Climates: Architecture and the Planetary Imaginary

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A Third Space: Neither Fully Urban nor Fully of the Biosphere

SASKIA SASSEN

There is a specific and critical zone for action and intervention within the larger problem of climate change: a complex assemblage of biospheric and human capabilities that can be thought of as constituting an intermediate space that is neither fully urban nor fully of the biosphere.[1] It contrasts with the more familiar emphasis in critical environmental literature on the rupture in the relation between cities and the biosphere caused by our environmental destructions. This rupture has been described as the *unbiological* consumption by cities of the biosphere. That is, cities today, unlike in past periods, take more from the biosphere than she can regenerate. This is, in fact, mostly the case, especially in very large cities. Yet it is this intermediate space, the interstice of biosphere and city, that can contain multiple articulations of the city and the biosphere, and I want to theorize these articulations as capabilities. Today these are mostly seen as negative capabilities—humankind's potent degradation of the environment, for example—but these capabilities can also be seen as connective tissue that is neither fully urban nor fully of the biosphere, a bridge between these two so different zones. Our challenge is to make these articulations positive, since we are also the ones who made them negative to begin with. The aim is to make this a hybrid working space for experimenting with diverse types of knowledge, from biology to architecture, open and incomplete.

This project is both theoretical and practical: It is predicated on the importance and necessity of using the multiscalar and socioecological properties of cities and recognizing the need to recode these properties as potentials that can be made to work positively. One key aspect of such an effort is to delegate back to the biosphere what she does well. Rather than using man-made chemicals—fertilizers, pesticides, and so on—can we use biospheric elements (for example, bacteria and algae, or, in the case of crops, crop rotation rather than fertilizers and pesticides)? Further, how can we use the knowledge and tools we have developed to strengthen the outcomes of that delegating? The question, then, is how we can extend this type of conception or formula to the case of the city, one of the more complex and incomplete, and thereby unmanageable, systems we have.[2]

Delegating back to the biosphere what she does best is a framing for an analytics that differs from more familiar (and

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Portions of this essay were originally published as a foreword to Vanessa Keith, *2100, A Dystopian Utopia: The City After Climate Change* (New York: UR Books, 2016). UR Books is the publishing imprint of Terreform. For a fuller treatment of this mode of conceptualizing the relation between city and biosphere, see Saskia Sassen and Natan Dotan, "Delegating, not Returning, to the Biosphere: How to Use the Multi-Scalar and Ecological Properties of Cities," *Global Environmental Change*, vol. 21, no. 3 (2011): 823–834. We humans, and all the animal life in cities, are of course part of the biosphere. My emphasis is on built environments and technical systems when I speak of the city as distinct from the biosphere. Therein lies a hypothesis: that the urban dwelling of human, plant, and animal life can take place in a broad range of settings; some of this range, though a very narrow tranche of it, is evident in the diverse ways in which cities relate to the biosphere—compare, for example, Oslo and Beijing, not only in terms of air quality but also the expanding range of initiatives that entail working with the biosphere that we see in Oslo but not in Beijing.

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For a full development of this model, see Sassen and Dotan, "Delegating, Not Returning, to the Biosphere"; Saskia Sassen, "Global Finance and Its Institutional Spaces," in *The Oxford Handbook of the Sociology of Finance*, ed. Karin Knorr Cetina and Alex Preda (Oxford: Oxford University Press, 2013); and Saskia Sassen, *Expulsions: Brutality and Complexity in the Global Economy* (Cambridge, MA: Harvard University Press/Belknap, 2014).

romantic) notions of a "return to nature." It can take us well beyond mitigation and adaptation, today's two dominant approaches that, while welcome, are clearly insufficient to address our destructive relationship to the biosphere. Delegating back to the biosphere does not only entail very complex operations; it can also entail very simple ones. But it does entail collaborations across diverse fields of knowledge, including biology, materials science, technology, and engineering. The aim becomes combinations of specialized types of knowledge that can function in an intermediate zone (that is neither fully of the biosphere nor fully urban) rather than directly involving or focusing on the specific settings of people's lives, such as the home, work, transport, or consumption, with all their social and built environment dimensions.

In short, delegating to the biosphere requires a particular kind of intermediation or bridging function. One way of conceiving of such a function is that it is achieved more through *instruments* that can be deployed in diverse domains than, for example, *buildings*. However, I argue that built environments can also be made to function as instruments. That is to say, they become a medium for implementing or incorporating capabilities that are not simply about the building but that have a far larger and heterogeneous role: deploying biospheric capabilities, digital capabilities, and so on, which often inhere in materials or in the aerodynamic or sun-oriented design of a building.

