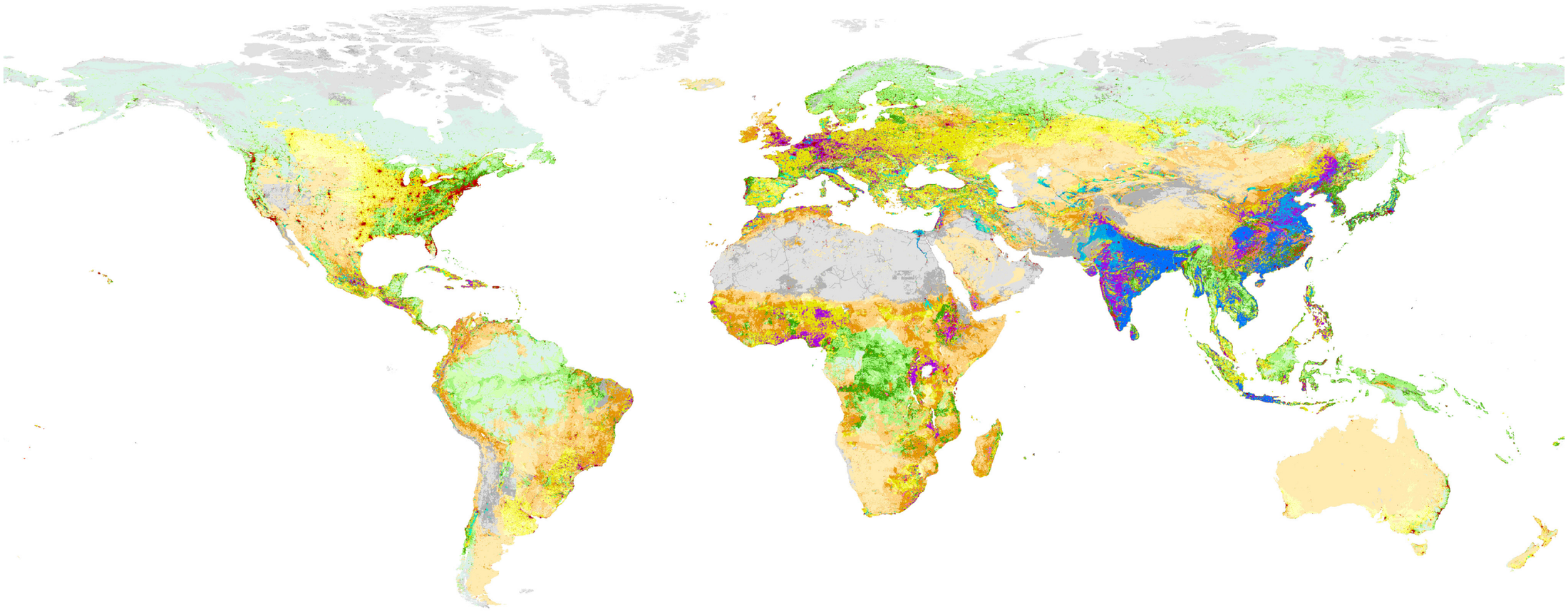

FIGURE 38: ANTHROPOGENIC BIOMES OF THE WORLD (ANTHROMES) V.2.

ENDNOTES TO PART 02

1 For a review see: Gregory, D. and Castree, N. (eds.) *Human geography*. (London: SAGE, 2012); for a critique on models of quantitative geography see: Smith, N. *Uneven development: Nature, capital, and the production of space* (Athens, GA: University of Georgia Press, 2008).

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27 Ibid.

28 Ibid.

29 Industries with high labor costs per ton of products will be concentrated at the favorable international labor markets.

30 I will discuss in detail this relation between elements of natural geography and the social division of labor in part 03, where I largely base my analysis on Neil Smith's work on Uneven Development.

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PART 03

THE CONSTRUCTION OF THE HINTERGLOBE

INTRODUCTION TO PART 03: REVISITING THE MICROCOSM OF THE ISOLATED STATE

CHAPTER 06: ELEMENTS OF GEOGRAPHICAL ORGANIZATION

- EXPANSIVE GEOGRAPHIES OF CAPITALIST URBANIZATION
- LOCATIONAL TENSIONS AND THE ASYMMETRIES OF FIRST AND SECOND NATURE
- TERRITORIAL ORGANIZATION AS A SOURCE OF EXTERNALITIES
- GEOGRAPHICAL ORGANIZATION AND ECOLOGICAL ORGANIZATION

CHAPTER 07: COMPOSITE GEOGRAPHIES OF URBANIZATION

- DENSITY, CONCENTRATION AND AGGLOMERATION
- LANDSCAPES OF POSSIBLE EXTERNALITIES
- AGGLOMERATION LANDSCAPES
- OPERATIONAL LANDSCAPES
- HYBRID LANDSCAPES
- REMOTE LANDSCAPES

CHAPTER 08: COMPOSITE CARTOGRAPHIES OF URBANIZATION

- CHARTING THE COMPOSITE GEOGRAPHIES OF URBANIZATION
- GENERALIZING THE VALLEY SECTION
- CHARTING AGGLOMERATION LANDSCAPES AND OPERATIONAL LANDSCAPES

CHAPTER 09: ELEMENTS OF GEOGRAPHICAL ASSOCIATION

- THE ASSEMBLY OF COMPOSITE GEOGRAPHIES
- INFRASTRUCTURAL CONVERGENCE
- COMMODIFICATION
- COMMODITY CHAINS
- COMMODITY CHAINS AND THE COMPOSITE GEOGRAPHIES OF URBANIZATION

INTRODUCTION TO PART 03:
REVISITING THE MICROCOSM OF THE ISOLATED STATE

The starting point of this research is that urbanization suggests a particular condition of geographical organization. Urbanization organizes geography through a process of continuous redistribution of the concentrations of population and economic operations over variegated landscapes. What is particular about the urban condition, is the wide set of biogeographical interdependencies associated with the concentration of population in relatively few areas of the planet, and the general social and spatial division of labor they suggest, which however extends far beyond them. The concept of the hinterland has been introduced in order to unpack exactly this broader condition of geographical interdependency.

As discussed in the previous part, an obvious and persistent interpretation of the hinterland is as a supply source that provides inputs to processes that are concentrated in cities, or in an even narrower interpretation, to the city that it is connected to. These processes belong roughly to two categories: They can either be inputs for production processes (for example energy and raw materials for manufacturing), or they can be the means of subsistence that enable the social reproduction of the population that is concentrated in the city. In the simple microcosm of Von Thünen, the hinterland provides food and raw materials (in the form of wood and mining products) to the city, which is the locus of all manufacturing and exchange and as a result, supplies the hinterland with the necessary manufacturing products.

This simple model of geographical interdependency, could have indeed been the case in pre-industrial, or early-industrial societies. However, with the continuous division of labor under capitalism, the chain of production and labor processes, which are involved in the production of almost every commodity, grows exponentially: An obvious example is the food supply of a city. The production of almost any type of food, has become a process consisting of multiple steps, in which the output of every process becomes the input for the next until it reaches consumption. The same could be said for the raw materials that are the inputs of industrial processes: The raw material for the steel industry is already the product of several steps of processing, the raw material for the oil industry has already undergone refining processes, etc.[1]

The two very ends of all these process can be indeed reduced to a simple interpretation of the city - hinterland model: The one end, the very basic extraction process, is connected to the exploitation of natural resources from the land; the other end, the final steps of the manufacturing and eventually consumption process, are connected to the areas of high population concentration – the city. All the intermediate steps however, involve a multitude of different spatial configurations that can be located in a multitude of sites: Next to the extraction area there can be an initial processing, or storage facility, which can then be connected to a further processing facility which can most likely be located in a city, which however might not be the final destination of the commodity produced. This might be exported and consumed in another city (in the case of a finished product), or become the input for a new cycle of processing (in case it is a 'manufacture' – an intermediate manufactured product that is the input for a subsequent manufacturing process). In this case, the hinterland of a city, could very well be another city. The involvement of all these potentially different areas is of course directly connected to the specialization of the social and spatial division of labor, and dependent upon the connectivity offered by (some sort of) transport infrastructure. Obviously, the more complex the commodity that is produced, the more steps are added in the process, and as production becomes globalized the network of spatial configurations that are involved in the production of commodities, as well as the infrastructures that connect them, grows. I will try to unpack these issues when I discuss in particular the geographical configuration of certain production networks.

But for now, my argument is more of a conceptual nature: The question of the hinterland has mostly been framed as the question of defining the supply area of a city. This supply could range from the supply of industrial raw materials, to the supply of the necessary inputs for the subsistence of the population. However, with the thorough division of labor and the complex organization of commodity production into lengthy commodity chains, the question of defining the hinterland of the city as linear relationship, becomes not only methodologically elusive, but conceptually restrictive. Instead then of trying to define the specific areas of supply and the specific flows of resources, I start with the following observation:

The biogeographical interdependencies of urbanization are associated with a multitude of production and consumption processes that involve a multitude of geographical configurations. Within this condition of interdependency, both the city, or the broader agglomeration, and the hinterland, or the broader productive landscape, can be characterized as geographical configurations with certain characteristics that make them attractive to, and the product of, the location of certain economic operations. Instead of trying to identify the particular connections of these operations across space, I will try to define what distinguishes particular geographical configurations as possible landscapes that can be activated by these operations. What I will try to

present, is a landscape of possibilities part of which are both areas of concentration, which I will call 'agglomeration landscapes', and the broader production landscapes, which I will call 'operational landscapes'. These landscapes suggest, define and restrict different sets of possibilities for the location of different sets of operations that are all part of the urbanization process.

The relation between urbanization and the restructuring of the social and spatial division of labor has been always highlighted and deeply investigated. I claim however that this investigation has been largely limited to only one set of interdependencies, and in specific those unfolding within, or between what I have framed as agglomeration landscapes. In fact, the dominant narratives of urbanization have mostly highlighted the globalization of only these economic sectors that are connected with processes centered on agglomeration landscapes, which are the secondary and tertiary sectors of the economy. What I claim here is that associated with this globalization of the secondary and tertiary economic sectors, a globalization of the primary sectors of the economy has also been unfolding. This globalization of the broadly defined primary sectors of the economy, has been the one responsible for the transformation of the majority of the used terrain of the planet, as I have tried to chart it in part 01.

My aim in this last part is to reveal the process of urbanization as the continuous interplay between various forms and combinations of agglomeration landscapes and operational landscapes. It is this continuous interplay that shapes the geographical organization of world urbanization. Within this context, the construction of the global hinterland cannot be conceived as a one-to-one relationship between cities and hinterlands. Rather it should be investigated as the construction of a wide set of operational landscapes that are shared by the global configurations of agglomeration landscapes. The construction of this global system of operational landscapes is the construction of the Hinterglobe.

In order to start developing the categories of agglomeration landscapes and operational landscapes in a systematic way, I return to Von Thünen's model of the isolated state. I claim that the elements of geographical organization that construct the various configurations of agglomeration landscapes and operational landscapes, are implied (directly, or indirectly) within the microcosm that the model suggests, and can be identified as follows: The exchange between town and country and the associated specialization of land use and division of labor; the asymmetries of natural geography; the asymmetries in the equipment of the ground; the topology and geographical extents of exchange.

My hypothesis here is that this microcosm manages to compact almost all elements that need to be unpacked in order to develop a contemporary theory of urbanization as a form of geographical organization. The elements are there, but in the case of Von Thünen, as well as in several of the other approaches that I examined in the second part of this project, they are treated either in isolation or through linear relationships to each other. The starting point of this chapter is that all the elements of the isolated space are actually co-produced under successive waves of capitalist urbanization processes.

This proposition implies an immense complexity of interrelations. I will try to address this complexity by developing two toolkits: A theoretical and conceptual toolkit; and a geostatistical toolkit. Through their productive synergies I aim to develop new conceptual, spatial, and representational categories for addressing the construction of the Hinterglobe. These toolkits build upon a series of fundamental developments in geographic thought, which however have been developed rather in parallel: On the one hand, since the early seventies, breakthrough developments in geographic thought have stared questioning and investigating how space, society and nature are co-produced under dominant, capitalist relations of production and circulation.[2] This chapter builds heavily upon the conceptual, theoretical and methodological contributions of this line of thought, which is also directly connected to the contemporary problematique of Planetary Urbanization. On the other hand, the past decades have seen a proliferation of geographic information systems, and associated tools, methods and datasets of investigating the configuration of geographic phenomena.[3] Throughout the first two parts I have already touched upon several of these contributions and discussed their potentials and limitations. This last part can be seen an effort to develop a series of synergies across these two paradigms in geographic thought. First of all however, the elements of the Isolated State, so linearly interconnected, require a certain re-framing in order for them to serve as the basis of the subsequent parts of analysis:

- The exchange between town and country and the associated specialization social and spatial division of labor. First of all the condition of exchange and the condition of specialization are directly interrelated: It only makes sense to exchange things that are differentiated, and in the same way, a condition of differentiation requires exchange assuming the need to achieve some sort of subsistence. At the same time, the specialization of economic activities corresponds to different forms of land occupance (physical and functional) that are connected to, and depended upon, different locations and associations between these locations. A first specialization is between the activities that are concentrated in the town (in this case manufacturing),

and those who are spread over the countryside (in this case agriculture). A second specialization lies within each one of these two domains: Within the town we can assume different activities, and within the countryside we can observe the specialization of different cultivation zones. The question can be generalized as follows: What defines which activities are located in dense settlements and which not? And how are these connected to each other? How do they relate with the conditions of population concentration and land occupance?

- The asymmetries of physical geography. The term here is not meant to refer to 'nature' as an external set of conditions, but rather to generalize upon how the geographically specific conditions of the atmosphere, hydrosphere, biosphere, and geosphere become part of this process of geographical interdependence. The patterns of these conditions are of course asymmetrical and often fluctuating. In the case of the Isolated State, they refer to conditions relevant to agricultural activities (like the fertility of the soil), and to the location of resources (the mines,) which include two of the most important factors that affect the location of economic activities. The question can be generalized as follows: How are the asymmetries of the natural environment integrated in the locational shifts and the distribution of population, economic activities and the associated patterns of land occupance?

- The asymmetries in the equipment of the ground. In Von Thünen's microcosm, the infrastructure that is highlighted through its absence is transport infrastructure, since there are no roads or canals to differentiate the overall mobility landscape. I can generalize by framing as 'equipment' all the structures and infrastructures, hard and soft that modify the elements of natural geography, with the goal either to amplify and harness their potentials, or to overcome their limitations. This equipment is not to be conceived as an additional layer that is added to natural geography, but rather as a mutation of natural geography itself and is mostly interwoven with (but not limited to) the elements of the biosphere and geosphere. The composition of this equipment alters, takes advantage of, or tries to overcome the asymmetries suggested by the elements of natural geography, thus modifying their pattern of asymmetries into new ones. The question can be generalized as follows: How are the asymmetries of these modified geographies connected to the asymmetries of natural geography and how do they become integrated into the locational shifts and the distribution of population and economic activities?

- The topology and geographical extents of exchange. In the first point, the system of exchange was connected to the patterns of specialization of labor and land use. The topology of this exchange, is in the case of Von Thünen's model quite peculiar: First of all, exchange only happens through the town which means that commodities produced in the various zones cannot be exchanged between the zones directly, but need to be circulated through the town. This is of course one of the major historical roles that allowed towns to flourish already from antiquity - towns as catalysts of exchange. This touches upon the second issue, that of commodification: Same products which are produced in different parts of the isolated state, are traded in the same way, considered to be similar and have the same price set by the market. In addition, this attribute of centralized exchange is what allows us to interpret the Isolated State as a landscape of commercial agriculture, instead of a landscape of subsistent agriculture. Of course, as a whole, the Isolated State can be conceived as a subsistent unit. But the town, or any of the zones in themselves, cannot. They are all acquiring their means of subsistence through the centralized exchange that connected to their specialization. Finally it is striking to note that the configuration of the productive landscape and the reach of exchange have certain, well defined, boundaries. In the case of Von Thünen, the boundaries are defined by the cost of production and transport to the marked in relation the price of the commodity, which theoretically would make the limits particularly fluid: Various combinations of production costs (transport costs, labor costs, etc) and commodity prices would allow this limit to be expanded or contracted. In addition, these fixed boundaries allow the productive landscape to be considered as part of the same regulatory regime - after all it is called 'state'. In this particular case the functional boundaries of the economy activity and the regulatory boundaries overlap. But the more general question could be framed as follows: How is the exchange between town and country unfolding within various territorial entities and their regulatory regimes? How does this affect the patterns of organization of the productive land? How dopes this relationship be framed within contemporary globalization processes? Which are the boundaries of the microcosm?

Before I turn to a critical appraisal of these general observations, it is time to once again unleash the full potential of this microcosm by initiating the following thought experiment: I assume that the Isolated State is a micrographic conceptualization of the world. The town of the model, corresponds to the universe of agglomeration areas, while the countryside of the model corresponds to the productive landscapes.

CHAPTER 06:
ELEMENTS OF GEOGRAPHICAL ORGANIZATION

EXPANSIVE GEOGRAPHIES OF CAPITALIST URBANIZATION

The question of geographical organization under capitalism, has been the focus of a series influential approaches that have been developed since the early seventies from critical geographers introducing a historical-materialist framework in the understanding of the social production of space. Within this context, social and geographic structures are dialectically co-produced under the capitalist mode of production and circulation. In my approach, I will try to build upon seminal concepts of geographical organization focusing on the influential works of Neil Smith and David Harvey, integrating them into the specific study of the co-development of agglomeration landscapes and operational landscapes.[4] In doing so, I will try to frame the elements of geographical organization that I have briefly introduced through the microcosm of the isloted state, and theorize how they are co-produced under conditions of capitalis urbnization. According to Harvey, exploding urbanization processes are largely an outcome of consecutive waves of capitalist development that have radically reshaped inherited patterns of city-hinterland interaction that used to be rather limited in scale and intensity:

> Up until the 16th or 17th centuries, urbanization was limited by a very specific metabolic relation between cities and their productive hinterlands coupled with the surplus extraction possibilities (grounded in specific class relations) that sustained them. No matter that certain towns and cities were centers of long-distance trade in luxuries or that even some basic goods, like grains, salt, hides and timber could be moved over long distances, the basic provisioning (feeding, watering and energy supply) of the city was always limited by the restricted productive capacity of a relatively confined hinterland... What changed all this, of course, was the wave of new technologies (understood as both hardware and the software of organizational forms) generated by the military-industrial complex of early capitalism. Capitalism as a mode of production has necessarily targeted the breaking down of spatial barriers and the acceleration of turnover time as fundamental to its agenda of relentless capital accumulation.[5]

The process of urbanization can here be interpreted as a dynamic relationship between city and hinterland that should be examined within the broader capitalist production and circulation processes. What characterizes the latter is the quest for the maximization of profit and the associated accumulation of capital. For Harvey,

this is not always without problems, which are often inherent in the nature of the capitalist system itself and could be expressed as crises of over-accumulation or stagnation. I will examine these elements by returning to the initial four points:

First of all the hinterland of a city could be considered as a resource system that we can assume has certain limits. However, the organization of a resource system in which all profits are redistributed within the system, and as such aims to accomplish an optimal organization of resources within it, is very different than the organization of a resource system that aims to accumulate some sort of profit. In the first case, the competition for locations could eventually create a certain stabilized configuration, which would reflect a landscape of zero accumulation, like in the case of Von Thünen's microcosm; in the second case however, this scenario of a neatly organized, optimized configuration of the landscape (and in our case of the city - hinterland system), is impossible. As Neil Smith notes,

> Capitalist production (and the appropriation of nature) is accomplished not for the fulfillment of needs in general, but for the fulfillment of one particular need: profit.[6]

In the case the system is closed, either the conditions of competition within the system would have to be continuously redefined (since the tendency towards equilibrium would mean a declining rate of profits), or the surplus would have to be exported outside the system thus continuously expanding it. The first scenario would mean a continuous reconfiguration of the city hinterland relation; the second scenario would mean an expansion. Attempting these two processes can be discussed under what Harvey defines as: The interplay between locational and technological advantage; and the contradiction between fixity and motion.[7] Both of these cases need to be further unpacked.

LOCATIONAL TENSIONS AND THE ASYMMETRIES OF FIRST AND SECOND NATURE

According to Harvey, every form of geographical organization can be considered a dynamic moment in the process of capital accumulation through spatial competition.[8] This spatial competition, the competition for the location of economic activities, as well as the associated spatial division of labor, operates upon, modifies and aims to take advantage of the asymmetries of physical geography, continuously producing and reproducing them in the form of processed mosaics. An anthropogenic geography. I referred to both these elements briefly in two different points, as the asymmetries of the physical geography (the geosphere, biosphere, atmosphere, hydrosphere), and

the equipped, modified asymmetries that are produced through the equipment and modification of this first layer of asymmetries. The two categories roughly correspond to the framing of the dialectical relationship between 'first nature' and 'second nature' that originates in the Marxist and Hegelian critique.[9] This distinction is however also blurry (and is perhaps meant to be so): Following Cronon's discussion in his seminal work on Chicago, first nature refers to the specificities of the conditions of the natural environment, and second nature to these conditions modified, to the processed natural environment, as for example through its equipment with infrastructural systems.[10]

For the purposes of this project, I cannot go into this debate, but I need to clarify the framing of the aforementioned points: Physical geography refers here to elements that are considered to be properties of the natural world, such as the climatic conditions (rainfall, temperature, humidity etc), geologic conditions (composition of the earth's surface and subsurface like soil quality and mineral resources), topographical and hydrographical features, vegetation (crops, pastures and forestry), which have the potential be integrated in the production process. What is of interest here, is not to define if these elements are part of nature in its pure or processed form. But rather their asymmetrical distribution: All these conditions appear in very different compositions and patterns over the earth's surface defining an important layer of differentiation. This natural differentiation does not have to be considered a 'base layer' - at least historically. However, connected to certain economic operations, combinations of these elements offer what came to be called as natural advantage, or what Marx framed as 'gifts of nature'. This natural advantage, promises the generation of surplus value without any particular effort:

> Given different natural conditions, the same expenditure of labor will result in different quantities of a given commodity, and this implies the possibility (but only the possibility) of surplus product in one place though not in another. Further, the qualitative differentiation of nature sets certain limits upon which production processes can take place in a given area. Thus cotton cannot be grown naturally in the Arctic, and coal cannot be extracted from geological strata that contain none. This is the natural basis to surplus product.[11]

Gifts of nature can be extracted in non-reproducible (minerals) or reproducible ways (agriculture, forestry), or they can be mobilized in the production process (hydropower, wind power).[12] However, the asymmetries of natural conditions and their different combinations, present different opportunities for the production of surplus to different economic activities, since competition does not only take place between activities of the same kind (agriculture of the same or different crops), but also between different kinds of activities (agriculture versus mining). Moreover, these advantages are often immovable: Resources can be extracted out of a mine, but the mine itself cannot be moved, as well as the specific conditions of the mine cannot be reproduced elsewhere. As a result, the possibility for the production of surplus is a permanent, not a dynamic feature. But most importantly, they are only one aspect in the general development of geographical organization, that is interwoven with (and thus has to be checked against) the other elements that are mobilized in the production of surplus value. These include technological advancements and the mobility and availability of labor.

Technological developments broadly conceived, lie behind the creation of the second set of asymmetries that modify the landscape of production. They are tightly interwoven with the locational advantages (or disadvantages) discussed above as part of the competition for profit-maximizing location. According to Harvey:

> A direct trade off exists, therefore, between changing technology or location in the competitive search for excess profits. Producers in disadvantaged locations, for example, could compensate for that disadvantage by adopting a superior technology, and vice versa.[13]

We can broadly define these technological advancements as machinery, but also modifications of the physical geography in the form of various forms of infrastructures, from land improvements (like irrigation systems), to transportation infrastructures (like ports and highways), energy infrastructures (like dams) etc. All these 'instruments of labor' have to be also produced and according to Harvey:

> ...when the various instruments of labour are produced as commodities, exchanged as commodities, productively consumed within a work process given over to surplus value production and, at the end of their useful life, replaced by new commodities, they become, in Marx's lexicon, fixed capital.[14]

The definition of fixed capital according to this framework is quite particular and interesting for our purposes. The most important elements are the following: First of all, fixed capital is only these parts of the physical equipment, structures and infrastructures that are mobilized during the capitalist production and circulation process. As a result, fixed capital cannot be defined in absolute terms as the totality of machines, structures and infrastructures, but only in relation to a particular production process. Fixed capital is then revealed to always be a subset of the total material

equipment of the earth. As a result, the amount of fixed capital can also grow or decline by including or excluding elements of this equipment from the production processes, which means that it is not only and directly connected to the production or destruction of this equipment. Already existing structures can become fixed capital when they are instrumentalized as part of a particular production process and in the same way, elements of fixed capital can become simple equipment if they stop being part of it.

The second observation to be made is that through its definition, fixed capital is utilized over multiple cycles of the process of accumulation. As a result, it has a certain durability that is connected to its material properties. However this durability is only indirectly connected to the lifecycle of the materials: As it is only gradually consumed over the production process, it can always be repaired but also devalued if technological change or another combination of instruments allows the generation of more surplus than it can provide. Finally, this durability does not mean that fixed capital has to be actually 'fixed' in space, meaning immovable. Machinery for example can be rather movable, like the equipment of a factory, or an airplane. Some fixed capital is embedded in the land (primarily in the form of the built environment) and therefore fixed in place. This capital is 'fixed' in a double sense (tied up in a particular objects like a machine and pinned down in place).[15]

The category that is mostly relevant to this research is the one that is actually locked into specific spatial configurations, the fixed capital that is fixed in space. This immovable fixed capital can be found in the form of docks, airports, highways, irrigation and land improvement systems, factory buildings and mines, etc. According to Harvey, this type of fixed capital is characterized both by its great scale, and its durability. It is obviously connected with the movable fixed capital (for example an airplane is depended upon an airport), but most importantly it is often directly connected to the modification of the asymmetries of physical geography: Transportation networks are meant to overcome the disruptions set by topographic or hydrographic features, irrigation systems to overcome problems of aridity, buildings to deal with climatic conditions, dams to take advantage of the hydrological potential etc. In this way, fixed capital is meant to cancel out, or amplify the natural advantages that are inscribed in physical geography, thus creating either a more homogeneous, or a more asymmetrical landscape. These mutations can address both issues of productivity and accessibility: With the investment in irrigation networks, poorly rainfed croplands become equally productive with those that are in more advantageous climatic conditions; with the construction of tunnels a mountainous passage becomes equally accessible to a valley.

Moreover, fixed capital of this category is more receptive to improvements that enhance its capacities without canceling them. In many cases, pieces of infrastructure can be incrementally expanded, or upgraded: A railway network can expand though the construction of additional routes, have additional tracks added or its power supply upgraded without being deconstructed. The same could be the case with the improvement of the soil, both with permanent, and with transitional modifications that build upon each other: A swamp can be drained to provide agricultural land, which can be in addition equipped with irrigation systems and have the soil improved with the application of chemical fertilizers. As these continuous modifications build upon each other, they tend to become more and more embedded into the landscape, in such a degree that they become part of the physical geography. In this way a new set of conditions is created that is deforming the asymmetries of the physical environment. Within the process of spatial competition, this processes can be viewed as an effort to create "in one place conditions of production that are free gifts of nature elsewhere," canceling the natural advantages of certain areas and creating a more homogeneous production landscape.[16]

At the same time however, investment in fixed capital is not only guided by the effort to maximize the potential for surplus value: Following Harvey's famous argument on the spatial fix, fixed capital plays a dual role in helping to resolve the crises of overaccumulation that are inherent in the nature of capitalism:[17] On the one hand, the investment in fixed capital is a way to channel excess capital in structures of great durability, which do not necessarily increase accordingly the creation of surplus in the short term and as a result, they do not feed back into the loop of overaccumulation. On the other hand, investment in specific forms of fixed capital, such as transport and communication infrastructures, enhance the mobility of capital allowing it to 'escape' the landscapes of overaccumulation in search of new markets and new areas for investment. This process entails according to Harvey an intrinsic contradiction: That space has to be fixed (in immovable structures of transport and communication networks, as well as in built environments of factories, roads, houses, water supplies, and other physical infrastructures), in order for processes of accumulation to remain flexible and mobilized. At the same time, this fixity is only ephemeral, functioning at a certain point in history only to be destroyed (devaluing much of the capital invested therein) at a later point in order to make way for a new 'spatial fix'. Eventually the quest for flexibility tends to create an increasingly immobile and sclerotic landscape:

> The longer the turnover times the greater the geographical and temporal inertia within the space economy of production. The effect is to stabilize

> the landscape of production - a not altogether undesirable countervailing influence to the tendency towards frenetic instability identified in the preceding section. But problems of another sort then emerge. Industries employing large quantities of fixed capital cannot re-locate easily. In a production system characterized by both interdependency and competition, differentials in turnover times as between industries, specific structures of agglomeration and dispersal, and the like, problems of coordination abound and barriers to the spatial reorganization of production multiply to corresponding degree. Space and location then appear as active sources of surplus value to individual capitalists. Capitalism increasingly relies upon fixed capital (including that embedded in a specific landscape of production) to revolutionize the value productivity of labour, only to find that its fixity (the specific geographical distribution) becomes the barrier to be overcome. The tension between the instability generated by newly forming capital and the stagnation associated with past investments, is ever-present within the geography of capitalist production.[18]

Two instances of fixed capital can be highlighted and their associated effects: Fixed capital meant to facilitate circulation, such as transport and communications; fixed capital meant to modify the capacity for production. Both are part of the process of production and in both cases, technological developments become part of a complex interplay of integration and fragmentation: Connectivity infrastructures are important for the mobility of commodities, raw materials and labor and through the 'annihilation of distance' their effect is spatial integration and the homogenization of space. This integration however, can be also very selective with areas connected at different degrees and areas left out. Moreover, spatial integration is connected with spatial fragmentation, since it is the spatial differentiation of production processes that makes their connectivity necessary. At the same time, by the creation of an integrated landscape that connects different landscapes of production, spatial competition for excess profit is reactivated:

> ...the closer production approaches some spatial equilibrium condition (the equalization of profit rates across locations, for example), the greater the competitive incentive for individual capitalists to disrupt the basis of that equilibrium through technological change... Competition, we may conclude, simultaneously promotes shifts in spatial configurations of production, changes in technological mixes, the re-structuring of value relations and temporal shifts in the overall dynamic of accumulation.[19]

Harvey already draws a very useful picture that unpacks the structure behind the locational dynamics that organize geographic space under capitalism. Locations without natural advantages seek to compensate their inferior position through technological change, in other words, they seek to cancel out the natural advantage of other locations. In this way, a new form of homogenization tents to occur between competing activities. However, once these technological advancements are diffused through the integrated landscape, new incentives arise for relocation, or extension of the productive landscape through the search for, and integration of new locations. At the same time, in the process of establishing technological advantage, or associating dispersed areas in order to exploit their natural advantages, capital is embedded into specific geographical configurations that construct additional sets of asymmetries, which however become increasingly sclerotic as the process unfolds. This sclerotic nature of the emerging geographical configurations of fixed capital under capitalism, can be interpreted as a continuously modified landscape of possibilities. In what follows, I will try to show how these possibilities for further accumulation emerge in different ways in agglomeration landscapes and operational landscapes.

TERRITORIAL ORGANIZATION AS A SOURCE OF EXTERNALITIES

What complicates the picture even more, is the fact that locational advantages, these sets of possibilities for the production of surplus value, are not only connected with natural advantages and their modification through technological developments, and as a result, geographical organization is not simply an outcome of the interplay between first and second natures. In order to understand how these possibilities of the productive landscape emerge and perform as part of the process of capitalist development, I turn to what Erik Swyngedouw's investigation of 'territorial organization'.[20] Through this concept, Swyngedouw aims to investigate spatial configurations as active agents, as productive forces under capitalism. Conditions of 'territorial organization', emerge out of the spatial configurations of a series of elements that include:

'Natural goods', that could be here interpreted as natural resources that are not only inputs to the production process (as raw materials), but also inputs that are crucial to social reproduction, such as clean air, water, etc; what he broadly frames as 'collective goods', which include the elements of fixed capital that is again necessary for the production and circulation process, but also for the social reproduction, but also the characteristics of the labor force, not only demographic in terms of size, age etc but also in terms of their skills; the specific institutional and regulatory forms that guide and frame the interactions between all the elements of territorial organization; and

finally the characteristics of the specific capitalist units, from firms to individuals, which mostly refer to the cultural norms that shape their practices.[21] Different conditions of territorial organization can emerge out of different combinations of these elements in time and space, elements which cannot be considered independently. Following Lefebvre, Swyngedouw is particularly interested in revealing how these particular combinations can be interpreted as 'forces of production' under capitalism:

> The spatial arrangement of a city, a region, a nation, or a continent increases productive forces, just as do the equipment and machines in a factory or in a business, but at another level. One uses space just as one uses a machine...[22]

Swyngedouw is mostly concerned with identifying the social tensions that arise as these elements are continuously combined and recombined into different territorial organizations, and focuses in the arenas where these tensions mainly express themselves, the urban and regional scale. For the purposes of this project however, my intention is: first to see how this concept can be generalized in order to allow a reclassification of the various production landscapes; and second, how it can help assign a specific agency to the process of urbanization in relation to the construction of these various landscapes of possibilities. According to Swyngedouw, the way conditions of territorial organization turn space into a machine, has to do with the potential of exploiting particular 'externalities' out of certain configurations. Swyngedouw bases his conceptualization of externalities upon Perrin's definition, who in turn identifies externalities as:

> ...collective advantages [or disadvantages, I would add] which result from the economic combination and spatial convergence of diversified and complementary productive equipment, superior business and collective services and industrial and administrative structures which assure communication and concentration. This advantage derives from an organizational process which is different from that of the market. They (externalities) produce a structural and indivisible commodity which confers capacities upon a macro-economic ensemble which cannot be attained without them.[23]

These effects, are not planned, but rather an emergent property of any configuration that adds some sort of advantage to the activity that will be able to identify them but also exploit them. In a way, externalities are an untapped potential that conditions of territorial organization offer, and which can roughly translated as a form of locational advantage. Of course externalities are specific to different processes and as a result the same territorial organization can present different degrees of externalities to different operations that could 'harness' them in different ways. Swyngedouw highlights the city as a condition of territorial organization where numerous externalities emerge through mechanisms such as "agglomeration, scale, multiplier or infrastructure effects, but also through the combination of diversified activities, bundles of information centers, networks and flows, decisions centers, market organization and characteristics, etc", where eventually externalities determine the "relative competitive positions of the territorial organization vis-a-vis each other".[24]

The externalities that emerge out of conditions of territorial organization are almost always collectively produced by various social agents operating across the various elements that constitute territorial organization, and they are rather indivisible: If one of the elements is transformed, or ceases to be bundled with the rest, the whole externality disappears. In a very simple example, the mobility of the workforce in an urban environment that could be considered as an externality for the location of firms, could be the result of a combination of factors that could include the density of the urban fabric, the decision of local governments to invest in public transport, even the climatic conditions that would allow the extensive use of bicycles. The value of these processes that is hard to be calculated and thus be charged, through for example the real estate market, could be offered as a positive externality, a locational advantage to the process that will manage to identify and exploit it.

Two more elements need to be highlighted out of Swyngedouw's analysis: The first is the observation that, as the production of territorial organization is a collective process, while the appropriation of their externalities a private one, this tension becomes the basis for social struggle in the production of space. The second and most important for the purposes of this work, is that the production of territorial organizations could be considered as a continuous historical process, which proceeds through the re-combination of particular bundles of territorial effects. These effects are embedded into the landscape and are therefore, both space forming and space dependent. In short the operational and transformational capacity of each new territorial organization does not happen in vacuum, but is largely influenced by the previous forms of territorial organizations that where shaped to exploit the potentials of previous externalities, according to previous goals, which in turn where the result of past configurations and so on and so forth. As Swyngedouw notes, the relative fixity of territorial organization, (meaning not only the physical, infrastructural, and spatial allocation but also the institutional form, skill and qualification patterns of social entities), is necessarily rooted in space and history

and its use-value (and, hence, value) cannot be dissociated from this rootedness. Since every new configuration of territorial organization has to undo or restructure previous versions, this historical and geographical fixity creates certain restrictions in the reconfiguration of landscapes.

In this way, Swyngedouw's interpretation extends what Harvey highlights as the contradiction between fixity and motion, inherent in the process of capitalist development. Every territorial organization provides a set of opportunities in the form of externalities, which however are gradually exhausted. With this exhaustion capital's potential for the generation of surplus falls and as a result new territorial organizations have to be created. But this process is constrained through the sclerotic nature of previous territorial organizations, which under this framework can be interpreted not simply in relation to the rigidity of fixed capital, but to much more complex and potentially even more rigid socio-techno-natural bundles that plaster together the various social, institutional, infrastructural and natural elements.

GEOGRAPHICAL ORGANIZATION AND ECOLOGICAL ORGANIZATION

The concept of territorial organization largely focuses on the urban production of externalities that could be (in a simple way) interpreted as valuable factors, whose value is not accounted for and can thus be considered as 'free', in the same way the environment offers certain 'free gifts of nature'. An additional layer of analysis of this process of production and appropriation of 'free gifts of nature', is offered through the work of Jason Moore and his concept of the ecological surplus.[25] Moore's work is positioned within a growing body of literature that tries to offer a critical interpretation of the question of ecological production (as already presented in part 02), drawing from the early discussion on the modification of the biosphere by capitalism as introduced by Marx. Within this framework, ecological production and the production of nature in general, is considered to be an inseparable part of the development of capitalist value, and the associated crises of accumulation and the quest for their resolution.

Moore defines the concept of the ecological surplus through a thorough investigation and distinction between labor and work, both of which are mobilized in the process of capitalist production. For Moore capitalism does not only extract value out of the exploitation of paid work – wage labor, but also from unpaid work, work that is for example included in the process of the reproduction of the labor force (such as cooking or nurturing). What is interesting however, is that unpaid work is not restricted to human nature: It can also refer to processes of the natural environment. For example, the growth of a tree, or photosynthesis in general, but even the geological processes that produce minerals, the water cycle etc., are all elements that require some kind of 'work' to be performed, by plants, by the geosphere, by the atmosphere, work that when it becomes part of the production process remains unpaid:

> Work…signifies the historically-grounded forms of geo- and bio-physical activity as they 'bundle' with humanity's distinctive forms of sociality and embodied thought.[26]

The successful appropriation of this unpaid work, which can come either from the human, or from the extra-human domain, is what allows capitalism to develop upon the exploitation of what Moore frames as the four cheaps: Labor power, food, energy, raw materials. The exploitation of the combination of unpaid work from the human and non-human work in the production of these big four inputs, is what eventually keeps them cheap, cheap being of course relative to the fluctuations of the average value circulating in the form of commodities. Based on this definition, the ecological surplus is defined as the ratio between the actual capital investment in paid work (wage-labor), fixed capital and raw materials, and the unpaid work that is mobilized with it:

> When capitalists can set in motion small amounts of capital and appropriate large volumes of unpaid work, the costs of production fall and the rate of profit rises. In these situations, there is a high world-ecological surplus (or simply, "ecological surplus"). The ecological surplus is the ratio of the systemwide mass of capital to the systemwide contribution of unpaid work.[27]

For example, with the logging of a previously 'untouched' forest, minimal investment in labor and machinery can be considered to exploit high amounts of work that has been produced by nature in growing the forest. The same is the case with an untapped oil reservoir, etc. For Moore, every big wave of accumulation starts with such a high ratio of ecological surplus, which depends upon the maximized output generated by small inputs, not only of capital, but also of capitalist power. The latter can be territorial, as for example unpaid rights of mining a specific territory (as in the colonial era), or cultural which could be connected with advantageous for capital modes of social reproduction which are not 'charged'. This ratio however tends to fall as these relations become generalized and most importantly commodified:

> As reproduction becomes channeled through commodity relations, the share of unpaid work stagnates or declines. When this occurs, the expanded accumulation of capital becomes increasingly dependent on the commodified, rather than the

> uncommodified, reproduction of life, and the costs of accumulating capital rise. This dynamic is the tendency of the ecological surplus to fall.[28]

Again, reproduction here could refer both to the human domain (the costs of the reproduction of the work force, mobility costs, food etc), but also to the extra-human domain: The forest that was logged needs to be replanted somehow and this process (that was initially offered as a free gift from nature) would most likely require additional investment. With the percentage of unpaid work declining, or approaching zero, the ratio of ecological surplus falls. Following this framework, the whole question of sustainable development, a question that is often framed as one of the exhaustion of natural resources, could be framed as a question of exhaustion of capitalism's strategies to appropriate high ecological surplus. Of course, the exhaustion of resources and the closing of resource frontiers, are important issues in this framework. But they are issues raised not in absolute terms (there is x or y quantity available in x and y place), but in relational terms connected to the waves and crises of capitalist development. In fact, for Moore, capitalism's whole history could be explained as an effort to implement various strategies of appropriation of ecological surplus, which however cannot be repeated when exhausted:

> Capitalism's longue durée cheap nature strategy has aimed at appropriating the biological capacities and geological distributions of the earth in an effort to reduce the value composition of production, thereby checking the tendency towards a falling rate of profit… That process of getting extra-human natures—and humans too—to work for very low expenditures of money and energy is the history of capitalism's great commodity frontiers, and with it, of capitalism's long waves of accumulation.[29]

The question of the construction of hinterlands and operational landscapes can thus be framed in a way that connects it to the fluctuation of the 'four cheaps' in a dynamic way: The construction of hinterlands, can be interpreted as the expansion of operational landscapes in search for natural advantage, corresponding to an effort of maximization of the ecological surplus. The intensification of operational landscapes on the other hand, can be considered to belong to a subsequent phase where falling rates of ecological surplus require the intensification of capital investment, through commodified relations. In this way, while claiming prime agricultural land over new suitable areas, promises to exploit a high ecological surplus, the gradual exhaustion of the soil will start to require more and more investment in the landscape in the form of landwork, fertilizers etc. In the same way the exhaustion of groundwater reservoirs would require investment in irrigation systems for something that was previously offered as a free gift of nature. The construction of operational landcsapes can thus be conceptualized as operating through these two processes, of expansion and intensification. The unfolding of these two processes across the earth's surface will be the focus of the last part of the research, where I will discuss the construction of the Hinterglobe as the interplay between agglomeration landscapes and expansive and intensive operational landscapes.

In this chapter I tried to bring together a series of fundamental concepts that could be instrumentalized in order to interpret urbanization as a form of geographical organization. In what follows, I will try to summarize these dynamics before integrating them into my understanding of urbanization and the construction of its globalized hinterland. But first, a last layer of interpretation is required, one that connects more the quest for the production of surplus to the reproduction of the natural environment:

Geographical organization can be seen as the dialectical process through which spatial configurations are both agents and products in the pursuit for the production of excess profits and the circulation of the resulting surplus capital. This process operates through the 'harnessing' of particular forms of externalities that are connected to the production and reconfiguration of the various elements of territorial organization. The latter include which include elements of the natural environment; various forms of fixed capital that serve production, social reproduction and circulation as well as the nature and distribution of population; the associated institutional and regulatory frameworks; and the structure of capitalist units, like firms. Within this framework, the quest for the production of surplus value can be seen to operate through the interplay between locational and technological advantages that are connected to the territorial configuration of particular externalities. Locational advantages are highly connected to the existence of free gifts of nature and the potential for high ecological surplus and create the incentive to disadvantaged agents to tend to cancel them through technological innovation, a condition which with the diffusion of technological developments, create new pressures for relocation and pushes the ecological surplus ration to fall. These pressures could be translated either in the integration of completely new locations into the system, or to the exploitation of new externalities through the reconfiguration of existing forms of territorial organization. As development proceeds, this continuous reconfiguration is adding consecutive layers of fixed capital that enhance the sclerotic nature of geographical organization and make it increasingly inflexible to new reconfigurations that are more and more depended upon processes of creative destruction.

CHAPTER 07:
COMPOSITE GEOGRAPHIES OF URBANIZATION

DENSITY, CONCENTRATION, AGGLOMERATION

The biogeographical interdependencies of urbanization are associated with a multitude of production and consumption processes, which involve a multitude of geographical configurations. These configurations can be considered to emerge out of specific combinations of what Swyndedouw defined as elements of territorial organization: Elements of the natural environment, elements of physical equipment in the form of fixed capital, demographic factors, institutional frameworks and the characteristics of economic actors. Within this context, both the city, or broader the agglomeration, and the hinterland, or the broader productive landscape, can be characterized as geographical configurations with certain characteristics that make them attractive to, and the product of, the location of certain operations. But what is specific to the se particular landscapes?

In this chapter, I will try to deconstruct the specific geographical configurations that are normally conceived to correspond to as 'the city' and 'the hinterland' and reconstruct their essential qualities through the concepts of agglomeration landscapes and operational landscapes. I will base this analysis upon the different ways in which different configurations of the elements of territorial organization lead to different externalities, and examine how the are associated to different modes of activation through different operations. In the next chapter, I will try to investigate how they could be constructed not only conceptually, but also cartographically and present their distribution over the surface of the earth. Finally, in the remaining chapters I will try to unpack their dynamic interplay, through an attempt to construct a historical overview of the transition from hinterland to Hinterglobe.

In doing so, I build heavily upon the concept of 'concentrated' and 'extended' urbanization, developed by Brenner and Schmid within the paradigm of Planetary Urbanization, as an effort to construct an alternative conceptualization of the spatialities of urbanization that would be able to transcend the dichotomies of urban-rural, town-country and of course, city-hinterland:[30] For Brenner, these categories do not constitute opposing, or exclusive spatial units. Rather, they refer to mutually constructed dialectical processes connecting sociospatial configurations in densely inhabited and densely built areas of intense economic activity (concentrated urbanization), with sociospatial configurations in extensive landscapes of production, extraction, disposal and circulation that could include even very remote areas like deserts or the atmosphere and the oceans themselves (extended urbanization). As such, they offer a significant starting point, but certainly deserve some further elaboration.

