IMPLOSIONS / EXPLOSIONS

NEIL BRENNER

"I'LL BEGIN WITH THE FOLLOWING HYPOTHESIS: SOCIETY HAS BEEN COMPLETELY URBANIZED."

—HENRI LEFEBVRE, *LA RÉVOLUTION URBAINE* (1970)

NEIL BRENNER IS PROFESSOR OF URBAN THEORY AND DIRECTOR OF THE URBAN THEORY LAB AT THE GRADUATE SCHOOL OF DESIGN (GSD) HARVARD UNIVERSITY.

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IMPLOSIONS / EXPLOSIONS

TOWARDS A STUDY OF PLANETARY URBANIZATION

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IS THE MEDITERRANEAN URBAN?

Neil Brenner and Nikos Katsikis

1

Where do the boundaries of the urban begin and where do they end? This question has long preoccupied urban scholars, and it continues to stimulate considerable debate in the early twenty-first century as urbanization processes intensify and accelerate across the world.

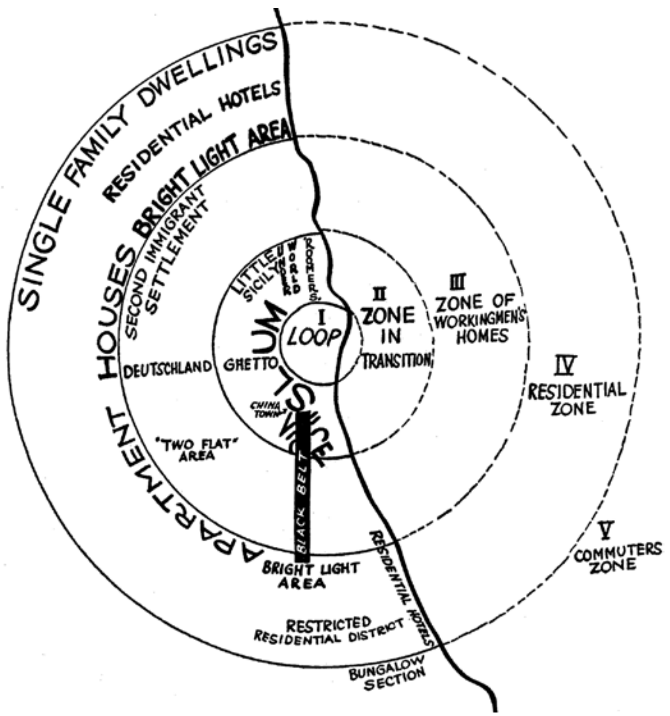
Despite major disagreements regarding basic questions of method, conceptualization and ontology, most twentieth-century urban theorists conceived the urban (or: the city) as a distinctive type of settlement space that could be delineated in contradistinction to suburban or rural spaces. The nature of this space, and the appropriate demarcation of its boundaries, have generated considerable disagreement.[1] However, all major twentieth-century traditions of urban theory have presupposed an underlying vision of the urban as a densely concentrated territorial zone that is both analytically and geographically distinct from the putatively non-urban areas situated "outside" or "beyond" its boundaries.[2]

Such conceptualizations are embodied paradigmatically in Chicago urban sociologist Ernest Burgess' 1925 "dartboard" model of the city, in which diverse population groups are clustered densely together in concentric rings radiating progressively outwards from a dominant central point until the map abruptly ends (Figure 27.1). Beyond the single family

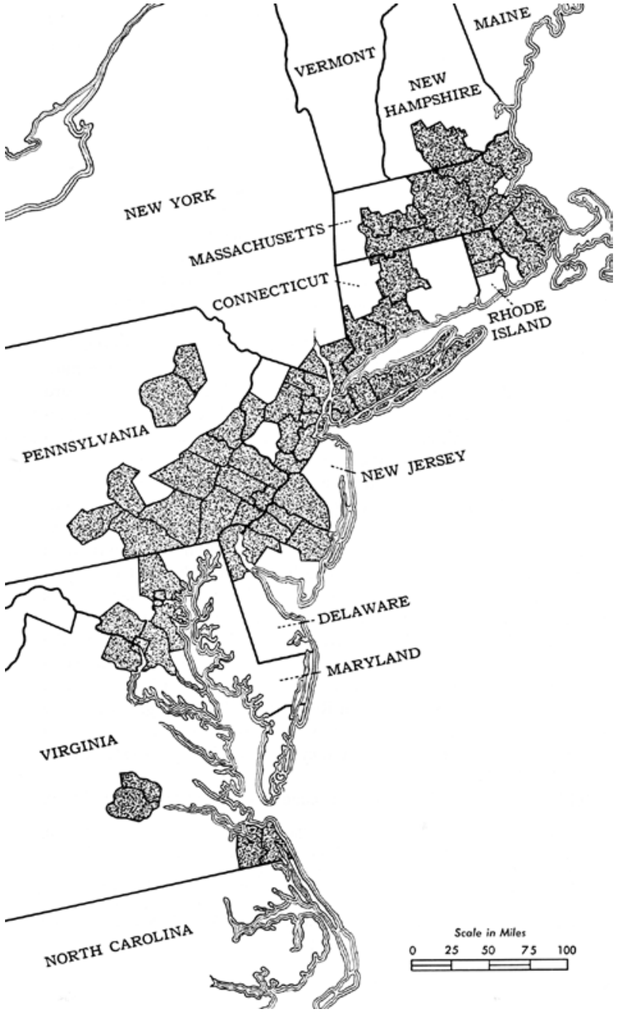
dwellings of the suburbs begins a void, a realm disconnected from the urban territory and thus representationally empty.[3]

Jean Gottmann's equally famous 1961 vision of the BosWash Megalopolis complicated the clean, monocentric geometries of Burgess' model and considerably expanded its territorial scale (Figure 27.2, next page).[4] Yet Gottmann's otherwise pioneering approach continued to embrace a notion of the urban as a type of settlement, now upscaled from city to megalopolis, and a vision of settlement space as being divided, fundamentally, among urban and non-urban territorial zones. In Gottmann's provocative map, the territory of megalopolis is vast and its boundaries are jagged, but the zones beyond it are, as in Burgess' visualization of the city, depicted simply as empty spaces.

In contemporary debates on global city formation, the urban/non-urban opposition is reinscribed onto a still larger scale, but the basic geographical imaginary developed in earlier twentieth-century traditions of urban theory is perpetuated. Thus, in John Friedmann's foundational speculations on the emergent world city network, the urban is understood not as a bordered territory, but as a concentrated node for transnational investment and corporate control embedded within a worldwide network of capital flows (Figure 27.3, page 431).[5] Yet, here too, the non-urban zones surrounding the world cities are depicted simply as a void—as a vast empty space that is both functionally and geographically disconnected from the urban condition. Indeed, in the models developed by world city theorists, the



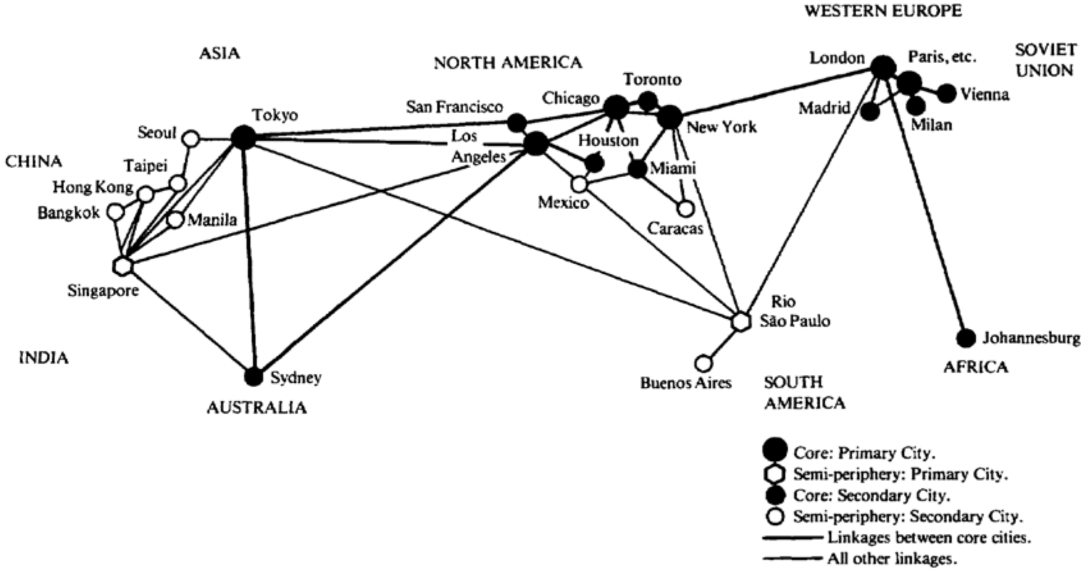
27.1 Burgess' dartboard (1925): the urban as bounded, concentrated settlement space



27.2 Gottmann's Megalopolis (1961): the explosion of urban boundaries

space of flows produced under global capitalism appears to have further separated urban zones from their erstwhile territorial hinterlands. Enhanced global connectivity and urban concentration are thus accompanied by new forms of macroterritorial fragmentation that render the non-urban even more distant—socially, economically, institutionally and geographically—from the transnational urban networks that crosscut its unevenly developed landscape.[6]

In the early twenty-first century, urbanization processes are intensifying and accelerating, creating new, multiscalar geographies of urban transformation around the world that are difficult, if not impossible, to decipher on the basis of inherited, settlement-based notions of urbanism and their associated assumption that most of the world's territory can be viewed as a "non-urban" void. Edward Soja and Miguel Kanai describe emergent formations of urbanization as follows:



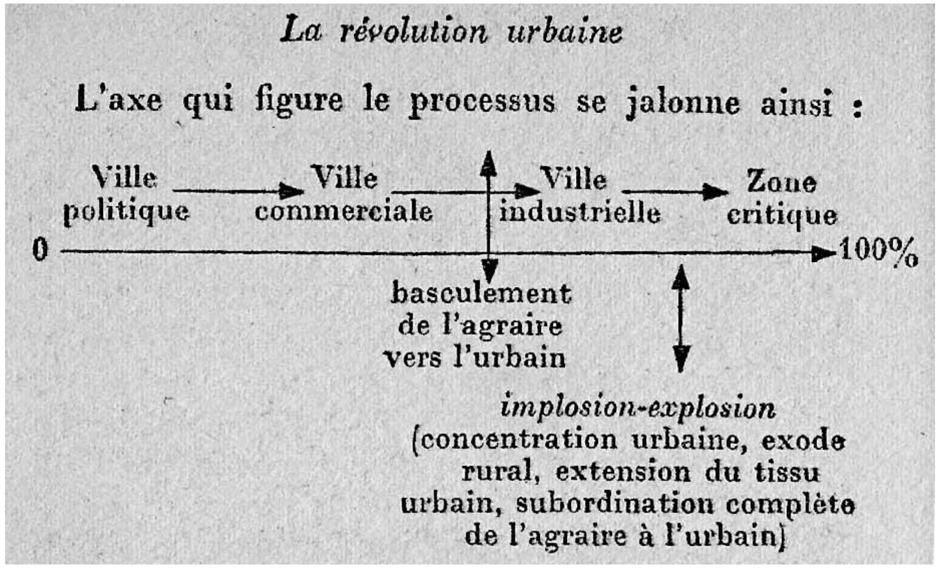
27.3 Friedmann's world city network (1986): urban nodal points in a worldwide system of flows

> … urbanism as a way of life, once confined to the historical central city, has been spreading outwards, creating urban densities and new "outer" and "edge" cities in what were formerly suburban fringes and green field or rural sites. In some areas, urbanization has expanded on even larger regional scales, creating giant urban galaxies with population sizes and degrees of polycentricity far beyond anything imagined only a few decades ago … [I]n some cases city regions are coalescing into even larger agglomerations in a process that can be called "extended regional urbanization."[7]

Can the urban/non-urban distinction be maintained under these conditions? Already in the early 1970s, French sociospatial theorist Henri Lefebvre suggested otherwise. In his classic text, *La révolution urbaine*, Lefebvre proposed a provocative hypothesis that exploded the urban/non-urban binarism on which investigations and visualizations of urban transformations had long been based: "Society has been completely urbanized," he declared, and on this basis he proceeded to develop a radically new understanding of urbanization as a worldwide process of sociospatial reorganization encompassing diverse places, territories and scales, including those situated far beyond the traditional centers of agglomeration, urbanism and metropolitan life.[8] Rather than conceiving the urban as a distinctive type of settlement space, to be contrasted to suburban, rural and other putatively non-urban zones, Lefebvre argued that capitalist urbanization had formed an uneven "mesh" of "varying density, thickness and activity" that was now being stretched across the entire surface of the world.[9]

This situation of complete urbanization, Lefebvre proposed, was creating new, territorially variegated urban landscapes, embodied in huge, polycentric concentrations of infrastructure, investment and population, that radically superseded the local and metropolitan formations of cityness inherited from earlier rounds of capitalist industrialization. Additionally, in Lefebvre's conceptualization, the contemporary urban revolution entailed the "prodigious extension of the urban to the entire planet" through a process of "implosion-explosion" in which inherited models of centrality, territorial organization and scalar hierarchy were being blurred and tendentially superseded.[10] Somewhat polemically, Lefebvre presented this situation using a starkly linear diagram in which urbanization was measured on a 0%-to-100% axis; his claim was that a "critical point" would soon be reached in which "the *urban problematic* becomes a global phenomenon" (Figure 27.4).[11] Under these circumstances, Lefebvre proposed, the urban condition would soon become synonymous with that of planetary capitalism as a whole. Urban transformations would impact all zones of the planet, from the oceans to the earth's atmosphere, and planetary processes, both social and ecological, would in turn shape all dimensions of the urban landscape, at once within and beyond inherited centers of dense agglomeration.