BUILDINGS AS INSTRUMENTS

Architecture, more so than other fields, is marked by its ability to both destroy the biosphere and to work with it in multifaceted ways. What also stands out is its capacity to go well beyond such basics as recycling and gathering rainwater. To repeat, the key here is implementing biospheric capabilities that can transform a building into an instrument for environmental sustainability. Further, working with the biosphere can construct channels that might be of great use for other urban conditions screaming for change.

It is an approach to building that can lead to a whole range of novel biotechnological innovations that advance sustainability in cities and buildings. A growing range of bacteria, algae, and mushrooms are becoming inputs for a variety of applications. For William Myers, biodesign is about "forging relationships with nonhuman life to improve the ecological performance of manufacturing and building." "Evolution," he says, "has shaped a biosphere teeming with miraculous machines. The degree to which we can successfully integrate with them for mutual benefit is limited only by our imaginations."[3]

What makes it work is the marriage between these live elements and forms of technical and scientific knowledge. Many examples of this have become familiar to architects.[4] For instance, living mushrooms can be used to make bricks "that can be assembled and configured into almost any form, and naturally weld into a single object when set together." These "fungal-polyominoes" are the building blocks of what Phillip Ross calls "mycotecture."[5] Algae are another major input for biotech. One example is the Solarleaf façade developed by Arup, the Strategic Science Consult of Germany (SSC), and Colt International. It filters carbon dioxide from the air by using it to grow algae, which in turn can be used as fuel in bioreactors.[6]

Whole building complexes can become sites for incorporating these types of biospheric capabilities. One good example that would not be so difficult to replicate in a variety of diverse buildings is the Omega Center for Sustainable

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William Meyers, *Biodesign: Nature + Science + Creativity* (New York: Museum of Modern Art, 2012). See also Jake Simons, "Biodesign: Why the Future of Our Cities Is Soft and Hairy," *CNN*, August 29, 2014, http://www.cnn.com/2014/08/27/tech/innovation/biodesign-why-the-future-of-our-cities-is-soft-and-hairy.

4

For a deeper and more detailed account, see Sassen and Dotan, "Delegating, Not Returning, to the Biosphere," 20.

5

"Biofabricate: There's a Bio-Revolution on the Horizon!" *Makezine*, December 18, 2012, http://makezine.com/2014/12/18/biofabricate-theres-a-bio-revolution-on-the-horizon.

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Patrick Lynch, "For Terreform ONE, Bioengineering Is the Future of Design," *ArchDaily*, January 9, 2016, http://www.archdaily.com/779946/for-terreform-one-bioengineering-is-the-future-of-design.

Living (OCSL) in Rhinebeck, New York, built by Kansas City–based BNIM Architects. This building is carbon neutral and produces 100 percent of its own energy through solar and geothermal systems, and uses photovoltaic power. The green roof collects and cleans rainwater before diverting it to a cistern.[7] These are just a few of the multiple ways in which technical knowledge gets linked to the biosphere, and together they produce a viable solution that is neither fully technical nor fully biospheric.

INSERTING THE THIRD SPACE IN THE CITY

A recent volume by Vanessa Keith explores a variety of concrete cases in very diverse regions of the world that illustrate what I am arguing here, and do so along enormously diverse vectors.[8] And because they focus on extreme conditions in extreme cities, they help make visible key features of this delegating to the biosphere that might be less visible in less extreme situations.

The case of Beijing points both to the need and the possibility of organizing production as more of a loop rather than a line going from extraction to production, consumption, and waste. Keith's work examines how a landfill can be repositioned as a center not only for recycling but also for waste transformation. Carbon will be captured, and the carbon dioxide transformed into carbon fiber, for instance. The project explores the ways in which the city can be made to work more in concert with the biosphere, benefiting from its capacities. Beijing's future is marked by desertification, yellow dust storms, and extreme air pollution. All will require remediation. But the project presented here asks us to reimagine these conditions as opportunities rather than only dangers by designing for and transforming them.

Beijing: View from recycling hangars toward hybrid residential. © Vanessa Keith, 2016. This image originally appeared in Vanessa Keith, *2100: A Dystopian Utopia*, UR Books, the publishing imprint of Terreform, New York, 2016.

7 Damir Beciri, "Green Architecture—Omega Center for Sustainable Living," RobAid, August 16, 2009, http://www.robaid.com/tech/green-architecture-omega-center-for-sustainable-living.htm.

