

# SPONGE CITIES & PANDA HABITAT

The Nature Conservancy's  
Foray into China

The Nature Conservancy China is working in Sichuan Province to conserve giant panda habitat. Credit: Oktay Ortakcioglu

By James N. Levitt and Emily Myron

PARADOXICALLY, CHINA IS EMERGING AS AN INNOVATIVE GLOBAL LEADER IN GREEN INITIATIVES, JUST AS IT HAS OVERTAKEN THE UNITED STATES AS THE WORLD'S BIGGEST SOURCE OF CARBON DIOXIDE EMISSIONS (Global Carbon Atlas 2016). "After decades of rapid expansion brought smog and contaminated soil," noted the official Xinhua News Agency, "China is steadily shifting from GDP obsession to a balanced growth philosophy that puts more emphasis on the environment" (Xiang 2017).

China generated more solar power in 2016 than any other nation. In January 2017, the government announced plans to invest RMB 2.39 trillion (US\$361 billion) in renewable energy generation by 2020, according to China's National Energy Administration. This September, the government also promised to ban the sale of gasoline- and diesel-powered cars at an unspecified date (Bradsher 2017). And to help meet its commitments to the Paris Climate Accords, China will launch the world's largest carbon "cap and trade" market in November 2017, targeting coal-fired power generation and five other large carbon-emitting industrial sectors (Fialka 2016, Zhu 2017).

Land-based green initiatives include "sponge cities," designed to manage storm water runoff and prevent urban flooding, and conservation efforts to protect water quality and preserve wildlife habitat. The Peking University–Lincoln Institute Center for Urban Development and Land Policy (PLC) is collaborating with The Nature Conservancy's China program (TNC China), providing technical support for a sponge city pilot in Shenzhen and exploring innovative conservation finance mechanisms for China.

The two organizations are complementary in terms of expertise: TNC China has done a lot of ground work to turn sciences and technologies into practice. With the Lincoln Institute providing an international knowledge base, the PLC can

focus on China's conservation strategy, policy, and finance. "The Lincoln Institute has done a lot of research on land conservation in the United States and elsewhere around the world, and the international knowledge developed from this work helps China to address its enormous conservation challenges," says Zhi Liu, director of the PLC and Lincoln's China program.

"For a few years, we have been looking for a way to engage ourselves in China's land conservation. The partnership with TNC China—starting with sponge city development or, more broadly, conservation for cities—provides us a perfect entry point. As one of the partnering institutes in the sponge city pilot project in Shenzhen, we are focusing on strategic and institutional frameworks and long-term finance. We hope that the work in Shenzhen will also help lay a research foundation for national policy making," says Liu.

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## Sponge Cities

China's unprecedented urban growth has taken a hard toll on the landscape. In 1960, it had no metropolitan areas with populations over 10 million. Now it has 15. In 50 years, the urban population multiplied by a factor of six: from 131 million residents or 17.9 percent of total population in 1966, to 781 million or 56.7 percent by 2016 (World Bank 2017). And by 2030, one billion people, or 70 percent of China's total population, are expected to live in cities (Myers 2016). Resulting proliferation of hardscaped roads and building sites have created a vast expansion of

This storm event and other recent floods spurred the Chinese government to develop a series of “sponge cities.” Shenzhen and 29 other cities received instructions and incentives to develop green infrastructure—including bioswales, pervious paving technologies, and rain gardens to absorb storm water into the ground.



impervious surfaces that prevent storm water from seeping into the earth to replenish ground water sources and mitigate the threat of major flooding. In recent years, increasingly severe storms and other surface water running at street level in Chinese cities have presented life-threatening peril to urban residents, such as the 2012 flood in Beijing that killed 79 and caused RMB 11.64 billion (US\$1.76 billion) in damages, according to Xinhua News Agency.

This storm event and other recent floods spurred the Chinese government to announce a national program to develop a series of “sponge cities.” Shenzhen in the Pearl River Delta and 29 other cities, from Wuhan in Central China to Baotou in Inner Mongolia (Leach 2016), received instructions and incentives to develop green infrastructure—including bioswales, pervious

paving technologies, and rain gardens to absorb storm water into the ground. The government will test the results of the pilot projects with the intention of replicating proven-effective practices on a nationwide basis.

