

# Making cities sustainable through rehabilitating polluted urban rivers:

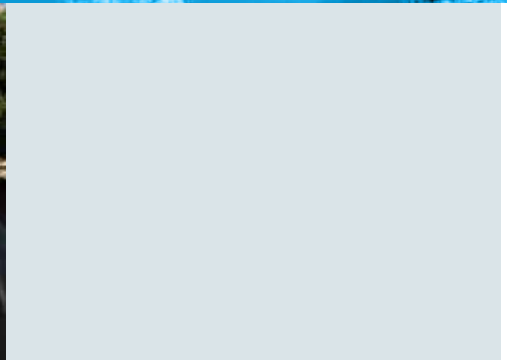
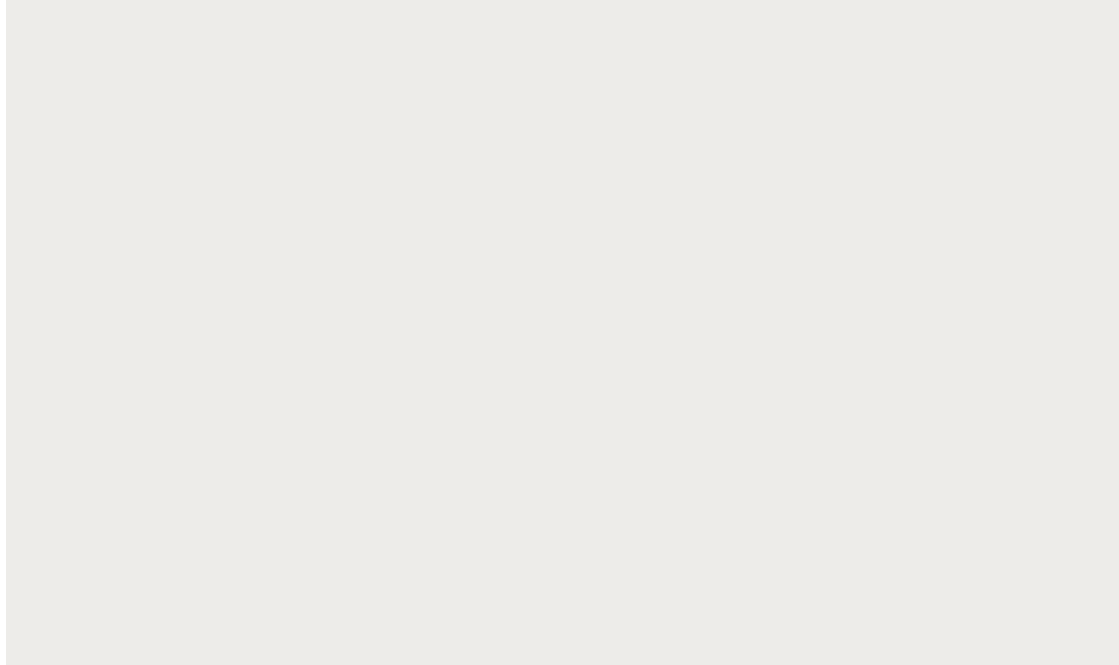
Lessons from China and other developing countries



**UN HABITAT**  
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TONGJI UNIVERSITY





## **Making cities sustainable through rehabilitating polluted urban rivers:**

Lessons from China and other developing countries

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United Nations Human Settlements Programme (UN-Habitat)

P.O. Box 30030 00100 Nairobi GPO KENYA

Tel: 254-020-7623120 (Central Office)

[www.unhabitat.org](http://www.unhabitat.org)

Tongji University

1239 Siping Road, Shanghai, P.R. China

Tel: +86-21-65982200

[www.tongji.edu.cn](http://www.tongji.edu.cn)

