City, Territory
and Architecture

RESEARCH ARTICLE

Reimaging Earth. Architecture and the critical and speculative uses of geovisualization

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Abstract

This article addresses the debates surrounding the design uses of satellite-based geovisualizations. It asks, in particular, how geovisualizations can support new design politics towards global urbanization. The initial section of the article presents a series of theoretical critiques of geovisualization. These stress that satellite-based imagery represents a disembodied, detached form of vision that hides under a totalizing image the actual, variegated conditions and struggles happening on the ground. As a result, geovisualization is considered as an instrument that neutralizes the critical dimension of design. The article counters this critique through an analysis of two cartographic and design practices which heavily rely on satellite data. The first one is the work of Neil Brenner's Urban Theory Lab (UTL), which uses cartography as an analytical and critical tool aimed at unpacking the sociospatial dimensions of planetary urbanization. The second case is Joyce Hsiang and Bimal Mendis' speculative, cartographic project *City of Seven Billion*. My argument is that this project partially builds upon the UTL's work, but it substitutes the latter's analytical orientation for a projective one to investigate how architectural design can operate in the context of planetary urbanization. By analysing these two works, the article concludes that both support a design politics oriented to recognizing and then defining the questions and scales upon which architecture can intervene today.

Keywords Geovisualization, Planetary urbanization, Cosmopolitical design, Critical cartography

Article text

Satellite imaging the Anthropocene

Without even asking to, we have been invited: *Welcome to the Anthropocene.* This unapologetic, unrequested proposal titles a 3-min digital animation premiered at the 2012 United Nations Earth Summit Rio + 20 which, we are told, presents a historical account of how "one species changed the planet." Rapidly zooming in from an initial image of our planet from outer space, the animation takes us to the British Isles, to show how the industrial revolution initiated there in 1725 fostered a process

of continuous population and economic growth which, relentlessly unfolding until today, ended up transforming the entire globe. The last video frames, our present, purportedly show the resulting planetary transformation; the current "state of our planet" (Anthropocene Info 2012a) (Fig. 1). What we see in this last stage is an aesthetic spectacle: a stunning contrast between the delicate palette of blues used to represent physical geography—turquoise for the land masses, dark blue for the oceans—and the vast network of luminous, yellow areas representing settlements and infrastructural connections. These final images constitute an accomplished embellishment of the night lights maps produced using satellite imagery. They portray a planet entirely covered by different layers of human use, but whose only effect seems to be a magnificent superficial ornamentation of an otherwise unaltered

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Fig. 1 Globaïa. *Welcome to the Anthropocene.* 2012

planet; perhaps a beautiful display for extra-terrestrial beings.

The video was developed by non-profit organization Globaïa to raise "planetary awareness through science and art" (Globaïa 2009–2021). These goals were later expanded when Globaïa became one of the founding members of the Welcome to the Anthropocene network, an internet portal which develops similar video animations of global phenomena such as the extents of urbanization, or human-induced modifications of climate and water cycles. For Globaïa and the Welcome to the Anthropocene network, video visualizations are the crucial part of a communications project that is both artistic and educational, seeking to "engage people about the interactions between humans and the planet" (Anthropocene Info 2012b).

Such video works constitute the key examples art curator and professor TJ Demos uses in his book Against the Anthropocene: Visual Culture and Environment Today to denounce the conceptual and ideological limits of prevailing visual explorations of the notion of Anthropocene. Despite its origins in art criticism, Demos' analysis is important also for contemporary architectural production. The term Anthropocene gained general currency when in 2000 ecologist Eugene F. Stoermer and atmospheric chemist Paul J. Crutzen employed it to propose a still unverified scientific hypothesis: that we inhabit a new geological epoch, driven by human activity and not by natural forces. Demos joins ranks with a number of thinkers who are highly critical of term, and who denounce the universalization of responsibilities the notion entails. His argument favours alternative concepts, such as Andreas Malm and Jason Moore's "capitalocene", which emphasize that it is not humanity as a universal, undifferentiated whole who is transforming the planet, but a specific form of social organization: capitalism (Haraway 2015). He subsequently contends that the use of the term Anthropocene obliterates the uneven social

and ecological relations that impact our planet and it obscures a proper understanding of the human and non-human collectives that are negatively affected by the transformation of the earth.

Video geovisualizations such as Welcome to the Anthropocene are instrumental to this neutralizing ideological conceptualization of socio-ecological processes. They rely on a post-photographic regime of techno-vision—namely, digital, satellite imagery—which they uncritically use to portray the universalizing effects of globalization while neglecting both its causes and its very visible, deleterious effects. Moreover, the satellite-based technologies on which geovisualizations rely are in themselves fundamental enablers of the global, capitalist regime of social relations that causes the so-called Anthropocene. Even if unintentionally, the irreflexive appropriation of satellite imagery by geovisualizations such as *Welcome to the Anthropocene* does nothing but reinforce a techno-positivist discourse which conceives the planet as a manageable entity, fully understandable from above. For Demos, the detached view of geovisualizations goes hand in hand with the understanding of engineering and architecture as ameliorative techniques aimed at solving planetary phenomena such as climate warming or ecological devastation through a geo-technical lens which addresses partial effects of globalization while preserving the uneven social relations that cause them (Demos 2017).

Underlying Demos' critical analysis of the relations between geovisualizations and satellite imagery lies a long tradition of criticism to the universalizing, imperialistic, and technocratic uses of global cartographies, which historians of geographical knowledge often portray as an abstract, detached form of representation that negates the benefits of positioned forms of vision from the ground. This is an argument that we find in the writings of thinkers such as Elizabeth DeLaugrey, Bruno Latour, Tim Ingold, William Ranking or Peter Sloterdijk (DeLaugrey 2014; Latour 2017; Ingold 1993; Ranking 2016; Sloterdijk 2014). In fact, the arguments of the latter resound powerfully in Demos' analysis. In *Globes*, Sloterdijk's monumental study of the modes and techniques of globalization, the German philosopher argues that the cartographic enterprise of world-mapping initiated in the fifteenth century represents the progressive consolidation of a vision of the planet as a closed entity, only fully comprehensible for a being situated outside it. Such a form of vision allows humans to subject the planet to "polytechnical dreams of control" which, in their modern stages, depend upon the "development of a physical-technical, aero- and astronautical imagination" (Sloterdijk 2014). Precisely the form of imagination epitomized now by satellite imagery and geovisualizations.

Still, Demos recognizes that planetary phenomena constitute a representational challenge for artistic practices. The propositional part of *Against the Anthropocene* presents a series of counter-examples whose common thread is to employ forms of vision that address global matters of concern from specific and local view-points. That is, to the exo-vision of geovisualization, Demos counterposes the benefits of the locally situated, particular intervention—a position that he shares with fellow curators such as Simon Sheikh, Paul O'Neill, Lucy Steeds and Mick Wilson, and which fundamentally depends on the cosmopolitical emphasis on the idea of "vision from within" (O'Neill 2020; Yaneva and Zaera-Polo 2015). Central among the examples Demos provides is the work of the collective of architects and artists World of Matter. The works of World of Matter are in many ways the opposite of *Welcome to the Anthropocene*. They are acts of photographic and video documentation of the deleterious consequences of resource extraction. They present industrialized monocultures, areas of ecologic devastation, displaced and disempowered populations (Fig. 2). They are also, often, activist interventions seeking to mobilize and interrelate collectives affected by socio-ecological distress across the planet. For Demos, the works of World of Matter do not negate the value of globalization. Rather, they offer an alternative, cosmopolitical way of understanding the global project, interested in promoting forms of universality that bring together the voices and visions of those marginalized by the global hegemon.