By the government’s definition, a city will reach the “sponge” standard when 70 percent of rainfall is absorbed into the ground, relieving strain on traditionally constructed drainage systems and minimizing floods. The goal is that 20 percent of urban built-up areas in pilot cities will reach sponge standard over the course of five years.

TNC China is the key partner and technical adviser to Shenzhen’s sponge city project. TNC invited the PLC and several other institutions to join the effort, providing insight on policy, strategy, and finance. The pilot demonstration project in Shenzhen includes four components: pilot demonstration sub-projects for industrial plants, office buildings, schools, urban neighborhoods, etc.; dissemination and upgrading of past experiments; an education and promotion campaign; and studies of strategy, policy, and financing mechanisms.

“Our work on the sponge city strategy, policy, and finance is currently underway,” says Liu. “We have looked extensively into relevant international experiences from the United States, Germany, the Netherlands, Singapore, and other countries. The sub-projects of the Shenzhen pilot demonstration give us a great sense of which technologies are most feasible, as well as their benefits and costs,” he adds.

The major challenge is how to develop long-term financial mechanisms for sponge city development. Sponge infrastructure is costly, estimated at over RMB 100 million (US\$15.08 million) per square kilometer of built-up urban area. It is a public good in nature. The question is who will pay for it. Today, Shenzhen’s sponge city project is supported by central government subsidies, the municipal budget, and businesses volunteering to build sponge infrastructure facilities, such as rain gardens and rain roofs on their own properties. But the available financial resources are far from adequate to meet the target.

China’s sponge cities will include green infrastructure such as this wetland park in Tianjin, which collects rainwater to irrigate vegetation on the site of a former garbage dump. Credit: Kongjian Yu



“We are investigating other countries’ experiences with financing rainstorm management,” says Liu. “For example, the city of Philadelphia imposes storm water fees based on the amount of impervious surface that a parcel contains. The city also offers several programs to assist nonresidential customers to lower their storm water fees through green projects that reduce the amount of impervious surface on their properties. In the context of China, we believe that the long-term financial solutions will require some careful consideration of fiscal policy reform at the local level,” he says.

## Nature Sanctuaries and Land Trust Reserves

TNC China is also active in the conservation of resources beyond China’s cities. In the past several years, TNC China has adapted the American land trust model to local conditions to protect land, biodiversity habitat, and ecosystem services, from air and water purification to flood and drought mitigation. “We’ve been testing this localized land trust model as a way to expand society’s ability to protect and sustainably manage China’s most important lands and waters, while providing green livelihood solutions

for local communities and creating a mechanism to finance long-term reserve management through private contributions. We believe that this new model could become an important supplement to China’s current protected area system,” says Science Director of TNC China, Dr. Jin Tong. Building on this successful experience and taking advantage of access to international knowledge through the International Land Conservation Network (ILCN), a project of the Lincoln Institute, the PLC is exploring land conservation finance for China more broadly.

Land trusts are an American innovation. As charitable organizations, land trusts leverage the power of the private and nonprofit sectors to conserve land by acquiring it outright, and owning title or fee ownership to it; by acquiring conservation easements, also known as conservation restrictions or conservation servitudes; or by serving as the stewards or managers of protected lands owned by others. Indeed, about 56 million U.S. acres (about 23 million hectares) have been protected in the United States by local, regional, and national land trusts as of year-end 2015, according to the 2015 Land Trust Census compiled by the Land Trust Alliance in cooperation with the Lincoln Institute of Land Policy. The United States is believed to be the global leader in private and civic land conserva-

tion, though no comprehensive figures compare nations around the world in terms of private and civic land conservation. Land conserved by NGOs and other private and civic actors complement the 7.9 billion acres (3.2 billion hectares) protected, principally, by governments around the world (UNDP-WCMC 2014).

The world's first regional land trust was established in Massachusetts in 1891. Known today as The Trustees of Reservations, that group continues to protect exceptionally beautiful, naturally important, and historically significant properties in Massachusetts through fee ownership and conservation easements. From that small beginning, more than 1,000 land trust organizations are now spread across the United States. They exist in every state of the union and continue to improve the pace, quality, and permanence of protected lands across the nation, providing multiple public benefits. This work greatly benefits from U.S. federal tax credits for conservation easements to land trusts.

