

Antje Katzschner · Michael Waibel
Dirk Schwede · Lutz Katzschner
Michael Schmidt · Harry Storch *Editors*

Sustainable Ho Chi Minh City: Climate Policies for Emerging Mega Cities

Sustainable Ho Chi Minh City: Climate Policies for Emerging Mega Cities

Antje Katzschner • Michael Waibel •
Dirk Schwede • Lutz Katzschner •
Michael Schmidt • Harry Storch
Editors

Sustainable Ho Chi Minh City: Climate Policies for Emerging Mega Cities

 Springer

Editors

Antje Katzschner
Department of International Affairs
Universität Hamburg
Hamburg, Germany

Michael Waibel
Department of Geography
Universität Hamburg
Hamburg, Germany

Dirk Schwede
Institute for Lightweight Structures and
Conceptual Design
University of Stuttgart
Stuttgart, Germany

Lutz Katzschner
Environmental Meteorology
University of Kassel
Kassel, Germany

Michael Schmidt
Environmental Planning
Brandenburg University of Technology
Cottbus-Senftenberg
Cottbus, Germany

Harry Storch
Environmental Planning
Brandenburg University of Technology
Cottbus-Senftenberg
Cottbus, Germany

ISBN 978-3-319-04614-3

ISBN 978-3-319-04615-0 (eBook)

DOI 10.1007/978-3-319-04615-0

Library of Congress Control Number: 2015956812

Springer Cham Heidelberg New York Dordrecht London

© Springer International Publishing Switzerland 2016

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made.

Printed on acid-free paper

Springer International Publishing AG Switzerland is part of Springer Science+Business Media (www.springer.com)

Foreword “Research for the Sustainable Development of Megacities of Tomorrow – Ho Chi Minh City”

Current forecasts predict that more than seven billion people will be living in cities by 2050—that is more than 70 % of the world’s population. Today, more than half of the population are city dwellers. More and more people in developing and emerging countries in particular are moving into cities, driven by the desire for economic and social participation, work, better and more modern living conditions, education and medical care. More than 80 % of economic activity worldwide is now taking place in urban areas. Not at least because more than three quarters of global CO₂ emissions are generated in these urban areas is it that cities are a key driver of climate change which are also especially susceptible to its effects.

The population of Ho Chi Minh City roughly doubled from four million in the early 1990s to nearly eight million today. Because of its geographical location, the city’s people are especially exposed to the negative impacts of climate change, which include flooding and the increasing occurrence of heavy storms. Not only are climate protection measures therefore urgently necessary in cities like Ho Chi Minh City, but they are also particularly effective and sustainable. Research—conducted in close cooperation with local stakeholders—is a key to finding new adaptation strategies.

The Federal Ministry of Education and Research has provided funding for the “Sustainable Ho Chi Minh City – Climate Policies for Emerging Megacities” project under its “Research for the Sustainable Development of Megacities of Tomorrow” programme. German and Vietnamese partners from science, administration and industry have jointly developed methods for integrative urban and environmental planning. Their efforts took a number of different levels into consideration—from the individual household to structure plans for neighbourhood communities. We consider the translation of project results into practice as proof of their success.

This book is an impressive record of this project. I hope it will provide the impetus for more sustainability in urban planning and that people in other cities will also benefit from the experience gained in Ho Chi Minh City.

Johanna Wanka
Federal Minister of Education and Research
Bonn, Germany

Preface by Dr. Andrea Koch-Kraft

More than a decade ago, the German Federal Ministry of Education and Research set up the research priority “Future Megacities”—Research for the sustainable development of the megacities of tomorrow. Since then, Future Megacities has been the longest running implementation oriented funding activity targeting energy- and climate-efficient structures in urban growth centers of emerging economies and developing countries. Nine research projects under Future Megacities have so far created more than 1000 research products. Of these nine projects, HCMC was the only cooperative project in Vietnam.

Future Megacities challenged the ingenuity of all participants. Not only did the trans-disciplinary working teams have to prove their scientific excellence in new findings and academic discourse. They also had to provide evidence that their research is integrated with the actual concerns of stakeholders and policy makers. This objective was regarded as essential to achieve an impact after the funding had come to an end, meaning lasting outcomes and new partnerships.

HCMC focused on the integration of urban and environmental planning. In that regard, HCMC contributed significantly to the overall program’s goals. Among others, the project significantly helped to promote the adaptation of urban areas to and the development of concepts dealing with foreseeable climate changes and weather extremes. HCMC also supported mitigation measures.

Since good or even best practice examples for energy- and climate-efficient urban structures are in high demand among many other future megacities, it is my sincere wish that this book will benefit cities and citizens far beyond HCMC.

Dr. Andrea Koch-Kraft
Deutsches Zentrum für Luft- und Raumfahrt e. V. (DLR)
German Aerospace Center
Project Management Agency/Environment, Culture, Sustainability
Bonn, Germany

Preface by Dr. Bao Thanh

Ho Chi Minh City (HCMC), metropolis and economic centre of Viet Nam, is facing the challenges to ensure not only economic growth but also control effects on its ecology, infrastructure and society due to process of urbanization, ensuring a high quality of life for their residents. Furthermore, in the context of global climate change, the city is confronted to impacts such as urban flooding by tide, storms or heavy rains, the heat island effect and extreme weather. These fast-growing climate change hazards are becoming key factors for HCMC in achieving sustainable development.

At the national level, the National Strategy on climate change and the National Action Plan on Climate Change were issued. At the city level, in 2012, HCMC issued the action plans to respond to climate change, mobilizing domestic resources and supports from international organizations. The local government has promoted international supports for finance and technology, especially international technical cooperation including knowledge and experience exchange through workshops, seminars and working networks, which has enhanced the capacity of relevant stakeholders in implementing response activities. In this framework, the cooperation with the Megacity Research Project, Ho Chi Min City took place.

