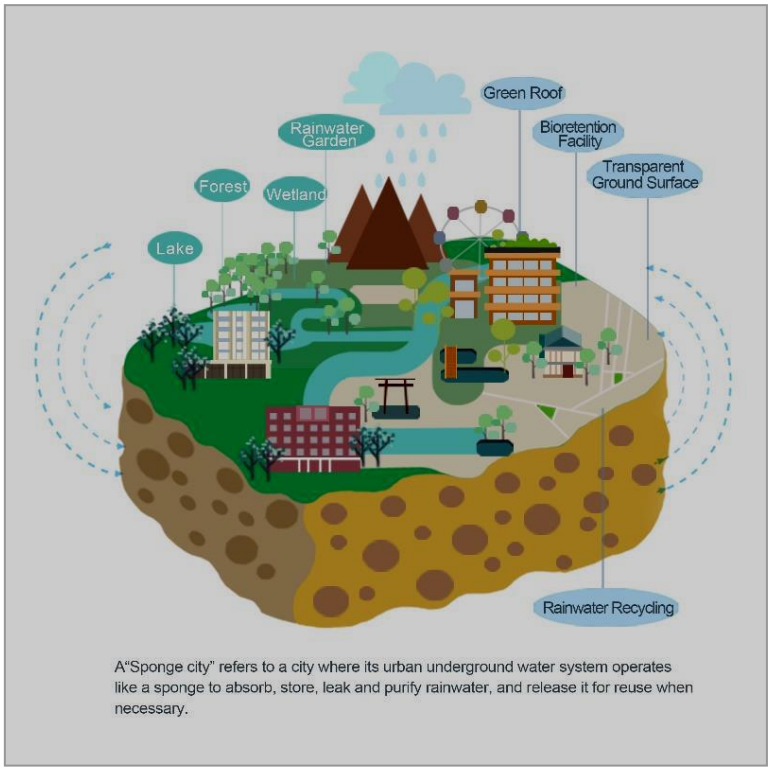
SPONGE CITIES IN CHINA

NATURE-BASED SOLUTIONS TO MANAGE RAINWATER

Since 2015, the Government of China continues to successfully implement its national strategy focused on building Sponge Cities which enables buildings, streets and wetlands in cities to absorb, store and release rainwater like a sponge to better serve the country's new-type urban construction. The aim of the Chinese strategy by 2030 is that 80% of cities in China should have elements of a *Sponge City*, new drainage systems and infrastructures that allow for efficient infiltration of rainwater and recycle at least 70% of rainfall.



A"Sponge city" refers to a city where its urban underground water system operates like a sponge to absorb, store, leak and purify rainwater, and release it for reuse when necessary.

In this national strategic framework, today 30 Chinese cities are realizing projects adopting the *Sponge City* approach. The principle of working with nature to absorb, clean and use the rainwater in the cities rather than using concrete to channel it away, has also gained the international attention in the framework of the global strategies to face the catastrophic effects of climate change. The practices of the *Sponge Cities* of China are currently studied and documented by international organizations, universities and by networks of ecological and sustainable cities around the world to replicate the methods adopted by adapting them to the most diverse contexts.

The *Sponge City* concept, inspired by the ancient wisdom of water management, has been proposed by Chinese researchers and by the urban planner Yu Kongjian, professor of landscape architecture at Peking University, to find an ecological and effective way to face both water shortages and the great damage created by recurrent floods in cities. Since ancient times, Chinese cities with monsoon climates have used ponds to manage flooding and stormwater and the *Sponge City* concept is inspired on these approaches that had worked for over 2,000 years. While in rural contexts the recovery of rain waters is part of the traditional knowledge of every village, contemporary cities are mostly impermeable systems that divert water into sewage drainages which channel untreated water directly into local rivers. By regenerating and expanding its own freshwater eco-systems (rivers, lakes, urban wetlands, gardens, parks etc.) the *Sponge City* allows storm water to be absorbed by the soil, which also naturally purifies it and stores it as groundwater.

This concept has generated pilot studies and practical experiences in different cities of the country. In 2009, for example, the city of Qunli in Northern China started the project to re-design and transform its former degraded wetland into a *green sponge,* in collaboration with the College of Architecture and Landscape of Peking University.

