

ROUTLEDGE ADVANCES IN CLIMATE CHANGE
RESEARCH

Urbanization and Climate Co-Benefits

Implementation of Win-Win
Interventions in Cities

Edited by Christopher N.H. Doll and
Jose A. Puppim de Oliveira



 **Routledge**
Taylor & Francis Group
www.routledge.com

an informa business

ISBN 978-1-138-95344-4



9 781138 953444

Urbanization and Climate Co-Benefits

Edited by Christopher N.H. Doll and Jose A. Puppito



ROUTLEDGE

Urbanization and Climate Co-Benefits

Implementation of Win–Win Interventions
in Cities

Edited by Christopher N.H. Doll and
Jose A. Puppim de Oliveira

 **Routledge**
Taylor & Francis Group
LONDON AND NEW YORK

earthscan
from Routledge

First published 2017
by Routledge
2 Park Square, Milton Park, Abingdon, Oxon OX14 4RN

and by Routledge
711 Third Avenue, New York, NY 10017

Routledge is an imprint of the Taylor & Francis Group, an informa business

© 2017 selection and editorial matter, Christopher N.H. Doll and Jose A. Puppim de Oliveira; individual chapters, the contributors

The right of the editors to be identified as the authors of the editorial matter, and of the authors for their individual chapters, has been asserted in accordance with sections 77 and 78 of the Copyright, Designs and Patents Act 1988.

All rights reserved. No part of this book may be reprinted or reproduced or utilized in any form or by any electronic, mechanical, or other means, now known or hereafter invented, including photocopying and recording, or in any information storage or retrieval system, without permission in writing from the publishers.

Trademark notice: Product or corporate names may be trademarks or registered trademarks, and are used only for identification and explanation without intent to infringe.

British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library

Library of Congress Cataloging in Publication Data

Names: Doll, Christopher Hideo, editor. | Oliveira, Jose Puppim de, editor.

Title: Urbanization and climate co-benefits: implementation of win-win interventions in cities / edited by Christopher Hideo Doll and Jose Puppim de Oliveira.

Description: Abingdon, Oxon; New York, NY: Routledge, 2017. |

Series: Routledge advances in climate change research

Identifiers: LCCN 2016030751 | ISBN 9781138953444 (hb) |

ISBN 9781315667300 (ebook)

Subjects: LCSH: Sustainable urban development. | Urban ecology (Sociology) | City planning—Climatic factors. | Urbanization—Environmental aspects.

Classification: LCC HT241.U743 2017 | DDC 307.1/216—dc23

LC record available at <https://lcn.loc.gov/2016030751>

ISBN: 978-1-138-95344-4 (hbk)

ISBN: 978-1-315-66730-0 (ebk)

Typeset in Goudy
by Wearset Ltd, Boldon, Tyne and Wear

Urbanization and Climate Co-Benefits

Urban areas are increasingly contributing to climate change while also suffering many of its impacts. Moreover, many cities, particularly in developing countries, continue to struggle to provide services, infrastructure and socio-economic opportunities. How do we achieve the global goals on climate change and also make room for allowing global urban development? Increasing levels of awareness and engagement on climate change at the local level, coupled with recent global agreements on climate and development goals, as well as the New Urban Agenda emerging from Habitat III, present an unprecedented opportunity to radically rethink how we develop and manage our cities.

Urbanization and Climate Co-Benefits examines the main opportunities and challenges to the implementation of a co-benefits approach in urban areas. Drawing on the results of empirical research carried out in Brazil, China, Indonesia, South Africa, India and Japan, the book is divided into two parts. The first uses a common framework to analyse co-benefits across the urban sectors. The second part examines the tools and legal and governance perspectives at the local and international level that can help planning for co-benefits.

This book will be of great interest to students, practitioners and scholars of urban studies, climate/development policy and environmental studies.

Christopher N.H. Doll is a research fellow at the United Nations University Institute for the Advanced Study of Sustainability in Tokyo, Japan. He is active across many areas of sustainability research, including urban development, biodiversity governance and the diffusion of low carbon technologies. He holds a Masters and PhD in remote sensing from the University of London.

Jose A. Puppim de Oliveira is a faculty member at the Getulio Vargas Foundation (FGV/EAESP and FGV/EBAPE), Federal University of Rio de Janeiro (COPPEAD-UFRJ) and Fudan University (Shanghai). He is also a researcher affiliated to the United Nations University (UNU-IIGH) in Kuala Lumpur and MIT Joint Program on Science and Policy of Global Change, Cambridge (USA).