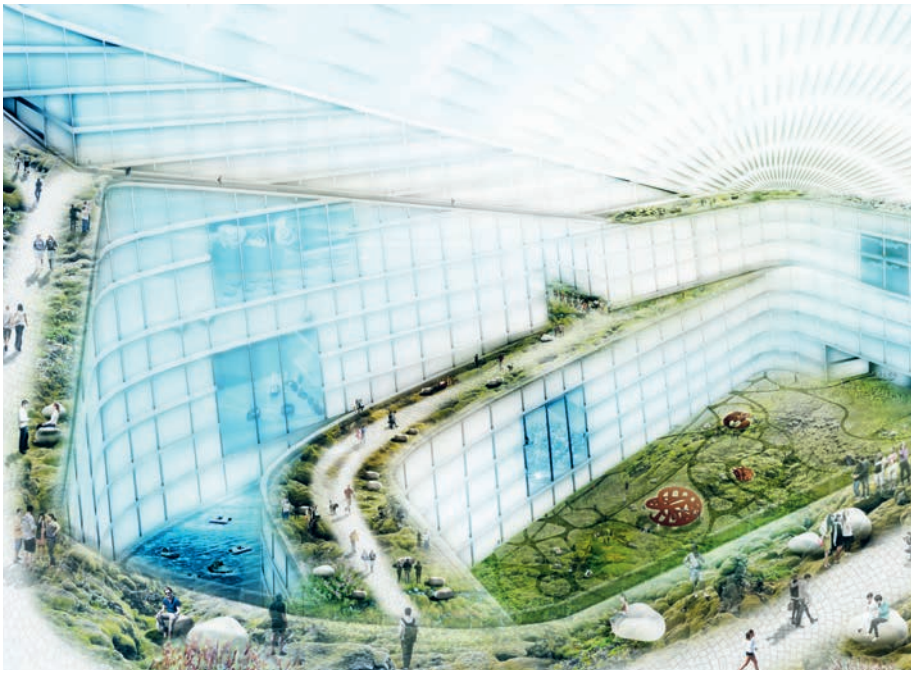
8 Vanessa Keith, *2100, A Dystopian Utopia: The City After Climate Change* (New York: UR Books, 2016).

We can extract a generic lesson from this specific case, and I think it is one with multiple applications. A chemical plant kills and leaves death behind. The biosphere gives us storms, fires, floods, and droughts that are destructive for a particular affected site and that can kill animals, trees, and humans. But we must interrogate each of these different types of destruction. Is the biosphere's capacity to kill similar or different from that of the chemicals and poisons we have made and are now present in more and more areas of the world, leaving death behind—of land, floras, faunas, and humans. When the biosphere kills it is as a part of a larger cycle, not an end point. And that cycle often strengthens life at some point in its trajectory.

A very different version of extreme climate is the case of the Troll Research Station in Antarctica. Here, the project is how to make cities that absorb more of the waste they produce, generate their own clean energy, and produce their own food through urban farming. The urban condition becomes an interconnected system, and urban morphology becomes something shaped by environmental as well as social forces. The buildings are shaped so as to create pinched areas that capture the prevailing wind, with technologies placed along these corridors to generate wind energy. Also factored into the urban morphology are water collection and solar orientation for day lighting and energy generation.

This environmental shaping is further strengthened by the fact of an extreme climate: the urban in this case is a series of interconnected interior spaces, with shared green and recreational spaces within. The project makes visible, in a microsetting, the work of balancing dense urban settlements with natural systems. The Troll project is one illustration of what I think of as an emergent sociobiospheric space/system that belongs neither fully to the city nor fully to the biosphere. It enacts a hybrid in-between space with a positive environmental valence.[9]

9 For a fuller development of this argument, see Saskia Sassen, *Territory, Authority, Rights: From Medieval to Global Assemblages* (Princeton, NJ: Princeton University Press, 2008). Chapters one and nine examine how capabilities produced in a given historical system can switch organizing logics and become constitutive of a novel system. One implication is that systemic change can be furthered by capabilities belonging to the prior regime but on the condition that they switch organizing logics.



Troll, Antarctica: Megastructure interior view overlooking hybrid park / agricultural space. © Vanessa Keith, 2016. This image originally appeared in Vanessa Keith, *2100: A Dystopian Utopia*, UR Books, the publishing imprint of Terreform, New York, 2016.

Johannesburg: Elevated pedestrian / bike pathway with living façade. © Vanessa Keith, 2016. This image originally appeared in Vanessa Keith, *2100: A Dystopian Utopia*, UR Books, the publishing imprint of Terreform, New York, 2016.