Lefebvre's hypothesis has often been misinterpreted as a vision of planet-wide densification akin to the dystopian science fiction fantasies of writers such as H.G. Wells, J.G. Ballard or Isaac Asimov, in which the entire world is envisioned as a single, seamless skein of built-up, metallic or concrete infrastructure. More recently, however, as illustrated in the other chapters of this book, Lefebvre's notion of an urban revolution has been productively reappropriated by critical urban theorists concerned to decipher some of the patterns and



27.4 Lefebvre's (1970) "critical point" of generalized urbanization (1970)

pathways associated with early twenty-first century urbanization processes.[12] For example, building upon several ideas from Lefebvre, geographer Andy Merrifield has interpreted planetary urbanization as a simultaneous instrumentalization and transformation of the erstwhile countryside within an unevenly integrated, thickly urbanized mesh:

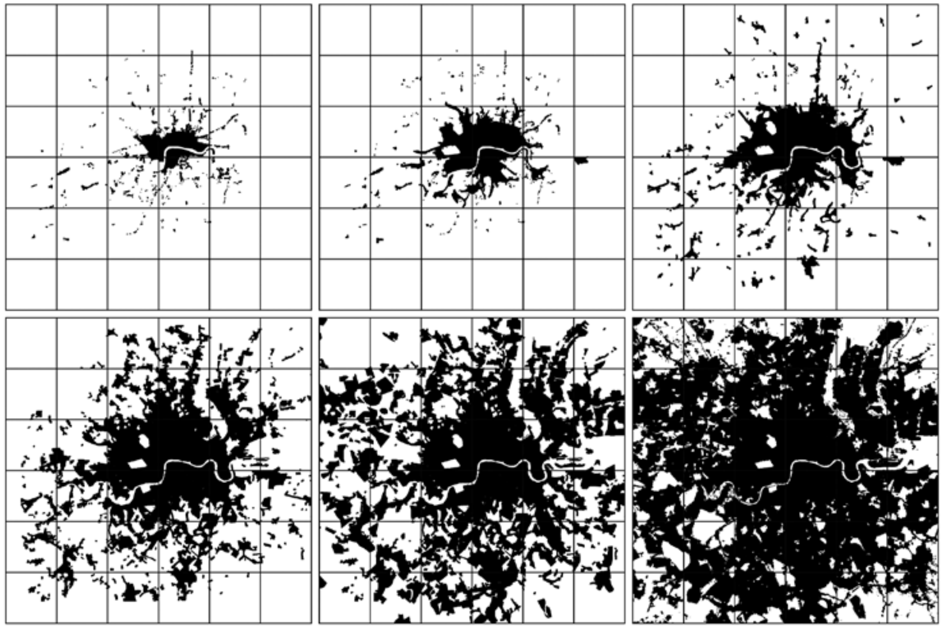
> The urbanization of the world is a kind of exteriorization of the inside as well as interiorization of the outside: the urban *unfolds* into the countryside just as the countryside *folds* back into the city. … Yet the fault-lines between these two worlds aren't defined by any simple urban-rural divide, nor by anything North-South; instead, centers and peripheries are *immanent* within the accumulation of capital itself. … Therein centrality creates its own periphery, crisis-ridden on both flanks. The two worlds—center and periphery—exist side-by-side everywhere, cordoned off from one another, everywhere. … Absorbed and obliterated by vaster units, rural places have become an integral part of post-industrial production and financial speculation, swallowed up by an "urban fabric" continually extending its borders, ceaselessly corroding the residue of agrarian life, gobbling up everything and everywhere in order to increase surplus value and accumulate capital.[13]

Within the unevenly woven skein of the planetary-urban condition, the infrastructures of urbanization are no longer localized within dense agglomerations or polycentric metropolitan regions, where they can be counterposed to the "outside" realm of rural existence. Instead, urbanization increasingly crosscuts and supersedes the erstwhile urban/rural divide, stretching across and around the earth's entire surface, as well as into both subterranean and atmospheric zones, which provide "liminal landscapes" for resource extraction, agro-industrial production, energy and information circulation, waste management, and diverse geopolitical strategies.[14] Thus understood, planetary urbanization intensifies interdependence, differentiation *and* polarization across and among places, territories and scales rather than creating the "borderless world" envisioned by globalization boosterists or, for that matter, the globally consolidated "endless city" predicted by some contemporary urban intellectuals.

Such developments pose huge challenges for urbanists and all other scholars concerned to decipher emergent urbanization processes and sociospatial conditions. Insofar as the conceptual grammar of urban theory is inherited from a period of capitalist development and territorial organization that has now been largely superseded, it is essential to experiment with alternative "cognitive maps" that can more effectively grasp the rapidly changing geographies of our planetary-urban existence.[15] In collaboration with Christian Schmid, our own efforts to confront this challenge hinge upon the conceptual distinction between concentrated and extended urbanization, which we consider an essential foundation for theorizing and investigating the geographies of urbanization processes during the last two centuries of world capitalist development.[16]

The concept of *concentrated urbanization* refers to the perpetual formation and crisis-induced restructuring of densely concentrated agglomerations (cities, city-regions, megalopolises, megacity regions and the like). The geographies of concentrated urbanization broadly approximate those of cities, agglomerations, urban regions and metropolitan areas, as traditionally understood and visualized by urban geographers with reference to successive historical formations of urban territorial organization (Figure 27.5).

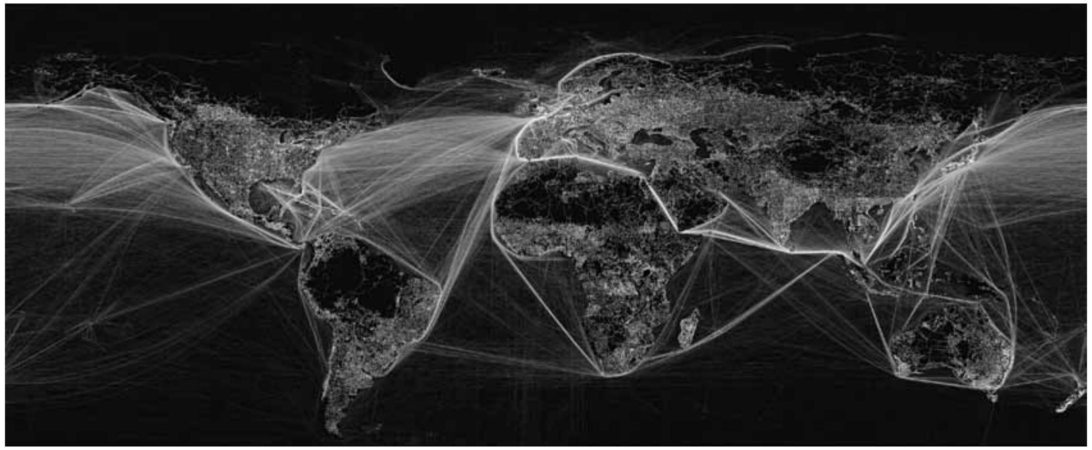
By contrast, *extended urbanization* denotes the consolidation and continued reorganization of broader operational landscapes—including infrastructures for transportation and communication, food, water and energy production, resource extraction, waste disposal and environmental management—that at once facilitate and result from the dynamics of urban agglomeration. Although it has largely been ignored or "black-boxed" by urban theorists, this realm of drosscapes, *terrains vagues*, in-between cities (*Zwischenstädte*), horizontal urbanization, holey planes, quiet zones, fallow lands and liminal landscapes, has long been integral to the urban process under capitalism, and during the last few decades it has become increasingly strategic in both economic and ecological terms.[17] The visualization of extended urbanization, with its intensely variegated morphologies, its vast territorial scales, its dispersed networks and its apparently all-pervasive voids, poses complex analytical and cartographic challenges. How to understand, and on this basis to represent, the various ways in which agglomerations hinge upon, and continually transform, the operational landscapes associated with such diverse, multiscalar processes as transportation, communication, resource extraction, energy circulation and waste management? A recent visualization of



27.5 A window into concentrated urbanization: the expanding scale of agglomeration in London, 1800, 1840, 1880, 1920, 1960, 1980

worldwide transportation infrastructures offers one among many possible strategies for interpreting such connections and their systemic importance to the dynamics of planetary urbanization (Figure 27.6).[18]

We believe that this distinction can provide a powerful analytical and cartographic tool for exploring the question of urban boundaries posed above. It can also offer a basis on which to explore Lefebvre's famous hypothesis of an urban revolution. From the point of view of concentrated urbanization, the urban revolution involves the spatial expansion and increasing strategic centrality of major metropolitan regions, as postulated by global city theorists and other, more recent commentators on the role of cities in economic life.[19] However, consideration of the *problematique* of extended urbanization introduces a more complex, fluid, diffuse and spatially variegated conceptualization of the Lefebvrian notion of an urban revolution, one that we consider essential for investigating and visualizing early twenty-first-century forms of planetary urbanization. From this perspective, the urban revolution entails the consolidation of a new relationship between urban agglomerations and their operational landscapes. The latter no longer serve simply as hinterlands, resource extraction zones, supply depots and waste dumps for city growth—the realms of "un-building" (*Abbau*) and planetary ecological degradation, which Lewis Mumford observed with considerable alarm in the early 1960s.[20] Instead, the operational landscapes of extended urbanization are today increasingly designed, comprehensively managed, logistically coordinated and "creatively destroyed" to serve specific purposes within the broader political-economic and ecological infrastructures of a planetary-urban system. This ongoing instrumentalization, operationalization and logistical coordination of erstwhile hinterlands—their tendential transformation into zones of customized infrastructure designed and managed to fulfill specific production, reproduction and circulatory functions within a worldwide spatial division of labor—represents one of the distinctive tendencies within emergent twenty-first-century formations of planetary urbanization.



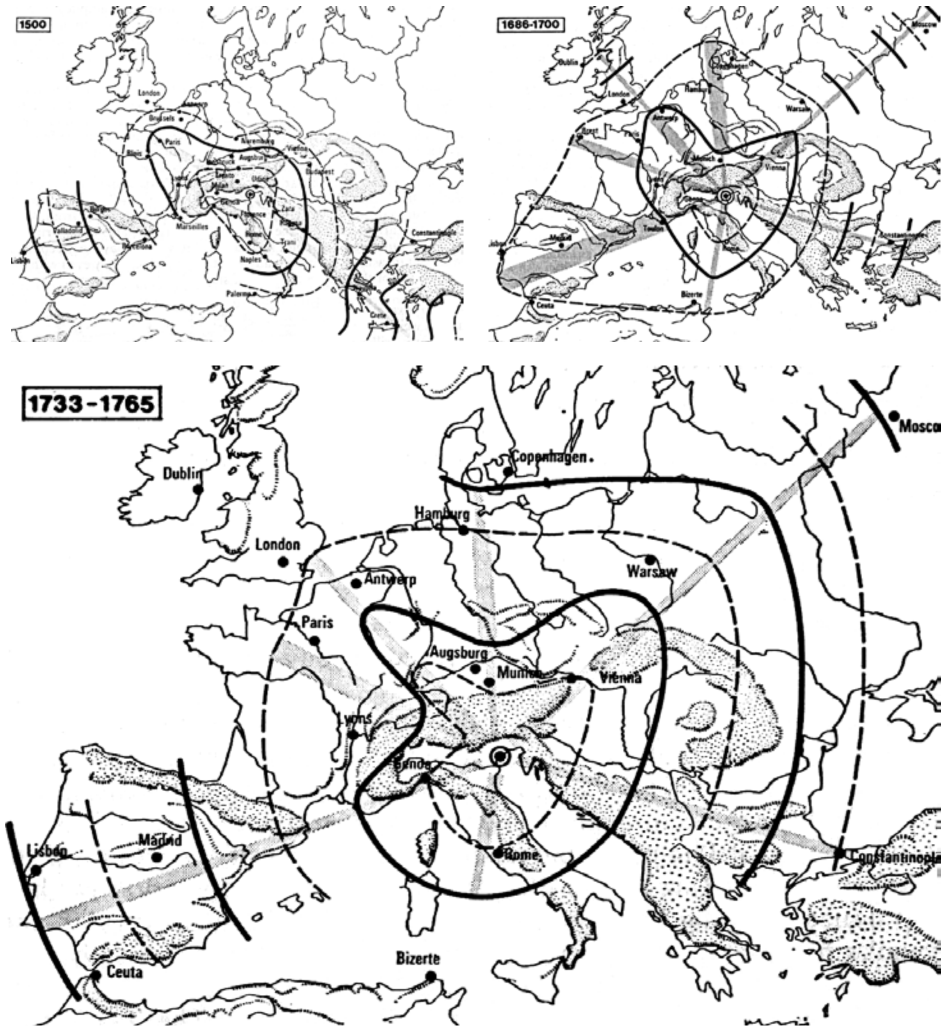
27.6 A window into extended urbanization: the operational landscape of global transportation (a compilation of road, rail and marine transportation networks)

The preceding considerations point towards an ambitious, far-reaching and long-term theoretical, historical and cartographic agenda that we are pursuing with other researchers in the Urban Theory Lab-GSD, as well as with Christian Schmid and his team of collaborators at the ETH-Zürich. In the remainder of this essay, taking the contemporary Mediterranean region as a "test site" for our approach to planetary urbanization, we explore one specific challenge within this massive *problematique*—namely, that of *visualizing* the contemporary urban condition. As Denis Cosgrove has noted, "urban space and cartographic space are intimately related."[21] For this reason, visualizations of the Mediterranean urban fabric may offer some potentially fruitful clues for deciphering the transformed forms, patterns and pathways of early twenty-first-century urbanization both within and beyond this important global region, and in relation to some of the conceptual and epistemological challenges demarcated above.