While powerful and rhetorically clear, Demos' contraposition between detached, techno-based geovisualizations, and situated, local practices does not fully exhaust the visual politics that architecture and other artistic practices can elaborate vis-à-vis the challenges of globalization. A fundamental reason to question this clear-cut division is that such a dichotomy impedes exploring the possible interrelations between different levels of vision and thinking, and thus between discourses and practices, frameworks and interventions. Cartographic explorations of the planet have the capacity to produce representational and conceptual meta-frameworks, which in turn help to place situated practices, such as those of World of Matter, within a broader set of references and analysis. Even more importantly, the crucial role existing geovisualizations play in the constructions of global knowledge and imaginaries should not be simply deflected by a reversed engagement in local practices, but also by the elaboration of alternative representations of the planet which critically engage with satellite remote sensing and other technologies of exo-vision.

To exemplify such a possibility, what follows analyses the value of two different—and yet related—approaches to geovisualization, which have been selected because of the strength of their intellectual and representational in the field (Aït-Touati et al 2022, Diller Scofidio + Renfro et al. 2020, Weller 2016). The first one consists in the elaboration of critical, analytic cartographies of globalization, and it is represented by the work of Neil Brenner's Urban Theory Lab (UTL). I have selected this work not only because of the central position Brenner's theories occupy in contemporary urbanism, but also because the UTL's representational project has been questioned from a postcolonial perspective with arguments similar to Demos' critique of geovisualization. For Rajyashree N. Reddy, for example, the UTL elaborates "disabling, disembodied, aerial and 'god's eye-views' of the extended landscapes of urbanization" which obliterate onsite struggles and negate the agency of local communities (Reddy 2018). Challenging this view, my analysis intends to articulate the relation between the UTL's critical mobilization of GIS and satellite imagery and the agency of local spaces and actors who question current globalization. This examination of the UTL's theories and cartographic mechanisms serves as an introduction to a second approach to geovisualization: the design of projective, speculative cartographies of the planet. In this case I will focus on the project City of 7 Billion, by Plan B's founders Joyce Hsiang and Bimal Mendis. City of 7 Billion builds upon Brenner's theories of urbanization. Yet, the UTL mechanisms of cartographic analyses are substituted by an alternative investigation, in which the convergence between cartography and architectural mechanisms of design becomes a tool to examine the spatial fabric of globalization and its potential for political articulation. In both cases, the use of geovisualization helps the authors to question the relation that dominant architectural and urban practices maintain with ongoing, global processes of sociospatial modification, and to advance key spaces and issues that an alternative architectural positioning towards globalization should address.

Fig. 2 Frauke Huber and Uwe. H. Martin (World of Matter). *LandRush*. 2011

Across scales. The critical cartographies of the Urban Theory Lab

In 2011, geographers Neil Brenner and Christian Schmid co-authored a highly influential article titled Planetary Urbanisation. Building upon the hypothesis Henri Lefebvre proposed in The Urban Revolution that society was entering a moment of complete urbanization, the article claimed that there are evident signs that the entire planet has become subjected to the urban logics. The authors based their assertion on four principal indicators: the creation of new scales of urbanization (i.e., the consolidation of huge metropolitan regions or urban galaxies); the blurring and rearticulation of urban territories (meaning the radical transformation of core-periphery relations); the disintegration of hinterlands (as they become involved in multiple, cross-geographic trans-scalar relations); and the end of the wilderness. The latter thesis was a crucial part of their argument, as it implied that the planetary effects of urbanization could be felt in the radical integration within urban circuits of those areas that formerly constituted the great outsides of urbanization: the oceans and the atmosphere, the deserts of Sahara and Gobi, the two poles and Siberia, the great forests of the Amazon.

Brenner and Schmid's fourth indicator constitutes a clear alternative to the predominant ways global urbanization has been understood in urban analysis. Since Kingsley Davis' pioneering studies of world urbanization in the 1950s and, more particularly, since the late 1990s, when the United Nations Settlement Program started promoting the idea of "Urban Age" to describe the expected surpassing of the global rural population by the urban one, urbanization has been mostly equated to the spatial and demographic growth of cities. In Brenner and Schmid's work, the most powerful evidence of urbanization does not lie in the dense human agglomerations, but on their opposite: the scarcely populated, former wilderness.

This contrast between the planetary urbanization thesis and previous ways of conceiving world urbanization

was graphically summarized in a series of five geovisualizations by architects Nikos Katsikis and Daniel Ibáñez, two former members of the Urban Theory Lab (UTL) Brenner directs (Fig. 3). The first drawing represents John Friedman's World City Hypothesis, according to which economic relations across the world are structured by a group of highly interconnected global-cities, almost completely detached from their surrounding territories. A second drawing represents Earth through the bars Richard Florida used to quantify the relation between urban economy and population; while a third represents the United Nations' "Urban Age" through numerical data registering percentages of urban population per country. Challenging the previous visions, Katsikis and Ibáñez present, first, Constantinos Doxiadis' 1967 *Ecumenopolis*—the Greek architect's prediction of a city encompassing all Earth. This is followed by a last image representing the idea of planetary urbanization through a globe where oceans, continents, atmosphere and outer space are deeply interconnected through multiple networks. The result is a deeply interwoven mesh where the black of the previous globes—their unexplored, non-urban outside—has been almost entirely integrated within global circuits of production and communication.

There are some superficial resemblances between this last image of planetary urbanization, and the last frames of Welcome to the Anthropocene. Most notably, both visualizations include the networks that interrelate the planet. Yet, there are fundamental representational and conceptual differences between the two projects, which ultimately point to completely divergent design politics towards globalization. Crucially, the UTL's drawing does not represent cities. It shows, instead, a mesh of varying intensity, at times surprisingly denser in the oceans than in the landmasses. As a result, the continents' profile often dissolves into lines of maritime and aerial transport. Further, satellites create a sort of second, parallel Earth, of fluctuating borders. Such representational decisions are a conceptual tool. They support a politico-economic and politico-ecological interrogation of urbanization
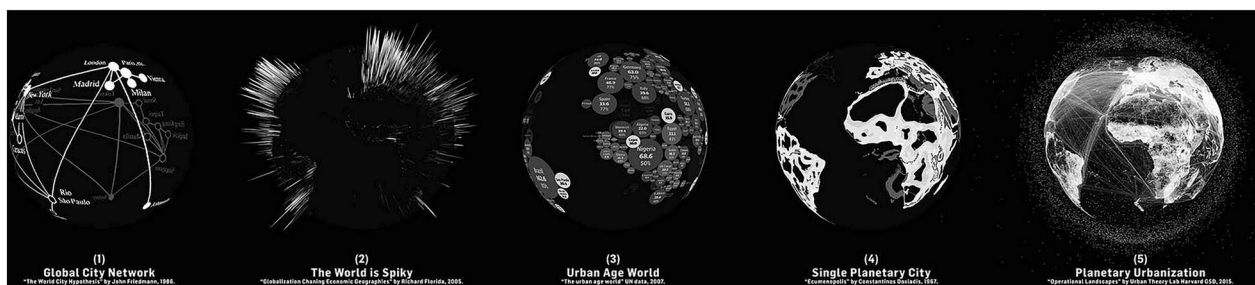

Fig. 3 Daniel Ibáñez and Nikos Katsikis. Contrasting concepts of global urbanization. 2015

which questions the fundamental notions we use to think about Earth's spatial organization. Geovisualizations not only help the authors to understand what the notion of planetary urbanization entails but also, more profoundly, to question the notion of urban itself.

One of Brenner's main theoretical tenets is to challenge the city-centrism that dominates urbanism. His argument is that urban discourse still depends upon a differentiation between the notion of urban and a putative outside (often termed rural, countryside, or wilderness); a distinction which originated in the late nineteenth century in response to the massive rural migrations to cities that were then taking place. The necessity at that moment of defining the specificity of the city in contrast to other forms of settlement and spatial organization motivated the assimilation of the idea of urbanization to the process of city creation. Brenner's writings and the UTL's geovisualization seek to question this equation by positing that urbanization is not only the process of settlement but the ways in which the economies and necessities of cities under globalized capitalism produce a whole set of socio-spatial transformations that imply the complete operationalization and enclosure of natural geographies and landscapes. While initiated in the nineteenth century, this process of total instrumentalization and global integration of nature intensified during the twentieth century and, substantially, after the emergence of neoliberal regimes of production in the 1970s. A contemporary understanding of urbanization requires then not only looking at cities but, most importantly, to the multiple geographies affected by them. Copper mines in Atacama are no less urban than Washington D.C. (Arboleda 2020).