Both the 'concentrated' urbanization and 'extended' urbanization categories suggest a certain geographical configuration that refers to density broadly conceived. The concept of density refers to a certain asymmetry in the distribution of phenomena, which allows for the observation of higher concentrations and lower concentrations. As a result, density can only be conceived in a relational manner, while differences in density can be very gradual, or very abrupt. A common and simple interpretation of the distinction between the city and its hinterland, is often based on the concept of density, either applied to the distribution of population, or to the distribution of built space in the form of structures and infrastructures. The lens of density however, can also be applied to the investigation of the hinterland, to landscapes that might not be densely populated or built up, but have for example high levels of primary production in the form of agricultural extraction, or minerals. Areas of high density of agricultural operations, or forestry, can thus be considered instances of relative concentration in the landscape, even if they occupy huge territories in relation to areas of settlement. In a similar way, resource extraction operations are concentrated in areas where the density of resources in the composition of the geological layers allows their meaningful extraction. The mining operations themselves can be very punctual (like most drilling operations), or very land extensive (like open pits), but in both cases they correspond to concentrations of mining activity. In sum, high concentrations of certain activities in certain areas (in relation to their concentrations elsewhere), are translated in high densities of these concentrations per area.

LANDSCAPES OF POSSIBLE EXTERNALITIES

Besides being directly connected to the notion of density, the notion of concentration is often connected to the concept of agglomeration, and the verb 'to agglomerate' is often used in a similar fashion to the verb 'to concentrate'. In fact, the two words are often used interchangeably as synonyms. In order to advance the concept of agglomeration landscapes and operational landscapes however, I will need to distinguish between the two. With the term agglomeration I will not just refer to spatial concentration, but rather to certain effects of concentration that are related to what in economic geography is known as 'agglomeration economies'. The concept of agglomeration economies, is a fundamental concept that allows to conceive the positive effects on economic operations that are derived from various forms of concentration and are considered to be 'external' to them.[31] They can be roughly distinguished in three categories:[32]

- A first category, which could be broadly defined as localization economies, refers to the advantages that are derived from the spatial clustering around a specific resource or facility (a certain natural resource, a transportation node etc).

- A second category, which could be broadly defined as industrialization economies, refers to the advantages that are derived from the clustering of several operations together, through which they can either exchange inputs and outputs, share the skills of specialized labor, benefit from the diffusion of information and spillover effects, etc.

- Finally, a third category, which could be broadly defined as urbanization economies, refers to the advantages derived from the combination of a multitude of conditions which normally characterize urban areas such as the high density of population (which means access to diverse and sizable labor as well as market pools), the sharing of infrastructures and associated the high degrees of accessibility etc. This last category is undoubtfully the most obscure one. I have already discussed certain elements of agglomeration economies in the discussion of the economic interpretation of urbanization, namely when discussing the approaches of Weber and Jacobs. What is important to revisit and add to this last category, is the generative capacity of urban environments for the production of technological innovation and economic development through the invention of new divisions of labor, unpredictable mobilizations of 'idle' work and spillover effects.

Returning to the framework of territorial organization that I have presented, all of the above conditions could be considered to emerge in the from of externalities out of particular configurations of the elements of territorial organization, which I have broadly generalized and reframed as elements of geographical organization. Based on these two notions, I will start unpacking the categories of agglomeration landscapes and operational landscapes. One of the main distinctions between what I define as agglomeration landscapes, and what I define as operational landscapes, is the fact that while the two first modes of concentration effects can occur in both, the latter characterizes only agglomeration landscapes.

Agglomeration landscapes are the geographical configurations through which several or all of the above externalities can emerge, but which are predominantly characterized by the presence of urbanization economies, or urbanization externalities. As a result, the operations that activate agglomeration landscapes are those that can benefit the most from these externalities. On the other hand, operational landscapes are the geographical configurations that are characterized by the presence mainly of localization economies, or localization externalities, and to a lesser degree of industrialization economies, or industrialization externalities. The operations that activate operational landscapes, are those that can benefit from these two categories, but are either unable, or do not need to cluster in areas where urbanization externalities emerge.

Although the complexity of the contemporary economy makes classifications of economic operations appear rather simplistic, one rough way to approach the types of operations related to each geographical configuration would be to follow the general division of labor and economic activity into three sectors. The first sector includes what we can call as extractive industries: These include the extraction if resources from the earth both in a non-reproducible manner (like mining), or in a reproducible manner (like agriculture or forestry). The second sector of the economy includes what we can broadly frame as manufacturing, the processing of raw materials and the production of material commodities. Finally the tertiary sector of the economy broadly includes services, retail, administration activities etc.

According to this framework, agglomeration landscapes are the primary locations for the operation of activities that belong to the secondary and tertiary sectors of the economy, while operational landscapes are mostly connected to operations that belong to the primary sector of the economy, but also operations from the secondary sector. It should be noted that, while indeed the sectoral model of economic functions (primary, secondary, tertiary) offers a reasonable entry point to grasp the specific functional basis of agglomeration landscapes and 'operational landscapes, it does not mean that economic operations taking place in one, or the other, are distinct: On the contrary, the dialectical relationship of both is the basis of their mutual transformation, since (under the contemporary capitalist production and circulation system) almost all economic functions activate several geographies, which cut across several agglomeration and operational landscapes. For example, the food industry includes not only areas of agricultural cultivation (operational landscapes), but also processing facilities and distribution centers that are often clustered in and around cities (agglomeration landscapes). In the same way, the construction industry (with a mainly urban locus) is dependent upon mining operations, which often source materials from very remote mining areas, mediated through heavy and often dedicated freight transportation systems.[33]

It is exactly this interplay between multiple geographical configurations that I will try to unpack in the next two chapters, after I present more in detail the characteristics of agglomeration operational landscapes, operational landscapes, but also the particular configurations that emerge out of their combinations, or the lack thereof: hybrid landscapes, which emere out of the combination of elements of both agglomeration landscapes and operational landscapes; and remote landscapes, that are characterized by the overall weak synergies of elements of geographical organization. A relation summary of these composite geographies of urbanization is offered in the table and diagram in figures XX. Having these two schemes as references, the four categories of composite geographies of urbanization are unpacked below:

AGGLOMERATION LANDSCAPES

Agglomeration landscapes are characterized by a relatively high density of population, which creates the potential for a sizable market, but also a diverse labor force, accompanied by a very fine grained division of labor. The overall landscape of agglomeration is characterized by a relatively high density and diversity of structures and infrastructures, which are however shared by a large population and facilitate an equally large set of operations. Thus agglomeration landscapes are characterized by a high ratio of equipment per area unit, but rather small ratio of equipment per capita, and by the fact that the majority of equipment is shared. The presence of a dense population, also increases the density of operations related to its reproduction. As a result, a large portion of the equipment of agglomeration landscapes aims to cover these needs in the form of housing, transportation systems, retail, educational facilities, public provisions like water energy etc. Only a relatively small portion of the fixed capital is thus directly connected to the production process. The relation of agglomeration landscapes with elements of natural geography, is again mostly connected to the process of social reproduction (water, clean air, parks, etc).

The combination of high density and diversity of population and physical equipment is the source of most of the externalities associated with agglomeration landscapes. These externalities however, are not only connected to the 'internal' configuration of these elements of geographical organization, but also through its composition as a much broader entity, connected to numerous other agglomeration landscapes and operational landscapes. As already discussed, the operations that are mostly relevant to the possible externalities of agglomeration landscapes, are those connected to the secondary and tertiary sectors of the economy, sectors which can benefit from the diversity and size of labor and market and from the potential for innovation and efficient allocation of resources that agglomeration landscapes promise.

Competition within agglomeration landscapes create also important disadvantages, which together with the negative externalities of high-density areas (congestion, population, rent) are important factors for the reconfiguration of their elements.[34] This reconfiguration however, has to deal with the sclerotic nature of the agglomeration landscapes. This rigidity should not only be considered as a factor of the high density of fixed capital, but most importantly as a factor of the high degree of interconnectivity of its various elements (for example the coupling of transport and energy infrastructures), but also of their overall social and spatial embeddedness.[35] The overall configuration of agglomeration landscapes is complicated even more through the addition of the multiple administrative and regulatory regimes that often overlap (the local, regional even national government etc), which have a dual effect in modifying the asymmetries of operational landscapes, by creating or restricting envelopes of possibilities. From an ecological perspective and following Jason Moore's framework, agglomeration landscapes can be considered as consumers of ecological surplus, which is produced by the operational landscapes, but also potential sources of exploitation of cheap labor.

Agglomeration landscapes can indeed be associated with the various forms agglomerations have been taking, from the city to the metropolis, the megalopolis, to zones of regional urbanization etc. The multitude of these terms, which reveals the increasing challenges in defining contemporary agglomerations, justifies the experimentation with this novel definition: Agglomeration landscapes are composite landscapes of possibilities for the emergence of particular forms of externalities (urbanization externalities), which emerge out of particular configurations of the various elements of geographical organization that construct them. They are in fact not characterized by specific physical configurations or forms, but from the specific envelope of possibilities physical forms and configurations might offer conceived as specific types of externalities. Again, the above relations are summarized in the table of figure 39 and the diagram of figure 40.

OPERATIONAL LANDSCAPES

In a similar way, operational landscapes can be conceived composite landscapes of possibilities for the emergence of externalities associated mainly with operations of production and circulation that characterize the primary sectors of the economy. In their highly specialized form they can be extremely monofunctional, as for example a vast landscape of monocultural cultivation, or an extensive oil, or mining field. Operational landscapes are characterized by a relatively low density of population. The low population density does not necessary have to do with the absolute size

of the labor force occupied in the specific operation, but is relative and has to do with the rather land extensive nature of the operation. Agricultural operations for example might still be labor intensive, but the overall land extensive nature shifts this ratio. The population of the operational landscapes can still be concentrated in dense areas of settlements, which do not necessary have to be hamlets, or agricultural villages, but can also be sizable dense settlements. However, these dense areas of inhabitation do not necessary showcase the characteristics of agglomeration landscapes, since they often do not have the thorough division of labor and high degree of economic diversity and connectivity that characterizes them. If their division of labor is rather limited to serving the basic needs for the reproduction of the concentrated population, and if they do not present the dynamism and sets of externalities that agglomeration landscapes do, they can be considered as zones of concentration within the operational landscapes. For example, a mining town that does not present the possibilities for the emergence of agglomeration economies, is not an agglomeration landscape, but a zone of population concentration within the mining operational landscape. On the other hand, operational landscapes can also be completely uninhabited, such as a dam, or a wind, or solar park (which just requires periodic monitoring and maintenance), or even an operational landscape of circulation (like a highway or port).

For the same reason, the majority of the equipment of operational landscapes could be considered to be directly connected to the production process, with only a small portion being associated with the social reproduction of the workforce. As a result, the infrastructural basis of operational landscapes is rather monofunctional and not particular versatile. The movable and immovable equipment associated with the production process, is often dedicated to the specific process (like for example an irrigation system) and cannot be shared or used in a more generic way. Even transport infrastructures that can serve the mobility of the population, are also often geared towards the accommodation of freight. Operational landscapes are overall characterized by the low ratio of equipment per area unit, high ratio of equipment

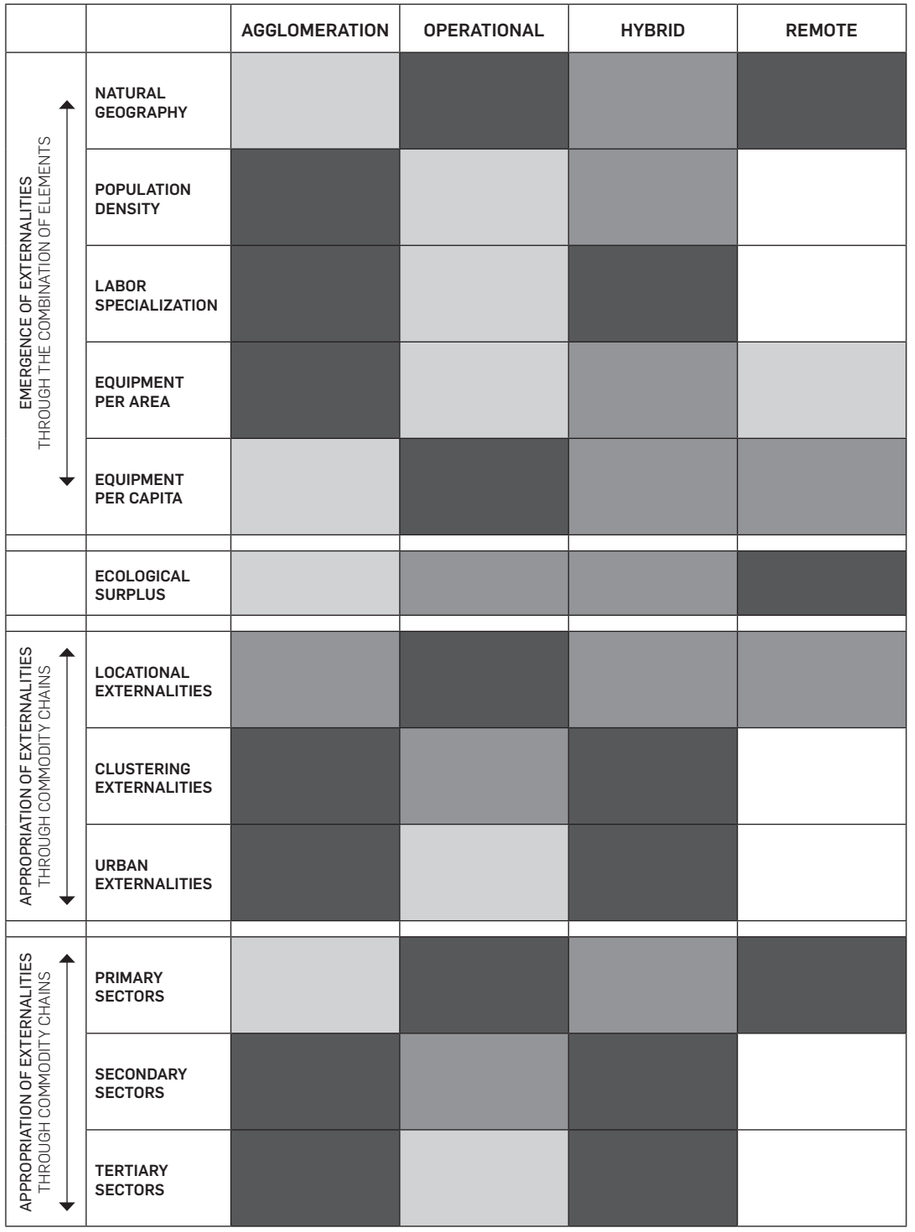


FIGURE 39 (OPPOSITE PAGE): RELATIONAL MATRIX OF THE COMPOSITE GEOGRAPHIES OF URBANIZATION.
Agglomeration, operational, hybrid and remote landscapes are landscapes of possible externalities that emerge out of the combination of elements of geographical organization and appropriated through the assembly of commodity chains that operate across all sectors of the economy. The diagram shows the relations between the different elements and the directions of associations. Darker colors correspond to higher intensity and lighter colors to lower intensity.

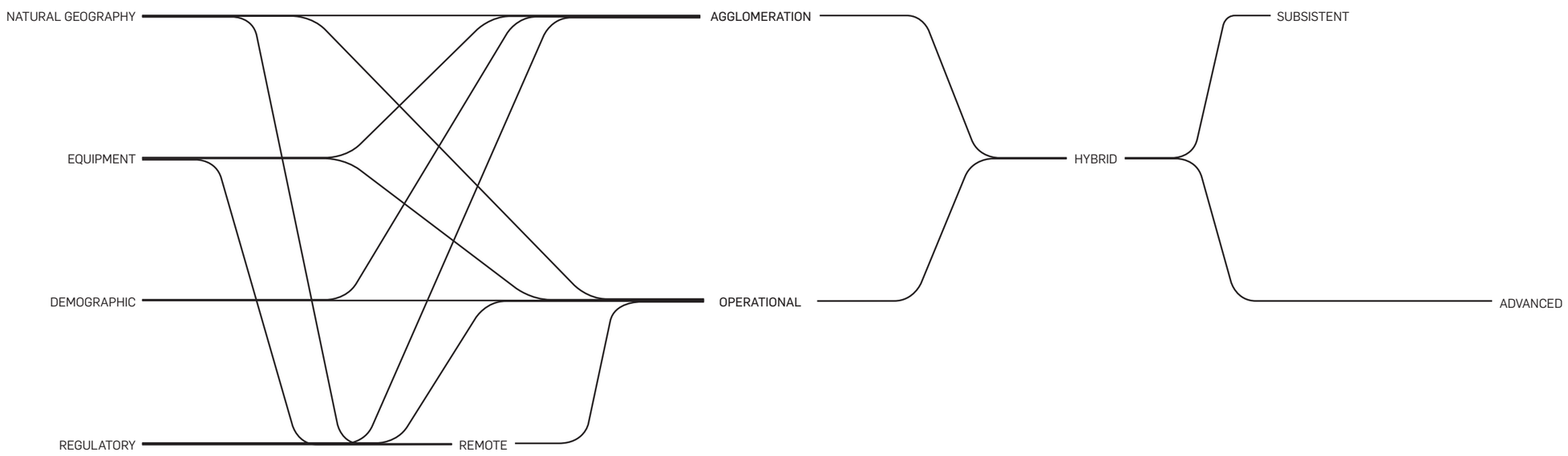


FIGURE 40: RELATIONAL DIAGRAM OF THE COMPOSITE GEOGRAPHIES OF URBANIZATION.

per capita and by its low versatility. Even in the case of more punctual operations, like for example mining, the areal density of equipment is rather low in comparison to agglomeration landscapes (compare for example the indeed vast system of mining tunnels, or drilling machines with the multitude of stacked structures and infrastructures that often cover every square meter of agglomeration landscapes).

What mostly defines the operational landscapes however, is their relation to the elements of natural geography. Since the operational landscapes host operations of the primary sector of the economy, which are directly connected to the land, the externalities that characterize them are locational externalities that are initially connected to some sort of natural advantage. In relation to agglomeration landscapes, where externalities emerge as the product of coordination of complex configurations, the locational advantages of operational landscapes are initially rather simple to identify, and often inscribed into physical geography in the form of concentrations of natural resources, soil fertility, climatic conditions, etc. These externalities, at least in their initial phase, are thus site specific and immovable. The very site specific nature of primary production, can be seen as a restriction to the closer spatial association, or the emergence of the conditions that characterize agglomeration landscapes. As Bunker notes:

> Far more than modern industrial economies, extractive and agricultural economies are fixed in geographical space. Natural resources can only be extracted where they occur, and agriculture depends on soil fertility, climate, and relatively large proportions of surface space. The fixity of resources in space often isolates extractive enterprise from other enterprises and from the locational advantages that create urban agglomerations and their economies of shared infrastructure, labor pools, and potential for political organization and mobilization. The rigidity of resource location determines transport requirements, and transport costs often constitute a much higher proportion of extractive investment than of transformative investment. Topography may become a major factor in determining transport routes and technologies and their social, demographic, and economic effects. Chance and nature, and not human agency, determine whether there are alternative commodities with which to adjust to changing markets.[36]

Operational landscapes then are not so much 'indifferent' to the externalities of agglomerations, but rather incapable of developing them, while at the same maintaining their own externalities intact. However, the asymmetries of the natural environment cannot constitute externalities in isolation, but only as they get integrated into the broader system of organization of operational landscapes, connected with transport infrastructures, storage areas and often processing facilities. The latter, areas of storage and processing, add a second layer of operations to the extractive operations of operational landscapes that has to do with manufacturing processes that are often directly connected with the primary resources extracted. Nevertheless, these processing operations, open up the possibility for a second set of externalities, of the industrial sort, related to the benefits, emerging out of the clustering of manufacturing processes next to each other. The nexus of this primary and secondary economic operations is often dependent upon the biophysical characteristics of the material extracted, its weight, perishability etc, and as Bunker highlights, with the relative transport costs.

The aforementioned issues, justify a considerable rigidity that characterizes operational landscapes, which although appearing 'softer' than agglomeration landscapes (in terms of the density of equipment placed), introduces a rather more literal and physical fixity. Their sclerotic nature is a combined outcome of the specificities of natural advantages, and their large scale, immobile but above all monofunctional equipment, while social and institutional questions are not so important factors, as in the complex configurations of agglomeration landscapes. On the other hand, while the institutional and regulatory frameworks that govern them are much simpler and less numerous than in the case of the overlapping frameworks of operational landscapes, they are much more direct in their agency in forming landscapes of possibilities.

In general, operational landscapes are characterized by the lack of presence of urban externalities, either if they seem to share similar elements of configuration with agglomeration landscapes. An additional lens through which operational landscapes could be interpreted, is Jane Jacobs' differentiation between 'cities' and 'cities own regions' on the one hand, and their 'supply' and 'transplant' regions on the other hand: According to this framework, agglomeration landscapes correspond to the former, while operational landscapes largely correspond to the latter, to areas where agglomeration externalities are very limited. Jacobs recognizes that, although large settlements with high population densities may exist in supply and transplant regions, they are not considered 'cities' if they lack the generative effects that characterize 'true' cities. I approach in the same way the presence of large settlements, or even industrial and infrastructural clusters, within operational landscapes. I have already tried to clarify the question of settlements, but we can also consider that industrial or infrastructural clusters, even if they do not connect with a productive operation of the

primary economic sectors and are just transplanted from agglomeration landscapes (without being dynamic part of their synergies), are part of operational landscapes, and in fact can be regarded as zones of concentration within operational landscapes.

In sum, operational landscapes are characterized by a more 'machinic' behavior, one that is linearly connected with the efficiency of a specific set of operations. Following Jacobs' framework, it could be argued that operational landscapes are machines, while agglomeration landscapes are engines. Both however are important elements of the contemporary production system as organized under capitalist urbanization processes. Finally from an ecological perspective and following Jason Moore's framework, operational landscapes can be considered as high producers of ecological surplus, both produced by the natural environment, but also potentially through the exploitation of cheap labor. Again, the above relations are summarized in the synthetic table of figure 39 and the diagram of figure 40.

HYBRID LANDSCAPES

Although I have presented agglomeration landscapes and operational landscapes as two distinct conditions, they are both connected to particular geographical configurations – combinations of elements of geographical organization – which mostly exist as parts of continuous gradients. The asymmetries of these gradients and their synergies are those that create a set of possibilities for the particular externalities that are associated with agglomeration landscapes and operational landscapes. As a result what mostly characterizes them is the envelope of possibilities they present for the emergence of these particular externalities, and not the configurations themselves. Having said that, it could be argued that agglomeration landscapes and operational landscapes represent two 'extremes', two pure conditions which are not necessarily the only ones that can be found, or even more the ones that dominate the organization of geographic space. Returning to Jean Gottmann, they can be conceived as a pure expression of what he described as the emerging distinction between two types of regions, urbanized regions and specialized primary production regions:

> The long-accepted opposition between town and country has therefore evolved toward a new opposition between urban regions, of which Megalopolis is certainly the most obvious and advanced case, and agricultural regions, the largest and most typical of which is found in the grain-growing Great Plains.[37]

Gottmann's Megalopolis corresponds to a rather pure case of an agglomeration landscape, while the grain growing Great Plains, correspond to a pure case of operational landscapes, agricultural operational landscapes in particular. But in fact, the configurations that characterize agglomeration landscapes and operational landscapes are not always found in their pure forms. On the contrary, they are often blended together, which means that their envelopes of opportunities are also overlaid: These composite geographies of urbanization, which combine elements of both agglomeration landscapes and operational landscapes, and allow for their different externalities to emerge, could be characterized as hybrid landscapes.

Hybrid landscapes are landscapes where all three types of externalities emerge in a significant degree and are configured by the dense presence of operations that could belong to all three sectors of the economy. Thus hybrid landscapes can maintain an important base of primary productivity, combined with clusters of manufacturing, but also services that are connected to the presence of a dense and diverse population and a thorough division of labor. Hybrid landscapes have become a particularly characteristic condition of contemporary urbanization, as urban externalities are starting to be found over larger and larger areas around dense urban cores, through synergies associated with the densification of transport and communication infrastructures. In a simplistic way, which however does not grasp the complexity of the condition, hybrid landscapes can be considered as landscapes that are becoming densified in terms of infrastructural equipment, population density and diversity, without however losing their primary production basis. In other words, the generalization of the conditions that are necessary for the emergence of clustering and urban externalities (connected to secondary and tertiary economic sectors), does not cancel out the capacity of these landscapes to remain also attractive to operations of the primary economic sectors (agriculture, forestry, resource extraction).

It is important to note that this definition of hybridity is quite sensitive to the question of scale: It could be assumed that at a larger scale of analysis most geographies will appear as a hybrid mosaic of agglomeration landscapes and operational landscapes. For example, a region could be considered to consist of a set of agglomeration landscapes (settlements or agglomeration zones of various forms), and operational landscapes (various landscapes of primary production) which in their particular configurations could be recognized as different composites according to the different possible externalities they present. As a whole however, and here is how the question of scale becomes central, the region could be considered to be a hybrid landscape, combining both elements of agglomeration landscapes and operational landscapes. In fact, the whole planet could be conceived as one, assuming that the synergies of agglomeration landscapes become generalized.

This fundamental point can only be unpacked through the dynamic reconfiguration of the elements or geographical organization. This task will be the focus of the last chapter. For now I present the following hypothesis: Hybrid landscapes characterize both historical and contemporary phases of development. In their earlier, but still persistent 'subsistent' form, the synergies of agglomeration are characterized by a high fragmentation. In their more recent, 'advanced' form, the synergies of agglomeration are presented over larger and larger territories in more integrated ways. In a way, the condition of hybridization does not cancel agglomeration landscapes and operational landscapes. It just generalizes the potential for the presence of the agglomeration externalities over the operational landscapes. As I will claim in the final part of this work, complete urbanization can be interpreted as the generalization of this hybrid condition at the global scale, which however can only happen through the increased specialization of both agglomeration and operational landscapes. Again, the above relations are summarized in the table of figure 39 and the diagram of figure 40.

REMOTE LANDSCAPES

Finally, the last category of composite geographies of urbanization is characterized by a general absence of operationalization revealing a weak presence of active conditions of possible externalities. These 'remote' landscapes, are very thinly populated, or even uninhabited areas, with minimal or non-existent infrastructural equipment and weak presence of economic activities overall. Although this might make them appear unimportant, their role in the process of geographical organization is crucial, since they correspond to an untapped landscape of possibilities. As a result, the existence of remote landscapes, carries with it the potential for achieving locational advantage through expansion, regulating in a way the composition of the majority of operational landscapes. This potential lies almost completely within the composition of the layers of natural geography, and requires an initial investment in the equipment of the ground in order to be exploited. In a way, they are potential operational landscapes, in the process or the very initial stages of becoming. They are charted, coded, and internalized to the global system of operations for their capacities, but are not a material part of the production and circulation process. As a result, remote landscapes present the promise for a very high ratio of ecological surplus. Again, the above relations are summarized in the synthetic table of figure 39 and the diagram of figure 40. I will return to this relation of possible expansion in the last chapter when discussing the limits of the Hinterglobe. But first, in the next chapter, I will attempt to chart the elements that compose agglomeration landscapes, operational landscapes, hybrid and remote landscapes and trace their distribution over the earth's surface.

CHAPTER 08:
COMPOSITE CARTOGRAPHIES OF URBANIZATION

CHARTING THE COMPOSITE GEOGRAPHIES OF URBANIZATION

In the previous chapters, I have built upon the approaches of Harvey, Smith, Swyngedouw and Moore, in order to offer a dialectical interpretation of how the several socio-techno-natural elements of geographical organization are being co-produced under consecutive ways of capitalist development. Within this context, geographical configurations are mostly considered as 'dynamic moments' in the process of capitalist production.[38] As a result, although helpful in many respects, these approaches have been very reluctant in engaging with questions regarding the definition of spatial categories, or typologies, and the articulation through cartographic exploration of these geographical configurations, as these would be inherently incapable of grasping the dynamic nature of underlying processes.

Geographical configurations, or forms of territorial organization, are indeed recognized as important factors in the process of capitalist production, but while their elements and the way the come together are unpacked, there seems to be a gap in understanding how these specific configurations are crystallized into spatial typologies, and moreover, how these could be conceptualized beyond the established ones, especially the city, the region, or even the Ecumene. In short, while there has been tremendous progress in theorizing and conceptualizing the dynamics of processes behind the construction of geographical configurations, the nature of the later in terms of their physical attributes, spatial performance, composition and distribution, has not been thoroughly investigated in a systematic way, let alone charted, mapped and visualized. It is the purpose of this chapter to try and add this missing dimension from these very powerful explanations of the processes of geographical organization.

In order to frame the dynamics of this condition, I will embark upon a cartographic exploration, in which with the help of geospatial analysis, I will try to offer an alternative approach to defining the spatial categories of urbanization. In what follows I will attempt to construct a series of composite gradients, in order to start sketching the interplay of elements that could allow the definition of the certain configurations through which agglomeration landscapes, operational landscapes, hybrid landscapes and remote landscapes emerge. It should be noted that this is not a process of defining the actual landscapes themselves, but rather the distribution and combination of the elements that might potentially reveal their presence. I will start by exploring the composition of elements of population density and land use, with elements of the natural environment,

and then with each other. This exploration does not aspire to offer an explanation, but the descriptive and cartographic basis of an explanation that I will attempt in the last chapter.

GENERALIZING THE VALLEY SECTION

In a way, this effort borrows conceptual elements from Patrick Geddes' famous model of the valley section, first published in 1909. In this model Geddes attempted to associate in an abstract way elements of the natural environment, with modes of human occupation and the organization of settlement patters. Geddes introduced the imaginary description of the Valley section as follows (figure 41):

> Beneath vast hunting desolations lie the pastoral hillsides, below these again scattered arable crofts and sparsely dotted hamlets lead us to the small upland village of the main glen: from this again one descends to the large and prosperous village of the foothills and its railway terminus, where lowland and highland meet. East or west, each mountain valley has its analogous terminal and initial village, upon its fertile fan-shaped slope, and with its corresponding minor market; while, central to the broad agricultural strath with its slow meandering river, stands the prosperous market town, the road and railway junction upon which all the various glen-villages converge. A day's march further down, and at the convergence of several such valleys, stands the larger country-town. . . . Finally, at the mouth of its estuary, rises the smoke of a great manufacturing city, a central world-market in its way. Such a river system is, as geographer after geographer has pointed out, the essential unit for the student of cities and civilisations.[39]

Not unlike Von Thünen's model, Geddes model describes the geographical organization of a complete region, where a hierarchy of settlements is organically interwoven with various elements of the productive landscape, which all find their position in very specific geographic configurations across a river valley. The Valley section also corresponds to a very specific division of labor, where specific occupations are associated with specific parts of the geography of the valley: The highlands are sparsely populated and support hunting, grazing and mining operations (all part of the primary sector of the economy), products of which are traded through an intermediate town, which connects highlands and lowlands; further down the lowlands, agriculture is associated with larger and more densely distributed settlements, also connected with road and rail infrastructure; the epicenter of these agricultural landscapes and settlements is an even larger town, which serves as a larger trade center, this time for agricultural products, and facilitates the connection to the great manufacturing city; the latter lies at the mouth of the estuary and signals the end of the valley section, which unfolds from the 'mountain to the sea', connecting it to the circuits of interregional trade. The organic and hierarchical structure of the region resembles Grass' interpretation of the economic relationship of the city to its region as a spider web: The industrial city at the end of the valley is the hub that connects the region to the 'outside world', and at the same time this hub is supported by the hierarchical connection to its hinterland, which is transformed gradually as it moves up the mountain.

In what follows I will try to reconstruct partially Geddes model. The main question that I will try to explore is the association of different conditions of human occupance to a selection of foundational elements of the natural environment. In fact, as I will show, Geddes associations of certain modes of human occupation to certain geographic regimes, are not completely unrealistic. What is however highly problematic, as I have also stretched before, is the conception of these associations as part of a regional unity, as part of a continuous closed hinterland that is connected hierarchically to a central settlement. I claim that, although the association between land use patterns and population concentrations to geographical asymmetries are rather persistent and quite particular, the associations with each other are much more complex, something which presents the main element that characterizes the interpretation of the global hinterland. This investigation will also set the main framework for investigating the question of geographical determinism in a contemporary perspective. In reconstructing in a contemporary way an abstract version of the global valley section, I will examine the relationship between population distribution and land use patterns with elevation and distance from the coast.

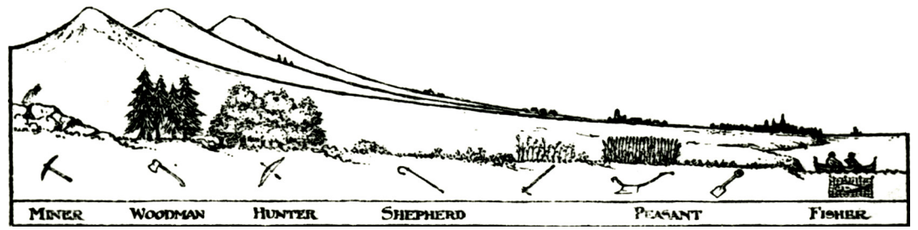


FIGURE 41: PATRICK GEDDES' VALLEY SECTION.

Before embarking upon this geostatistical investigation, it is important to observe a series of basic geometric and topographic properties of the structure of continents. The diagram in figure 42, shows how the total land area of the planet (not only used, or inhabited land area), is distributed in relation to the changing distance from the closest coastline, and to average elevation. Around 60% of all land area of the world lies within 500km distance from the closest coastline, with more than 15% lying within a 100km distance (more than 20 million km^2), a distribution which is easily justified by the surface properties associated with the length of the perimeter of continents. At the same time, y of the land area is found in altitudes of less than 500m, which following a rather expected section, increase variably with the distance from the coast. These observations are important in order to position in their correct dimensions the striking asymmetries in the distribution of population, land use and infrastructure, which appear to be significantly correlated to certain zones of these generic topographic features:

One of the most important characteristics of the global distribution of population is that its vast majority resides close to the world's oceans and water basins. Around 40% of the world population is compacted within a zone of 100km from the coast, an area that corresponds to 20% of the overall land surface, with densities being on average more than double in relation to all other land zones. The geostatistical section in figure 43 aims to represent this asymmetry in the distribution of world population, both in terms of absolute numbers, but most importantly in terms of density. It should indeed be expected that the majority of population would be located around the coastlines, since as already discussed, this is where the majority of the land is located. What is more striking to observe however, is that these coastal areas is where the population is found in its densest configurations, and as such potentially dominated by the emergence of agglomeration landscapes. The density of built up areas also follows the distribution of these population and land use distributions, as shown in the geostatistical section of figure 44. Again, what is important to observe here is not so much the absolute area occupied by artificially constructed surfaces, but rather that is density closest to the coast is more than double in relation to mainland areas.

A more complex image is starting to appear by observing the distribution of productive landscapes in relation to the changing distance from coast. The geostatistical sections in figures 45 and 46, show that, in absolute numbers, almost 20% of all agricultural, and grazing landscapes lie within a 100km zone from the coast, and almost 50% within a zone of 500km. However, looking at the distribution of their densities, a very

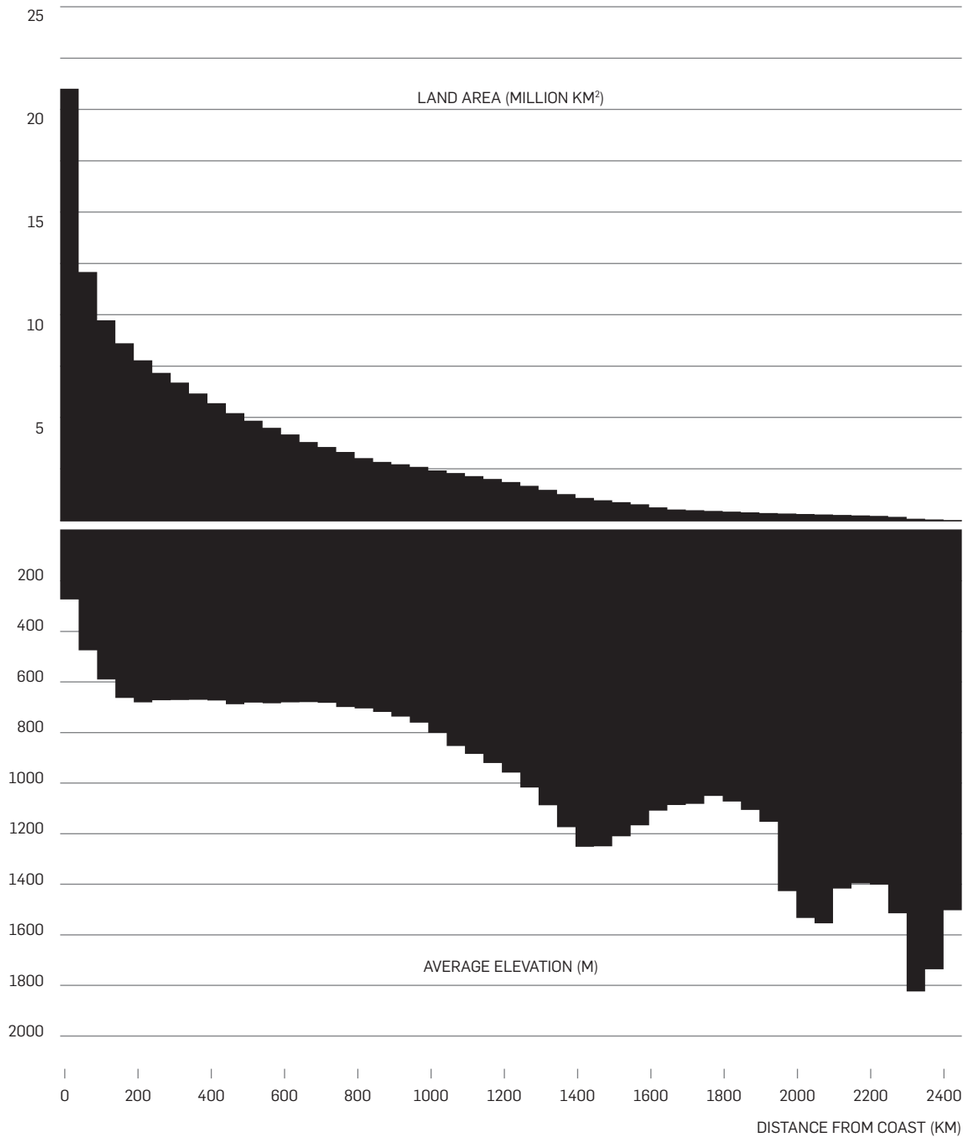


FIGURE 42: TOTAL LAND AREA AND AVERAGE ALTITUDE IN RELATION TO DISTANCE FROM COAST.

different image is drawn: Cropland areas are found in their highest densities within a zone of 500-1500km from the coast, while the land that is predominantly used for grazing lies even further away, after 1500km. These distributions suggest very particular patterns of human occupation, which could offer useful 'pointers' towards an understanding of the geographical organization of world urbanization. However, at this point, they should only be interpreted as useful observations, and not as part of an explanatory framework that aims to explain the patterns of human occupation through persistent elements of natural geography. These elements are just one ingredient in the overall assembly that composes the potential externalities of agglomeration landscapes, operational landscapes, hybrid and remote landscapes.

Within this context, a second set of useful observations can be extracted through the relation of elements of human occupation with a second major geographical element: elevation. According to the geostatistical sections in figure 47, more than 40% of the world's population is concentrated within a vertical zone of 0-100 meters, which corresponds to just 15% of the total land area, while another 35% of the population is settled within a zone of 100-500 meters above sea level. The distribution of built-up areas is not that different, with more than 80% of the artificially constructed surfaces being concentrated between 0 and 500 meters above sea level. This patterns largely replicate the image that was drawn by figures 43 d 44, adding a complementary dimension that could be also connected back to the overall geostatistical section of figure 42. The world's population and constructed surfaces are compacted in asymmetrically high densities within very particular zones found in elevations no more than 500m and close to the major water basins

Similarly to the geostatistical sections in figures 45 and 46, the patterns of productive landscapes suggests a rather different distribution: According to figure 48, only 22% of cropland and 10% of grazing areas lies within the first elevation zone of 0-100 meters. Almost 50% of cropland is concentrated in altitudes between 100 and 500 meters and only 25% in altitudes more than 500 meters, something which is somehow reversed for grazing areas with almost 60% concentrated in altitudes of 500 meters or more. These are all reasonable and rather expected observations. Both croplands and pastures are quite land extensive and no matter how favorable areas in lower altitudes could be, they still offer a small amount of surface area, no more than 15% of the lands surface. On the contrary, more than 40% of the land surface is found between 100 and 500 meters while higher altitudes provide longer grazing periods for pasture. Moreover, in lower altitudes, productive landscapes have to compete over space with the immense concentrations of populations and built-up areas.

Operational landscapes of production however, are not the only ones that are quite sensitive to topographic and climatic asymmetries. An additional layer of interpretation of the relation between human occupation is offered by examining the distribution of surface transportation networks with topographic features. The geostatistical sections in figure 49, show the relative distributions of the major road and rail networks according to various elevation zones. Ground transportation networks are of course denser where population is, but especially rail networks, are quite sensitive to the variations of terrain: Almost 85% of railway tracks lie below the altitude of 1000 meters with 60% of them below 500 meters. Road networks are on the contrary more adaptable to terrain and can reach higher altitudes.

In this effort to reconstruct in an abstract way Geddes' model, I have sketched some broad associations between elements of natural geography and the distributions of population, land use patterns and infrastructural systems. These associations reveal certain correlations that allow for an initial impression of the way human occupation is very much connected with, and not independent of the asymmetries of the earth's surface. As urbanization becomes a generalized phenomenon of planetary dimensions, incorporating more and more operational landscapes into the web of interdependency that unfolds around expanding agglomeration landscapes, its organizational principles become increasingly interwoven with, and not independent from, the climatic, topographic, geologic, hydrologic and resource asymmetries of the earth. These elements can no longer be considered as distinct attributes of an external natural geography, as they are now being internalized into the extensive, complex and thickening urbanization fabric that extends beyond dense agglomerations to include the operational landscapes that sustain them and make them possible. It is the increasingly hybrid and sclerotic nature of the urbanization fabric – both natural and socio-technical – that defines the geographical organization of world urbanization.

Of course, additional layers could be added to this initial geographic interpretation. For example one of the most important questions is related to the distribution of mineral resources, which I have not questioned in this exploration, or to the observation of the distribution of productive landscapes in relation to composite indicators of suitability, lime for example indicators calculated through the combination of various factors like soil, aridity, climate etc. In addition, what could be even more interesting would be to frame these questions in a dynamic way as part of historical processes. I will return to this important issue in the last chapter of this work, when I will discuss the construction of the Hinterglobe in a historical perspective.

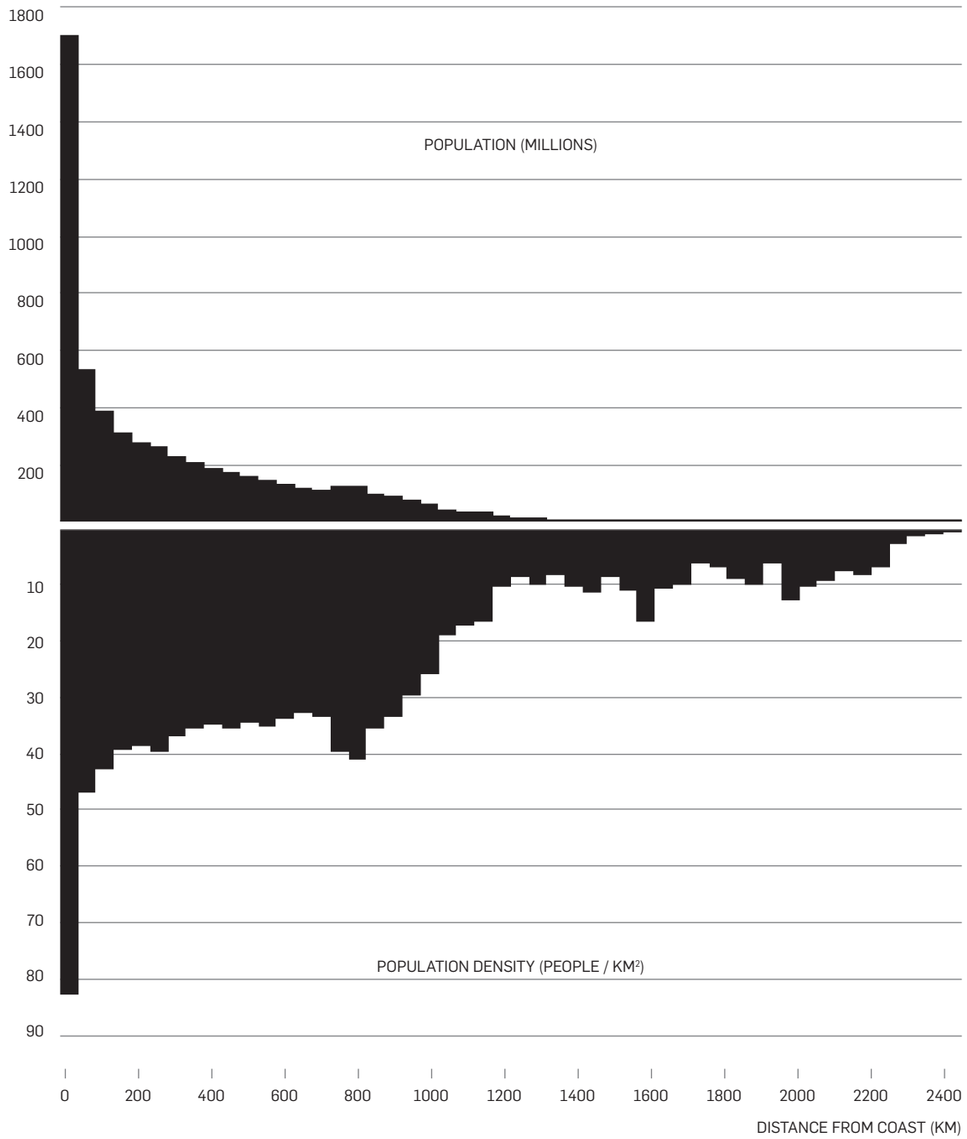


FIGURE 43: TOTAL POPULATION AND POPULATION DENSITY IN RELATION TO DISTANCE FROM COAST.