Since Braudel's classic investigations of the Mediterranean economy and ecology during early modern capitalism, the distinctively urban dimensions of this zone have been widely appreciated.[22] In Braudel's conceptualization, Mediterranean cities represented sites of intense commercial activity within a steadily expanding mercantile capitalist economy. With several major centers, including the city-states of Venice and Genoa, the Mediterranean urban system was visualized primarily with reference to levels of connectivity—especially for communication flows and trade networks—among nodes dispersed within a vast terrestrial and coastal zone (Figure 27.7).

Even though many of the cities examined by Braudel remain vibrant economic centers, the urban fabric of the Mediterranean has of course been transformed dramatically over the last four centuries of capitalist industrial growth, logistical intensification, socioecological reorganization and political-territorial restructuring. Yet, the Mediterranean remains a densely urbanized zone, permeated by thick transportation and communications networks; processes of urbanization and capital accumulation remain as tightly intertwined in the early twenty-first century as they were during the period of Braudel's investigation.

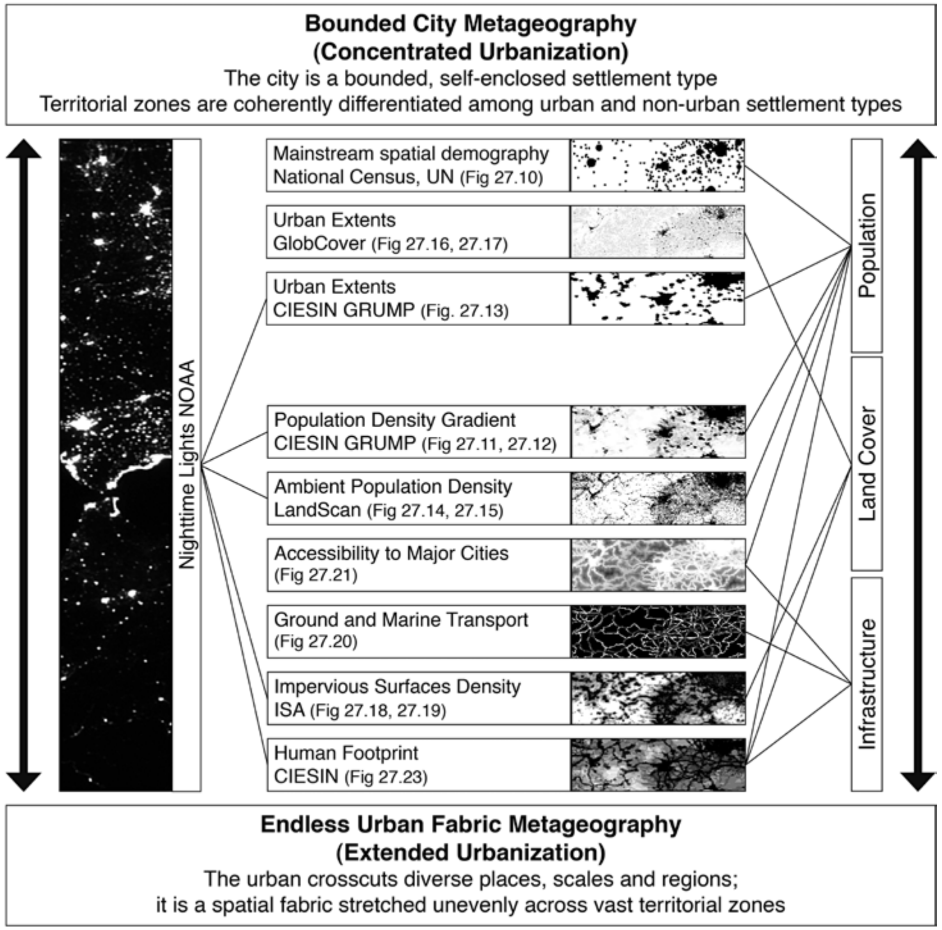
For present purposes, the urban geographies of the contemporary Mediterranean are explored on the basis of an extensive assemblage of recent georeferenced information that have been derived from some of the world's major laboratories for spatial data procurement and analysis.[23] Since the 1970s, the proliferation of new representational techniques associated with geographic information systems (GIS) and other recently established forms of spatial data has radically transformed the cartographic toolkit available to practitioners, policy makers and scholars for mapping the urban landscape. Although many new mapping techniques continue to rely, at least in part, on data collected by state census agencies, most have significantly loosened the hold of state-centric, methodologically territorialist methods in contemporary geospatial analysis. In a methodological maneuver that seriously challenges



27.7 Braudel's visualization of news travelling to Venice (five-day intervals): 1500, 1686–1700, 1733–1765 AD

the hegemonic embrace of "state-istics" within the social sciences, the development of increasingly sophisticated, remotely sensed imaging techniques has permitted the reaggregation of administratively derived data with reference to coordinates, contours, morphologies and gradients that more directly approximate *de facto* terrestrial conditions across the earth's landscape than has ever previously been possible.[24] The availability of such fine-grained, readily customizable data on diverse spatial conditions thus presents urban theorists with a unique opportunity to interrogate inherited assumptions regarding urban boundaries, and on this basis, to develop new conceptualizations and visualizations.[25]

We confront this challenge using contemporary georeferenced data sets on three key indicators that have been commonly invoked to represent urban territories: (1) population distribution, (2) land cover, and (3) transportation infrastructures.[26] In exploring the visualizations associated with such spatial data, we devote particular attention to their *metageographical* assumptions and implications—that is, to the underlying conceptions of sociospatial order they presuppose or which flow from their technical operations—with specific reference to the analytical and cartographic status of the urban. According to historians Martin Lewis and Kären Wigen, "every global construction of knowledge deploys a metageography, whether acknowledged or not."[27] This proposition certainly applies to the construction of global knowledge on urbanization, including at the smaller scale of the Mediterranean explored here. Figure 27.8 offers a stylized contrast between the two opposing metageographical frameworks—labeled, respectively, the *bounded city* and the *endless urban fabric*—that emerge from the visualizations under discussion here, and that broadly correspond to our own distinction between concentrated and extended urbanization. It is the bounded city metageography that is presupposed in each of the three models from twentieth-century urban theory discussed above (Figures 27.1, 27.2 and 27.3), although Jean Gottmann's concept of megalopolis begins to overturn this vision of territorial organization by extending and interweaving urban borders deeply into the erstwhile hinterlands. The bounded city metageography is still widely taken for granted in



27.8 Geospatial data and the metageographies of urbanization

much of contemporary urban social science, and it is also evident in several of the geospatial models of population and land cover discussed below. However, since the introduction of geospatial data on nighttime lights in the late 1990s, several major approaches to geospatial visualization have begun to advance a more radical, quasi-Lefebvrian vision of an endless urban fabric stretched and woven across place, territory and scale.

In Figure 27.8, the various approaches under discussion in this essay are positioned along an analytical continuum in relation to the two opposed metageographies of urbanization. Those positioned closest to the top of the figure are most tightly connected to a bounded city metageography, whereas those closest to the bottom are most directly oriented towards an endless urban fabric metageography. The figure also differentiates the representations according to which indicator (population, land cover and infrastructure) they attempt to visualize. Finally, the figure shows how several of the approaches build upon the influential nighttime lights data set, which has been connected to a rather broad spectrum of metageographical assumptions. By excavating such metageographies, this analysis is intended to highlight the basic theoretical assumptions that invariably underpin efforts to visualize spatial data on urban questions. In the absence of critical reflexivity regarding such metageographical assumptions, even the most exhaustive, fine-grained forms of spatial data cannot be appropriated effectively to illuminate the urban condition and its restlessly changing geographies.

3

Few images have had a greater impact on contemporary metanarratives of global urbanization than the "nighttime lights of the world" series, one of the oldest and most basic sources of remote-sensed information about urbanization. Although this approach was under development as of the early 1970s, it was only in 1997 that the data set produced by the National Geophysical Data Center (NGDC) in Boulder, Colorado was first used to create an integrated global image showing light sources, including human settlements, thus producing a visually striking, intuitively plausible representation of world urbanization patterns.[28]

According to one prominent team of urban geographers, this paradigmatic image of world urbanization has effectively superseded earlier state-centric, territorialist and Eurocentric models of modernity in favor of a globalized, city-centric model that highlights "flows, linkages, connections and relations; an alternative metageography of networks rather than the mosaic of states."[29] Moreover, as the representation of the Mediterranean in Figure 27.9 (next page) strikingly indicates, such images have also entailed a radical shift in the visualization of urban spaces themselves.

Earlier mappings of an urban landscape configured among distinct, bordered, neatly separated places are here replaced by that of an urbanized *continuum* based upon varying

27.9 Nighttime lights around the Mediterranean region (2003 Nighttime Lights of the World data set). The Northwest Mediterranean coast—a focus of several maps below—is demarcated by the white rectangle.

density gradients of settlement and infrastructure ranging from massive, bright metropolitan agglomerations at one extreme to zones of apparent emptiness, darkness and wilderness at the other. Beyond this metageographical influence, the nighttime lights data sets have been among the most ubiquitous sources of spatial information regarding contemporary urban systems; they play an important role in many of the visualizations of spatial data presented below.

The haphazardly intermixed patterns of light depicted in this overview visualization of the Mediterranean lend some initial plausibility to the conceptual distinction between concentrated and extended urbanization introduced above. Traditional zones of urban concentration in the Mediterranean region are readily discernible in the map—for example, Barcelona, Rome, Naples, Athens, Istanbul, Izmir, Beirut, Tel Aviv, Cairo, Tripoli, Tunis, Algiers and Casablanca. But, so too are some much larger scale territories of urbanization whose contours extend well beyond established urban cores, often in uninterrupted bands of high-intensity light emissions stretched along coastal edges. Such large-scale territorial configurations include the lengthy urbanized corridor along the Iberian coastline, the French Riviera conurbation, the Rome-Naples corridor, a northern Adriatic urbanized zone articulated unevenly between Venice and Trieste and an eastern Mediterranean urban corridor stretching almost continuously from Beirut to Gaza. Significant bands of this coastal zone were highlighted for their megalopolitan potentials by Jean Gottmann in the 1970s, and in more recent years scholars have described it variously as the Mediterranean Arc (extending from Barcelona to Marseilles and Genoa), the Mediterranean Sunbelt or as the Latin Arc (including the latter corridor but encompassing a still larger zone stretching from Andalusia to Rome and Naples); others have suggested it also juts inland along Alpine extensions towards Lyon and Milan, among other large cities.[30] Along the north African rim of the Mediterranean, the map reveals impressive complexes of activity bursting westwards along the coastlines of both Tripoli and Algiers, as well as, most strikingly, the thin but intense concentration of light emissions threaded southwards from the Nile river delta along a tightly circumscribed, fluvial band down to the Aswan dam.[31]

Most crucially for our purposes, the nighttime lights map depicts an intricate, transnational complex of settlement patterns and infrastructural grids that crosscut and interpenetrate the major metropolitan zones across the entire Mediterranean region. In stark contrast to the concentric circles of Chicago School urban sociology, the jagged territorial borders of Gottmann's megalopolis or the networked nodal points of world city theory, these urban geographies more closely resemble an uneven latticework that has been woven around and among the major conurbations, metropolitan regions, cities and towns, across an unevenly organized but densely settled transnational territory. This aspect of the nighttime lights image thus provides an initial, impressionistic visualization of the vast, variegated and unevenly developed terrain of extended urbanization in the Mediterranean region as well as across much of northern, central and eastern Europe. Can other visualizations be produced that add more precise analytical content to the metageography of endless urbanization suggested by the nighttime lights image?

