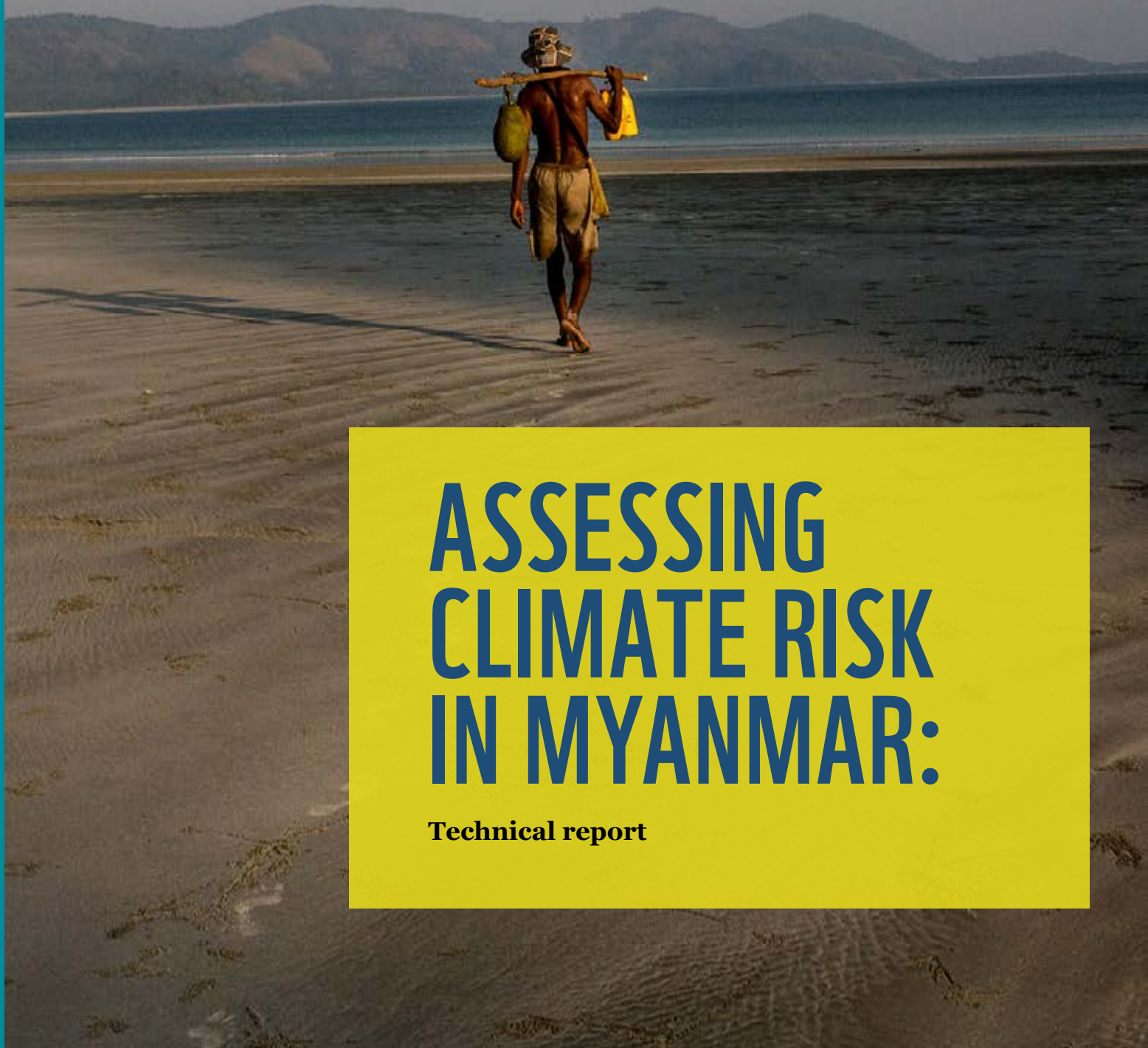




**MYANMAR
REPORT
2017**



ASSESSING CLIMATE RISK IN MYANMAR:

Technical report

ASSESSING CLIMATE RISK IN MYANMAR

A contribution to planning and decision-making in Myanmar

TECHNICAL REPORT

March, 2017



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Note: Like all future projections, climate projections have uncertainty embedded within them. Sources of uncertainty include data and modeling constraints, the random nature of some parts of the climate system, and limited understanding of some physical processes. In this Report, the levels of uncertainty are characterised using state-of-the-art climate models, multiple scenarios of future greenhouse gas concentrations, and recent peer-reviewed literature. The projections are not true probabilities, and scenario-planning methods should be used to manage the risks inherent in future climate.

