Gigalopolises: Urban Land Area May Triple by 2030

Suburbs, slums and city centers may grow by more than a million square kilometers—much of it now home to wildlife

David Biello

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More than half of the world’s expected nine billion people will live in giant urban expanses by 2030 as cities and their hinterlands occupy an additional 1.2 million square kilometers, thereby tripling in size. That’s an additional 1.35 billion people living in cities, suggesting that urban areas that currently occupy roughly 3 percent of the planet's surface will continue to expand. By comparison, urban areas increased by just 58,000 square kilometers between 1970 and 2000.

In new work published in Proceedings of the National Academy of Sciences, urban environment researcher Karen Seto of the Yale School of Forestry and Environmental Studies and her colleagues first divided the global land area into discrete parcels and, using predicted gross domestic product growth, population growth and urban land area cover in 2000, they projected which parcels had a high or low probability of succumbing to citification over the next few decades. Using that model, 1.2 million square kilometers of land have probabilities higher than 75 percent of becoming citified and nearly six million square kilometers have some probability of going urban.

“More than half of the urban land cover on the planet by 2030 has yet to be built,” Seto explains. “The expansion of urban areas will have a direct impact on biodiversity hot spots.”

Fifty-five percent of that expansion would come from massive urbanization in India and China—a trend that has been growing in recent decades. For example, a megalopolis similar to the urban corridor between Boston and Washington, D.C., in the U.S. is likely to form between Hangzhou and Shenyang in China. But the fastest urbanization is predicted to occur in newly developing regions in Africa, such as the coast of west Africa along the Gulf of Guinea and the shores of Lake Victoria farther south, encompassing Burundi, Kenya, Rwanda and Uganda, among other regions.

This may be bad news, in some cases, for the rich array of plants, animals and microscopic life that also inhabit Earth. The Eastern Afromontane, Guinean forests of west Africa and Western Ghats of India, along with Sri Lanka, are all home to such biodiversity—as well as projected to undergo rapid urban expansion that will encroach on the territory of already endangered amphibians, birds and mammals. Seto and her colleagues project the worst impacts of urban growth to occur in Central and South America.

In addition, such land use change is likely to result in even more of the greenhouse gas emissions that drive climate change, according to the new analysis. An estimated 1.38 billion metric tons of carbon could be released as forest transforms to roads, buildings and homes. As it stands, the world's cities bear responsibility for at least 70 percent of global carbon dioxide emissions. “We need to be more deliberate as a society about how we want urban places to become what they serve for humanity,” Seto argues. “Too often, urban expansion is haphazard.”

This is not just bad news for animals or the atmosphere, of course. Haphazard urbanization can also ill serve human inhabitants cut off from supplies of clean water or food. And the impact of urbanites is not confined to city limits; a typical Australian from Melbourne or Sydney requires greenhouse gas emissions, water diversion and land use from the entire continent. “Cities have always relied on their hinterlands and other distal places for resources from food and fuel to waste assimilation,” the researchers wrote.

Blockading urban sprawl may not be the answer either. Allowing for the same population growth without urbanization might have even more severe environmental consequences, as subsistence farming expands, enmeshing residents in chronic and crippling poverty. If urbanization fails in developing regions, whether in Africa or the Indian subcontinent, the world could see continued migrations to London, Los Angeles and other developed world megacities, suggests physicist Luis Bettencourt of the Sante Fe Institute, who studies urbanization issues. Indeed, Seto and her colleague’s modeling suggests that cities in North America will nearly double their real estate by 2030.

The next 20 years or so represent a window of opportunity to learn how to grow. Seto, for her part, suggests more research is needed on “what types of urbanization minimize negative environmental and social impacts and how do they emerge?” Her group plans to continue its work by projecting global density of population—a key metric for minimizing environmental impacts. In addition, the world will need to avoid the kind of infrastructure lock-in—from coal-fired power plants that produce cheap electricity but also pollute to living and working areas separated by vast distances requiring energy-intensive commutes—that has characterized the first century of rapid urbanization. Some estimates suggest that as much as $30 trillion in infrastructure investments will be made to support such urbanization by 2030.

Of course, as Bettencourt observes: “Cities were never formed and have never grown with the objective of saving energy or protecting the environment.” Yet, cities often serve that purpose by default. One of the defining features of slums is densely packed inhabitants, and more developed city areas often boast high land values that then encourage tall buildings also densely packed with people and businesses, which further encourage walking or mass transit. “This is how larger cities manage to do more with less,” he adds, suggesting that such opportunities should be “consciously and systematically seized as development happens.”

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