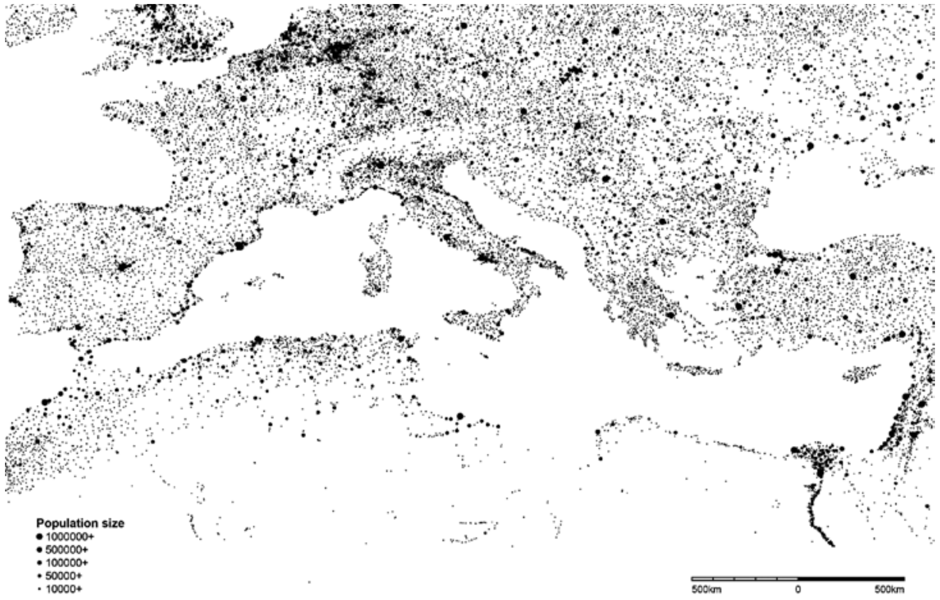
4

One obvious indicator for such an endeavor is population, the spatial distribution of which has long been a focal point for visualizations of urban conditions well before the development of remote-sensed, georeferenced data sources. Contemporary georeferenced spatial data permit the visualization of population distribution in several distinct ways corresponding in various gradations to the bounded city or endless urban metageographies.

In the standard demographic approach, whose roots lie in the pioneering research efforts of Kingsley Davis in the post-period after World War II, population distribution is represented with reference to extant municipal units; a numerical threshold is used to delineate urban from non-urban settlement units.[32] Although debates have raged for over five decades regarding the appropriate threshold on which to delineate urban from non-urban populations (100,000? 20,000? 10,000?), this approach still figures crucially in the data classification systems used by the United Nations Population Division (UNPD). For instance, it underpins the widely repeated but hugely problematic proclamation that a global "urban age" has dawned due to the purported fact that over 50 percent of the world's population now lives within urban areas. [33]

Using a population threshold of 10,000, Figure 27.10 illustrates the implications of this approach for the visualization of Mediterranean urbanization. Here, cities are considered to be dimensionless points, positioned according to the terrestrial coordinates of their abstractly defined centers, and weighted according to their population size. Aside from the persistent problem of justifying an appropriate numerical threshold on which to base such visualizations, the resulting representational landscape suggests a purely locational conception of the urban: it is simply a point on the earth's surface, lacking areal articulation or morphological specificity. The operational landscapes of extended urbanization thereby disappear completely from view; cities appear as relatively self-sufficient islands within a vast territorial void. This model thus paradigmatically embodies the bounded city metageography.

Although this approach is still a popular way of representing urban population levels, whether at a world scale or nationally, its core data are not connected to *de facto* settlement patterns, but are derived from extant administrative units. The limits of such procedures are recognized but not resolved through the establishment of larger units for statistical aggregation—agglomerations, standard metropolitan areas, metropolitan regions, and the like—by the United Nations and many national census bureaus. For, as Louis Wirth, Jean Gottmann, Lewis Mumford and other major twentieth-century urbanists recognized, the complex demographic patterns associated with modern urbanization processes persistently leapfrog beyond the boundaries of such administrative units; data which are derived from them are therefore an extremely imprecise basis on which to interpret the geographies of urban processes. In the early twenty-first century, moreover, population settlement patterns are being still further reshuffled in profound ways that undermine even the most reflexive



27.10 Cities containing populations of larger than 10,000 around the Mediterranean (GRUMP)

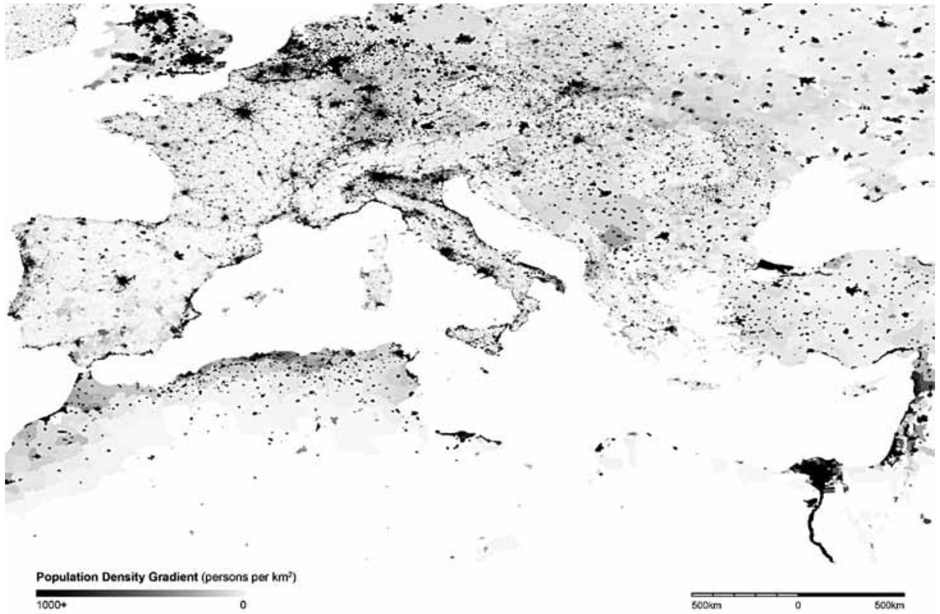
efforts to develop an appropriate statistical/spatial unit for calculating urban population levels. As Edward Soja notes:

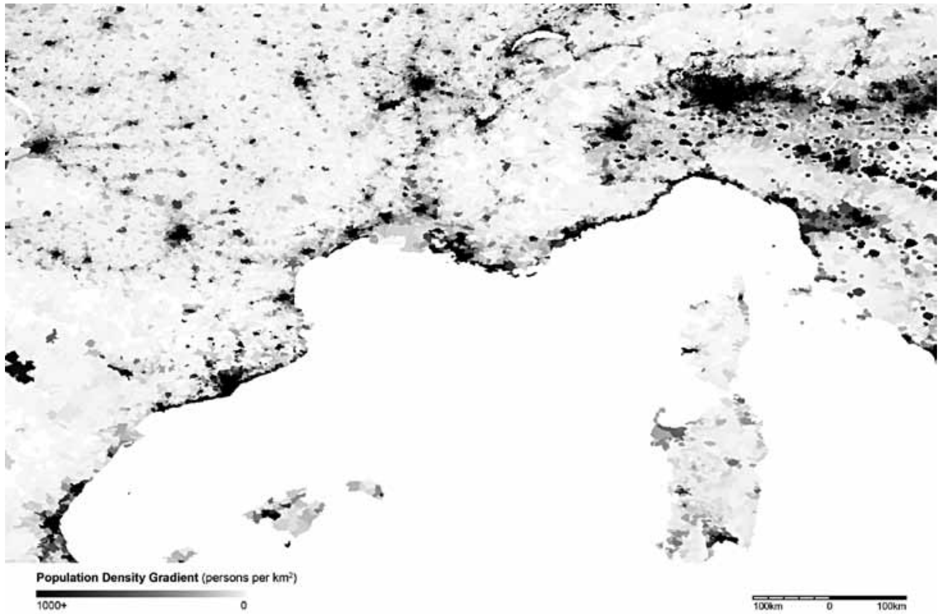
> Once-steep density gradients from the center have begun to level off as peripheral agglomerations multiply and the dominance of the singular central city weakens. What were formerly relatively clear boundaries between city and suburb, the urban and the non-urban, urbanism and suburbanism as ways of life are becoming increasingly blurred as new networks of interaction emerge and the city and the suburb flow into one another in what can best be described as a regional urbanization process.[34]

A second approach to spatial demography, the Global Rural-Urban Mapping Project (GRUMP) developed by a research team at Columbia University's Earth Institute, has attempted to grapple with such issues by plotting population density gradients across broad territorial landscapes around the world. Using a multiparameter algorithm, the GRUMP approach synthesizes three basic types of data in order to estimate and visually distribute population densities: (1) population levels within official administrative zones, (2) the locations of settlement boundaries, and (3) the presence of nighttime lights. Figures 27.11, 27.12 (next page) and 27.13 (page 445) build upon various types of GRUMP spatial data to illustrate some of its implications for the visualization of urban population geographies in the Mediterranean.

At first glance, Figures 27.11 and 27.12 appear to transcend the bounded city metageography of urbanization, offering more nuanced visualizations of population geographies than those associated with standard demographic approaches. These figures illustrate not only the concentrations of high population density in all of the major Mediterranean cities and urban regions mentioned above, but also the outward spread of population clusters across and among the extended metropolitan corridors that are on display in the nighttime lights map in Figure 27.9. These maps of population density gradients appear to reinforce the image of extended urbanization produced through the nighttime lights images, and thus to advance the endless urban fabric metageographical model. Intense light emissions appear to equate seamlessly with high levels of population density, which now occur through the broad networks of interaction mentioned by Soja rather than being confined to traditional city cores.

However, as its acronym suggests, an uninterrogated, methodologically territorialist distinction between urban and non-urban zones underpins the statistical procedures used in the GRUMP approach to visualizing density gradients. Indeed, despite its capacity to map population density gradients across the entire territorial landscape, a key element of the GRUMP approach is to delineate a clear, continuous territorial border around the most densely populated zones. To this end, GRUMP researchers construct what they term an "urban mask" by combining data on the locations of settlements whose populations exceed 5,000 with information on the distribution of continuous-intensity nighttime lights.[35] On this basis, urban areas are represented as clearly bounded territories; other areas are classified as rural, and thus as empty, blank spaces on the map. Whereas Figures 27.11 and 27.12 use GRUMP data to plot the population density gradient across the entire Mediterranean territory, Figure 27.13 illustrates the bounded city metageography that underpins the GRUMP's urban mask technique. As illustrated starkly by the vast, empty spaces scattered across the map, the GRUMP urban mask algorithm generates a



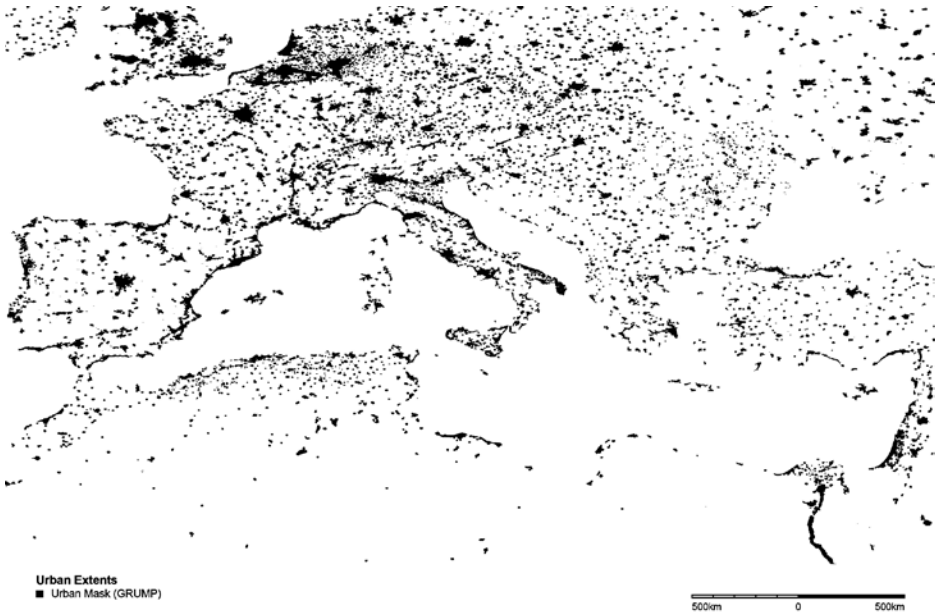


27.11 (top) Population density gradients around the Mediterranean (GRUMP)
27.12 (bottom) Population density gradients on the northwest Mediterranean coast (GRUMP)