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## TONGJI UNIVERSITY

**Lead Author:** Zuxin Xu

**Co-Authors:** Wei Jin, Jin Xu

**Other Authors:** Hailong Yin, Huaizheng Li, Chen Zhang, Jun Wu, Lijun Xiong, Dingbao Wang, Weiyun Hua

**Contributors:** Fengting Li, Shijing Wang, Lingling Wang, Zhenhua Wu, Houqiang Zhang, Zhichao Zhao, Qianqian Ma, Xuejun Tan, Ran Cai, Ming Hua, Dongsheng Liu, Jinping Zhang, Dahe Jiang, Qian Jia, Zhuqing Wu, Jingyi Zhang, Jingyi Wang, Peng Li, Mei Wang, Yajun Hong, Yang Qu, Zongqun Chen, Jie Shen

## UN-HABITAT

**Authors and Contributors:** Thomas Chiramba (Coordinator), Hezekiah Pireh Otieno, Isabel Shirin Enyonam Wetzel, Gladys Huchu, Josphine Karimi Maina, Joel Balagizi Asipingwe

**Peer Reviewers:** George Krhoda, Daniel Odom, Walter Rast

**Editors:** Rebecca Katumba, Christine Sinclair

**Design and Layout:** Michael Lusaba

**Cover Photo:** Weiqin Ma, Huanxing Han

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## Foreword

The pollution of urban rivers is increasingly becoming a global challenge. It is estimated that more than half of the world's five hundred biggest rivers are seriously polluted. The United Nations World Water Development Report for 2017 reports figures to show that, on average, high-income countries treat about 70 per cent of the municipal and industrial wastewater they generate. That ratio drops to 38 per cent in upper middle-income countries and to 28 per cent in lower middle-income countries. In low-income countries, only 8 per cent undergoes treatment of any kind. The remainder finds its way into water bodies, threatening public health, food security, the environment and the availability of fresh water for consumption, which is significant in water-scarce regions in the developing world.<sup>1</sup>

The 2030 Agenda for Sustainable Development, adopted by world leaders at the United Nations General Assembly in September 2015 includes Sustainable Development Goal (SDG) 11 to “Make cities and human settlements inclusive, safe, resilient and sustainable”. Goal 11 specifically commits countries to “...*reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management*” (target 11.6), and SDG 6 to “Ensure availability and sustainable management of water and sanitation for all”. In this Goal, countries commit to “...*improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally*” (target 6.3).

In the New Urban Agenda, adopted at the third United Nations Conference on Housing and Sustainable Urban Development (Habitat III) in Quito, Ecuador in 2016, Member States committed to promote the conservation and sustainable use of water by rehabilitating water resources within the urban, peri-urban, and rural areas and reducing and treating wastewater. The Agenda 2030 for Sustainable Development and the New Urban Agenda reaffirm the commitment of world leaders to find sustainable solutions to restore the health of rivers and other water bodies. Increasing wastewater collection and treatment to restore the health of heavily polluted urban rivers is, therefore, an urgent global priority.

Delivering on these international commitments on wastewater management and the rehabilitation of water resources requires international cooperation and partnership. This publication is the product of an ongoing partnership between the United Nations Human Settlements Programme (UN-Habitat) and Tongji University. It presents lessons in technology and practices in urban river rehabilitation in China and offers measures and pathways to pursue the rehabilitation of heavily polluted urban rivers in developing countries. The rehabilitation project of the Suzhou Creek has proved that better management of drainage systems is key to controlling pollution discharged into rivers, both in dry and wet weather. Managerial and financial measures are also important in order to sustain a healthy environment for the whole river basin.

Developing countries may learn from China's experience in the rehabilitation of the Suzhou Creek, including the technical measures in sewage interception and pollution control combined with systematic planning and effective governance through a “river chief” system. Selected international case studies from the Mekong River Basin in the Greater Mekong Region in China, the Lake Victoria Basin in East Africa, the Densu River Basin in Ghana and Bethlehem City in Palestine are included in this publication to showcase the global nature of the challenge as well as efforts in wastewater management and rehabilitation of urban rivers. These examples also illustrate how UN-Habitat is actively engaged in supporting governments and diverse stakeholders to improve wastewater management and public open spaces in the urban environment.

