Climate Resilient Cities: A Primer on Reducing Vulnerabilities to Climate Change Impacts and Strengthening Disaster Risk Management in East Asian Cities

The Primer addresses and answers the question “Why will cities be interested?”

> They will understand the issues and importance of climate change in urban governance, especially in East Asia.
> They will engage in identifying their vulnerabilities to potential climate change impacts.
> They will learn about the “why” and the “how” of reducing vulnerabilities to climate changes and natural disasters through illustrative examples from other cities in East Asia and other parts of the world.
> They will understand the requirements and process for moving from theory to practice in adapting sound practices to their particular contexts.

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The Primer can be downloaded from www.worldbank.org/eap/climatecities
Climate Resilient Cities

A Primer on Reducing Vulnerabilities to Climate Change Impacts and Strengthening Disaster Risk Management in East Asian Cities

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Acknowledgments

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Acronyms and Abbreviations

ABI  Association of British Insurers
ADPC  Asian Disaster Preparedness Centre
APEC  Asian-Pacific Economic Cooperation
ASMC  ASEAN Specialized Meteorological Centre
ASEAN  Association of East Asian Nations
BCA  Building Construction Authority (Singapore)
C  Celsius
CCSFC  Central Committee for Storm and Flood Control (Hanoi, Vietnam)
CDM  Clean Development Mechanism (Kyoto Protocol)
CER  Certified Emission Reduction
CERT  Community Emergency Response Team (Albuquerque, USA)
CFCs  Chlorofluorocarbons
CH₄  Methane
CIG  Climate Impacts Group (University of Washington)
CIRCA  Center for Initiatives and Research on Climate Adaptation (Albay Province, Philippines)
CNCCP  China National Climate Change Program
CNG  Compressed natural gas
CO  Carbon monoxide
CO₂  Carbon dioxide
COP  Conference of the Parties (UNFCCC)
Dept.  Department
DFID  Department for International Development (U.K.)
DRI  Disaster Risk Index
DRM  Disaster Risk Management
DRR  Disaster Risk Reduction
EAP  East Asia and the Pacific Region – World Bank
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>EASSD</td>
<td>East Asia and the Pacific Region Sustainable Development Department – World Bank</td>
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<td>EASUR</td>
<td>East Asia and the Pacific Region, Urban, Water, and Disaster Management Sector Unit – World Bank</td>
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<td>ECLAC</td>
<td>Economic Commission for Latin America and the Caribbean</td>
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<td>EDB</td>
<td>East Asia and the Pacific Region, Urban, Water, and Disaster Management Sector Unit – World Bank</td>
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<tr>
<td>EEA</td>
<td>Economic Development Board (Singapore)</td>
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<td>EMS</td>
<td>European Environment Agency</td>
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<td>EMS</td>
<td>Emergency Management Section of the Emergency Preparedness Bureau of the Seattle Police Department</td>
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<td>EU</td>
<td>European Union</td>
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<td>F</td>
<td>Fahrenheit</td>
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<td>FEMA</td>
<td>Federal Emergency Management Agency</td>
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<tr>
<td>GEF</td>
<td>Global Environment Facility</td>
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<td>GDP</td>
<td>Gross Domestic Product</td>
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<td>GFDRR</td>
<td>Global Facility for Disaster Reduction and Recovery</td>
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<td>GHG</td>
<td>Greenhouse gas</td>
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<tr>
<td>GIS</td>
<td>Geographical Information System</td>
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<td>GRIP</td>
<td>Global Risk Identification Program (UNDP)</td>
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<td>HDB</td>
<td>Housing Development Board (Singapore)</td>
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<td>HDI</td>
<td>Human Development Index</td>
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<td>IADB</td>
<td>Inter-American Development Bank</td>
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<td>ICLEI</td>
<td>International Council for Local Environment Initiatives</td>
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<td>IEA</td>
<td>International Energy Agency</td>
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<td>IFRC</td>
<td>International Federation of Red Cross and Red Crescent Societies</td>
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<td>INCD</td>
<td>Intergovernmental Negotiating Committee</td>
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<td>INEMAR</td>
<td>Inventario Emissioni in Aria (Milan, Italy)</td>
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<td>IPCC</td>
<td>Intergovernmental Panel on Climate Change</td>
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<td>JBIC</td>
<td>Japan Bank for International Cooperation</td>
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<td>Km²</td>
<td>Square Kilometer</td>
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<td>LED</td>
<td>Light emitting diodes</td>
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<td>LEZ</td>
<td>Low emission zone in cities (i.e. London, Milan)</td>
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<td>LGA</td>
<td>Local Government Association</td>
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<tr>
<td>LNG</td>
<td>Liquefied natural gas</td>
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<td>MCDCC</td>
<td>Makati City Disaster Coordination Council (Philippines)</td>
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<td>MCEPC</td>
<td>Makati City Environmental Protection Council (Philippines)</td>
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<tr>
<td>MDG</td>
<td>Millennium Development Goal</td>
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<td>MEWR</td>
<td>Ministry of Environment and Water Resources (Singapore)</td>
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<td>MOSE</td>
<td>Modulo Sperimentale Elettromecanico (Venice, Italy)</td>
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<td>MoU</td>
<td>Memorandum of Understanding</td>
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<td>N₂O</td>
<td>Nitrous oxide</td>
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<td>NAPA</td>
<td>National Adaptation Programme of Action</td>
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<td>NASA</td>
<td>National Aeronautics and Space Administration (USA)</td>
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<tr>
<td>NDMA</td>
<td>National Disaster Management Agency (Indonesia)</td>
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<tr>
<td>NDRC</td>
<td>National Development and Reform Commission (China)</td>
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NEA  National Environmental Agency (Singapore)
NGO  Nongovernmental organization
NH₃  Ammonia
NMVOC  Non-methane volatile organic compounds
NOₓ  Nitrogen oxide
NYC  New York City (USA)
NYCDEP  New York City Department of Environmental Protection (USA)
O&M  Operation and management
OECD  Organization for Economic Cooperation and Development
PACD  Plan of Action to Combat Desertification
PAP  People’s Action Party (Singapore)
PCDD/Fs  Polychlorinated dibenzop-dioxins and dibenzofurans
PDR  People’s Democratic Republic (Lao)
PM  Particulate matter
PM₂.₅  Particles of 2.5 micrometers
PM₁₀  Particles of 10 micrometers
PUB  National Water Agency (Singapore)
R&D  Research and development
SCDF  Singapore Civil Defense Force
SDART  Seattle Disaster Aid and Response Teams
SGP  Singapore Green Plan
SINERGY  Singapore Initiative in New Energy Technologies
SLR  Sea-level rise
SO₂  Sulfur dioxide
TMG  Tokyo Metropolitan Government
TSP  Total Suspended Particles
UCLG  United Cities and Local Governments
UK  United Kingdom
UKCIP  United Kingdom Climate Impacts Program
UN  United Nations
UN/ISDR  United Nations International Strategy for Disaster Reduction
UNCCD  United Nations Conventions to Combat Desertification
UNCED  United Nations Conference on Environment and Development
UNCOD  United Nations Conference on Desertification
UNDP  United Nations Development Program
UNEP  United Nations Environmental Program
UNFCCC  United Nations Framework Convention on Climate Change
US  United States
USA  United States of America
USAID  United States Agency for International Development
USEPA  United States Environmental Protection Agency
WRI  World Resources Institute
Climate change is no longer a distant possibility but a current reality. Global temperatures have recorded unprecedented increases. The length and timing of seasons are changing. The frequency and severity of floods and cyclones accompanied by rising sea levels are increasing. In short, climate change has become one of the defining challenges for policymakers, industry, and civil society in this century, and is a development, investment, economic, and social issue, which affects most sectors.

