

Francesco Musco *Editor*

# Counteracting Urban Heat Island Effects in a Global Climate Change Scenario



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# Counteracting Urban Heat Island Effects In A Global Climate Change Scenario

**Afroditi Synnefa, Shamila Haddad, Priya  
Rajagopalan, Matthaios Santamouris**

## **Counteracting Urban Heat Island Effects In A Global Climate Change Scenario:**

**Counteracting Urban Heat Island Effects in a Global Climate Change Scenario** Francesco Musco, 2016-08-30  
Urban heat islands are a new type of microclimatic phenomenon that causes a significant increase in the temperature of cities compared to surrounding areas. The phenomenon has been enforced by the current trend towards climate change. Although experts consider urban heat islands an urgent European Union public health concern, there are too few policies that address it. The EU carried out a project to learn more about this phenomenon through pilot initiatives. The pilots included feasibility studies and strategies for appropriately altering planning rules and governance to tackle the problem of urban heat islands. The pilots were carried out in eight metropolitan areas: Bologna, Modena, Budapest, Ljubljana, Lodz, Prague, Stuttgart, Venice, Padova, and Vienna. The feasibility studies carried out in these pilot areas focused on the specific morphology of EU urban areas, which are often characterised by the presence of historical old towns.

**Counteracting Urban Heat Island Effects in a Global Climate Change Scenario** Francesco Musco, 2020-10-08  
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*Remapping Urban Heat Island Atlases in Regenerative Cities* Abusaada, Hisham, Elshater, Abeer, Khalifa, Marwa, 2022-06-17  
In the past decades, protecting the urban environment in the face of environmentalism and environmental rights has become crucial to saving the planet from the dangers of the rapid urban development of new cities and societies. Air temperature is one of the factors influenced by climate change and contemporary city morphology that lacks compact city features. Contemporary cities have taken on global paradigms adopting open fabric, multiple and ultrahigh residential towers, and superhuman scale spaces at the level of squares and public parks. This type of planning results in a radical thermal transformation not only in the movement and transportation network but also in all public spaces and their external spaces. It is essential to understand the dimensions and principles of urban planning and design in conjunction with the competence of environmental design to reduce the impact of the urban heat island (UHI) phenomenon. *Remapping Urban Heat Island Atlases in Regenerative Cities* focuses on public health and wellbeing, decent work, and economic growth, sustainable cities, and

societies and climate action It presents atlases of UHI based digital techniques and methods of modelling as well as the use of these atlases mapping and models in exploring the placemaking problems in the new cities Covering topics such as artificial intelligence pedestrian density mapping and urban heat island mitigation this premier reference source is a critical resource for architects city planners urban planners city officials government officials policymakers non profit organizations politicians engineers libraries students and educators of higher education researchers and academicians **The Strategic**

**Management of Place at Work** David B. Audretsch,Alice Civera,Erik E. Lehmann,Konstantin P. Leidinger,Jonah M. Otto,Laurenz Weiße,Katharine Wirsching,2023-06-24 Global economic forces underpin political and social issues and have real impacts on the quality of life in local communities cities states and regions In the face of potential volatility leaders in every place concern themselves with how they can ensure local economic resiliency for present and future generations This book argues for the strategic management of places through intentional public policy that brings together stakeholders from the public private and nonprofit sectors to create an inclusive and sustainable economic path forward While many economists and political scientists have proposed one size fits all approaches this book puts forward a more holistic approach giving local leaders and policymakers the tools to take inventory of their local contexts and providing case study examples of how to craft public policies that create prosperous and sustainable economic conditions **Computational Science and Its**

**Applications - ICCSA 2024 Workshops** Osvaldo Gervasi,Beniamino Murgante,Chiara Garau,David Taniar,Ana Maria A. C. Rocha,Maria Noelia Faginas Lago,2024-08-19 This eleven volume set LNCS 14815 14825 constitutes the refereed workshop proceedings of the 24th International Conference on Computational Science and Its Applications ICCSA 2024 held at Hanoi Vietnam during July 1 4 2024 The 281 full papers 17 short papers and 2 PHD showcase papers included in this volume were carefully reviewed and selected from a total of 450 submissions In addition the conference consisted of 55 workshops focusing on very topical issues of importance to science technology and society from new mathematical approaches for solving complex computational systems to information and knowledge in the Internet of Things new statistical and optimization methods several Artificial Intelligence approaches sustainability issues smart cities and related technologies