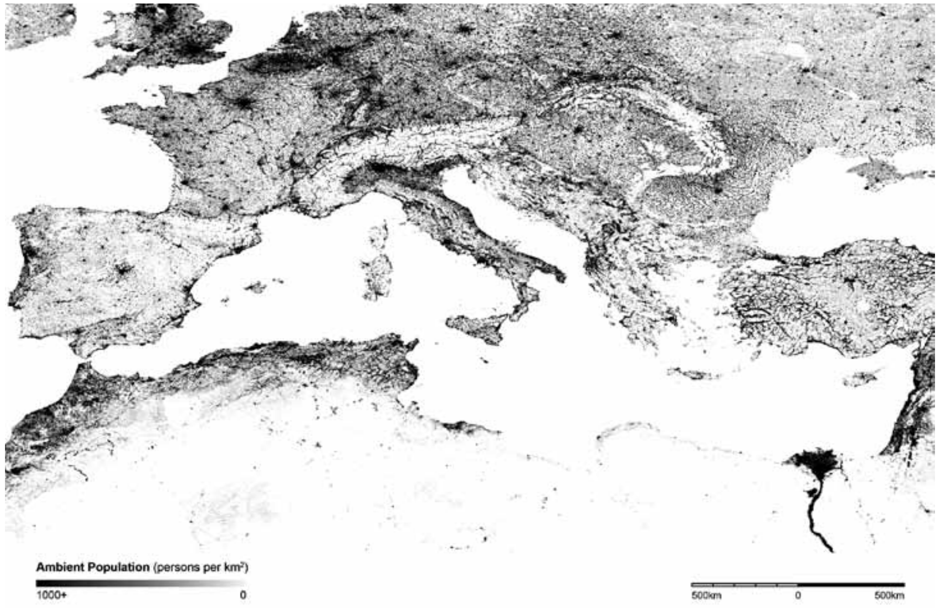
visualization of territorial differentiation that, despite its expanded mapping of the urban, is still as untenably binary as the mainstream approach to spatial demography discussed with reference to Figure 27.10.

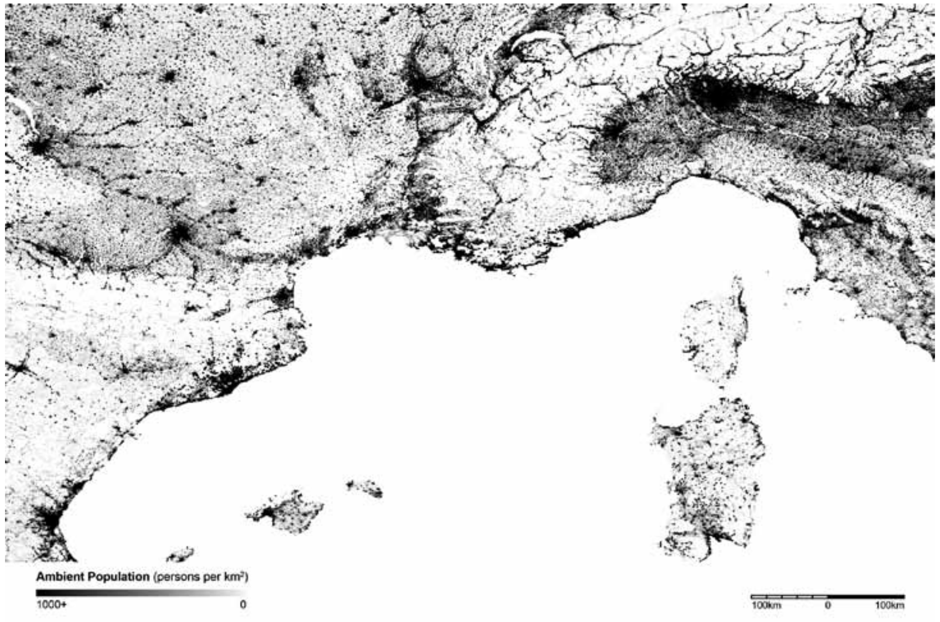
One further, still more far-reaching approach to spatial demography has been associated with the LandScan data set, which was originally introduced in 1988 at the Oak Ridge National Laboratories (ONL). While its initial purpose was to serve emergency workers responding to disasters, it has subsequently been used to inform investigations of large-scale population distributions. In contrast to the static residential or nighttime population data used by national census bureaus, the LandScan approach uses a complex probability coefficient to capture the fluid movement of populations over a 24-hour period.[36] This "ambient" population is intended more closely to approximate the actual daily distribution of people in space (Figures 27.14 and 27.15, next page).

Although LandScan takes urban agglomerations into account, the database does not impose boundaries upon urban areas, nor does it formally distinguish urban and rural populations. Consequently, even though it does reveal the broad contours of diverse settlement areas, the LandScan approach offers a particularly striking visualization of the vast commuter sheds that undergird and crisscross large territorial zones. Thus, in the enlarged image in Figure 27.15 depicting ambient population around the northwest Mediterranean, major transportation corridors appear highly urbanized. This reveals the intensive daily use of social space, not only road infrastructures, far beyond the core zones of metropolitan areas. In effect, the LandScan database provides a georeferenced foundation for the classic



27.13 Urban extents around the Mediterranean (GRUMP) concepts of megalopolis, daily urban systems and commuter sheds developed in the 1960s and 1970s by innovative urbanists such as Jean Gottmann, Constantinos Doxiadis and Brian Berry.[37] Much like the LandScan scientists, but lacking such precise geospatial data, each of these theorists was centrally concerned to underscore the fluid movement of populations within and across a large-scale regional or national territory. Mapping this fluidity, the imprint of human mobility within and across territory, is a key contribution of the LandScan approach.





27.14 (top) Ambient population density around the Mediterranean (Landscan)
27.15 (bottom) Ambient population density around the northwest Mediterranean coast (Landscan)

Among major geospatial visualizations of population distribution, then, it is the LandScan approach that pushes most forcefully towards an endless urban fabric metageography. Due to its expansive mapping of urban morphologies beyond traditional city cores and its fluid depiction of urban boundaries, the LandScan approach provides a powerful visualization of how population flows produce a landscape of extended urbanization in the Mediterranean.

5

All population-based attempts to bound urban areas in cartographic space, and thus to examine processes of concentrated urbanization, require the specification of some threshold—usually either population size or population density—in terms of which to separate the urban from the non-urban. Mainstream approaches to spatial demography and the GRUMP effort to define the urban mask specify this threshold in different ways, but both undertake a basic statistical operation in order to visualize the presumed areal bounding of urban units from a surrounding non-urban realm. A second approach to the problem of specifying such boundaries focuses not on population distribution or density gradients, but on land cover indicators, with particular reference to the spatial patterns of artificially constructed or built-up areas. Here, too, the delineation of a statistical threshold for the unit of data collection has massive implications for visualization outcomes.

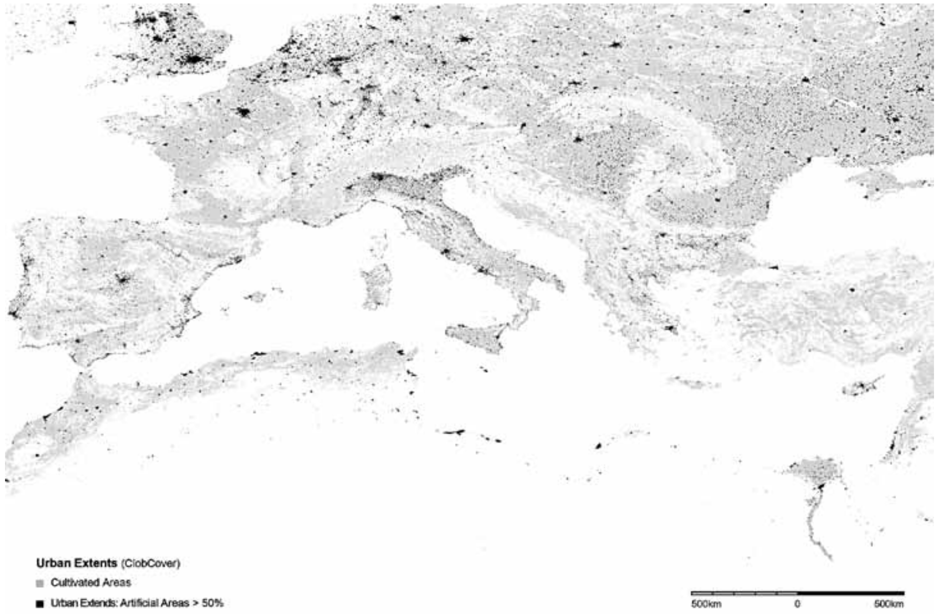
A powerful contemporary method for investigating land cover types is through remote sensing. This technique entails the regular use of satellite sensors to scan the earth's surface, producing gridded data sets in which dominant land cover types are classified and then visualized with reference to quite fine-grained spatial units, ranging in size from one square kilometer to, most recently, 300 square meters. Since the major task of these satellites is environmental monitoring, most of their land cover classifications pertain to types of vegetation or hydrological conditions rather than to human settlement types or infrastructural arrangements. Despite this, however, any number of metageographical assumptions regarding the nature of urban space emerge from georeferenced studies and visualizations of urban land cover. As with the major approaches to geospatial data on population discussed above, contemporary approaches to urban land cover oscillate between metageographies that attempt to circumscribe urban zones and those that emphasize their explosion and differentiation across a vast territorial landscape.

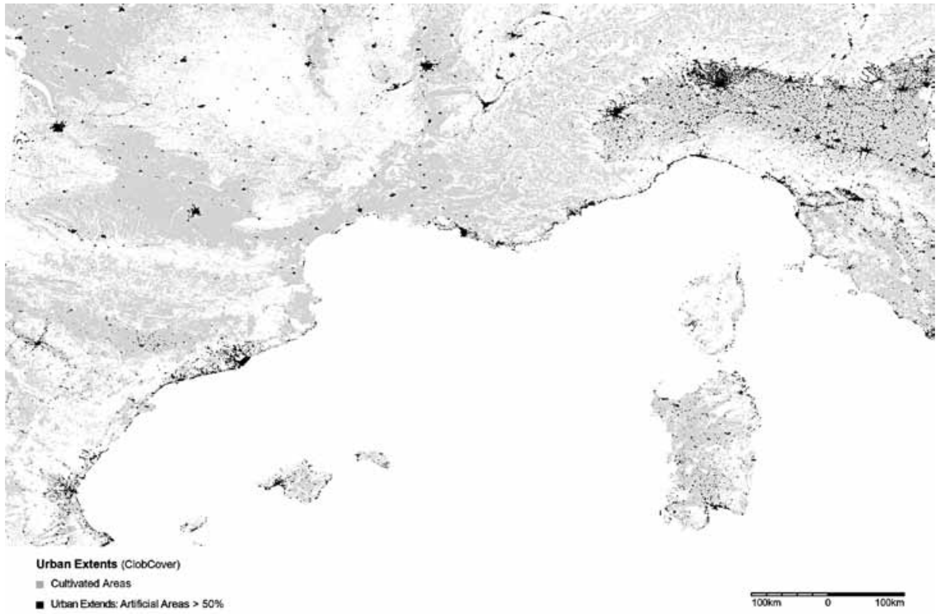
Two of the major approaches to global land cover have been developed by the European Space Agency (the GlobCover data set) and by NASA (the MODIS data set).[38] In the case of GlobCover, the MERIS sensor has been used to scan and classify every gridded cell on the earth's surface among 22 classes, only one of which is used to define urban areas. As in almost all land cover data sets, GlobCover defines the urban condition as a physical feature of the earth's surface, formally analogous to the different types of vegetation or hydrological conditions to which the other 21 land cover categories apply (examples of the latter include: cultivated and managed terrestrial areas, bare areas and artificial water bodies). Within this classificatory scheme, urban areas are those in which built, artificial or non-vegetative surfaces predominate over other land use arrangements. Under the rubric of the technical term "impervious surfaces," such delineations of the urban generally include not only buildings but also roads, pavements, driveways, sidewalks, parking lots and any other surfaces in which artificial forms of land coverage predominate.[39] Crucially, within this database, the threshold for the predominance of any feature within the landscape unit being studied is 50 percent of total land cover. The implications of this approach for visualizing the urban Mediterranean are presented in Figures 27.16 and 27.17, which are derived from the 2006 GlobCover data set.