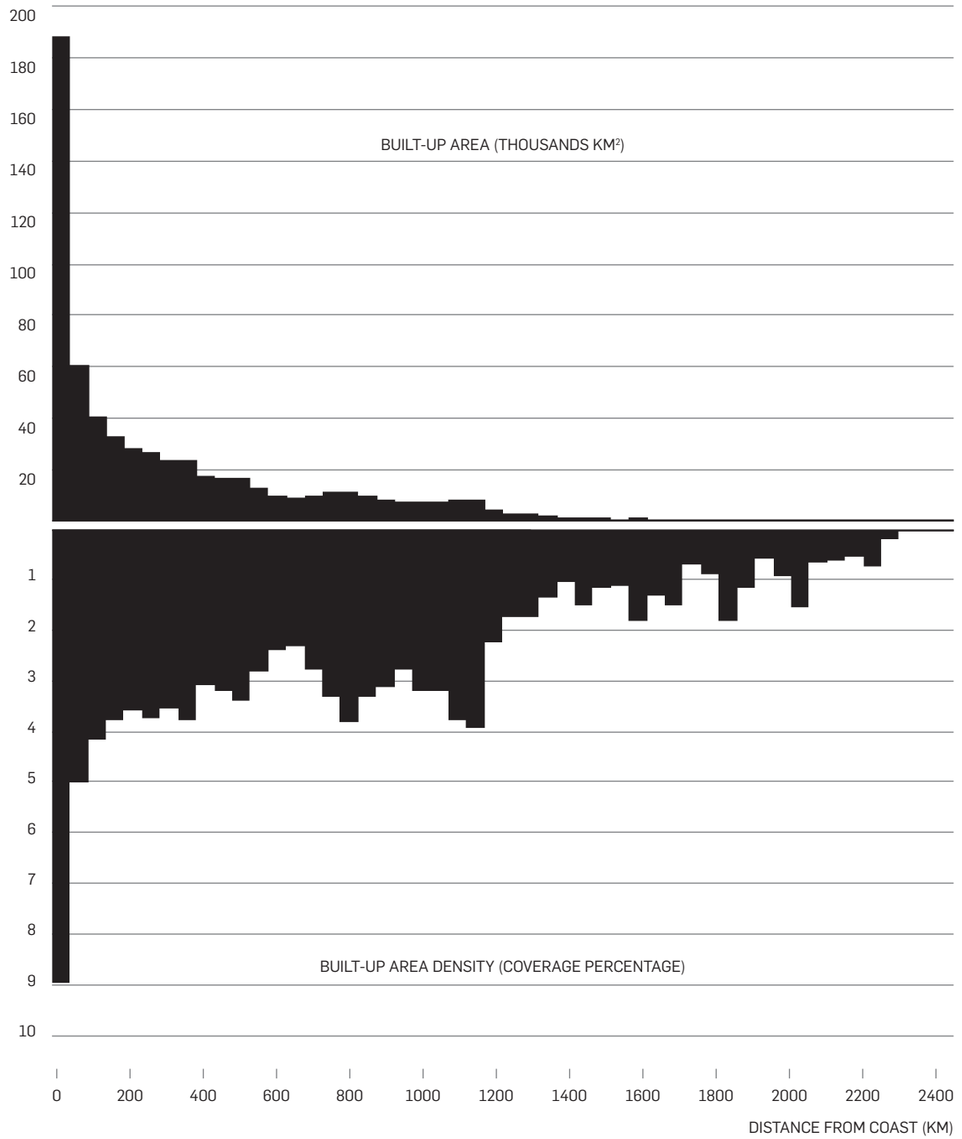


FIGURE 44: TOTAL BUILT-UP AREA AND BUILT-UP AREA DENSITY IN RELATION TO DISTANCE FROM COAST.

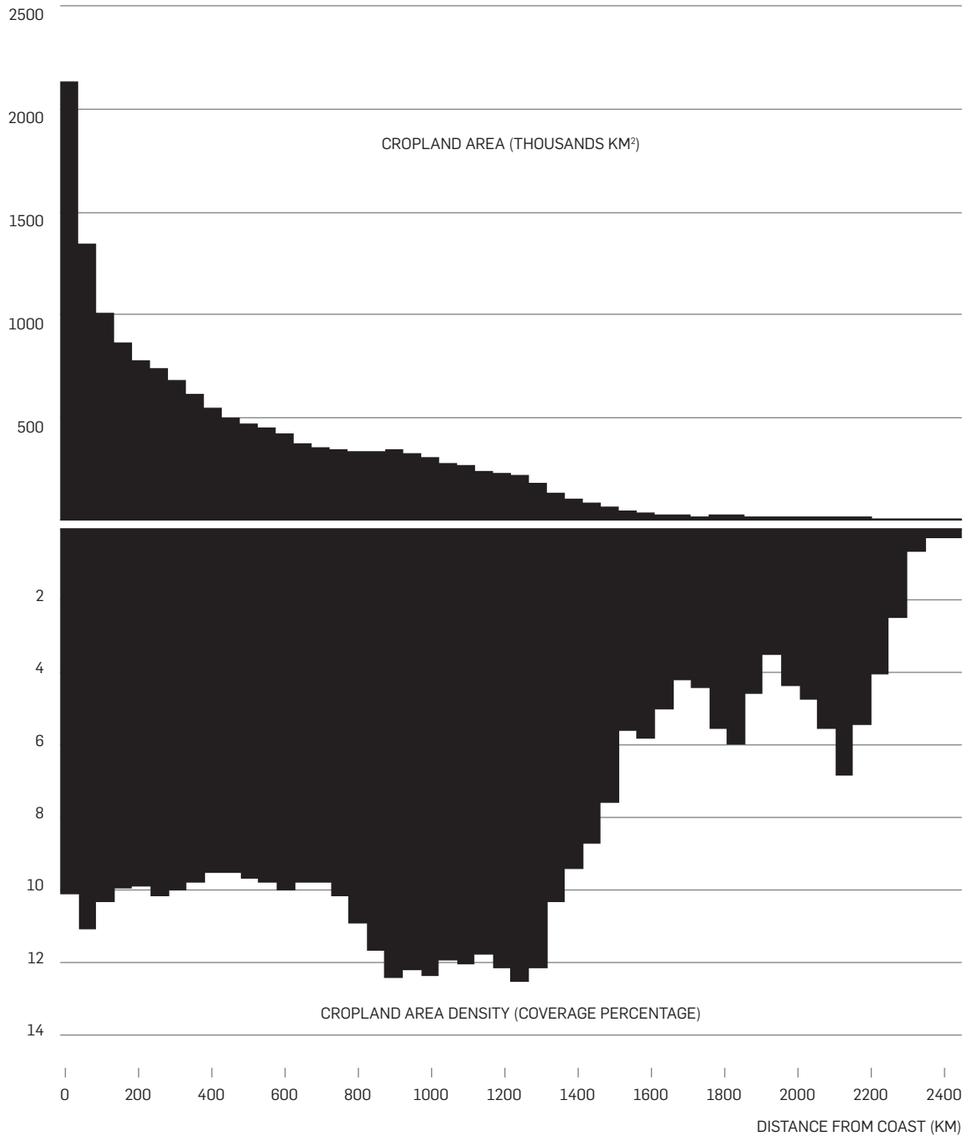


FIGURE 45: TOTAL CROPLAND AREA AND CROPLAND AREA DENSITY IN RELATION TO DISTANCE FROM COAST.

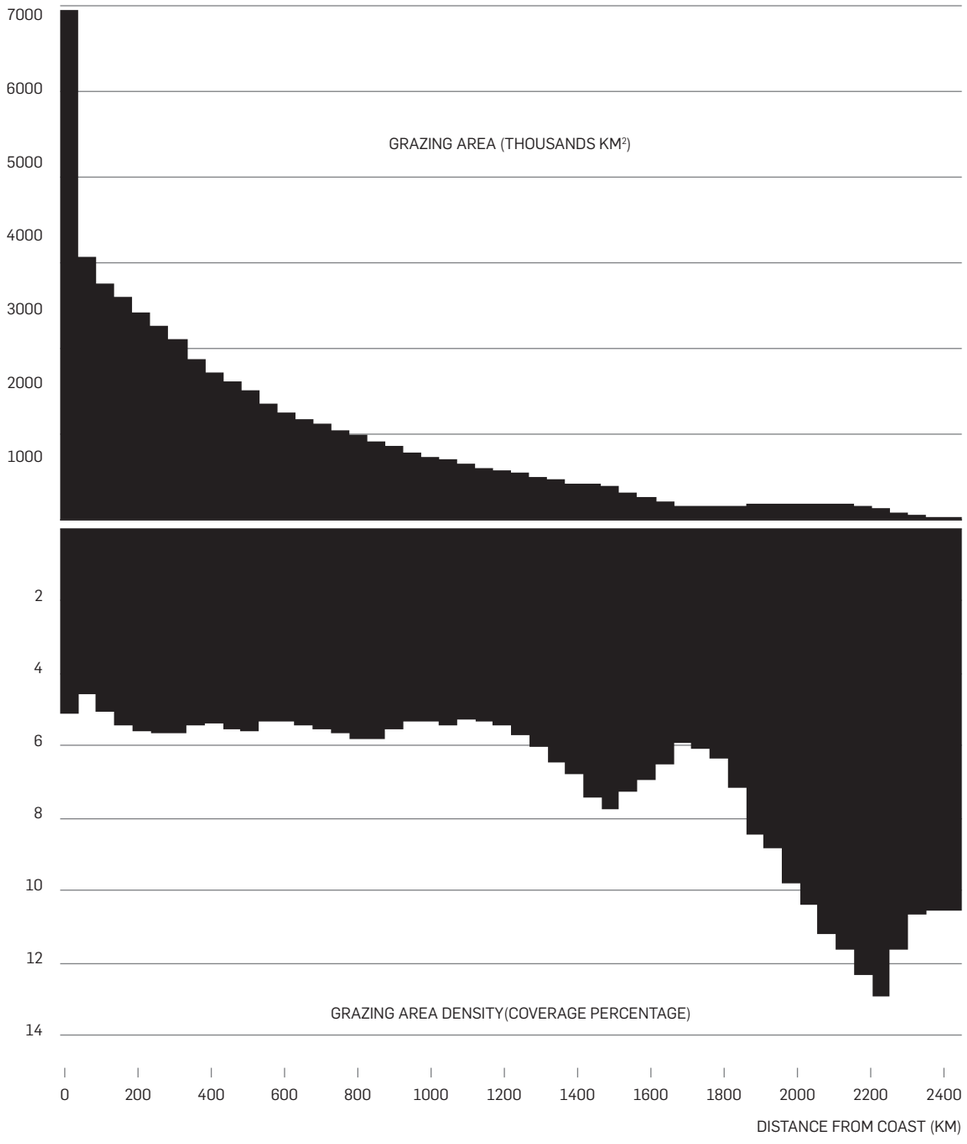


FIGURE 46: TOTAL GRAZING AREA AND GRAZING AREA DENSITY IN RELATION TO DISTANCE FROM COAST.

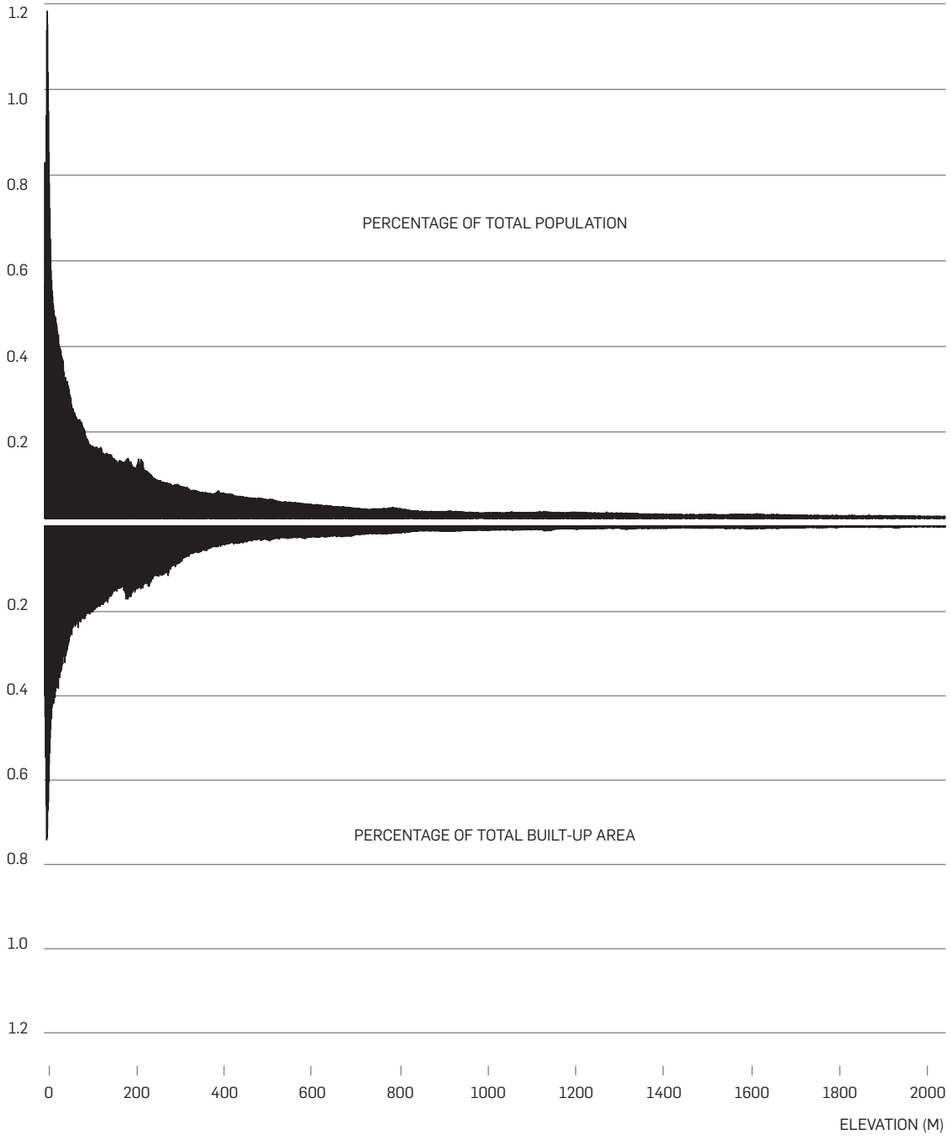


FIGURE 47: PERCENTAGE OF TOTAL POPULATION AND TOTAL BUILT AREA IN RELATION TO ELEVATION.

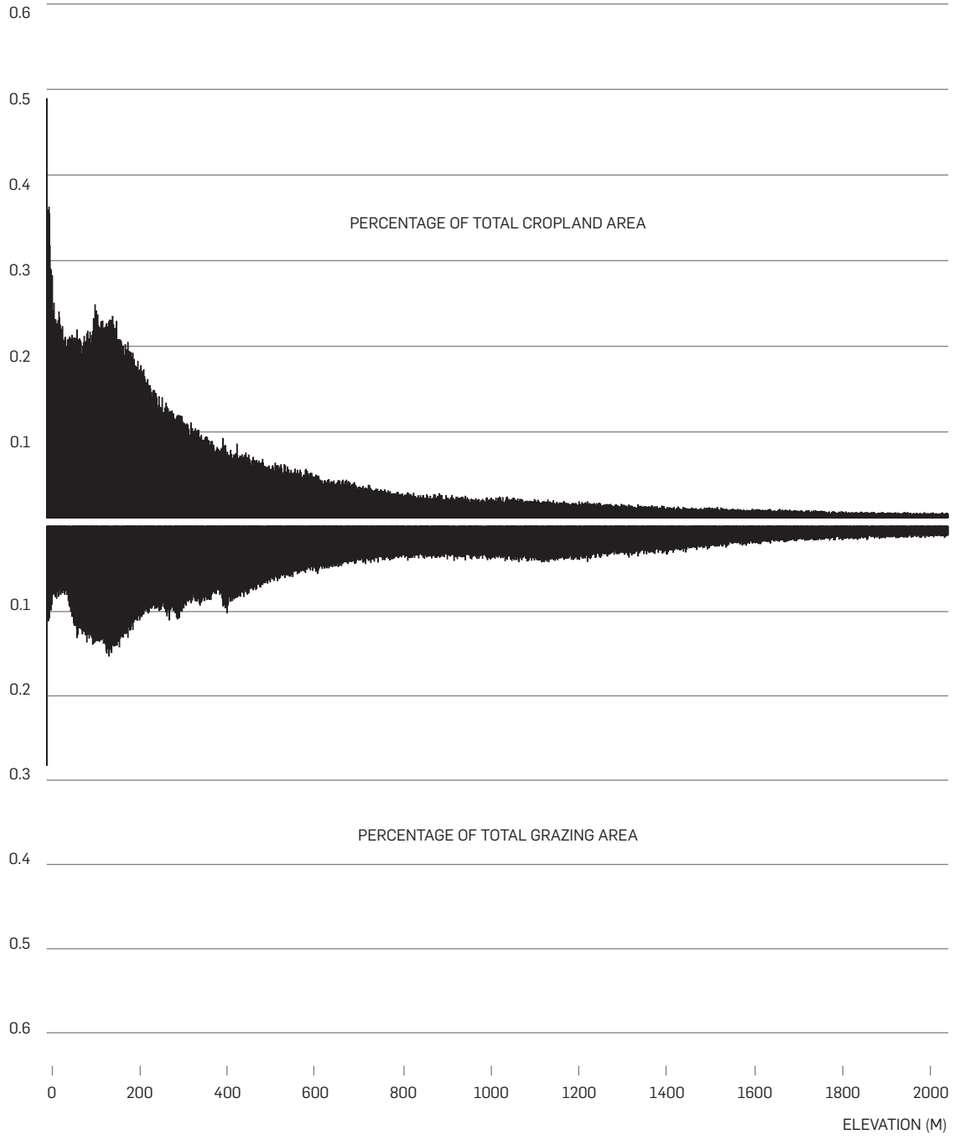


FIGURE 48: PERCENTAGE OF TOTAL CROPLAND AND TOTAL GRAZING AREA IN RELATION TO ELEVATION.

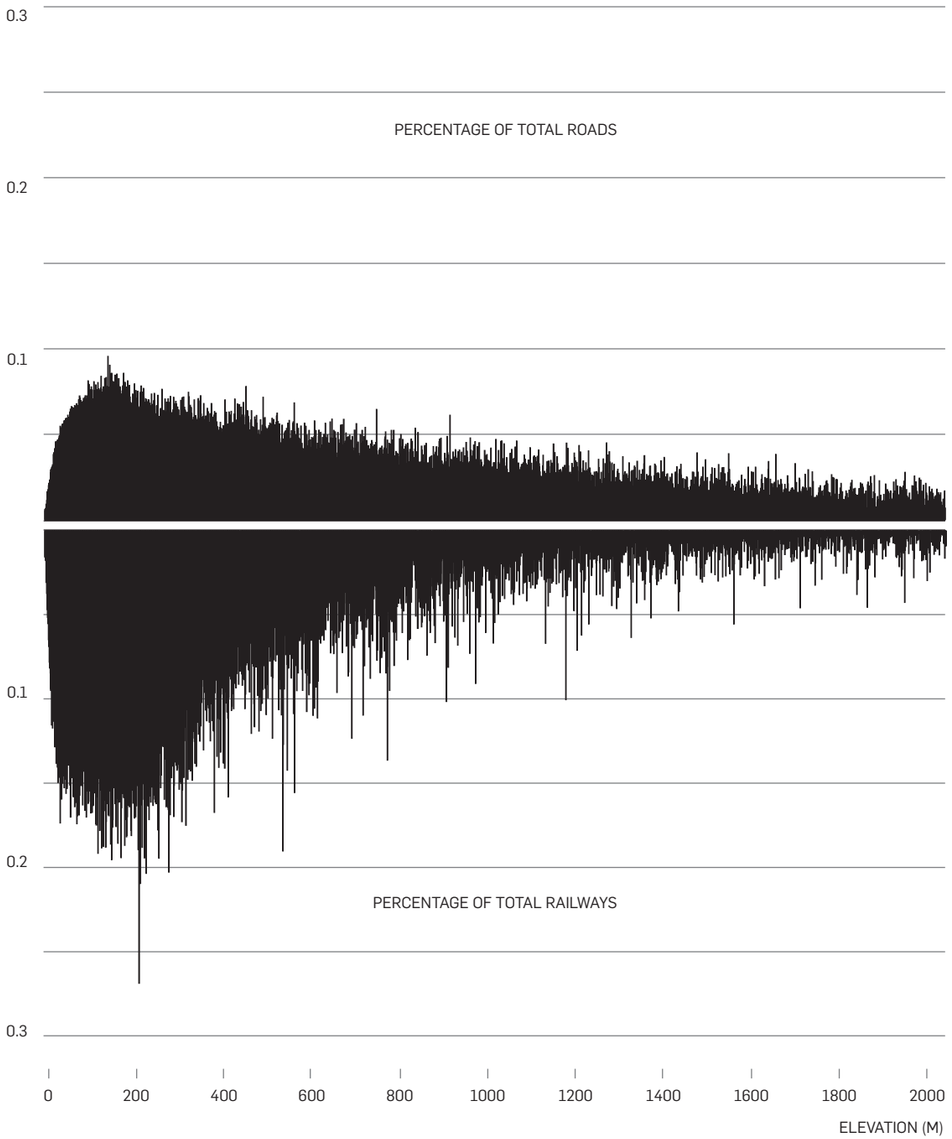


FIGURE 49: PERCENTAGE OF TOTAL ROADS AND TOTAL RAILWAYS IN RELATION TO ELEVATION.

CHARTING AGGLOMERATION LANDSCAPES AND OPERATIONAL LANDSCAPES

In the previous chapter, I attempted a first conceptual framing of a series of alternative classifications of the composite geographies of urbanization. I suggested that the fabric of urbanization includes both the familiar agglomeration landscapes, as well as a multitude of operational landscapes as well as their associated hybrid landscapes and remote landscapes. In my discussion, I explored how all these composite geographies emerge out (but are not completely defined by), certain configurations of the elements of geographical organization: Elements of the natural geography, population distribution, equipment of the ground in the form of fixed capital, as well as administrative and regulatory regimes. In what follows I will attempt to sketch a potential distribution of agglomeration landscapes and operational landscapes, through a cartographic investigation of several associated layers of geospatial information which correspond to these elements of geographical organization.

Before embarking upon this exploration, it is important to note that, since these composite geographies are defined as landscapes of possibilities, and not as specific geographical configurations, the geospatial explorations that follow are only limited in scope, which is to allow the charting of their potential, and not necessarily actual contours. The basic assumption is that operational landscapes and agglomeration landscapes can be approached by monitoring the associations of specific elements of geographical organization in the way I presented them in the previous chapter (and in specifically in the table of figure 39). In the previous part of this chapter, I tried to associate several of these elements with elements of the natural environment. In what follows, I will attempt to associate them with each other in order to start charting the necessary, but not adequate, conditions for the emergence of the possible externalities associated with agglomeration landscapes, operational landscapes, hybrid landscapes and remote landscapes.

The first set of cartographic explorations, involves the association of the distribution of population densities, with patterns of the distribution of productive land (figures 51-57). The maps in figures 51, 55 and 56 construct a double matrix in which areas of variegated population densities are overlaid upon variegated densities of cropland, grazing and forestry areas. The maps in figures 52, 53 and 54, are enlarged instances of the map of agricultural densities of figure 51, presenting a series of additional more detailed views for selected regions (N. America, Europe and N. Africa, Asia). Finally, the map in figure 57, attempts a combination of the three aforementioned categories (cropland, grazing, forestry), into a composite map of population densities and primary production landscapes.

The gradient matrix that serves as legend for the maps, combines variegated densities of population densities with variegated densities of productive land, offers an initial lens into investigating the potential configurations of agglomeration landscapes, operational landscapes, hybrid landscapes and remote landscapes. The matrix presented in detail in figure 50, can be broadly interpreted as a guide for tracing variegated composite terrains that are structured between four 'extreme' configurations:

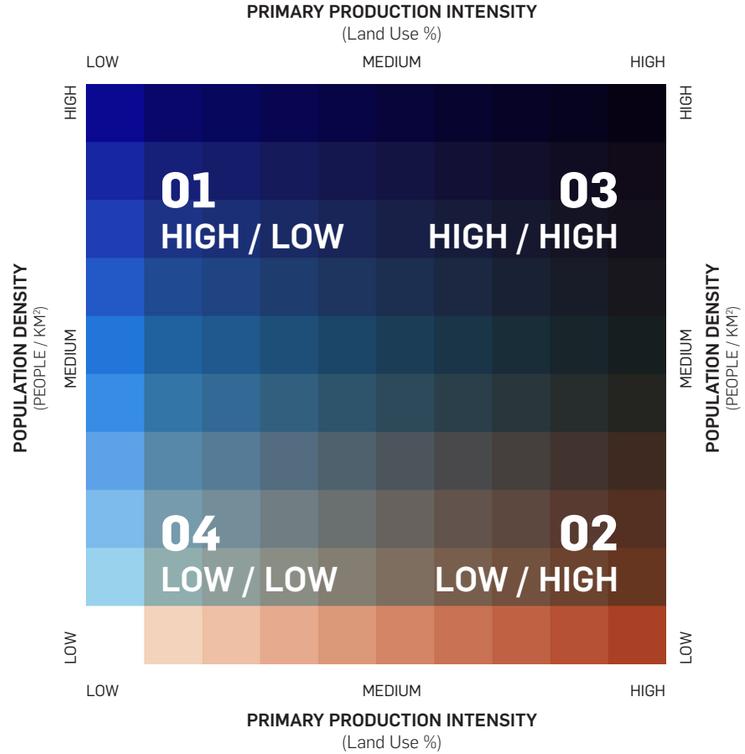
- At the one corner (and extreme), there are areas which are characterized by high concentrations of population and very low, or non-existent densities of primary production (cropland, grazing, forestry). These areas can be broadly considered to provide the conditions for the existence of 'pure' agglomeration landscapes. On the maps, these areas of course seem to correspond to most of the well-known metropolitan, or megalopolitan areas, but also to smaller cities and settlements and are represented in pure blue color.

- On the opposite corner (and extreme) of the matrix, there are areas very thinly populated, which however are characterized by a very high density of productive landscapes (cropland, forestry, grazing). These areas can be broadly considered to cast the conditions for the emergence of pure forms of operational landscapes. On the maps, these areas correspond to what can be characterized as areas of industrialized, mechanized agriculture and forestry and are represented in pure red color. Grazing and mining zones are somehow more difficult to delineate within this context due to the inherently 'remote' nature of the first and 'nodal' nature of the second.

- The third corner of the matrix corresponds to areas that are characterized by, both high concentrations of population, and by high concentrations of productive land (cropland, forestry, grazing). These areas can be broadly considered to combine the conditions for the emergence of externalities that are connected, both to agglomeration landscapes, and to operational landscapes and as a result can be characterized as hybrid landscapes. On the maps, these hybrid landscapes correspond to the darker areas which blend together blue and red colors into a black gradient. However, while agglomeration landscapes and operational landscapes are quite easy to distinguish according to this matrix, the conditions that characterize hybrid landscapes might be very distinct and can be classified into two additional categories. In case high concentrations of population are connected with highly industrialized modes of primary production, these hybrid landscapes

01
POSSIBILITY FOR AGGLOMERATION LANDSCAPES
HIGH POPULATION DENSITY
LOW PRIMARY PRODUCTION

03
POSSIBILITY FOR HYBRID LANDSCAPES
HIGH POPULATION DENSITY
HIGH PRIMARY PRODUCTION



04
POSSIBILITY FOR REMOTE LANDSCAPES
LOW POPULATION DENSITY
LOW PRIMARY PRODUCTION

02
POSSIBILITY FOR OPERATIONAL LANDSCAPES'
LOW POPULATION DENSITY
HIGH PRIMARY PRODUCTION

FIGURE 50: COMPOSITE MATRIX OF AGGLOMERATION, OPERATIONAL, HYBRID AND REMOTE LANDSCAPES.
Based on a combination of the indicators for primary production intensity and population density.

can be considered to be of an 'advanced type'. In this case the concentration of population will not necessarily be primary engaged in primary operations and a high division of labor and diversity of the economic base can be assumed, which is important for the emergence of agglomeration externalities. In case however that the concentrations of population are connected to very labor intensive forms of primary production, the emergence of agglomeration economies might be challenged and these landscapes could be considered to belong to a 'subsistent type'. These two different types of hybrid landscapes cannot be directly traced through this type of cartographic exploration, and will require the investigation of a series of additional layers of infrastructural equipment. Before introducing this second set of composite cartographic explorations however, a final note should be made regarding the areas that appear empty on the maps.

- The forth and last corner of the map, corresponds to areas that are characterized by very low or non existent population densities, and very low or non existent densities of primary production. These areas can be considered to correspond to the last category of remote landscapes, in their pure form, uninhabited and largely unused areas of the world. On the maps, these areas are shown in white color.

Of course, according to the different primary production operations as they are presented in isolation in maps 51-56 (cropland, forestry, grazing), different areas appear to present the potential for the emergence of agglomeration landscapes and operational landscapes of the various kinds in each case. The map in figure 57 attempts a synthesis of all these landscapes, showcasing areas of aggregated primary production, in relation to variegated population densities. This map is also the most useful for the delineation of remote landscapes, areas that do not present any density of primary production of any of these three categories.

An additional element that can contribute to the framing of the composite landscapes of urbanization and act complementary to this first set of primary production maps and the matrix presented in figure 50, is the distribution of the constructed equipment of the earth's surface approached through the density of built structures and infrastructures. A second set of cartographic explorations then, attempts to offer additional elements for tracing agglomeration, operational, hybrid and remote landscapes, by charting the distribution of population densities in relation to the density of ground transportation networks, and artificially constructed surfaces in general.

The map in figure 58 is based upon a transport density gradient, which is generated by calculating the length of road and rail networks (in km) over a specific area of one square kilometer. This density gradient is combined with a map of the global distribution of population densities in the year 2000. The resulting composite map and matrix reveals the ratio between population density, and the density of transport equipment. According to this ratio, and always based on the relational matrix of the table in figure 39, areas where high population densities are combined with high infrastructure densities can be considered to suggest the potential presence of agglomeration landscapes. On the other hand, areas of low population densities but densely equipped, can be considered to correspond to operational landscapes, and indeed can reveal one of their purest types, where land is just operated in a machinic way, without hosting any activities related to social reproduction.

The map and matrix in figure 59 offers a second exploration in the same direction, this time combining population densities with the densities of artificially constructed surfaces, which could be assumed to include buildings of all types and of course infrastructural networks such as roads and railways. The relationships of this ratio of population and built-up land can be read in the same way as the ratio of figure 58, with high densities of population and artificially constructed surfaces suggesting the presence of agglomeration landscapes, and low densities of population but high densities artificially constructed surfaces suggesting the presence of operational landscapes.

It is important to highlight that overall, the matrix of these maps (58 and 59), does not operate in the same way with the matrix corresponding to the maps of primary production landscapes (figure 50). It can indeed be indicative of the presence of agglomeration landscapes (areas of high infrastructure density and high population density - the darkest areas of the map), and operational landscapes (areas with high infrastructure density but low population density - the red areas on the map), but in the case of charting hybrid landscapes, it operates in a different way. When this indicator is combined with the primary production matrix and composite maps, it offers an additional perspective for identifying hybrid landscapes with high potential of urban externalities (advanced type) from hybrid landscapes with low potential for the presence of urban externalities (subsistent type): One assumption for this distinction is that hybrid landscapes, which also overlap with areas of dense infrastructural equipment, present higher potentials to belong to the advanced type. On the contrary, hybrid landscapes with relatively low infrastructure density, could point to the direction of hybrid landscapes of the primitive type.

This experiment could be particularly useful when observing hybrid areas with extremely high population densities and primary production intensities like for example the Ganges plain: In this area, one assumption could be that the hybrid landscape that is revealed is relatively weak in constructing the necessary synergies for the emergence of urban externalities, and as such of being a hybrid landscape of the primitive type. On the contrary, hybrid landscapes that are presented in areas of Europe that are also characterized by a high ratio of infrastructure per capita, can be assumed to present the potentials for the emergence of urban externalities over wide areas and thus belong to the advanced type. In general, it could be argued that, areas characterized by high population densities but low densities of infrastructure have weaker potential for interconnectivity and as such, for the emergence of agglomeration externalities.

This point allows me to attempt a generalization in relation to a series of sensitive issues regarding, both the previous point on hybrid landscapes of the advanced versus the primitive type, and the broader distinction made in the previous chapter between concentration and agglomeration: As already mentioned, the challenge is to distinguish between areas of high population density, which are characterized by the high levels of interaction, division of labor and overall the urban dynamics that Jacobs describes, and those which are not. High density of infrastructure can be a sign of high mobility of population and of the high division of labor, which is both the result and the basis for this high mobility and interaction. But besides this hypothetical point, a densely populated area with dense transportation equipment, can be considered to have superior relative density, in relation to an equally dense area with thinner infrastructural equipment. As Marx suggested when he was discussing the dimensions of population concentration:

> A relatively thinly populated country, with well-developed means of communication, has a denser population than a more numerously populated country, with badly-developed means of communication; and in this sense the Northern States of the American Union, for instance, are more thickly populated than India.[40]

Overall, this second set of maps in figures 58 and 59, can act complementary to the initial set of composite maps and matrix, in also helping to examine in more detail, not only the equipment and use of the ground, but also the composition of hybrid landscapes of the two aforementioned types. A final series of composite cartographic explorations can be thus attempted by combining these two sets of composite maps, the ones exploring primary production landscapes, and the second exploring infrastructural equipment and artificial constructed surfaces.

The maps in figures 61-64, offer a composition of all the composite gradients (figures 51-60). These maps are a largely impressionistic effort to deconstruct the dichotomy that was introduced in the beginning of the project, the dichotomy between the agglomerations and the 'outside' dark pattern of the used planet (figure 03). An alternative interpretation is offered, one that emerges out of the complex configurations of the asymmetrical distribution of population, infrastructure, built land and productive land: Population densities (in blue gradient) are weighted upon the density of transportation networks (red gradient) and built land (red gradient), as well as upon densities of productive land, cropland, forestry and grazing (green gradients). This final scheme uncovers the rich complexity of configurations and the great unevenness in the distribution of equipment, population and productive land, but also allows for a more a final and more refined attempt to chart the composite geographies of agglomeration landscapes, operational landscapes, hybrid landscapes, and remote landscapes. Areas of high ratios of equipment and densely used production landscapes are revealed by the combination of green and red colors (in Europe and the US). At the same time, areas of high population densities without major equipment structures are revealed in blue, while production landscapes without major densities of equipment or population in green.

An additional interpretation can be added through the darkest areas of he map, with the composites of dark red and dark blue clearly defining the major zones of potential agglomeration landscapes. More interestingly, the hybrid landscapes can now be somehow distinguished between those of the subsistent and those of the advanced type: The dark areas of blue and red color can be assumed to correspond to areas with higher ratios of equipment per capita, and thus to hybrid landscapes of the advance type; the dark areas of blue and red color can be assumed to correspond to areas of thinner equipment, and thus to hybrid landscapes of the primitive type. At the same time, instances of infrastructural equipment seem to be penetrating remote landscapes in North Africa, Siberia, the Andes (pure red instances within purely white areas).

The map reveals that there is quite intensive equipment of the ground in sparsely populated areas, in the form of operational landscapes, something which is further investigated through the diagram in figures 65 and 66: The diagram in figure 65 correlates the distribution of population and artificially constructed, built-up surfaces,

with selected classes of population densities. Complementary to figure 65, figure 66 shows the percentage of population and built-up area across ranges of population density, as a percentage of their total distribution, as well as the changing density of built-up areas. What is quite revealing is the fact that although areas of high population density are also areas of high density of constructed surfaces, on the other hand, in absolute numbers, most of the built-up, constructed surfaces on the planet are not in densely populated areas, but rather in low density, or even uninhabited areas. More than 50% of the constructed surfaces of the world are found in areas with population densities of 100 people / km^2 or less, while less than 20% of the total area of constructed surfaces is found in areas with population densities of 2000 people / km^2. This essentially means that most of the constructed areas of the planet are not in agglomeration landscapes, but rather equip its operational landscapes.

An additional line of interpretation is offered in figure 67. This final diagram tries to explore the distance between the majority of the various productive landscapes and the dense areas of population concentration: The diagram builds upon the construction of a cost distance gradient surface that is based upon the transport networks density gradient which was part of the composite map of figure 58, as well as the major transportation networks presented in figure 16. This cost distance gradient surface can be interpreted as a global map of accessibility calculating the distances around major agglomeration zones, as derived by the urban extents map of figure 19. Based on the correlation of this accessibility gradient with selected landscapes of primary production (cropland, grazing, forestry but also mining), the following observations can be made: More than 50% of agricultural areas, and around 30% of grazing lands, mining and forestry areas lie within a distance of three hours from the closest agglomeration zone. However, the majority of cropland is much closer to agglomeration areas than any other of the primary production activities, with the least sensitive to the distance to agglomeration areas being forestry.

These two last sets of diagrams, offer a first attempt of unpacking not only the distribution, but also the association between the different composite geographies of urbanization and their elements. As I have stated at the beginning, the task of this chapter has been to sketch an alternative portrait of the geographical organization of world urbanization. This task has had an ambitious, as well as a quite modest dimension: The ambitious dimension has been to deconstruct inherited spatial and representational categories into their essential attributes, and then attempt to recompose these attributes into composite geographies, through which agglomeration landscapes, operational landscapes, hybrid landscapes and remote landscapes could be traced. The modest dimension reflects the hypothesis that these cartographic experimentations are only useful as part of the broader theoretical framework that has been introduced in the previous chapter, and as a result they mostly have a complementary and descriptive role. Nevertheless, these composite cartographies of urbanization, offer a first sense of the multitude of variegated landscapes that comprise the contemporary urban condition, landscapes that can be much better investigated through the assemblies of asymmetrical gradients elements of geographical organization, rather than through delineated and fixed categories.

But how are these gradients animated, produced and transformed under contemporary urbanization processes? How are the various agglomeration, operational, hybrid and remote landscapes assembled under the increasingly generalized condition of geographical interdependency that characterizes urbanization?

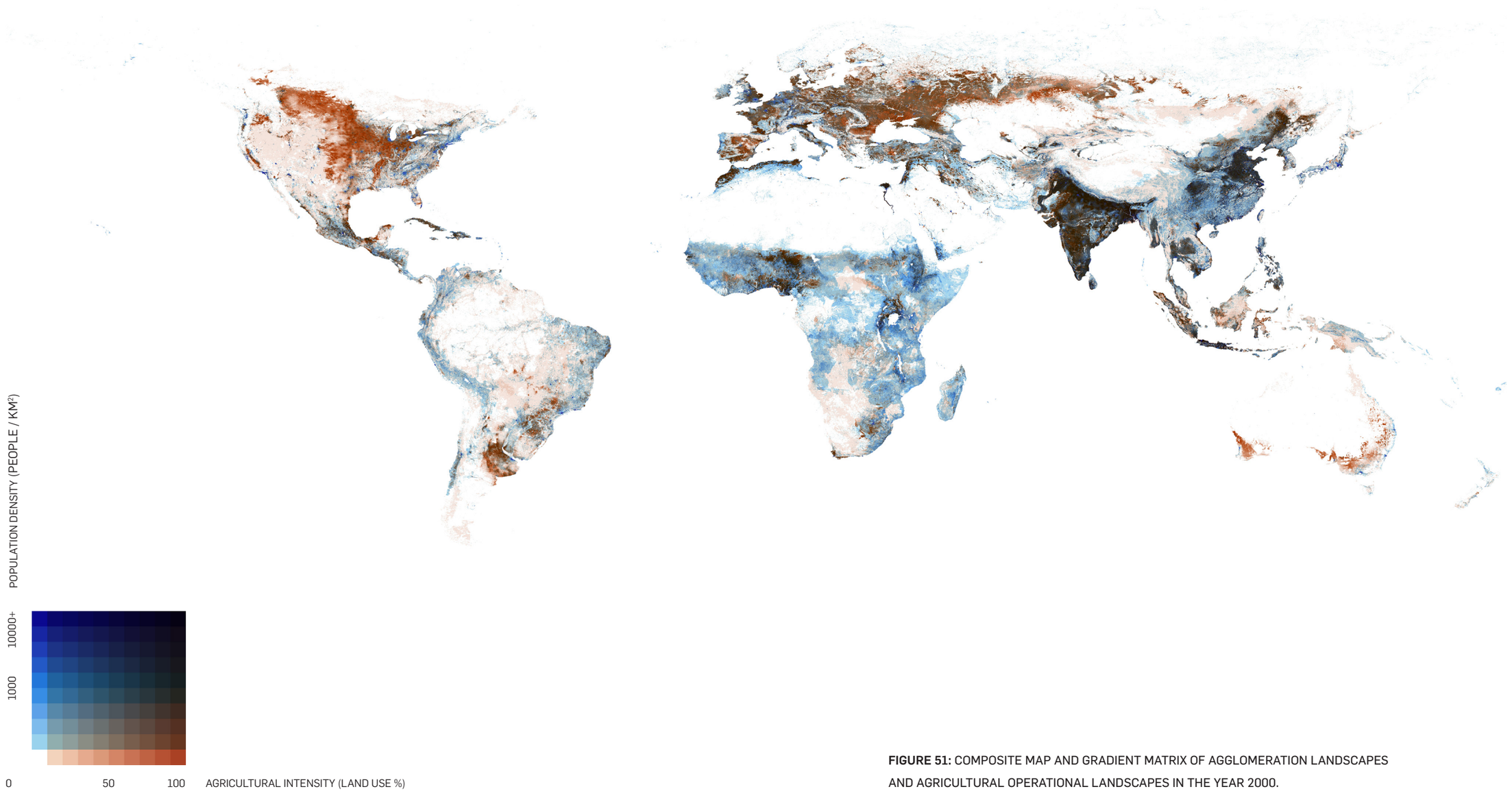


FIGURE 51: COMPOSITE MAP AND GRADIENT MATRIX OF AGGLOMERATION LANDSCAPES AND AGRICULTURAL OPERATIONAL LANDSCAPES IN THE YEAR 2000.

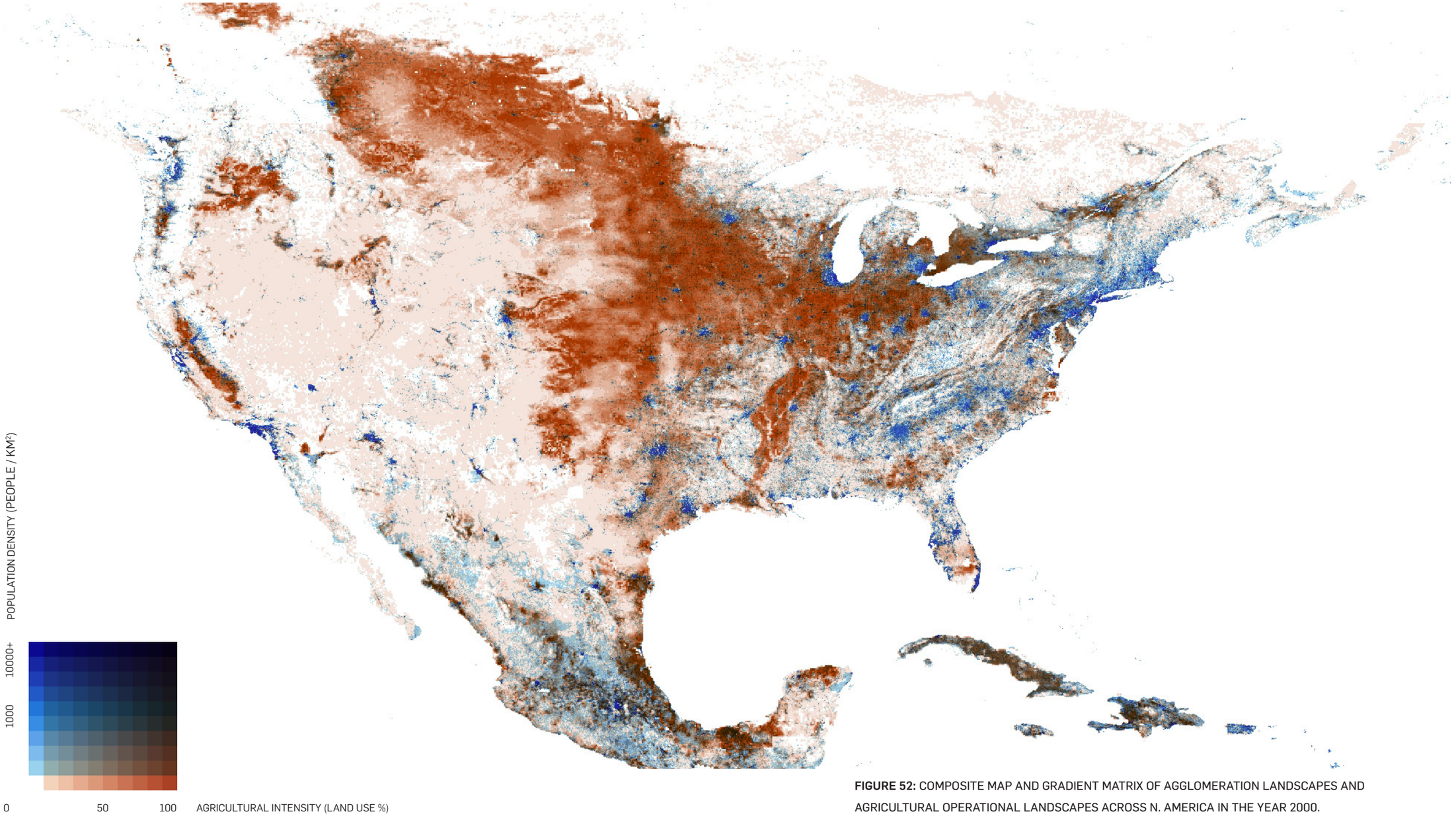


FIGURE 52: COMPOSITE MAP AND GRADIENT MATRIX OF AGGLOMERATION LANDSCAPES AND AGRICULTURAL OPERATIONAL LANDSCAPES ACROSS N. AMERICA IN THE YEAR 2000.