But the core concept at work in Troll finds a not-so-evident parallel in a high-density city such as Johannesburg. Here, the effort is how we can manage high-density human settlements without cutting off natural ecosystems. The site has two nature preserves. A series of sections that separate the human from the animal make space for animals to migrate across farmland. These sections become animal bridges and animal tunnels. Further, making buildings that incorporate spaces for bird nesting and encourage the growth of plant life on their surfaces, which in turn absorb CO_2, all contribute to the interconnecting of human, plant, and animal systems.

One aspect of interest to me in this case is that the urban condition can, and often does, include somewhat pastoral settings. Elsewhere I have argued that in today's vast urbanized territories, the rural does not fully disappear, but it is repositioned as an interstice in urban space. I think we should strengthen and perhaps expand these rural interstices. The urban today is increasingly constituted through processes that produce diverse instantiations of space, time, place, and "new natures." Examples on the negative side are new eco-urban conditions such as heat islands and, to scale up, ozone holes. To some extent, this means that the urban also contains some of the transformative possibilities embedded in these same processes. For example, the temporal dimension becomes critical in environmentally sound initiatives. Thus, ecological economics enables us to recognize that what is inefficient or value-losing, according to market criteria with short temporal evaluation frames, can be positive and value-adding when we use criteria driven by the biosphere's orderings, including the longer times of uninterrupted flows and multiscalar shifts. These possibilities need to be distinguished from notions such as a return to nature via rural living or lifestyles.[10]

These projects, as does my own work, emphasize an active engagement with scientific, technological, and architectural knowledge as a way to

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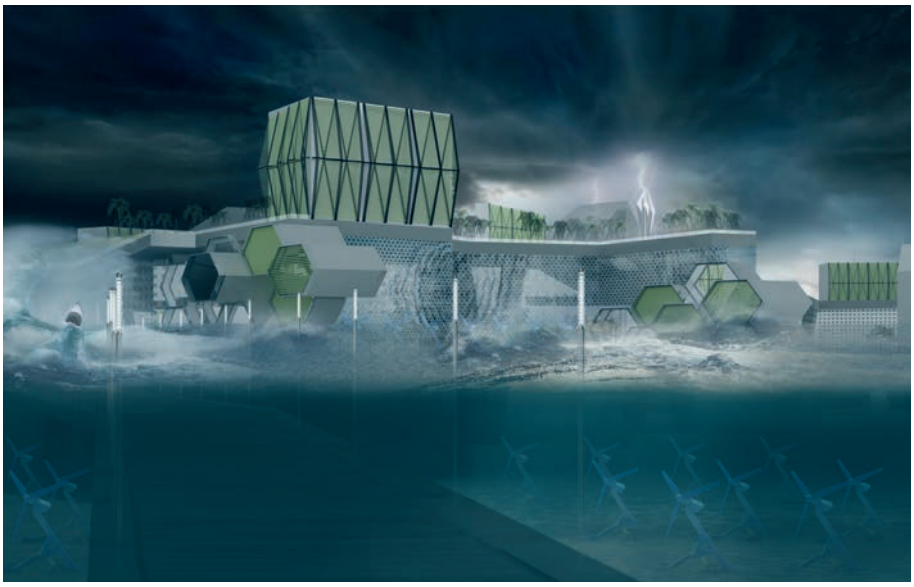
Two decades ago there was a body of critical analysis on the "return to nature" as a viable option. Thus David Harvey notes that, at best, traditional environmental ecologists can offer some return to an earlier form of urbanization regulated by the metabolic constraints of a bioregional world "as it supposedly existed in the past," a world that for Harvey never really existed. At that time, and perhaps still in much of the world, much of what passed as ecological among social scientists studying cities actually dealt with quality-of-life issues for middle- and high-income people and neglected the needs of the poor. See David Harvey, *Justice, Nature, and the Geography of Difference* (Cambridge, MA: Blackwell, 1996); David Satterthwaite, *Striving for Universal Provision: The Governance of Basic Services in an Urbanizing World* (New York: Routledge, 2014); and David Satterthwaite, *The Earthscan Reader in Sustainable Cities* (London: Earthscan, 1999).



Manila: Elevated plinth with storm and wave energy capture. © Vanessa Keith, 2016. This image originally appeared in Vanessa Keith, *2100: A Dystopian Utopia,* UR Books, the publishing imprint of Terreform, New York, 2016.

take us beyond the stasis in today's policy debate, with its timid notions of adaptation and mitigation of damage.[11] Manila, for example, is a place that can benefit enormously from such a more radical approach aimed at using particular biospheric capacities. Since this city is subject regularly to strong winds and floods, the aim of Keith's design is to create renewable energy from wave energy as well as storm energy. Secondly, given high levels of pollution, Manila is a good candidate for bioremediation: the use of algae farming to absorb carbon in the air and water, as well as microorganisms in the ocean that will feed on plastic waste. These microorganisms accelerate the process of breaking down the micro-particles of plastics in the water, though not the larger pieces. Importantly, recovered plastic in the ocean can be adapted into fuel to power the city. To complete the cycle, fungi will be used "to clean heavy metals and other toxic chemicals from the water and ground."