The UTL's geovisualizations thus seek to deconstruct the notions of urban and urbanization, as well as to understand and represent their effects across the globe. This conceptual program is further developed in a series of maps produced by Nikos Katsikis, aimed at revealing the extents of the operational landscapes of production urbanization requires. While the content of these maps is of crucial importance, what concerns me in first place is to understand their process of construction as a rhetoric mechanism of argumentation. The drawings decode urbanization through a critical interrogation of the value of satellite data. They are planispheres with a very strong technical character. The layers of information each one presents derive mostly from satellite imagery (sources are NASA, ESA, and Landsat, among others). These are then flattened using a conventional, equirectangular cartographic projection that preserves the familiar North–South, East–West poles of orientation, and their related geographical hierarchies. The result is a cartographic set which uses conventional, textbook forms of geographic representation to demonstrate that urbanization needs

to be analysed well beyond agglomerations; that is, not as "the condition of concentration per se, but rather (as) the condition of geographical interdependency that emerges out of it" (Katsikis 2018).

Katsikis' direct engagement with satellite imagery and with the codified and abstract forms of visions it entails aims to expose both the potentials and the limitations of the knowledge this technology provides. The planetary decoding of urbanization is crucially based on satellite imagery because only the latter generates homogenous, unified layers of geographic information which relegate the disparate quantitative and qualitative considerations state agencies employ. As of today, this overcoming of state-produced data is not absolute. Gridded datasets offer a "standardized, universal framework" which has not "replaced, but rather complemented (…) traditional census data" (Katsikis 2018). Yet, partial as it is, satellite imagery helps to visualize the effects of urbanization without relying on bounded administrative divisions.

A way to do so is through the appropriation of information originally developed for purposes other than the analysis of cities—for instance, nightlight maps, one of the most conspicuous ways of portraying urbanization today, were originally developed as a meteorological sensor to monitor cloud coverage (Katsikis 2018). A second path consists in the consideration of socio-spatial indicators usually disregarded in prevailing cartographies. Following this latter procedure, Katsikis visualizes the extent of natural resources and operational landscapes which are vital for cities: agricultural, forestry, grazing, and resource extraction areas (Fig. 4). The superposition of these spaces with more conventional city-based parameters, such as density gradients or transport networks, is revealing. It shows that "the majority of the urbanization fabric is constituted by softscapes," but also that the structure of hardscapes, mostly of the transportation infrastructures, is central for the organization of these softscapes into
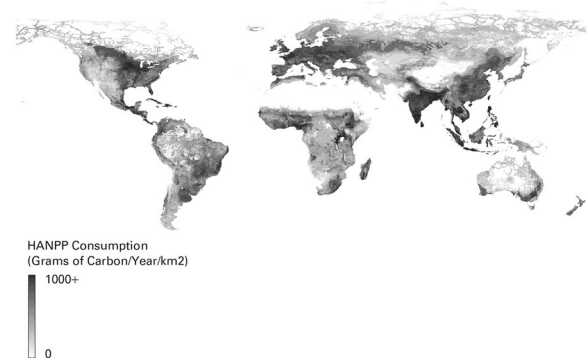

HANPP Consumption
(Grams of Carbon/Year/km2)
1000+

0

Fig. 4 Nikos Katsikis. HANPP global consumption." 2018

an operational matrix fully integrated with agglomerations. Statistically, Katsikis superposition shows that "for every unit of agglomeration area, more than twenty units of operational landscapes are activated." Visually, it produces a counter image of conventional portraits of urbanization. The intermingling between operational landscapes and infrastructures is often denser in those areas of the planet that are more distant from agglomerations. In this light, urbanization appears as a process "organizing the surface of the earth, underwriting all major processes of social and ecological development." Too often with extremely damaging consequences in both realms (Katsikis 2018).

Katsikis' maps explicitly reframe the notion of urbanization by adopting the same quantitative and technical procedures on which city-centric definitions of the urban rely. The drawings accept existing methodological procedures and forms of representation in order to reveal that urbanization (also) happens elsewhere. This wholehearted embrace of satellite imagery and geographic information systems (GIS) paradoxically reveals that, by themselves, both technologies of vision are incapable of showing what urbanization is. Their instrumentalization is only possible after a proper interrogation of our conceptual assumptions of what the urban is. A purely technical understanding of GIS, one that strictly privileges our growing abilities to manipulate increasingly larger data sets, de facto hinders the very agency of the technology. If we are to understand and portray planetary urbanization—or for that matter, Anthropocene—what is required "is not better resolution, but on the contrary, alternative abstractions and conceptualizations of processes, which could in turn lead to the need for the development of completely new, dedicated datasets" (Katsikis 2018). But also, only through satellite imagery are we able to decipher the actual characteristics of the urban process.

In this sense, the planispheres can be seen as a decided contribution to the emergence of new conceptualizations of the urban. Yet, they do so while entirely refraining from developing the critical representational project that should accompany these news concepts. In this sense, Katsikis' visualizations are manifestly—and knowingly— incomplete. To fill that gap, the UTL has developed a third, still tentative type of work: the research *Extreme Territories of Urbanization*. This is a work fully invested in exploring new forms of representing the urban, and which focuses, strictly, on how urbanization affects those areas of the world that Brenner described as the bygone great outsides of the urban: the oceans, poles, and deserts, Siberia, the Amazon and the atmosphere. The planetary is thus here a framework for the analysis of these particular geographies.

In *Extreme Territories of Urbanization*, representation is the fundamental tool to enquire which metabolic processes, economic circuits, and infrastructural connections tie these remote areas to agglomerations located elsewhere. Methodologically, the research complements the use of GIS and satellite imagery with an exploratory use of other techniques of geovisualization, ranging from almost anthropological forms of addressing the relation between local sociospatial conditions and planetary processes, to the use of charts, diagrams, timetables, maps, and video animations. Similarly, the visualizations employ varying modes of cartographic projection and mixed-media, always specific to each of the areas of study (Fig. 5, 6). Together they propose that the investigation of planetary urbanization needs a parallel questioning of our visual conceptions of geographical space, scale, and territorial demarcation.

Such visual analyses show that the post-1970s wave of globalization increasingly subjects geographical space to multiple, and variable forms of exploitation. They highlight how the integration of remote territories into transnational economic circuits motivates vast spatial transformations, including radical alterations to ecosystems, huge infrastructural operations, and the implementation of regulatory strategies facilitating the appropriation of space by transnational corporations. The visualizations show that planetary urbanization proceeds by dispossessing local communities, creating a world increasingly integrated, but also, substantially unjust. Extreme Territories of Urbanization ties Brenner's broader analysis of planetary dynamics to specific, on ground conditions. It localizes global phenomena, revealing some of the sociospatial transformations that motivate ongoing politico-economic and politico-ecologic struggles.