Sustainability in Energy and Buildings 2023 John R. Littlewood,Lakhmi Jain,Robert J. Howlett,2024-03-06 This book contains the proceedings of the 15th KES International Conference on Sustainability and Energy in Buildings 2023 SEB2023 held in Bari Italy during September 18 20 2023 organized by KES International SEB23 invited contributions on a range of topics related to sustainable buildings and explored innovative themes regarding sustainable energy systems The conference formed an exciting chance to present interact and learn about the latest research and practical developments on the subject The conference attracted submissions from around the world Submissions for the full paper track were subjected to a blind peer reviewed process Only the best of these were selected for presentation at the conference and publication in these proceedings It is intended that this book provides a useful and informative snapshot of recent research developments in the

important and vibrant area of sustainability in energy and buildings      **Disaster Risk Reduction for Resilience** Saeid Eslamian, Faezeh Eslamian, 2022-04-08 This book is part of a six volume series on Disaster Risk Reduction and Resilience The series aims to fill in gaps in theory and practice in the Sendai Framework and provides additional resources methodologies and communication strategies to enhance the plan for action and targets proposed by the Sendai Framework The series will appeal to a broad range of researchers academics students policy makers and practitioners in engineering environmental science and geography geoscience emergency management finance community adaptation atmospheric science and information technology This volume offers the international guidelines and global standards for resilient disaster risk reduction and lessons learned from disasters particularly the COVID 19 and Cholera pandemics A resilient health system and an effective disaster risk management Index are then suggested The book further emphasizes urban resilience strategies with local authorities adaptation strategies for urban heat at regional city and local scales and lessons from community level interventions Also addressed are coastal erosion displacement and resettlement strategies Land use planning and green infrastructure are suggested as tools for natural hazards reduction Human security in times of climate change and urban heat at regional city and local scales is discussed for an integrated action with case studies based in Manila Burkina Faso Chad Mauritania Niger Senegal Nigeria India Spain and Ghana Structure design for cascading disasters resulting from mining and flooding is presented and sustainable smart city planning using spatial data is recommended      Livable Cities Mohsen Aboulnaga, Antonella Trombadore, Mona Mostafa, Ahmed Abouaiana, 2024-07-01 Livable Cities Urban Heat Islands Mitigation for Climate Change Adaptation Through Urban Greening elucidates on livability in urban areas providing readers with definitions and indicators of what makes a city livable It comprehensively introduces the urban heat island effect UHIE and offers strategies for mitigating high surface temperatures in metropolitan areas and adapting to climate change CC The coverage highlights the linkage between UHIE and Sustainable Development Goals SDGs the socio economic impacts of urban heat islands UHIs their effect on livability for citizens and the costs and benefits of mitigating UHI In addition it encompasses background information about the problems and challenges that megacities face in the 21st century followed by the cooling benefits that can be achieved from the different types of urban green coverage UGC whether conventional or innovative The book presents case studies on six cities that have successfully applied UGC Chicago United States Curitiba Brazil Stuttgart Germany Tokyo Asia Melbourne Australia and Johannesburg South Africa Additional case studies illustrate UHIE mapping in greater Cairo Egypt and Rome Italy to determine hot spot areas that need interventions and prioritization of UGC Highlights also include the role of blue and green infrastructures in creating livable cities in the post COVID 19 world trends of bi correlation between urban green spaces UGSs UGC and COVID 19 and global patterns of UGSs to shape better healthy sustainable and resilient cities Explains urban heat islands their causes and strategies for climate change adaptation to create livable cities Highlights the role of urban green coverage in post COVID 19 regulations in shaping more livable