This publication “Sustainable Ho Chi Minh City: Climate Policies for Emerging Mega Cities” will provide a holistic approach of environmental and urban planning; an overview on methods of vulnerability assessment and related recommendations for urban planning; recommendations for climate change adaption and mitigation on urban, district and building scale; and socio-economic dimension of urban development.

Dr. Bao Thanh
Director of the Sub-Institute of Hydrometeorology and
Environment of South Vietnam
Ho Chi Minh City, Vietnam

Preface by Dr. Arch. Do Tu Lan

The Megacity Research Project in Ho Chi Minh City: Contribution and Achievements

Following the National Target Program to Respond to Climate Change in 2008, the issue of climate change is trickling down from Vietnam's national to the local level in 2010. Reducing vulnerability to climate change has become an urgent issue on the agenda of the Ministry of Construction (MoC) and the city's authorities in Vietnam. Urban planning should have a key role for the city's adaptation to climate change threats, and MoC has started several activities to integrate concerns of climate change adaptation and mitigation in the current urban development projects and strategies in Vietnam. The Megacity Project has contributed to this task not only with capacity building activities and sharing of knowledge but especially with the development of guidelines as checklist for plan approval procedures and a handbook explaining different strategies to integrate urban climate and urban flooding concerns in urban design and planning, the Handbook on Green Housing for the promotion of climate-adapted architecture and energy-efficient buildings and a broader community-based approach for regeneration and adaptation of the existing urban environment (Urban Regeneration). The project could contribute significantly to best practice dissemination and awareness raising and has supported the improvement of the urban regulatory framework in the field of urban planning and construction.

Dr. Arch. Do Tu Lan
Ministry of Construction
Hanoi, Vietnam

Contents

Part I Introduction

Frank Schwartz, Antje Katzschnher, and Michael Schmidt

Introduction to Ho Chi Minh City 5

Antje Katzschnher, Frank Schwartz, Bao Thanh, and Michael Schmidt

Climate Change Adaptation Governance in the Ho Chi Minh City Region 19

Andreas Gravert and Thorsten Wiechmann

Part II Urban Environment

Harry Storch and Nigel K. Downes

Urban Environment: An Overview of Results 41

Harry Storch and Nigel K. Downes

Adaptation: Integrative Planning Framework for Adapted Land-Use Planning 51

Harry Storch, Nigel K. Downes, Michael Schmidt, Thi Cam Van Nguyen, Le Canh Dinh, and Bao Thanh

Administrative Requirements for the Integration of Environmental Concerns and Demands of Climate Change into the Planning Process . . . 75

Manfred Goedecke and Jörn Welsch

Understanding Ho Chi Minh City’s Urban Structures for Urban Land-Use Monitoring and Risk-Adapted Land-Use Planning . . . 89

Nigel K. Downes, Harry Storch, Michael Schmidt, Thi Cam Van Nguyen, Le Canh Dinh, Thong Nhat Tran, and Le Thanh Hoa

Urban Climate 117

Lutz Katzschnher, René Burghardt, Sebastian Kupski, and Sabrina Campe

Urban Water Management: Spatial Assessment of the Urban Water Balance 133
Hendrik Rujner and Manfred Goedecke

Remote Sensing and Spatial Analysis for Flood Monitoring and Management in Ho Chi Minh City 151
Xuan Thinh Nguyen, Jakob Kopec, and Maik Netzband

Urban Transport in Ho Chi Minh City, Vietnam 175
Guenter Emberger

Part III Urban Development

From Research to Design: From Design to Action 195
Frank Schwartze and Dirk Schwede

Climate Responsive Neighbourhoods for HCMC: Compact City vs. Urban Landscape 207
Ronald Eckert and Le Hai Chau Huynh

Promoting Climate Adapted Housing and Energy Efficient Buildings in Vietnam: Chances and Challenges 239
Dirk Schwede, Michael Waibel, Christoph Hesse, and To Thi Nhien Ngo

People-Centred Innovative Bottom-Up Approaches 259
Ulrike Schinkel

About the Authors

Dipl.-Ing. René Burghardt is a landscape planner and landscape ecologist. Since 2009, he is working at the Department of Environmental Meteorology, which is dedicated to the Institute for Architecture, Urban Planning and Landscape Design of the University of Kassel, Germany. Also, he is managing partner of the engineering office “Burghardt and Partner”, established in 2013. Mr Burghardt is well trained in the use of Geographic Information Systems (GIS). His main objectives at the Department of Environmental Meteorology are the development and elaboration of urban climate analysis and recommendation maps, next to geo-statistical analyses and development of GIS based solutions. In cooperation with Prof. Dr. Katzschner, Mr Burghardt holds national and international teaching sessions at the technical university Munich (TU München) and at the Vietnamese-German-University (VGU) in Ho-Chi-Minh City, Vietnam.

Dipl.-Ing. Sabrina Campe studied Landscape Architecture at the University of Kassel and got her Diploma as a qualified engineer in 2009. From 2010 to 2014, she was an assistant of Prof. Dr. Lutz Katzschner (professor emeritus) at the University of Kassel, Department of Architecture, Urban Planning and Landscape Architecture in the subject area Environmental Meteorology. Her main research interests lie in climatic research of inner-city public open space and green infrastructure at microclimatic level. In various different national and international projects, she worked on sensitive urban open space planning and urban development concerning climate adaptation. She is now working at studio LOMA architecture landscape urbanism in Kassel.

Nigel Downes studied Geography at the University of Edinburgh, UK, and is currently a researcher at the Department of Environmental Planning of the Brandenburg University of Technology Cottbus-Senftenberg in Germany. He undertakes research in the development of an adaptation planning framework within the BMBF-funded ‘Megacity Research Project TP. Ho Chi Minh: Integrative Urban and Environmental Adaptation Planning Framework’. His main research focus is the applicability of an urban structure type approach for urban monitoring and embedding spatial climate change adaptation solutions into urban land-use planning.