The theoretical understanding of planetary urbanization and the involvement of design in deciphering its spatial conditions are, in this sense, a contribution toward the development of a critical project seeking new, more just, forms of planetarization—a project whose impulse we can detect in other works, as the cartographies of Brazil's urbanization that country presented at the 16th Venice Architecture Biennale. There is a relation of complementarity, not of opposition, between the development of a critical, global framework of theoretical analysis and representation and the attention to local conditions and struggles. If we return now to World of Matter, we can detect that the collective's attention to the spatial and ecological transformations related to resource extraction, and the group's interest in how urbanization affects areas which are well beyond urban agglomerations has a complement in the development of a critical representational project that can visualize the global interrelations between those processes.
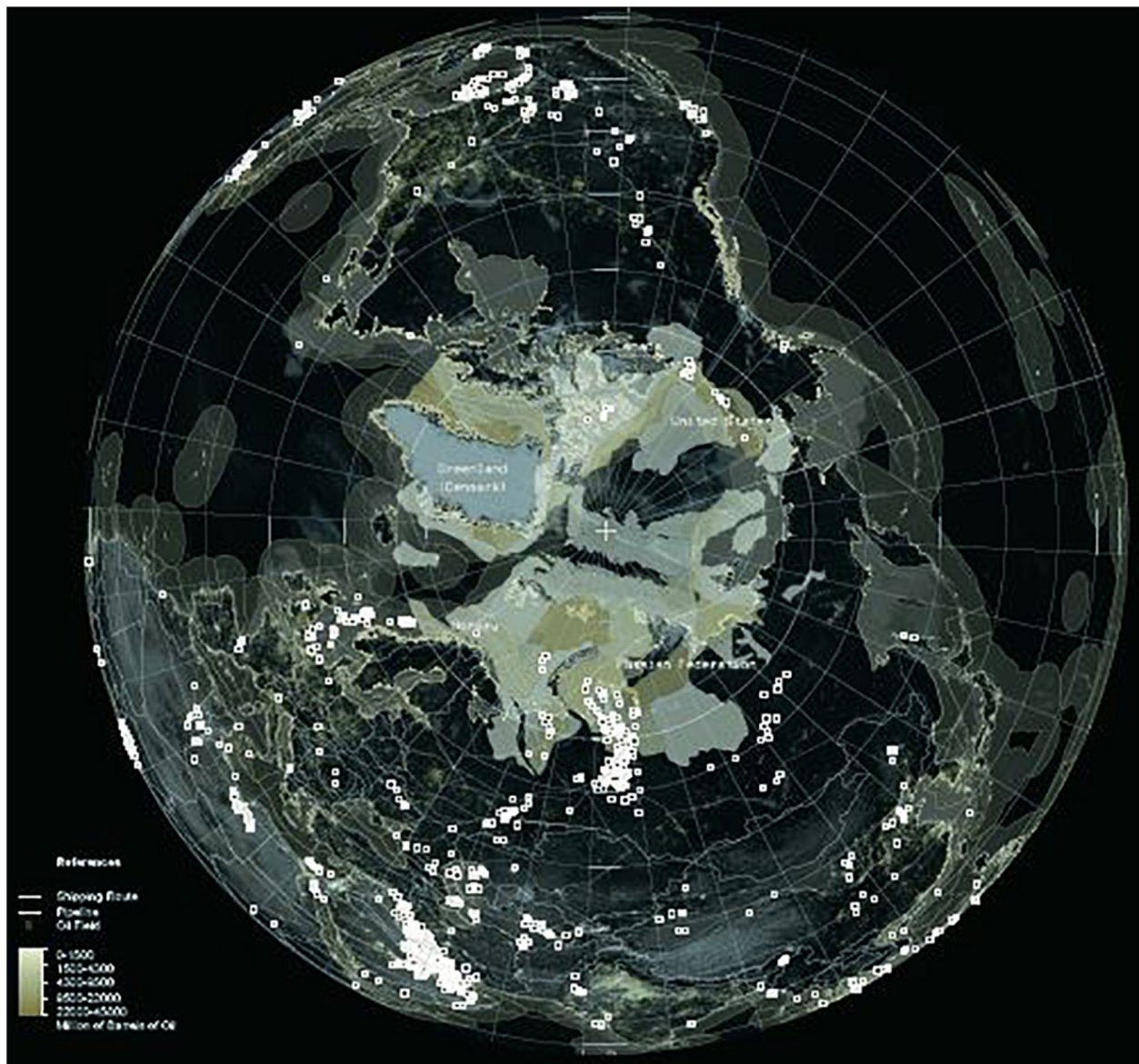
Fig. 5 Urban Theory Lab. *Extreme Territories of Urbanization.* "Arctic." 2013

This does not mean a visual project that is content with neutrally representing the different layers of human inhabitation, but one seeking to unpack the sociospatial processes shaping our planet, thus generating analytical frameworks that other critical design practices concerned with globalization can employ, interrogate, and advance.

The image of the world-city. Projective cartographies and political space in Plan B's City of 7 Billion

Plan B's City of 7 Billion is a graphically exuberant project. Its first section, titled "Set of Drawings," consists of black and white linear renderings of the world and of its agglomerations, drawn in a way that substitutes the dominant cartographic conventions of planetary representation for the architectural repertoire of plan, section, and axonometric (Fig. 7, 8). The section "Figure and Ground" uses that same repertoire to visualize the world's forms of connectivity together with its different densities. The section also includes a vast model, which subsumes the individuality of the continents into a single land mass, and brings together representations of population density with natural geological formations. Another large model, the globe "The Sphere of the Unknown," presents the world as a mesh of connections leaving, yet, significant blank spaces in the net. "Urban Cores" consists, in turn, of cuts showing the stratigraphic relations between settlements, geology and forms of subterranean occupation.
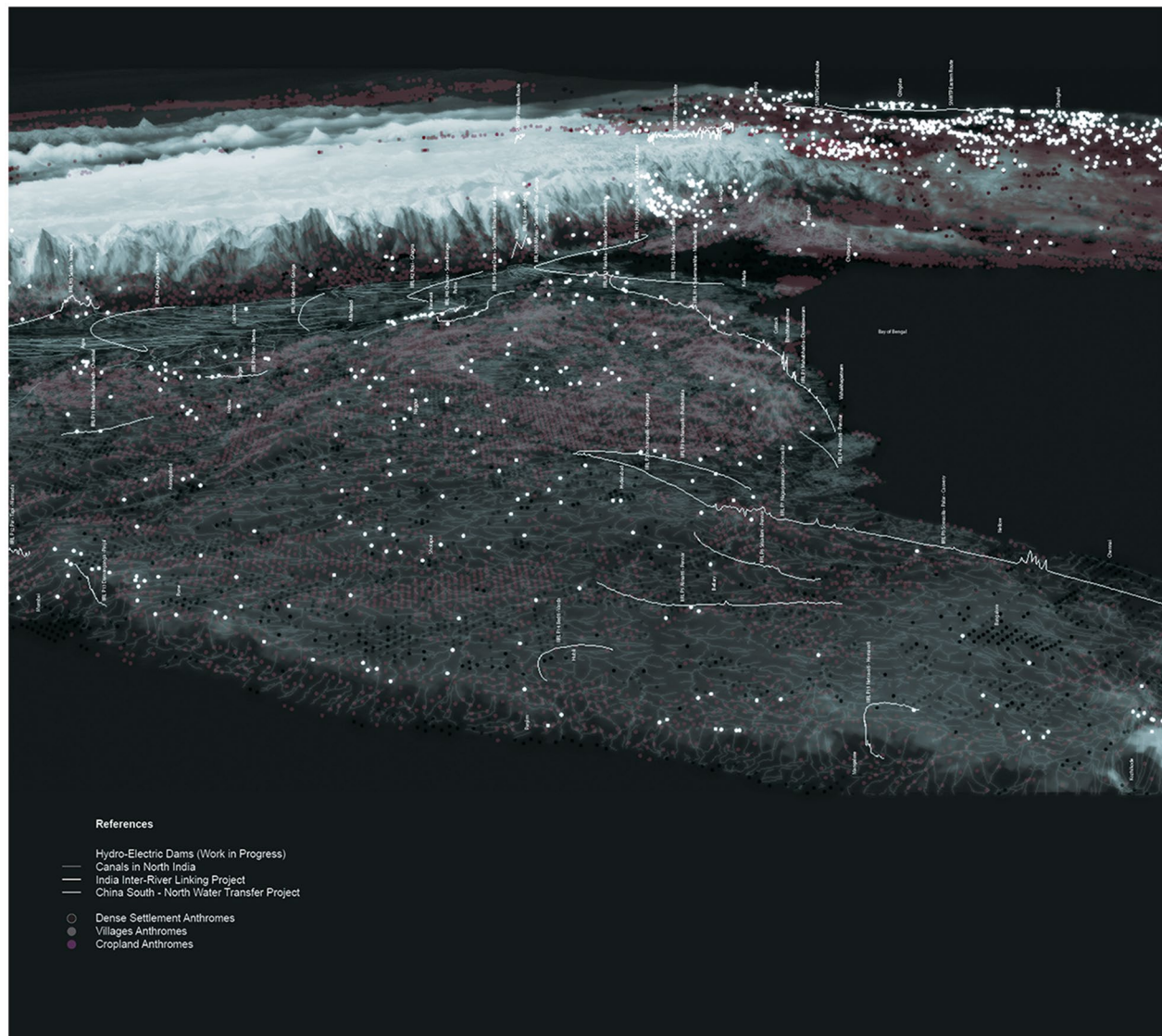
Fig. 6 Urban Theory Lab. *Extreme Territories of Urbanization.* "Himalaya." 2013

The drawings propose a sectional representation of the planet, which the authors continue in a visualization of the range of altitudes of urbanization, from the oceanic trenches to stationary orbits (Fig. 9, 10). This preoccupation with the occupation of the air is even more intense in the 78 m long "Scenes from the Horizon," a continuous view of Earth as seen from the sky. The drawing is rendered with the hyper-realistic conventions of the nineteenth century panorama, but it changes the central position that the viewer occupied in the latter for an extra-terrestrial and moving point of view that reveals the diverse elements that populate our aerial surrounding.

