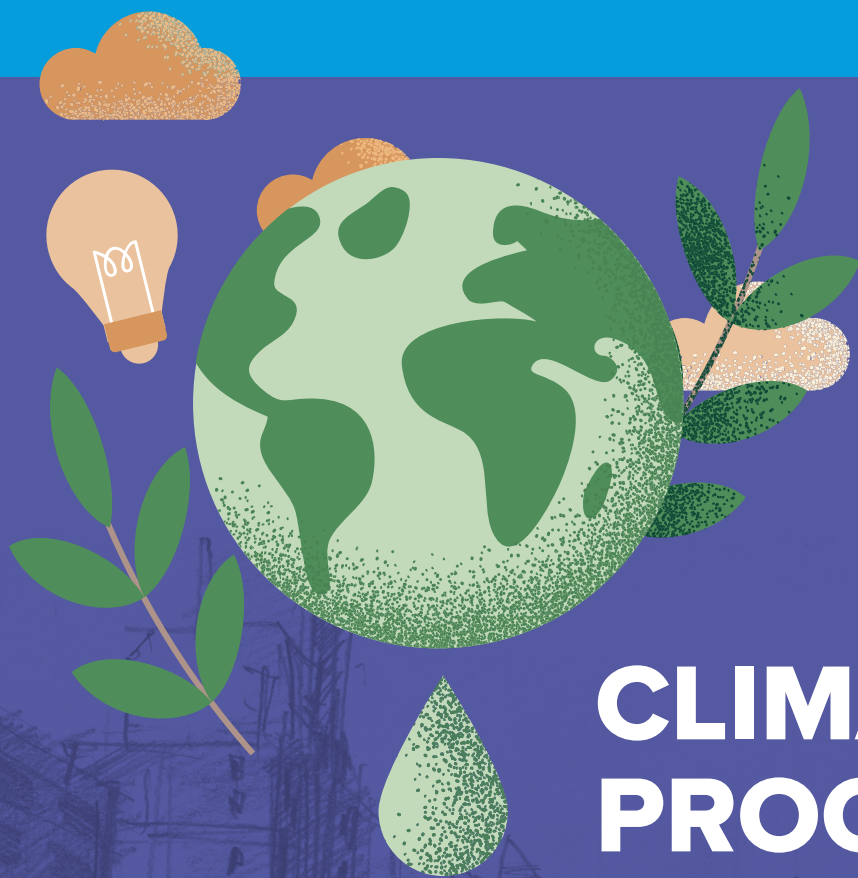


April 2021



CLIMATE PROOFING TOOLKIT

FOR BASIC URBAN
INFRASTRUCTURE, WITH
A FOCUS ON WATER AND
SANITATION

CLIMATE PROOFING TOOLKIT FOR BASIC URBAN INFRASTRUCTURE, WITH A FOCUS ON WATER AND SANITATION

Nairobi, April 2021



All rights reserved ©2018 United Nations Human Settlements Programme (UN-Habitat)
P.O. Box 30030, 00100 Nairobi, Kenya www.unhabitat.org

HS Number: HS/025/20E

DISCLAIMER:

The designations employed and the presentation of material in this report do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the delimitation of its frontiers or boundaries, or regarding its economic system or degree of development. The views expressed in this publication do not necessarily reflect the views of the United Nations Human Settlements Programme or its Executive Board.

ACKNOWLEDGEMENTS:

COORDINATORS: Andre Dzikus and Hezekiah Pireh, UN-Habitat

LEAD AUTHOR: Prof. George Krhoda, University of Nairobi, Kenya

PEER REVIEWERS: Ms. Mara Mendes, Former Expert, United Nations Framework Convention on Climate Change (UNFCCC), Mr. Sergey Makarov, Adviser, Green Climate Fund, GIZ and former expert, UNFCCC, Dr. Kodwo Andah, Former Scientific Coordinator, Water Resources Research and Development Centre, University of Foreigners of Perugia.