Dipl.- Ing. Ronald Eckert is an urban planner based in Berlin. He obtained his diploma in Urban and Regional Planning in 2005 and has been working for several planning consultancies being responsible for the conception of urban design, urban development and urban renewal concepts in Germany and the Asia-Pacific region. Between 2006 and 2012, Ronald was research associate and lecturer at the Department of Urban Planning at the University of Cottbus. He was involved in the application of the “Megacity Research Project – TP. Ho Chi Minh” and was responsible for the work package “Climate-change adapted neighbourhoods”. After 2 years at the Municipality of Frankfurt (Oder), he is currently employed at the Department for Urban Development Planning at

the Berlin Borough Office of Tempelhof-Schöneberg. His research foci are sustainable urban development in Asia and the investigation of densified urban structures.

Dr. Guenter Emberger is Associate Professor at the Institute of Transportation—Research Center of Transport planning and Traffic Engineering at the Vienna University of Technology. He works since 1990 in the field of transport planning and policy with a focus on sustainable transport. His expertise lies in developing of decision support tools based on qualitative (such as the “Decision Makers Guidebook”) and quantitative (co-developer of the strategic, dynamic land use and transport interaction model MARS) methodologies. He was involved in more than 30 international projects covering the regions Central- /Eastern-Europe and South-East-Asia. He has led the work package “WP 5—Urban Transport” in the Megacity Research Project TP Ho Chi Minh City (BMBF Megacity Programme).

Dipl.-Ing. Manfred Goedecke is deputy head of the unit for Urban and Environmental Information System at the Department of Urban Development and Environment of the Senate Berlin. He studied and graduated in landscape planning/ecology at the Technical University of Berlin. During his time at university he had a special focus on environmental problems and land-use planning in low developed countries. He worked several years as a consultant. Since 1983, he is responsible for the Environmental Atlas of Berlin, first in two Research and Development Projects and after that as an employee at the Berlin administration. He is editor of the Environmental Atlas and author of several maps concerning water and soil topics. He turns his special attention to processing and implementation of instruments for collecting and application of spatial environmental data for planning purposes and for the information of the public. His main focus is on soil protection and urban water balance. From 2008 to 2013, he took part in the BMBF-funded “Megacity Research Project TP. Ho Chi Minh—Integrative Urban and Environmental Planning—Adaptation to Climate Change” and in this project responsible for administrative integration and environmental governance.

Dipl. Geogr. Andreas Gravert is Scientific Assistant at TU Dortmund University, Faculty of Spatial Planning. His research concentrates on institutional theory, metropolitan governance, and adaptation to climate change. Gravert has been doing research on Ho Chi Minh City since 2005 and worked on the Megacity Research Project, Integrative Urban and Environmental Planning Framework—Adaptation to Climate Change between 2008 and 2011. His focus was on the adaptation of the urban and regional planning system within the Megacity Project.

Christoph Hesse (Dipl. Arch. E.T.H., M.A.U.D.) graduated with a Diploma in Architecture (hons.) from ETH Zurich (2003) and received a Masters of Architecture in Urban Design with Distinction from Harvard University (2007). Since 2008, he shares his time working at his private firm Christoph Hesse Architects and teaching at the Department of Architecture and Urban Design at TU Darmstadt. He teaches courses in urban design at the Mundus Urban Programme in International Cooperation and Urban Development. Mr. Hesse possesses fieldwork experience in various countries worldwide like Vietnam, China, Russia and the USA. Currently, he works on a BMBF financed research project in Cairo Imbaba called “Improving environmental performance in informal areas”. Mr. Hesse publishes frequently on the mutual effects of climate change and the built environment. His most recent publication on mitigation and adaptation is the “Handbook for Green Housing” (2011, Hesse, Schwede, Waibel). Mr. Hesse lectures extensively on energy-efficient and climate-responsive solutions in the international context, e.g. in the USA, Columbia, Hong Kong, China, Singapore, South Korea, Russia, Vietnam, Norway, Germany and Egypt.

Le Hai Chau Huynh graduated from University of Architecture of Ho Chi Minh City, Vietnam, in 2007. After a few years working as an architect and project coordinator, in 2009, she continued to study Master of International Cooperation and Urban Development at Technical University of Darmstadt, Germany. From 2011 to 2013, she had been working as a research associate for the “Megacity Research Project TP. Ho Chi Minh—Integrative Urban and Environmental Planning—

Adaptation to Climate Change” at Brandenburg University of Technology Cottbus-Senftenberg. Her research focus was climate change adapted urban planning and design. Since 2013, she is a Ph.D. candidate within the DAAD’s (German Academic Exchange Service) scholarship program “Sustainable Water Management” at the Department of Spatial Information Management and Modelling, Technical University of Dortmund, Germany.

Antje Katzschner, M.A., studied Sociology at the University of Cologne and got her degree as Magistra Artium in 2006. From 2010 to 2013, she was coordinator of the BMBF-funded “Megacity Research Project TP. Ho Chi Minh—Integrative Urban and Environmental Planning—Adaptation to Climate Change” at the Brandenburg University of Technology Cottbus-Senftenberg in the field of urban planning and climate change adaptation at the Department of Environmental Planning. Before that, she has been working in the BMBF-funded project KLIMES (Development of strategies to mitigate enhanced heat stress in urban quarters due to regional climate change in Central Europe), which dealt with solutions for planning-related problems caused by the impacts of extreme heat in summer on people in cities. She is now working at Universität Hamburg, Department of International Affairs as a coordinator for a trilateral network with a university in Shanghai, China and Sydney, Australia.

