



Climate Change and Disadvantaged Communities

Challenges and Opportunities

Edited by

**Sk Ajim Ali, Quoc Bao Pham,
and Yunqing Xuan**



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Climate Change and Disadvantaged Communities

As climate change accelerates, so does the urgency to understand and address its unequal impacts. This book explores the uneven impacts of climate change and how it affects the lives and livelihoods of climate-disadvantaged communities by highlighting the specific challenges they face, such as heat-waves, droughts, flooding, health issues, and economic losses. It explains why vulnerable populations are more at risk due to factors such as lack of infrastructure, poverty, and limited access to resources. This book offers insights into conceptual frameworks to help vulnerable communities adapt and become more resilient to climate impacts. Real-life examples with challenges and actionable suggestions aim to inform policymakers and the public about the urgent need for targeted initiatives.

Features:

- Provides a comprehensive examination of how marginalized groups, from indigenous populations in the Niyamgiri Hills to urban slum dwellers in Asia, are disproportionately affected by climate change and what can be done to mitigate these impacts.
- Includes practical examples from different countries to help understand the intersection between climate change and social inequality.
- Utilizes advanced technologies and provides cutting-edge tools such as geospatial maps and diagrams for modelling climate threats and predicting climate-related challenges.
- Provides a roadmap for more resilient and inclusive future strategies.
- Highlights interdisciplinary discussions and contributions by various stakeholders to reach different audiences and offer regional problem-solving opportunities.

This book serves as a valuable resource for a wide audience, including climate scientists, geographers, ecologists, geologists, urban planners, environmentalists, research scholars, and policymakers engaged in the fields of environmental management, climate justice, and sustainable development. By featuring the voices and experiences of disadvantaged communities, this book contributes meaningfully to the ongoing debates of climate justice, sustainable development, and equitable adaptation pathways.



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Preface

According to the World Health Organization (WHO) report, between 2030 and 2050, climate change is expected to result in an extra 2,50,000 fatalities per year. The most vulnerable populations are expected to be children and the underprivileged people of developing nations. In this regard, this book is to draw academics' and researchers' attention to the critical issue of how climate change disproportionately impacts vulnerable and disadvantaged communities by examining the socioeconomic, environmental, and infrastructure factors that contribute to these disproportions and offering a thorough understanding of why some communities are more affected than others.

The recent increase in temperature and alteration of rainfall patterns are undoubtedly signs of climate change, which will have an adverse impact on communities and society as a whole. This book explores how climate change affects the lives and livelihoods of people in general and climate-disadvantaged communities in particular by highlighting the specific challenges they face, such as increased risk of heatwaves, droughts, flooding, health issues, and economic losses, and explains why vulnerable populations are more at risk due to factors like lack of infrastructure, poverty, and limited access to resources. It also offers empirical insights about the unequal impacts of climate change and a conceptual framework to help vulnerable communities adapt and become more resilient to climate impacts. By emphasizing real-life examples, this book also aims to inform policymakers and the public about the urgent need for targeted initiatives to support disadvantaged communities in the face of climate change.

This book presents a vision for integrated solutions and a path forward for climate-disadvantaged communities, recognizing that climate change is intensifying extreme weather events such as heatwaves, droughts, and floods which disproportionately affect vulnerable populations, leading to death, illness, hunger, displacement, and the disruption of lives and livelihoods. This book helps readers gain a better understanding of the multiple impacts of climate change and the disproportionate effects on vulnerable communities by outlining the particular challenges that these people confront, along with practical responses and strategies to support and sustain them.

This book is organized into three thematic parts, each addressing a crucial dimension of the climate vulnerability-resilience nexus. Part I: Climate Change Vulnerability, Livelihoods, and Resilience of Disadvantaged Communities delves into the structural and place-based vulnerabilities that shape exposure and adaptive capacity in rural and peri-urban regions. The chapters in this section examine issues ranging from agrarian distress and gendered vulnerabilities to indigenous coping strategies and the role of social capital in resilience-building. Part II: Urbanization, Public Health, and Microclimate Challenges in a Changing Climate shifts focus to the rapidly urbanizing landscapes of the Global South, where informal settlements, limited infrastructure, and public health crises intersect with intensifying climatic events. This section presents empirical analyses and case studies on urban heat stress, air quality degradation, disease burdens, and governance deficits in urban climate adaptation. Part III: Natural Resources, Ecosystems, and Climate Impact Assessments: Modeling, Mapping, and Risk Assessment explores the role of data-driven tools in understanding climate impacts on ecosystems and resource-dependent communities. Employing a mix of spatial mapping, vulnerability modelling, and ecological assessments, these chapters provide methodological and policy insights into managing climate risks at various scales.

Taken together, the 19 chapters and one introductory chapter in this book offer diverse perspectives and critical reflections that emphasize the importance of inclusive, participatory, and context-specific approaches to climate action. By foregrounding the voices and experiences of disadvantaged communities, we hope this volume contributes meaningfully to ongoing debates on climate justice, sustainable development, and equitable adaptation pathways.

We extend our sincere gratitude to all the contributors who submitted their chapters with dedication and on time. Their insightful and rigorous scholarship has been instrumental in shaping

this volume into a meaningful contribution to the discourse on climate change and disadvantaged communities. We believe this book will serve as a valuable resource for a wide audience, including climate scientists, geographers, ecologists, geologists, urban planners, environmentalists, research scholars, and policymakers engaged in the fields of environmental management, climate justice, and sustainable development. We are also deeply thankful to CRC Press – Taylor & Francis Group, especially Irma Shagla Britton, Senior Editor for GIS & Remote Sensing, Environmental Engineering & Science, and her team, for their professional guidance and support throughout the publication process.