sustainable and resilient cities Explores ways to reduce the urban heat island effect by exploiting urban greening to mitigate high temperatures in large cities like Cairo and Rome **The Middle East, Abstracts and Index**, 1996 **The Urban Heat Island** Iain D. Stewart, Gerald Mills, 2021-05-25 The Urban Heat Island UHI is an area of growing interest for many people studying the urban environment and local global climate change The UHI has been scientifically studied for 200 years and although it is an apparently simple phenomenon there is considerable confusion around the different types of UHI and their assessment The Urban Heat Island A Guidebook provides simple instructions for measuring and analysing the phenomenon as well as greater context for defining the UHI and the impacts it can have Readers will be empowered to work within a set of guidelines that enable direct comparison of UHI effects across diverse settings while informing a wide range of climate mitigation and adaptation programs to modify human behaviour and the built form This opens the door to true global assessments of local climate change in cities Urban planning and design strategies can then be evaluated for their effectiveness at mitigating these changes Covers both on surface and near surface or canopy measurements and impacts of Urban Heat Islands UHI Provides a set of best practices and guidelines for UHI observation and analysis Includes both conceptual overviews and practical instructions for a wide range of uses Urban Climate Change Crossroads Maria Paola Sutto, 2017-05-15 Urban climate change is a crossroads in two very different senses One is historical With the world now more than half urban and given the ecological consequences of the world's high consumption urban centers we are at an ecological crossroad We either head off the worst of ecological collapse through concerted and forward looking action or we face a Mad Max future of dystopia violence and upheaval The second crossroad is intellectual Our individual disciplines are unable to grasp the magnitude of the economic ecological challenges ahead For that we need to work holistically calling on the knowledge of climatologists engineers sociologists economists public health specialist designers architects community organizers and more The intellectual crossroad is nothing less than a new intellectual field of Sustainable Development Based on a major international forum held in Rome in 2008 this volume brings together leading climate change experts to engage with the climate change discourse as it shifts from mitigation to adaptation with particular attention to the urban environment In doing so it provides important insights into how to deal with the first crossroad by achieving the second It represents a new generation of thinking involving not only science but the broad array of fields that must be called upon to effectively address the global climate crisis from ecological science to political science from economics to philosophy to architecture and from public health to public art It is a pioneering effort to broaden the discursive field and is likely to remain a landmark study on the subject for a generation **Urban Climate Change and Heat Islands** Riccardo Paolini, Mattheos Santamouris, 2022-11-14 Urban Climate Change and Heat Islands Characterization Impacts and Mitigation serves as a go to reference for a foundational understanding of urban climate drivers and impacts Through the book's comprehensive chapters the authors help readers identify problems associated with urban climate change along with

potential solutions Global case studies are included and presented in a way in which they become globally relevant to any urban or intra urban environment The authors call on their extensive experience to present and explore methodologies and approaches to quantifying urban heat mitigation measures in a clear manner focusing on heat islands urban overheating and effects on air quality Includes global case studies that demonstrate how to design and implement urban heat mitigation measures that are area specific and effective under both current climate and future conditions Provides an overview of urban parameterizations in models leading to an improved understating of intra urban climate variability drivers Assesses potential heat and air quality health impacts of excessive heat events and changes in local urban climates      **Global Urban Heat**

**Island Mitigation** Ansar Khan,Hashem Akbari,Francesco Fiorito,Sk Mithun,Dev Niyogi,2022-06-15 Global Urban Heat Island Mitigation provides a comprehensive picture of global UHI micro thermal interaction in different built environments The book explains physical principles and how to moderate undesirable consequences of swift and haphazard urban development to create more sustainable and resilient cities Sections provide extensive discussion on numerous UHI mitigation technologies and their effectiveness in cities around the globe In addition the book proposes novel UHI mitigation technologies and strategies while also assessing the effectiveness and suitability of UHI mitigation interventions in various climates and urban forms Adopts a multidisciplinary approach bridging theoretical and applied urban climatology with urban heat mitigation Compiles disparate urban climate research concepts and technologies into a coherent framework Includes contributions from leaders in fields from around the globe      Urban Climate Change Adaptation in Developing Countries

Mohsen M. Aboulnaga,Amr F. Elwan,Mohamed R. Elsharouny,2019-03-14 This book describes the risks impacts measures actions and adaptation policies that have developed globally as a result of the severe impacts of global climate change In depth chapters focus on climate change assessment CCA in terms of vulnerabilities and reflection on the built environment and measures and actions for infrastructure and urban areas Adaptation actions specific to developing countries such as Egypt are presented and illustrated Global Climate change adaptation projects CCAPs in developing countries in terms of their targets and performance are presented and compared with those existing CCAPs in Egypt to draw learned lessons Climate change scenarios 2080 using simulations are portrayed and discussed with emphasis on a case study model from existing social housing projects in hot arid urban areas in Cairo in an effort to put forward an assessment and evaluation of current CCA techniques This book helps researchers realize the global impacts of climate change on the built environment and economic sectors and enhances their understanding of current climate change measures actions policies projects and scenarios Reviews and illustrates the impact of global climate change risks Provides an understanding of global climate change risks in seven continents Illustrates policies and action plans implemented at the global level and developing countries level Discusses climate change assessment and vulnerabilities with emphasis on urban areas Presents measures and action plans to mitigate climate change scenarios by 2080      **Survivability under Overheating** Afrodit

Synnefa,Shamila Haddad,Priya Rajagopalan,Matthaios Santamouris,2020-12-23 The present book discusses three significant challenges of the built environment namely regional and global climate change vulnerability and survivability under the changing climate Synergies between local climate change energy consumption of buildings and energy poverty and health risks highlight the necessity to develop mitigation strategies to counterbalance overheating impacts The studies presented here assess the underlying issues related to urban overheating Further the impacts of temperature extremes on the low income population and increased morbidity and mortality have been discussed The increasing intensity duration and frequency of heatwaves due to human caused climate change is shown to affect underserved populations Thus housing policies on resident exposure to intra urban heat have been assessed Finally opportunities to mitigate urban overheating have been proposed and discussed