Prof. Dr. Lutz Katzschner is meteorologist and Professor for environmental meteorology at the University Kassel/Germany in the faculty of architecture and urban planning. His main science interest is urban climatic mapping from meso- to microscales and their implementation in an urban planning perspective and the impact of global climate change in cities. He is chairman of the guideline committee urban climate and planning Verein Deutscher Ingenieure in Germany. He is presently carrying out projects on global warming and their effect in urban climate in different cities and countries. He does presently courses on fundamentals of urban climate at the Technical University München, the Chinese University Hong Kong, Vietnamese Germany University.

Jakob Kopec, M.Sc., studied Spatial Planning at TU Dortmund University. During his studies, he focused on geographic information systems, remote sensing and geoinformatics, as well as on planning systems in the renewable energy sector. Since 2010, he has been working at the Department of Spatial Information Management and Modelling of TU Dortmund University. From 2012 to 2013, he worked as student assistant in the BMBF Megacity Research Project TP. Ho Chi Minh. Now, he is working as research associate in the BMWi Research Project Evaluation and Planning of Power Networks. He is also one of the founders of the cooperative “Die Energiegesellschaft eG”. In 2013, his Bachelor-Thesis was honoured with the Young Researcher’s Award at the second International BMBF Conference Future Megacity in Action in Hamburg.

Dipl.-Ing. (graduated engineer) Sebastian Kupski is a research assistant at the University of Kassel (Germany) in the department of environmental meteorology. He studied urban planning with main focus on urban development. Now, his speciality is urban climate in all mentioned planning scales. His research aim is to develop adaptation tools for cities based on urban climate maps. Sebastian Kupski worked in a regional research project called KLIMZUG (2008–2013) and developed a regional climate zone map with recommendation on the meso scale, based on that more detailed investigations could follow like city wide or microclimate analyses. Now, he is copartner in the institute for climate and energy strategies.

Dr. Eng Le Canh Dinh (Ph.D. and M.Sc. in Geomatics Engineering, land evaluation, land-use planning and management/development) currently is a vice director of sub-National Institute of Agriculture Planning and Projection (Sub_NIAPP)—MARD. From 2012 to 2013, he was the head researcher and the head consultant of the project of “Land use planning of HCMC to 2020, the land-use scheme for the period of 2011 – 2015”. Therefore, he has significant connections to the BMBF-funded Megacity HCMC project. Since 2005, he has also been a visiting lecturer in

“sustainable land-use planning” of the master programme of land administration, Nong Lam University, Thu Duc, in HCMC.

Dr. Le Thanh Hoa is currently Dean of the Department of Environmental Geography and also senior lecturer at the Department of Cartography, GIS and Remote Sensing of the Faculty of Geography at the University of Social Sciences and Humanities in HCMC. He is additionally the director of the Sea and Island Research Center. He has over 20 years’ experience in environmental sciences and has carried out many projects in the Mekong Delta on soil, water and forest analysis and management. He gained full scholarship from the German Academic Exchange service (DAAD) for his Ph.D. research at the Brandenburg University of Technology (BTU) Cottbus-Senftenberg where he analysed urban morphology and fractal geometry to better understand both the urbanisation and environmental challenges of HCMC for adaptation to climate change.

During his career, **Dr. Maik Netzband** has focused on methodological knowledge of remote sensing techniques when approaching questions of urban ecology and urban planning. In particular, problems associated with urban land-use, climate, soil imperviousness, and land consumption, green areas, and open spaces have caught his attention. Currently, he is working with the Ruhr-University in Bochum/Germany on various urban related and internationally focused geoinformation research projects in which monitoring and evaluating urban land use with respect to urban ecological questions play a significant role.

To Thi Nhien Ngo is working as national consultant for the Renewable Energy Development Project funded by the World Bank and executed by the Ministry of Industry and Trade, Vietnam. She graduated with a degree in “Engineering of Electronics Informatics” at the Hanoi University of Science and Technology in 2000 and a Master of Science of “Energy Systems and Management” at the University of Flensburg, Germany, in 2007. She has been working as national consultant for various projects in the realm of sustainable energy systems related to renewable energy technology and energy efficiency to GHG emission reductions. In this regard, she is particularly interested in researching on new policies, which promote renewable energy and energy efficiency in Vietnam. A special interest of her is to research how energy policies in developing countries can find a balance between sustainable development and climate protection objectives, which secures the overall well-being of society, after all.

Ms. Thi Cam Van Nguyen is Head of Planning Division of the Department of Natural Resources and Environment, HCMC (DONRE). She is an expert in land use management, surveying, mapping, and land use planning with over 30 years of experience. She obtained Master of Science in Civil Engineering from HCMC’s University of Technology. In the past, she had made the land-use planning of HCMC with the vision until 2010 and 5-year land-use plan from 2006 to 2010. Recently, she has completed the land-use planning of HCMC with the vision until 2020 and 5-year land-use plan from 2011 to 2016. In addition, she collaborated with Megacity project in order to incorporate determinants of climate change into the City’s land-use planning. She also contributes to the Megacity project from 2007 to 2012.

Prof. Dr. Xuan Thinh Nguyen has been professor and head of the Department of Spatial Information Management and Modelling at TU Dortmund University since 2011. Now, he is vice dean of the Faculty of Spatial Planning at TU Dortmund University. From 2008 to 2013, he was leader of the two WPs Urban Flooding and Urban Energy of the BMBF Megacity Research Project TP. Ho Chi Minh. Currently, he is managing a subproject of the BMWi Research Project Evaluation and Planning of Power Networks. He is reviewer of several scientific journals and German Research Foundation (DFG). Using mathematics, multiple criteria decision analysis, geographic information science (GIS) and remote sensing Xuan Thinh Nguyen is working on the development of methods, modelling tools and models for analysis, assessment and simulation of urban dynamics with a view to sustainable development and to eco-efficiency.

