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MEMORANDUM

FOR : **All Service Directors**
All Bureau Directors
Heads of Attached Agencies

All Regional Executive Directors
All Regional Directors (EMB, MGB)

ATTENTION : **Planning Chiefs**
Climate Change Focal Persons

FROM : **The Director**
Climate Change Service

SUBJECT : **EXECUTIVE SUMMARIES OF PHILIPPINE CLIMATE EXTREMES REPORT 2020, STATE OF THE 2019 PHILIPPINE CLIMATE, AND OBSERVED CLIMATE TRENDS AND PROJECTED CLIMATE CHANGE IN THE PHILIPPINES (2018)**

DATE : 2 November 2022

This refers to the strategies of the Department to adopt climate risk lens in programming, investment planning and policy formulation and risk-based assessment of the ecosystems and natural resources to manage the uncertainties.

In line with the Secretary's directives, may we provide you the attached copy of the Executive Summaries of the following country reports on climate change:

1. Philippine Climate Extremes Report 2020
2. State of the 2019 Philippine Climate
3. Observed Climate Trends and Projected Climate Change in the Philippines (published in 2018)

In addition, previous State of the Philippine Climate reports may be accessed via this link: omlopezcenter.org/state-of-the-philippine-climate/.

For your information and reference.

ELENIDA DR. BASUG

MEMO NO. 2022 - 771

Philippine Climate Extremes Report 2020

Observed and Projected Climate Extremes in the Philippines to Support Informed Decisions on Climate Change Adaptation and Risk Management

ATENEO DE MANILA UNIVERSITY

Philippine Climate Extremes Report 2020

Observed and Projected Climate Extremes in the Philippines to Support Informed Decisions on Climate Change Adaptation and Risk Management

Republic of the Philippines
Department of Science and Technology (DOST)
Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)

ISBN 978-621-95882-1-8

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Data Availability:
The data supporting the findings of this study may be provided upon request and collaborative research agreement with DOST-PAGASA, Manila Observatory and collaborating partners. CORDEX-Southeast Asia data may be downloaded from the Southeast Asia Regional Climate Change Information System (SARCCIS) website (http://www.rucore.ru.ac.th/SARCCIS).

Referencing this report:
DOST-PAGASA, Manila Observatory and Ateneo de Manila University. 2021. Philippine Climate Extremes Report 2020: Observed and Projected Climate Extremes in the Philippines to Support Informed Decisions on Climate Change Adaptation and Risk Management. Philippine Atmospheric, Geophysical and Astronomical Services Administration, Quezon City, Philippines. 145 pp.

Executive Summary

The Philippine Atmospheric, Geophysical and Astronomical Services Administration of the Department of Science and Technology (DOST-PAGASA) regularly conducts climate modeling initiatives, in collaboration with domestic and international partners to better understand climate change and its effects in the country. In partnership with the Manila Observatory and the Ateneo de Manila University, DOST-PAGASA took part in the "Analyzing CORDEX-SEA (Coordinated Regional Climate Downscaling Experiment — Southeast Asia) Regional Climate Simulations for Improved Climate Information over the Philippines: SST Influence, Variability and Extremes, Tropical Cyclone Activity" program that aims to generate high-resolution climate change information from multiple state-of-the-art climate models.

In this report, the downscaled historical and projected daily extremes data were used to calculate the projected changes in 24 climate extremes indices for two Representative Concentration Pathways: RCP4.5 and RCP8.5. Historical simulations for the baseline period (1986–2005) served as the threshold. The multi-model ensemble consisted of 12 models consisting of three regional climate models (RCMs) forced with data from 10 global climate models (GCMs) from the Coupled Model Intercomparison Project — Phase 5 (CMIP5) archive. SA-OBS, a daily gridded observational dataset for Southeast Asia based on the Southeast Asian Climate Assessment & Dataset (SACA&D) project was used as the historically observed baseline data.

The Philippine Climate Extremes Report 2020 presents information on historical and projected annual climate extremes indices of the country and demonstrates their relevance to sector-specific climate impacts assessment. This report extends the climate projection information released by DOST-PAGASA in 2018 which used the 10th, 50th and 90th percentile thresholds of temperature and rainfall to describe the average annual and seasonal changes in future climate scenarios. The annual climate extremes indices may be used to identify areas and sectors which are most at risk to climate extremes and thus require rapid disaster risk assessment and climate adaptation planning to minimize current and future impacts. Local government units may use this report in formulating local climate change action plans and mainstreaming of national climate change initiatives.