Routledge Advances in Climate Change Research

Ageing, Wellbeing and Climate Change in the Arctic

An interdisciplinary analysis

Edited by Päivi Naskali,

Marjaana Seppänen, and Shahnaj Begum

China Confronts Climate Change

A bottom-up perspective

Peter H. Koehn

Community Action and Climate Change

Jennifer Kent

Reimagining Climate Change

Edited by Paul Wapner and Hilal Elver

Climate Change and the Anthropos

Planet, people and places

Linda Connor

Systemic Crises of Global Climate Change

Intersections of race, class and gender

Edited by Phoebe Godfrey and

Denise Torres

Urban Poverty and Climate Change

Life in the slums of Asia, Africa and Latin America

Edited by Manoj Roy, Sally Cawood,

Michaela Hordijk and David Hulme

Strategies for Rapid Climate Mitigation

Wartime mobilisation as a model for action?

Laurence L. Delina

Ethical Underpinnings of Climate Economics

Edited by Adrian Walsh, Sæde Hormio and Duncan Purves

Responding to Climate Change in Asian Cities

Governance for a more resilient urban future

Edited by Diane Archer,

Sarah Colenbrander and

David Dodman

Climate Change Finance and International Law

Alexander Zahar

Urbanization and Climate Co-Benefits

Implementation of win-win interventions in cities

Edited by Christopher N.H. Doll and

Jose A. Puppim de Oliveira

Climate Change and Food Security

Africa and the Caribbean

Edited by Elizabeth Thomas-Hope

Contributors

Editors

Christopher N.H. Doll is a research fellow at the United Nations University Institute for the Advanced Study of Sustainability in Tokyo, Japan. He is active across many areas of sustainability research, including urban development, biodiversity governance and low carbon technology diffusion. He holds a Masters and PhD in remote sensing from the University of London.

Jose A. Puppim de Oliveira is a faculty member at the Getulio Vargas Foundation (FGV/EAESP and FGV/EBAPE), Federal University of Rio de Janeiro (COPPEAD-UFRJ) and Fudan University (Shanghai). He is also a researcher affiliated to the United Nations University (UNU-IIGH) in Kuala Lumpur and MIT Joint Program on Science and Policy of Global Change, Cambridge (USA).

Contributors

Kaoru Akahoshi is a programme officer at the Institute of Global Environmental Strategies. Kaoru's research focuses on a co-benefits approach and integrating environment and social consideration (ESC) into development projects.

Osman Balaban is an associate professor in the Department of City and Regional Planning at the Middle East Technical University in Ankara, Turkey. His research and teaching interests include urban politics, environmental politics and policies and low-carbon urbanism. He currently serves as the Editor-in-Chief of the *METU Journal of the Faculty of Architecture*.

Tomás Bredariol holds a MSc from the Public Policies, Strategy and Development Program from the Federal University of Rio de Janeiro. He is an environmental engineer and has been working with climate change since 2011 at the Center for Integrated Studies on Climate Change and the Environment – Centro Clima/COPPE/Federal University of Rio de Janeiro – Brazil.

Anthony Capon is the inaugural professor of planetary health at the University of Sydney. A former director of the global health institute at United Nations University (UNU-IIGH) in Malaysia, Tony is a public health physician and an authority on environmental health and health promotion.

Flavia Carloni is a consultant of the World Bank and of the Center for Integrated Studies on Climate Change and the Environment, at COPPE/Federal University of Rio de Janeiro, Brazil. She holds a PhD in Energy and Environmental Planning at COPPE/UFRJ. She is currently supporting the City of Rio de Janeiro in implementing a monitoring system for GHG emissions and climate mitigation actions.

Amit Chatterjee is an assistant professor with the faculty of Planning, School of Planning and Architecture, Bhopal, India. He has over a decade of combined experience in teaching, research and industry. His research interest is primarily focused on urban environment and future cities.

Jining Chen heads the Ministry of Environmental Protection in the People's Republic of China. Prior to that, he was the President of Tsinghua University. His research interests include, but are not limited to, environmental policy design and implementation.

