RAPID CITIES
Prototyping Urban Growth

Because cities are the funnels through which raw materials and energy flow to create prosperity (and generate waste), environmental problems increasingly boil down to the structure of cities and the way urban dwellers' needs are met. Cities define the global economy... and for most of humanity, living in an innovative, dynamic, well-governed city means the difference between the most marginal existences and poverty alleviation... From population growth to climate emissions, human security to public health, the driving forces of the twenty-first century will be defined on the streets of the world's cities and made manifest in their communities, infrastructures, and buildings.[1]

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When Jean Gottmann identified the urbanized northeastern seaboard of the United States in his four-year study *Megalopolis,*[2] published in 1961, he argued that the 600-mile-long strip covering the area between Boston and Washington, with 30 million inhabitants, was the beginning of a new order in the organization of urban territories. While Gottmann initially forecasted an exclusively positive future for the newly identified urban condition, he revised his statements in 1975, pointing out that neither governmental institutions nor urban theories were able to handle this emerging dimension of urban aggregations.[3]

Twenty-three years later, in 1998, MVRDV published *FARMAX: Excursions on Density,* followed by *MetaCity Datatown* in 1999.[4] Both publications can be understood as a symptom of an unfolding pragmatism in Dutch architecture and urban design, clearly incorporating the limitations of natural resources as well as space and making them the drivers of architectural diagrams. The Netherlands is not only reputed to have one of the highest average population densities in the world, but is also a global case study for the rising sea level crisis due to the fact that through its history of land reclamation, 50% of the country lies around sea level or below.[5] Though Dutch design culture developed in the context of a lack of inhabitable land, a range of high-density, low-rise housing typologies, FARMAX indicates that vast areas of the Netherlands are filling up with "suburban matter," turning the limited territory into a "sea of mediocrity"

that threatens to transform the country into a sort of city-state. Taking necessary growth as a given reality, FARMAX sets out to discover the prospects for and limitations of a world that accepts massiveness, density, and extreme floor area ratio. Winy Maas argues that "under maximized circumstances, every demand, rule, logic is manifested in pure and unexpected forms that go beyond artistic intuition or known geometry and replace it with 'research'."[6] In exploring density, architectural form becomes the result of an extrapolation that not only materializes the demands behind it but examines the potential of vertical rather than horizontal growth.

In the U.S., Alan Berger's description of the American landscape in *Drosscape: Wasting Land in Urban America,* published in 2006, shows even more dramatic patterns of urbanization.[7] In a study of 10 American cities, Berger shows a rapid growth of population along the edges of metropolitan areas, leaving behind vast areas of urban vacancy and wastelands. According to Berger, between 1960 and 2010, the U.S. population density in core-urbanized areas dropped by more than 50%, while the highest rate of population growth appeared at the outskirts of metropolitan areas. Between 1982 and 1992, the conversion rate of undeveloped to developed land was 1.4 million acres per year. In the years between 1992 and 1997, however, this conversion rate rose to 2.2 million acres annually. Berger's studies point to two important trends: Population is rapidly growing on the outer boundaries of metropolitan areas, and development is consuming increasing amounts of land and resources per person.[8] In addition to these numbers, this style of low-density growth demands investments into infrastructure three times higher than in core urban areas with higher population densities.[9]

These research findings articulate an argument for higher density in core urban areas and for calling out the utilization of wastelands, understood as new territories for design interventions. They also suggest that urban growth along multifunctional, large-scale infrastructural systems that cross political boundaries and require common policies among municipalities in order to manage growth. Though we are familiar with statements addressing the issue of urban sprawl and edge cities, this topic would be re-accelerated by incorporating the endmost facts of the prospected global growth as articulated in *The Endless City,* published in 2008.[10]

As of 2007, for the first time in human history, more than 50% of the earth's population was living in urban areas, and this percentage will increase to 75% until 2050. Given that, questions of shape, size, density, demographics, economy, and distribution are increasingly politicized, placing problems of social justice and urban ecology front and center. Six international cities—New York, Shanghai, London, Mexico City, Johannesburg, and Berlin—have been discussed at six conferences by renowned professionals seeking to understand the future of a contemporary urban environment that allows for development without constraining growth, and while promoting better social and economic life.[11]

Since Gottmann coined the term "Megalopolis" in 1961, the U.S. population has nearly doubled from 183 million to 317 million in 2013. According to *America 2050*, within the next 40 years, the U.S. population will grow by an additional 130 million, mostly in 11 dedicated Megaregions and economic centers.[12] Speaking in global terms, the world population increased from 2.5 billion in 1950 to an expected 9.3 billion in 2050.[13] Six billion of those are expected to live in urban areas. This abstract figure might be better understood in conceivable dimensions: To accommodate this growth, it will be necessary to build four thousand Seattles until 2050, or one Seattle every three days. This growth is currently occurring according to the development strategies of the last century, though scientists have proven that the model of suburban American lifestyle lies far beyond the biocapacity of our planet.[14]

The upcoming surge in urban growth will bring increasing challenges due to global climate change, water shortage, economic and social instability, as well as aging infrastructural systems lacking any kind of resilience. While we might consider these processes "under control," even higher rates of rapid urbanization are happening in Asia and in the mega cities of economically underdeveloped countries. The world's urbanization is inevitable, and while over a billion people will migrate within the next decades into China's cities alone, the country is planning to build 400 new cities between 2006 and 2020, increasing the country's urbanization rate to 60%.[15] However, according to the FIG report on Rapid Urbanization and Mega Cities 2010 around 70% of the current urbanization process takes place outside the formal planning process and 30% of urban populations in developing countries are living in slums or informal settlements. In sub-Saharan Africa, 90% of new urban settlements are occurring in the form of slums.[16] This rapid growth will require a scale of real estate development and infrastructure never seen before in human history, while traditional urban strategies and planning codes—if they even exist in a particular region—will collapse and fail. During the next decades, the global design community has the opportunity and responsibility to create forward-thinking design strategies that will holistically integrate cultural codes and ecological systems across multiple scales.