The East Asia Region will face the brunt of climate change impacts. A stark example of the future is the timing and intensity of the May 2008 Myanmar cyclone that left around 80,000 dead and many others missing, with millions homeless and food production severely affected.

Loss from flooding and hurricanes is an all too frequent occurrence in many countries in the Region, particularly in cities where people and assets are concentrated. Urban centers must be prepared with specialized tools to deal with climate change impacts and early warning systems. Moreover, given the potential devastation associated with future climate change-related disasters, it is vital to change the way we build and manage our cities, which account for 80 percent of greenhouse gas emissions today.

The 13th Conference of the Parties to the United Nations Framework Convention on Climate Change at Bali in December 2007 affirmed the increased willingness of city governments to take action in addressing climate impacts. The World Mayors’ and Local Governments’ Climate Protection Agreement lays out direct principles for adaptation and preparedness, in addition to concrete targets for mitigation. Similarly, the C40 Climate Leadership Group of large cities – including Bangkok, Hanoi, Hong Kong, Jakarta, Seoul, Shanghai, and Tokyo from East Asia – are cooperating to reduce greenhouse gas emissions.

Other natural disasters, beyond those that are climate induced, also add to the challenges facing East Asian cities. The ring of fire – composed of 75 percent of the world’s active and dormant volcanoes
and located at the borders of major tectonic plates (prone to seismic activity) follows along the eastern edge of Asia as well as Southeast Asia. China’s Sichuan earthquake in May 2008, the tsunami that hit the Region in 2004, and the volcanic eruption from Mount Pinatubo in the Philippines in 1991 have all resulted in devastating economic damage and loss of lives.

Now is the time, therefore, for policymakers to take an integrated look at reducing vulnerabilities to climate change and other natural disasters in a comprehensive disaster management system.

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