### **Urban Overheating - Progress on Mitigation Science and Engineering**

**Applications** Michele Zinzi,Matheos Santamouris,2019-04-04 The combination of global warming and urban sprawl is the origin of the most hazardous climate change effect detected at urban level Urban Heat Island representing the urban overheating respect to the countryside surrounding the city This book includes 18 papers representing the state of the art of detection assessment mitigation and adaption to urban overheating Advanced methods strategies and technologies are here analyzed including relevant issues as the role of urban materials and fabrics on urban climate and their potential mitigation the impact of greenery and vegetation to reduce urban temperatures and improve the thermal comfort the role the urban geometry in the air temperature rise the use of satellite and ground data to assess and quantify the urban overheating and develop mitigation solutions calculation methods and application to predict and assess mitigation scenarios The outcomes of the book are thus relevant for a wide multidisciplinary audience including environmental scientists and engineers architect and urban planners policy makers and students

### Urban Heat Island (UHI) Mitigation Napoleon Enteria,Matteos

Santamouris,Ursula Eicker,2020-12-14 This book discusses the concepts and technologies associated with the mitigation of urban heat islands UHIs that are applicable in hot and humid regions It presents several city case studies on how UHIs can be reduced in various areas to provide readers researchers and policymakers with insights into the concepts and technologies that should be considered when planning and constructing urban centres and buildings The rapid development of urban areas in hot and humid regions has led to an increase in urban temperatures a decrease in ventilation in buildings and a transformation of the once green outdoor environment into areas full of solar energy absorbing concrete and asphalt This situation has increased the discomfort of people living in these areas regardless of whether they occupy concrete structures This is because indoor and outdoor air quality have both suffered from urbanisation The development of urban areas has also increased energy consumption so that the occupants of buildings can enjoy indoor thermal comfort and air quality that they need via air conditioning systems This book offers solutions to the recent increase in the number of heat islands in hot and humid regions

### Smart Growth and Climate Change Matthias Ruth,2006-01-27 The consensus on global



warming and its effects are now almost unanimous Even those politicians with serious denial issues are converting That said the question becomes How well does this book deal with urban sprawl and climate change Professor Ruth is a master at organizing thought and of creative thought but an editor most needs the former He has pulled together a very impressive list of experts from good institutions and organized their contributions to this subject in a meaningful useful way I think the coverage of the issue is both very competent and complete Bruce Hannon University of Illinois Urbana US This innovative volume systematically brings together two strands of applied research that to date have been carried out separately smart growth research and climate change adaptability research By providing theory models and case studies from North America Oceania and Europe the book creates synergies between the two strands reconciles differences and provides insights for decision makers at national and local levels

**Climate Change and Cities** Cynthia Rosenzweig, William D. Solecki, Patricia Romero-Lankao, Shagun Mehrotra, Shobhakar Dhakal, Somayya Ali Ibrahim, 2018-03-29 The Urban Climate Change Research Network's Second Assessment Report on Climate Change in Cities ARC3 2 is the second in a series of global science based reports to examine climate risk adaptation and mitigation efforts in cities The book explicitly seeks to explore the implications of changing climatic conditions on critical urban physical and social infrastructure sectors and intersectoral concerns The primary purpose of ARC3 2 is to inform the development and implementation of effective urban climate change policies leveraging ongoing and planned investments for populations in cities of developing emerging and developed countries This volume like its predecessor will be invaluable for a range of audiences involved with climate change and cities mayors city officials and policymakers urban planners policymakers charged with developing climate change mitigation and adaptation programs and a broad spectrum of researchers and advanced students in the environmental sciences

The Urban Fix Douglas Kelbaugh, 2019-04-01 Cities are one of the most significant contributors to global climate change The rapid speed at which urban centers use large amounts of resources adds to the global crisis and can lead to extreme local heat The Urban Fix addresses how urban design planning and policies can counter the threats of climate change urban heat islands and overpopulation helping cities take full advantage of their inherent advantages and new technologies to catalyze social cultural and physical solutions to combat the epic unprecedented challenges humanity faces The book fills a conspicuous void in the international dialogue on climate change and heat islands by examining both the environmental benefits in developed countries and the population benefit in developing countries Urban heat islands can be addressed in incremental manageable steps such as planting trees and painting roofs white which provide a more concrete and proactive sense of progress for policymakers and practitioners This book is invaluable to anyone searching for a better understanding of the impact of resilient cities in the monumental and urgent fight against climate change and provides the tools to do so

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