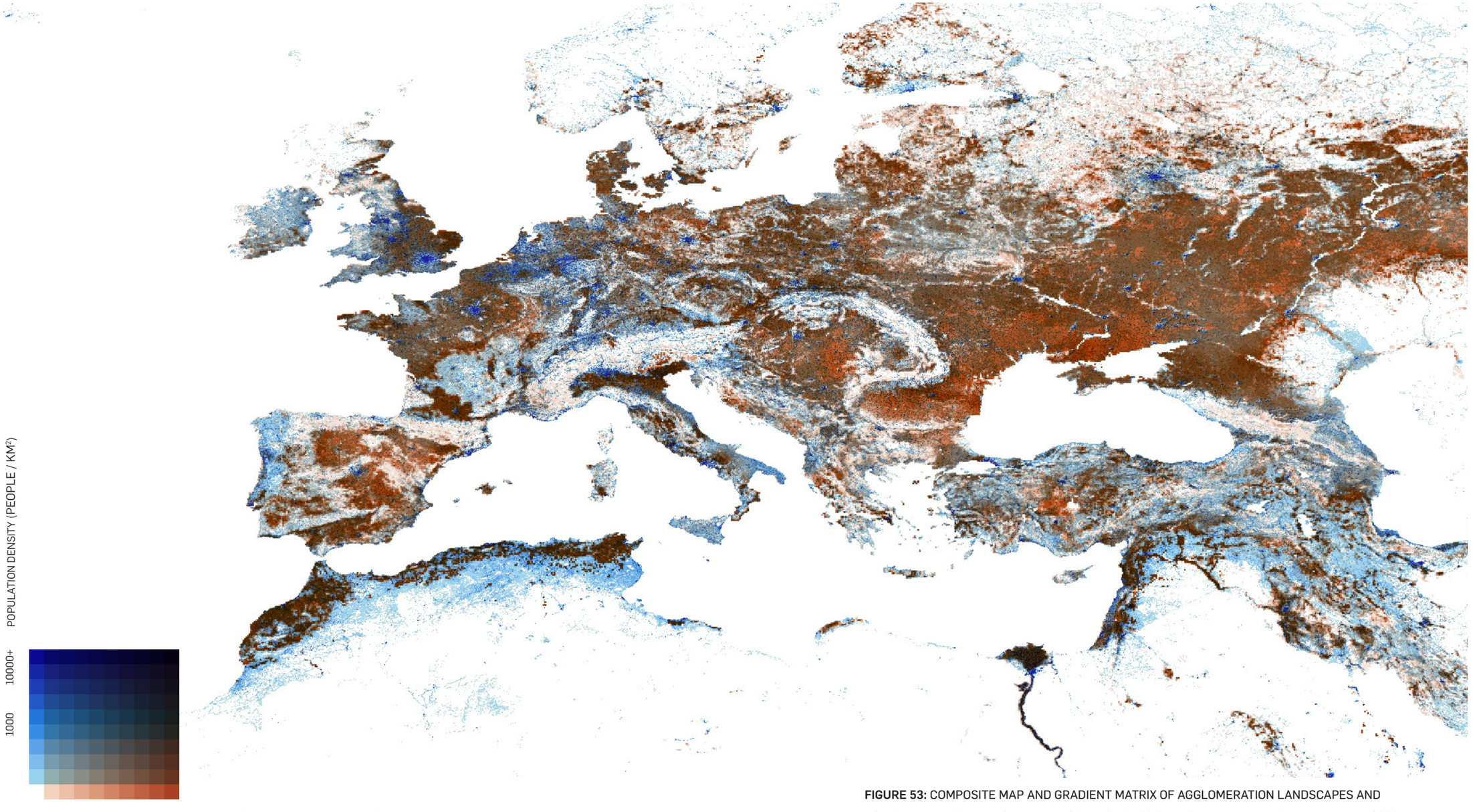


FIGURE 53: COMPOSITE MAP AND GRADIENT MATRIX OF AGGLOMERATION LANDSCAPES AND AGRICULTURAL OPERATIONAL LANDSCAPES ACROSS EUROPE AND N. AFRICA IN THE YEAR 2000.

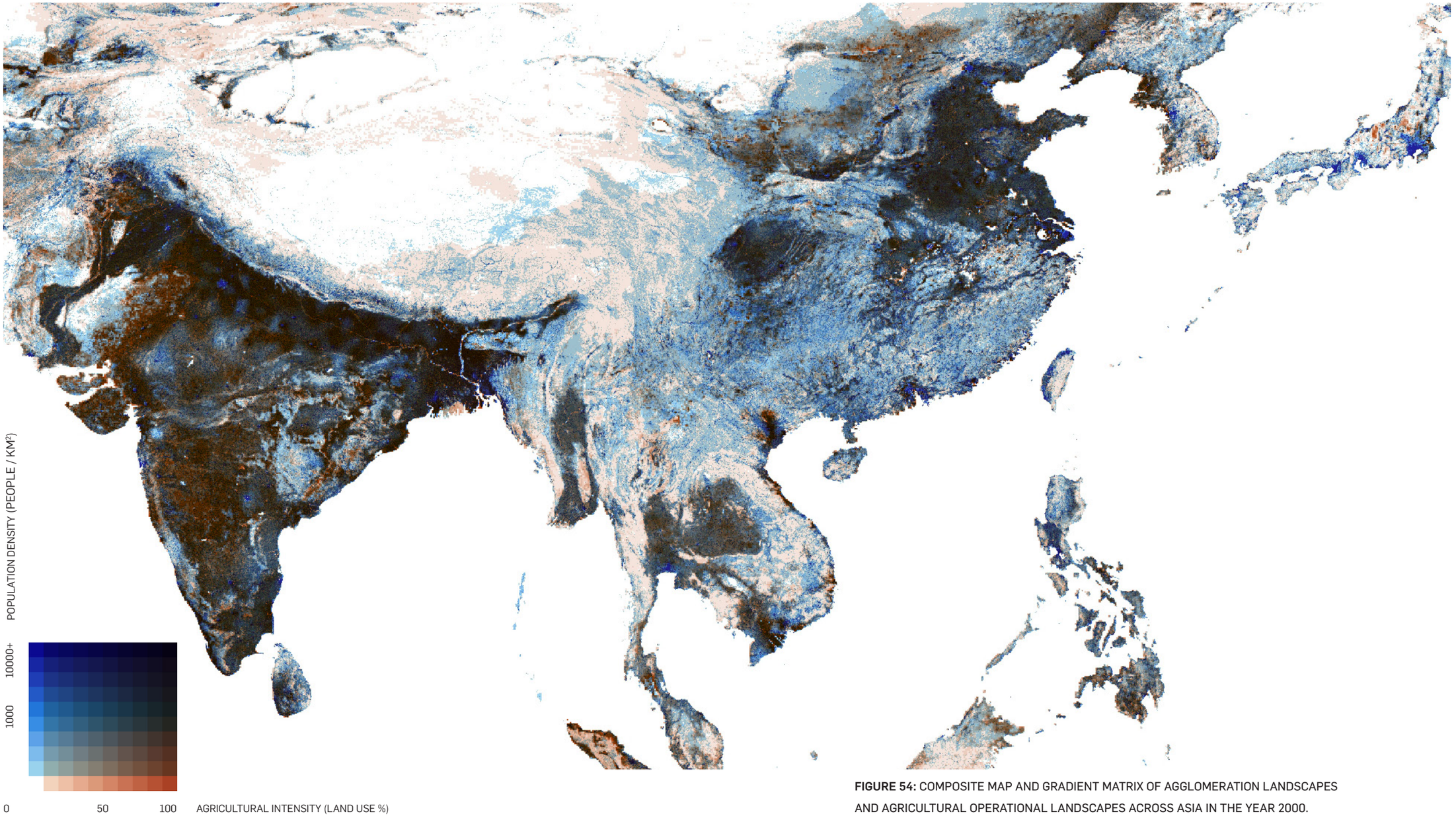


FIGURE 54: COMPOSITE MAP AND GRADIENT MATRIX OF AGGLOMERATION LANDSCAPES AND AGRICULTURAL OPERATIONAL LANDSCAPES ACROSS ASIA IN THE YEAR 2000.

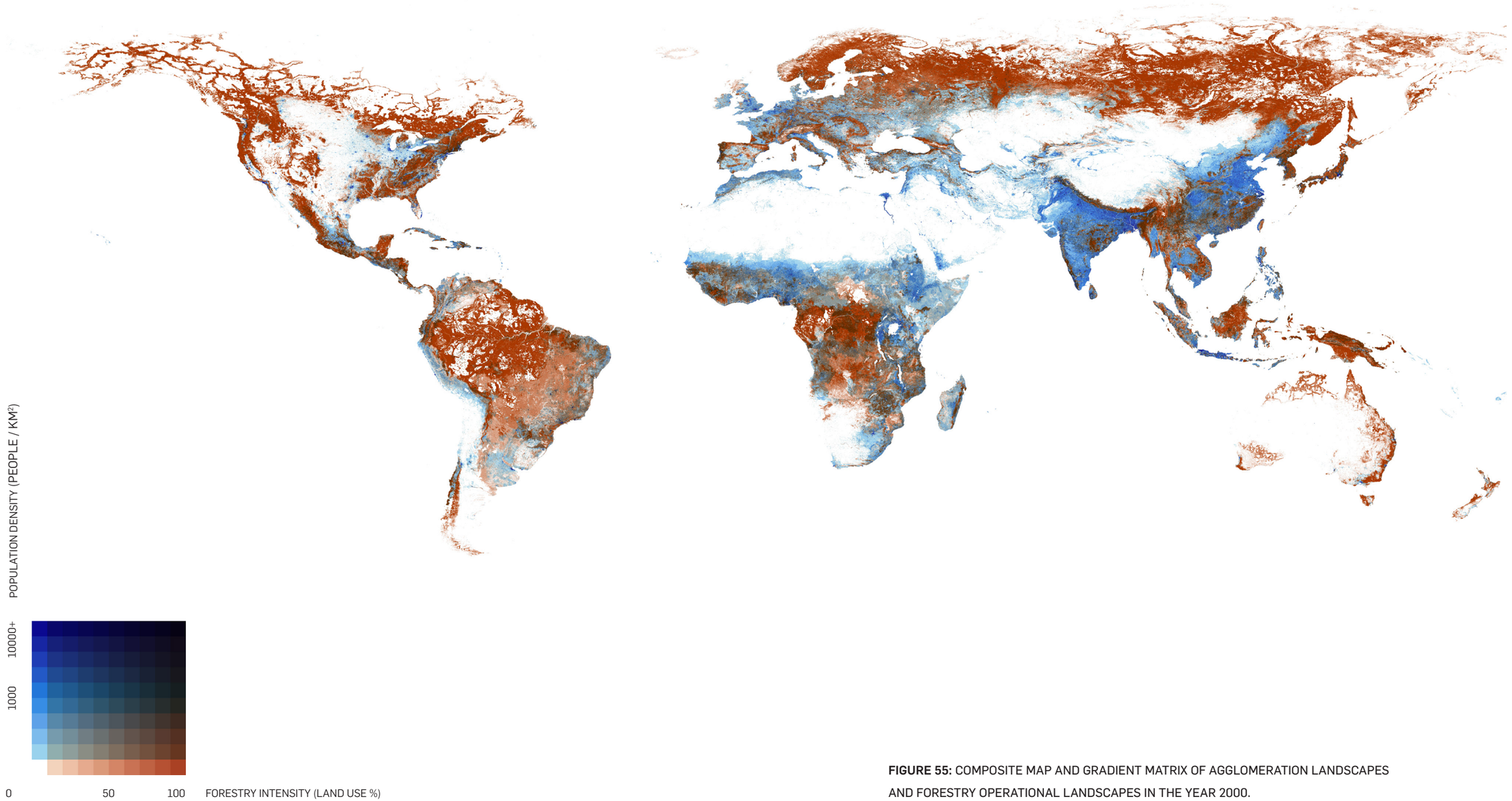


FIGURE 55: COMPOSITE MAP AND GRADIENT MATRIX OF AGGLOMERATION LANDSCAPES AND FORESTRY OPERATIONAL LANDSCAPES IN THE YEAR 2000.

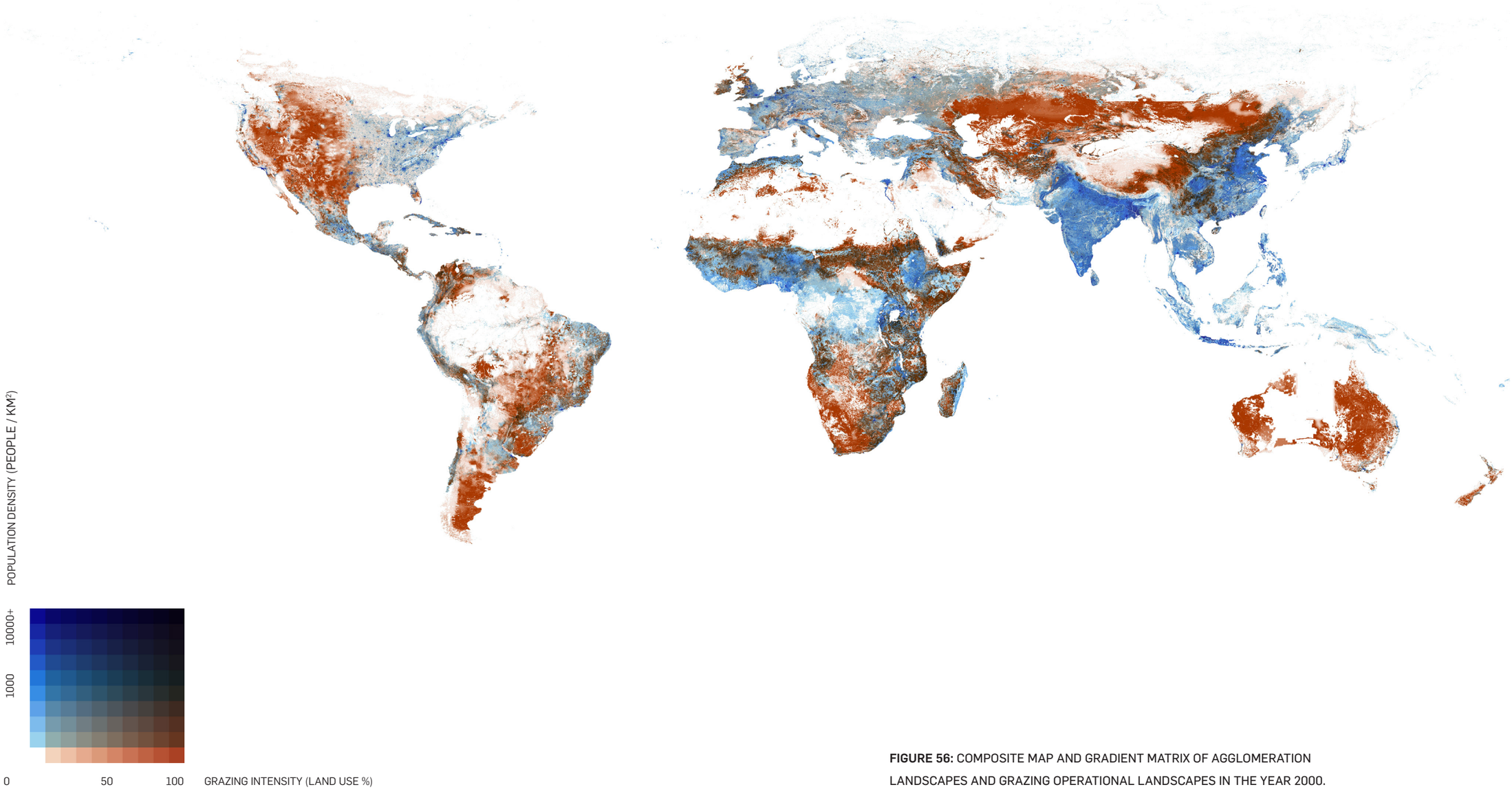


FIGURE 56: COMPOSITE MAP AND GRADIENT MATRIX OF AGGLOMERATION LANDSCAPES AND GRAZING OPERATIONAL LANDSCAPES IN THE YEAR 2000.

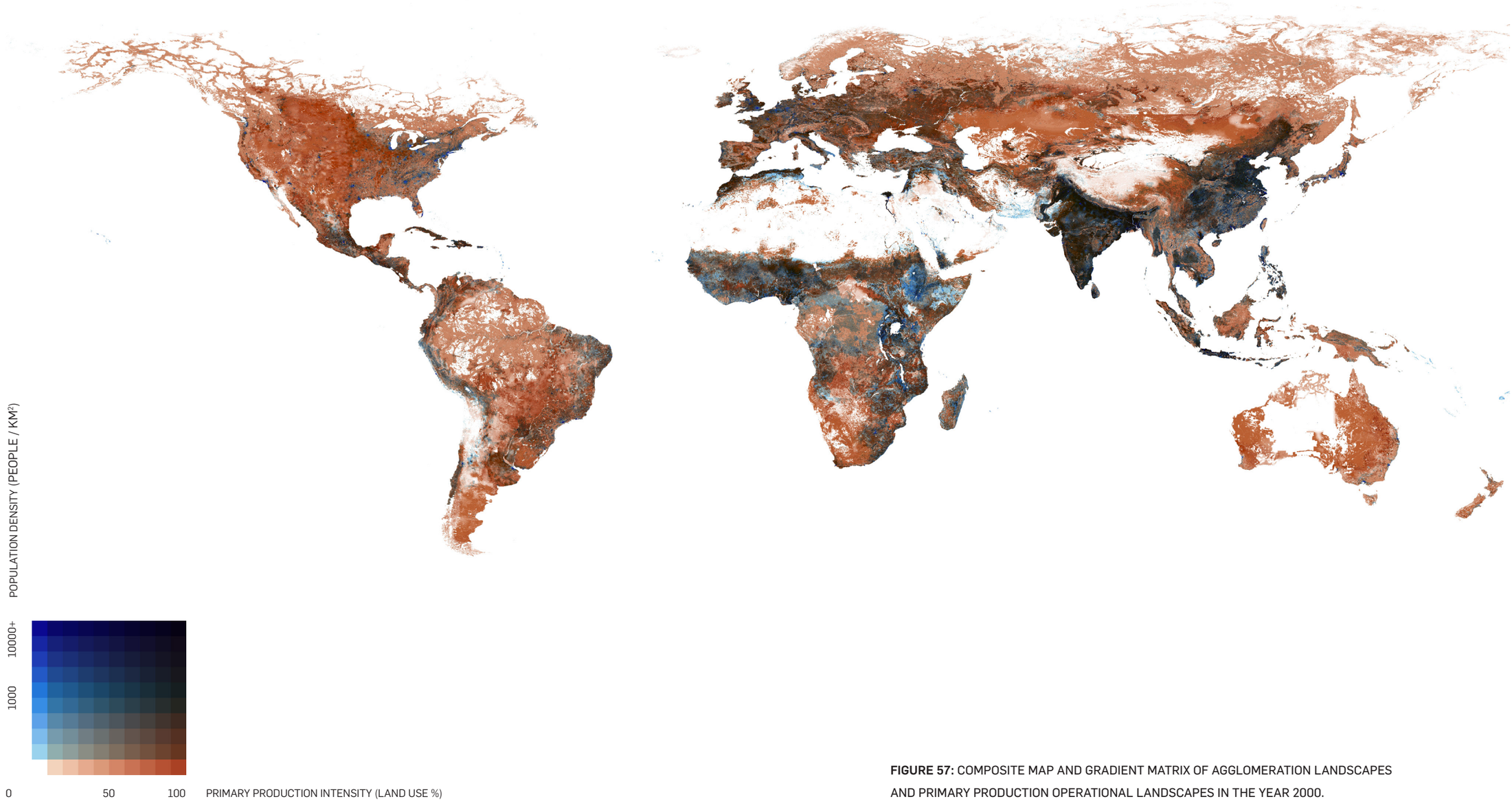


FIGURE 57: COMPOSITE MAP AND GRADIENT MATRIX OF AGGLOMERATION LANDSCAPES AND PRIMARY PRODUCTION OPERATIONAL LANDSCAPES IN THE YEAR 2000.

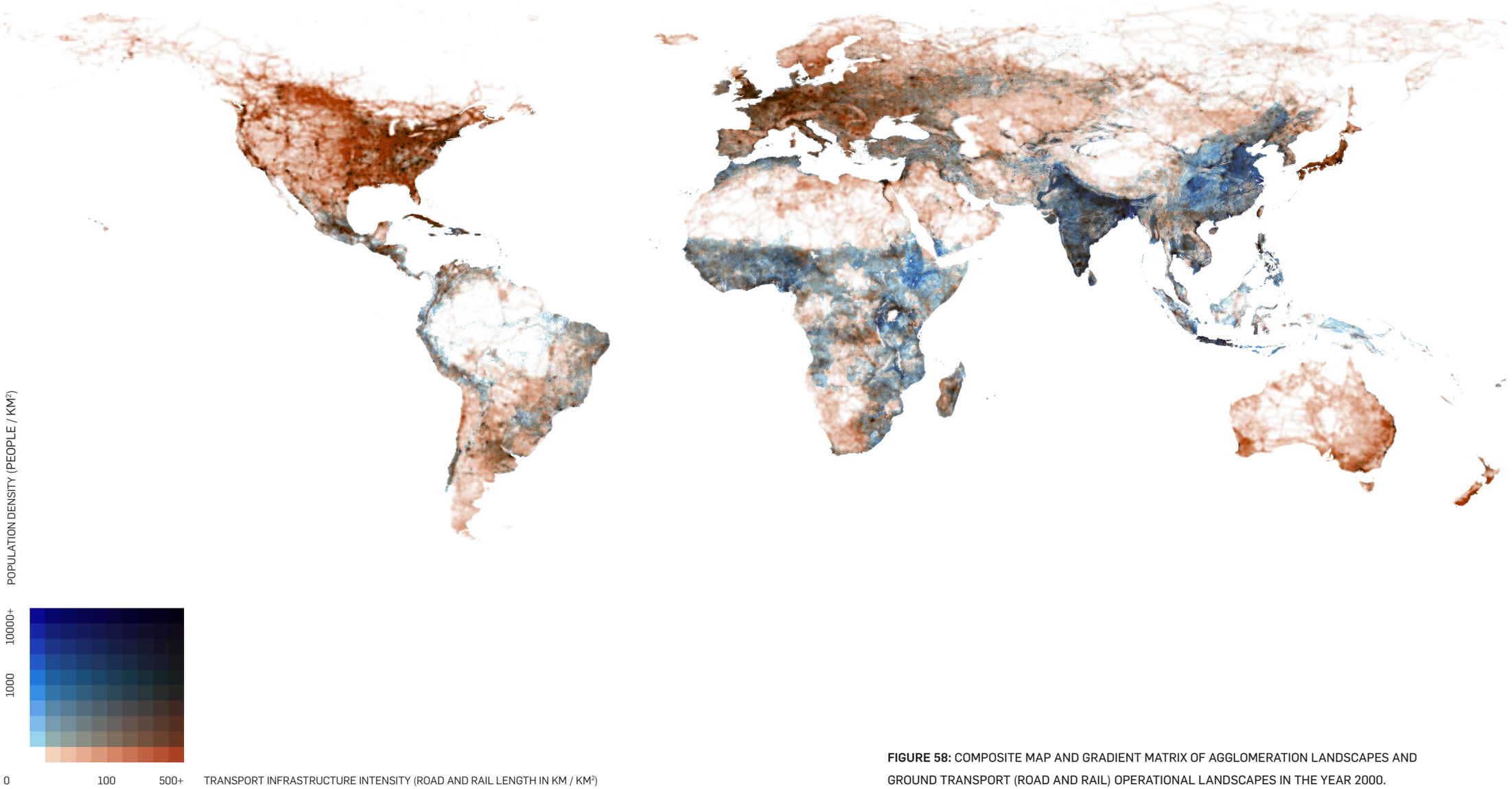


FIGURE 58: COMPOSITE MAP AND GRADIENT MATRIX OF AGGLOMERATION LANDSCAPES AND GROUND TRANSPORT (ROAD AND RAIL) OPERATIONAL LANDSCAPES IN THE YEAR 2000.

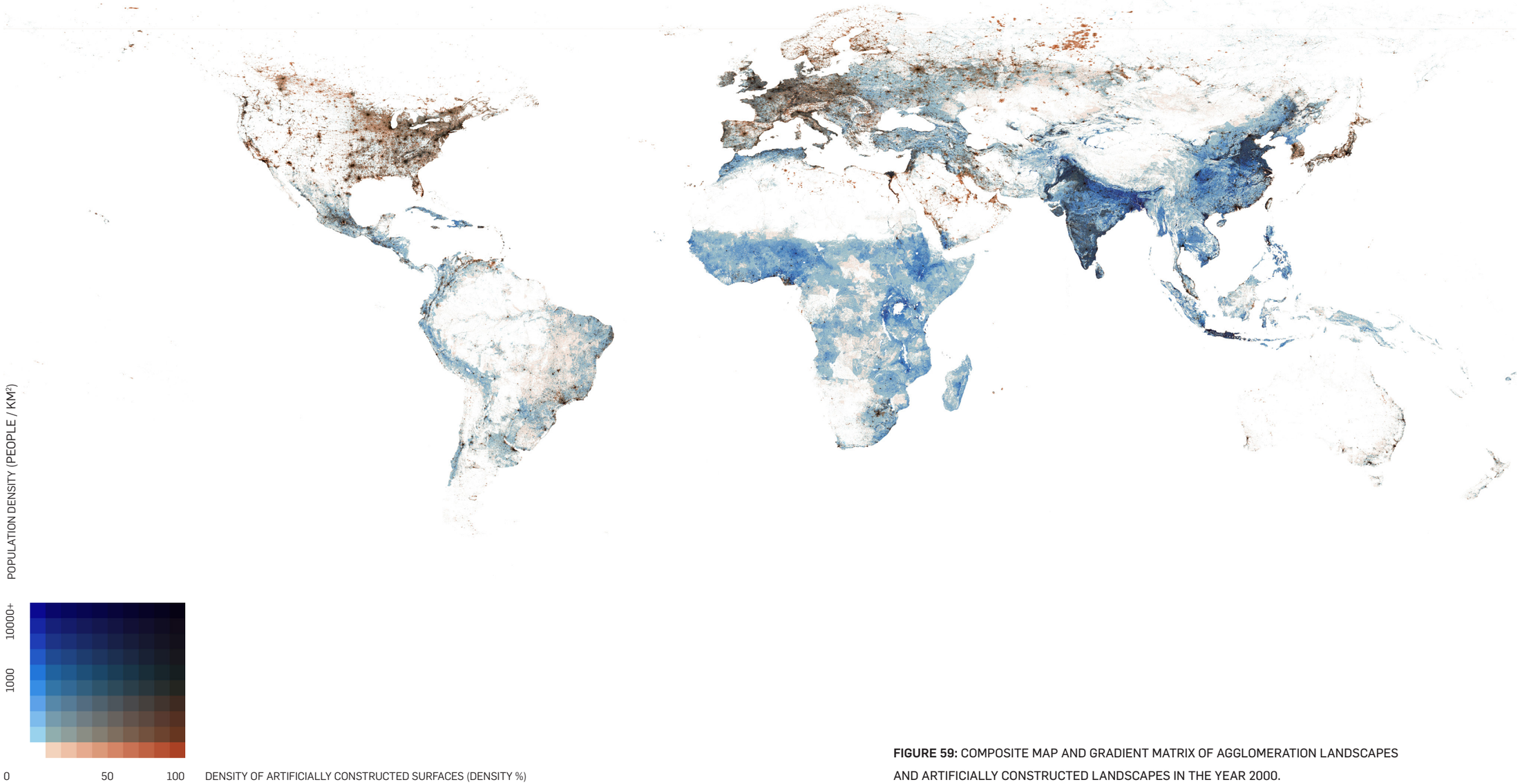


FIGURE 59: COMPOSITE MAP AND GRADIENT MATRIX OF AGGLOMERATION LANDSCAPES AND ARTIFICIALLY CONSTRUCTED LANDSCAPES IN THE YEAR 2000.

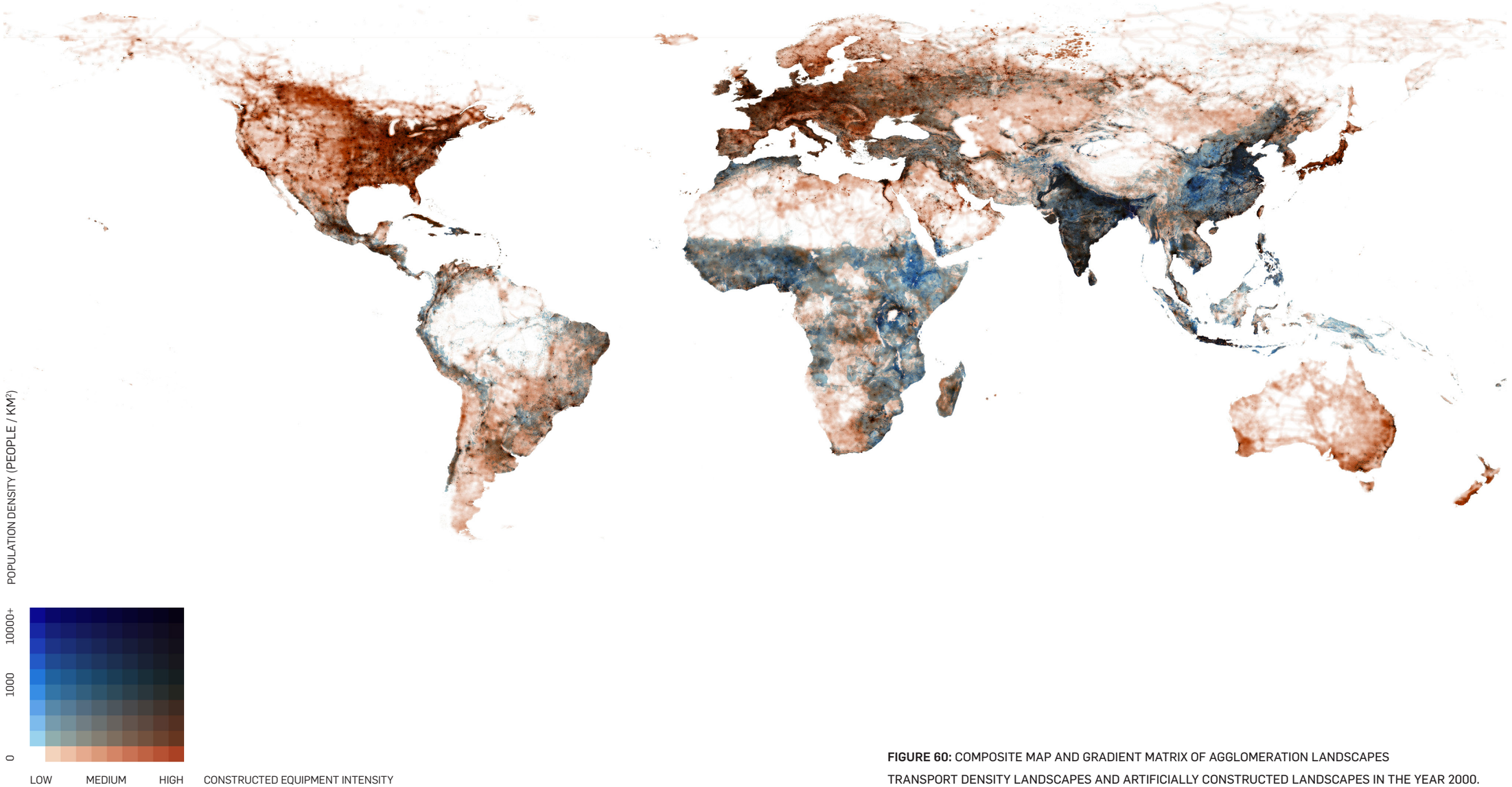


FIGURE 60: COMPOSITE MAP AND GRADIENT MATRIX OF AGGLOMERATION LANDSCAPES TRANSPORT DENSITY LANDSCAPES AND ARTIFICIALLY CONSTRUCTED LANDSCAPES IN THE YEAR 2000.

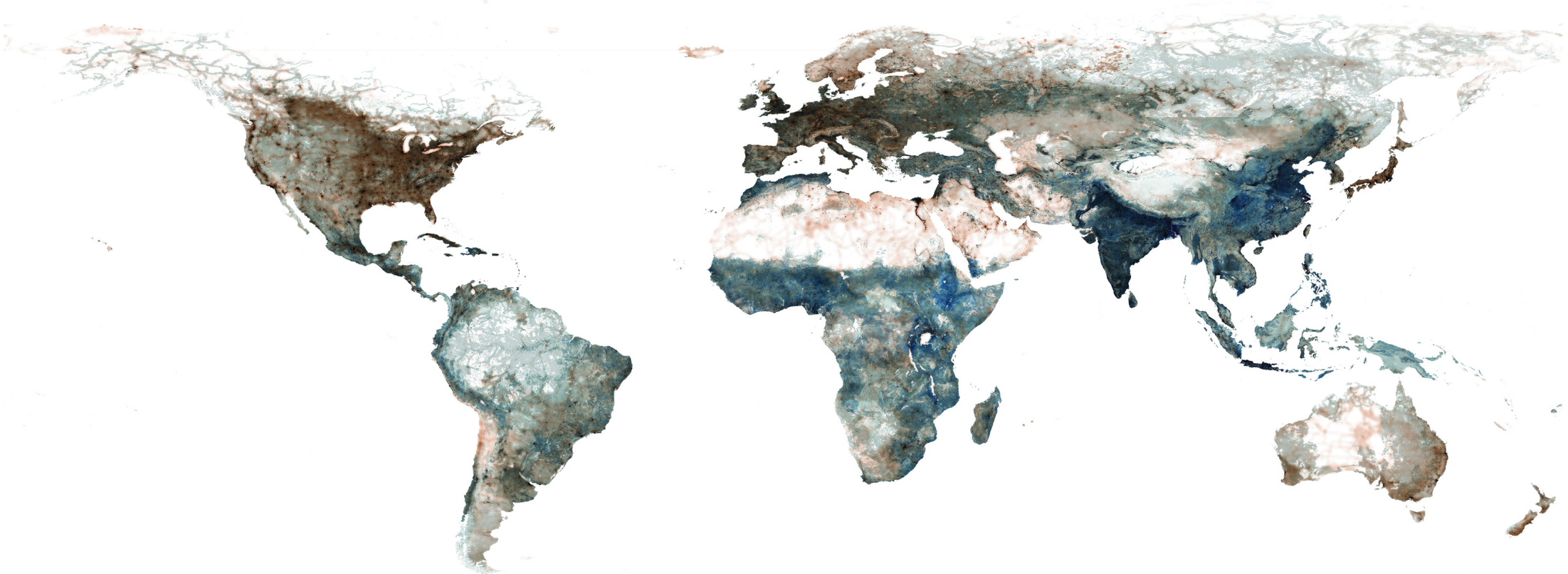


FIGURE 61: COMPOSITE GEOGRAPHIES OF URBANIZATION IN THE YEAR 2000.

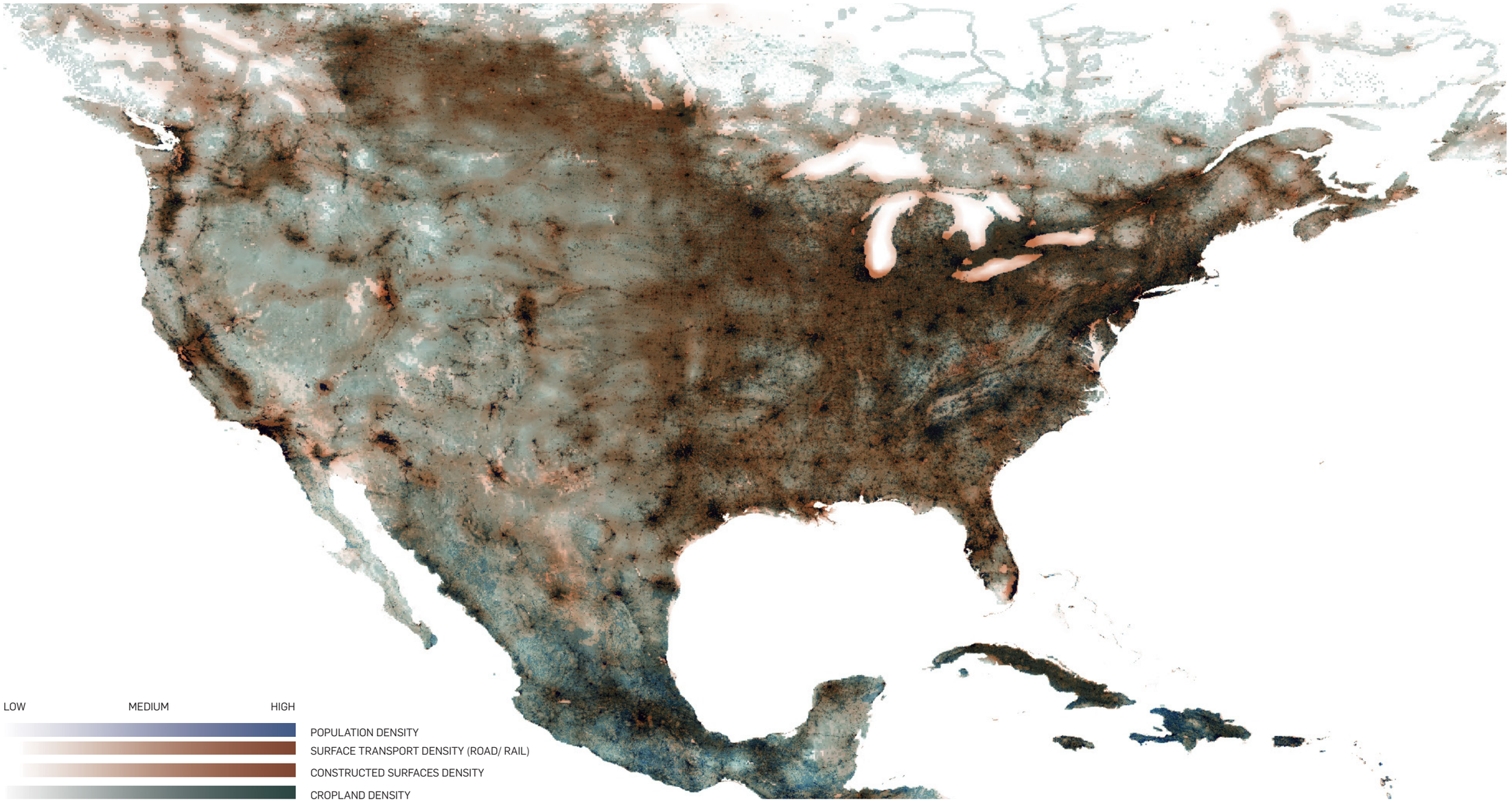


FIGURE 62: COMPOSITE GEOGRAPHIES OF URBANIZATION ACROSS N. AMERICA THE YEAR 2000.

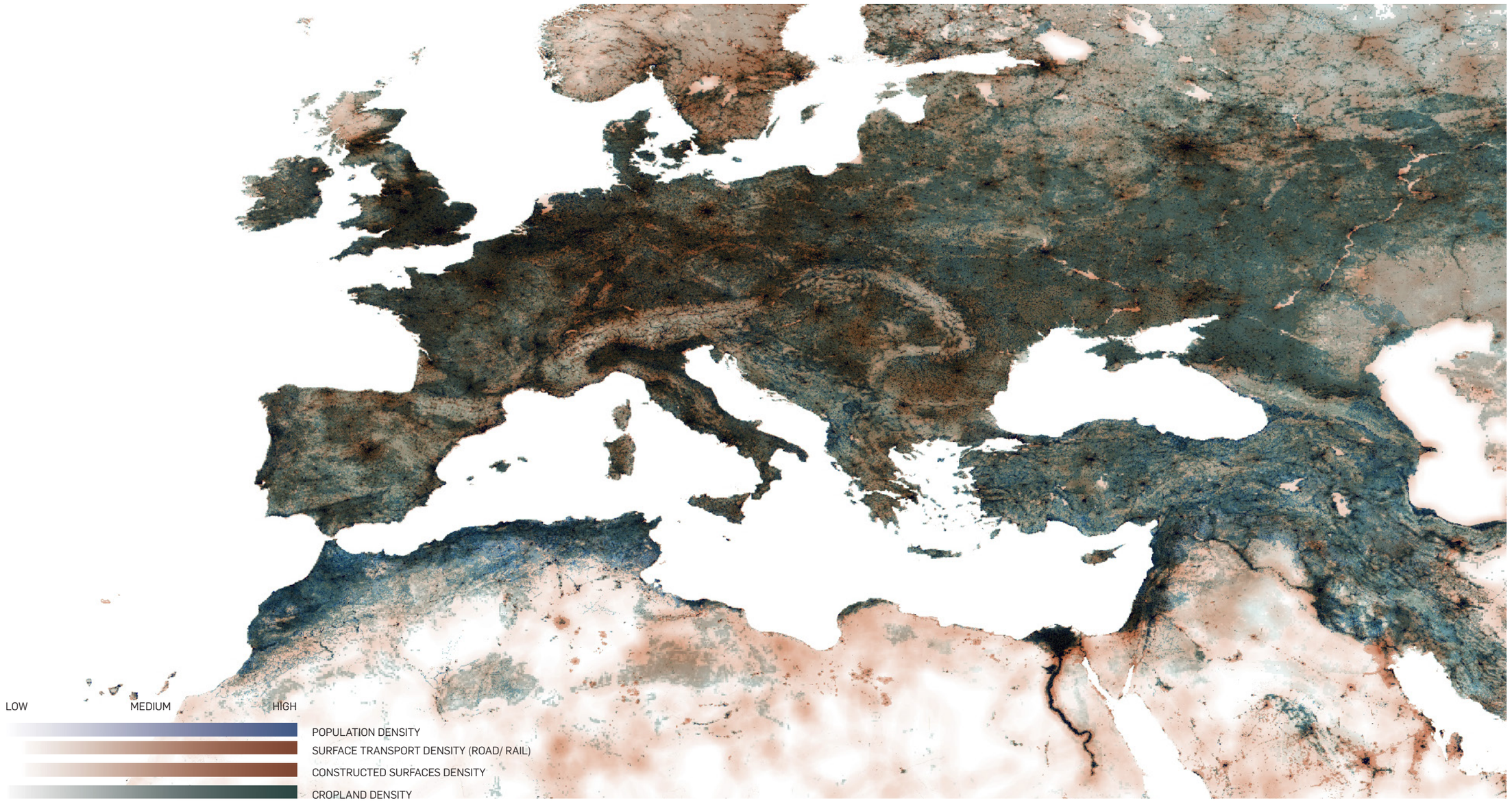


FIGURE 63: COMPOSITE GEOGRAPHIES OF URBANIZATION ACROSS EUROPE AND N. AFRICA IN THE YEAR 2000.