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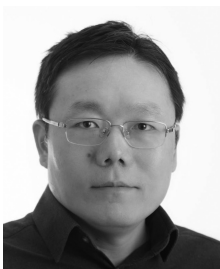
Sk Ajim Ali is an environmental geographer who studies environmental concerns with a focus on places, politics, and the safe management of human and built environments. He received his PhD from Aligarh Muslim University, Aligarh. Currently, he is remotely working as a Research Associate at the Global Development Institute, School of Environment, Education and Development, University of Manchester, Manchester, UK. His principal areas of research include disaster management, climate change, and public health.

Last year, he worked in a SEED-funded project on socio-spatial heat wave vulnerability and public health at the University of Manchester. Additionally, he studied geohazards vulnerability assessment through international collaboration with different countries of the world to understand environmental hazards, risk, and attendant issues of sustainable development. He was also employed as a guest lecturer at the Faculty of Life Sciences, Aligarh Muslim University, where he taught Environmental Studies to undergraduate students. He has contributed 57 scientific research papers in international journals on issues pertaining to environmental degradation, waste management, and geohazards vulnerabilities. He is a reviewer of many journals published by a variety of reputable academic publishers. He is the author of two books on remote sensing and quantum GIS. He is also contributing as an associate editor, editorial board member, and guest editor of different journals.



Quoc Bao Pham is currently working as an Assistant Professor at the Faculty of Natural Science, Institute of Earth Science, University of Silesia in Katowice, Katowice, Poland. He has obtained his PhD degree from the Department of Hydraulic and Ocean Engineering, National Cheng Kung University, Taiwan. He has more than eight years of research experience in hydrology, GIS, and remote sensing. His research interests are water resources engineering, applied machine learning, climate change, hydrology, remote sensing, GIS, and spatial analysis. He has collaborated actively with many

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Dr. Xuan strives to contribute to the learner and professional communities. This includes his other undertakings as the Vice Chair of the Welsh Local Centre of the Royal Meteorological Society, Review Editor of the *Weather* journal, and Board Member of the Conference Committee of the Institute of Mathematics and Its Applications.

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12 Navigating the Climate Crisis

Public Health Challenges and the Role of Community Empowerment

Mariya Hasnat, Mohd Kashif Khan, and Sania Kulsum

INTRODUCTION

Climate change is one of the most significant global challenges of the 21st century, with far-reaching consequences for ecosystems, economies, and societies. However, its effects on community well-being are among the most pressing concerns. As global temperatures rise, extreme weather events such as hurricanes, droughts, and floods have become more frequent and intense, resulting in widespread disruptions to human health and well-being. In addition to these extreme events, long-term shifts in climate patterns, such as rising sea levels, changing precipitation patterns, and the warming of oceans, are contributing to an evolving landscape of health risks. The primary driver of global climate shifts is the increase in greenhouse gases (GHGs), particularly carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O), which trap heat in the Earth's atmosphere (Watts et al., 2018). These gases primarily result from human activities, including the burning of fossil fuels for energy, deforestation, industrial processes, and agricultural practices. As the concentration of these gases in the atmosphere rises, the Earth's average temperature continues to climb, leading to a cascade of environmental and health effects. Alongside GHG emissions, air pollution is another major environmental factor linked to global climate shifts (Costello et al., 2009). The burning of fossil fuels not only releases carbon emissions but also contributes to the formation of particulate matter (PM) and ozone, which are harmful to human health. Long-term exposure to poor air quality can lead to respiratory and cardiovascular diseases, exacerbate asthma, and even increase mortality rates. Heatwaves, which are becoming more frequent due to global climate shifts, also exacerbate the effects of air pollution, leading to additional health complications (Smith & Bradley, 2016).

The intensification of extreme weather events due to global climate shifts has profound implications for community well-being. More frequent and intense heatwaves increase the risk of heat-related illnesses, such as heat exhaustion, heat stroke, and dehydration. Additionally, severe storms and flooding can directly injure or kill people and destroy infrastructure, including health facilities, disrupting medical care. Flooding also increases the risk of waterborne diseases, as contaminants spread through water systems (Lloyd et al., 2011). Climate change affects the habitats of disease vectors such as mosquitoes, ticks, and other insects, leading to shifts in the geographic distribution of diseases like malaria, dengue, Lyme disease, and Zika virus (Haines & Ebi, 2019). Warmer temperatures and altered rainfall patterns create favorable conditions for these vectors to thrive in areas previously not affected by such diseases, putting new populations at risk. Changes in climate patterns disrupt agricultural productivity, leading to food insecurity and malnutrition, particularly in developing countries. Droughts, floods, and shifts in growing seasons reduce crop yields and threaten food supplies. Additionally, water sources are increasingly affected by global climate shifts, with rising temperatures and changing rainfall patterns influencing water availability. Contaminated water supplies, exacerbated by extreme weather events, increase the risk of waterborne diseases. The emotional and psychological toll of global climate shifts is often overlooked (Luber & McGeehin, 2008). The stress and anxiety caused by extreme weather events, displacement due to natural disasters, and the gradual realization of environmental degradation can have