FOREWORD

With new temperature records being set regularly, the effects of climate change are already a stark reality throughout the world.

The agreement signed in Paris in 2015 is a sign of great hope that the world is collectively driven toward addressing climate change. However, as we have already seen around the world, even 1°C of warming is already having significant impacts.

This is especially the case for Myanmar, which, as recent events have shown – from severe flooding to extreme drought and exposure to strong coastal typhoons like the devastating Cyclone Nargis in 2008 – is highly vulnerable. As Myanmar develops its economy to bring millions out of poverty, it is critical that it does so in ways that ensure investments in infrastructure and human capital are resilient to these increasing extremes. One of the best ways to build resilience is to harness the power of ecosystems and the numerous benefits they provide to people; from forests, that help provide clean drinking water and reduce flooding downstream, to coastal mangroves that provide critical defences against coastal erosion and increasingly intense typhoons.

Our diverse group of partners has worked closely together to develop this report, outlining climate change impacts in different sectors and how these sectors can use climate risk information. Using best available data, including 30 years of weather station data generously provided by the Department of Meteorology and Hydrology and a new dataset from NASA that allows for higher resolution analysis than ever before, this report provides critically needed information on how climate change has already begun to affect Myanmar and is likely to continue into the future. We are pleased to collaborate in tackling such a critical issue, and believe this report serves as an important contribution for addressing important changes in Myanmar's future.



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FOREWORD

We live in a world already affected by climate change. Global temperatures in 2015 were the hottest since record keeping began, and 15 out of the last 16 hottest years on global record have occurred since the year 2000.

At the same time, 2015 brought a glimmer of hope with the globally adopted Paris Agreement, in which over 190 countries committed to ensuring the average global temperature does not rise more than 1.5°C above pre-industrial levels. This agreement is of critical importance for Myanmar, one of the most vulnerable countries in the world to climate change.

Understanding and incorporating climate risk information today is crucial for building long-term resilience across various sectors in Myanmar. The population and economy are dependent upon agriculture, which relies on predictable seasonal cycles of water and temperature. Long-term investments in infrastructure must be built to withstand future climate conditions, to prevent future costs being incurred for repairs and upgrades as a result of extreme weather events. Myanmar is already exposed to natural hazards such as floods, droughts, cyclones and coastal storms – all of which are exacerbated by climate change. Myanmar's ecosystems provide crucial protection against these hazards. Mangroves and coastal habitats, for example, help to reduce the impact from coastal storms, while forests play a key role in regulating floods. As such, protecting these ecosystems will become even more important to building climate resilience.

We have an opportunity to ensure development activities are both sustainable and climate resilient. Using information about how our climate is likely to change in the coming decades will help to ensure a more sustainable, resilient economy while keeping our incredible ecosystems and biodiversity intact. In order to achieve a climate-resilient future, we need to work together – across ministries and sectors and with a wide range of stakeholders. I hope this report will contribute to better integration of climate science into decision making and planning, which will be essential if we are to adapt and build much needed resilience to climate change.



Dr. Hrin Nei Thiam,
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ABOUT THE INSTITUTIONS

Department of Meteorology and Hydrology

Department of meteorology and Hydrology (DMH) is under the Ministry of Transport and Communications. DMH responsibilities include taking precautionary measures against and minimize the effects of natural disasters. DMH also issue meteorological information, warning, news, alerts and special outlook to prevent natural disasters. They support public weather services, information, data, weather forecasts, advise and observations to decision makers, policy makers and different sectors.

Columbia Center for Climate Systems Research

The Center for Climate Systems Research (CCSR) is the home of the cooperative relationship between Columbia University and the NASA Goddard Institute for Space Studies (GISS) and a research center of The Earth Institute at Columbia University. CCSR was established with the objective of providing enhanced understanding of the Earth's climate and its impacts on key sectors and systems. CCSR also plays a large role in dissemination of climate change research and information to governments, local and international organizations, educational institutions, and stakeholders.

WWF

For more than 50 years, WWF has been protecting the future of nature. The world's leading conservation organization, WWF works in 100 countries and is supported by 1.1 million members in the United States and close to 5 million globally. WWF's unique way of working combines global reach with a foundation in science, involves action at every level from local to global, and ensures the delivery of innovative solutions that meet the needs of both people and nature.

