



## Advance the ecosystem approach in cities

To make cities better for people and the planet, the approach must become more systemic and pragmatic, and include the global south, says Xuemei Bai.

More than half of the world's population now live in urban areas, and both the proportion and numbers continue to grow. In future, we will require drastically different ways of planning, building and governing cities.

Since at least the 1970s, researchers have been doing long-term studies to understand how cities alter ecosystems. Now, the lens is on what ecology can do for cities. The ecosystem approach incorporates nature into urban settings to make them more sustainable, liveable and resilient, and means managing cities themselves as ecosystems: intricately connected, dynamic subsystems of social, built and natural components. The approach encompasses concepts such as green infrastructure, nature-based solutions (adopting sustainable practices that harness the natural world) and ecosystem-based adaptation (managing natural ecosystems to help cities face climate change).

One of many compelling demonstration projects includes the Vertical Forest (*Bosco Verticale*) in Milan, Italy. There, more than 900 trees and thousands of shrubs and other flora have been planted on the facades of two residential towers to improve air quality and carbon storage. The benefits have been estimated as equalling those offered by 2 hectares of natural forest. Meanwhile, 'sponge cities' are being built across China to mitigate increasingly frequent and severe flooding. Roofs are being covered with vegetation, wetlands restored and roads and other spaces designed with permeable surfaces. Urban managers hope that these will absorb enough rainwater to prevent major floods.

Sundry individual projects reveal the benefits of the ecosystem approach, including water purification, improved public health, reduced disaster exposure, enhanced resilience and social justice, but it will take a lot more to change the future of cities and achieve the global targets agreed to in the United Nations' Sustainable Development Goals and emerging guidelines encompassed in the New Urban Agenda.

Several hurdles must be cleared: researchers and practitioners must dissect what hasn't worked, develop approaches suited to the global south and learn to unite disparate efforts in a systemic way.

To start with, studies need to go beyond individual success stories. Researchers must ask when, and to what extent, the ecosystem approach can truly replace conventional infrastructure. If it is to be incorporated into urban structure seriously, its effectiveness, constraints and scalability must be discussed openly and compared with mainstream engineering solutions. For example, green rooftops can require considerable water resources; where water is scarce, it is essential to invest in technology to reuse 'grey water', or waste water from households and offices. The fact that such critiques are hard to find in the literature signals how the ecosystem approach is still at an early stage of application in practice.

In addition, the ecosystem approach must be assessed and applied in

the global south. The vast majority of studies are in cities in Europe or North America, with a few from China. But the greatest challenges lie elsewhere in Africa, where urbanization is proceeding particularly fast, and in Asia's and Latin America's many developing countries.

Here, priorities and appropriate solutions will differ. For example, Amsterdam invested €20 million (US\$23 million) — and leveraged up to €55 million in co-financing — for its 2015–18 Green Agenda. Developing cities, with their limited funds, often need first to meet more-severe and urgent infrastructure needs, such as sanitation and water supply.

I have seen this at work. Just after finishing my PhD at the University of Tokyo, I took on a reforestation project at a mining site in Ma'anshan, China. The approach had proved successful at about 1,400 experimental

sites in Japan. However, our local counterparts saw no point in planting native trees that they perceived as neither beautiful nor useful. They were also concerned about the cost of maintaining and monitoring the reforested area. Eventually, we developed a plan to ring the site with fruit trees. These supplied revenue that supported workers and enabled the project's success. Both researchers and practitioners must learn the art of adaptation.

Most of all, integration is essential. Right now, projects are labelled as 'green' for adding vegetation, 'blue' for bodies of water and 'grey' for built-up systems. We need more 'kaleidoscopes' that amalgamate all of these elements and more. Cities must be viewed as a human-dominant ecosystem, with natural, social, technical, economic and cultural components, and we need to apply systems principles — a recognized approach in

urban ecology — to manage them.

Analysis and planning must bring together different city functions, weigh trade-offs and hunt out synergies. We researchers need to get our acts together by bridging conceptual, methodological and disciplinary divides to develop integrated and actionable urban knowledge. Sometimes, the same stretch of road is dug up multiple times, by different city departments working independently to improve the water, sewage and gas pipes and road quality. City planners often try to optimize just one variable without considering others, for example, designing a suburb to fit in a lot of residents, without providing much room for green spaces. High density might be the right direction, but it needs to be examined alongside other implications and trade-offs.

To move cities — and so the planet — into a sustainable future, we need to break down silos and learn how to improvise in context. ■ [SEE EDITORIAL P.5](#)

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