As Figures 27.16 and 27.17 indicate, the GlobCover data set produces a bounded city metageography in which urban zones are relatively circumscribed and separated representationally from a diversity of other landscape features, which occupy the bulk of the territory. This metageographical orientation stems, first, from the GlobCover's use of a 50 percent threshold as the basis for classifying each landscape unit. Even when a very fine grain of data collection is used, this typological approach to visualization automatically erases all features of land cover that fall beneath the 50 percent threshold within the unit in question. This means, for example, that densely forested or vegetated zones containing moderately dense built environments or populations cannot register on the map as having any urban features. Second, this approach to land cover analysis replaces the urban/rural dualism used in mainstream spatial demography with an equally binary urban/nature divide. Because the GlobCover approach is oriented towards classifying the diversity of ecological landscapes, it envisions the natural environment as extending across the entire earth, thus enabling its features to be investigated systematically and then visually differentiated. This in turn consigns the urban to tightly delineated "bins," in which the 50 percent threshold for artificial surfaces has been crossed. The possibility that putatively "natural" spaces, or those with dense concentrations of particular ecological features (grasslands, water, ice and so forth), may be permeated, crosscut and/or transformed through urbanization processes is thereby excluded from consideration by classificatory fiat.

The Global Impervious Surface (ISA) data set, developed in the early 2000s by the Earth Observation Group in Boulder, Colorado, offers an alternative approach to the *problematique* of urban land cover that begins to map infrastructural geographies beyond city cores and metropolitan regions, and thus to explore the land cover features of extended urbanization. Unlike GlobCover and MODIS, the ISA does not draw upon remotely sensed land cover data; instead, it combines nighttime lights data from NOAA and ambient population information from LandScan (see Figures 27.9 and 27.14). Most crucially, because the ISA is focused on only one general landscape feature, artificially covered or impervious surfaces, it need not deploy a classificatory threshold, 50 percent or otherwise. Instead the ISA creates a 0 percent to 100 percent density gradient for artificial surfaces, leading to a quite differentiated visualization of built land cover densities across vast territorial zones.[40] The visual consequences of this approach are readily evident in Figures 27.18 and 27.19

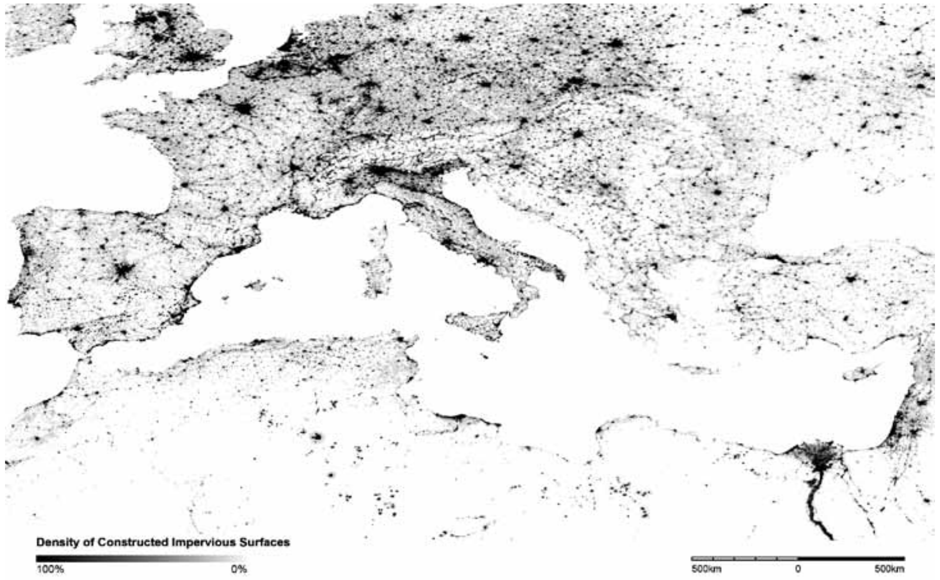
(page 450), which reveal a thick mosaic of built-up areas and connective infrastructure corridors stretched and threaded unevenly across the Mediterranean zone. For purposes of comparison, the GlobCover urban extents are also depicted in red on these maps, thus offering a striking contrast between an approach to urban land cover oriented towards a bounded city metageography and one that produces an endless urban fabric metageography.

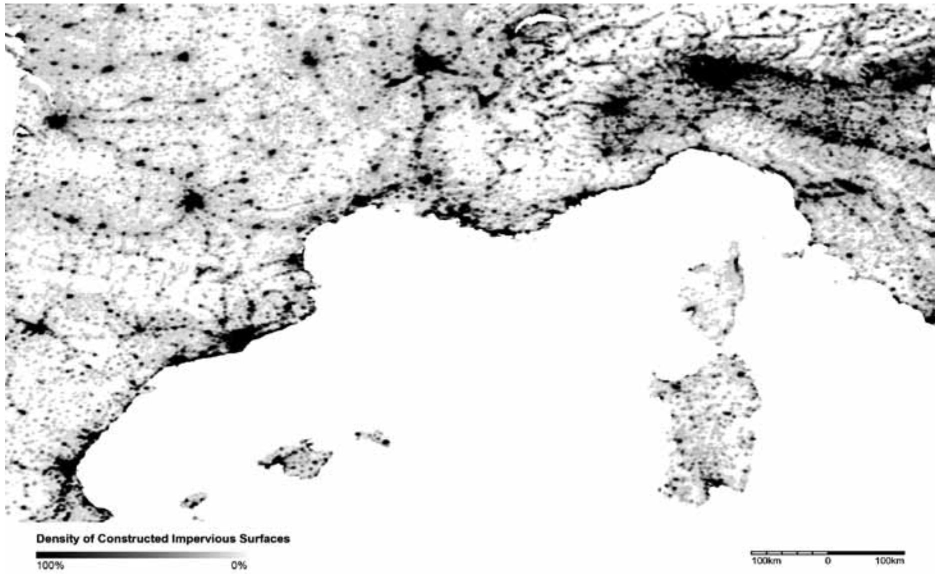




27.16 (top) Urban land cover around the Mediterranean (Globcover). The black outline corresponds to urban areas defined as more than 50 percent artificial areas. The background of light gray areas depicts all cultivated areas.
27.17 (bottom) Urban land cover around the northwest Mediterranean coast (Globcover). The black outline corresponds to urban areas defined as more than 50 percent artificial areas. The background of light gray areas depicts all cultivated areas.

While the theoretical significance of impervious surface distribution requires further investigation and clarification, the ISA visualizations underscore the massive extent and variegated distribution of built structures and surfaces across the Mediterranean. According to one team of geospatial scientists, the construction of impervious surfaces is "a universal phenomenon—akin to clothing—and represents one of the primary anthropogenic modifications of the environment."[41] However, rather than viewing the contemporary production and transformation of built surfaces as a universal feature of anthropogenic





27.18 (top) Density and distribution of impervious surfaces around the Mediterranean (Global Distribution and Density of Constructed Impervious Surfaces data set)
27.19 (bottom) Density and distribution of impervious surfaces around the northwest Mediterranean coast. (Global Distribution and Density of Constructed Impervious Surfaces data set)

activity, we emphasize the historically and geographically specific frameworks of *capitalist* urbanization within which such processes have been occurring, both in the Mediterranean and beyond, since the period of mercantile expansion investigated in Braudel's classic studies. But the metaphor of clothing—or, better, a skein—covering major zones of the earth seems appropriate. In John Friedmann's recent formulation, "as the skein of the urban steadily advances across the earth, its vertical dimensions are layered to produce a new global topography of the urban."[42] The ISA visualization usefully illuminates one strategically important layer of this emergent global-urban topography. While such visualizations do not, in themselves, reveal much regarding the institutions, strategies and struggles through which this skein is produced and transformed, they do offer a more plausible representation of their geographies, than the bounded city model associated with the GlobCover and MODIS approaches.

6

At a very large scale, visualizations of impervious surface gradients reveal the material imprints of infrastructural networks, including those of transportation systems, that extend well beyond city cores and metropolitan centers. These transportation infrastructures—road, rail, marine and air—are obviously essential to both historical and contemporary forms of capitalist urbanization, facilitating the circulation of capital, labor and commodities across large-scale territories and, as David Harvey has famously argued, continuously accelerating both the turnover time of capital accumulation and the "annihilation of space by time."[43] The role of such infrastructures of circulation in the urbanization process has long been recognized. For instance, as discussed above, Braudel's analysis of the urban Mediterranean devoted some attention to the vectors of interconnectivity, for both information and commerce, linking the major ports and economic centers (Figure 27.7). Likewise, despite his territorialist conception of the urban, Jean Gottmann's investigation of Megalopolis included a detailed analysis of internal and external transportation linkages, and presented national-scale visualizations of rail, highway and airplane networks as part of his investigation of commuter flows.[44] In most such approaches, however, the geographies of transportation connectivity are understood as being extrinsic to an urban process that is animated internally, through the powerful socioeconomic and cultural forces unleashed by agglomeration.

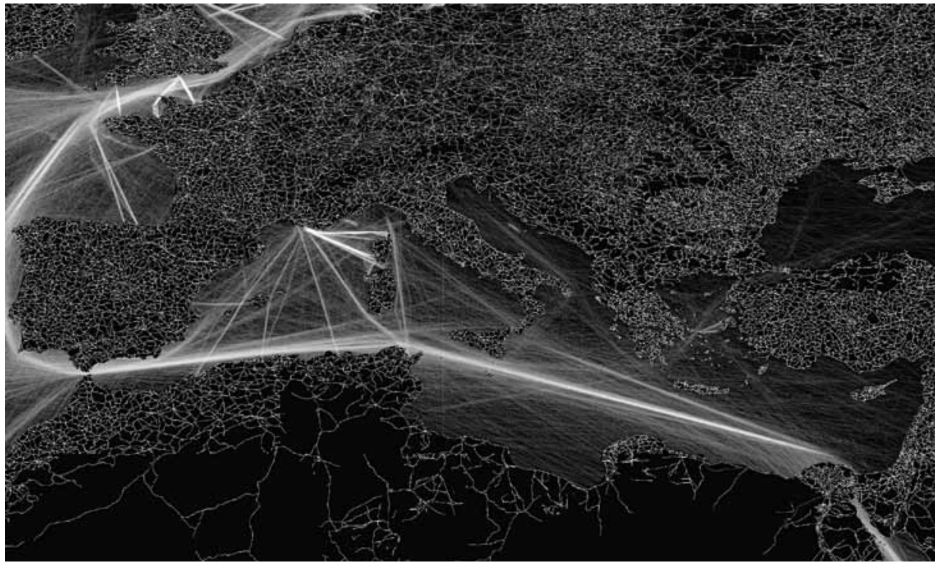
Following from the analytical and cartographic explosion of the urban we have been tracking in this discussion, it is no longer plausible to reduce the *problematique* of transport geographies to an adjunct spatial formation, subordinate to the nodal points and bounded urban territories upon which twentieth-century urban theory was focused. Consideration of transportation infrastructures offers a powerful basis on which to visualize the thickening landscapes of extended urbanization. Of course, such a perspective requires continued attention to concentrated urbanization, and to the diverse processes through which centers of socioeconomic activity and population are constructed, reproduced and interconnected. Just as importantly, such an investigation requires an interpretation of transportation networks and their sociomaterial infrastructures as essential elements within an extended fabric of urbanization, regardless of their locational geometries or morphological configurations.[45]

Drawing upon a data set produced by the National Imagery and Mapping Agency (NIMA) of the US Geological Survey (USGS), Figure 27.20 presents such a visualization with reference to the major terrestrial and marine transportation networks around the Mediterranean. This visualization reveals a generalized geography of interconnectivity that stretches across the entire region, from the hyperdense webs along the coastlines and around the major agglomerations, to the latticework of corridors stretched across both marine and terrestrial zones and the sparsely equipped North African desert and mountain hinterlands. It illustrates not only connections among major centers, but also the density and scope of the transportation networks themselves, which are woven thickly across regions, territories and scales, and thus represent important spatial infrastructures for extended urbanization.

A complementary visualization of the operational geographies associated with these transportation infrastructures is presented in Figure 27.21, which is based upon the Global Accessibility Map, a data set that was commissioned in conjunction with the World Bank's World Development Report of 2009. Whereas Figure 27.20 depicts the positionality, shape and density of the various routes, Figure 27.21 uses a cost-distance algorithm to compute the projected travel time to major settlement areas. The resultant "friction-surface" is represented spatially using a color coding system in which brightness denotes high accessibility and darkness indicates low accessibility. The friction surface used to color-code the map is calculated with reference to estimated travel times associated with different types of transport infrastructures, while also taking into account intervening factors such as land cover, slope and political borders.[46] In effect, this approach generalizes Braudel's earlier diagrams of Venetian accessibility (Figure 27.7) to every major destination within the entire Mediterranean territory. Each portion of the zone is assigned a projected travel time to the nearest major city, but as in Braudel's maps, the changing gradient (here, a grayscale coding scheme) represents not a spatial attribute but a time-distance vector. In this way, urbanization is revealed as a relation of access to a broader terrain through networks that link cities, yet expand beyond them via long-distance transport corridors that cumulatively become important landscape attributes.