Historical observed data show that temperature extremes indices have a large spatial variability throughout the Philippines: with "cool" extremes generally occurring at high elevations and inland while the "hot" extremes occurring at low elevations and near the coasts. Small islands are particularly exposed to these "hot" extremes. On the other hand, projected changes indicate a generally spatially uniform warming trend with the magnitude, frequency and duration of warming increasing in the future throughout the country.

The precipitation extremes indices show distinct spatial variability in the historically observed data, roughly following the rainfall-based Coronas climate types, particularly for the magnitude and frequency extreme indices. The projected changes indicate a general drying trend but also the occurrence of localized extreme rainfall "wet spots". Prolonged wet events tend to decrease, but prolonged dry events also show localized decreases, indicating possibilities of increased frequency of wet events in the future which could interrupt the long-duration dry events.

The spatial variability in the projected changes in both temperature and rainfall extremes thus require a more localized analysis of these changes; perhaps even the need to further downscale the climate data to pinpoint where and how these local variations develop. However, despite being limited by the 25km by 25km horizontal resolution and daily temporal resolution, estimates at the provincial level can still be useful.

Since the choice of climate change adaptation strategies is rooted in the proper understanding of the impacts of extreme events, this report also presents a framework for analyzing possible impacts and assessing adaptation options for highly sensitive sectors.

Section 1 provides an overview of the methodology used in generating projections using climate models; an introduction of climate extremes and the indices used in the report; and a short description of how historical and projected climate information are currently being used by local stakeholders.

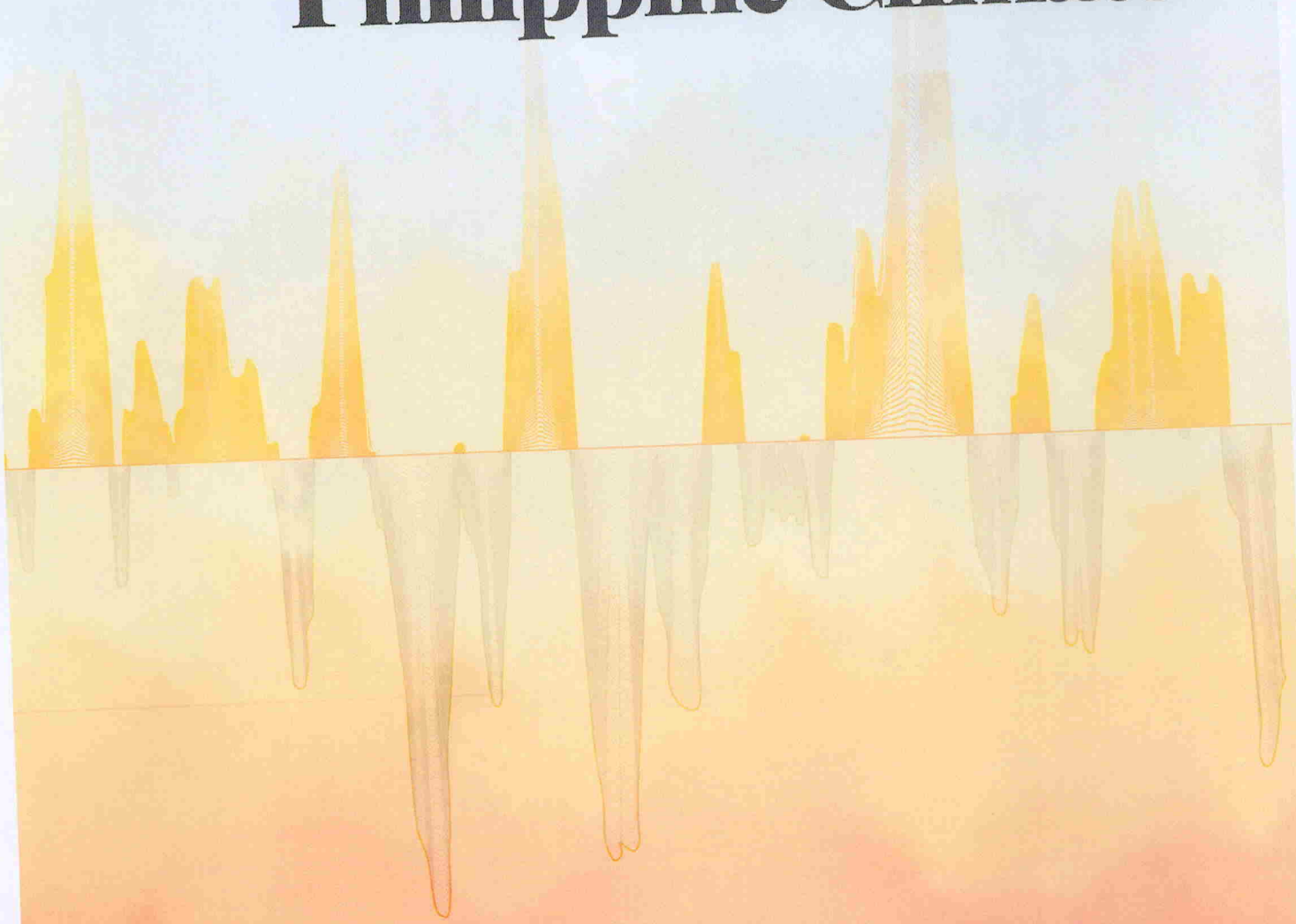
Section 2 describes climate extremes indices in detail and presents the observed and projected changes in these extremes indices on a national level.