What can be done from an academic research perspective to contribute to this urgent matter? Though academic institutions and laboratories should be connected to professional practice, their biggest advantage lies in their independence. Without the pressure caused by a market-driven economy, academic research is able to develop design strategies and methods to create a speculative urban future that is based on data and radically rethinks the existing. These approaches need to cross scales, negotiate between top-down and bottom-up strategies, and incorporate all advanced digital technologies that we have to visualize patterns of change and to iterate growth scenarios that are directed by urban attributes.

Academic research dedicated to this topic needs to unfold across multiple (and simultaneously occurring) scales and different methodical

approaches. As much as publications like *Ecological Urbanism* are stressing that the issue of sustainability unfolds in the complex interconnection of systems addressing a multiplicity of content, rapid urbanization is not just a question of advanced policies, upgraded infrastructures, or increased density.[17] As partly reflected in the topic of this session, research needs to be dedicated to how and where design—understood as the making of tools, advanced data analysis, and strategic thinking—can be applied to allow sustainable growth even in areas where no infrastructures and no supportive economy are currently in place.

LEARNING FROM

First of all, it will be extremely necessary to understand the status quo. As Alex Steffen indicates, scientists can measure the current crisis. The planet's biocapacity, consisting of nine major natural systems, is being pushed to its edge to sustain life as we know it. Four of those systems—greenhouse-gas concentrations in the atmosphere, freshwater consumption, deforestation, and terrestrial biodiversity—are immensely affected by how urban growth will occur within the next 50 years.[18] The rapid extension of urban footprints on the scale of megaregions or the transformation of their hinterlands will stress the current biocapacity beyond equilibrium and can't be tested in a 1:1 mock-up model. The effects of potential planning mistakes are—in this scale and quantitative dimension—irreversible and fatal in their consequences. We can and need to learn from precedent cities and global megaregions that show the failures and successes of current systems. However, it will not be enough to critique current conflicts; we will also need to offer solutions.

NETWORKS AND COUPLED SYSTEMS

The question is not if growth will occur—there is no doubt in the professional field—but whether it can happen in a sustainable form and whether the current challenge might be understood as an opportunity that will foster a paradigm shift, creating ground for a new understanding of a synthetic urbanism. These new settlement patterns, infrastructural systems, and resource circuits, as argued by Weinstock, need to be understood as an urban metabolism in which form drives and therefore supports performance.[19] In addition, the urban matter—to replace the terminology of the traditional city—is a system consisting of coupled networks and elements in which bottom-up, small-scale manipulations of the fabric have the potential to upgrade the larger system.

PARAMETRIC PROTOTYPES

The development of parametric design tools that generate, test, evaluate and iterate scenarios of growth will be a critical area of research. These scenarios will be driven by environmental, social, and economical factors unfolding from the scale of the region and infrastructural landscapes to the development of housing typologies. The next excursion on density needs to offer architectural types that are applicable for usage but are based on scenarios in which we manipulate the currently dominant market conditions toward a more sustainable future.

DATA AND PATTERNS

As much as it will be important to understand what the current status is, it will be critical to capture patterns of transformation. Advanced data visualization and processing software are helping to interpret complex data sets that show patterns of change over time. These new forms of analysis will create a ground for political arguments, and will foster the establishment of design strategies.

COOPERATING AND INTERACTING

And finally—this will be critical for all topics at this conference—it will be extremely important to cooperate among disciplines and academic institutions as well as governmental, non-governmental, and professional partners. If academic design disciplines are disconnected from the real, they will scarcely have a chance to influence development beyond educating the next generation. This new generation of designers needs to learn to work across the professional boundaries of their own design discipline. The important cooperation among planners, landscape architects, architects, and urban designers seems unresolved in the current education system, let alone a true interaction with environmental engineering, scientists, and economists.

As indicated by the Rockefeller Foundation in 2008, we are living in the century of the city.[20] If any form of social, ecological, and economic sustainability is to be achieved in the future, we need to invent a new understanding and handling of urban aggregations that live beyond our currently developed concepts. The combination of an economy that motivates land and energy resource consumption and global population growth will irrefutably lead into a crisis without precedent in human history.

The session on RAPID CITIES consists of four papers approaching the topic from very different angles, showing diverse methods of analysis, critique, and potential techniques to allow growth in a more sustainable way. ◆

ENDNOTES

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7. Alan Berger ed., *Drosscape: Wasting Land in Urban America* (New York: Princeton Architectural Press New York, 2006), p.18.
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