In 2015, by capitalizing on the methods and results of ongoing pilot projects in different cities, the State Council issued the guideline for addressing waterlogging through the construction of *Sponge Cities* thus achieving a city development mode during which the rainwater can be naturally stored, permeated and purified. The Guideline specifies that at least 70% of rainwater should be soaked into the underground instead of being discharged into the nearest rivers and lakes.

To implement this sustainable urbanization strategy, 16 pilot Sponge cities were selected by the Chinese Government in 2015 and other 14 in 2016, with a committed financial investment. Various fund-raising methods, including public private partnership have been identified to complement the funds allocated by the central budget to support the construction of *Sponge Cities*. Governments at provincial and city levels take up the challenge of increasing investments and prioritize the construction projects in mid-term financial budgets and annual construction plans.

The UN Environment Foresight Brief published in 2018, highlights that according to Chinese researchers, the main guidelines of the *Sponge City* concept include three parts:

- Protection of the original ecological environment of cities including natural rivers, lakes, wetlands, ponds, ditches, meadows, woodlands, and other ecosystems;
- Remediation of contaminated waters and other damaged natural ecological systems by recovering the ecosystem service function of destroyed systems using ecological techniques;
- Low Impact Development and water logging prevention concept through a series of separate and small source control facilities such as highly permeable and breathable pavements, squares and communities, grassed swales, rain gardens, bio-retention facilities and green roofs.

The Brief also underlines that the *Sponge City* concept has many other benefits besides urban rainwater management, which include improving the ecology, cooling urban temperatures as trees and other plants absorb water and then release it through evaporation, and mitigating urban heat islands effects which are more pronounced in built-up areas where concrete and asphalt trap heat. *Sponge cities* increase air humidity, regulate urban microclimates, and reduce public health risks. Measures taken in sponge cities include covering buildings with green roofs and facades, and creating urban wetlands and trenches to filter run-off water that can be used to replenish aquifers, irrigate gardens and urban farms, flush toilets and clean homes.

Transforming a city built with conventional methods and materials into a *Sponge City* certainly represents a great challenge because it requires the reformulation of local plans so that they include all the necessary components, taking into account existing structures and the specific characteristics of the surrounding environment.

The *Sponge Cities Architect* Yu Kongjian, which also created the planning and design studio Turenscape in Beijing to provide technical assistance to interested municipalities, underlines the principle that to be resilient *a Sponge City* should handle any flood and also stresses the great potential offered by national regulations. Chinese cities today are required by the law to maintain 30% of the city as green space and another 30% as community space. In 60% of the land in cities, nature can be used to create more ponds and water-absorbing parks that can capture vast amounts of water rather drain it away. Another important data recorded in the experiences underway in China is that a *Sponge City* would costs only a quarter of conventional solutions.







Considered as outstanding examples of nature-based solutions, the *Sponge Cities* have become a point of reference for many international organizations, universities and networks working to contribute to today's great challenges for environmental sustainability and to cope with climate change. Their principles and methods can be adopted in large cities but also in smaller-scale urban settlements. The large and qualified offer of documents published and freely available on the internet allows all interested actors to deepen the knowledge gathered and design similar initiatives in different contexts, considering the specific characteristics of the environment and the traditional knowledge heritage of the area.

To know more

[State Council 2015 Guidelines for *Sponge Cities*]

[Article in Peking University website]

[The sponge revolution in turenscape.com website]

[Turenscape Media coverage]

[Sponge City in Shenzhen]

[Sponge City Xiamen in climatecooperation.cn website]

[Brochure on Sponge Cities in UNEP website]

[Article in World Bank website]

[Article in World Economic Forum website]

[Sponge cities in growgreenproject.eu website]

[Sponge Cities in euronews-green website]

[Article in Asla.org website]

[Article in China Water Risk website]

[Sponge Cities in earth.org website]

[Sponge Cities in urbanet website]

[Study in urbantransitions.global website]

[Study on Sponge City in Science Direct]

[Study in Frontiers in Environmental Science website]

[Study published in MDPI -2017]