Mehrnoosh Dashti is a post-doctoral fellow in the United Nations University, Institute for the Advanced Study of Sustainability (UNU-IAS). She has focused on sustainable urban waste management and climate change mitigation, particularly in the area of low carbon technology transfer and to Asian developing countries. She holds a MSc and PhD in Energy Systems Engineering.

Puspita Dirgahayani is an assistant professor in the Urban and Regional Planning Department, Institute of Technology Bandung (ITB), Indonesia. Her research interests are urban public transportation planning and policy, including Transit-Oriented Development. She earned her doctoral degree from Urban Transportation Research Unit, Department of Urban Engineering, University of Tokyo, in 2009. She then joined the United Nations University as a UNU-IAS Postdoctoral Fellow.

Huijuan Dong is an associate professor at Shanghai Jiao Tong University in Shanghai, China. She is also a former research associate of the National Institute for Environmental Studies in Tsukuba, Japan. Her research interest is to study the environment and energy-related problems by adopting different environmental economic methods, focusing particularly on China.

Wenbo Dong is a professor at the Department of Environmental Science and Engineering, Fudan University, Shanghai, China. His research interests are in the areas of environmental photochemistry and radical chemistry of organic pollutants, theory and methodology of pollutant control, and development and planning of low-carbon society.

Magali Dreyfus is a CNRS (French National Centre for Scientific Research) researcher, based at CERAPS – Lille University. Her research interests focus on environmental and energy law, climate multi-level governance and local governments' sustainable development policies.

Fábio Duarte is a professor at the Pontifícia Universidade Católica, in Curitiba, Brazil, and scholar at the Massachusetts Institute of Technology, working on the interface between technologies and cities. His new book is *Space, Place and Territory: A Critical Review on Spatialities* (Routledge).

Hooman Farzaneh is currently a junior associate professor at the Institute of Advanced Energy, Kyoto University, Japan. He has expertise on a broad spectrum of issues related to quantitative and qualitative analysis focusing on developing research patterns of low carbon scenarios and policy implementations designed to tackle air pollution problems in regional and local scales.

Tsuyoshi Fujita is the Director/Professor of Center for Social and Environmental System Research, National Institute for Environmental Studies in Tsukuba, Japan. He is also an Alliance Professor of Nagoya University and a visiting professor of the United Nations University. His research focus is mainly on industrial ecology, eco-towns and low-carbon cities.

Tatiana Gadda is a professor at the Universidade Tecnológica Federal do Paraná, in Curitiba, Brazil. She has developed research in a number of topics, including urban revitalization, urban transportation system, sustainable consumption, material flows, urban food system and urban ecosystems analysis. She is also an expert member of the Intergovernmental Panel on Biodiversity and Ecosystem Services (IPBES).

Yong Geng is the Dean and a distinguished professor in the School of Environmental Science and Engineering at Shanghai Jiao Tong University. His research interests include environmental management, energy analysis, low carbon policies and integrated water resource management.

Andreas Jaeger has worked as a policy researcher at the Institute of Global Environmental Strategies since 2013. In addition to his engagement in policy processes related to the Sustainable Development Goals (SDGs) and Habitat III, Mr Jaeger has conducted research and coordinated projects on low-carbon transport, low-carbon development policy frameworks and multi-level governance, as well as subnational data issues in Asia.

Ping Jiang is an associate professor of Fudan Tyndall Centre and the Department of Environmental Science and Engineering of Fudan University in Shanghai, China. His research is in the area of environmental management.

Momoe Kanada is a consultant at the World Bank Environment and Natural Resources Global Practice Group. She is a former assistant fellow at the National Institute for Environmental Studies in Tsukuba, Japan. Her

research interest is in effective policy design for pollution prevention and control.

Manmohan Kapshe is a professor in Architecture and Planning at the Maulana Azad National Institute of Technology (MANIT), Bhopal, India. His research areas are low carbon development actions, regional and sectoral analysis of emissions, and impacts of climate change on human settlements. He has served as lead author, contributing author and expert reviewer for various reports of Intergovernmental Panel on Climate Change (IPCC).

Paulose N. Kuriakose is currently serving as an assistant professor at the School of Planning and Architecture, Bhopal, India. His research interest lies in the domain of travel behaviour and sustainable transport policies in the context of the global south.

Emilio La Rovere is currently a professor in the Energy Planning Program at COPPE/UFRJ, and Coordinator of the Center for Integrated Studies on Climate Change and the Environment. He has been serving as Lead author of IPCC, Intergovernmental Panel on Climate Change reports, and is author of several reports prepared for the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC).