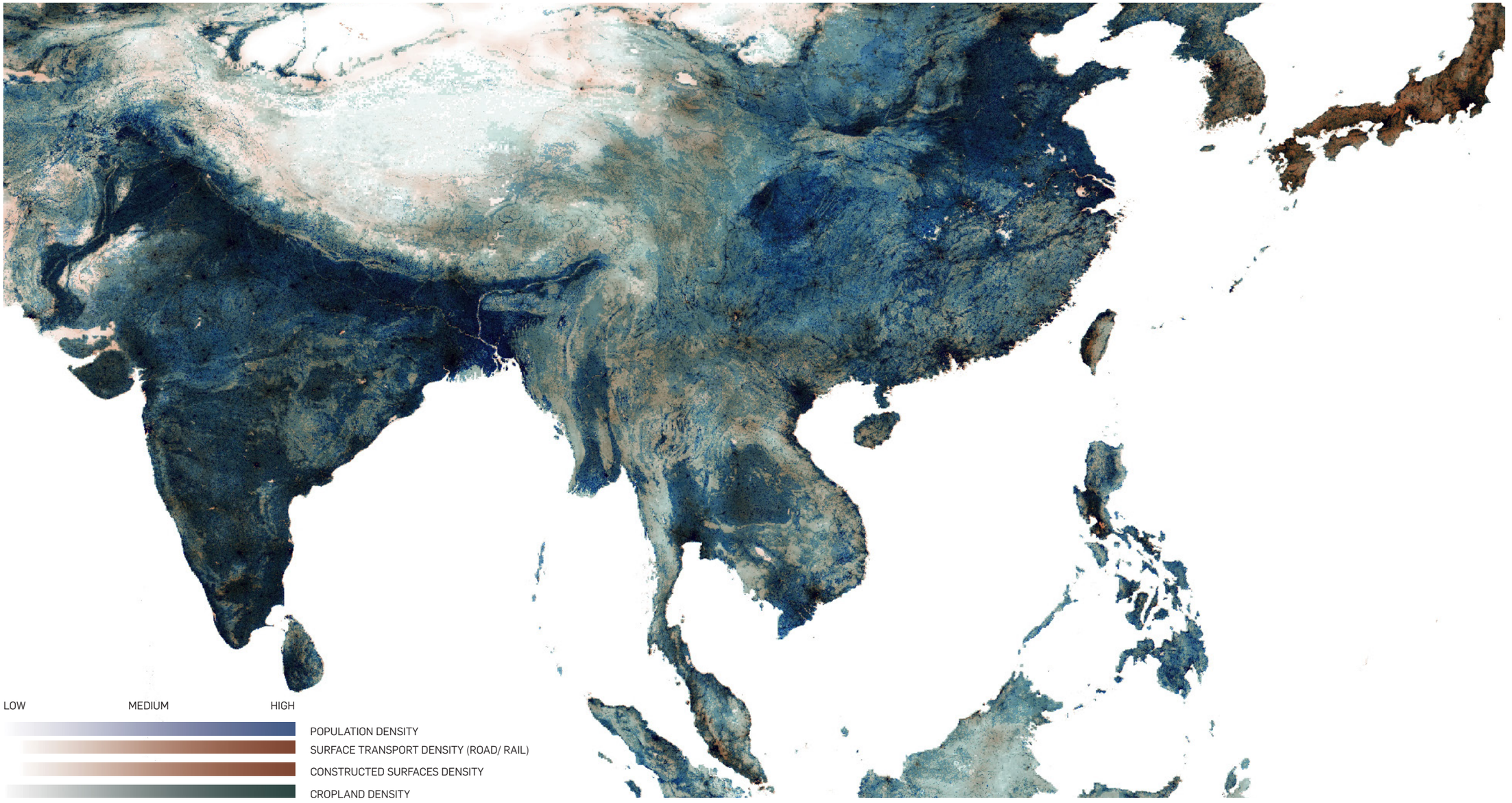


FIGURE 64: COMPOSITE GEOGRAPHIES OF URBANIZATION ACROSS ASIA IN THE YEAR 2000.

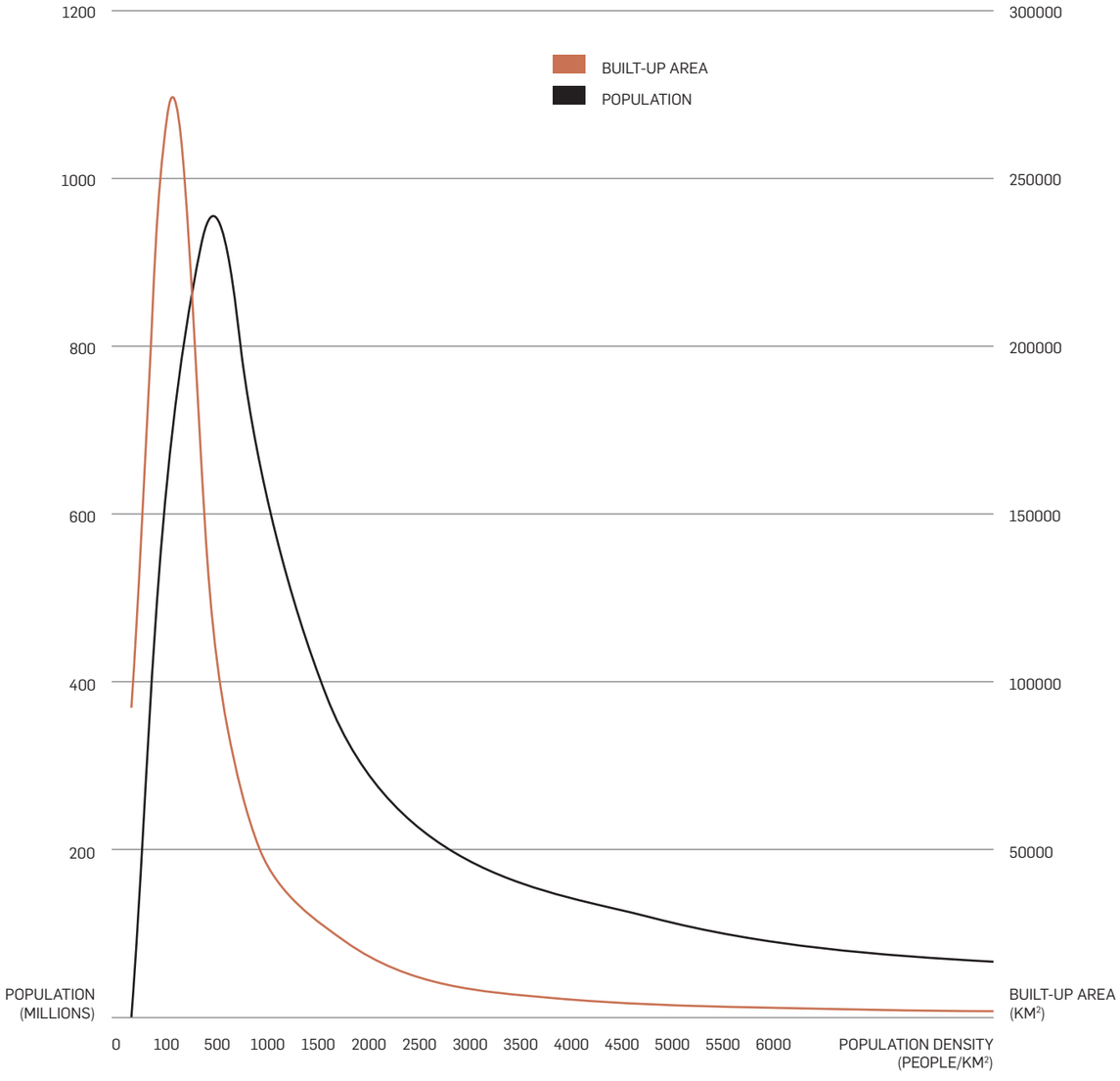


FIGURE 65: POPULATION DENSITIES AND DISTRIBUTION OF POPULATION AND BUILT-UP AREAS.

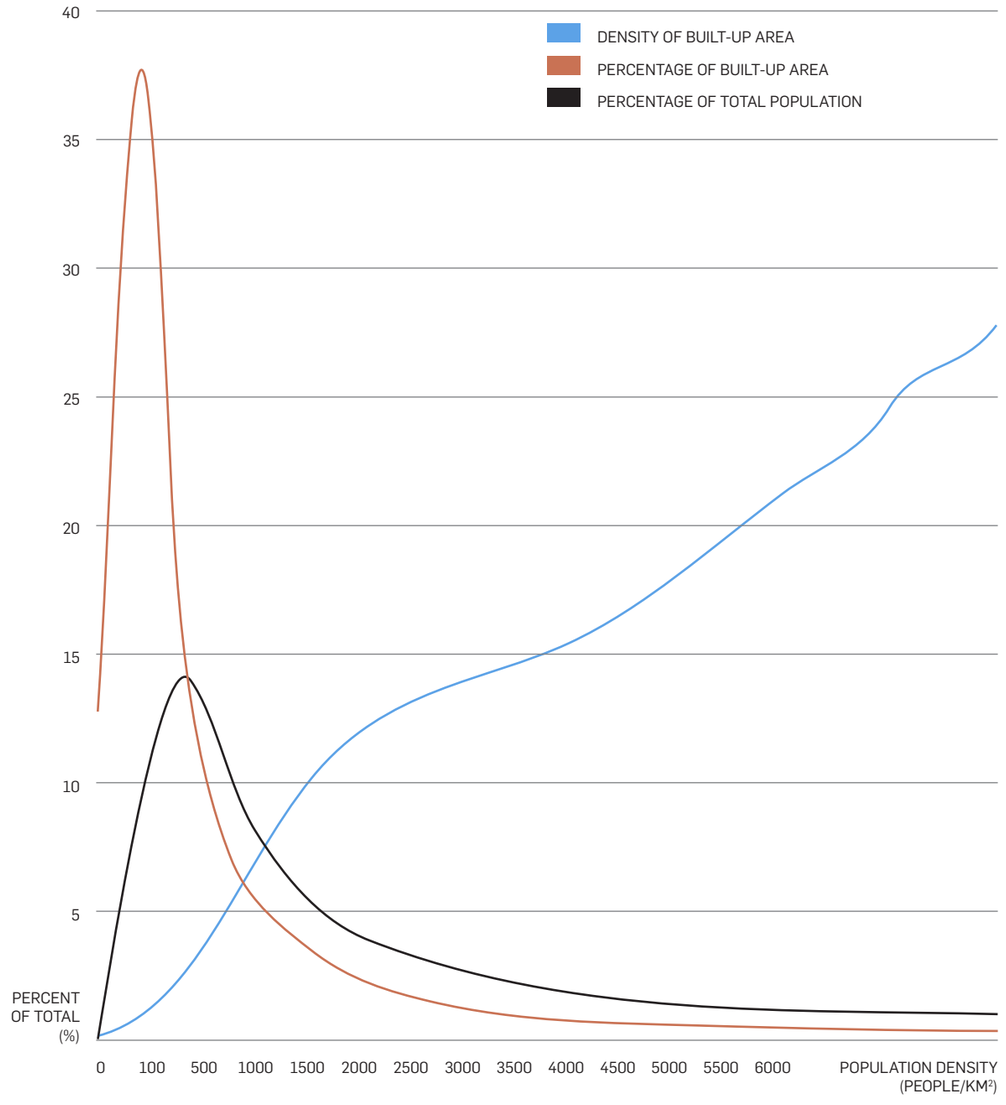


FIGURE 66: POPULATION DENSITIES AND PERCENTAGES OF POPULATION AND BUILT-UP AREAS.

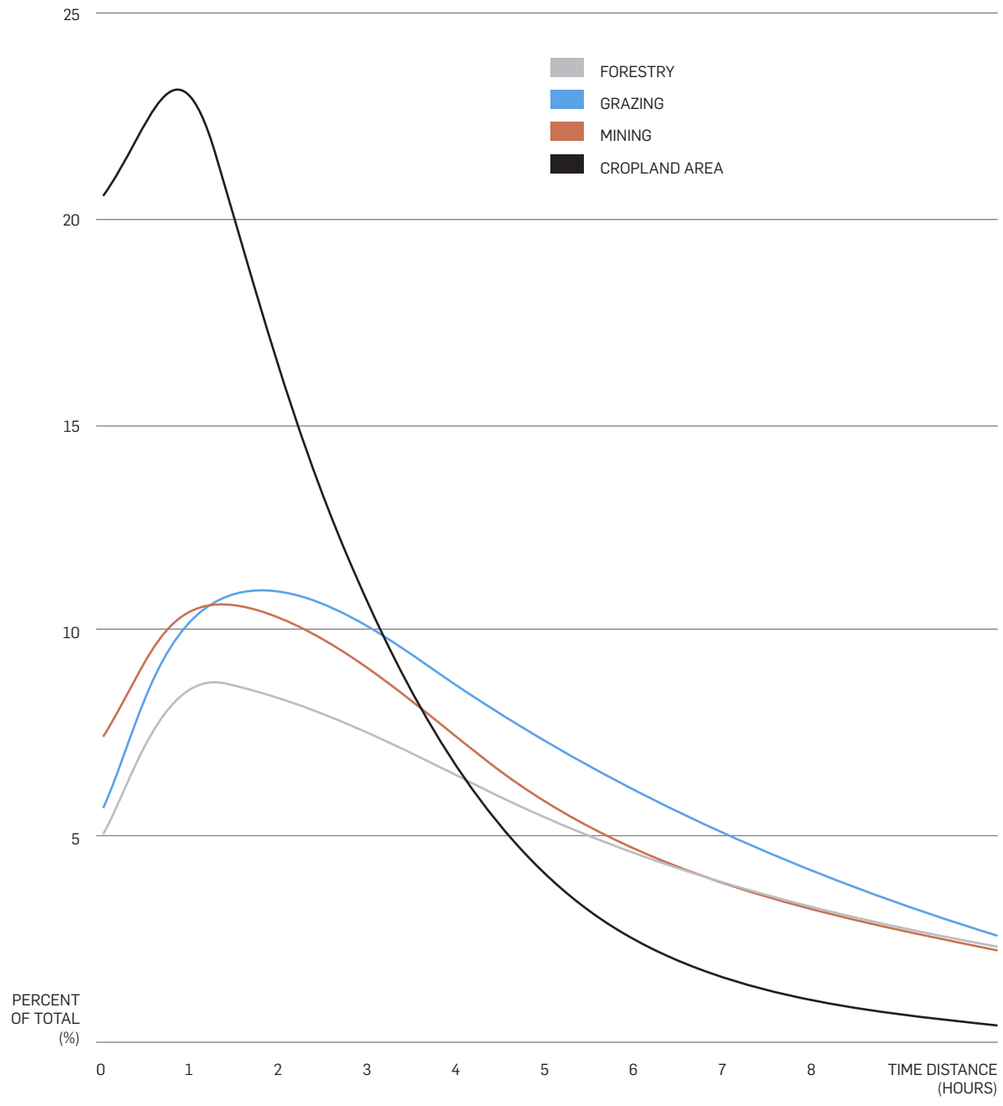


FIGURE 67: ACCESSIBILITY OF PRIMARY PRODUCTION OPERATIONS FROM MAJOR AGGLOMERATION ZONES.

CHAPTER 09:
ELEMENTS OF GEOGRAPHICAL ASSOCIATION

THE ASSEMBLY OF COMPOSITE GEOGRAPHIES

In the previous parts, I have introduced the spatial concepts and cartographic categories of agglomeration, operational, hybrid and remote landscapes, as alternative conceptualizations of the geographical organization of world urbanization. I have already discussed how these landscapes should not be considered in isolated, but as part of the dynamic process of geographical interdependency constitutes the essence of urbanization. These composite geographies of urbanization constitute landscapes of possibilities that are activated within this process, through multi-scalar assemblies. The task of these chapter will be to examine exactly how this process of geographical association is unfolding. In order to start unpacking this condition, I return to the question of the Hinterglobe. I start with the following hypothesis:

Instead of trying to define particular, one to one, relations between agglomerations and their hinterlands, the concept of the Hinterglobe suggests the investigation of the modes and sequences of operationalization of the multitude of operational landscapes, mobilized by the process of urbanization: The Hinterglobe consists of the sum of operational landscapes, landscapes directly or indirectly connected to the primary sectors of the economy, which however host operations that are only part of broader assemblies, assemblies which involve also areas of agglomerations, not only as areas of final consumption, but also as part of seamless production processes. In sum, the Hinterglobe can be considered as a discontinuous matrix, equipped to support operations and construct externalities associated with the primary sectors of the economy. The Hinterglobe is thus a meshwork, rather than a network, or delineated area, a meshwork embedded within a complementary meshwork of agglomeration landscapes.

Although the Hinterglobe can be considered more and more as a totality, its landscapes are only activated sporadically according to various operational ecologies. As a result, the Hinterglobe cannot be considered independently of the activation and configuration of agglomeration landscapes: In fact, both agglomeration landscapes and operational landscapes, emerge out of the discontinuous operationalizations of a largely continuous fabric, a fabric that increasingly covers the whole world. Operational landscapes of primary production are connected, through the activation of operational landscapes of transportation, to agglomeration landscapes which can be again be part of broader assemblies with operational and agglomeration

landscapes elsewhere. This assembly constitutes a continuum, a continuum which however is full of asymmetries in the distribution and activation of its multiple operations.

Before I embark upon the examination of how this meshwork has unfolded over the past two centuries, I will first try to unpack a series of parallel processes that have both been enabled, and co-produced through the construction of the Hinterglobe. Through the process of urbanization, the emergence of the Hinterglobe is part of the generalization of a condition of geographical interdependency. The generalization of this condition has been tightly interwoven with a series of processes that have struggled to establish, or benefit from the continuities and discontinuities of the composite geographies of urbanization, and have been closely associated with the concept of globalization, broadly defined. As a result, understanding the development of the following processes is important for understanding the process of the construction of the Hinterglobe:

- First, the development, diffusion and densification of transport infrastructures has been fundamental in generalizing the potential for physical connectivity, through a process that I frame as 'infrastructural convergence'.

- Second, the increasing trend towards commodification, both of material and of labor processes, has generalized the conditions of exchange and abstracted the conditions of labor.

- Finally, the horizontal, flexible organization of production systems, through the emergence of global production networks and global commodity chains, has introduced additional degrees of geographical complexity and interdependence, unprecedented to the preceding, vertical models of capitalist production.

INFRASTRUCTURAL CONVERGENCE

The role of connectivity infrastructures has always been recognized as paramount in the process of globalization and capitalist development. As Bunker notes:

> The critical link in the nexus between naturally produced ecosystems and geological processes that supply the inputs necessary for industrial production and absorb the waste from these production processes and the capitalist world economy is transportation.[41]

What needs to be highlighted here however, are certain specific characteristics of the development of transportation infrastructures. The first has to do with the structure of the networks and with the notion of connectivity; the second has to do with the notion of efficiency; and the third has to do with the notion of accessibility.

The development of transport systems has evolved in parallel with the various stages of industrial revolution.[42] Steamships, canals and eventually railways characterized most of the 19th century and restructured drastically the landscape of accessibility.[43] What is important to note here, is that this initial stage of 'industrialization' of transportation was characterized by a selective extension that started to build a rather 'linear' systems of nodes and lines: Steamships initially connected ports with rather poor inland accessibility, thus creating a series of bottlenecks that were initially addressed by the expansion of canals, but most importantly by the development of railway networks. Both canals and early railways however, were still characterized by a rather 'linear' topology, affecting drastically the connectivity of areas close to their nodes of access, a topology that introduced a rather hierarchical asymmetry in the connectivity and accessibility of the geographic terrain. Moreover, the initial development of railways was also structured through a nodal, regional basis, with railway lines selectively connecting important cities – nodes, with each other, and at a second level, with their regional hinterlands. A tree like structure could be easily read in these cases, not only in the development of railways, but also in the development of the road networks, which again served predominantly the connection of central settlements to their regional hinterlands, and eventually to other central cities (as for example through the development of the turnpike roads in the UK).[44] It could be argued that this combination of regional, tree-like networks, with hub and spoke interregional connections, closely replicates the typical interpretation of geographical organization as a set of hierarchically interconnected regional units as presented in the diagram of figure 22.

However, already at the beginning of the twentieth century, the densification and diffusion of transportation networks across the land surface, was starting to create more continuous patterns of connections, which resembled less tree-like or hierarchical networks and more meshworks. Not only were the railway systems reaching a mature phase, during which regional systems were merging into larger and larger assemblies, but the development of the automobile generalized its much more flexible topology over the organization of surface transportation networks.[45] This process could be characterized as a process of gradual convergence of transport infrastructures.

This process reflected a highly influential moment in the process of nation state building. Graham and Marvin characterize it as the unfolding of the integrated infrastructural ideal:[46] During a period of almost a century, up until the mid-20th century, national states became decisive agents in rolling out, interconnecting, or upgrading a multitude of connectivity infrastructures, from transport, to energy and telecommunications, in order to construct a homogeneous and seamlessly serviced unified national territory. This process of integration unfolded not only through the construction of new networks and the interconnection of previously fragmented physical infrastructures, but also through the standardization of the various (previously fragmented) networks that this rescaling required, as well as the consolidation of the various agents behind them, either through the merging of providers and operators, or through their nationalization. This process of infrastructural convergence is shown in figure 68, which monitors major phases in the development of the US railway network, from a system of regional hinterlands to a continental meshwork.

This process of infrastructural convergence continued to unfold during the second half of the 20th century, this time integrating transnational territories into continental surfaces, a tendency that promised the generalization of the integrated ideal. At the same time however, a second contradictory set of practices started introducing new asymmetries upon the connectivity landscape: With the increasing privatization and deregulation of infrastructure services, and the overall collapse of the integrated infrastructural ideal, what often characterized the further development of connectivity infrastructures, were selective enhancements that aimed at the exploitation of the specific advantages of particular territories. This condition, started to largely erode the homogeneous landscapes that the integrated ideal was trying to construct, through what Graham and Marvin characterize as a process of 'splintering': The fragmentation and selective interconnection of specific territories, through their premium equipment, which differentiated them and eventually detached them from their surrounding areas.[47] These splintering processes, that often operated upon already heavily equipped landscapes, signaled an era not of infrastructural expansion, but rather of infrastructural modification and in specifically selective intensification. This process of selective intensification can be conceived as part of an effort to create a series of interconnected premium infrastructural enclaves, through which the efficiency of infrastructural systems could be harnessed.

The efficiency of transport systems however is a rather multifaceted issue: A typical interpretation of transportation evolution is associated with the effects of speed upon the compression of the space - time continuum. Indeed, the process of globalization

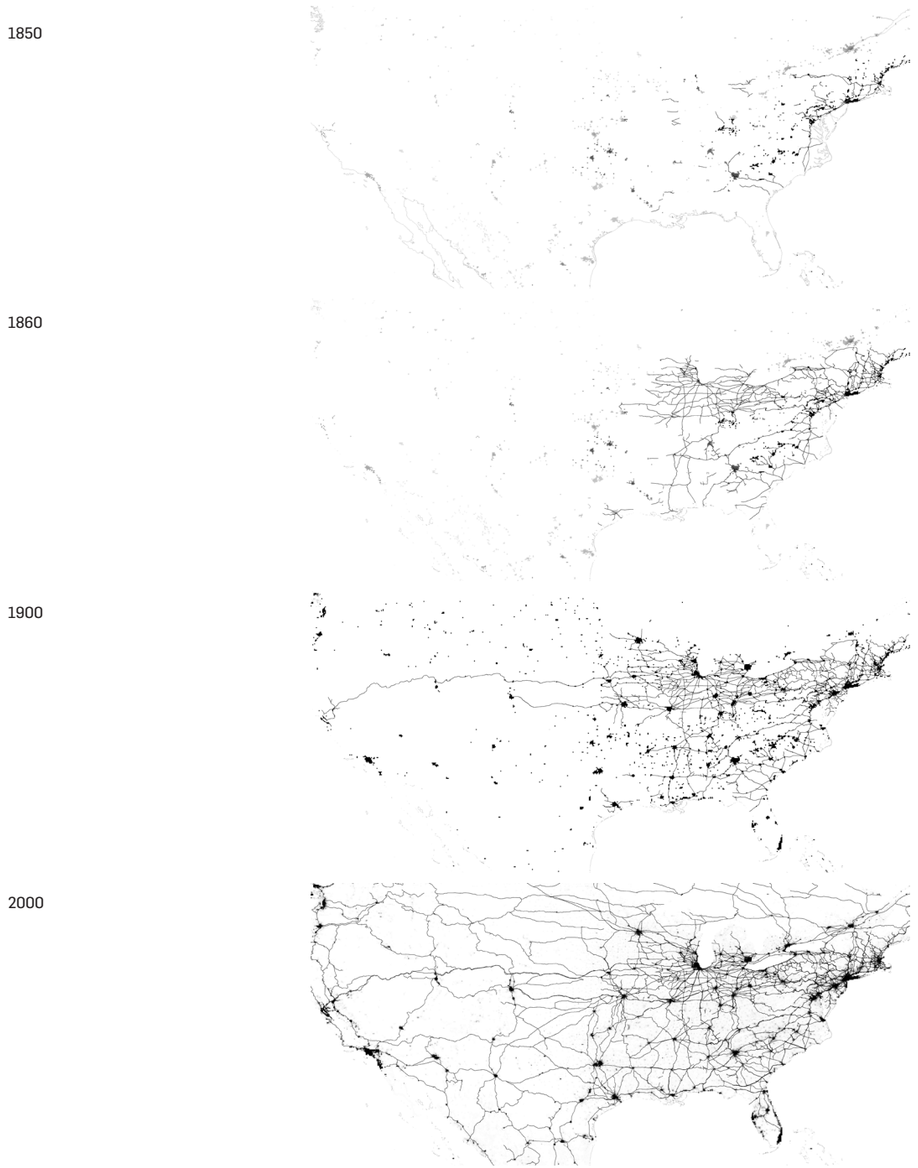


FIGURE 68: THE DEVELOPMENT OF THE US RAILWAY NETWORK FROM THE MID 19TH TO THE 20TH CENTURY.

has often been associated with the image of a 'shrinking' planet, through the ever increasing speeds of transport and the upscaling of the range of transport systems. However, the aspect of velocity is not the only measurement of efficiency in transport systems, especially in relation to the transportation of the rather bulky materials that are associated with the construction of the Hinterglobe. What seems to be equally and perhaps even more decisive in relation to the development of the Hinterglobe, is not speed, but rather capacity, the volume that can be transported, and in specifically the cost of transporting this volume. As a result, a parallel narrative to the 'shrinking' world, a narrative with a temporal connotation, can be constructed by charting not the evolution of the speed of transport, but rather the volume transported. This narrative could be unfolded around what could be characterized as the 'volumetric transshipment effect': The process (and effects) of the exploding increase in the capacity of infrastructural systems to transport seamlessly larger and larger volumes of matter, over longer and longer distances, thus transforming the material composition of the earth's surface in drastic ways. Within this context, a series of observations should be made:

First of all, different modes of transport relate in very different ways to the attributes of scale, speed and volume, and have evolved in very different ways in relation to these attributes. Maritime freight, by far the most cost efficient large-volume and long-distance transport mode (due to the physical properties of water), has evolved the most in terms of capacity, followed by rail infrastructures, the predominant mode of overland freight transport. As Rodrigue notes:

> The importance of maritime transportation in global freight trade in unmistakable, particularly in terms of tonnage as it handles about 90% of the global trade. Thus, globalization is the realm of maritime shipping...[48]

On the other hand, road transport has been by far the more flexible way of medium-distance transport, and air transportation has lately emerged as a dominant mode of transporting high-value, but small-volume artifacts. But what has mostly characterized the recent developments of infrastructural systems, has not been so much the respective advancements in every respective mode, but rather their intermodal synergies: In fact, several of the processes of 'splintering', unfold exactly around the advantages emerging out of the efficient configuration and coordination of multiple infrastructural modes and layers. Containerization has been perhaps the most prominent development in the process of intermodal integration, mostly enabling the seamless interconnection of land and maritime networks.

At the same time however, different modes of transport and their associated imovable forms of land equipment have very different 'conformities' to specific terrains, as well as specific spatial structures, both of which could be interpreted through two different notions of accessibility:[49] The first notion could be characterized as topological, or nodal accessibility, and is calculated over a system of nodes and paths, or a network. It can be easily related to infrastructural systems that are highly depended upon their terminals (airports or ports). The second notion, could be characterized as contiguous accessibility, and refers to the conditions of accessibility over a continuous surface. This conceptualization is more related to systems, which have either the density, or the flexibility to spread over a contiguous area. Maritime or air transport for example, utilize a continuous medium (atmosphere or sea), but are bound to very nodal terminals, or gateways (the port and airport), which (not surprisingly) correspond to some of the most costly and fixed types of infrastructures. Unless connected efficiently to other modes of land transport, which can spread over the landscape, these systems can only offer limited, nodal access. On the other hand, road and rail systems operate upon an often topographically discontinuous terrain (with mountains, rivers, etc interrupting land surfaces), but can lead to much more diffuse surface conditions of accessibility. While a linear or tree-like railway network, with limited density, can also be considered to operate over a network rather than a surface, when adequately densified, as already discussed in the first part, the accessibility generated by this dense meshwork can be considered a generalized attribute of a whole surface, something which can be much more the case with a road network.

Based on this conceptual distinction, we can roughly summarize the development of transport systems as the continuous interplay of the two: The initial expansion of transport infrastructures, had regionally a limited effect on surface accessibility around a central agglomeration, and inter-regionally, or inter-continentally mostly had a nodal accessibility effect. This was often interpreted as a connection between a node with a continuous hinterland (the one around the agglomeration), and a set of discontinuous hinterlands (the areas connected through a network most likely overseas). Accordingly, the integrated infrastructural ideal, can be viewed as a way to equalize the surface conditions of accessibility over the national territory, while the splintering effect as a way to reconstruct nodal conditions of accessibility, often curved out the more generalized surface condition.

Generalizing this process, it could be argued,that an initial condition of expansion is directly connected with an initial introduction of a nodal accessibility, which can then be generalized through the densification and diffusion of transport infrastructures

over a surface condition. After a continuous condition of surface accessibility is introduced, further asymmetries can be reintroduced in the from of additional layers of nodal accessibility, this time over an already equipped landscape, though the selective intensification, or enhancement of certain of its attributes. The phases of the initial introduction of the nodal accessibility, and the subsequent diffusion of the surface condition of accessibility, can both be considered as part of a stage of infrastructural expansion; the subsequent re-introduction of nodal accessibility through the modification, or enhancement, of an already equipped landscape of accessibility can be considered as part of a stage of infrastructural intensification.

These stages do not have to happen in a historic sequence, since as it was already discussed, not only because they can unfold across different parts of the planet, but also because they apply differently to deferent modes of transport. Infrastructural systems can construct nodal conditions of accessibility in one place and surface conditions in another, or even more often, nodal conditions in one scale and surface in another, but also nodal conditions in one mode and surface in another. The multi-scalar, multi-modal interplay of these two processes characterizes diachronically the construction of the planetary infrastructural landscape. In fact, what the densification and overlaying of multiple infrastructural systems is generalizing, is not the conditions of accessibility per se, but the potential for constructing differentiated conditions of accessibility according to different operations. Under the conditions of globalized urbanization, this potential is becoming generalized. While initially the hinterland condition was bound to a certain structure of infrastructural systems (for example the canal, or the hierarchy of networks around the city) which it often replicated in the structure of the associate operations, the generalization of the equipment of the ground with dense connectivity infrastructures, also generalizes the possibility for multiple and unpredictable operationalizations of operational landscapes.

COMMODIFICATION

Like the development of a global system of transport infrastructures, the process of commodification has been a central feature in the process of construction of a unified (though asymmetrical) system of exchange, and as such, one of the most important elements of capitalist development. The concept in itself has been rather contested and certainly its nature cannot be grasped within the context of this work.[50] Still, certain aspects of the process of commodification need to be unpacked since they play a fundamental role in the construction of the Hinterglobe. In an attempt to offer a review of critical approaches to the concept, Prudham defines commodification as:

> ...interlinked processes whereby: production for use is systematically displaced by production for exchange; social consumption and reproduction increasingly relies on purchased commodities; new classes of goods and services are made available in the commodity-form; and money plays an increasing role in mediating exchange as a common currency of value.[51]

Prudham further defines two commodification processes, which in a way resemble the dual processes of expansion and intensification that I have discussed in the development of transport infrastructures. The first processes is defined as 'stretching' and it refers to the condition in which commodification processes expand in scale across greater and greater distances. This could be interpreted quite simply as a 'horizontal', scalar transformation of a market regime over larger and larger areas. The second process, framed as 'deepening', refers to the application of relations of commodified exchange upon more and more categories of artifacts, tangible and intangible. In this way, the rule of exchange value is applied to the provisioning of more and more goods and services, a process which can be conceptualized as a vertical one and can extend the domain of commodification without geographical expansion, just by intruding to the exchange circuit of more and more commodities which were previously governed by other types of relations.[52]

The two processes of stretching and deepening should not be considered as separate, but rather as part of a continuous loop, which can very well be used to explain the process of the construction of geographical interdependencies: Within this context, natural elements (land, resources, etc.), labor, as well as all products of human labor, movable and immovable, tangible and intangible, can be commodified, with these processes reinforcing each other. The commodification of nature (e.g. land) is connected to the commodification of labor (through the exclusion from means of subsistence associated with natural elements), which is connected to the increasing reliance of purchasing power for obtaining goods and services, which in turn expands the scale of commodification, both vertically and horizontally (stretching into new lands and deepening into new products and services) and son on and so forth.

Before discussing the importance of the stretching and deepening of commodification in the construction of the Hinterglobe, it is important to note an additional attribute of commodification: What can be broadly defined as a process of abstraction. Abstraction can be theoretically considered as an inherent characteristic of commodification, since the process reduces various use values of completely different elements and services to the (monetary) units through which they are being exchanged. But a more

particular interpretation of abstraction is specifically relevant here. This interpretation emphasizes the homogenization of qualitative differences, both across functional spectrums, and across a spatial ones. Building upon Cronon and Robertson, Castree defines abstraction as:

> ...a process whereby the qualitative specificity of any individualized thing... is assimilated to the qualitative homogeneity of a broader type or process... functional abstraction involves looking for real and classifiable similarities between otherwise distinct entities as if the former can be separated out from the latter unproblematically. Functional abstraction is a precondition for a second form of abstraction, which is spatial. This involves any individualized thing in one place being treated as really the same as an apparently similar thing located elsewhere.[53]

This dual process of abstraction is central to the transition from the regional hinterland to the system of operational landscapes that construct the Hinterglobe: In the regional hinterland, it can be largely assumed that the quality of products is connected to the particular area of production, with different hinterlands supplying qualitatively different products (of the same category) to their respective centers of consumption. The condition which characterizes the Hinterglobe however, is that of a generalized supply and circulation of qualitatively homogenized 'types' of products, which are sourced from various locations of production, often intermixed, but in any case obscured in terms of their particular conditions of production, and consumed in a multitude of consumption centers. The different commodities are generally not categorized based on the location or particular conditions of production, but rather based on a generalized classification that standardizes generic characteristics of quality.

William Cronon's discussion of the process of abstraction through the different stages of the packaging and repackaging of grain transported through Chicago, is quite elucidating:[54] The process emerges out of a combination of factors that have to do with the scale and intensity of farming, the technologies and process of transport and storage, as well as with the regulatory apparatus necessary for implementing the standardization of grain types. Through this gradual transformation, grain that used to be sourced, packaged and sold at the basis of individual farms, was mixed through bulk systems of transport and storage and was only classified based on generic indicators of quality, which cut horizontally across the locations of farms. Farmers just had to ensure that they would comply with the standards of a certain grade, and after the grain left their farms, it was impossible to distinguish it again from grain of the same grade produced at other farms. For Cronon, this constituted a monumental change, one that would reshape the trade of commodities forever:

> It was a momentous change: as one visitor to Chicago later remarked... "It dawns on the observer's mind that one man's property is by no means kept separate from another man's.[55]

The functional and spatial abstraction is one of the major characteristics of commodity markets, and it applies even more directly to the trade of raw materials which are found among the basic commodities: The majority of agricultural products (for food or raw materials), ores and fossil fuels are long commodified and exchanged as particular types of commodities, with their price often defined at the global scale: grains, metals, oil, cotton, coffee, different categories of lumber, even livestock, are traded based on their generic characteristics, although produced across a wide range of specialized, but differentiated operational landscapes. It is useful to try and get an initial sense of the various categories of different commodities. Commodities could be classified according to their stage of the production process, or their particular nature. In terms of their stage in the production process they could be raw materials (basic inputs to further processing), semi-finished products (already processed or manufactured products, which however are not meant for final consumption but as inputs for further manufacturing processes), and manufactures goods (the finished manufactured products that reach consumer markets). According to the nature of their economic sectors they could be grouped as agricultural commodities (for food and raw materials), energy commodities, metals, chemicals, wood and paper commodities, construction materials, manufacturing products.[56]

Within this context, two factors could be highlighted as instrumental in the process of the continuous restructuring of the Hinterglobe: The first is the friction between the common and globally defined price of commodities, and the very different contexts in which they are produced, and as a result the very different production costs according to the various combinations of the factors of production. The second and most relevant to this study, is the different geographical dependencies, which characterize the various interconnected processes involved in the production of commodities, in short where the various operations in the stages of commodity production and circulation are located and why. In the remaining part I will try to understand how different commodities can be analyzed as part of the broader geographical assemblies in which they are being produced and circulated.

COMMODITY CHAINS

No matter how they become classified, literally all commodities are part of broader production, processing and circulation operations, which are directly connected with the social and spatial division of labor. The brief and selective summary of certain characteristics of infrastructure systems and of the nature of commodities, has been important in order to start unpacking how the production process of the multitude of commodities, is connected both to the configuration of agglomeration landscapes and operational landscapes. In terms of the relation between cities and hinterlands, this question has been addressed in a rather simplistic way. The city has been considered as the de-facto site of manufacturing of finished and semi-finished products, as well as the center for consumption, while the hinterland has been considered the site of raw material production, and of consumption of the manufactured products produced in the city.

This conception of geographical interdependency, although indeed reflecting in a very general way the overall spatial division of labor between operations which are agglomerated and operations which are not, is problematic for two reasons. The first reason has to do with the spatial abstraction, in which particular spatial units are thought to be exchanging products with each other: The city (as a spatial unit), trades with the hinterland (another spatial unit). This has been a mis-conceptualization, which is quite similar to the common state-centric view, which challenges a more robust analysis of patterns of international trade: States are again considered to be distinct and separate spatial units trading with each other. However, the fact is that in reality exchange is happening not between spatial units (the city and the hinterland, cities with each other, or states with each other), but between certain actors (corporations, individual consumers etc), operating through specific geographical configurations. Having said that, the relationship between agglomeration landscapes and operational landscapes should be conceived as a relation between situated processes, and not between specific areas.[57]

Following from this abstract conceptualization, the second reason has to do with the simplistic view suggesting that the processes connecting city and hinterland, are rather linear and can be easily delineated in space based on the rough distinction these two units suggest. This could be indeed the case in a condition characterized by a very simple division of labor, where for example the farmer would be responsible for producing food, which then would be sold in the city, while the urbanite would be responsible for manufacturing tools that the farmer would be able to use. Indeed, the hinterland, as the basis of initial extraction and cultivation, can be considered as the initial source for all food and raw materials, while the city, as an agglomeration of population, the main center of consumption. But these are just the two very ends of production processes that have gradually become extremely complex and elongated: As I have already mentioned, the advanced division of labor and its associated spatial expression, has added several steps in the production process of very commodity, steps which include multiple actors and mobilize and produce various landscapes and forms of equipment, in short various forms of geographical organization.

My suggestion is that the configuration of agglomeration landscapes and operational landscapes can be understood through the way they are actively part of the configuration of these elongated processes that operationalize them. Over the past decades, two related paradigms have tried to unpack the complexities behind these commodity production processes: The global commodity chain framework (GCC) and the global production networks framework (GPN).[58] Both frameworks are primarily interested in understanding how global industries of various sectors are organized and how actors, territories, institutional and regulatory frameworks come together in the production of capitalist goods and services. Both approaches frame the production process as an input- output process, in which materials are processed through a series of stages until they reach consumption. While both approaches are strongly interrelated, the global commodity chains approach is more focused in unpacking the structure of the chain, and not so much focused in understanding the structures of the corporations involved in these global networks (as is the global production networks framework), and as a result it is more relevant for our purposes. Moreover, although both approaches are a response to the need for unpacking the emerging complexities of the contemporary globalized systems of production, the global commodity chains framework can be also generalized and extended in order to study past forms of economic interaction, which were also based upon a high degree of commodified exchange.

In fact, Wallerstein's early work, which introduced commodity chains as a concept and framework of study, addressed the formation and transformation of commodity chains in the world economy before the 19th century, through the paradigm of ship building.[59] In these studies, Wallerstein offers a sharp definition of commodity chains:

> Let us conceive of something we shall call, for want of a better conventional term, 'commodity chains.' What we mean by such chains is the following: take an ultimate consumable item and trace back the set of inputs that culminated in this item – the prior transformations, the raw materials, the transportation mechanisms, the labor input into each of the material processes, the food

> inputs into the labor. This linked set of processes we call a commodity chain. If the ultimate consumable were, say, clothing, the chain would include the manufacture of the cloth, the yarn, etc., the cultivation of the cotton, as well as the reproduction of the labor forces involved in these productive activities.[60]

It is important to highlight that the global commodity chain framework does not only refer to production processes, which are internal to the firm, or firms associated with the process. In this way it is not just limited to interpreting the rather linear industrial ecology behind a particular production process. Rather it is interested in uncovering the broader social, technical and economic conditions, through which the whole process of commodity production is accomplished. Processes of social reproduction, or environmental issues, can thus become part of this extended understanding of commodity chains. Wallerstein conveniently stops the interrogation of the extents of the chain to the relations of sustenance of the labor force, but we can also assume that the chain can be expanded in several directions: Raw materials coming from the land need to be produced by nature, the means of transport mediating the connections of the various stages of production need to be produced and put in place, which eventually leads to a meshwork of synchronous, or previously assembled commodity chains. Theoretically, the chain can be infinitely expanded, as every process is directly connected and interconnected to millions of others. As a result, the focus of this research is not on the exhaustive reconstruction of any given chain by following the various flows, a task which would be soon rendered impossible and dependent upon the arbitrary construction of a system boundary. But rather, the understanding of the geographical interplay of the various combinations of the factors of production and of the fact that these factors are themselves socially constructed and part of longer processes. As Wallerstein notes, the study of commodity chains, especially in a historical perspective, can reveal:

> (1) the geographical distribution of operations; (2) the forms of the labor force encompassed by the chain; (3) the technology and relations of production; and (4) the degree of dispersion / concentration of operations within each site of production.[61]

For the purposes of this study, the relevance of understanding the structure of commodity chains is somehow inverse: My goal is not to unpack the complexities of commodity chains, but through their shifting configurations to understand the processes behind the construction of the Hinterglobe. In these processes, all of the above elements play an important role, and I will try to frame them as part of the conditions of geographical organization. However, the focus will be on the changing geographic distribution of operations, as well as on the fundamental question of dispersion and concentration. As a result, certain commodity chains have more relevance than others. In what follows, I will try to define the characteristics and shifts, which connect them to specific elements of geographical organization.

Returning to Wallerstein's generic scheme, it could be argued that most of the commodities that support contemporary material life, include the interweaving of several commodity chains across several sectors of the economy: The food sector for example, involves not only agricultural commodity chains (for the cultivation and initial processing of agricultural products), but also wood and paper commodity chains (for packaging). The agricultural commodity chains are in turn also depended upon chemical commodity chains and manufacturing commodity chains and so on and so forth. There are potentially numerous ways in which commodity chains can be structured and restructured, and how they can be interwoven with each other, something which makes the exact monitoring of commodity flows a rather impossible task. What could be however defined with a relative accuaracy, is the various dependencies of certain types of operations related to the commodity chains with certain types of composite geographies.

COMMODITY CHAINS AND THE COMPOSITE GEOGRAPHIES OF URBANIZATION

In the previous chapter, I introduced two plus two distinct types of composite geographies, the main categories of agglomeration landscapes and operational landscapes, and the landscapes that are defined by their relative combination or absence, hybrid landscapes and remote landscapes. My hypothesis is that commodity chains connect several instances of these landscapes in certain sequences. No matter where these landscapes are, particular operations are always bound to particular composites and in particular associations of composites (refer to the relational matrix of figure 39). Defining first the types of landscapes associated, and afterwards where their possible configurations could be, introduces an inverse approach to unpacking the complexities of the operationalization of the planetary terrain.

As already discussed, the different composite landscapes are activated according to certain types of operations that relate to the externalities they present. However these landscapes are not directly produced, but also depended upon preexisting combinations of the multiple elements of geographical organization. In the previous chapter, I outlined these elements of geographical organization as: elements of the natural environment; elements of the equipment of the ground; elements of

demographic distribution; regulatory and institutional elements both of the public and private realm. In what follows, I will try to offer a summary of the main dependencies and interrelations with these elements, which can be connected to the specific nature of different commodity chains:

- First of all, agricultural commodity chains, besides land and labor, also require the input of a series of chemicals (fertilizers), as well as specific equipment, both immovable (irrigation systems) or movable (tractors and other machinery). The primary commodities produced (corn, soy, cotton etc), are often inputs for further processing, either for food, or for manufacturing (cotton).[62] The transportation patterns of agricultural commodity chains are very much depended upon the various degrees of perishability and the seasonality of harvesting season. As a result storage becomes an important factor in smoothening the temporal asymmetries of transportation. Like most other bulk commodities, the majority of agricultural commodities is transported by ship, followed by rail and truck.[63] As a result, agricultural commodity chains, and especially their initial stages of extraction, are directly connected to the production and activation of some of the most distinct operational landscapes. Cultivation operational landscapes are highly depended upon the availability of extended amounts of land characterized by specific combinations of elements of the natural environment (soil fertility, slope, growing seasons, and irrigation), and large scale investment in dedicated infrastructure (artificial irrigation, soil and slope improvements), in order to be able to achieve economies of scale, which are also reflected upon the storage and transportation facilities. The later can often benefit from the externalities that emerge out of industrial clustering and can develop into zones of concentration within the extended agricultural operational landscapes. Eventually agricultural commodity chains can become inputs for further processing from various manufacturing sectors (food, textile industry, rubber industry, etc.) and thus connected to facilities that can benefit not only from industrial clustering, but also from urban agglomeration externalities.

- Metal and energy commodity chains operate through the extraction, initial processing and transportation of minerals (aluminum, iron, zinc etc) and fuels (oil natural gas), which are on the one end directly connected to very specific deposits, and on the other become inputs for various manufacturing operations.[64] Unlike agricultural commodities, metal and energy commodities are seasonally constant and nonperishable, but they are even more dependent upon efficient modes of bulk transport. Since the geographic zones of location of deposits are often very remote, or isolated, they need to be transported over long distances towards the major zones of processing or manufacturing. Thus, metal and energy commodity chains depend heavily upon shipping and rail transport, but are also transported through systems of pipelines, which can ensure a steady flow over theoretically unlimited distances. As a result, metal and energy commodity chains are also linked to the configuration of very particular extractive operational landscapes. Unlike the cultivation operational landscapes however, whose physical properties demand their horizontal configuration, resource extraction operational landscapes are often characterized by a vertical, and not horizontal, exploitation of the ground. Their zones of concentration are thus much more nodal in relation to agricultural cultivation landscapes. This nodality is enhanced by the externalities of industrial agglomeration, which often characterize their processing activities creating additional zones of concentration. Similar to the agricultural commodity chains, while their initial operations are connected to very specific operational landscapes of extraction and circulation, their final stages link them to the manufacturing sectors which are often clustered within agglomeration landscapes, in order to take advantage of urban and industrial externalities.