Myanmar Climate Change Alliance

The MCCA programme is an initiative of the Myanmar's Ministry of Natural Resources and Environmental Conservation, implemented by the United Nations Human Settlements Programme (UN-Habitat) and the United Nations Environment Programme (UN-Environment) and funded by the European Union. It aims at mainstreaming climate change into Myanmar's development agenda by raising awareness of policy-makers and public opinion, formulating policies, strengthening coordination, building technical capacities and helping communities to adapt.

ADVANCE Partnership

ADVANCE is a partnership between World Wildlife Fund (WWF) and the Columbia University Center for Climate Systems Research (CCSR) at The Earth Institute. Launched in 2015, ADVANCE facilitates adaptation by providing new ways of generating and integrating climate risk information into conservation and development planning, policies, and practice. ADVANCE envisions a future where the world is using co-generated climate risk information based on the best-available science to guide conservation, development, and disaster risk reduction to benefit human well-being and ecosystem health.

ACRONYMS AND ABBREVIATIONS

CCSR – Center for Climate Systems Research

CMIP5 – Coupled Model Intercomparison Project Phase 5

DMH – Department of Meteorology (Myanmar)

EM-DAT – Emergency Events Database

ENSO – El Niño-Southern Oscillation

GCM – General Circulation Model

IPCC – Intergovernmental Panel on Climate Change

MCCA – Myanmar Climate Change Alliance

MoF – Matrix of Functions –
Ministry of Natural Resources and Environmental Conservation (Myanmar)

NAPA – National Adaptation Programme of Action

NASA – National Aeronautics and Space Administration

NASA GISS – NASA Goddard Institute for Space Studies

NASA NEX-GDDP – NASA Earth Exchange Global Daily Downscaled Projections

NOAA – National Oceanic and Atmospheric Administration (United States)

RCP – Representative Concentration Pathway

UN-Environment – United Nations Environment Programme

UN-Habitat – United Nations Human Settlements Programme

VA – Vulnerability Assessment

WMO – World Meteorological Organization

WWF – World Wide Fund for Nature

EXECUTIVE SUMMARY

Myanmar's climate is projected to shift dramatically in the coming decades, having a lasting and significant impact on Myanmar's ecosystems and, in turn, on human health, agriculture, food security, infrastructure, local livelihoods and the larger economy. The climate risk information in this report, developed in collaboration with the Department of Meteorology (DMH) and in consultation with other key stakeholders, can aid adaptation and resilience planning across many sectors.

This report presents climate risk information including observed climate and future projections of temperature, rainfall, sea level rise and various extreme events, and outlines how this information can be used in decision-making. It also describes how climate change will affect biodiversity and ecosystem services, coastal zones, health, agriculture, infrastructure, water resources and urban areas. Finally, it documents how climate risk information is being used by the Myanmar Climate Change Alliance (MCCA) to support local ecosystem-based adaptation planning in the delta and Dry Zone towns of Labutta and Pakkoku. It should be seen as a contribution to the broader work on climate change and official projections on temperature and precipitation being carried out by DMH and the Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES) due to be released in the near future.

OBSERVED CLIMATE

Climate trends are based on observed weather data from 19 stations across Myanmar that were graciously provided by DMH. Between 1981 and 2010, average daily temperatures increased by about 0.25°C per decade and daily maximum temperatures by 0.4°C per decade between 1981 and 2010. The data indicates that the pace of warming has been faster in inland areas than in coastal areas, and that the rise in daily maximum temperatures has been greater than the daily average. A heat wave and drought in 2010 broke temperature records across the country and caused widespread damage to health and livelihoods (ReliefWeb, 2010). Based on the available weather station data, annual total precipitation rose slightly between 1981 and 2010, with a greater rate of increase in coastal areas than in inland ones. In coastal areas, the precipitation increases occurred throughout the year, while in inland areas the increases occurred mainly during the monsoon season. Research suggests that the summer monsoon season has become shorter by approximately one week on average (Lwin, 2002).

CLIMATE PROJECTIONS FOR MID-CENTURY

Outputs from 21 state-of-the-art climate models, downscaled to high spatial resolution, and two scenarios of future changes in greenhouse gases are used to project annual and seasonal temperature and precipitation projections for the early and mid-21st century. To project sea level rise, outputs from 24 climate models were integrated with other sources of information, including peer-reviewed literature.

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_18335