In different ways, Figures 27.20 and 27.21 provide evidence for the continued centrality of agglomerations as nodal points within medium, and long-distance transport networks. In Figure 27.20, this is due to the obvious presence of cities as endpoints and way-stations within the networks. In the case of Figure 27.21, the calculations that generate the grayscale gradient are tied to the locations of cities containing more than 50,000 people as of the year 2000. Despite this, however, both maps also serve to destabilize the bounded

city metageography by illuminating the impressive density and territorial coverage of crisscrossing transportation networks within and around the Mediterranean. For this reason, both maps have been aligned with the endless urban fabric metageography in Figure 27.8. Even if they are not as expansive in their estimation of urban boundaries as the impervious surfaces density (ISA) data set, they do extend them well beyond those associated with GRUMP population density gradients and the LandScan account of ambient population density. More generally, insofar as these maps transpose the territorialist concern with urban boundaries into a more fluid *problematique* of networked infrastructures, interdependencies



27.20 (top) Major ground and marine transportation routes around the Mediterranean (Compilation of road, rail and marine transportation networks based on VMAP0)
27.21 (bottom) Accessibility map of the Mediterranean region. The gradient is derived from estimations of travel times to major cities with populations over 50,000 in the year 2000.

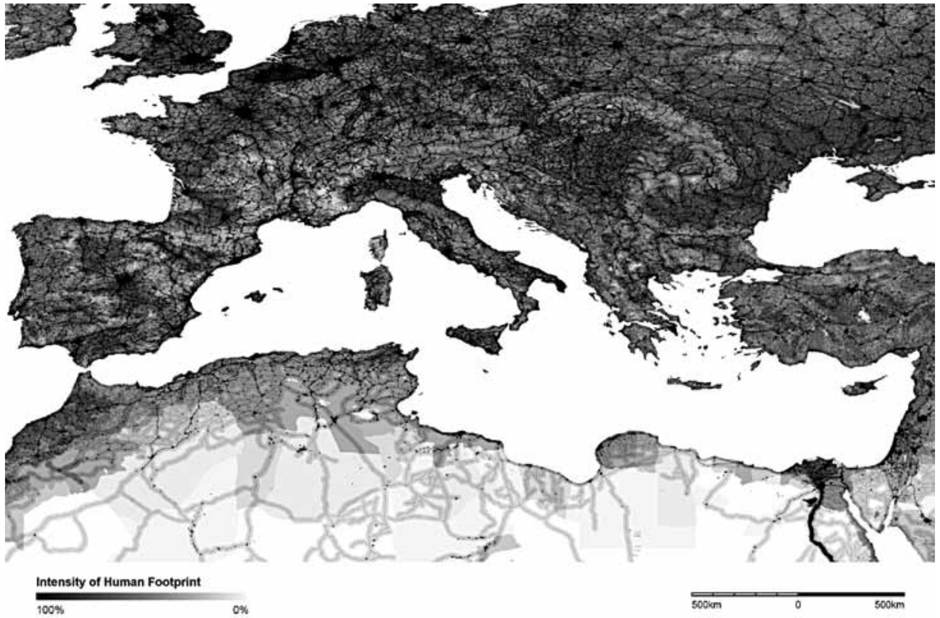
and connectivities, they offer particularly vivid illustrations of John Friedmann's metaphor of the "skein of the urban."[47]

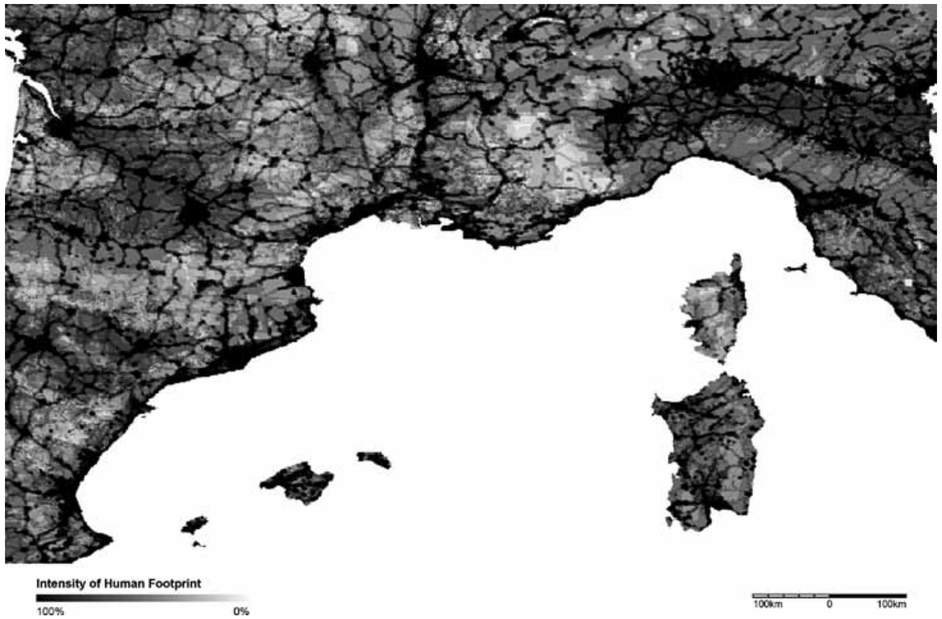
7

How far can this extended model of Mediterranean urban geographies be stretched? Are there not additional traces, layers and vectors of the urban radiating beyond population density gradients or ambient population densities, the "hardscapes" associated with impervious surfaces and the variegated geographies of transportation accessibility? A particularly expansive visualization of urbanization processes, which almost completely explodes the urban/non-urban distinction, is engendered through the Human Footprint data sets produced by the Wildlife Conservation Society and Columbia's Earth Institute. These approaches are grounded upon a synthetic combination of population, land cover, land use, transportation and energy data, and attempt to grasp the cumulative effects of human transformations on the landscape through a grayscale color-coding system (with darkness signifying high impact, lightness signifying low impact). In Figures 27.22 and 27.23, these putative human impacts on the Mediterranean landscape—arguably a proxy measure for the diverse, historically specific social processes associated with modern capitalist urbanization—are depicted as being nearly co-extensive with the entire region.[48] The non-urban "outside" presupposed in earlier approaches has now been almost totally annihilated; urbanization is represented as an encompassing continuum expressed through a vast assemblage of landscape conditions across the entire territory. This and the previously discussed visualizations of the Mediterranean thus clearly underscore the futility of attempts to demarcate fixed urban boundaries within a territorial landscape that, as Lefebvre recognized over four decades ago, is simultaneously exploding and imploding around, across, among and through inherited city centers.[49]

However, despite their usefulness in illustrating the large-scale areal continuity of the urban fabric and the densely networked interconnections among places and regions across the Mediterranean, one of the most serious limitations of the visualizations discussed here is their static character—their depiction of synchronic conditions and cross-sectional distributions rather than restructuring processes and sociospatial transformations. In the case of geospatial data on population, the visualizations discussed above are purely descriptive; they do not effectively illuminate the unevenly articulated, crisis-prone urbanization processes, with associated moments of explosion and implosion, that underlie and continually transform the variegated patterns of population distribution, growth and decline around the Mediterranean.[50] Similarly, geospatial data on land cover serve mainly to describe the material and morphological configuration of built space around the contemporary Mediterranean, but they explain almost nothing regarding the cyclical, often speculative processes of creative destruction that constantly reshape the latter. Even visualizations that explore the density of impervious surfaces do not effectively illuminate the ways in which such differentiated geographies are mediated through common, large-scale

forces of restructuring, such as state planning strategies, tourist infrastructural investment or real estate speculation. Finally, the abstract visualizations of transportation networks presented above are no more than a generic starting point for investigating the interplay between connectivity infrastructures and strategies of urban and regional development at various scales.[51] Indeed, this relationship is left completely indeterminate in Figures 27.20





27.22 (top) The human footprint around the Mediterranean (CIESIN Global Human Footprint data set). Human impact is rated on a scale of 0 to 100.
27.23 (bottom) The human footprint around the northwest Mediterranean coast (CIESIN Global Human Footprint data set). Human impact is rated on a scale of 0 to 100.

and 27.21, which do little more than represent real or hypothesized connections among already established population centers.

Such visualizations may also contain profoundly ideological assumptions, which are naturalized through their technoscientific representation as self-evident spatial conditions. For instance, the vision of the bounded city presented in mainstream spatial demography as well as in the GRUMP data on population density is symptomatic of a broader, increasingly hegemonic discourse on the "urban age," which is often used to justify the continued concentration of infrastructure, investment and population within the most economically prosperous cities and metropolitan regions. Such visualizations are thus deeply implicated in the proliferation of urban locational policies that effectively naturalize the shrinkage of redistributive spatial policies and the ongoing state-mediated, publicly funded proliferation of territorial inequalities at all spatial scales, across Europe and beyond.[52] Similarly, the recent roll-out of large-scale, trans-European motorway and sea infrastructures is intended to promote the forms of large-scale spatial integration envisioned in Figure 27.21. However, this visualization is blind to ways in which such initiatives fragment and marginalize some zones precisely as they more tightly interconnect others, thus contributing to a wide-ranging "splintering" of territory.[53] Many other examples of the naturalization of spatial ideology could be excavated from these and other forms of geospatial visualization, not least in relation to the representation of urbanization processes. As powerful and provocative as such representational techniques may appear, therefore, urban scholars must treat them with extreme caution, recognizing their politically inflected, ideologically strategic character, especially in their most technically sophisticated forms.

A fundamental challenge for any attempt to visualize twenty-first-century urbanization is to specify, in substantive theoretical terms, the essential properties and dynamics of this process, at any spatial scale, such that its geographical imprint and effects can be investigated and subjected to representational ordering. Visualization strategies, including those based on geospatial data, can serve as powerful aids in the effort to build such a theorization, but they cannot substitute for the basic analytical work required to invent, refine and operationalize concepts. Indeed, the sources of geospatial data analyzed here deploy relatively simple, mostly descriptive understandings of the urban that may prove useful for information processing and visualization, but do little to clarify the metageographical questions explored above or, for that matter, to illuminate the transformative dynamics that shape and reshape urban landscapes. From our point of view, a new theory of urbanization is today required for deciphering twenty-first-century sociospatial transformations, but its key conceptual elements have yet to be consolidated. This exercise in the visualization of urban boundaries and spaces within the Mediterranean is therefore intended to facilitate reflection and debate regarding the "transformed form" of contemporary urbanization, and thereby, to stimulate further reflection on the "urban question" under twenty-first-century conditions. This is a task to which we and our colleagues in the Urban Theory Lab-GSD are now dedicating considerable energies.

Meanwhile, urban ideologies and associated visualizations persist.[54] The vision of a bounded city, the notion of a worldwide "urban age," the assumption of an urban/non-urban divide and the fantasy of total connectivity continue to pervade scholarly writing, administrative discourse, planning practice and public culture. The production of such ideologies is an important dimension of the urbanization process itself, especially during a conjuncture in which inherited spatial formations are being exploded and reconstituted anew. The visualization of urban space (as bounded or unbounded, for example) and of territorial order (as unified, divided or variegated, for example) may figure crucially in the production and entrenchment of such spatial ideologies. For this reason, even though they are often derived from seemingly technical decisions regarding numerical threshold percentages, measurement instruments, classificatory schemes or unit boundaries, the metageographies associated with geospatial data are never neutral. Such apparently trivial statistical or cartographic manipulations may serve to naturalize, or to unsettle, established assumptions regarding territorial organization, sociospatial interdependence and geopolitical identity. In this sense, our metageographical explorations regarding the visualization of Mediterranean urbanisms may be articulated to some of the broader questions about planetary urbanization and the reinvention of urban epistemologies that are explored throughout this book.