DESIGN AND LAYOUT: Michael Lusaba

Table of Contents

PREFACE	8
KEY MESSAGES	9
ACRONYMS	12
DEFINITIONS	14
CHAPTER 1: CLIMATE CHANGE TRENDS AND REFLECTIONS	18
1.1 Introduction	19
1.2 Scope and objectives of the toolkit.....	19
1.3 Target audience	20
1.4 Toolkit structure.....	20
CHAPTER 2: CLIMATE CHANGE HAZARD AND CHALLENGES TO URBAN INFRASTRUCTURE.....	22
2.1 General reflections on climate change and water resources	23
2.2 Cities and climate change.....	26
2.3 UN-Habitat role in climate change.....	26
2.4 Trends in urban disasters associated with extreme weather events.....	27
CHAPTER 3: SETTING STAKEHOLDER PARTICIPATION	34
3.1 Role of stakeholders in climate proofing	35
3.2 National and subnational institutional framework for planning climate proofing.....	36
3.3: Local institutional arrangements.....	37
3.4 Sectoral level	38
3.5 Stakeholders' engagement.....	38
CHAPTER 4: CLIMATE PROOFING TOOLKIT	40
STEP 1: SCREENING, HAZARD IDENTIFICATION AND LEVELS OF EXPOSURE	41
4.1 STEP 1: Screening, hazard identification and levels of exposure	41
4.2 Sensitivity measures	54
STEP 2: SENSITIVITY MEASURES	54
4.3 Adaptive capacity analysis.....	61
STEP 3: ADAPTIVE CAPACITY ANALYSIS	61
4.4 Vulnerability assessment for infrastructure	69
STEP 4: VULNERABILITY ASSESSMENT FOR INFRASTRUCTURE	69
4.5 Options for determination and assessment of climate proofing.....	79

STEP 5: OPTIONS FOR DETERMINATION AND ASSESSMENT OF CLIMATE PROOFING	79
4.6 Governance, infrastructure, capacity-building	93
STEP 6: GOVERNANCE, INFRASTRUCTURE, CAPACITY BUILDING	93
4.7 “Soft” climate proofing options for general infrastructure	99
STEP 7: “SOFT” CLIMATE PROOFING OPTIONS FOR GENERAL INFRASTRUCTURE	99
4.8 Implementation of climate proofing measures	106
STEP 8: IMPLEMENTATION OF CLIMATE PROOFING MEASURES	106
CHAPTER 5: MONITORING AND EVALUATION	118
5.1 Introduction	119
5.2: Monitoring and evaluation plan for climate proofing infrastructure	119
5.3 What to monitor: integrity of infrastructure, floods and drivers, weather, water quality, ecosystem.....	119
5.4 Regular review of vulnerability and adaptation options.....	123
CHAPTER 6: FINAL CONSIDERATION AND WAY FORWARD	124
6.1 Conclusion.....	125
REFERENCES.....	126
ANNEX 1: INDICATIVE LIST OF SOFTWARE PACKAGES AND WEB APPLICATIONS FOR GENERATING CLIMATE CHANGE PROJECTIONS STEPS FOR CLIMATE RISK MANAGEMENT	132
ANNEX 2: ADDITIONAL MATERIALS	133
ANNEX 3: COMMUNITY-BASED RISK SCREENING TOOL – ADAPTATION AND LIVELIHOODS	134

List of Boxes

Box 2.1: Effects of rainfall changes.....	28
Box 2.2: The floods in Mozambique.....	29
Box 4.1: Use of historical data in climate policy formulation	45
Box 4.2: Peru hit by drinking water shortage as death toll in flooding up over 70	46
Box 4.3 Creating a community map of features and key landmarks.....	48
Box 4.4 Estimates of flooding using the 3Di area model.....	49
Box 4.5. Flood hazard map: Bucao, the Philippines	50
Box 4.6 Green Book: Adapting South African settlements to climate change.....	51
Box 4.7: Heatwave in Europe	55
Box 5.1: Identifying indicators to assess adaptive capacity and barriers to adaptation to flooding specific climate change variable	62
Box 6.1: Reducing vulnerability through storm warning in Mozambique coastal cities	70
Box 6.2: Flooding in the Mekong Delta and rural road development in Cambodia.....	74
Box 6.3: Risk Perceptions towards flooding in low-income households' adaptation to flooding in Indore, India.....	77
Box 6.4: Economic development and ecosystem change in the Gulf of Mexico	78
Box 7.1: Options for water security, climate change and development in Iloilo, the Philippines	81
Box 7.2: Exploring adaptation options for water infrastructure at sea level	89
Box 8.1: Objectives of the Kenya's NAP	98
Box 10.1: Other international funds that can be considered for adaptation and climate proofing.....	114
Box 10.2 The Adaptation Benefit Mechanism.....	115
Box 11.1: Monitoring of the LIFE+ funded project climate-proofing social housing landscapes, London	121

List of Figures

Figure 2.1: Global mean temperature difference 1850–1900 (degrees Celsius).	24
Figure 7.1: Impact of climate change and of climate proofing	83