City of 7 Billion seeks, above all, to explore how the world scale can be situated, conceived and made operative for the architectural imagination. The project thus continues a centennial lineage of architectural speculations about the planetary scale which includes the work of designers as Buckminster Fuller, Le Corbusier, Saverio Muratori, and—especially in this case—Constantinos Doxiadis. While Doxiadis' Ecumenopolis. The Inevitable City of the Future was a quantitative and cartographic representation of the possible structure of urbanization circa 2100, City of 7 Billion explores the same phenomenon today. Yet, contrary to the scientific ambition that characterized *Ecumenopolis*, City of 7 Billion is not so much a supposedly objective representation of how the world is, but a theoretically positioned projection about how it could be thought. The architects
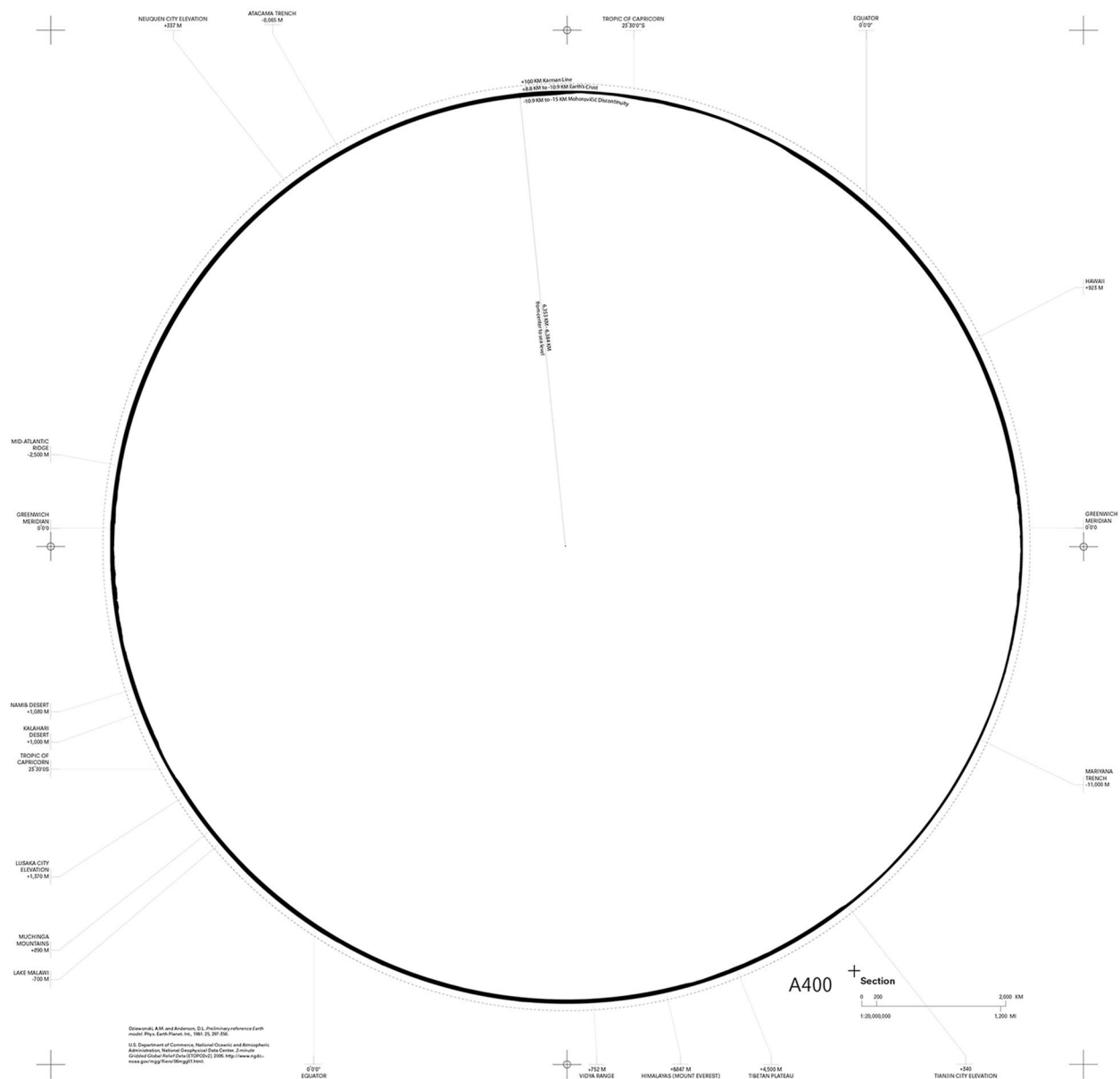
Fig. 7 Plan B. *City of 7 Billion*. "World. Section." 2015

portray urbanization not as an aggregate of multiple settlements but as a "city-world" encompassing the entire Earth. From a theoretical standpoint, this position continues or expands Brenner's theses, as well as the work of other thinkers of globalization dealing with the interaction between humans and non-humans, such as environmental scientist Erle C. Ellis or anthropologist and philosopher Bruno Latour.

The exercise of cartographic imagination thus brings together theoretical debate and architectural speculation. The argument here is that any spatial proposition

cannot exist without an initial conceptualization and visualization of its object of intervention, without an initial act of framing, which—because it inevitably establishes the confines and possibilities of the project—is, often inadvertently, a project in itself. The exhaustive work of cartographic representation in City of 7 Billion insists upon the complex circularity between description and proposition and upon the breaches this relation contains. Contrary to the seemingly seamless, seemingly frameless, naturalized experience of world-vision provided by
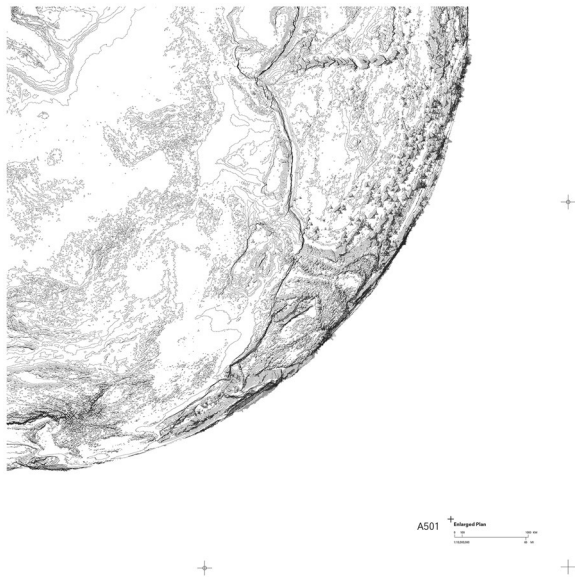
Fig. 8 Plan B. *City of 7 Billion*. "World. Enlarged Plan." 2015

digital platforms such as Google Earth, the work emphasizes that global visualizations offer the space for partisan projects that make explicit statements about the form the world is taking as a whole. In this sense, the layering of geographical and geological information, the representation of agglomerations, connections and global hinterlands in City of 7 Billion intends to offer a reading of the form of the intermingling between urbanization and the space of the world, and to highlight the operative and the dialogical values such an intermingling can have.

