United Nations Development Programme

Paving the Way for Climate-Resilient Infrastructure

Guidance for Practitioners and Planners

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DEFINITION

Climate proofing

Climate proofing refers to the explicit consideration and internalization of the risks and opportunities that alternative climate change scenarios are likely to imply for the design, operation and maintenance of infrastructure. In other words, integrating climate change risks and opportunities into the design, operation, and management of infrastructure.

Acronyms and Abbreviations

AsDB	Asian Development Bank
CAPRA	Central American Probabilistic Risk Assessment
CBA	cost-benefit analysis
CCA	climate change adaptation
CEA	cost-effectiveness analysis
CHIPS	Couple Hurricane Intensity Prediction System
CO_2	carbon dioxide
DRM	disaster risk management
DRR	disaster risk reduction
ECLAC	Economic Commission for Latin America and the Caribbean
EIA	environmental impact assessment
ETH	Swiss Federal Institute of Technology Zurich
EWS	early warning system
FRACC	Feedback-Rich Adaptation to Climate Change
GCM	global climate models
GDP	gross domestic product
GFDRR	Global Facility for Disaster Reduction and Recovery
GHG	greenhouse gas
GIS	geographic information System
HDI	Human Development Index
IDB	Inter-American Development Bank
IPCC	Intergovernmental Panel on Climate Change
ISDR	International Strategy for Disaster Reduction (see UNISDR)
JCSS	Joint Committee on Structural Safety
LECRDS	low-emission climate-resilient development strategies
LQI	Life Quality Index
MARN	Ministry of Environment and Natural Resources, El Salvador
M&E	monitoring & evaluation
MC	marginal cost
MCA	multi-criteria analysis
MNSB	marginal net social benefit
MOP	Ministry of Public Works, Transport, Housing and Urban Development, El Salvador
MSB	marginal social benefit
NGO	non-governmental organization
NSB	net social benefit
OECD	Organisation for Economic Co-operation and Development
PNG	Papua New Guinea
PDNA	Post Disaster Needs Assessment
PDF	probability density function
PIEVC	Public Infrastructure Engineering Vulnerability Committee
PRA	probabilistic risk assessment
SCCF	Special Climate Change Fund
SNET	National Service of Territorial Studies, El Salvador
SLR	sea-level rise
SVSL	societal value of a statistical life
SWTP	societal willingness to pay
TC	total cost
TSB	total social benefit
UNDAC	United Nations Disaster Assessment and Coordination
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNISDR	United Nations International Strategy for Disaster Reduction
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
USAID	United States Agency for International Development

Foreword

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According to the Global Facility for Disaster Reduction and Recovery (GFDRR) and the United Nations Disaster Assessment and Coordination (UNDAC), El Salvador is recognized as the most vulnerable country in the world. The 2010 UNDAC report, *Assessment of the Capacity for Emergency Responses 2010*, states that almost 90 percent of the territory in El Salvador is located in an area of high risk. These areas are home to more than 95 percent of the country's population, and approximately 96 percent of the country's gross domestic product (GDP) is linked with these locations. According to studies from the Economic Commission for Latin America and the Caribbean (ECLAC), natural disasters have caused 6,500 deaths since 1972, with an economic cost of greater than 16 billon 2008 United States dollars. Of these impacts, more than 62 percent of the deaths and between 87 to 95 percent of the economic losses were related to climatic events.

These figures are alarming and give rise to considerable concern in light of the projections that El Salvador will experience an increase in frequency and severity of natural hazards as a result of climate change, particularly in relation to extreme rainfall. The country is already witnessing such extreme events, with devastating consequences including economic and human loss.

During the two first years of this administration, the country suffered extreme weather events with exceptional levels of rainfall. On 29 May 2010, during Tropical Storm Agatha, precipitation levels were recorded at 483 mm over the course of 24 hours with maximum rainfall intensity concentrated over six hours. The period of return for this level of intense rainfall is more than 300 years.

In November 2009, the combination of Hurricane Ida and a low-pressure system in the Pacific coast also presented extremely high rainfall intensity over six hours. Like Tropical Storm Agatha, the period of return for this level of intense rainfall is more than 300 years. The disaster provoked by Ida caused the death of 200 people, and directly affected another 122,816 people. The damages and material losses were estimated at $314.8 million, equivalent to 1.44 percent of GDP. The rehabilitation and reconstruction needs were estimated at close to $344 million.

These two events clearly demonstrate the country's high vulnerability to natural hazards, and the necessity to take preventive action through a combination of risk management and climate change adaptation measures. The Salvadoran government, through the Ministry of Public Works (MOP), the Ministry of Environment and