- The wood commodity chains, partially blend characteristics from both agricultural and metal and energy commodity chains: They depend upon the efficient exploitation of forestry landscapes, which are land extensive like most of cultivation landscapes, but are not so sensitive to questions of seasonality, or perishability and can support a more steady flow of supply. Moreover, forestry is mostly involved in the harvesting of biomass, and not in its production through cultivation, and as a result truly stands between agriculture and resource extraction. Like mining, forestry is also very depended upon efficient bulk transportation, especially since due to the economies of scale it relies upon the existence of dense and extended forest areas, which are also rather remote and isolated from agglomeration areas and existing networks of transportation.[65] Wood products are connected both to the paper and the packaging industry, as well as to the construction industry, which makes it tied to operations particularly connected to the versatility of manufacturing processes and the density of constructed environments that characterize agglomeration landscapes.

- Finally, the manufacturing commodity chains are connected with the production and circulation of semi-finished and finished products across various industries, from food, textiles, plastics and chemicals, to machinery and electronics. Unlike the agricultural, energy, metals and wood commodity chains, which transform products harvested across vast production landscapes to certain inputs that are connected to agglomeration landscapes, manufacturing commodity chains tend to operate completely through agglomeration landscapes, the externalities of which they are particularly good at harvesting. Although their reliance upon, both extractive operational landscapes, and transportation operational landscapes, is paramount, it is their configuration within and between agglomeration landscapes and its transformations over the past several decades that has attracted most of the attention of studies of globalization and has been the main focus of unpacking the associated changing role of cities in globalization.

THE INVISIBLE GLOBALIZATION OF OPERATIONAL LANDSCAPES

As a result, while contemporary debates on globalized urbanization, have overemphasized the restructuring of manufacturing commodity chains and the associated international division of labor, the globalization of agricultural, metal and energy, and wood commodity chains has remained rather unnoticed. Although directly interconnected, the globalized restructuring of agglomeration landscapes has overshadowed the interrelated globalized restructuring of operational landscapes. This parallel explosion that has largely remained unnoticed, has certain very specific characteristics, quite different from the discourse on globalization that has dominated the past two decades. Bunker and Ciccantel who have worked extensively in elucidating this hidden aspect of globalization – the globalization of primary economic sectors, approach this condition through the different ways in which extractive sectors and manufacturing sectors achieve economies of scale.[66]

Manufacturing sectors can achieve economies of scale by clustering in agglomeration landscapes and in general taking advantage of their externalities, where the total capital, sunk in infrastructure and technology, can be shared, or become part of network or spillover effects. On the contrary, extractive economies cannot exploit these advantages. The main way of continuously achieving economies of scale is through the incorporation of new resource areas into their reach, in short through expansion. As these resource areas are often highly dispersed, extractive industries eventually need to expand in terms of their scalar operations, by placing additional amounts of fixed capital in space. Through this process:

> Extractive economies thus become more dispersed, while productive economies become more agglomerated[67]

In terms of the framework of possible externalities I have introduced, this could be rephrased as follows: Extractive economies can only become more dispersed in order to take advantage of possible externalities, while productive economies can also become agglomerated in multiple ways. This impossibility of extractive economies to take advantage of the urban and industrial externalities of agglomeration, has of course to do with the dispersed nature of distribution of raw materials on the earth's surface, and with the often land intensive nature of these operations. With the gradual exploitation of the nearest sources of raw materials and optimal conditions, extractive industries need to eventually expand more and more their reach, in order to exploit untapped resources, by turning previously remote landscapes into operational landscapes. This process introduces an additional dynamic between extractive economies and productive economies is revealed: As Bunker and Ciccantel suggest:

> Seeking to resolve the contradiction between economies of scale and the cost of space, capitalists and agencies of capitalist states develop and implement cost-reducing, scale-dependent innovations in the technologies, infrastructures, and social organization of transport… Such innovations both cheapen access to raw materials and increase their available volume and variety, thus enabling a new cycle of even greater economies of scale in production. These then reproduce the need to procure more raw materials at even greater distance, thus reiterating and expanding previous cycles… Each cyclical reiteration of these processes (1) expands the space in which national firms procure raw materials, and thereby (2) stimulates development of stronger, faster, more capacious technologies – ships, trains, and loading equipment – and larger, more extensive infrastructure – ports, rail-lines, and warehouses – for their handling and transport, which also (3) reduce the cost of exporting products and so expand the space in which each national economy can competitively market its products and, thus, (4) advance the globalization of the world economy while expanding its reproduction of capital.[68]

In this way, the restructuring of operational landscapes is revealed as an active process in the configuration of agglomeration landscapes through a continuous process of geographical expansion and concentration. In what follows, I will try to position this cyclical process that Bunker suggests, within a broader periodization of the relationship between agglomeration landscapes and operational landscapes.

CONCLUSIONS:
URBANIZATION AS GEOGRAPHICAL ORGANIZATION
TOWARDS A PERIODIZATION

Building upon the agenda of planetary urbanization, this study has tried to introduce a set of geographical categories, in the form of composite geographies of urbanization, in order to help envision how the condition of generalized interdependence that Doxiadis and Lefebvre were trying to decipher half a century ago, unfolds upon the surface of the earth. Through this framework, the condition of urbanization as a form of geographical organization can be interpreted as the changing relationship between agglomeration landscapes, operational landscapes and their combinations into various forms of hybrid landscapes. In this last part of the work, I will try to offer an experimental application of this framework, through an attempt to reconstruct a short history of urbanization. This effort should be seen mostly as an experiment, a way to test how these novel categories and frameworks allow for an alternative interpretation of the major transitions, which have shaped world urbanization over the past centuries. It is mostly an effort to test the specif lens, rather to derive any conclusions. Before attempting this historical overview of urbanization as geographical organization, I will offer an overview of the main points raised in the previous chapters:

- Urbanization is a process of geographical organization characterized by a state of biogeographical interdependency, connected to the condition of concentration of population and operations over relatively small areas. The associated social and spatial division of labor includes not only these areas of concentration, but also all productive areas that are constructed under this interdependency.

- Urbanization as a process of geographical organization can be conceptualized as a constant interplay between agglomeration landscapes, operational landscapes and their hybridizations. These composite geographies of urbanization are landscapes of possibilities for the emergence of externalities associated with the location of particular operations: Agglomeration landscapes are characterized by the presence of urban and clustering externalities, while operational landscapes are mostly connected to locational externalities. According to this framework, agglomeration landscapes are the primary locations for the operation of activities belonging to the secondary and tertiary sectors of the economy, while operational landscapes are mostly connected to operations belonging to the primary sector of the economy.

- Externalities emerge out of particular combinations of elements of geographical organization that include: Elements of the natural environment, elements of physical equipment in the form of fixed capital, demographic factors, institutional frameworks and the characteristics of economic actors. These elements can be continuous across operational landscapes and agglomeration landscapes, but their particular configurations allow them to present different possible externalities for different operations. As a result agglomeration and operational landscapes are not static or absolute, but always constituted through particular operations.

- In contrast to the spatial conceptualizations of continuous and discontinuous hinterlands, agglomeration and operational landscapes are always operating across continuums: Even when different landscapes of production are connected across long distances, these connections involve the activation of intermediate operational landscapes, since transport and communication systems are part of them.

- The assemblies of agglomeration landscapes and operational landscapes can be unfolded through the operations of commodity chains. With the further specialization of the division of labor, commodity chains are revealed as complex meshworks that interweave numerous landscapes. As such, the question of the city-hinterland as a one-to-one linear connection is dissolved.

- Under conditions of capitalist urbanization, agglomeration landscapes and operational landscapes become part of the quest for excess profits. The landscapes of possibilities they suggest, are translated into capitalism's overall profit landscape. Their configuration is interwoven with the interplay of locational and technological advantage. This advantage is connected to the mobility of factors of production, which are themselves embedded into the configuration of agglomeration and operational landscapes.

- Agglomeration landscapes and operational landscapes suggest only certain possibilities, while they restrict others through their sclerotic nature: This sclerotic nature however, emerges in different ways in agglomeration landscapes and operational landscapes. In agglomeration landscapes it is mostly a result of the collective effort needed to sustain the composition of the versatility of elements, which are at the basis of their externalities. It is more an issue of social embeddedness. On the other hand, the sclerotic

nature of operational landscapes is more connected to specificities of the natural environment and the efforts requited to instrumentalize them. It is more an issue of geographical embeddedness. As a result, the sclerotic nature of agglomeration landscapes and operational landscapes, defines changing patterns of development in different ways.

- The development of agglomeration landscapes and operational landscapes and their assembly into multi-scalar configurations, proceeds through a dual process of extension and intensification. Extension refers to the process of scalar expansion, in which the externalities of agglomeration landscapes and operational landscapes are to be found over larger and larger areas. It is a process of horizontal assembly. Intensification refers to the process, in which the externalities of agglomeration landscapes and operational landscapes emerge through the enhancement of selected synergies the composite layers of geographical organization, or the introduction of additional layers. It is a process of vertical assembly. As a result, the relational diagram figure 40, can be expanded as shown in the completed diagram of figure 69.

- As operational landscapes expand and specialize in order to achieve economies of scale, their planetary globalized totality tends to constitute a Hinterglobe. The Hinterglobe is the assembly of operational landscapes, which is shared by a set of global operations. The construction of the Hinterglobe signals the ultimate form of complete urbanization: While agglomeration landscapes can continue to be reconstituted through the reshuffling of the concentrations of population and economic activities in dense zones, the expansion of operational landscapes across scales, is defined by the totality of the part of the planet that can be used. Of course, a condition of 100% utilization of the planetary terrain, will not mean that the configuration of operational landscapes will seize. It will mean that it will be less and less connected to the possibility of expansion and more to a process of reconfiguration and intensification.

Since I have framed the concepts of agglomeration landscapes and operational landscapes in relation to a set of locational possibilities, a valid entry point for starting this exploration could be to follow their transformations in the processes of the relocation of the various factors of production. As Jason Moore notes, capitalism has always been trying to exploit advantageous combinations of the four main factors of production: labor, food energy, raw materials.[69] A history of the changing assemblies of agglomeration and operational landscapes could be indeed constructed by following this quest, a quest which was initially severely limited by the mobility of these factors: First of all however, I will re-frame these factors in a more conventional way as land, labor and capital, with raw materials considered to come out of the combination of the other three factors. For example, mineral resources come out of land with the application of capital and labor, etc. The mobility of these factors is fundamental, assuming that their asymmetrical distributions are not always coordinated to achieve a profitable operation. Cheap labor might not exist where there is a rich deposit of raw materials (and vice versa), while capital might not available to be invested in an area that has a combination of the two. The degree of mobility of the production factors is not only related to the physical attributes that define their transportation profile (distance, weight, terrain etc), but also to the regulatory frameworks that enable, or permit them. Thus returning to the initial elements of geographical organization, as they are expressed in the form of agglomeration landscapes and operational landscapes, it is clear that the mobility of factors of production has to do with a combination of all of them and not just with their location, technological developments, or regulatory frameworks.

Returning to the short prehistory I attempted at the beginning of this project (chapter 01), the political city, the city-state, offers an interesting unit to start unpacking the relation between subsistence and interdependence. The city-state can be thought to present a unit of complete urbanization: We can assume this unit to include an agglomeration landscape, the asty, and a surrounding operational landscape, with all its transportation infrastructures, specialized productive landscapes, but also areas of concentration within it (smaller villages, storage and manufacturing clusters), the chora. As a whole, the landscape of the city-state is a hybrid landscape, one that is attached to other hybrid landscapes in what could be conceived as a mosaic of completely urbanized units, one that as already discussed, led Bairoch to consider the ancient Greek world as one of the most urbanized that existed. What characterizes this scheme however, is that the overall interdependence of geographical organization is rather limited: Since every unit aims to achieve subsistence, it constructs for itself a set of specialized production landscapes, which as an assembly are quite diverse, like in Von Thünen's Isolated State. Thus, internally it is characterized by a condition of complete geographical interdependence, but externally to this unit, the condition of association with other units is rather weak.

Nevertheless, even this fragmented world had a series of larger scale operational landscapes: The subsistence of the Greek and subsequently the Roman world, was connected to certain specialized regions of primary production. The organization

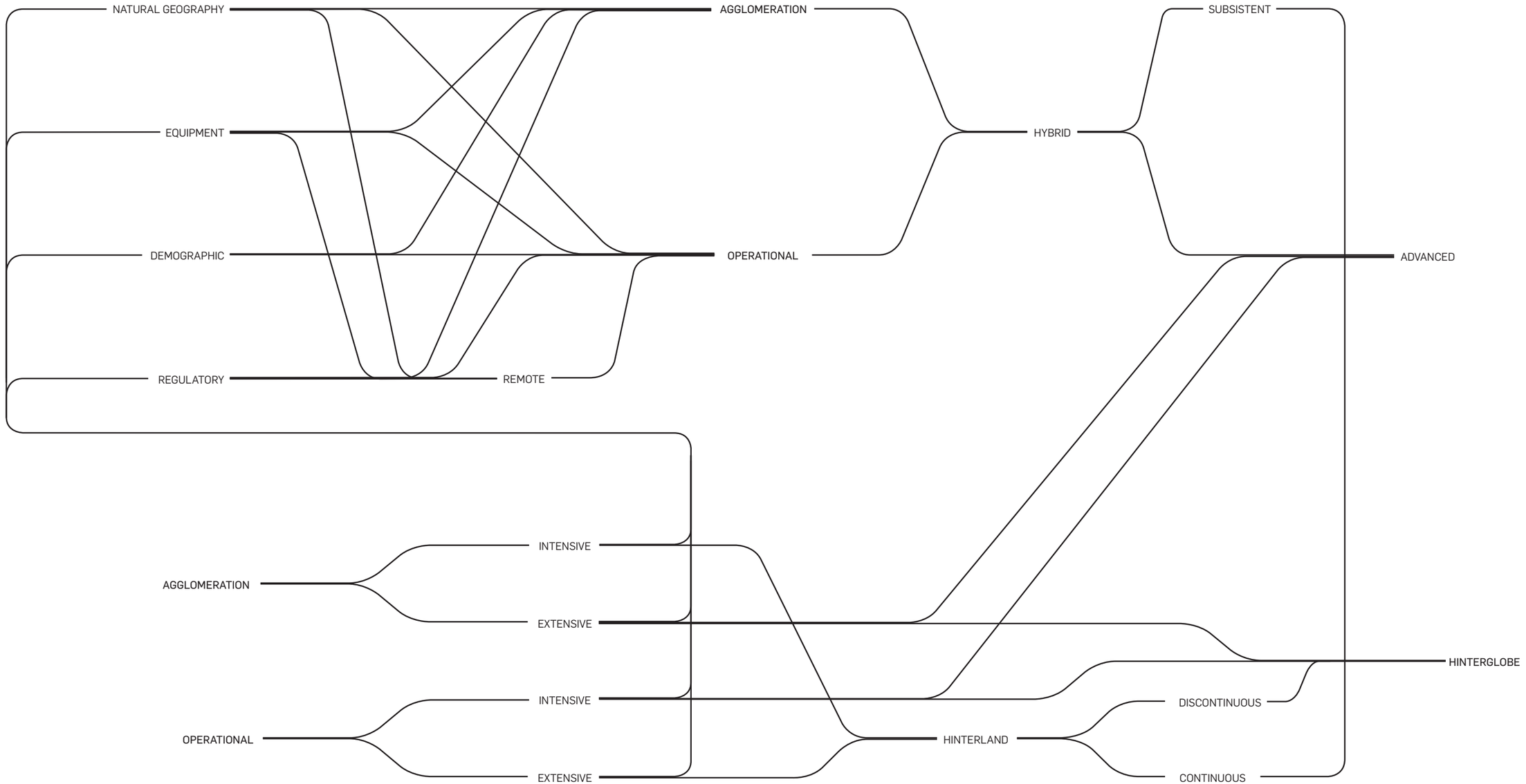


FIGURE 69: RELATIONAL DIAGRAM OF THE ASSEMBLY AND DEVELOPMENT OF COMPOSITE GEOGRAPHIES.

of these regions was mainly determined by locational externalities, which were connected to certain natural advantages (the fertile grain producing regions of N. Africa or the rich mineral deposits of the Iberian Peninsula), and connected though maritime networks. Small scale units of agglomerations with continuous and diverse operational landscapes around them, coexisted with larger scale discontinuous specialized operational landscapes. This condition was amplified by the development of more intense asymmetries in the distribution of population with the growth of Rome, but this development was rather a quantitative rather than a qualitative one, driven by a process of rescaling of the diverse immediate sets of operational landscapes and the more specialized large-scale ones.

This dual composition of operational landscapes, already allows for a clarification: In its archetypal form, the one constituting the city-state, the relation between a unit of agglomeration and a diverse set of operational landscapes, which are mainly connected to and structured around this sole agglomeration, can be characterized as a primitive hinterland condition. This definition does not have so much to do with the issue of geographical continuity (the condition of a continuous hinterland), but rather to the relational structure that demands a certain diversity in order to achieve subsistence. In the case of the hinterland, the maximum exploitation of a certain natural advantage through specialization is not the question, but rather the maximum diversity.

On the contrary, in the specialized landscapes of grain production that fed the Greek or Roman world, we can observe the first instances towards the creation of the Hinterglobe: These operational landscapes, are not referring to a single agglomeration landscape but are rather shared, and are set to exploit a certain locational advantage through their specialization, also maintained of course though their interconnection to a wider market. In short, we can define the hinterland as a set of diversified operational landscapes, which have a certain vector in their interdependence that connects them to a single agglomeration landscape. On the contrary, the condition of a specialized production landscape connected to a generalized system of exchange, and thus shared, establishes a quite different set of operational landscapes, which start becoming parts of the shared production landscapes of the Hinterglobe. The less operational landscapes are attached to certain configurations of agglomeration landscapes and the more they become specialized landscapes of production within a generalized system of exchange, the more they move away from the hinterland and tend towards the construction of the Hinterglobe. This condition is however only one aspect in the construction of the Hinterglobe.

Moreover, this trend however does not have to be considered as part of a uniform tendency: In fact, in most phases of geographical organization, instances of hinterlands coexist with instances of the Hinterglobe. Neil Smith described this pre-capitalist condition of geographical organization as:

> a mosaic— a mosaic of exchange spaces (centers and hinterlands), for example, constituted by a well-developed market system.[70]

We can add to this pre-capitalist mosaic of hinterlands a set of 'islands' of specialized operational landscapes, highly dependent upon the presence of certain natural advantages, which however were rather the exception and not the rule in the patterns of development. With the development of the mercantile city and mercantile capital however, it could be argued that this condition started being reversed: The generalization of exchange, channeled through mercantile cities, triggered the multiplication of shared, specialized operational landscapes. As Braudel notes, this condition was characterized both by a process of expansion, the creation of networks of specialized operational landscapes, as well as the specialization of the operational landscapes that used to constitute the immediate hinterlands of cities.[71] What mostly differentiated this process however in relation to previous forms of geographical organization, was that operational landscapes perhaps for the first time became so much connected to the capitalist quest for profit. In previous eras, even the very large-scale specialized operational landscapes were just seen as producers of supplies, crucial for the social production, but above all for the social reproduction processes, and as a result, were often collectively managed (as in the case of the food supply of Rome). With the development of mercantile capital however, the production of operational landscapes becomes one more link in the chain of commodity production, which is aligned with the rule of profit.

While immersed in the process of capitalist production, the development of operational landscapes (as well as agglomeration landscapes) until the industrial revolution, was rather limited by the relative (im)mobility of the factors of production. As such, the configuration of specialized operational landscapes kept being largely connected with certain locational advantages, and still restricted by the capacity of trade. With the advent of the industrial revolution however, the development of means of transportation and associated technological developments (like the steam engine), allowed the complete reconfiguration of the commodity chains and their associated production landscapes. A triple effect started being developed in relation to, both agglomeration landscapes, and operational landscapes: First of all, resources that

were distributed across the geographic surface did not have to be processed where they occurred, something that allowed manufacturing operations to be clustered around major concentrations of population. The mobility of raw materials allowed for manufacturing operations to take advantage of the externalities of agglomerations. This led to the creation of immense asymmetries in the distribution of population densities in the west , with the continuous concentration in agglomeration landscapes which started expanding and eventually merging together to create the first instances of the 'world metropolis'.

However, at the same time population was being concentrated in the agglomeration landscapes of the west, a double process was also restructuring the global system of operational landscapes: On the one hand, around the industrialized zones in the west, the concentration of manufacturing activities, which were once dispersed across operational landscapes, in dense agglomeration landscapes, was 'striping off' operational landscapes, both from population as well as from diverse activities of the secondary and tertiary sectors. Operational landscapes that were not being engulfed by the expanding metropolitan systems, were becoming more and more industrialized and relatively less and less populated, leading to more and more 'pure' forms increasingly intensified though layers of equipment.

At the same time that operational landscapes in the core were being intensified, a second parallel process, this time of expansion, led to the addition of new operational landscapes to the existing commodity chains. Already since the colonial era, land factors mostly associated with raw materials, were becoming part of the manufacturing operations of the agglomerations of the European core. This process involved a considerable extension of the agricultural, wood and metal commodity chains through the addition of new extractive landscapes. This extension was mostly associated with the establishment of transportation connections, which ensured the transport of bulk raw materials, while trade in manufactures and finished products remained rather limited and channeled in establishing national markets.

Until the mid-20th century, trade in commodities was still restricted by limitations in means of transport, but most importantly due to mercantilist policies that regulated transnational capital and commodity flows, especially semi-finished manufactures (parts). As a result, the organization of production remained inscribed into national boundaries, where it could only take advantage of agglomeration externalities at the local scale, through the creation of industrial clusters and the vertical organization of production. The need for the vertical organization of production was also an outcome of

weak communication means that limited efficient horizontal management. The whole process could be described as a parallel effort to develop a set of global extensive operational landscapes, intensify the operational landscapes within the national territories, and in addition create a set of national markets. It was characterized by the need to expand, both the supply basis and the demand basis.

After the Second World War, shifts in the regulatory regimes, and subsequently in transport and communication infrastructures, set the basis for unprecedented levels of mobility of the factors of production. This flexibility created the possibility for the exploitation of comparative advantages at the global scale, leading both to a process of concentration and dispersion: On the one hand, concentration occurred through a further specialization of operations, where 'natural' comparative advantages existed (such us the existence of natural resources), often in the regions that had been the theaters of expansion in previous stages. In this operational landscapes, intensification, followed extension.

On the other hand however, the ability to exploit the asymmetries in labor costs led to the dispersion of manufacturing activities from the industrial core. A much more complex set of processes was then unfolded, especially after the late sixties: Operational landscapes that had been added to the global circuit were now being intensified, while agglomeration landscapes across the world were also becoming part of the search for externalities, which would allow for profitable combinations of the factors of production: While new extractive landscapes kept being added to the commodity chains of agricultural, metal, wood and energy commodities, what characterized the second half of the twentieth century was the intensification of the operational landscapes that had been already integrated to the Hinterglobe and most importantly, the addition of new agglomeration landscapes to the global manufacturing networks. The intensification of operational landscapes around the world, was operating in parallel to a process of extension of agglomeration landscapes.

After the seventies, the latter has been amplified through a combination of regulatory shifts and advancements in transport and communication infrastructures, allowing the unrestricted flows of capital and the dispersion of the operations of transnational corporations. The resulting horizontal organization of production was possible through efficient global management and the seamless trade of semi-finished products between corporations of the manufacturing sectors. In fact the circulation of semi-finished products has started becoming an important flow in global trade. While in the colonial era global trade was mostly characterized by the trade in raw

materials, from operational landscapes to agglomeration landscapes of the core (and by the trade of finished commodities between agglomeration landscapes), after the seventies an increasing amount of the global trade flows started being dominated by the trade of manufactures (parts) between corporations. This condition is shown in figure 70, which presents the typical diagram that highlights the 'explosion' in the trade of manufactures from 1950 to 2010. Indeed, manufactured products seem to have dominated the volume of world trade, especially in relation to the volume of agricultural products, which used to be almost 45% of the world total during the mid fifties as shown in figure 71. However this diagram can be quite concealing.

First of all, the diagram shows the mainstream volume of trade in monetary terms, not in terms of physical volume (for example tones), statistics which are much harder to consolidate over the broad categories of commodities. Still, the trend it is revealing is an undeniable fact, one however that has obscured an equally unprecedented increase in the physical volume of extraction and circulation of primary commodities, which offers a much more material and geographical interpretation of trade: Indeed relatively to the global composition of trade, primary commodities, the products of operational landscapes, seem to have lost in importance. But in absolute terms, and compared with previous phases of capitalist development, the extraction and circulation of primary commodities has reached unprecedented levels. The diagrams in figures 72 and 73 reveal a parallel globalization, a globalization of the primary sectors of the economy: Diagram 72 shows the volume (in tonnes) of global material extraction since the beginning of the 20th century, and figure 73 shows the tonnes of major categories of materials exported since the 1960s. This 'metabolic' interpretation reveals the physical quantities of biomass (which includes agricultural products), fossil fuels, minerals and construction materials, showing how the extraction and trade of the majority of them has at least doubled. As a result, a parallel wave of globalization has been unfolding, one that as I will discuss next, has been more the result of a process of intensification rather than of expansion.

The last decades and the turn of the 20th century could be described by a dual process of extension of agglomeration landscapes and intensification of operational landscapes: On the one hand, in a process that has been described as 'density convergence', densities that were until the 50s found only in metropolitan centers were now to be found in larger and larger areas around agglomerations, creating continuous agglomeration zones through the extension of agglomeration landscapes. This process is shown in the diagram of figure 74. The unprecedented scale of the process meant also the interweaving of large areas of already intensified operational landscapes, which were not erased through this process, but rather integrated in the form of hybrid landscapes of the advanced type.

At the same time, in the areas of pure operational landscapes, processes of extension were slowed down in favor of continuous processes of intensification. The diagram in figure 75, shows the relation between the expansion of agricultural land and the growth of population during the 20th century: Until the mid fifties the growth in population was followed by a parallel expansion in agricultural land to support its metabolic needs: Population grew by more than 50% between 1900 and 1950 from almost 1.6 billion to more than 2.5 billion, and agricultural land followed. However, after the 50s the expansion of agricultural land stopped following the exponential growth of world population, which had reached 6 billion in 2000. While in 1950 there were around 200 people per square kilometer of agricultural land, by 2000 this ratio had doubled to 400, an increase that was covered by the increased mechanization and application of fertilizers (also shown in figure 75 on the left column), and in general with the intensification of the operationalization of the existing areas of agricultural land.

While these phenomena were also expanding to the exploding zones of densified population in the east and global south, sets of hybrid landscapes were being produced together with zones of pure operational landscapes that had stopped expanding. As overall, the global population was concentrating in higher rates than it was growing in absolute numbers, the asymmetries in its distribution became intensified, crystallizing in sets of pure operational landscapes, hybrid areas among them and extensive, but largely stabilized in terms of area, operational landscapes.

This rough summary can be complemented through a series of diagrams and cartographic investigations. The diagram in figure 76, charts the changing growth rate of global population, in relation to the changing expansion rate of the global area of used land, while the diagram in figure 77, offers a more detailed view of the various land use categories that constitute the totality of the used land. The diagrams show that until the beginning of the 20th century, the land used by humanity was expanding faster than population was growing, something that was reversed after the 20s and further amplified after the 50s, with population growth rates far exceeding the growth rates of land expansion. The diagram in figure 77 shows that in particular, the land uses that have been slowing down have been those associated with primary production (cropland, grazing), while the construction of artificially constructed surfaces keeps up with the explosive growth rates of population. These diagrams

offer a first impression of the processes of extension and intensification, with the 19th century being overall a century of extension, and the 20th century a century of intensification, with the slowing down of the extension of productive land, and the continuous equipment and extension of constructed surfaces.

The evolution of the dual process of extension and intensification can also be roughly represented through the changing ratio of population per used land, which is shown in the digram of figure 78. Overall, as the operational landscapes of the world started being assembled into more and more intensified configurations, the expansion of the emerging Hinterglobe was gradually slowing down. From 1800 until the mid-20th century, the total used part of the planet (estimated here as the combination of croplands, grazing areas and build up areas), was expanding faster than the population was growing, with the ratio of population per area of used land constantly falling. After the fifties however, the expansion of used land stopped following the explosive growth of population, with the ratio of population per land area reaching unprecedented levels. Less and less land per person is being mobilized to support a continuously growing population, through the investment of more and more equipment, energy, and capital in general. This diagram is one of the central diagrams of this work. It showcases the coming end of the hinterland, that is of extensive operational landscapes, continuous or discontinuous, and the coming age of the Hinterglobe, that is highly intensified specialized operational landscapes, necessarily discontinuous.

Complementary to this diagram, a series of historic cartographic representations, presented in figures 79-83, aim to reveal the distribution of composite geographies that corresponded to selected instances across this timeline. As already described, these representations that follow the scheme of the composite map and matrix presented in figure 51, are not actual representations of agglomeration landscapes and operational landscapes, but rather suggested lenses for understanding their possible distributions. The maps can be read together with the diagram in figure 78, which is presented on the bottom right corner. Following these cartographic explorations, at the beginning of the 19th century population densities and productive landscapes were not characterized by intense asymmetries in their distributions: The grey-red and grey-blue areas of the maps in figures 79-81, suggest the domination of low intensity hybrid landscapes among certain areas of intensification. The expansion of operational landscapes to the American continent had just started. By 1900, the expansion and intensification of operational landscapes continued, while the concentration of population in Europe and the East coast of the United States was starting to differentiate the patterns agglomeration zones from the productive landscapes (figure 91). With the colors on the maps starting to both being more differentiated and intensified, what is revealed is the construction of a set of 'purer' agglomeration and operational landscapes. Until the beginning of the 20th century, the process of expansion of the agricultural land had almost stopped, with operational landscapes being intensified more and more, something that is highlighted by their deeper and deeper red color in figures 82 and 83. At the same time the explosive population increase in the global east and south was creating large zones of hybrid landscapes, which were also starting to crystallize in areas of the west like the Blue Banana (figures 82-83).

A final note could be made regarding the dual process of expansion and intensification: In the case of the expansion of agricultural landscapes that was presented in this last experiment, what is clear is a process of gradual stabilization of the land extensive process of agriculture, and of intensification of the production: While between 1900 and 2000 the world population has almost quadrupled, the area of the agricultural landscapes of the world has not even doubled. And yet these landscapes have been able to sustain an increasing population through their continuous industrialization and specialization. As shown in the diagram of figure 75, since the 1950's, continuous mechanization, fertilizer application, as well as heavy investment in land capital, such as drainage and irrigation systems, have allowed agricultural yields per km^2 to rise substantially and cover demand, creating however very particular landscapes that did not resemble at all the rural landscapes of the early 17th century.[72] I have referred to this process of eventual necessary intensification, as a central process in the construction of the Hinterglobe, a condition in which all possibility for further expansion through the operationalization of new lands, would have been slowly exhausted.

A last series of composite maps, aims to showcase exactly this process of the 'closing' of the envelope of possibilities for expansion of operational landscapes, and the emergence of a condition of necessary intensification. The maps in figures 84-88 present this condition of agricultural expansion towards the envelope of areas most suitable for agriculture as calculated by the Food and Agriculture Organization of the United Nations (FAO). A complementary diagram at the bottom right corner of the maps, shows the percentage of suitable and very suitable land for agriculture that is used at every point in time. While throughout the 19th century, the process of expansion had been spreading agricultural landscapes over the most suitable areas for cultivation, after the mid-twentieth century, the most advantageous areas of the envelope have been filled, with the last remaining ones being located in zones

of intense forestry (like for example in central Africa). After the mid 20th century, what seems to overall characterize the development of agriculture is a process of intensification, a densification of agricultural land use in areas of high agricultural productivity. At the turn of the 20th century, almost 50% of all suitable land and almost 70% of all very suitable land is being used for agriculture.

It could be argued, that with the transition from hinterland to Hinterglobe, and the exhaustion of natural advantages (the free gifts of nature), operational landscapes will be less and less depended upon their geographical expansion in area, but rather upon their specialization and the intensification of their productive capacities through increasing investment in land capital, energy inputs, even labor. Does this condition signal the coming of an era of continuous intensification?

With this speculative question, as a closing statement I want to return to the influential Urban Age view of the world. Urbanization has been for long associated quite myopically, with the concentration of population to 'urban' areas, and the parallel expansion of urban 'land'. According to this view and the UN projections, by 2100, when the world population is expected to start leveling off at around 11 billion, it is estimated that more than 70% of it will be settled in dense 'urban' areas (figure 89). Would this mean that the process of urbanization would literally stop?

We are not leaving in an 'Urban Age' because more than half of the population lives in cities; we are living in an urban age (and perhaps have been living for quite a while now), because even the areas that lie well beyond densely populated areas, are significantly reconfigured as part of urbanization processes. As a result, urbanization does not – and will not – stop, or reverse itself, if and when the concentration of population in agglomerations stops, or if and when agglomerations stop expanding; as long as agglomeration patterns define a state of geographical interdependence of specialized areas of production, circulation and inhabitation, urbanization prevails. Thus it could be argued that urbanization, as a trend is not characterized by a shift from a condition of less concentration to a condition of more concentration, although concentration is definitely part of the process; it is rather characterized by a shift from a condition of less interdependence to a condition of complete geographical interdependence.

As urbanization generalizes a condition of geographical interdependency, operational landscapes expand and intensify constructing a globalized shared assembly. Instrumentalized through global commodity chains, this planetary operational totality signals the shift from the universe of fragmented hinterlands, to the totality of the Hinterglobe. The construction of the Hinterglobe can be considered an alternative interpretation of the complete urbanization of the world. This alternative narrative is summarized through the addition of the 'global intensification curve' of figure 78 upon the reductive global and urban population curves of figure 89. And by the canceling of the dichotomy that the introductory map of figure 03 suggests through the map of figure 90: A portrait of the composite geographies of urbanization in the year 2000.

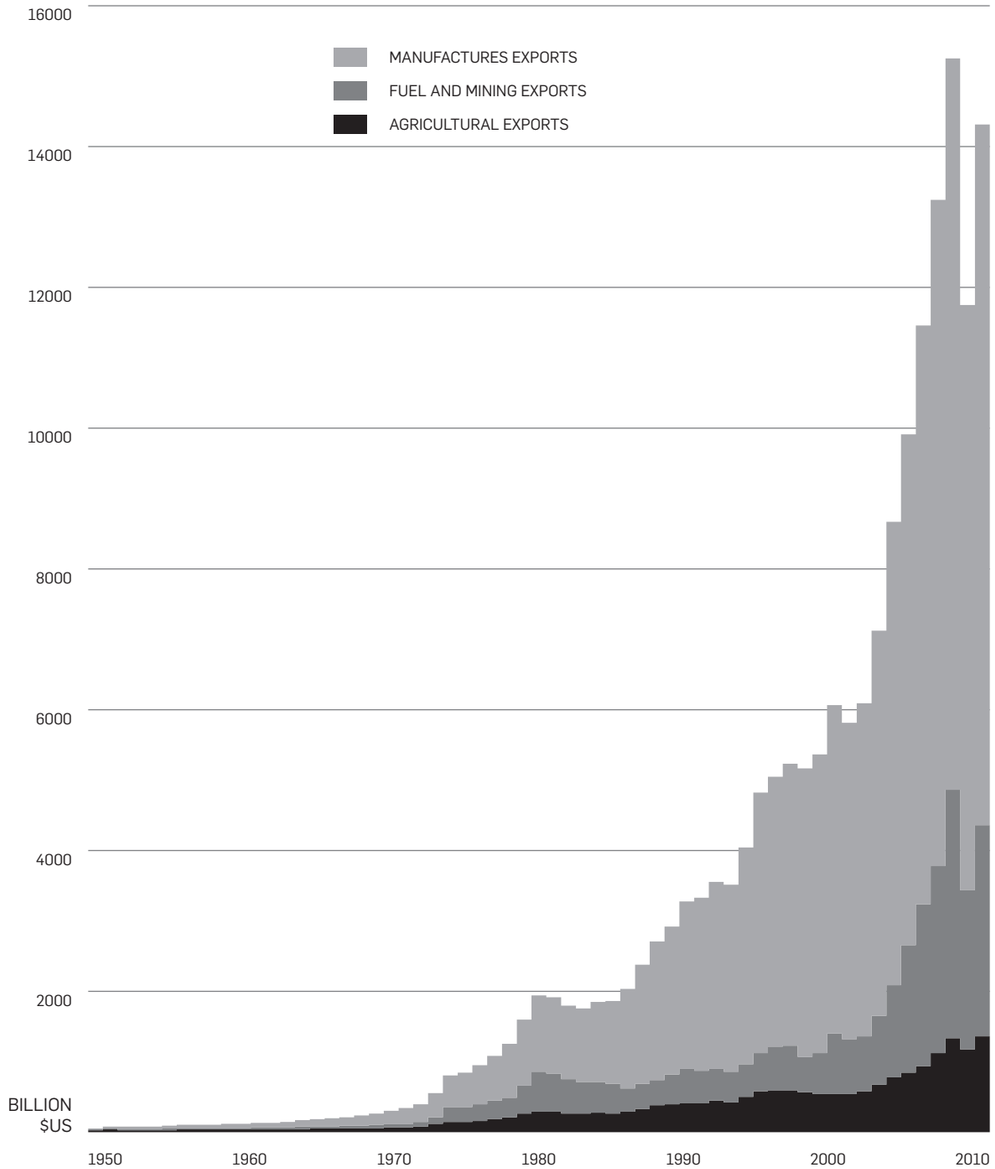


FIGURE 70: GLOBAL TRADE ACCORDING TO MAJOR SECTORS 19500-2100 (EXPORTS).

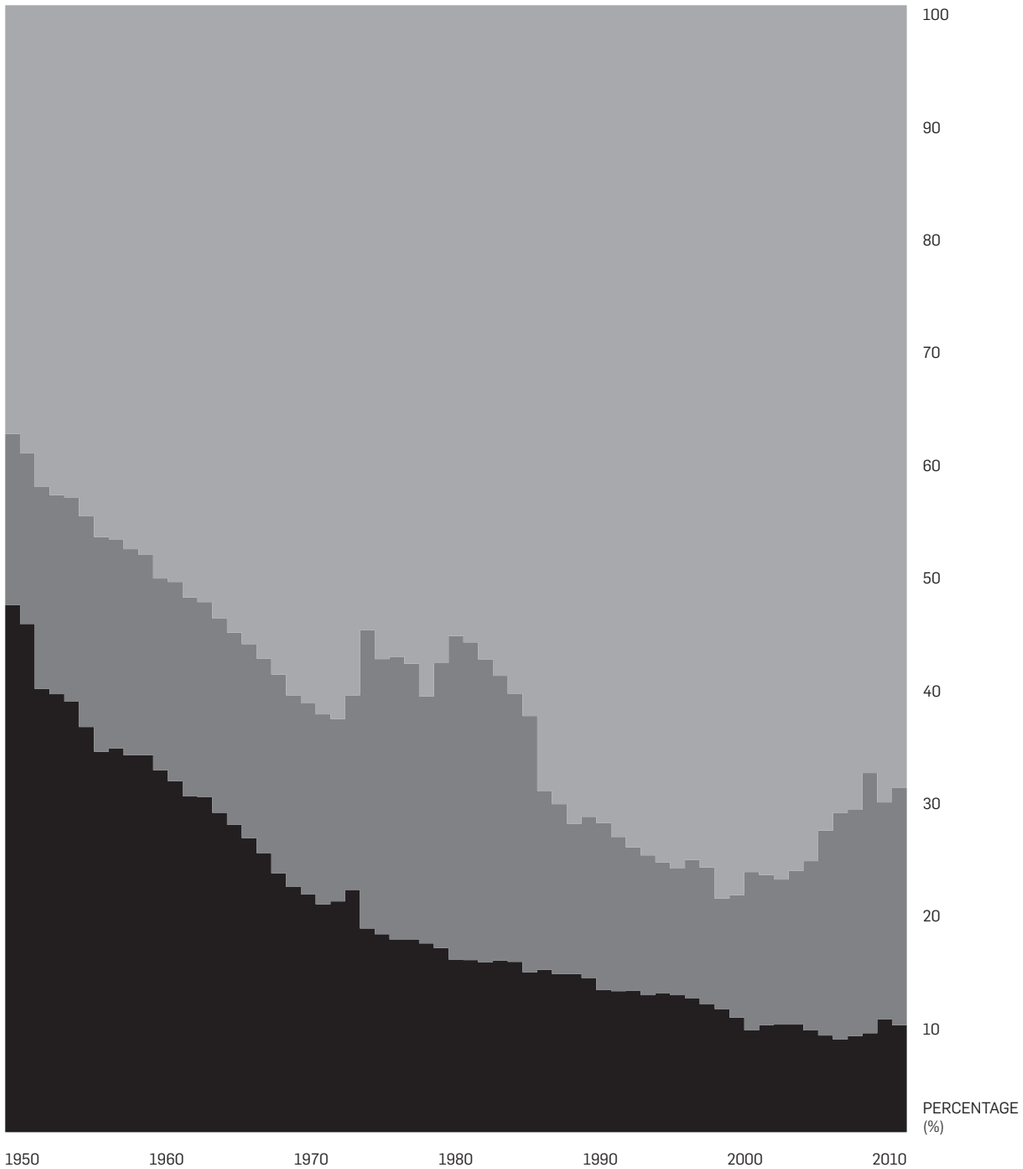


FIGURE 71: PERCENTAGE OF MAJOR SECTORS IN THE COMPOSITION OF GLOBAL TRADE 1950-2010 (EXPORTS)

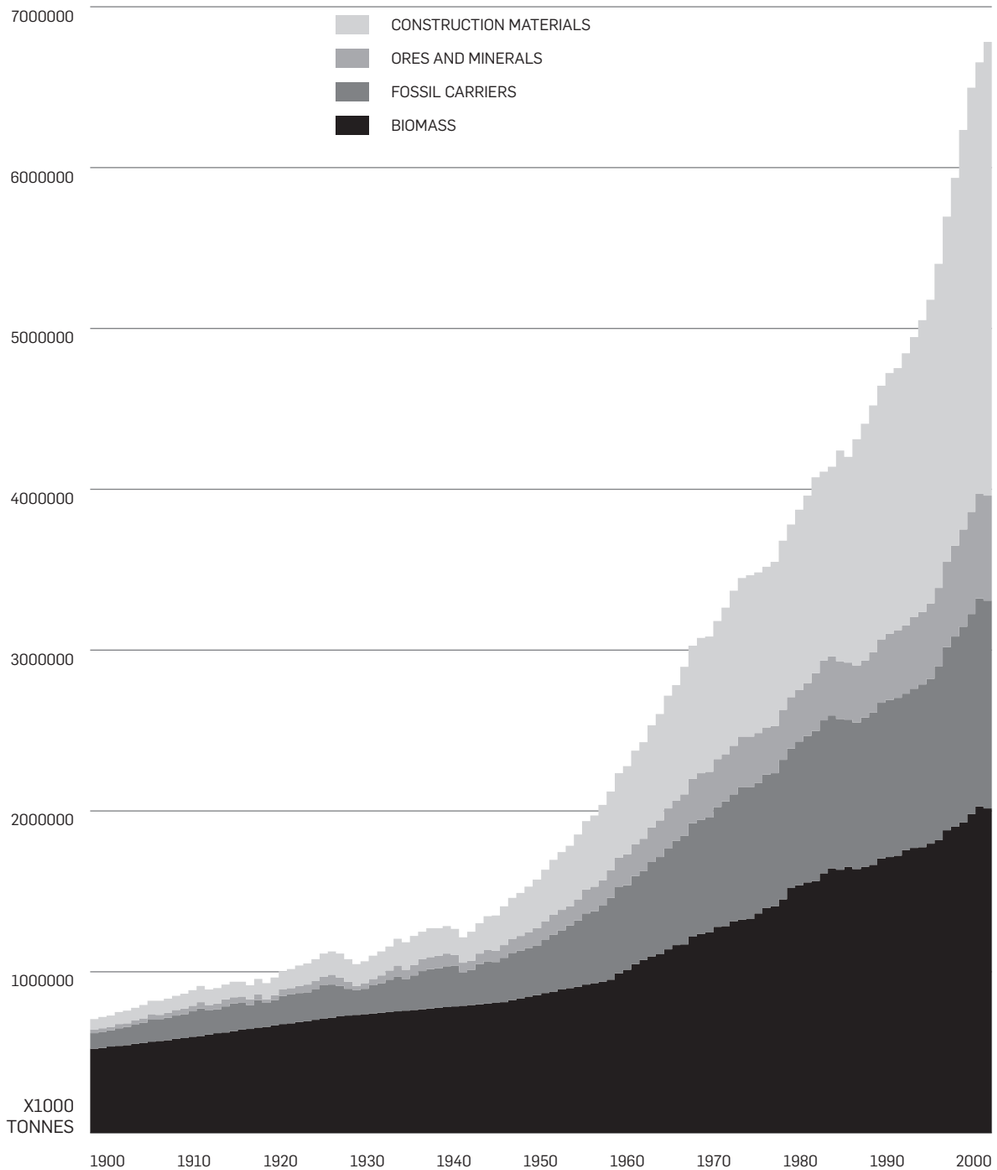


FIGURE 72: GLOBAL MATERIAL EXTRACTION ACCORDING TO MAJOR MATERIAL CATEGORIES 1900-2000.