In City of 7 Billion this sort of integration between urbanization and world is the gathering of a diversity; albeit a very structured one. The five areas of the exhibition offer various approaches to the form of the city-world. These operate mainly at four specific levels in order to highlight: (1) The variety of elements that constitute the fabric of this planetary city; (2) The overlapping in this fabric of natural and human-made elements; (3) The different and contrasting points of view from which the city-world needs to be apprehended; and (4) The wide range of techniques of representation required for comprehending it and intervening in it. Yet, this plurality does not prevent the formulation of clear statements: plurality is, on the contrary, the medium through which the representations of City of 7 Billion seek to construct a specific image and reading of the city-world.

Since Kevin Lynch and, more particularly, since Fredric Jameson's reading of Lynch, acts of image construction have been valued according to their cognitive attributes; as an instrument in achieving a unitary perception of a seemingly fragmented reality (Lynch: 1964; Jameson:

1991). This value notwithstanding, the image that City of 7 Billion creates is more precisely characterized by having the dialogical attributes for which French geographer Michel Lussault has advocated. For Lussault, the construction of a territorial image—understood as a vision or a project—is both the precondition and the primary place of any territorial politics (Lussault: 1998). In this sense, it is through the images elaborated for City of 7 Billion where we can seek out a position vis-à-vis contemporary debates about the relation between urbanization and globalization, and about the role spatial practices may have in shaping this relation. My intention now is to outline what I think are the key aspects of Hsiang and Mendis' intervention in these debates, highlighting three broad and main areas of intervention in them.

Debate 1. How to overcome the discrete city as analytical object?

Put in spatial terminology, for Brenner and Schmid the result of urbanization is not only the production of cities but the production of a planetary urban fabric. As the use of the term "urban fabric" reveals, their position is highly dependent on Henri Lefebvre's writings. In The Production of Space, Lefebvre starts to delineate a "unitary spatial theory." His goal is to counter the existing segmentation of the spaces by different forms of disciplinary knowledge and by their classification into pre-determined and often segregated scales, such as the city, architecture and territory, which in turn become the areas of specialization for particular disciplines and professions, and thus the trigger for a further process of spatial and intellectual division. Lefebvre counters this division of the spaces produced and thought, claiming instead that space, even it is highly complex and plural, is produced in toto and that therefore it must be conceptualized holistically.

A crucial consequence of understanding the production of space as a unitary phenomenon is that the intellectual basis for differentiating between natural and social space crumbles. For Lefebvre the "space-nature" as a distinct entity disappears, since even the very distinction itself is culturally mediated (Lefebvre 1991). When, in The Urban Revolution, the author proposes that our planet is approaching the stage of total urbanization, it becomes clear that in this phase the space-nature has become fully integrated within the networks of the urban, giving both spatial form and economic viability to the processes of capitalist production (Lefebvre 2003). Brenner's attempt with the UTL to analyse the planetary dimension of the urban, not through the abolition of the discrete city by its integration into a continuous planetary city but through the incorporation of formerly
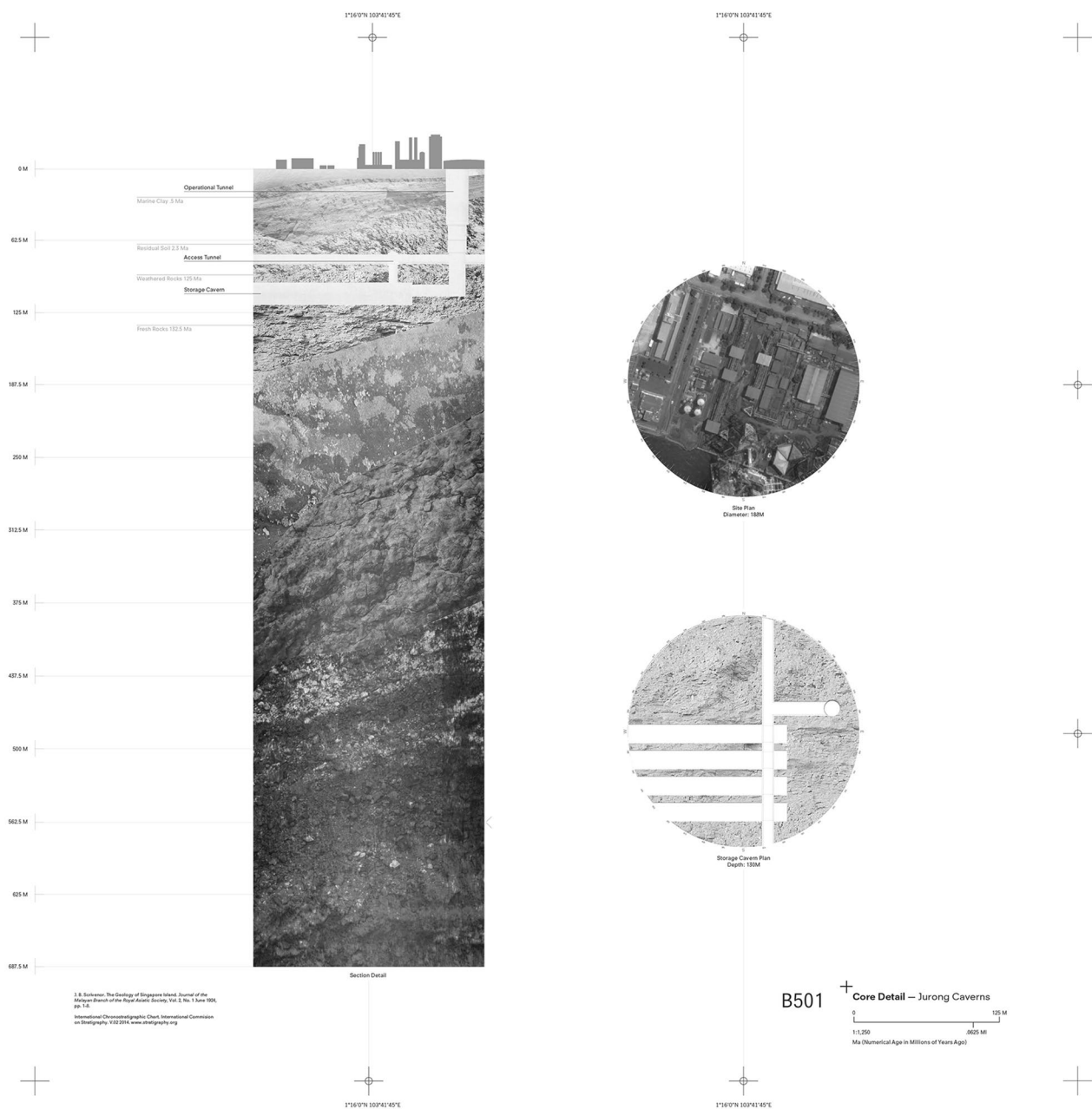
Fig. 9 Plan B. *City of 7 Billion*. "Urban Cores: Jurong Caverns". 2015

natural realms into the urban circuits of production, is a consistent development of this position.