Notes

1 Manuel Castells, *The Urban Question: A Marxist Approach* (Cambridge: MIT Press, 1977); and Peter Saunders, *Social Theory and the Urban Question*, Ssecond Edition (London: Routledge, 1985); and Andy Merrifield, *Metromarxism: A Marxist Tale of the City* (New York: Routledge, 2007).
2 Neil Brenner, "Theses on Urbanization," this book, Ch. 13.
3 Ernest Burgess, "The Growth of the City: An Introduction to a Research Project," *The City,* eds. Robert Park and Ernest Burgess (Chicago: University of Chicago Press, 1967 [1925]) 55.
4 Jean Gottmann, *Megalopolis: The Urbanized Northeastern Seaboard of the United States* (Cambridge: MIT Press, 1961) 20.
5 John Friedmann, "The World City Hypothesis," *Development and Change* 17 (1986) 69-84.
6 Versions of this argument are developed explicitly by Saskia Sassen, *The Global City*, Second Edition (Princeton: Princeton University Press, 2000); and Stephen Graham and Simon Marvin, *Splintering Urbanism* (New York: Routledge, 2005).
7 Edward W. Soja and J. Miguel Kanai, "The Urbanization of the World," this book, Ch. 10, page 146.
8 Henri Lefebvre, *The Urban Revolution*, trans. Robert Bononno (Minneapolis: University of Minnesota Press, 2003 [1970]) 1.
9 Ibid., 4.
10 Ibid., 169.
11 Ibid., 15; italics in original document.
12 See, among other works, Christian Schmid, "Networks, Borders, Differences: Towards a Theory of the Urban," this book, Ch. 4; Andy Merrifield, "The Right to the City and Beyond: Notes on a Lefebvrian Conceptualization," this book, Ch. 31; Edward W. Soja, "Regional Urbanization and the End of the Metropolis Era," this book, Ch. 19; David Madden, "City Becoming World: Nancy, Lefebvre and the Global-Urban Imagination," this book, Ch. 30; Roberto Luís Monte-Mór, "What is the Urban in the Contemporary World?" this book, Ch. 17; and David Wachsmuth, "City as Ideology," this book, Ch. 23.
13 Merrifield, "The Right to the City and Beyond," this book, Ch. 31, pages 524, 525.
14 The phrase "liminal landscapes" is drawn from Alan Berger, *Drosscape: Wasting Land in Urban America* (Princeton: Princeton Architectural Press, 2006) 29.
15 The concept of cognitive mapping is developed in Frederic Jameson, "Cognitive mapping," *Marxism and the Interpretation of Culture,* eds. Lawrence Grossberg and Cary Nelson (Chicago: University of Illinois Press, 1992) 347-57.
16 This distinction and its implications are developed at length in Neil Brenner and Christian Schmid, *Planetary Urbanization*, manuscript in progress. See also Neil Brenner and Christian Schmid, "The 'Urban Age' in Question," this book, Ch. 21; Neil Brenner and Christian Schmid, "Planetary Urbanization," this book, Ch. 11; and Neil Brenner, "Theses on Urbanization," this book, Ch. 13. We are grateful to Christian Schmid for permission to deploy this conceptual dyad in a preliminary way here.
17 These terms are discussed and elaborated in Roger Diener, Jacques Herzog, Marcel Meili, Pierre de Meuron and Christian Schmid, *Switzerland—An Urban Portrait, Volumes 1–4* (Zürich: Birkhäuser, 2003); as well as, Berger, *Drosscape*.
18 Berger's *Drosscape* represents a particularly sophisticated effort to confront this challenge through a brilliant combination of theoretical analysis, photographic documentation and creative visualization.
19 See, for example, Edward Glaeser, *Triumph of the City* (New York: Trantor, 2011); for a critique, see Brendan Gleeson, "The Urban Age: Paradox and Prospect," *Urban Studies* 49, 5 (2012) 931-43.
20 Lewis Mumford, "Mechanization and Abbau," *The City in History* (New York: Harcourt, Brace, Jovanovich, 1961) 450-2.
21 Denis Cosgrove, "Carto-city," *Geography and Vision: Seeing, Imagining, and Representing the World* (London: I.B. Tauris, 2008) 169.
22 See Fernand Braudel, *The Mediterranean and the Mediterranean World in the Age of Philip II, Volumes 1 and 11*, trans. Siân Reynolds (Berkeley: University of California Press, 1995).
23 These include the Columbia University Center for International

Earth Science Information Network (CIESIN), the Oak Ridge National Laboratory (ORNL), the European Environmental Agency (EEA), the European Space Agency (ESA), the National Geophysical Data Center (NGDC), the National Imagery and Mapping Agency (NIMA), the National Center for Ecological Analysis and Synthesis (NCEAS) and the Joint Research Centre of the European Commission (JRC-EC), among others.

24 On the relation between statistics and "state-istics," see Peter J. Taylor, "A Brief Guide to Quantitative Data Collection at GaWC, 1997-2001," *Globalization and World Cities Research Network, Loughborough University*, accessed 30 May 2012, http://www.lboro.ac.uk/gawc/guide.html.

25 Unfortunately, however, this opportunity has yet to be exploited effectively. To date, the dominant approach to the use of spatial data and analytical technologies in urban research has privileged description over theorization or conceptualization. This is a highly problematic tendency, in our view, because the descriptive sophistication and aesthetic complexity of georeferenced data visualizations can easily mask underlying conceptual confusions and a lack of theoretical coherence—in particular, a lack of definitional agreement on basic concepts, such as the "urban." For present purposes, our goal is to appropriate contemporary georeferenced data sets to explore visualizations of the conceptual distinctions introduced above. We shall elsewhere consider the theoretical and epistemological blind-spots of GIS and other new georeferencing technologies in relation to the investigation of planetary urbanization (see Neil Brenner and Nikos Katsikis, *Visualizing an Urban World: A Metageographical Analysis*, Urban Theory Lab-GSD research project, Harvard University).

26 There are other socioecological indicators relevant to this inquiry that cannot be considered here—including, among others, agricultural land use intensity, artificial irrigation infrastructures and human footprints, all of which figure crucially in the operational landscapes of extended urbanization. For present purposes, we have chosen three main indicators and associated forms of spatial data that most readily illustrate the challenges of visualizing the landscapes of extended urbanization.

27 Martin Lewis and Kären Wigen, *The Myth of Continents: A Critique of Metageography* (Berkeley: University of California Press, 1997) ix.

28 Until recently, the only satellite sensor collecting global nighttime lights data was the Operational Linescan System (OLS) developed by the US Air Force Defense Meteorological Satellite Program (DMSP). The program was designed in the 1960s to observe clouds illuminated by moonlight for meteorological purposes. However, it was soon realized that the instrument could also detect light sources present at the earth's surface, including human settlements and transportation networks. Nighttime lights data sets produced by the OLS have been widely used ever since, but they have until recently been dependent upon somewhat outdated technologies that generate a relatively low image resolution. In late 2011, NASA launched the improved National Polar-orbiting Operational Environmental Satellite System Preparatory Project (or Suomi NPP). Suomi is considerably more accurate than the earlier OLS system—it uses a much higher resolution for its images and it is more sensitive to dim lights. For details on the initial DMSP program, see Christopher D. Elvidge, Kimberly E. Baugh, Eric A. Kihn, Herbert W. Kroehl, and Ethan R. Davis, "Mapping City Lights with Nighttime Data from the DMSP Operational Linescan System." *Photogrammetric Engineering and Remote Sensing* 63, 6 (1997) 727-734; for a comparison of the two see Steven D. Miller, Stephen P. Mills, Christopher D. Elvidge, Daniel T. Lindsey, Thomas F. Lee, and Jeffrey D. Hawkins, "Suomi Satellite Brings to Light a Unique Frontier of Nighttime Environmental Sensing Capabilities," *Proceedings of the National Academy of Sciences* 109, 39 (2012) 15706-11.

29 Jon Beaverstock, Richard G. Smith, and Peter J. Taylor, "World City Network: a New Metageography?" *Annals of the Association of American Geographers* 90, 1 (2000) 123.

30 Jean Gottmann, "Megalopolitan Systems Around the World," *Ekistics* 41, 243 (1976) 109-13. For a contemporary discussion of the development of large scale agglomerations across Europe see Gert-Jan Hospers, "Beyond the Blue Banana? Structural Change in Europe's Geo-economy," *42nd European Congress of the Regional Science Association* (2002).

31 For a recent discussion of urbanization around the Mediterranean, see Claude Chaline, "Urbanisation and Town Management in the Mediterranean Countries," *Assessment and Perspectives for Sustainable Urban Development* (Barcelona: Mediterranean Commission on Sustainable Development, 2001).

32 Kingsley Davis, "The Origins and Growth of Urbanization in the World," *American Journal of Sociology* 60, 5 (1955) 429-37; and Kingsley Davis, "The Urbanization of the Human Population," *Scientific American* 213, 3 (1965) 40-53.

33 For an analysis and critique of this proposition—and of the use of urban population thresholds (UPTs) in the study of urbanization—see Brenner and Schmid, "The 'Urban Age' in Question," this book, Ch. 21. Already in the 1930s, the Chicago School sociologist Louis Wirth critiqued the use of UPTs, even though his own theory of urbanism emphasized the importance of population size as an important dimension of urban life. Wirth's critique was echoed in the early 1970s by his neo-Marxist theoretical antagonist Manuel Castells, who likewise emphasized the arbitrariness of the UPTs used in mainstream demography and the persistent need for a theoretical demarcation of "the urban question." See Castells, *The Urban Question*.

34 Edward Soja, "Reflections on the Concept of Global City Regions," *Artefact: Strategies of Resistance* 4 (2005), accessed 3 December 2012, http://artefact.mi2.hr/_a04/lang_en/theory_soja_en.htm.

35 The details of this approach are explained in Deborah Balk, Francesca Pozzi, Gregory Yetman, Uwe Deichmann and Andy Nelson, "The Distribution of People and the Dimension of Place: Methodologies to Improve the Global Estimation of Urban Extents" (paper presented at Urban Remote Sensing Conference, Tempe, Arizona, 2006).

36 The data used in LandScan are produced as follows: "[P]robability coefficients are assigned to every value of each input variable, and a composite probability coefficient is calculated for each LandScan cell. … The coefficients for all regions are based on the following factors: roads, weighted by distance from major roads; elevation, weighted by favorability of slope categories; and land cover, weighted by type with exclusions for certain types; nighttime lights of the world, weighted by frequency. The resulting coefficients are weighted values, independent of census data, which can then be used to apportion shares of actual population counts within any particular area of interest." See Jerome E. Dobson, Edward A. Bright, Phillip R. Coleman, Richard C. Durfee and Brian A. Worley, "LandScan: a Global Population Database for Estimating Populations at Risk," *Remotely Sensed Cities,* ed. Victor Mesev (London: Taylor & Francis, 2003) 277.

37 Gottmann, *Megalopolis*; Brian J. L. Berry and Quentin Gillard, *The Changing Shape of Metropolitan America: Commuting Patterns, Urban Fields and Decentralization Processes, 1960-1970* (Cambridge: Ballinger Publishing Company, 1977); and Constantinos Doxiadis, *Ekistics: An Introduction to the Science of Human Settlements* (New York: Oxford University Press, 1968).

38 On GlobCover, see Pierre Defourny, Patrice Bicheron, Carsten Brockmann and Marc Leroy. "GLOBCOVER: A 300 m Global Land Cover Product for 2005 Using Envisat MERIS Time Series," (paper presented at ISPRS Commission VII Mid-term Symposium, Remote sensing: From pixels to processes, Enschede, the Netherlands, 2006) 8-11; on MODIS, see Christopher O. Justice, "An Overview of MODIS Land Data Processing and Product Status," *Remote Sensing of Environment* 83, 1 (2002) 3-15.

39 See David Potere, Annemarie Schneider, Shlomo Angel and Daniel L. Civco, "Mapping Urban Areas on a Global Scale: Which of the Eight Maps Now Available is More Accurate?" *International Journal of Remote Sensing* 30, 24 (2009) 6531-6558.

40 See Christopher Elvidge, Benjamin T. Tuttle, Paul C. Sutton, Kimberly E. Baugh, Ara T. Howard, Cristina Milesi, Budhendra Bhaduri and Ramakrishna Neman, "Global Distribution and Density of Constructed Impervious Surfaces," Sensors 7, 9 (2007) 1962-79.

41 Ibid., 1963.

42 John Friedmann, *The Prospect of Cities* (Minneapolis: University of Minnesota Press, 2002) 6.

43 David Harvey, *The Limits to Capital* (Chicago: University of Chicago Press, 1982) chapter 12.

44 Gottmann, *Megalopolis*, chapter 12.

45 Schmid, "Networks, Borders, Differences," this book, Ch. 4, 77-8.

46 Hirotsugu Uchida and Andrew Nelson, "Agglomeration Index: Towards a New Measure of Urban Concentration," (paper for the *World Bank World Development Report 2009*, February 15, 2008), www.worldbank.org.

47 Friedmann, *The Prospect of Cities*, 6.

48 For further details on the Human Footprint data set, see Eric Sanderson, Malanding Jaiteh, Marc A.Levy, Kent H. Redford, Antoinette V. Wannebo and Gillian Woolmer, "The Human Footprint and the Last of the Wild," *BioScience* 52, 10 (2002) 891-904.

49 Lefebvre, *The Urban Revolution*, 14.

50 For a discussion of demographic growth along the Mediterranean rim since the 1950s, see UN Habitat, *State of the World Cities 2008/2009: Harmonious Cities* (Nairobi: UN Habitat, 2008); and for a general recent discussion on contemporary urbanization, Claude Chaline, "Urbanisation and Town Management in the Mediterranean Countries."

51 See, for example, Debra Johnson and Colin Turner, *Trans-European Networks: The political Economy of Integrating Europe's Infrastructure* (London: Macmillan, 1997); and Andreas Faludi, *Making the European spatial development perspective, Volume 2* (London: Routledge, 2002).

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54 Wachsmuth, "City as Ideology," this book, Ch. 23.

Figure Credits

27.1 Ernest Burgess, "The Growth of the City: An Introduction to a Research Project," *The City*, eds. Robert Park and Ernest Burgess (Chicago: University of Chicago Press, 1967 [1925]) 55.

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