Dipl.-Ing. Hendrik Rujner holds a Master degree (Diplom) in Land Use and Water Management of the Brandenburg University of Technology Cottbus, Germany. He gained early experience in urban water management issues as he worked in the field of Urban Flooding of the BMBF-Megacity Research Project TP. HCM during 2009–2011. In a follow-up German-Vietnamese project on integrated stormwater management in urban areas he could further develop his research interest. Currently, he is Ph.D. student at the Urban Water Research Group at the Luleå University of Technology, Sweden. There he focusses on quantitative performance of urban Green Infrastructure for stormwater management.

Prof. Dr.-Ing. Dr. h.c. Michael Schmidt graduated in 1983 in Landscape Planning at the University of Hannover, and received his doctoral degree in 1987 at the University of Kassel. After serving in the Federal Agency for the Environment, he became head of the soil protection unit at the Brandenburg State Agency of the Environment and was appointed Governmental Executive Director in 1992. At the BTU Cottbus, he initiated the international study programmes “Environmental and Resource Management” and “World Heritage Studies”. He was the head of the Megacity research project “TP. HCMC Integrative Urban and Environmental Planning Framework—Adaptation to Climate Change”.

Kathrin Schulte-Braucks studied Spatial Planning at TU Dortmund University and Michigan State University, USA. She was research associate at the Department of Spatial Information Management and Modelling of the Faculty of Spatial Planning, TU Dortmund University from 2011 till 2014 and focused her work on 3D-GIS, the importance of LIDAR data in Urban Planning and viewshed analysis. She was part of WP Urban Energy of the Megacity Research Project TP. Ho Chi Minh.

Prof. Frank Schwartz has held employment at the Office for Regional Development Strategies in Berlin and has been an assistant professor at the Department of Urban Design at the BTU Cottbus from 1996 to 2001. He has led as Vice-Director the BMBF Future Megacity Research Project: Integrative Urban and Environmental Planning Framework—Adaptation to Climate Change Ho Chi Minh City, Vietnam from 2009 to 2013. During that time, he was heading as Professor ad Interim the Department of Urban Planning at the Brandenburg University of Technology in Cottbus (BTU) and was the Head of the Master and Bachelor Study Program “Urban and Regional Planning”. He now teaches as a Professor Urbanism and Town Planning at the Luebeck University of Applied Sciences (LUAS) and is the Study Dean of the Master Program Urban Design and Town Planning. He is part of the Lab for Urbanism and Planning (LSO) of LUAS and member of the SmartCircle Research Center in Luebeck, an interdisciplinary research platform for Smart-City concepts and applications.

In 1997, he established in Berlin together with two partners his own urban planning and consultancy office, insar consult, schwartze, wessling and partner. As an expert for urban planning and development, he was working for the United Nation Mission in Kosovo and has been engaged in several development cooperation projects of UN Habitat and GIZ in East and Southeast Europe and the Mena Region.

His main field of interest and research is related to resource-efficient urban forms and processes of sustainable urban development. He is specifically interested in strategic planning, instruments and tools for the steering of urban development and urban regeneration processes.

Dr. Dirk Schwede (Ph.D. USyd AU, Dipl.-Ing.) studied civil engineering at the Technical University of Braunschweig (1993–1996) and the University of Stuttgart (1996–1999). He received a Ph.D. from the University of Sydney in Australia in 2006 (2002–2006). Dr. Schwede has worked as a researcher at the University of Sydney and Deakin University in Australia. In 2008, he founded the consulting firm energydesign in Shanghai as a partner and served then as its managing director from 2008 to 2013. He and his team of specialized engineers has been (and still is) contributing as consultants and engineers to sustainable building throughout China and Asia. He has been visiting professor at Tongji University in Shanghai (2010–2013). Since January 2013,

Dr. Schwede is junior professor for Sustainable Building at the University of Stuttgart endowed by the Robert Bosch Foundation. His research is focused on the sustainable development in the Asian context and climate through architectural and engineering measures in the built environment.

Dr. Harry Storch is a senior researcher at the Department of Environmental Planning at the Brandenburg University of Technology Cottbus, Germany, since 2008. He is scientific coordinator of the Action Field ‘Urban Environment’ and co-leader of the work package ‘Adaptation Planning Framework’ within the ‘Megacity Research Project TP. Ho Chi Minh: Integrative Urban and Environmental Adaptation Planning Framework’, funded by the German Federal Ministry of Research and Education (BMBF). Additionally, he acted as coordinator of the MSc. Programme ‘Urban Development Planning’ at the Vietnamese-German University in Ho Chi Minh City from December 2009 to April 2010 and from November 2010 to March 2011.

Dr. Bao Thanh is the Director of the Sub-Institute of Hydro-Meteorology and Environment of South Vietnam (SIHYMETE). Dr. Bao has over the past two decades experience in investigating the impacts of climate change on key features such as hydrological regimes, ocean physics and the environment of South Vietnam. He has worked on a number of significant projects, reviewing the impacts in the Mekong River Delta for the formulation and preparation of climate change adaptation and mitigation options and action plans. He is also has experience in analysing and assessing climate change impacts in socio-economic development planning of cities and urban areas in the South Vietnam region.

Dr. Thong Nhat Tran is director of the Department of Geographic Information System (GIS) and Remote Sensing (RS), Faculty of Geographic Information and Remote Sensing, Ho Chi minh City University of Natural Resources and Environment. He was born in Vietnam but studied higher education in Germany. In 2005, he got a full scholarship from the Vietnamese Ministry of Training and Education for studying his Master degree in Photogrammetry and Geoinformatics at Stuttgart University of Applied Sciences and then a full scholarship from the German Academic Exchange service (DAAD) for his Ph.D. research at the Brandenburg University of Technology (BTU) Cottbus-Senftenberg. After completing his PhD he returned to Vietnam where he focused on studying, developing and applying GIS-RS to the environment and resource fields.