List of Tables

Table 2.1: Potential impacts of climate change on water resources, water supply and sanitation infrastructure.....	25
Table 2.2: Global extent and impacts of certain disasters by hazard type, total 1990–2017.....	28
Table 2.3: Impacts on basic infrastructure resulting from climate change	30
Table 2.4: Climate-proofing options for water supply and sanitation investment projects	32
Table 3.1: Climate proofing activities and the type of stakeholder.....	35
Table 3.2: Types of national and subnational institutions involved in climate change	36
Table 3.3: Role of local and subnational government on planning.....	38
Table 4.1: Checklist for identification of levels of exposure.....	42
Table 4.2: Sources of data	44
Table 4.3: Example of local observation template.....	46
Table 4.4: Summary table for climate change impacts and costs	47
Table 4.5: Template for assessing flood disaster.....	47
Table 4.6: Housing - Inundation mapping for housing	49
Table 4.7: Example of an overview of exposed people, places, institutions	52
Table 4.8: Exposure assessment in water supply and sanitation infrastructures.....	53
Table 4.9: Data types and analysis	55
Table 4.10: Sensitivity of components of water supply and sanitation	57
Table 4.11: Format for measuring sensitivity of water supply and sanitation	58
Table 4.12: Estimation of sensitivity analysis	58
Table 4.13: Measures of socioeconomic sensitivity - different degrees of aspects of urban poverty	59
Table 5.1: Determinants of adaptive capacity.....	64
Table 5.2: Determinants and dimensions of adaptive capacity.....	66
Table 5.3: Indicative risks associated with diverse infrastructures	67
Table 5.4: Summary of indicators of vulnerability of subcomponents in water supply and sanitation.....	68
Table 6.1: Tasks in vulnerability assessment.....	72
Table 6.2: Data collection tools for vulnerability mapping.....	77
Table 7.1: Summary of steps for identifying options for climate proofing	80
Table 7.2: Economic screening of climate proofing options.....	83
Table 8.1: Governance structure for vulnerability assessment	97
Table 9.1: Examples of climate proofing in practice.....	100
Table 9.2: Climate proofing options using technical guidelines.....	101
Table 10.1: Climate proofing implementation worksheet.....	106
Table 10.2: Action plan for climate proofing urban infrastructure implementation.....	107
Table 10.3: Types of funds and schemes	111
Table 11.1: Categories of indicators applicable to climate proofing project.....	121

Preface

Maimunah Mohd Sharif, Under-Secretary-General and Executive Director, UN-Habitat

Climate change is not a crisis waiting to happen. It is happening now and we are getting accustomed to more devastating news of extreme events linked to these phenomena. From the largest drought-induced municipal water emergency in Cape Town, South Africa, the unprecedented tropical cyclones Idai and Kenneth hitting Mozambique in one season, to Hurricanes Katrina and Harvey, the most costly Atlantic hurricanes on record, as well as the ongoing consequences on sea-level rise in the Small Islands Developing States are great reminders. To echo the United Nations Secretary-General António Guterres' remarks to the 2019 Climate Summit Preparatory Meeting, *"the world is facing a grave climate emergency and climate disruption is progressing even faster than the world's top scientists have predicted."*

Hosting more than a half of the global population, cities are becoming increasingly vulnerable to the adverse effects of climate change. By one estimate, 530 cities are already reporting the devastating effects of climate change, subjecting up to 517 million urban residents to tropical diseases and lost livelihoods, destroying infrastructure, limiting access to water and food, and undermining the capacity of local governments to provide basic services to their citizens. Estimates project that by 2050, 800 million urban residents in over 570 low-lying coastal cities will be impacted by sea level rise and coastal flooding. It is also estimated that up to 650 million people in 500 cities will experience decreasing water supplies due to climate



At UN-Habitat, we have prioritized *"Strengthened Climate Action and improved Urban Environment"* as one of the four pillars of our 2020–2023 Strategic Plan. Through our flagship programme, *"RISE-UP: Resilient Settlements for the Urban Poor"*, we are working with our partners to leverage large-scale investment to improve services, build communities' resilience, and adapt the global hotspots of vulnerability to climate change. In that sense, focusing on water and sanitation may help cities to tackle challenges and enhance sustainable development while integrating climate resilience actions.

This *Climate Proofing Toolkit for Basic Urban Infrastructure, with a focus on Water and Sanitation* is part of our efforts to provide practical guidance to policymakers, planners and service providers on how to integrate climate actions and responses into infrastructure planning and investment.

It is my hope that the key messages and tasks outlined in this toolkit will inspire leaders, policymakers, planners and service providers to factor potential climate change

预览已结束，完整报告链接和二维码如下：

https://www.yunbaogao.cn/report/index/report?reportId=5_17359