**The local government of Sichuan Province's Pingwu County, the Nature Conservancy China, and the Sichuan Nature Conservation Foundation designated a county-level nature reserve, named Laohegou Land Trust Reserve, with over 27,000 acres (about 11,000 hectares) of important giant panda habitat.**

The practice of land conservation by private individuals and civic organizations has also spread across the world. Private and civic land conservation groups exist in more than 130 countries and territories in North and South America, Europe, Africa, Asia, and Oceania, according to a recent survey conducted by the ILCN (ILCN 2017). While the legal context and financial incentives for land conservation in the private and civic sectors differ from country to country, the motivation to protect and carefully steward land for the good of present and future generations is a constant across the globe.

Now land trusts, in a new form, may have the

potential to help reshape the way that China approaches the creation and management of protected areas. Currently, more than 15 percent of China's land is designated as a protected area, and more than 2,700 nature reserves have the highest level of legal protection in that nation. However, significant challenges continue to daunt the Chinese network of protected lands. Many protected areas lack adequate financial resources, enforcement and governance mechanisms, and management staff. In order to strengthen and expand the existing network of protected areas, TNC China and its partners are working to develop land trust analogues that work in the Chinese context.

A 2008 Chinese policy that allows private individuals and organizations to assume management rights on collectively owned forest land opened the door for a conversation about land trusts. In 2011, TNC China initiated a collaboration with the local government of Sichuan Province's Pingwu County to explore the establishment of the country's first land trust reserve. In keeping with the local nature of the land trust movement, TNC China then catalyzed the birth of a new local entity—the Sichuan Nature Conservation Foundation (SNCF)—which was later renamed the Paradise Foundation. In 2013, the SNCF signed the nation's first conser-

China's first land trust reserve, The Laohegou Land Trust Reserve, conserves more than 27,000 acres (about 11,000 hectares), strategically connecting existing protected areas for endangered species, such as the Sichuan snub-nosed monkey and the giant panda. Credit: The Nature Conservancy China



The Nature Conservancy China aims to work with partners to create 10 land trust reserves in China by 2020. Credit: The Nature Conservancy China

vation lease, allowing it to manage the parcel for the next 50 years.

The local government, TNC China, and the foundation promptly designated the leased land a county-level nature reserve, named Laohegou Land Trust Reserve, thereby conserving over 27,000 acres (about 11,000 hectares) of important giant panda habitat. This reserve's strategic location connects existing protected areas for endangered species, such as the giant panda and the Sichuan snub-nosed monkey, thereby establishing a large conservation corridor. The interconnected corridor effectively creates a large territory within which anti-poaching regulations can be rigorously enforced. Similarly, within the corridor, local streams that run free can be protected from diversion into hydropower.

The reserve is also important from a research perspective. Scientists have carried out a baseline inventory of wildlife and set up dozens of camera traps to learn more about the numerous important species present. Already, the cameras have captured rare footage of a giant panda eating the remains of a takin (a goat-antelope found in Asian mountain ranges and highlands), reinforcing the relatively new discovery that pandas are omnivores, occasionally consuming meat.

For day-to-day management of the reserve, the foundation sponsored the creation of a local

entity, the Laohegou Nature Conservation Center, which has in turn hired nearby residents to administer and execute management, enforcement, and ecological monitoring workplans.

Several entities supporting and managing the reserve are also piloting mechanisms to increase income in communities bordering the reserves and to fund the reserve's ongoing management. For example, outside Laohegou Reserve, the Paradise Foundation has set up a system in which they sell the community's eco-friendly agricultural products and honey wine to high-end markets. Revenues from these sales augment community income and reduce the pressure from local residents who want to hunt and forage within the reserve. The Paradise Foundation and others are also exploring the potential for limited ecotourism into the reserves, as well as online fundraising for individual projects. Finally, project managers are also optimistic that China's growing philanthropic sector will take interest and support these efforts. It remains to be seen whether these techniques will yield profits that are widely dispersed through the communities near the reserve or provide consistent, long-term funding needed for management activities.

The conservancy's goal is to create 10 land trust reserves in China by 2020 with partners, each employing a slightly different model to

demonstrate the flexibility of this approach, such as leasing land and turning it into a reserve, like in Sichuan Province, or assuming management responsibilities of an existing reserve.

Beyond Laohegou, the Conservancy and its partners are also exploring other models to demonstrate the flexibility of this approach, such as civil societies assuming complete or partial management responsibilities of an existing reserve. To date, four land trust reserves, including Laohegou, have been created around the country in partnership with various local entities, and interest continues to grow.