So-Young Lee is a senior policy researcher at the Institute for Global Environmental Strategies. Dr Lee specializes in environmental sociology, especially ecological discourses and practices, and environmental justice. Her current research focuses on governance in sustainability transitions and co-benefits for the underprivileged.

Wanxin Li is an associate professor at the Department of Public Policy, City University of Hong Kong. Her research interests include policy design, policy experimentation, policy evaluation, information transparency, environmental and social governance, inequality, and subjective well-being.

Zhixiao Ma is a post-doctoral researcher at the National Institute for Environmental Studies in Japan. His research focuses on climate change mitigation and environmental risk assessment, particularly those involving the water-energy-air-health nexus. His recent research has analysed the characteristics of air pollutants in China through big data.

Nirmala Menikpura is a research fellow at the Institute for Global Environmental Strategies (IGES). She holds a PhD in Environmental Technology and MSc in Bio-Systems Engineering. Her research interests are in the areas of waste management and climate change, development of indicators and quantitative tools/models for life cycle sustainability assessment, sustainability assessment of the waste electrical and electronic equipment (WEEE) process flow, and socio-economic and environmental Life Cycle Assessment (LCA) of products and processes.

Retno W.D. Pramono is Secretary of the Graduate Urban and Regional Planning study programme in Gadjah Mada University, Indonesia. Research interests include place quality and well-being, environmental management and spatial planning implementation-evaluation.

Csaba Pusztai earned his PhD in Environmental Sciences and Policy at the Central European University. Between 2012 and 2014, he was a UNU-IAS Postdoctoral Fellow at the United Nations University Institute of Advanced Studies in the Sustainable Urban Futures programme studying problems at the intersection of urban governance and sustainability. Currently he is a postdoctoral researcher at the New Zealand Forest Research Institute (Scion) focusing on forestry value chain optimization and sustainability.

Hitomi Roppongi studied environmental governance at the United Nations University, where she focused on local climate policy for her thesis. She is interested in the role local governments may play in tackling global environmental problems. She is a prospective doctorate student at the Bartlett School of Planning, University College London.

Wan-yu Shih is an assistant professor of the Department of Urban Planning and Disaster Management at Ming-Chuan University, Taiwan. Her research interests lie in exploring the interdisciplinary nature of ecological planning and climate change adaptation in urban areas, with a special focus on Green Infrastructure.

Norihisa Shima is an associate professor of urban and regional planning at the Department of Regional Development Studies, Toyo University, Japan. He received a PhD from the Department of Urban Engineering, University of Tokyo, awarded by the City Planning Institute of Japan. He was at UNU-IAS from 2010 to 2013.

José Gabriel Siri is a research fellow at the United Nations University's International Institute for Global Health in Kuala Lumpur, Malaysia. His work focuses on systems thinking to improve decision-making around urban health and well-being, including research on the role of cities in health, and input on the central place of health in global policy processes for urban development.

Leksono P. Subanu currently teaches at the Department of Architecture and Planning, Faculty of Engineering, Gadjah Mada University, Yogyakarta, Indonesia. His primary research interest is in social and cultural processes that uniquely influence the political and economic aspects of spatial and development planning in Indonesia.

Aki Suwa took a professor position at Kyoto Women's University in 2014 after being a research fellow at the United Nations University Institute of Advanced Studies. Her interests include renewable energy and the local governance to promotion of renewables. She is a Japanese national, holding a Master's degree in environmental technology from Imperial College, and a

PhD degree in Planning Studies from University College London, University of London.

Bing Xue is a principal investigator at the Research Center for Industrial Ecology and Sustainability at the Institute of Applied Ecology of the Chinese Academy of Sciences. His research interests mainly focus on the interactions analysis on human-environmental system and climate change governance.

Eric Zusman is a senior policy researcher at the Institute for Global Environmental Strategies (IGES). His research focuses on air pollution regulation, climate policy, transport policy and co-benefits in Asia. He is a political scientist by training with nearly two decades of work and research experience in Asia.