Hsiang and Mendis' work can be aligned with Lefebvre's and with Brenner's position. The analytic privilege of the discrete city is put aside to favour instead the consideration of the global circuits of material production, communication, etc. in which cities and nature are inscribed. The planar and sectional representations of connections and areas of production and resource extraction insist

on this point. However, importantly, there is an aspect of Lefebvre's writings that City of 7 Billion elaborates more thoroughly than the UTL. For Lefebvre, the functional analysis of this holistic process of space creation neither impedes the necessity of a structural and formal analysis of the space produced nor the need to understand the scales, forms, textures, etc. that the urban is acquiring. Plan B's work is particularly strong with regard to the elaboration of this aspect, offering at least two key
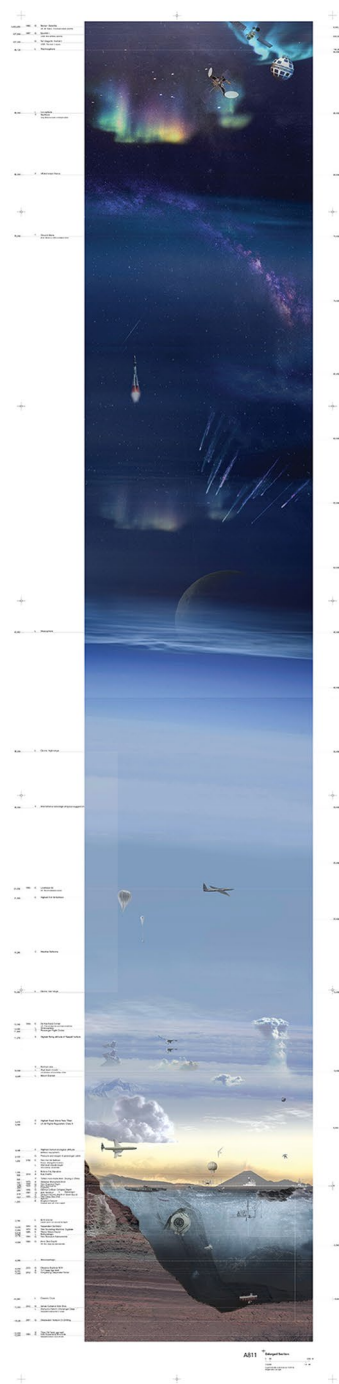
Fig. 10 Plan B. *City of 7 Billion*. "World. Enlarged Section." 2015

points to formally approach it. First, agglomerations are represented as a continuous system in three-dimensional interaction with geographic space, in contrast both to previous speculations about a global continuous urban system—such as Doxiadis' merely planar representation of *Ecumenopolis* or the mere superposition of Florida's

quantitative bars over the geographical space—and to the inverse segmentations of urban areas when analysed in contact with geographical space—in the manner of Jean Gottman's *Megalopolis* (Gottmann 1961). Second, networks are not considered as an immaterial space of flows but as three-dimensional physical traces and infrastructural equipment. In summa, the physical form and structure of the urban fabric is at least presented through the overlap of three-dimensional constructed flows, sectional geographical and geological conditions and the volumes of agglomeration, presenting then this overlap as the basis for our contemporary reflections about the forms and possibilities of the city.

There is a corollary to this approach to the city-world. Although in the analysis and visualizations conducing to the project the authors explored some diachronic dimensions of the City of 7 Billion, the final project privileges a synchronic, static view of the urban fabric. Since its conceptualization, urbanism has always had a strongly temporal, process-oriented component; its conventional definition vis-à-vis architecture has historically highlighted the divergent temporalities the two fields manage. From a theoretical standpoint, Brenner's theories take this temporal dimension to the extreme: in the conditions of planetary urbanization, the urban is no longer a form but a process. This emphasis on process rather than form has also been repeatedly taken into consideration by the spatial disciplines, occasionally associated with the incorporation of the values of flexibility and change the contemporary world allegedly requires. Urban metabolism and ecological urbanism, for instance, equally privilege the necessity of managing processes. City of 7 Billion privileges the other side of the form-process dialectic, stressing the relevance that formal and material analysis and propositions still have for design.

Debate 2. What is to Be Done with "objective" global geo-spatial information and with critical cartography?

The visualizations of City of 7 Billion required using a massive amount of geospatial, satellite data. However, this data was carefully re-elaborated and questioned. Significantly, the "Drawing Set" part of the exhibition opens with a blank map of the world, followed by a version of Lewis Carroll's Chart of the Ocean in The Hunting of the Snark. One of the centrepieces of the exhibition, the huge globe "Sphere of the Unknown," representing the world at a scale of 1:3,000,000 and the material and immaterial infrastructures that connect it and survey it, shows both the blank spaces between these nets and the intricacy that characterizes them, highlighting that the very complexity of this intermingling of connections is what produces unknown, and therefore uncontrollable, realms.

Yet, behind this questioning of the data employed and of the processes and elements that attempt to facilitate the comprehension of the world, there does not lie any sort of epistemological incommensurability. What is at stake is the proposition of a different cognitive attitude toward data, in contrast both to geospatial claims for objectivity and to the alternative tradition of critical cartography.

As seen in the work of the UTL, critical cartography questions the supposed objectivism of cartographic representation. In their case, the use of geospatial information serves to render visible the spaces, connections and dynamics that are commonly left aside by other geovisualizations. Geospatial and other sources of information become, therefore, an instrument to make knowledgeable hidden aspects of the global condition (Kurgan 2013). In parallel, the reflection critical cartography sparks about the mechanisms of geographical representation, and the attempt to challenge these conventions, are tools to render visible the ideologies that support dominant spatial conceptions and the ways in which they are already embedded in representational forms. As critical instruments, their goal is to question these ideological constructions and, eventually, from these critical positions, to open up new spaces for spatial or political action.

The visualizations of City of 7 Billion are indebted to this tradition of critical cartography. The consistent use of Buckminster Fuller's Dymaxion projection, the negation of the separation between continents—substituting the representation of the coastal limit by that of the territorial waters—or the introduction of conventionally non-urban dimensions into its representations of the urban adopt or continue previous critical explorations. However, City of 7 Billion does not follow the conceptual framework of critical cartography. Its insistence on the non-knowledgeable has another face and is oriented toward a different horizon. When geospatial data is employed in the project, its supposed objective condition is always rendered as manifestly insufficient: as a necessarily unaccomplished project of comprehension of reality. City of 7 Billion shows that a big gap exists between the world that is represented and its supposedly objective representations, not in order to denounce the latter's inaccuracy but rather to highlight the positive value of this gap for spatial speculation.

Aesthetic propositions and architectural and urban projects operate through that representational breach. Any GIS map of urban extents is an extreme abstraction of the actual urban conditions it allegedly represents, a fact rendered evident not only by the debates about the relative accuracy of alternative representations of that information, but also by the tremendous diversity of urban forms the abstract rendering of urban extents obliterates (Potere and Schneider 2007). Yet, this abstraction can be appropriated to project which conditions and forms the urban could adopt. In this projection, data is overcome by spatial forms and aesthetic positions. It loses its objectivity, becoming nothing, unavoidably, but the origin of an interpretation that necessarily exceeds its original source. An interpretation that—in its now obvious difference regarding reality—reveals the unavoidable difference between data and actual geographical or urban conditions.

Methodologically, this displacement into an aesthetic and projective realm is the opposite of sublimating the data. It also contravenes the merely critical use of geospatial information. Conventionally architectural in this respect, it points to a conception of reality mediated by the construction of an architectural or urban imaginary. In City of 7 Billion's proposition, the systematic use of white and black renderings, which decompose every volume into its outlines, emphasizes the conceptual overlap between urban and non-urban realms. It equates the means of representation of the urban with the lines employed to represent Earth's meridians and parallels, its topography, the networks of communication that cross it, or even with the messages contained in them. The proposed world is a matter of lines. Although entirely occupied, it can be, still, substantially hollow and essentially light—in the manner in which lightness is considered in Italo Calvino's Six Memos for the Next Millennium or in Michel Serres and Marcel Henaff's Global City, to name some references close to the architect's discourse (Calvino 1988; Serres 1994). As in the work of the latter authors, the world is also a place of transpositions and movements: of the territorial ungrounding Paolo Virno defines as the crucial condition of contemporary subjectivity (Virno 2003).

In that sense, the elevation of the epistemological abstraction of geo-spatial information to an aesthetic code legitimizes architectural sameness and, through it, the cross-geographic encounter of equivalent urban forms. Instead of a world of fragments and differences, we are confronted with a world where repetition prevails. One where the global disguise of equivalent architectural and urban operations in particularized iconic dresses is substituted by a re-examination of the value of sameness as a possibly positive constituent of its universal ethos.

Debate 3. What are the possible relations between Earth system and World system?