Dr. Michael Waibel, Ph.D., is working as senior researcher, lecturer and project leader at the Department of Human Geography of the University of Hamburg, since 2007. He holds a Ph.D. in Human Geography and an M.Sc. on economic geography, geography and national economy with key competencies in urbanism, housing, urban governance, green growth approaches, energy geography, empirical research methods, climate change mitigation and development research. He gains almost 20 years of international experience in academic work, and capacity development in Southeast Asia as well as in East Asia. In 2001, he published his Ph.D.-thesis about urban development of Hanoi/Vietnam.

From 2007 to 2009, he worked on several missions as consultant for the EU-funded project Vietnam Urban Environmental Planning Programme. In 2009, he was consultant in regard of the development of the Hanoi Capital Construction Master Plan to 2030. Currently, he is consultant in regard of the Revised Mekong Delta Regional Plan 2030. From 2007 to 2014, he was project leader within the Priority Programme 1233 of the German Research Foundation (DFG-SPP 1233) “Megacities—Megachallenge”. Within this programme, he did research on questions of urban governance related to economic-spatial upgrading in China. From 2008 to 2013, he was recognized research partner within the research programme “Research for the Sustainable Development of the Megacities of Tomorrow” funded by BMBF. Within a project led by BTU Cottbus, he coordinated a work package on green housing. Major outcomes of his project activities have been the “Handbook for Green Housing” (2011) and the “Handbook for Green Products” (2013), both in Vietnamese and English language. Regularly, he publishes academic papers, serves as peer-reviewer for various international academic journals or for scientific organisations. He is editor-

in-chief of the scientific journal *PACIFIC GEOGRAPHIES* since 1999 as well as of the book series *PAZIFIK FORUM* since 2002.

Dipl.-Ing. Jörn Welsch is collaborator of the unit for Urban and Environmental Information System at the Department of Urban Development of the Senate Berlin. He studied and graduated in landscape planning/ecology at the Technical University of Berlin. Soon he focused his interests on urban climate affairs. Since 1987, he is responsible for specific parts of the Environmental Atlas of Berlin, in the first 3 years within a Research and Development Project (“Ecological Planning Instrument Berlin” concerning the consideration of environmental needs into urban planning). Since 1990, he is the responsible editor of the category groups “Climate/Air”, “Traffic/Noise” and “Energy” of the Environmental Atlas and for drafting of expert’s reports on urban planning projects with respect to urban climate standards. Invitations to several stays abroad enabled him the professional exchange of knowledge on an international scale. From 2008 to 2013, he took part in the BMBF-funded “Megacity Research Project TP. Ho Chi Minh—Integrative Urban and Environmental Planning—Adaptation to Climate Change” and in this project responsible for administrative integration and environmental governance.

Part I

Introduction

Frank Schwartz, Antje Katschner, and Michael Schmidt

Overview

Undoubtedly, Ho Chi Minh City is not just the biggest city in Vietnam, but also its economic centre. With its regional location as hub in Southeast Asia, its airport, harbour and the intersection of main roads, the metropolis is well connected within the domestic as well as the most important international markets.

Located downstream of the Saigon-Dong Nai River with a relatively flat terrain, the city traditionally has a strong relationship to water. It is located at the north-eastern fringe of the Mekong Delta and its southern part is connected to the east sea. Major parts of the city are situated on low-lying marshy lands that are crossed by a complex network of canals and rivers. These topographic and geographic conditions make the city extremely sensitive to various flood sources.

The city's core area covers about 2095 km² and inhabits 7.7 million people, which means a population density of about 3666 person per km² (Labaeye et al. 2012). In fact, the city has already developed into Vietnam's first mega city with the benchmark of ten million inhabitants according to UN-definition. This is not only due to its migrants population but because the urban spatial growth of the city has already transgressed its administrative borders. The greater agglomeration

F. Schwartz (✉)

Laboratory of Urbanism and Planning, Luebeck University of Applied Science, Lübeck, Germany

e-mail: frank.schwartz@fh-luebeck.de

A. Katschner

Department of International Affairs, Universität Hamburg, Hamburg, Germany

e-mail: antje.katschner@uni-hamburg.de

M. Schmidt

Department of Environmental Planning, Brandenburg University of Technology Cottbus-Senftenberg, Cottbus, Germany

e-mail: michael.schmidt@tu-cottbus.de

consists of eight different provinces and has 18.3 million inhabitants (SIUP South/MoC 2007; GSO 2011). More than 70 % of the population of the region is below the age of 35, a fact that is clearly indicating the potential natural growth of the future. During the next years the city's population will grow with an average annual rate of 3.5 %, which means that by 2025 the core city is expected to host more than 10 million inhabitants and the HCMC region about 25 million people (SIUP South/MoC 2007; UPI).

Due to its role as the country's economic centre, the most significant driver of the population growth within the Ho Chi Minh City metropolitan region is migration: It is by far the most attractive destination of the country's migration streams (GSO 2011). For example, about one third of the total population of Binh Duong has migrated from other parts of the country to the HCMC region within the last decade (Marx and Fleischer 2010). The main originating provinces of migrants are the regions of the Mekong Delta, North Central and the Red River Delta, which are main agricultural centres of Vietnam. As in other countries of the region, the most important reasons for migration are economic ones: The decision to migrate is generally driven by the prospect to earn higher incomes than in the countryside. Further, it is an evidence for the shifting from an agricultural economy to an industrial and service oriented economy which centres are located in urban areas.

Today the HCMC region accounts for almost 70 % of the country's export revenue growing rate and contributes 40 % of its GDP. The region's average income is nearly 30 million VND per year, which is more than 2.5 times the national average. Until 2025 the city's economy is expected to grow at a rate of 7 % per year (PricewaterhouseCoopers 2009). A similar development is happening in the regions surrounding the municipality's boundaries, particularly in the provinces located east and southeast to Ho Chi Minh City. Those provinces are rapidly industrialising, are showing similar grow rates like the core city and are even receiving more foreign direct investments by now. Together with the gradual improving of the regional infrastructure—e.g. the envisaged international new airport Dong Nai—the whole metropolitan region is gradually emerging as an economic and logistic hub of the whole south-east Asian region. National and local policy makers aim to accelerate the economic development through a shift from a labour intense production to the division of functions focussing on service, commerce, education and high-tech industries.