Acknowledgements

This book is the result of a four-year research programme entitled 'Urban Development with Co-Benefits Approach', which was hosted and run by the United Nations University Institute for Advanced Studies (UNU-IAS) from 2010–2014. The project built a wide network of academics and practitioners around the world. Many of the contributors to this book have kindly hosted us on field visits to China, India, Brazil, Japan and Indonesia. Besides the academic outputs, the project generated a series of tools to assess co-benefits and ran several workshops with academics and practitioners to disseminate the tools and discuss the idea of climate co-benefits.

The project was funded and initiated by the Ministry of Environment Japan (MOEJ). We thank the continuous support of MOEJ, in particular Kazuhiko Takemoto, Takeshi Sekiya, Masako Ogawa, Osamu Mizuno, Sachio Taira, Keiko Kuroda and Takahiro Yanagida. The research was guided by the advice of the Scientific Steering Committee formed by Professor Keisuke Hanaki from the University of Tokyo (chair), Professor Tsuyoshi Fujita from the National Institute of Environmental Studies (NIES), Professor Atsushi Sunami from the National Graduate Institute for Policy Studies (GRIPS), Dr Akio Takemoto from MOEJ and Asia-Pacific Research Network for Global Change Research (APN) and Professor Govindan Parayil from UNU-IAS. We also appreciate the support of UNU-IAS staff: Yukie Shibata, Harumi Akiba, Ayuko Fujikawa and Bou Ty, as well as the inputs from many researchers, particularly Aki Suwa, Raquel Moreno-Peñaranda, Joni Jupesta, Joana Portugal-Pereira from UNU-IAS and Keiko Hirota, Eric Zusman, Jane Romero, Nirmala Menikpura and Magnus Bengtsson from other institutions.

Over the years, our project also benefited from the work of many students and interns from around the world who passed through UNU-IAS in Yokohama over the course of the project: Abdul Jalal, Erin Kennedy, Sybille Berger, Non Okamura, Franziska Ferdinand, Hitomi Roppongi, Tim Smith and Yukiko Kamio.

Finally, we are grateful to Kenichi Tsusaka, Christopher O'Malley and Tamara Luisce for their timely contribution to the preparation of the manuscript and last but not least to Annabelle Harris and Margaret Farrelly at Routledge for their understanding, guidance and encouragement through this process of taking our ideas and realizing them in this book.

Contents

<i>List of figures</i>	xi
<i>List of tables</i>	xiv
<i>List of boxes</i>	xvi
<i>Notes on contributors</i>	xvii
<i>Acknowledgements</i>	xxiii
1 Climate co-benefits in urban areas	1
JOSE A. PUPPIM DE OLIVEIRA AND CHRISTOPHER N.H. DOLL	
PART I	
Co-benefits in the urban sectors	25
2 Transport	27
CHRISTOPHER N.H. DOLL	
2.1 Delhi, India: governance-related opportunities and barriers towards effectiveness of co-benefits policies: the case of the Delhi Metro Project	43
OSMAN BALABAN	
2.2 Curitiba: the intended/unintended co-benefits of investing in public transport	49
FÁBIO DUARTE AND TATIANA GADDA	
2.3 Yogyakarta, Indonesia: technological change and institutional reform for sustainable urban transport	56
PUSPITA DIRGAHAYANI	

2.4 Rio de Janeiro, Brazil: The Bus Rapid System	61
FLAVIA CARLONI, TOMÁS BREDARIOL AND EMILIO LA ROVERE	
3 Land use	67
OSMAN BALABAN	
3.1 eThekweni Municipality (Durban), South Africa: greenspace planning for climate co-benefits	88
WAN-YU SHIH	
3.2 Yogyakarta, Indonesia: inter-governmental cooperation and land-use coordination by Joint-Secretariat Kartamantul	96
NORIHISA SHIMA	
4 Buildings	102
PING JIANG	
4.1 Shanghai, China, and Yokohama, Japan: energy efficiency at the building and district scale	119
PING JIANG	
4.2 Tokyo, Japan: low-carbon policy for buildings	125
HITOMI ROPPOGI	
5 Energy	130
HOOMAN FARZANEH	
5.1 Kawasaki, Japan: revealing co-benefits of energy from environmental policies	149
TSUYOSHI FUJITA, HUIJUAN DONG AND MOMOE KANADA	
5.2 Megaurban China: air pollution co-benefits of carbon mitigation in four Chinese cities	154
HUIJUAN DONG AND TSUYOSHI FUJITA	
5.3 Baoshan District (Shanghai), China: co-benefits in the industry sector	161
WENBO DONG	