The distinction between Earth system and World system terminologically represents the difference between natural and the human-made, in order to point to a fundamental problem when reconsidering how to conceive urbanization. The interaction between these two levels is

generally characterized by the perverse forms of exploitation of the planet derived from its total integration in the circuits of economic production and by the direct deleterious effects that urbanization, and the forms of capitalist production and consumption that propel it, have on the planet. Both considerations support the wide concern about the huge alteration of natural ecosystems mankind is producing and have subsequently informed the construction of politico-ecological discourses aimed at understanding and critiquing this situation and at the elaboration of instruments to counteract it (Latour 2004).

This lens is present in City of 7 Billion, especially in as much as it adopts an analytical framework similar to Brenner's differentiation between concentrated and extended urbanization in order to show that the city-world is formed both by agglomerations (concentrated urbanization) and by the diverse landscapes of extraction, production, etc. that it mobilizes (extended urbanization). However, together with this more consolidated concern for the ecological impact of urbanization, Plan B's contribution to the urban debate is particularly interesting in their elaboration and recuperation of another dimension of the relations between Earth system and World system—one which, in any case, brings their work back to the ethics and intentions of the ecological discourse.

The first approaches to urbanization from a planetary perspective highlighted the strong relationship between post-metropolitan settlement systems and geographic conditions. Le Corbusier's 1945 depiction of the "Natural Occupation of the Territory" in the Three Human Establishments considered that the linear cities crossing Eurasia from the Atlantic ocean to the Urals would follow specific advantageous geographic conditions, especially linked to connections between land, rivers and sea (Le Corbusier 1979). Doxiadis' 1967 *Ecumenopolis* followed a similar logic. What he termed as factors of special attraction guided urbanization along geographical axes; coastal areas and flat land zones concentrated the highest urban densities (Doxiadis 1967). Importantly, in his 1963 treatise Civiltà e Territorio, Saverio Muratori took an equivalent position to the extreme, claiming for the necessity of constructing the Ecumene according to inherent geographical logics which should allow us to read civilization as an integral part of territory (Muratori 1967). These analytical and projective links between post-metropolitan formations and geography have been, however, left aside in more recent analysis of the impact of globalization on the formation of a new territorial, urban order. The dynamics of deterritorialization that are integral to capitalist logics of interchange do motivate an alienation of urban formations from the actual locations where they are

settled. Paradigmatically, in the urban models derived from the Global City theories, from John Friedmann to Saskia Saasen, cities float in an undetermined blank space, uniquely existing in their networks of connections. More precisely, and going beyond Global City theory, the contemporary logics of liberal market connectivity construct relations that are, in fact, transscalar and discontinuous. Places may be connected intensely and primarily to a distant location, only to come back secondarily, if at all, to their contextual, geographic realm (Lyster 2014).

The ubiquitous networks of City of 7 Billion acknowledge the relevance of the latter factors. Yet, the exhibition shows that deterritorialization happens within a complex, and we could say multidimensional, physical territoriality, whose fundamental relevance has to be highlighted and studied. In this situation, the physical impact of urbanization is seen in terms that follow and expand the interactions between geography and urbanism envisaged by Le Corbusier, Muratori, Doxiadis and the like. Plan B follows the works of these authors, presenting the expansion of urbanization as a geographical phenomenon in itself. In contrast to them, City of 7 Billion expands their mostly planar approach, seeing this phenomenon as also sectional: a vertical dimension that is presented as potential catalysts of urban and architectural possibilities.

The consequences of this sectional approach are further explored at different scales. Globally, one of the first drawings of the exhibition is a section of the whole planet showing only the relation between its exterior topography, perfectly circular at the drawing's scale, and the notable varying depth of the Earth crust. This depth is then depicted in detail in the cuts of the "Urban Cores" as a built and inhabited space, explicitly presenting the production of this space as an object of architectural and urban production. Materiality and temporality are directly seen as a key question in this regard, since the progressive sedimentation of multiple built strata on natural ground is what finally made both systems indistinguishable: what was artificial became natural. Reversely, multiple systems of connection, extraction and infrastructures penetrate deep into the crust, integrating a former nature within the domain of urban space.

In 1963 Muratori claimed that, in geographical terms, mankind had dominated entirely, but uniquely, the surface of the planet. Now, City of 7 Billion shows an intense sectional and altitudinal occupation. The specificity of this project resides, again, in its insistence on not separating this dimension of the city-world from the set of aspects conventionally and historically included in the practices of architecture and urbanism: materiality, temporality, forms of relation, and forms of visual experience. After representing the altitudes of urbanization

in section, the panorama of "Scenes from the Horizon" highlights the visual repercussions of the constructed aerial stratum. Shortly after Muratori's analyses, Alison and Peter Smithson based their proposal to three-dimensionally rearticulate the relations between architecture, urbanism and territory on their concern with the world-wide ubiquity of the urban. In their 1967 Urban Structuring the two architects gave the name Ecological Table to the sectional orchestration of land uses, architectural typologies, forms of human association and forms of connectivity according to different overlapped horizontal strata (Smithsons 1967).City of 7 Billion expands this ecological approach to urban form, from the depth of the Earth's crust to the atmosphere.

Conclusion

These three debates constitute, in my reading, the more relevant questions City of 7 Billion addresses. They close the translation of the Urban Theory Lab's analytical work to the actual preoccupations of architectural practice. Yet, what is their political significance? While I framed the previous debates as a derivative of the political image that City of 7 Billion as a whole may construct, they are in fact debates about how we frame disciplinary approaches to a particular scale of urbanization. By participating in them, the primary goal of City of 7 Billion is to inform ways of architectural practice, not forms of political action.

Yet, it is of course through our disciplinary positions that politics is present in the fields of architecture and urbanism. If the polis has been the historical emblem of the political space, City of 7 Billion's interest in the construction of the planetary scale of urbanization as a city can be seen, after all, as an attempt to investigate what aspects have to be taken into account by the physics of a political space attuned to the scale of globalization. Contemporary practices of architecture and urbanism are often involved in enquiring how a political city can be built out of the seamless metropolitan and post-metropolitan scales (Aureli 2011). Meta-geographic, cartographic analyses are relevant because they operate at this point. Already in 1981, urbanist and theorist of cartography Manuel de Solà-Morales pointed to this fact (Solà-Morales 1981; Salgueiro-Barrio 2022). Working just after the end of Spanish dictatorship, his work highlighted that acts of political and territorial imagination, required parallel acts of cartographic re-representation—both of the urban and non-urban realms. Far from being a form of legitimizing existing spatial structures by cartographic means, his enquiry was an instrument for reconsidering the existing situation, finding common problems and potentials and seeking the corresponding diversity of scales and means to act

on them. City of 7 Billion projects a similar enquiry to the extents of the whole world. In doing so, it reiterates the necessity of elaborating meta-geographical analyses to inform other scales of intervention, bringing back the results of that planetary position to a diverse range of scales. As a result, and through its emphasis on architectural operations, City of 7 Billion stresses the possibility of progressively building this space and the role of architecture in that process.

The construction of the city-world is for sure a complex, variegated, multi-disciplinary enterprise, which does not leave architecture unaffected. Coming after a century-long tradition of architectural speculations about the planetary scale, often envisioned through radical reorganizations of the planet, *City of 7 Billion* faces a situation where that planetary scale is de facto an existing reality (Sarkis and Salgueiro Barrio 2020). Impossible to construct ex novo, this reality has to be addressed rethinking, with it in mind, the aesthetics, forms of vision, materials and dimensions that architecture manages and bringing to the forefront the relations created through those operations. Reflecting upon the possibilities of a geo-philosophy and thinking well beyond existing forms of democracy, Gilles Deleuze and Félix Guattari stated that: "If there is no universal democratic State, despite German philosophy's dream of foundation, it is because the market is the only thing that is universal in capitalism" (Deleuze and Guattari 1994). Politically, City of 7 Billion asks what our spatial universals could be and urges us to follow that investigation. By transitioning from the analytical work of the Urban Theory Lab towards the projective, *City of 7 Billion* ultimately questions and repurposes the technologies of exo-vision, satellite imagining, and data-gathering that operate the global, transforming them into the support of alternative forms of cosmopolitical thinking.

Declarations

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