Borrowing the idea of the Land Trust Alliance in the United States, the Paradise Foundation and TNC China aligned 11 other international and domestic environmental NGOs to launch the China Civic Land Conservation Alliance in 2017, aiming to catalyze the “China land trust movement” by providing a platform for communications, funding, standards, policies, and capacity building. The long-term vision of the Alliance is to collaboratively protect 1 percent of China’s terrestrial land by civic and private organizations and individuals.

“The Conservancy will soon enter its twentieth year in China,” says Jin Tong. “We’ve completed a lot of work on the ground that draws on our science-based approach and international expertise to find viable solutions to China’s most pressing environmental challenges, such as the sponge city pilot project and the land trust reserves. In collaboration with PLC, we could amplify the success of demonstration projects to make larger-scale impacts and create enabling conditions to trigger systematic changes through research on China’s conservation strategies, policy, and finance,” she says. □

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## REFERENCES

- Bradsher, Keith. 2017. “China’s Electric Car Push Lures Global Auto Giants, Despite Risks.” *New York Times*, September 10. [www.nytimes.com/2017/09/10/business/china-electric-cars.html](http://www.nytimes.com/2017/09/10/business/china-electric-cars.html).
- Demographia. 2017. *Demographia World Urban Areas, Thirteenth Annual Edition*. Belleville, IL: Demographia, April. [www.demographia.com/db-worldua.pdf](http://www.demographia.com/db-worldua.pdf).
- Fialka, John. 2016. “China Will Start the World’s Largest Carbon Trading Market.” *Scientific American*, May 16. [www.scientificamerican.com/article/china-will-start-the-world-s-largest-carbon-trading-market/](http://www.scientificamerican.com/article/china-will-start-the-world-s-largest-carbon-trading-market/).
- Global Carbon Project. 2016. “Global Carbon Atlas: CO2 Emissions.” [www.globalcarbonatlas.org/en/CO2-emissions](http://www.globalcarbonatlas.org/en/CO2-emissions).
- ILCN (International Land Conservation Network). 2017. “Locations.” [www.landconservationnetwork.org/locations](http://www.landconservationnetwork.org/locations).
- Leach, Anna. 2016. “Soak It Up: China’s Ambitious Plan to Solve Urban Flooding with ‘Sponge Cities.’” *Guardian*, October 3. [www.theguardian.com/public-leaders-network/2016/oct/03/china-government-solve-urban-planning-flooding-sponge-cities](http://www.theguardian.com/public-leaders-network/2016/oct/03/china-government-solve-urban-planning-flooding-sponge-cities).
- Myers, Joe. 2016. “You Knew China’s Cities Were Growing, but the Real Numbers Are Stunning.” Geneva, Switzerland: World Economic Forum, June 20. [www.weforum.org/agenda/2016/06/china-cities-growing-numbers-are-stunning](http://www.weforum.org/agenda/2016/06/china-cities-growing-numbers-are-stunning).
- UNDP-WCMC (United Nations Environment Programme World Conservation Monitoring Centre). 2014. “Mapping the World’s Special Places.” [www.unep-wcmc.org/featured-projects/mapping-the-worlds-special-places](http://www.unep-wcmc.org/featured-projects/mapping-the-worlds-special-places).
- Xiang, Bo, ed. 2017. “Chinese Vice Premier Stresses Green Development.” *XinhuaNet*, September 8. [http://news.xinhuanet.com/english/2017-09/08/c\\_136595063.htm](http://news.xinhuanet.com/english/2017-09/08/c_136595063.htm).
- Xinhua. 2013. “Rainstorms Affect 508,000 in SW China.” *China Daily*, July 10. [http://africa.chinadaily.com.cn/china/2013-07/10/content\\_16758256.htm](http://africa.chinadaily.com.cn/china/2013-07/10/content_16758256.htm).
- World Bank. 2017. “World Bank Open Data.” Accessed September 2017. Washington, DC: World Bank. <https://data.worldbank.org/indicator/SP.POPTOTL?locations=CN>.
- Zhu, Lingqing. 2017. “China to Launch Carbon Emissions Market this Year.” *China Daily*, August 16. [www.chinadaily.com.cn/business/2017-08/16/content\\_30686774.htm](http://www.chinadaily.com.cn/business/2017-08/16/content_30686774.htm).