Although Ho Chi Minh City has to fight with similar problems like other rapidly growing mega cities such as traffic congestion, environmental degradation, excessive population growth due the massive influx of rural migrants or the overburdening of technical and social infrastructure, the whole economic development can be regarded as a success story. However, there are significant threats to further increasing prosperity and the most important one is certainly related to the threats of global climate change. The exposure to sea-level rise, to the increasing frequency and intensity of extreme weather events and the tremendous task to potentially inhabit several hundred thousands of climate change refugees from the Mekong delta and other coastal regions put several severe challenges to the path of future urban development of Ho Chi Minh City.

Given all this, it was certainly a good decision of the German government to support a trans-disciplinary research consortium of urban planners, architects, construction engineers, traffic experts and social scientists to identify ways towards more sustainable urban development and to actively assist the local policy makers in terms of implementation.

A comprehensive documentation of all research carried out in the MC HCMC project can be found on the project homepage: <http://www.megacity-hcmc.org/>.

References

- General Statistics Office (GSO) (ed) (2011) Vietnam population and housing census – migration and urbanization in Vietnam: patterns, trends and differentials. General Statistics Office (GSO), Hanoi
- Labaeys A, Brugmann J, Van Phuoc N, Bao T, Thao LKT, Tuan NA, Storch H, Schinkel S (2012) Reality check: Ho Chi Minh City, Vietnam. In: Otto-Zimmermann K (ed) Resilient cities 2, vol 2, Local sustainability. Springer, Berlin, pp 367–376. doi:10.1007/978-94-007-4223-9_38
- Marx V, Fleischer K (2010) Internal migration opportunities and challenges for socio-economic development in Vietnam. Hanoi
- PricewaterhouseCoopers (2009) UK Economic Outlook November 2009—which are the largest city economies in the world and how might this change by 2025? <http://www.ukmediacentre.pwc.com/Media-Library/UK-Economic-Outlook-November-2009-61f.aspx>. March 2013
- SIUP South (Southern Institute of Urban and Rural Planning)/MoC (Vietnam Ministry of Construction) (2007) Regional Development Plan for the HCMC Metropolitan Area, HCMC

Introduction to Ho Chi Minh City

Antje Katschner, Frank Schwartze, Bao Thanh, and Michael Schmidt

Climate

With an average temperature of 27–28 °C and maximums of up to 40 °C, the HCMC region has a typical tropical wet and dry climate. Because of the aftermath of climate change the average temperature is constantly rising and is expected to be about 1.4 °C higher in 2050 than in the baseline period of 1980–1989 (ADB 2010). But that does not take in count the urban heat island effect, which is accountable for the fact that dense urban areas are up to 10 °C warmer than rural areas (Thi Van et al. 2009). That effect is also expected to increase in future times due to the rapid urbanisation and economic development.

Viet Nam features monsoon tropical climate with annual mean temperature varying from 12.8 to 27.7 °C. Average annual rainfall ranges from 1400 to 2400 mm. Each year, on average, the country is affected by six to eight typhoons or tropical cyclones.

A. Katschner (✉)

Department of International Affairs, Universität Hamburg, Hamburg, Germany

e-mail: antje.katschner@uni-hamburg.de

F. Schwartze

Laboratory of Urbanism and Planning, Luebeck University of Applied Science, Luebeck, Germany

e-mail: frank.schwartze@fh-luebeck.de

B. Thanh

Sub-Institute of Hydrology, Meteorology and Environment (SIHYMETE), Ho Chi Minh City, Vietnam

e-mail: baothanh56@gmail.com

M. Schmidt

Department of Environmental Planning, Brandenburg University of Technology Cottbus-Senftenberg, Cottbus, Germany

e-mail: umweltplanung@tu-cottbus.de

Climate Change in Vietnam

Water Resources

Taking into account only perennial rivers and streams over 10 km in length, Viet Nam has about 2360 rivers and streams with an average density of 0.6 km/km². There are nine major river systems in Viet Nam. The largest system, Mekong River, enters Viet Nam before draining into the East Sea. Annual flows of all rivers in Viet Nam average 835 billion m³. Groundwater reserve is 50 billion m³/year (SIHYMETE 2011).

Climate Change Manifestation

Temperature: Over the past 50 years (1958–2007), annual average temperatures increased by about 0.5 to 0.7 °C. Temperatures for winters and northern climate zones increased at faster rates compared to summers and southern climate zones, respectively.

Rainfall: Annual average precipitation over the last nine decades (1911–2000) does not show a clear trend across regions and time periods. Instead, both upward and downward trends can be seen. Northern climate zones have seen a decrease in annual rainfall, in contrast to southern zones. On a country-wide basis, average precipitation fell by 2 % during the last 50-year period (1958–2007).

Cold fronts: The number of cold fronts affecting Viet Nam has decreased significantly over the last two decades. However, anomalous events have occurred more frequently recently, with most notably the damaging cold surge which lasted for 38 days in the North of Viet Nam during January and February 2008.

Typhoons: In recent years, typhoons with higher intensity tend to occur more frequently. Typhoon tracks show signs of moving southwards (see Fig. 1), with abnormal movements while storm seasons tend to end later (SIHYMETE 2011).

Sea level: Observations by tidal gauges along the coastline of Viet Nam show that the mean sea level rose at a rate of 3 mm/year (during 1993–2008). Over the past 50 years, sea level at Hon Dau Oceanographical station has increased by about 20 cm as can be seen in Fig. 2.