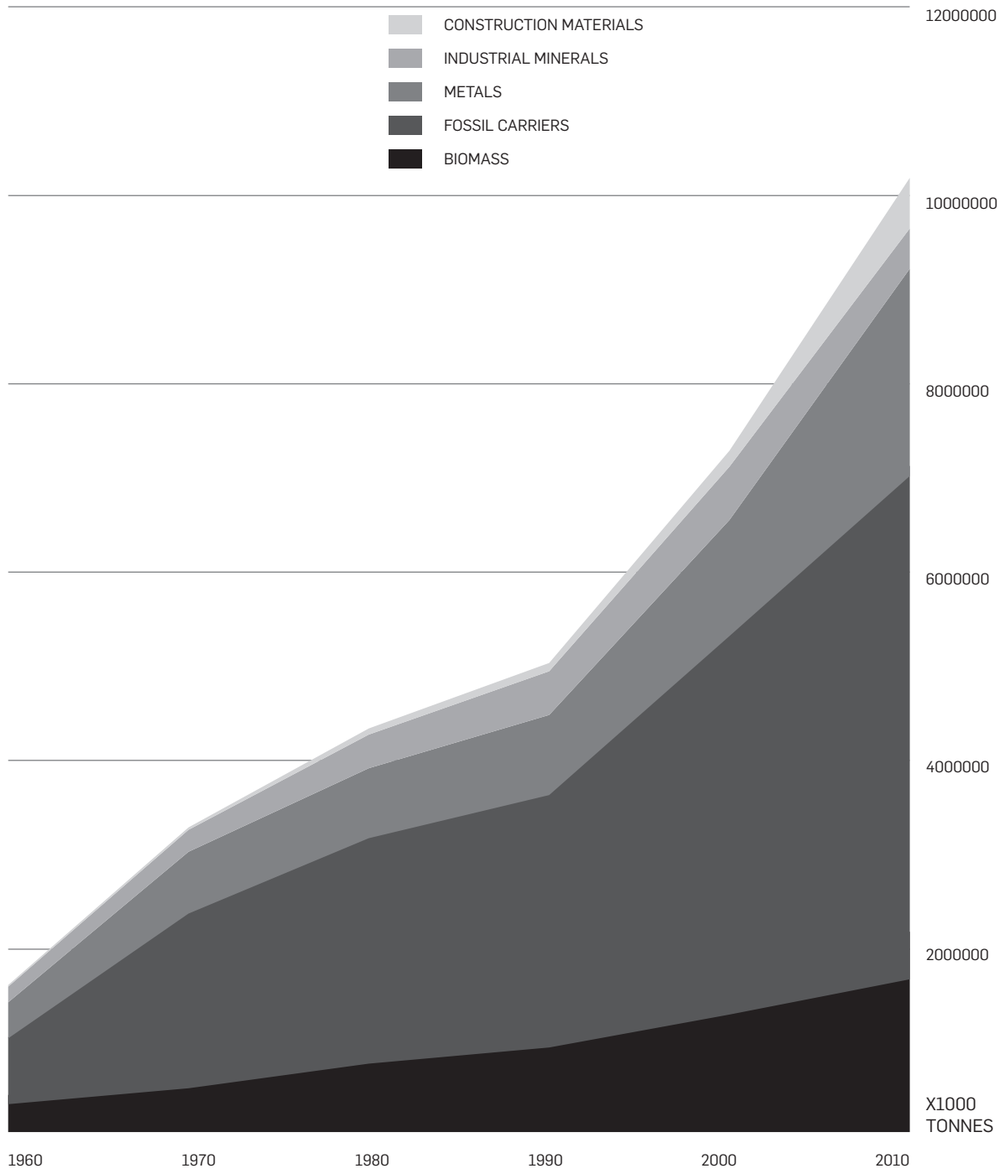


FIGURE 73: PHYSICAL VOLUME OF GLOBAL TRADE ACCORDING TO MAJOR MATERIAL CATEGORIES 1960-2010.

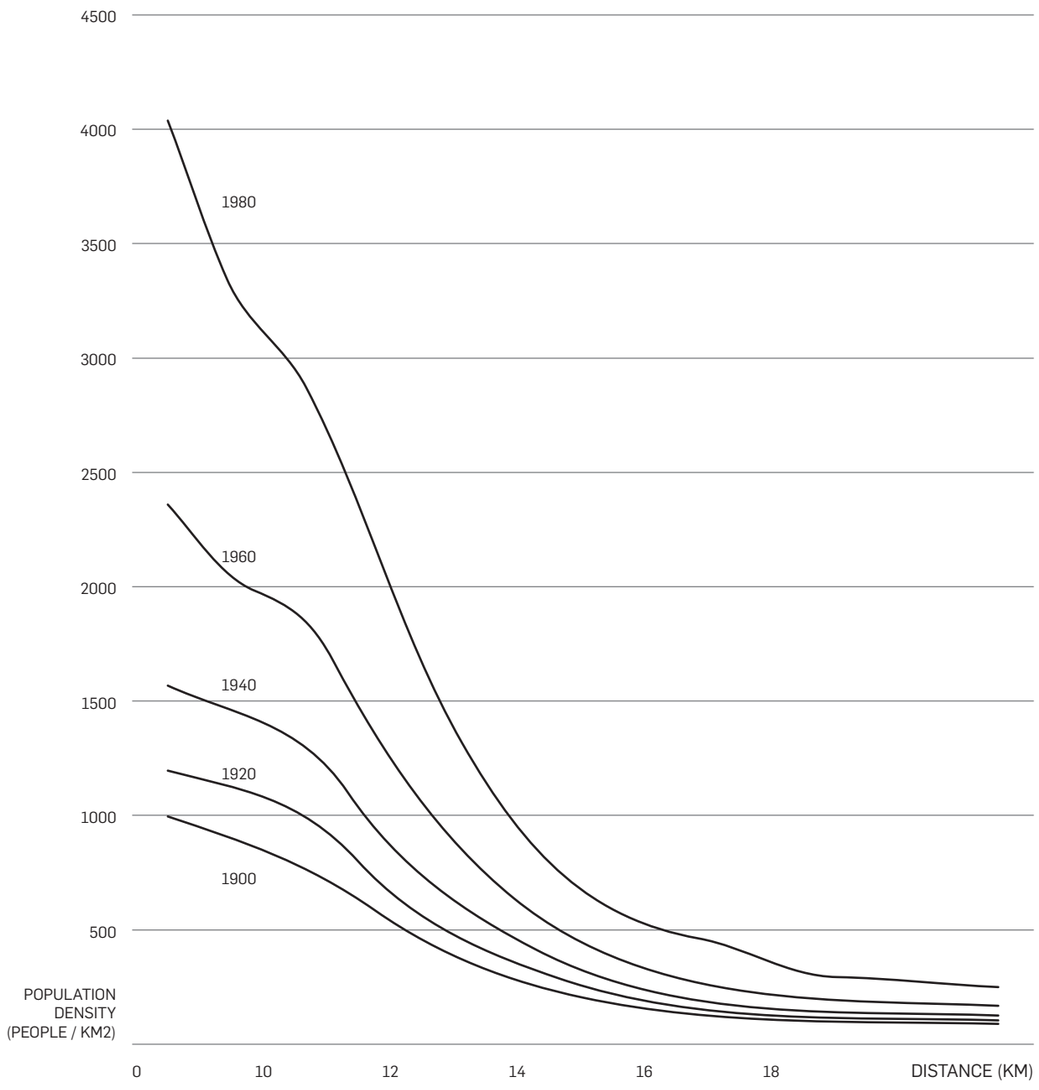


FIGURE 74: THE DIFFUSION OF POPULATION DENSITIES AROUND MAJOR AGGLOMERATION ZONES 1900-1080.

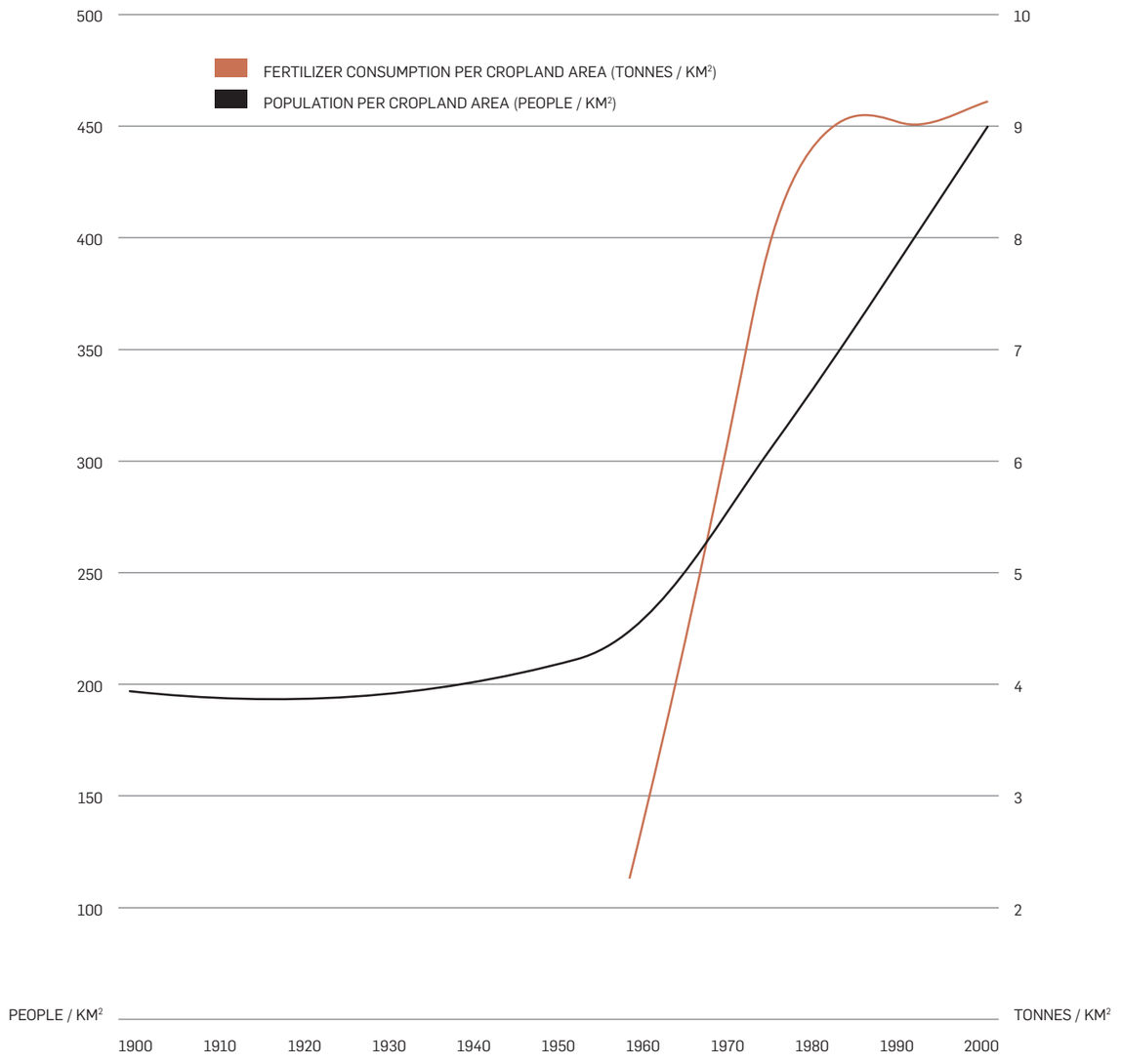


FIGURE 75: EVIDENCE OF THE PROCESS OF AGRICULTURAL INTENSIFICATION.

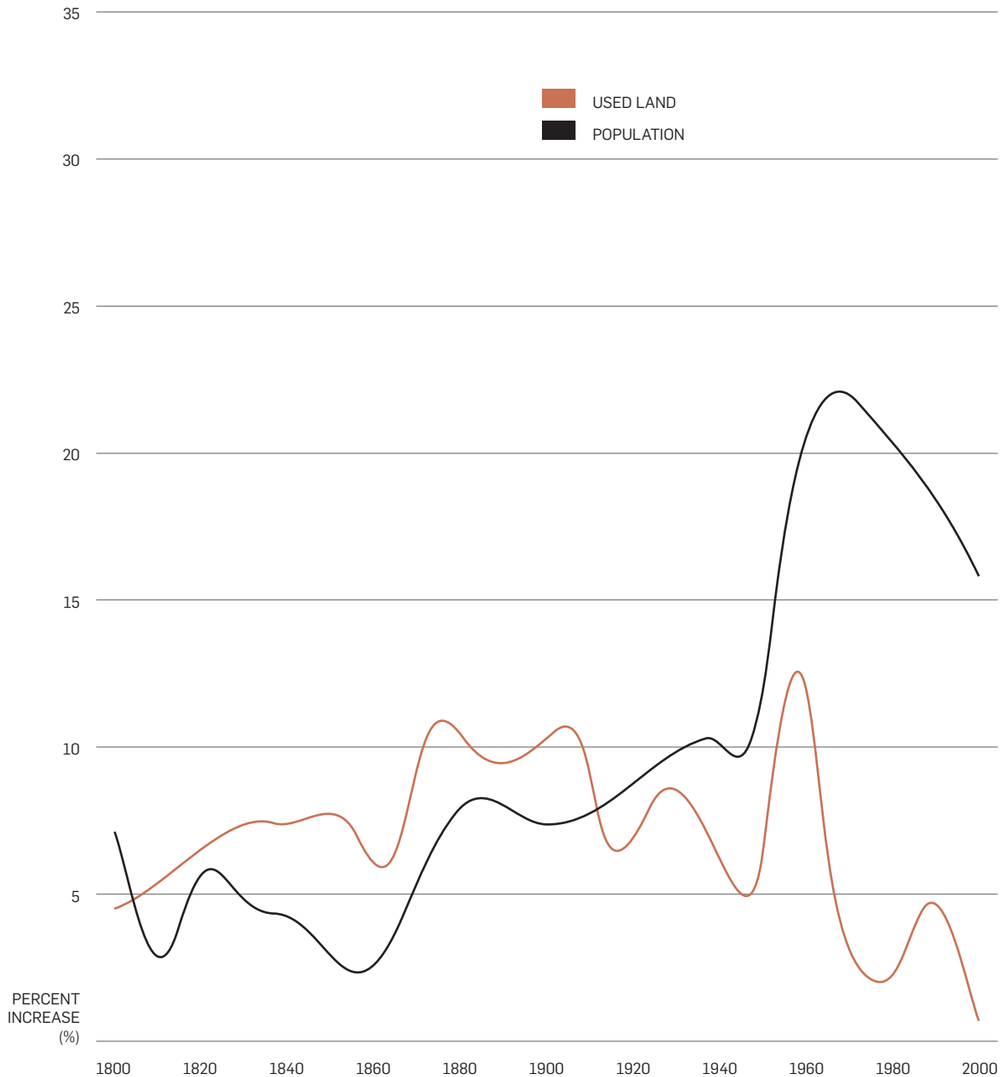


FIGURE 76: RELATIVE GROWTH RATES OF POPULATION AND THE USED LAND OF THE PLANET.

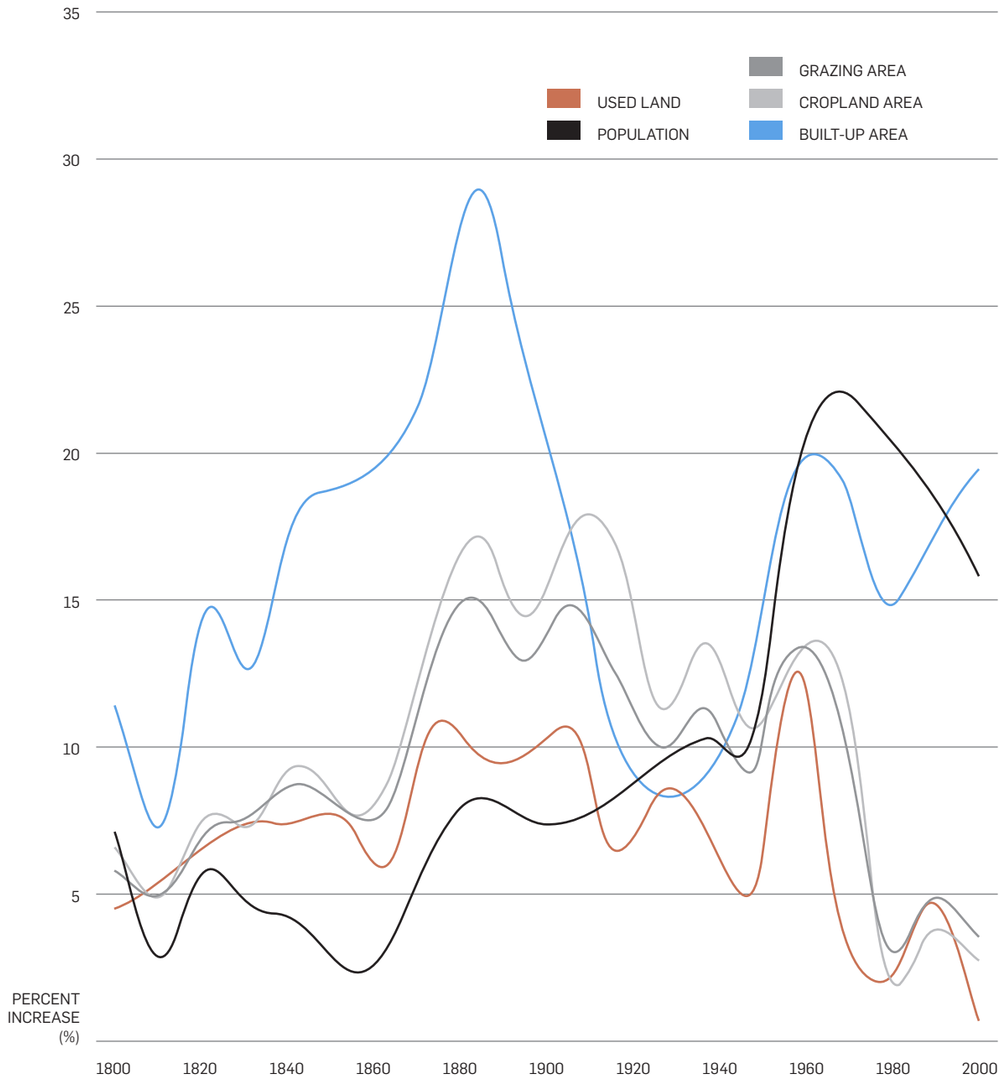


FIGURE 77: RELATIVE GROWTH RATES OF POPULATION AND SELECTED LAND USE CATEGORIES.

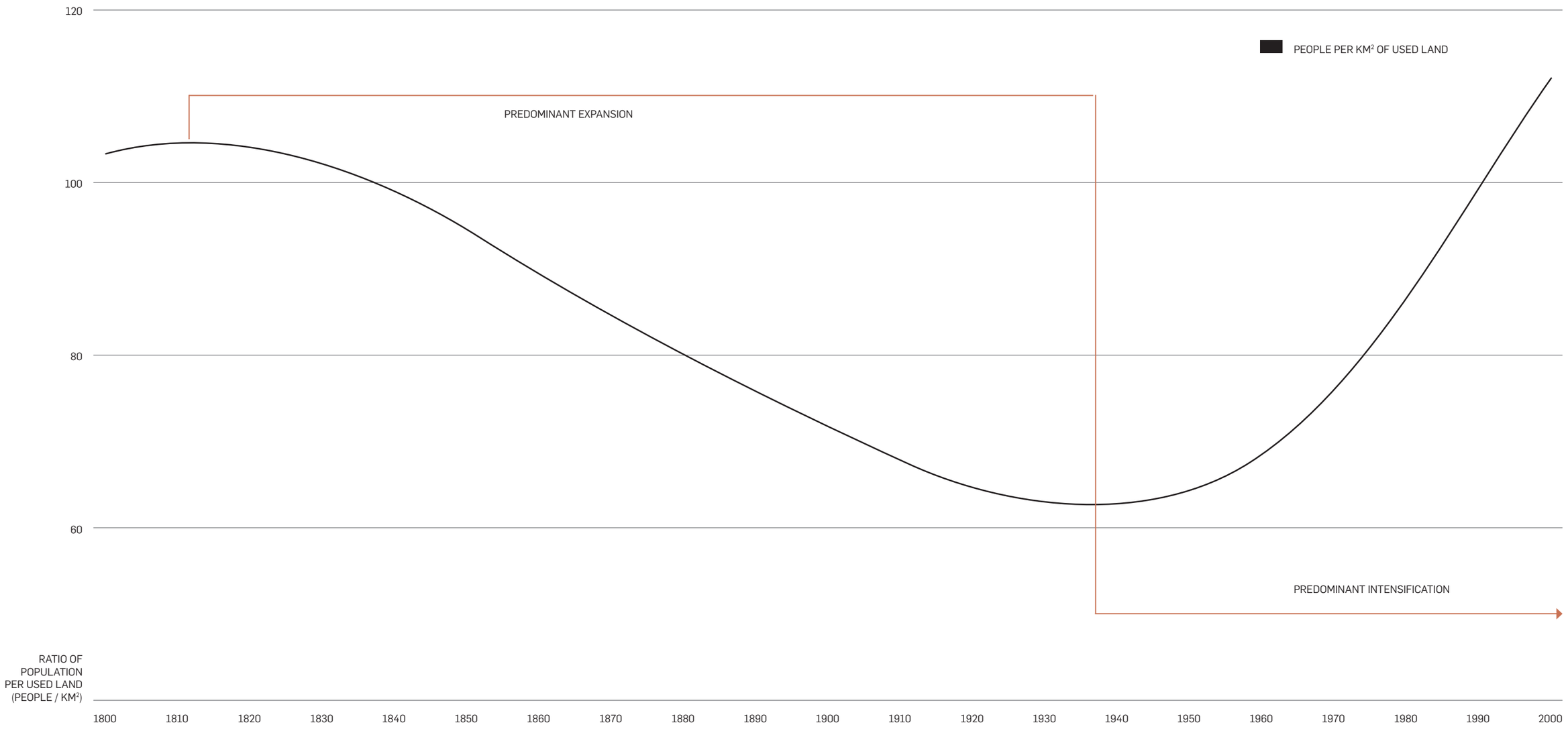
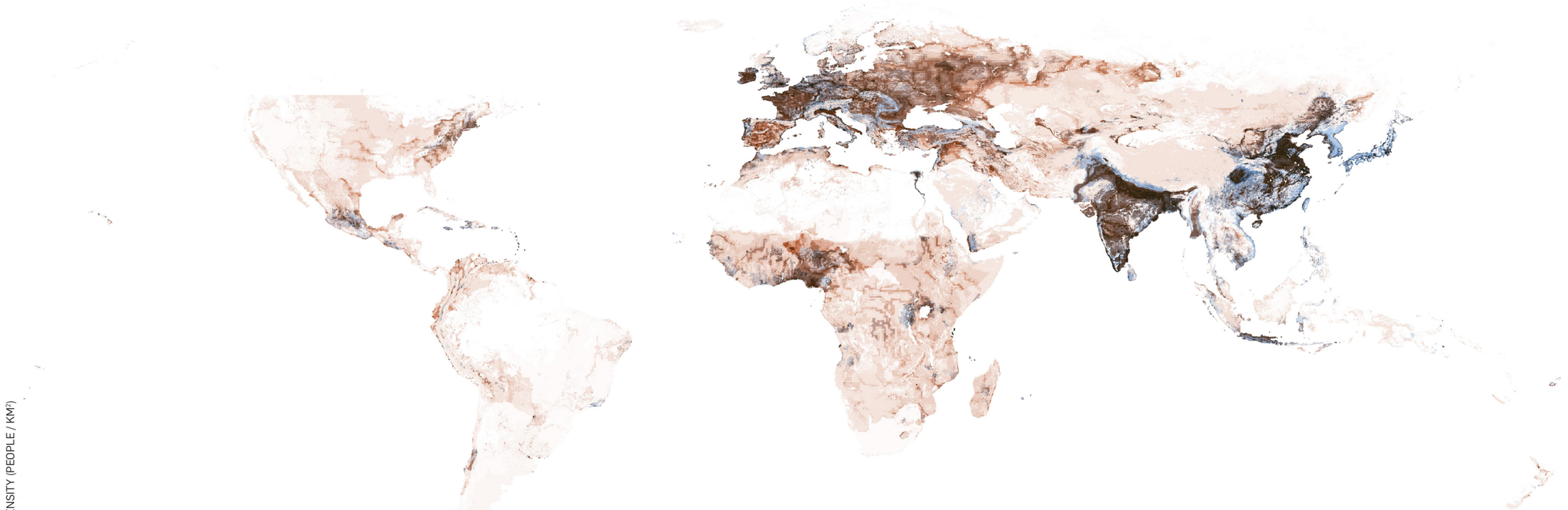


FIGURE 78: GENERAL RATIO OF POPULATION PER USED LAND AND THE EXPANSION-INTENSIFICATION CURVE.

FIGURE 79: COMPOSITE MAP OF AGGLOMERATION LANDSCAPES AND PRIMARY PRODUCTION LANDSCAPES IN 1800.



POPULATION DENSITY (PEOPLE / KM²)

10000+

1000

0

50

100

PRIMARY PRODUCTION INTENSITY (LAND USE %)

RATIO OF POPULATION PER USED LAND
(PEOPLE / KM²)

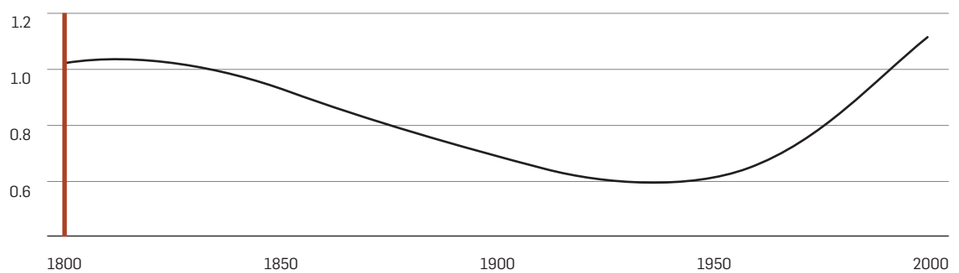
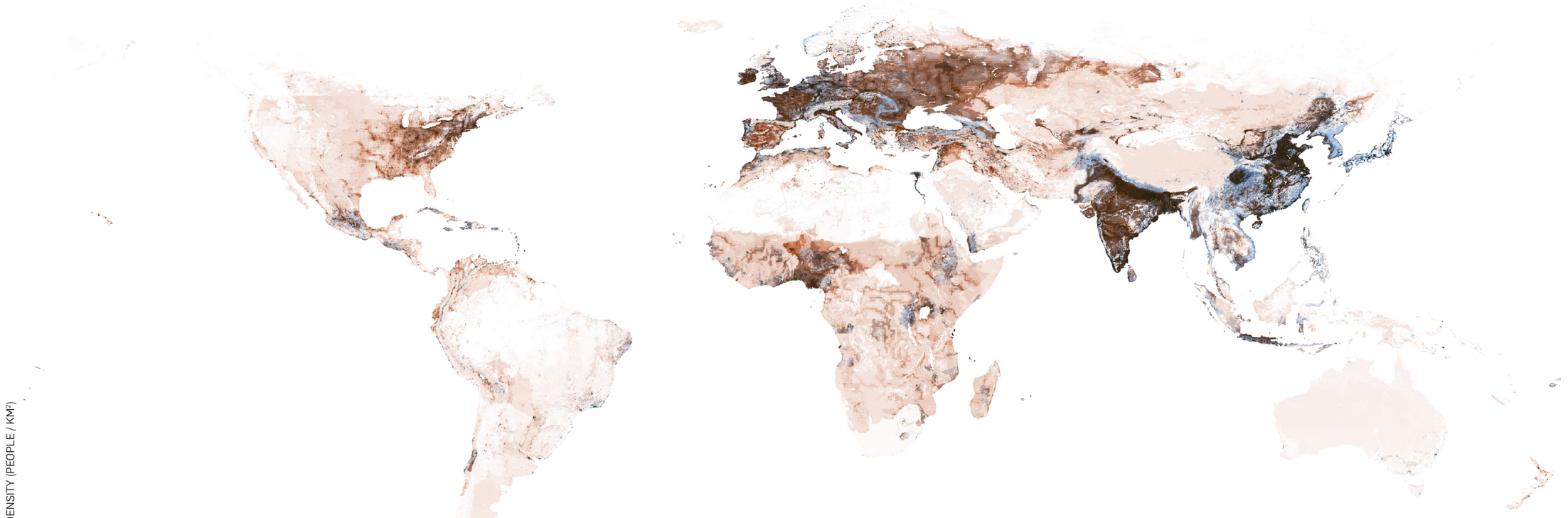
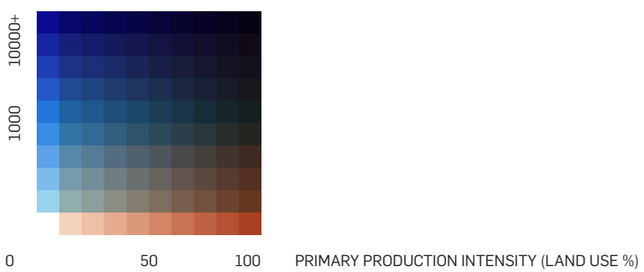


FIGURE 80: COMPOSITE MAP OF AGGLOMERATION LANDSCAPES AND PRIMARY PRODUCTION LANDSCAPES IN 1850.





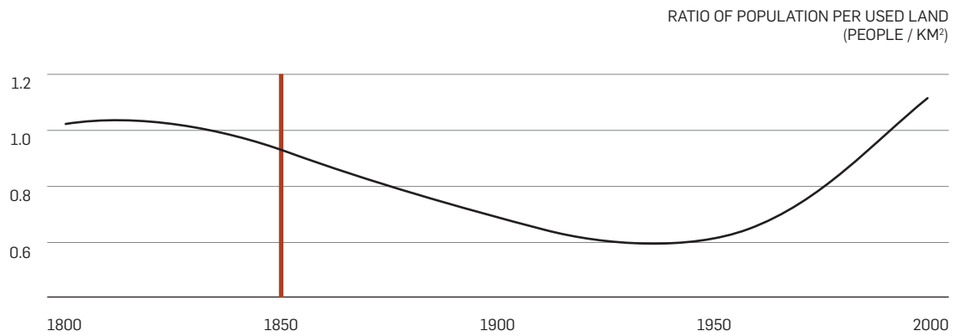
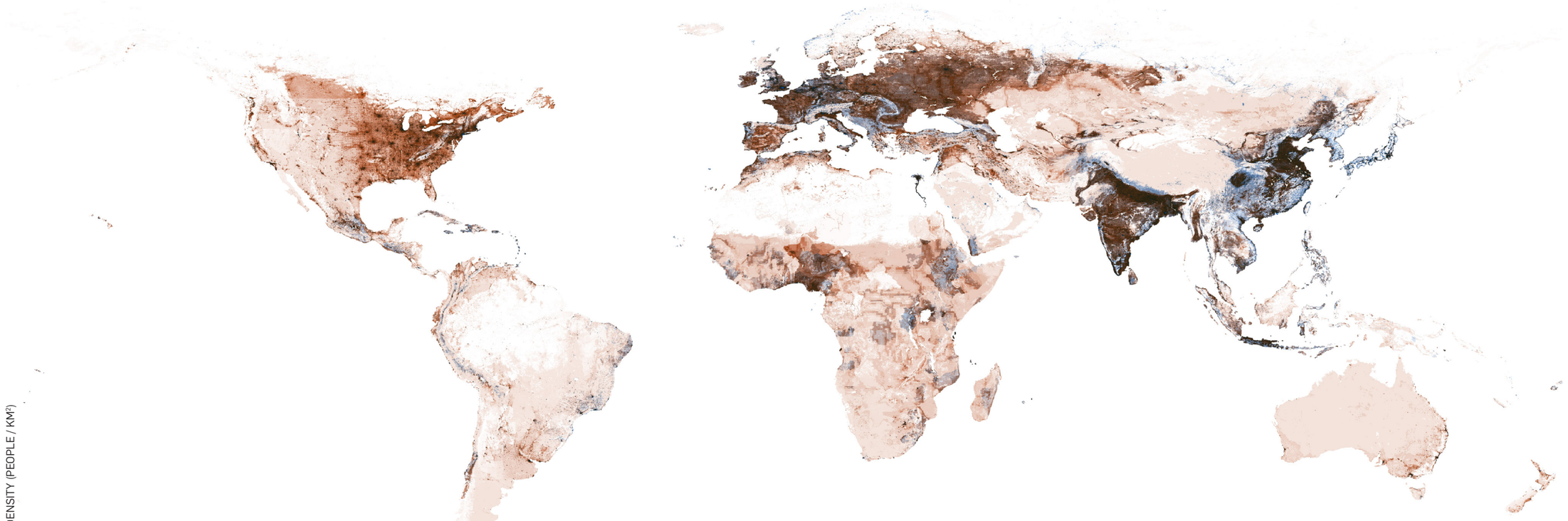
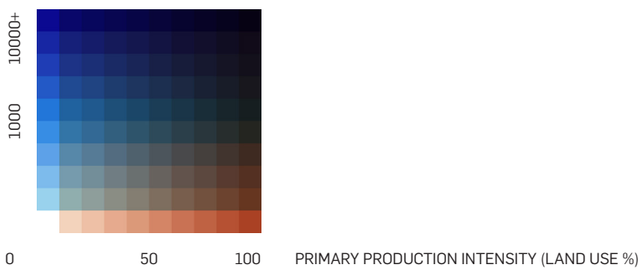


FIGURE 81: COMPOSITE MAP OF AGGLOMERATION LANDSCAPES AND PRIMARY PRODUCTION LANDSCAPES IN 1900.





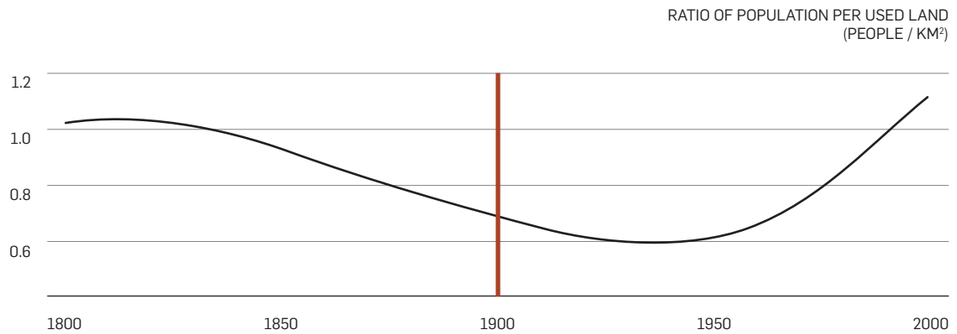


FIGURE 82: COMPOSITE MAP OF AGGLOMERATION LANDSCAPES AND PRIMARY PRODUCTION LANDSCAPES IN 1950.

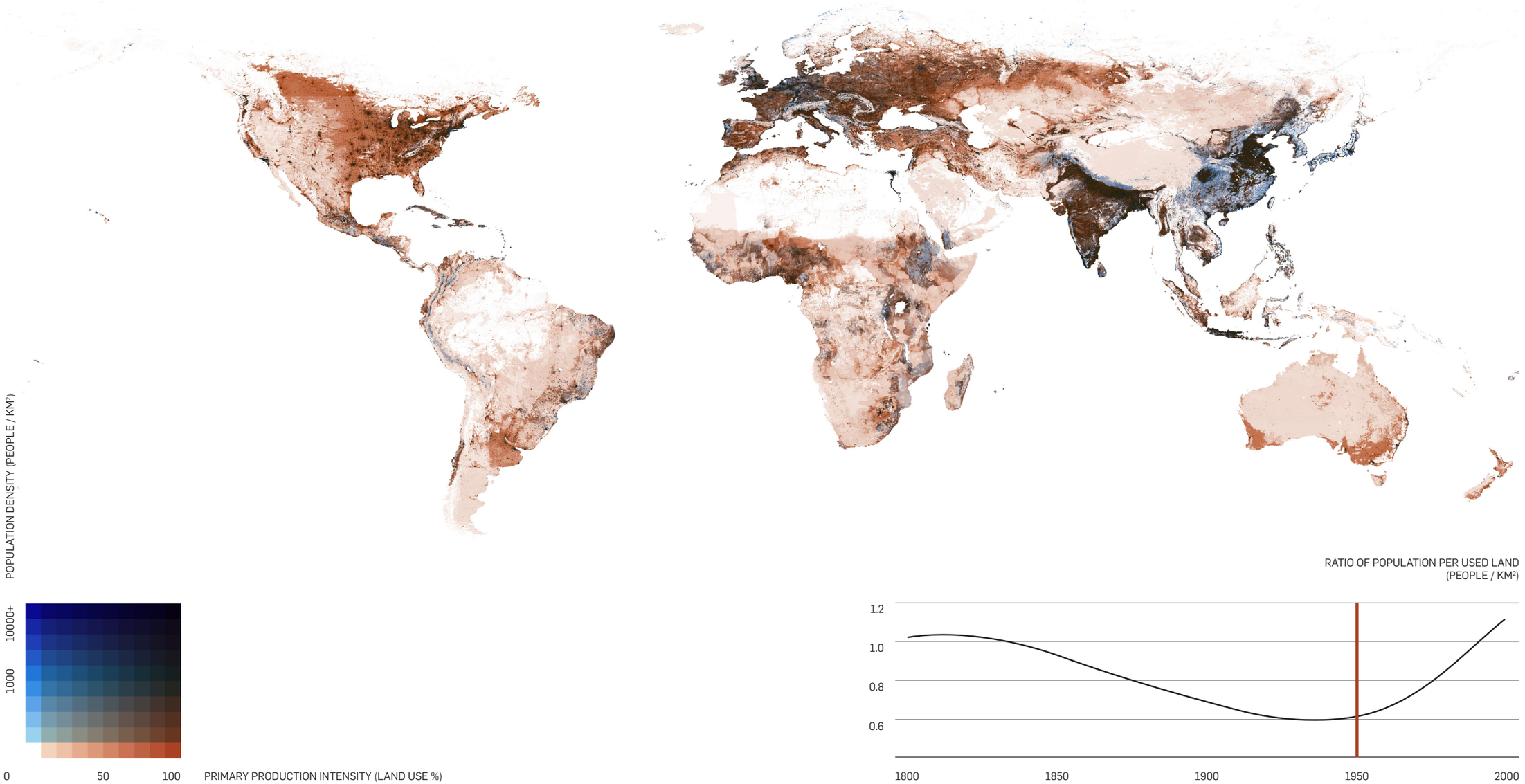
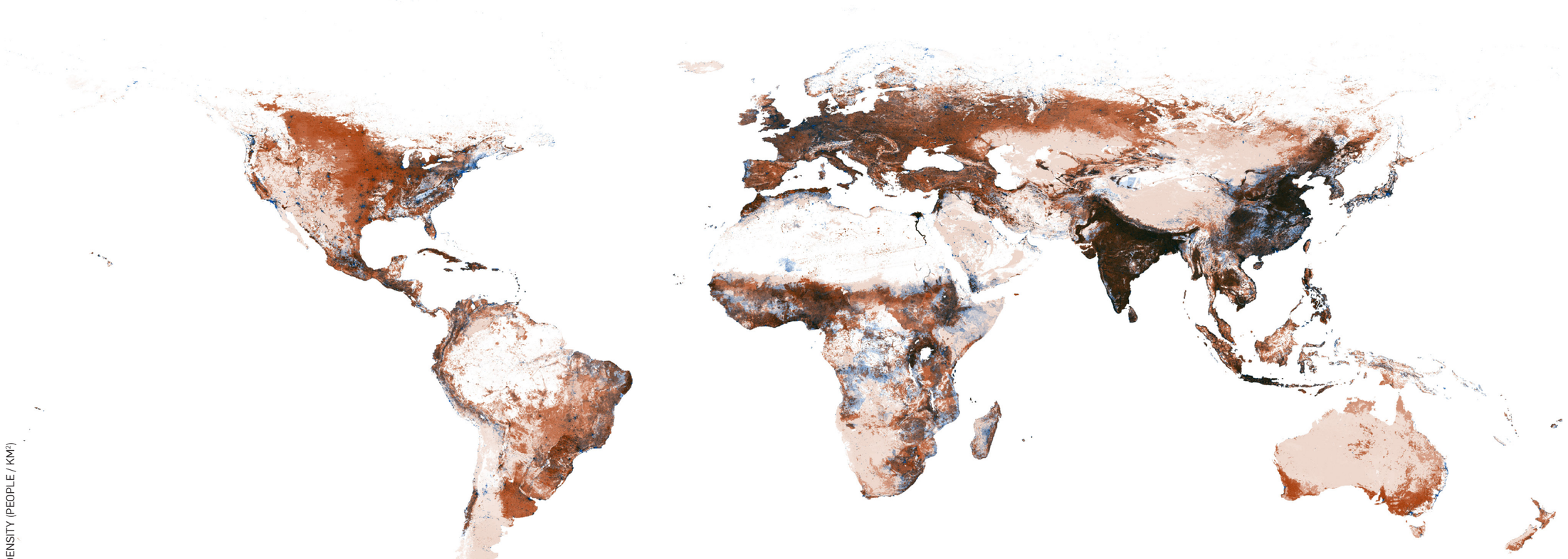
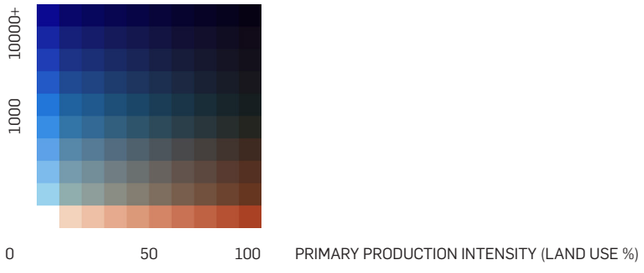


FIGURE 83: COMPOSITE MAP OF AGGLOMERATION LANDSCAPES AND PRIMARY PRODUCTION LANDSCAPES IN 2000.