One key to this productive encounter of the urban with the biosphere is that it mobilizes the diversity of ecologies and multiscalar capacities of the city. Keith's São Paulo project illuminates the challenges and possibilities. This is a vast city, prone to flooding, overwhelmed by its enormous population and by its unstoppable economic dynamism. The project here is an outpost settlement with a series of elevated sleeping pods "connected by a bridge to a larger 'mothership' pod where shared spaces exist" for people to come and live and work on the project for a period and then rotate out for a new group. Important here are alternatives to fossil-fuel-burning transportation. The bicycle is the key mode of transportation. Tree farming, harvesting of rain forest crops, and growing spirulina and other medicinal crops are major efforts, as is conversion of some of this into medicinal and nutritional extracts. To deal with the pollution, the project uses a "floating river infrastructure as a series of floating modules that combine remediation along with carbon sequestration and coastal protection." All structures are working at engaging the biosphere—the buildings serve to generate renewable energy, including use of surfaces.

11 Nor is the international regime of carbon trading a solution. For a critical analysis, see Mary Kaldor and Joseph Stiglitz, *The Quest for Security: Protection without Protectionism and the Challenge of Global Governance* (New York: Columbia University Press, 2013).

São Paulo: Flood state—elevated bikeway looking toward mothership. © Vanessa Keith, 2016. This image originally appeared in Vanessa Keith, *2100: A Dystopian Utopia*, UR Books, the publishing imprint of Terreform, New York, 2016.

CONCLUSION

All these cases include what I think of as the intermediate space where the work of delegating back to the biosphere takes place. It is space with a relative *conceptual* autonomy from power relations. In this regard the use of a concept such as "environmental sustainability" comes with a somewhat more forceful meaning than might be typical in government regulations and international treaties. Here I draw on David A. Sonnenfeld and Arthur P. J. Mol's proposition of a "new world (dis)order."[12] Though power relations are certainly important, they are in a sense orthogonal to that in-between space I am focusing on. Thus, *delegating back to the biosphere* constitutes a mode of theorizing contemporary changes that includes the biosphere as an active partner and turns its back on the endless discussions of policy.

One key starting point is the existence of material and chemical cycles in the biosphere that predate human industry, in the narrow sense of the term, and continue to be responsible for the maintenance of homeostasis on earth. We then need to factor in the limits of this capacity for maintenance given current economic and social logics. Delegating back to the biosphere entails a shift of focus. Every surface and every process needs to be recoded as far as is possible in terms of a deployment of biospheric capacities where we now use chemicals and synthetics that are environmentally destructive (not all chemicals and synthetics are).

Thus, delegating back to the biosphere takes management, making, inventing, discovering: human intervention in the formation of *novel* socioecological bridges with positive environmental valence. For instance, the rate of waste production accelerates with urban scale, whereas natural processes for waste removal would tend to decelerate with scale. So delegating waste management back to the biosphere must involve novel socioecological transactions that incorporate biosphere-centered methods. One familiar example is using algae and a bioreactor, rather than chemicals, to process wastewater: it is the same process as in the biosphere but accelerated via a human-made

12 David A. Sonnenfeld and Arthur P. J. Mol, eds., Symposium on "Social Theory and the Environment in the New World (Dis)Order," *Global Environmental Change*, vol. 21, no. 3 (2011).

innovation. That is to say, such processes are often *wrapped* in technology at the moment they are delegated back to the biosphere.

It does imply, perhaps at its most extreme and therefore clearest, that particular kinds of socioecological processes delegated back to the biosphere *must* be managed or accelerated in such a way as to keep pace with the urban material and energy flows that exhibit nonbiological scaling behavior—that is, processes that accelerate with growing urban scale. This contrasts with the biosphere's tendency to decelerate with growing scale. Shrinking or intermediating this unsustainable gap marks the specificity of "delegating back" to the biosphere, in contrast to a simple return to nature.

Saskia Sassen is the Robert S. Lynd Professor of Sociology and a member of the Committee on Global Thought, Columbia University. She is the author of several books and the recipient of diverse awards and mentions, ranging from multiple *doctor honoris causa* to named lectures and various honors lists. Her new book is *Expulsions: Brutality and Complexity in the Global Economy* (Harvard University Press/Belknap, 2014).

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