“  
By not addressing  
pollution at all levels of  
governance, countries risk  
not achieving the targets  
laid out in the SDGs.  
”

<sup>1</sup> WWAP (United Nations World Water Assessment Programme). 2017. The United Nations World Water Development Report 2017. Wastewater: The Untapped Resource. Paris, UNESCO.

It is our hope that this publication will be a useful reference for those involved in the rehabilitation of heavily polluted urban rivers in developing countries. We further hope that this publication will encourage countries and cities to prioritize investments in wastewater management – which is often treated as an afterthought – in the urbanization trajectory. By not addressing pollution at all levels of governance, countries risk not achieving key SDG targets.

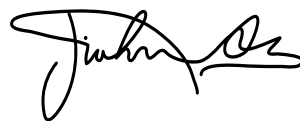
UN-Habitat and Tongji University are pleased to issue this joint publication and remain available to work with countries towards addressing diverse challenges associated with wastewater management and urban river pollution for the welfare of all urban residents.



**Mr. Qu Jihui**

Academician of Chinese Academy of Engineering, Tsinghua University

Research Centre for Eco-Environment Sciences, Chinese Academy of Sciences



**Ms. Maimunah Mohd Sharif**

Under-Secretary-General and Executive Director, United Nations Human Settlements Programme (UN-Habitat)



## Executive summary

Rehabilitation of polluted urban rivers is critical for the implementation of the New Urban Agenda and achieving the 2030 Agenda for Sustainable Development (Chapter 1).

The Chinese Government has prioritized environmental protection in the national strategy under ecological civilization and in recent decades, has achieved great success in restoring the urban water environment (Chapter 2). Their responses to pollution of urban rivers in China provide many lessons to developing countries. This is particularly the case with respect to the development of sewer systems that often have not kept up with the speed of urbanization, resulting in a significant negative impact to the water quality of urban rivers.

Through the support of Major Science and Technology Program on Water Pollution Control and Treatment of China, National High-technology Research and Development Program (“863” Program) of China, and science and technology projects of Shanghai Science and Technology Commission, Professor Zuxin Xu of Tongji University was able to lead the team that systematically studied the challenges of and related technologies to urban drainage pipe system. The team participated in many projects on the rehabilitation of heavily polluted urban rivers, including that of Suzhou Creek in Shanghai, which is a successful model of urban river rehabilitation with global significance. Meanwhile, UN-Habitat has put in considerable effort to support countries to overcome challenges associated with rapid urbanization, such as urban water resource management and the development and management

Based on the above experiences, UN-Habitat and Tongji University have co-authored this publication. The publication highlights the challenges of rapidly growing cities around the world, their struggles with urban water pollution, and provides proven approaches, solutions and technologies to tackle these challenges.

This publication identifies some of the main challenges for improving water quality in urban rivers as incomplete systems, damaged pipelines, and illegal connection of sewer systems to stormwater drains (Chapter 3).

**Incomplete sewer systems.** Developing countries often prioritize the construction of sewage network frameworks composed of main pipelines and not collecting and intercepting pipelines. In addition, municipalities tend to focus on collecting sewage from central urban areas or downtown districts, while ignoring suburban areas.

**Damaged sewer pipelines.** The construction and management practices of drainage pipeline systems in developing countries result in damaged sewer pipelines and misconnection of stormwater pipelines to sewer systems. A large amount of groundwater ends up at the wastewater treatment plants (WWTPs) in areas where groundwater levels are higher than the depth of sewerage pipes, stormwater enters sewer pipelines and is sent to the WWTPs during wet weathers, exceeding their capacity and resulting in overflow at the WWTPs.

**Sewer pipelines illegally connected to stormwater drainage systems.** It is common to illegally connect sewage pipes to stormwater pipes in developing countries as sewer systems were constructed much later

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