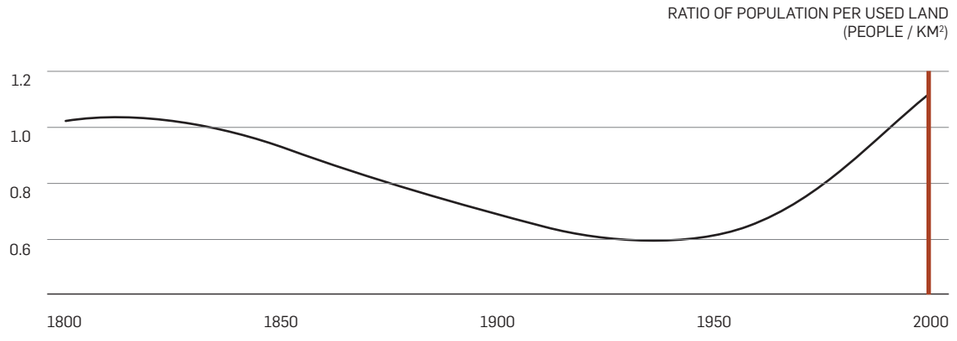
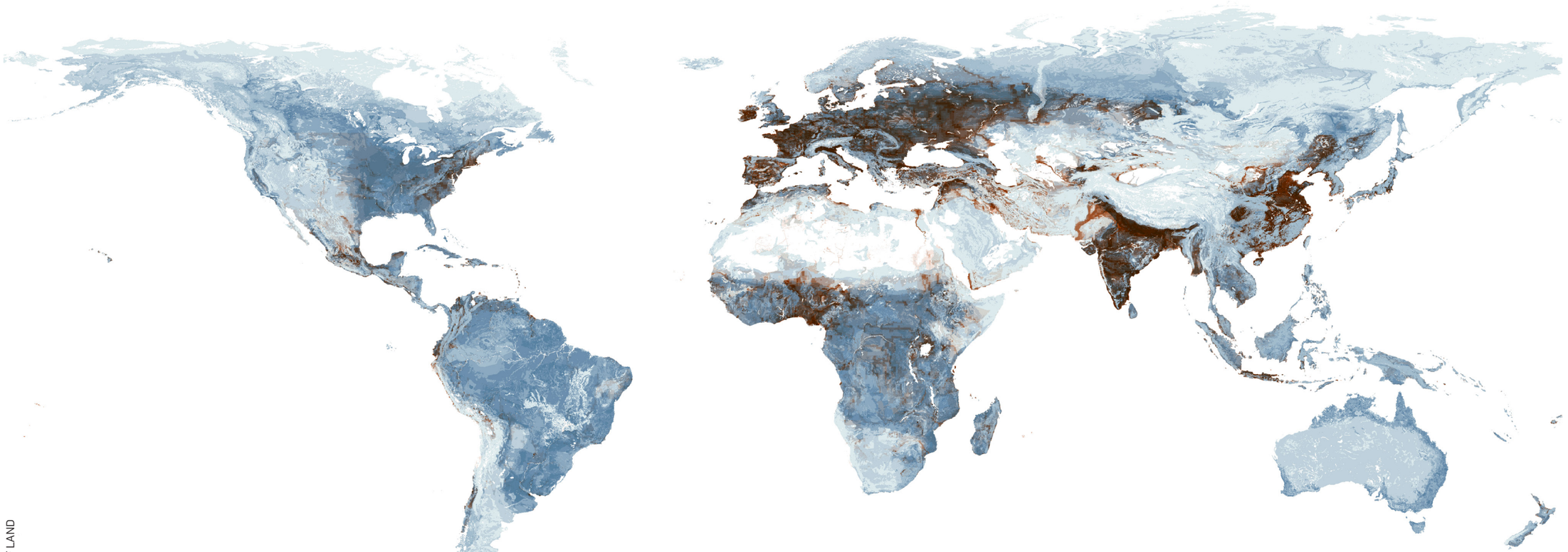
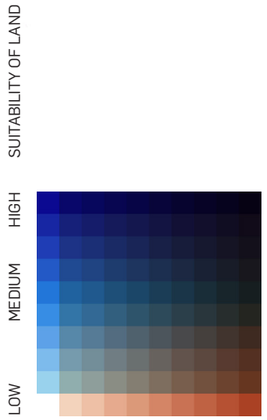


FIGURE 84: COMPOSITE MAP OF PRIMARY PRODUCTION LANDSCAPES AND SUITABILITY GRADIENT IN THE YEAR 1800





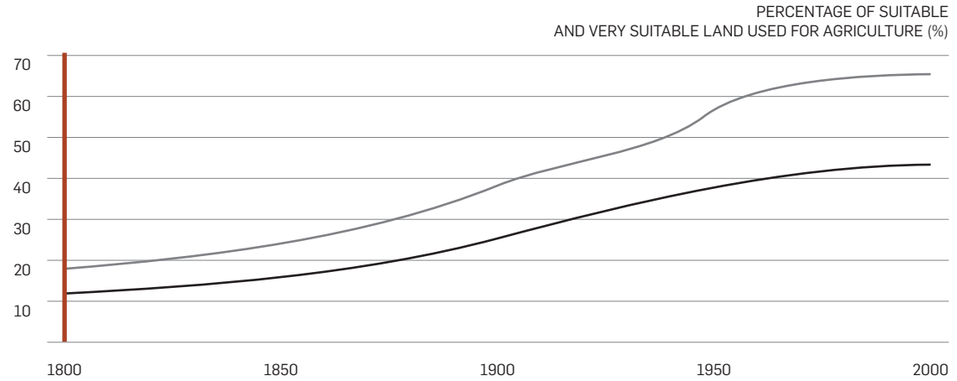
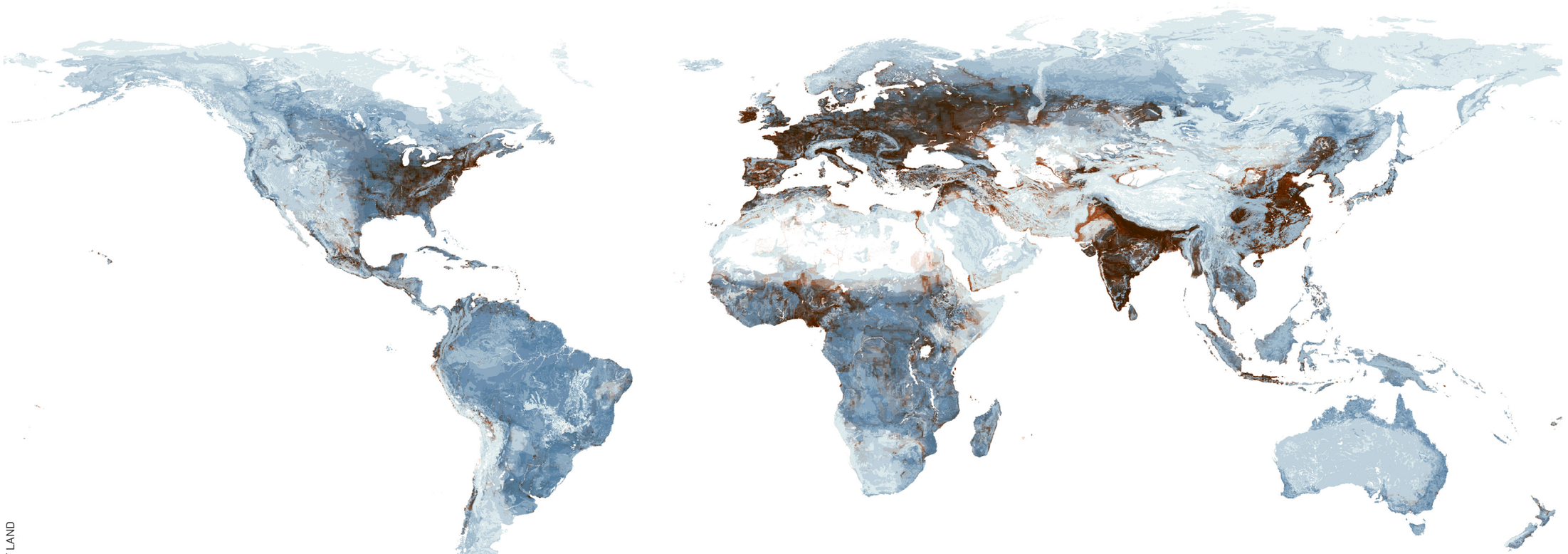
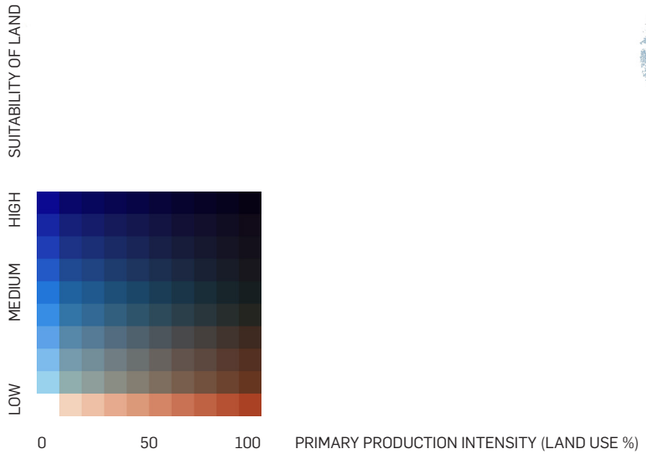


FIGURE 85: COMPOSITE MAP OF PRIMARY PRODUCTION LANDSCAPES AND SUITABILITY GRADIENT IN THE YEAR 1850





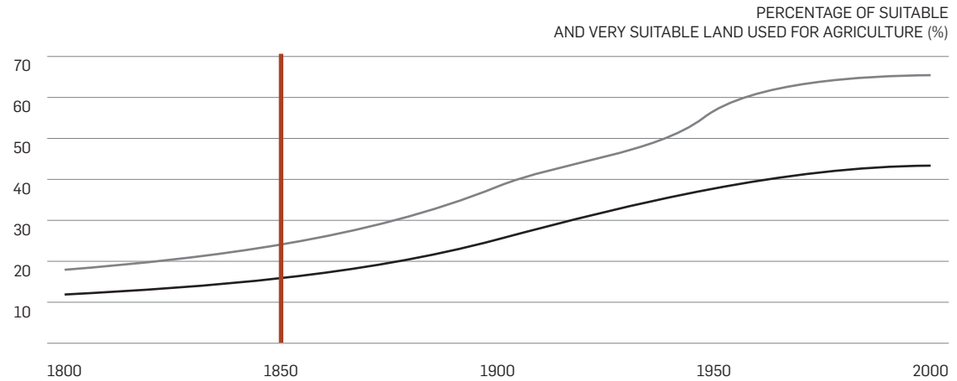
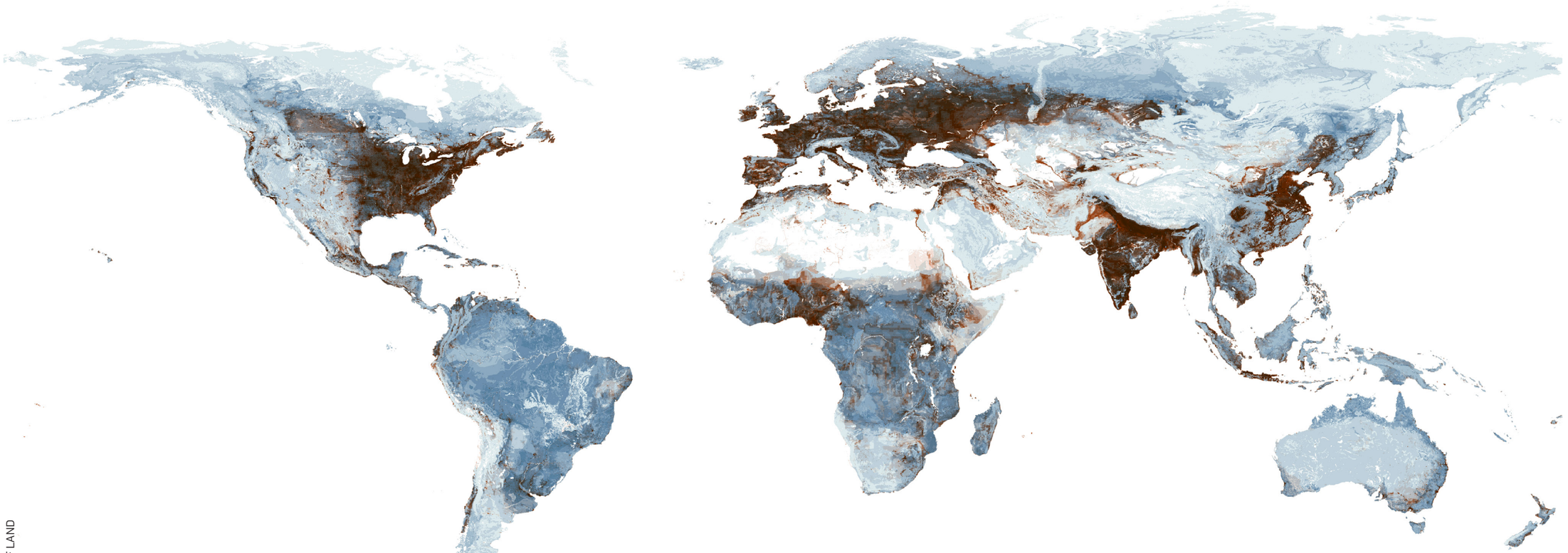
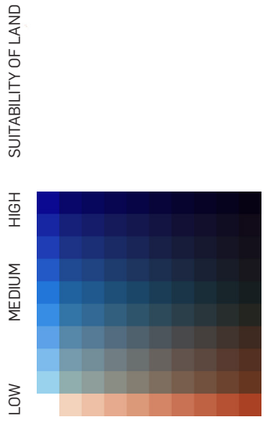


FIGURE 86: COMPOSITE MAP OF PRIMARY PRODUCTION LANDSCAPES AND SUITABILITY GRADIENT IN THE YEAR 1900





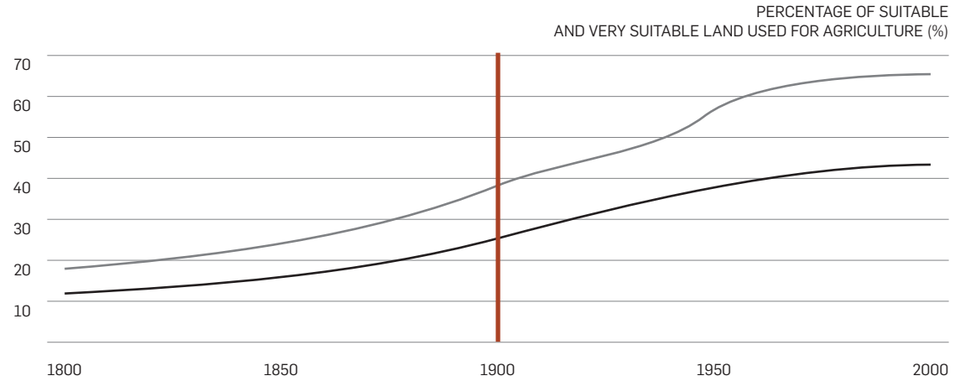
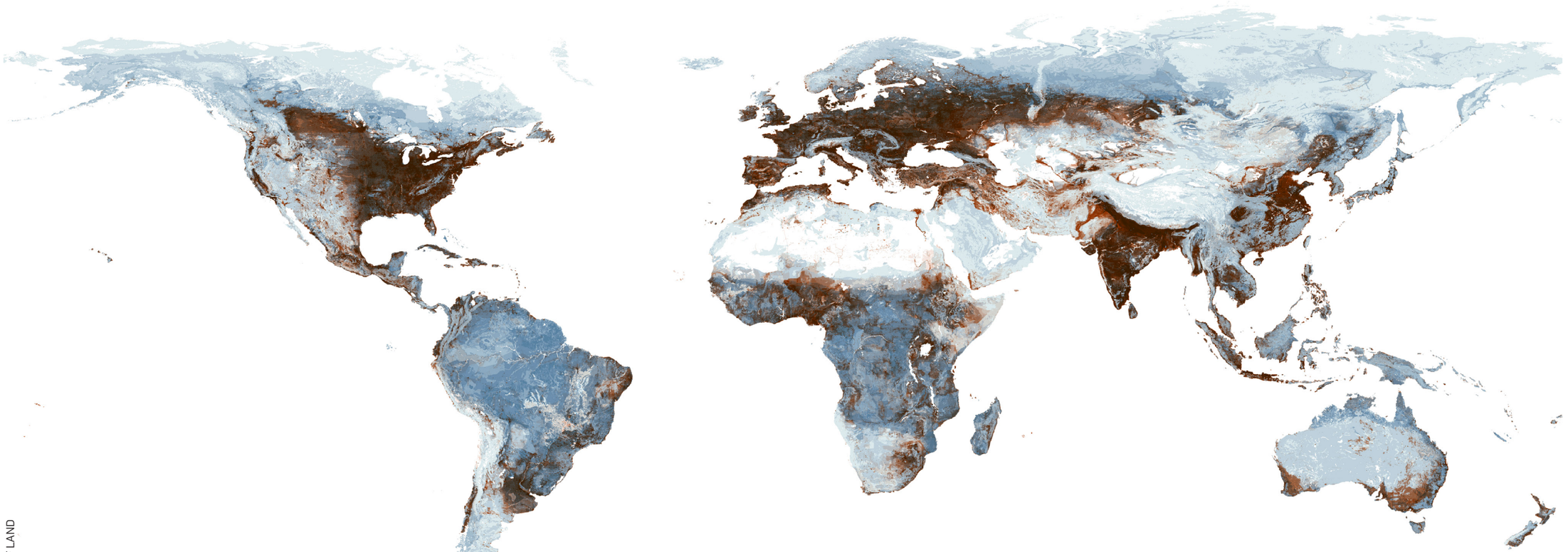
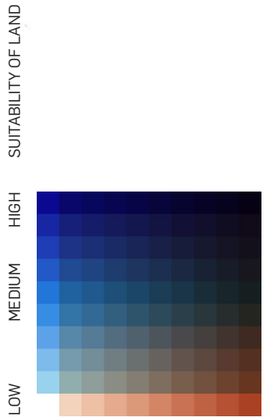


FIGURE 87: COMPOSITE MAP OF PRIMARY PRODUCTION LANDSCAPES AND SUITABILITY GRADIENT IN THE YEAR 1950





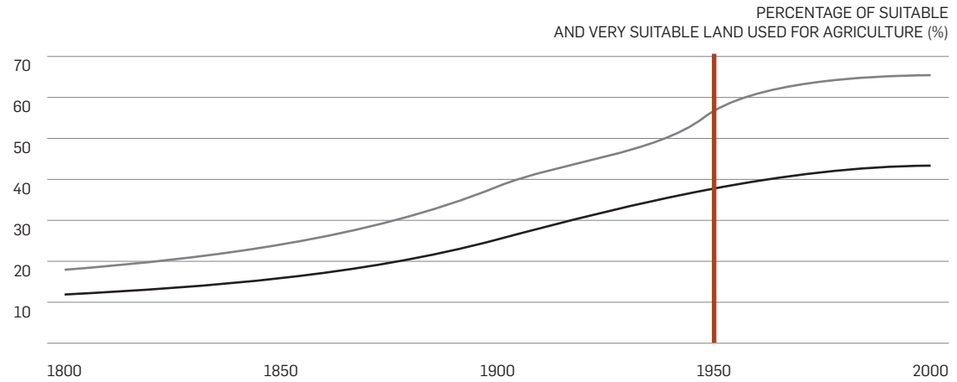
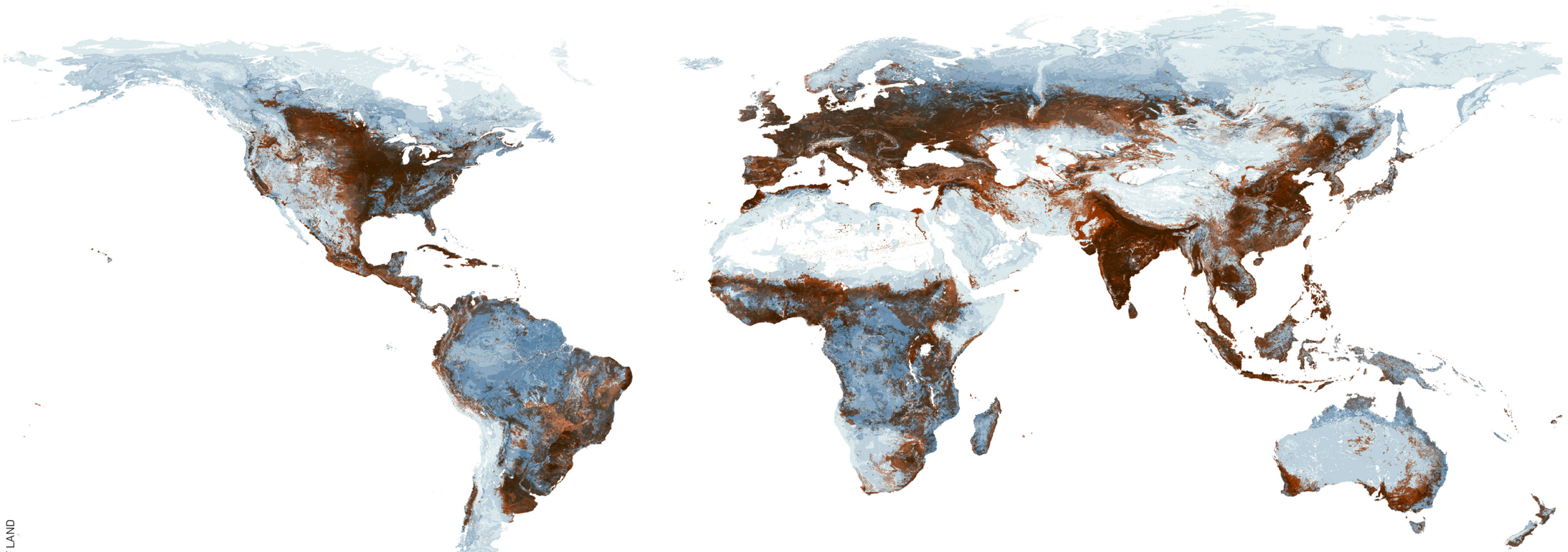
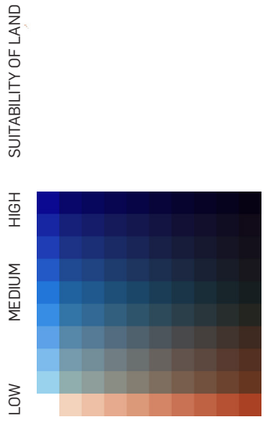
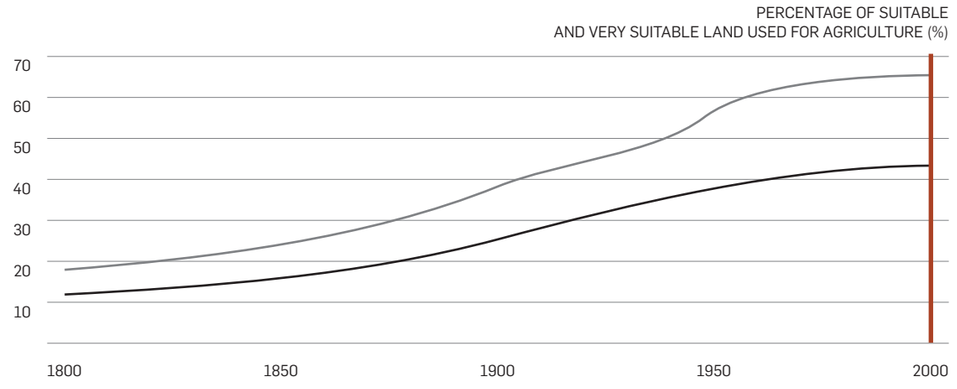


FIGURE 88: COMPOSITE MAP OF PRIMARY PRODUCTION LANDSCAPES AND SUITABILITY GRADIENT IN THE YEAR 2000







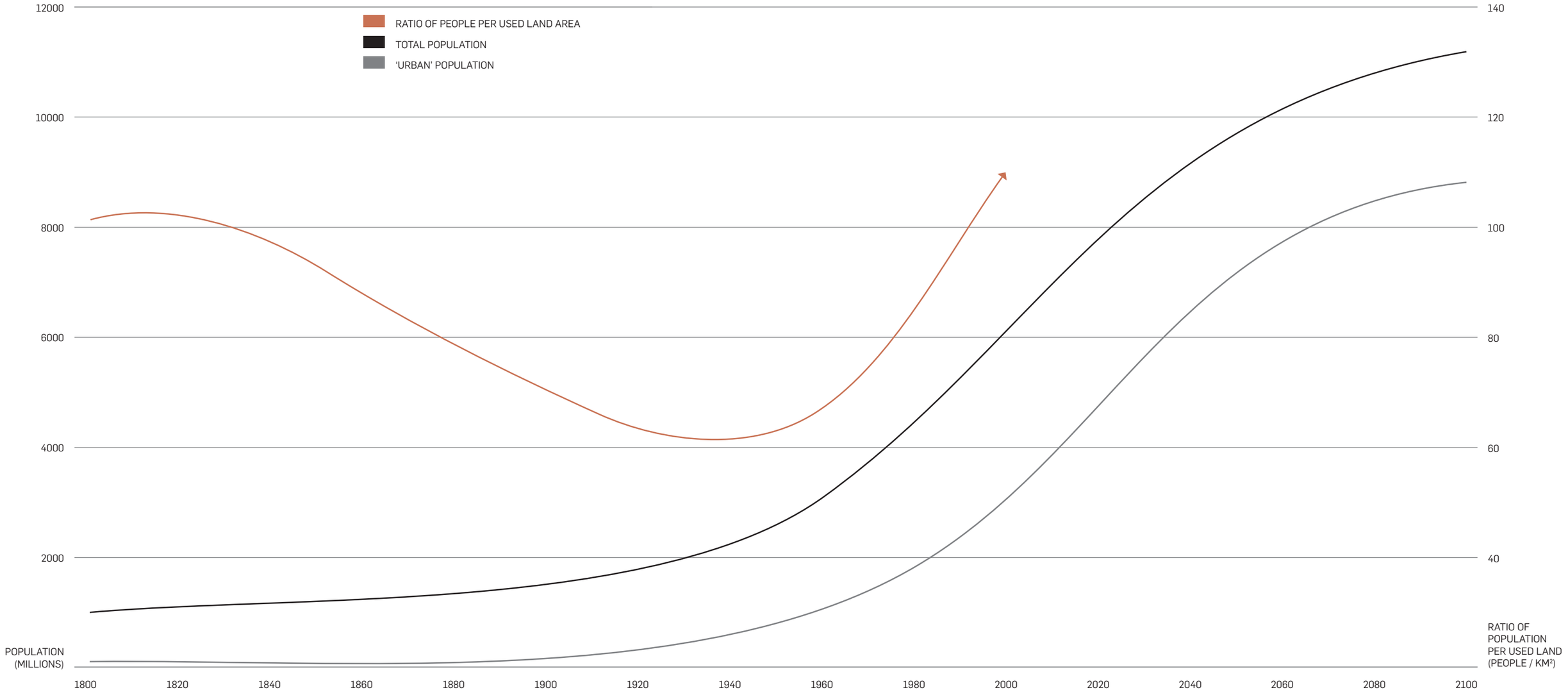


FIGURE 89: EVOLUTION OF WORLD AND URBAN POPULATION GROWTH (HISTORIC AND FUTURE ESTIMATES) AND THE GREAT INTENSIFICATION CURVE.

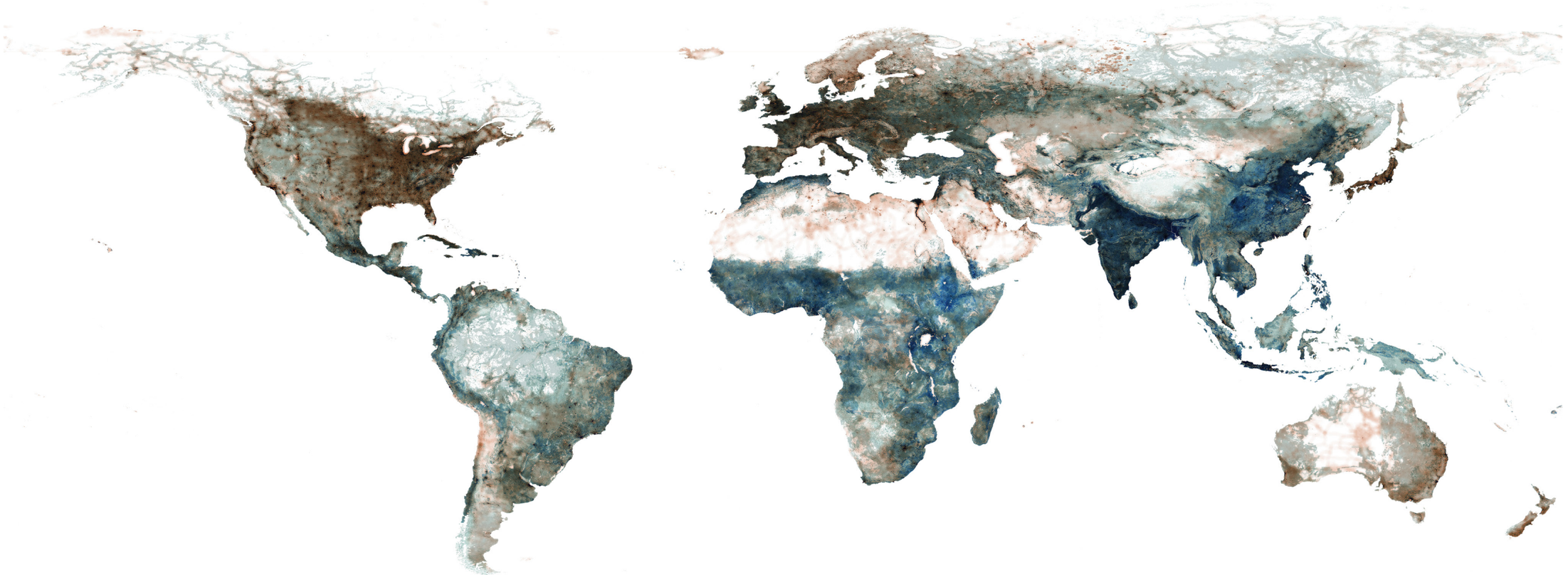


FIGURE 90: COMPOSITE GEOGRAPHIES OF URBANIZATION IN THE YEAR 2000.

ENDNOTES TO PART 03 AND CONCLUSIONS

1 Smith, N. *Uneven development: Nature, capital, and the production of space*. (Athens, GA: University of Georgia Press, 2008).

2 Seminal contributions include: Harvey, D. *The limits to capital* (London: Verso, 1999); Lefebvre, H. *The urban revolution*, trans. Robert Bononno (Minnesota: University of Minnesota Press, 2003); Smith. *Uneven development: Nature, capital, and the production of space.*

3 For a critical discussion on several of these indicators see: Brenner, N., and Katsikis, N. "Is the Mediterranean urban?." Petrov, A. (ed.) *New Geographies 5: Mediterranean* (Cambridge: Harvard University Press, 2013) 215-234.

4 Harvey. *The limits to capital*; Smith. *Uneven development: Nature, capital, and the production of space.*

5 Harvey, D. "Cities or urbanization?." *City* 1.1-2 (1996) 44.

6 Smith. *Uneven development: Nature, capital, and the production of space,* 78.

7 For a recent review of these central themes in Harvey's work see: Harvey, D. "Globalization and the spatial fix." *Geographische revue* 2.3 (2001) 23-31.

8 Harvey. *The limits to capital.*

9 Cronon, W. *Nature's metropolis: Chicago and the Great West* (New York: WW Norton & Company, 2009).

10 Ibid.

11 Smith. *Uneven development: Nature, capital, and the production of space,* 135.

12 Harvey. *The limits to capital.* 334-335.

13 Ibid. 390.

14 Ibid. 205.

15 Ibid. 378.

16 Ibid. 334-335.

17 Harvey, D. "The spatial fix–Hegel, von Thünen, and Marx." Antipode 13.3 (1981) 1-12; Harvey. "Globalization and the spatial fix."

18 Harvey. *The limits to capital.* 395.

19 Ibid. 393.

20 Swyngedouw, E. "Territorial organization and the space/technology nexus." *Transactions of the Institute of British Geographers* (1992) 417-433.

21 Ibid. 418.

22 Lefebvre, H. "Space, Social Production and Use Value." *Critical Sociology: European Perspectives* (1979) 288.

23 Perrin, as translated by Swyngedouw in Swyngedouw, in "Territorial organization and the space/technology nexus." 420.

24 Ibid

25 Moore, J.W. *Capitalism in the Web of Life: Ecology and the Accumulation of Capital* (Verso Books, 2015).

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27 Moore, J.W. "The End of Cheap Nature, or, How I learned to Stop Worrying about 'the' Environment and Love the Crisis of Capitalism." Suter, C. and Chase Dunn, C. (eds) *Structures of the world political economy and the future of global conflict and cooperation.* (World Society Studies, 2014) 295.

28 Ibid. 298.

29 Ibid. 308.

30 Brenner, N. “Theses on urbanization.” *Public Culture* 25.1 69 (2013) 85-114; Brenner, N. and Schmid, C. “Towards a new epistemology of the urban?.” *City* 19.2-3 (2015) 151-182.

31 For a review see: Coe, N. et al. *Economic Geography: A Contemporary Introduction.* (Malden, MA: Blackwell Publishing, 2007).

32 The concept of agglomeration economies is one of the most pervasive in economic geography. Among the extensive literature, foundational works include: Marshall, A. *Principles of Economics*. (London: MacMillan, 1920); Weber, A. *Theory of the Location of Industries* (London: Forgotten Books 2013 [1929]). More recently: Fujita, M. Krugman, P. and Venables, A. *The spatial economy: Cities, regions, and international trade.* (Cambridge, MA: MIT press, 2001). In relation to urbanization economies, the work of Jane Jacobs has been particularly important, as well as recent research by Edward Glaeser. Glaeser, E. “Growth in cities” *National Bureau of Economic Research* No. w3787 (1991); Jacobs, J. *The economy of cities.* (New York: Vintage, 1970); Jacobs, J. *Cities and the Wealth of Nations*. (New York: Random House, 1984). For a review see: Parr, J.B. “Agglomeration economies: ambiguities and confusions.” *Environment and Planning A* 34.4 (2002) 717-732. I base my analysis upon a summary offered by Rodrigue, J. *The geography of transport systems.* (Routledge, 2013).

33 For an overview of the various production sectors and their geographical specificities see: Knox, P., Agnew, J and McCarthy, L. *The geography of the world economy* (London: Routledge, 2014); Knox, 2014; Dicken, P. *Global shift: Mapping the changing contours of the world economy* (London: SAGE Publications, 2007).

34 See for example: Janelle, D.G. “Spatial reorganization: a model and concept.” *Annals of the Association of American Geographers* 59.2 (1969) 348-364; Richardson, H.W. “Economies and diseconomies of agglomeration.” *Urban agglomeration and economic growth*. (Berlin: Springer, 1995) 123-155.

35 Swyngedouw. “Territorial organization and the space/technology nexus.” 425.

36 Bunker, S.G. “Staples, links, and poles in the construction of regional development theories.” *Sociological Forum*. Vol. 4. No. 4. (Kluwer Academic Publishers, 1989) 591.

37 Gottmann, J. M*egalopolis: the urbanized northeastern seaboard of the United States.* (Cambridge, MA, USA: MIT Press, 1964) 215.

38 Harvey. *The limits to capital.*

39 Patrick Geddes cited in Welter, V. *Patrick Geddes and the city of life* (Cambridge, MA: MIT Press, 2003) 61.

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41 Ciccantell, P.S. and Bunker, S.G. *Space and Transport in the World-system* (Greenwood Publishing Group, 1998) 7.

42 I base this short historical review on: Vance, J.E. *Capturing the horizon: The historical geography of transportation since the transportation revolution of the sixteenth century.* (Harper Collins Publishers, 1986); Knowles, R.D. “Transport shaping space: differential collapse in time–space.” *Journal of transport geography* 14.6 (2006) 407-425; Rodrigue, *The geography of transport systems.*

43 Knowles. “Transport shaping space: differential collapse in time–space.”

44 See for example: Guldi, J. *Roads to power: Britain invents the infrastructure state* (Cambridge: Harvard University Press, 2012).

45 Vance. *Capturing the horizon: The historical geography of transportation since the transportation revolution of the sixteenth century.*

46 Graham, S. and Marvin, S. *Splintering urbanism: networked infrastructures, technological mobilities and the urban condition* (London: Routledge, 2001).

47 Ibid.

48 Rodrigue J., Notteboom, T. and Shaw, J. (eds.) *The SAGE handbook of transport studies.* (London: SAGE, 2013).

49 For the concept of the differential conformity to terrain see: Vance. *Capturing the horizon: The historical geography of transportation since the transportation revolution of the sixteenth century.*

50 For reviews see: Castree, N. “Commodifying what nature?.” *Progress in human geography*

27.3 (2003) 273-297; Prudham, S. "Commodification." Noel Castee (ed.) *Companion to Environmental Geography* (Willey-Blackwell, 2009) 123-142.

51 Prudham. "Commodification." 125.

52 Ibid.

53 Castree. "Commodifying what nature?" 281.

54 Cronon. *Nature's metropolis: Chicago and the Great West*.

55 Ibid. 116.

56 See: Dicken. *Global shift: Mapping the changing contours of the world economy.*

57 For the importance of the development of transnational corporations in this condition of intra and interfirm trade see: Dicken. *Global shift: Mapping the changing contours of the world economy;* Rodrigue, *The geography of transport systems.*

58 For a review see: Bair, J. "Global capitalism and commodity chains: looking back, going forward." *Competition & Change* 9.2 (2005) 153-180.

59 Hopkins, T.K. and Wallerstein, I. "Commodity chains in the world-economy prior to 1800." *Review* (Fernand Braudel Center, 1986) 157-170.

60 Hopkins, T.K. and Wallerstein, I. "Patterns of development of the modern world-system" *Review* (Fernand Braudel Center, 1977) 128.

61 Hopkins and Wallerstein. "Commodity chains in the world-economy prior to 1800." 163.

62 Rodrigue, *The geography of transport systems.*

63 Ibid.

64 Ibid.

65 Ibid.

66 Bunker, S.G., and Ciccantell, S.C. "Matter, space, time, and technology: how local process drives global systems." *Research in rural sociology and development* 10 (2005) 29.

67 Bunker, S.G., and Ciccantell, S.C. *Globalization and the Race for Resources.* (JHU Press, 2005) 12.

68 Bunker and Ciccantell. "Matter, space, time, and technology: how local process drives global systems." 30.

69 Rodrigue, *The geography of transport systems.*

70 Smith. *Uneven development: Nature, capital, and the production of space,* 180.

71 Braudel, F. *Civilization and Capitalism, 15th-18th Century: Volume II: The wheels of commerce* (University of California Press, 1982).

72 Federico, G. *Feeding the world: an economic history of agriculture, 1800-2000* (Princeton University Press, 2005); Weis, A. *The global food economy: The battle for the future of farming* (Zed Books, 2007).

APPENDIX:
LIST OF IMAGES, SOURCES AND DATASETS.

FIGURE 01:

Doxiadis, C. and Papaioannou, J. *Ecumenopolis: The Inevitable City of the Future* (New York: Norton, 1974) 368-369.

FIGURE 02:

Redrawn by the author, based on: Lefebvre, H. *The urban revolution*, trans. Robert Bononno (Minnesota: University of Minnesota Press, 2003) 15.

FIGURE 03:

Cartography by the author, based on datasets from: Center for International Earth Science Information Network - CIESIN - Columbia University, International Food Policy Research Institute - IFPRI, The World Bank, and Centro Internacional de Agricultura Tropical - CIAT. 2011. *Global Rural-Urban Mapping Project, Version 1 (GRUMPv1)*; Erb, K.H., Gaube, V., Krausmann, F., Plutzar, C., Bondeau, A., H. 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.

FIGURE 04:

Diagram drawn by the author, based upon Von Thünen's analysis and description of the geographical organization of the Isolated State. Von Thünen, J.H. *The Isolated State*, edited by Peter Hall (Oxford: Pergamon Press, 1966 [1826]).

FIGURE 05:

Redrawn by the author, based upon John Friedmann's original diagram. Friedmann, J. "The world city hypothesis". *Development and Change* 17, (1986) 71.

FIGURE 06:

Redrawn by the author based upon the original model of: Taylor P.J. and Globalization and World Cities (GaWC) Research Network, *Atlas of Hinterworlds*, (2004), http://www.lboro.ac.uk/gawc/visual/hwatlas.html (accessed 2016/02/01).

FIGURE 07:

Gottmann, J. *Megalopolis: the urbanized northeastern seaboard of the United States.* (Cambridge, MA, USA: MIT Press, 1964) 6.

FIGURE 08:

Gottmann, J. *Megalopolis: the urbanized northeastern seaboard of the United States.* (Cambridge, MA, USA: MIT Press, 1964) 317

FIGURE 09:

Cartography and spatial analysis by the author, based on data from: Natural Earth. Free vector and raster map data. www.naturalearthdata.com.

FIGURE 10:

Cartography and spatial analysis by the author based on data from: Natural Earth. Free vector and raster map data. www.naturalearthdata.com; Erb, K.H., Gaube, V., Krausmann, F., Plutzar, C., Bondeau, A., H. 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.

FIGURE 11:

Diagrams and spatial analysis by the author, based on data from: *HYDE 3.1 spatially explicit database of human induced land use change over the past 12,000 years,* developed by Klein Goldewijk, K., A. Beusen, M. de Vos and G. van Drecht (2011); Erb, K.H., Gaube, V., Krausmann, F., Plutzar, C., Bondeau, A., H. 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.

FIGURES 12-14:

Cartography and spatial analysis by the author based on data from: Erb, K.H., Gaube, V., Krausmann, F., Plutzar, C., Bondeau, A., H. 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.

FIGURE 15:

Cartography and spatial analysis by the author, based on data from: Erb, K.H., Gaube, V., Krausmann, F., Plutzar, C., Bondeau, A., H. 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; Elvidge, C.D., et al. *Global Distribution and Density of Constructed Impervious Surfaces dataset*, National Geophysical Data Center (NGDC) of the National Oceanic and Atmospheric Administration (NOAA)

FIGURE 16:

Cartography and spatial analysis by the author, based on data from: Road and rail networks are based on the *Vector Map Level 0 (VMap0)* dataset released by the National Imagery and Mapping Agency (NIMA) in 1997; marine routes are based on the *Global Commercial Activity (shipping)* dataset compiled by The National Center for Ecological Analysis and Synthesis (NCEAS); aviation networks based on the *Open Flights Airports Database*.

FIGURE 17:

Cartography and spatial analysis by the author, based on data from: Center for International Earth Science Information Network - CIESIN - Columbia University, International Food Policy Research Institute - IFPRI, The World Bank, and Centro Internacional de Agricultura Tropical - CIAT. 2011. *Global Rural-Urban Mapping Project, Version 1 (GRUMPv1).*

FIGURE 18:

Diagrams and spatial analysis by the author, based on data from: *HYDE 3.1 spatially explicit database of human induced land use change over the past 12,000 years,* developed by Klein Goldewijk, K., A. Beusen, M. de Vos and G. van Drecht (2011)

FIGURE 19:

Cartography and spatial analysis by the author, based on data from: Center for International Earth Science Information Network - CIESIN - Columbia University, International Food Policy Research Institute - IFPRI, The World Bank, and Centro Internacional de Agricultura Tropical - CIAT. 2011. *Global Rural-Urban Mapping Project, Version 1 (GRUMPv1).*

FIGURE 20:

Cartography and spatial analysis by the author, based on data from: Angel, S., J. Parent, D. L. Civco and A. M. Blei, 2010. *Atlas of Urban Expansion* (Cambridge MA: Lincoln Institute of Land Policy) http://www.lincolninst.edu/subcenters/atlas-urban-expansion/

FIGURE 21:

Diagrams and spatial analysis by the author, based on data from: *HYDE 3.1 spatially explicit database of human induced land use change over the past 12,000 years,* developed by Klein Goldewijk, K., A. Beusen, M. de Vos and G. van Drecht (2011)

FIGURE 22:

Diagram drawn by the author based on the description of the metropolitan economy offered by Gras. Gras, N.S.B. *An introduction to economic history* (New York: Harper & Brothers, 1922).

FIGURE 23:

Diagram drawn by the author, based upon Von Thünen's analysis and description of the geographical organization of the Isolated State. Von Thünen, J.H. *The Isolated State*, edited by Peter Hall (Oxford: Pergamon Press, 1966 [1826]).

FIGURE 24:

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Diagrams and spatial analysis by the author, based on data from: Natural Earth. Free vector and raster map data. www.naturalearthdata.com; Center for International Earth Science Information Network - CIESIN - Columbia University, International Food Policy Research Institute - IFPRI, The World Bank, and Centro Internacional de Agricultura Tropical - CIAT. 2011. *Global Rural-Urban Mapping Project, Version 1 (GRUMPv1).*

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FIGURES 45-46:

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FIGURE 48:

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FIGURE 49:

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FIGURE 50:

Diagram by the author.

FIGURES 51-57:

Cartography and spatial analysis by the author, based on data from: *HYDE 3.1 spatially explicit database of human induced land use change over the past 12,000 years,* developed by Klein Goldewijk, K., A. Beusen, M. de Vos and G. van Drecht (2011); *LandScan 2012™ High Resolution global Population Data Set,* copyrighted by UT-Battelle, LLC, operator of Oak Ridge National Laboratory (2012).

FIGURE 58:

Cartography and spatial analysis by the author, based on data from: *Vector Map Level 0 (VMap0)* dataset released by the National Imagery and Mapping Agency (NIMA) in 1997; *LandScan 2012™ High Resolution global Population Data Set,* copyrighted by UT-Battelle, LLC, operator of Oak Ridge National Laboratory (2012).

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Cartography and spatial analysis by the author, based on data from: Elvidge, C.D., et al. *Global Distribution and Density of Constructed Impervious Surfaces dataset*, National Geophysical Data Center (NGDC) of the National Oceanic and Atmospheric Administration (NOAA); *LandScan 2012™ High Resolution global Population Data Set,* copyrighted by UT-Battelle, LLC, operator of Oak Ridge National Laboratory (2012).

FIGURE 60:

Cartography and spatial analysis by the author, based on data from: *Vector Map Level 0 (VMap0)* dataset released by the National Imagery and Mapping Agency (NIMA) in 1997; Elvidge, C.D., et al. *Global Distribution and Density of Constructed Impervious Surfaces dataset*, National Geophysical Data Center (NGDC) of the National Oceanic and Atmospheric Administration (NOAA); *LandScan 2012™ High Resolution global Population Data Set,* copyrighted by UT-Battelle, LLC, operator of Oak Ridge National Laboratory (2012).

FIGURES 61-64:

Cartography and spatial analysis by the author, based on data from: *Vector Map Level 0 (VMap0)* dataset released by the National Imagery and Mapping Agency (NIMA) in 1997; GErb, K.H., Gaube, V., Krausmann, F., Plutzar, C., Bondeau, A., H. 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; Elvidge, C.D., et al. *Global Distribution and Density of Constructed Impervious Surfaces dataset*, National Geophysical Data Center (NGDC) of the National Oceanic and Atmospheric Administration (NOAA); *LandScan 2012™ High Resolution global Population Data Set,* copyrighted by UT-Battelle, LLC, operator of Oak Ridge National Laboratory (2012).

FIGURES 65-66:

Diagrams and spatial analysis by the author, based on data from: *LandScan 2012™ High Resolution global Population Data Set,* copyrighted by UT-Battelle, LLC, operator of Oak Ridge National Laboratory (2012); Elvidge, C.D., et al. *Global Distribution and Density of Constructed Impervious Surfaces dataset*, National Geophysical Data Center (NGDC) of the National Oceanic and Atmospheric Administration (NOAA).

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FIGURE 69:

Diagram by the author.

FIGURES 70-71:

Diagrams by the author, based on data from: United Nations Commodity Trade Statistics Database (COMTRADE); World Trade Organization Statistics Database.

FIGURES 72-73:

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FIGURE 75:

Diagrams and spatial analysis by the author, based on data from: *HYDE 3.1 spatially explicit database of human induced land use change over the past 12,000 years,* developed by Klein Goldewijk, K., A. Beusen, M. de Vos and G. van Drecht (2011); *The 2015 Revision of World Population Prospects*, Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat (2015); Fertilizer application statistics from the Food and Agriculture Organization of the United Nations, Statistics Division (FAOSTAT).

FIGURES 76-78:

Diagrams and spatial analysis by the author, based on data from: *HYDE 3.1 spatially explicit database of human induced land use change over the past 12,000 years,* developed by Klein Goldewijk, K., A. Beusen, M. de Vos and G. van Drecht (2011); *The 2015 Revision of World Population Prospects*, Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat (2015).

FIGURES 79-83:

Cartography, spatial analysis and diagrams by the author, based on data from: *HYDE 3.1 spatially explicit database of human induced land use change over the past 12,000 years,* developed by Klein Goldewijk, K., A. Beusen, M. de Vos and G. van Drecht (2011).

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FIGURE 90:

Same as figure 61.