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Ali Cheshmehzangi • Chris Butters
Editors

Designing Cooler Cities

Energy, Cooling and Urban Form: The Asian
Perspective

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We would like to dedicate this book to our friend and colleague, Dr. Terry Thomas, and to the welfare of the millions increasingly exposed to urban heat island effects.

For Ayra—always aim high!

FOREWORD

Keeping cool, in hot climates, has in recent decades become a matter for public concern and action affecting whole urban populations. Air-conditioning has extended from the rich to the middle classes in hot-climate cities and will soon be accessible to the fairly poor. City planners have expanded a two-centuries-old interest in the ‘urban heat island’ effect to include detailed thermal modelling of blocks and districts. Urban cooling has created a massive new demand for energy in rapidly developing countries and cooling energy is set to globally overtake that required for winter heating in the cold climates. The recent field of district cooling is beginning to replace building-by-building air-conditioning. At last, tropical architecture is returning to its traditions of climatically responsive solutions, though now with a mixture of passive design and mechanised cooling technologies.

Several forces are working to make hot cities even hotter, including global warming, hardscape and a steady growth in the release of heat from humans, vehicles and (ironically) from cooling plant itself. Rises in peak urban temperatures of up to 6 °C by the year 2100 are being forecast. The energy and greenhouse gas emissions associated with cooling are very serious, but so are the human consequences. Given rising heat stress and indeed mortality from high temperatures and heat waves, this is also a matter of public health policy. Cooling is even provoking discussion of rich-poor thermal inequity. Lower productivity is yet another consequence of the urban heat island effect.

This timely book has arisen in part from a 3-year, 6-partner study of ‘Energy and Low-income Tropical Housing’, funded by the UK government.

Edited by an architect and a town planner, it addresses urban cooling on three levels: individual buildings—urban neighbourhoods—whole cities. Its contributors address the concerns noted above and explore how cooling needs can at once be reduced, and supplied in ways that avoid the unwanted positive feedback of releasing ever more ‘reject heat’ into the streets and atmosphere of large cities. The Asian focus in the case studies reflects the expectation that soon most of the world’s megacities will be in tropical Asia.

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ABOUT THIS BOOK

Following a very brief discussion of cities, energy and cooling, we present examples that illustrate both research and practice in the field of cooling in hot climate cities. Whilst building on extensive scientific sourcing, we avoid detailed technical information, which is available in the specialised literature. The chapters and case studies in this book represent a deliberate mix of design, research, planning and policy approaches. Whilst our readers may have particular interest in one or two of these fields, we emphasise the need for interdisciplinary understanding and processes. Policy makers and urban planners often have little contact with the latest research, and researchers for their part often have limited interaction with the real world faced by the decision makers.

Conventional city policy and planning seldom consider which is the *optimal level* for sustainable solutions. This distinction of levels is vital. Is it most advantageous or cheapest to solve problems at the level of individual buildings, at the larger scale of an urban district, or at the level of the overall city energy system? One may broadly discern three ‘levels’ of action: termed here the micro, meso and macro levels. The micro level pertains to the scale of individual buildings; the meso or intermediate level to larger developments, such as a housing estate or office precinct; and the macro level to whole urban districts or cities. This book provides sections addressing each of these levels, with examples illustrating concrete solutions, scientific research, and overarching planning or policy questions.

On the micro level we present examples of individual buildings that reduce environmental impacts including the need for cooling, and a chapter

discussing research and policy processes on a national basis towards energy efficient buildings. Our meso level section includes a research study on creating cooler city microclimates using vegetation, an example of a climate-adapted residential neighbourhood, and a concept design for a dense urban development that aims to integrate all three aspects of building design, planning layout and energy supply system. On the macro level, finally, we again present examples from different perspectives: climate-adapted sustainable city design, scientific research into cooler city layouts, and macro-scale energy solutions for hot climate cities with their policy implications. The interconnections between these three levels are emphasised throughout the book.

A good cross-section of Asian countries is represented: China, Thailand, India, Sri Lanka, Malaysia and Singapore. Whilst the examples are selected from Asian hot climate cities, they are largely relevant for other hot climate contexts too. For a comparative perspective, we also draw on European state-of-the-art experience. Vernacular traditions are noted, for they contain evergreen wisdom, which we can, and indeed should, apply in new ways. A big challenge lies in identifying solutions that suit local cultural and governance conditions; technically excellent solutions in one country may be totally inapplicable in another. We face the questions: how relevant is recent temperate climate research for hot climate cities? What lessons are transferable? What particular opportunities can be found in hot climate developing countries? In our concluding chapters we, therefore, add reflections on types of city, on the dynamics and barriers to sustainable solutions, and a few key recommendations.

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