Impacts of Climate Change

Impacts on Water Resources

Climate change will impact river stream flow volumes and temporal and spatial distribution. The impacts of climate change on annual flows, flood flows and low

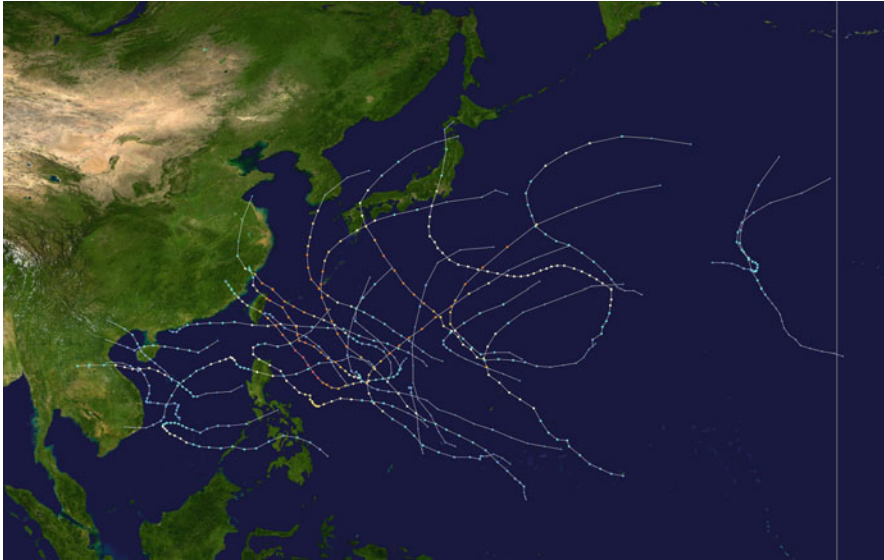


Fig. 1 West Pacific Ocean typhoon tracks in 2007 (own depiction by SIHYMETE 2013)

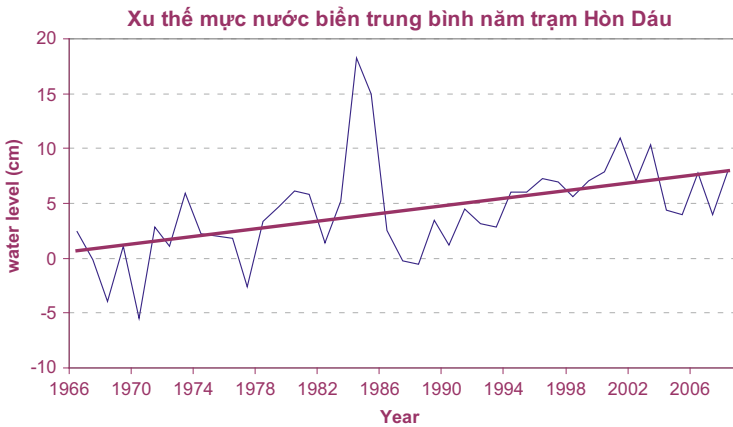


Fig. 2 Sea level changes at Hon Dau Oceanographical station (own depiction by IMHEN 2010)

flows in the future were assessed based on the rainfall-flow model and the above-mentioned climate change scenarios.

Climate change impacts on annual flows vary from one region/river system to another across Viet Nam's territory. According to the medium climate change scenario B2, annual stream flows in the Red River Delta and northern North Central region will trend towards increases under 2 % for 2040–2059 and between 2 and

4 % for 2080–2099. By contrast, annual flows for regions south of the North Central region to the northern South Central region and the Southeast (Dong Nai River system) will trend towards varying decreases, slightly below 2 % for the Thu Bon and Ngan Sau Rivers, but significantly higher at 4–7 % for the Dong Nai and Be River systems for 2040–2059 and 7–9 % for 2080–2099.

Flood flows for most rivers are generally projected to rise by 2–4 % for 2040–2059 and 5–7 % for 2080–2099, albeit with a wide degree of variations between rivers. Flood flows for Thu Bon and Ngan Sau Rivers are likely to rise by less than 2 % for 2040–2059 and below 3 % for 2080–2099 (SIHYMETE 2011).

Post-2020, groundwater table may decrease significantly due to overexploitation and decrease in groundwater recharge during the dry season. In the South, if river flow decreases by 15–20 % in the dry season, the corresponding groundwater level may drop by 11 m below current levels. The groundwater level may drop even lower in areas not subjected to tidal activities (SIHYMETE 2011).

Impacts on Coastal Zones

Sea-level rise will increase flood area, intensity and duration. Recent research has indicated that a 45 cm rise in sea level would increase the annual flooded area to 18,346 km², affecting 44,210 km². A 100 cm rise in sea level would increase these figures to 40,000 km² and 56,000 km², respectively, with the worst affected area being the Mekong River Delta which would account for 90 % of the national flooded area. Rising sea levels may also lead to higher risks of salinization for freshwater rivers and aquifers, causing serious socio-economic damage. Coupled with increased storm intensity, the sea-level rise would additionally exacerbate coastal erosion.

Coral reef ecosystems are in danger of destruction. Reefs in shallow waters are most vulnerable to destruction by the concurrence of rising sea levels and strong storm waves. Seagrass: Large disturbances to the living conditions of seagrass caused by storms and sea-level rise threaten the reproduction and development of seagrass ecosystems. In 1997, typhoon Linda swept away 20–30 % of the Con Dao seagrass bed. Lagoons: Lagoon environments are very vulnerable to severe floods and rising sea level. Rising lagoon water salinity causes damage to aquaculture infrastructure, and the disappearance of rivulets in lagoons with adverse impacts on local aquaculture and fishing activities. Conservation areas: Viet Nam has 68 major wetlands and 15 marine conservation areas, 36 of which are set to be frequently flooded, 13 of these 36 will be severely inundated when sea level rises by 100 cm. Conservation areas such as U Minh Thuong National Park and Bac Lieu Natural Reserve will be completely submerged, thus affecting the conservation of endangered species in the area (SIHYMETE 2011).