Section 3 highlights the documented impacts of observed climate extremes and how projected changes will affect crucial sectors such as agriculture, human health, water resources, environment and biodiversity, and infrastructure. Examples of adaptation options that may help reduce possible impacts of these changes in the extremes are also presented.

Section 4 presents the Climate Extremes Risk Analysis Matrix (CERAM), a complementary tool to CLIRAM, that is intended to help users develop their disaster risk assessment and climate adaptation plans following the Climate and Disaster Risk Assessment (CDRA) process.

Provincial tables of observed and projected changes in climate extremes are provided in the Annex as reference.

State *of the* 2019 Philippine Climate



Oscar M. Lopez Center
Science for Climate Resilient Communities

State *of the* 2019 Philippine Climate

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STATE OF THE 2019 PHILIPPINE CLIMATE

This is the sixth of a series of annual reports entitled *State of the Philippine Climate*.

Also available at: www.omlopezcenter.org/state-of-the-philippine-climate/

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Philippines

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ABOUT THIS PUBLICATION

The *State of the Philippine Climate* (SPC) is an annual report that provides a summary of observations of the country's essential climate variables, as well as notable climatic and weather events. This publication is based on data provided by the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), National Disaster Risk Reduction and Management Council (NDRRMC), and other national and international institutions. The primary goal of this annual climate report is to efficiently disseminate necessary climate information that can aid policy makers, local government units, and other stakeholders in their decision making processes towards science-based climate change adaptation and disaster risk management.

Effective communication of climate information to relevant stakeholders and the general public is one key step towards building a climate-resilient society. Such information allows the authorities to better visualize the implications and make informed decisions that could help the general public adapt to a changing climate.

This edition of the SPC gives a brief but comprehensive overview of climate indicators (e.g. temperature, rainfall, ENSO, tropical cyclones) and the patterns, changes, and trends representing the country's climate in 2019. Several climatological records that have been broken or equaled, as well as climate anomalies and significant extreme events, that occurred in 2019 are also presented.

Please let us know your thoughts and help us improve the SPC series at http://www.tinyurl.com/spcuserfeedback.

ABOUT THE COVER

Inspired by the colors from NASA's depiction of the sea surface temperature of a weak ENSO from 2019 as shown from this link. The graph is based on the Sea Surface Temperature Anomaly from January 1982 to January 2020 stylized and rendered by Annie Beldia.

TEMPERATURE

2019 is the fourth warmest year on record for the Philippines, being warmer by 0.5 °C than the 1981-2010 baseline temperature. Both daytime and nighttime temperatures exhibited hotter-than-normal conditions.

In all 12 months of 2019, above-normal temperatures were recorded. With an average temperature of 29.3 °C, June had the highest temperature anomaly.

RAINFALL

Except in August and in December, the country generally received below-normal rainfall in all months. February reached 24% way-below-normal rainfall conditions. Eastern portions of the country received annual rainfall amounts that were 500-1,000 mm lower than 1981-2010 baseline amounts.

TROPICAL CYCLONES

Twenty one (21) tropical cyclones (TCs) entered the Philippine Area of Responsibility (PAR) in 2019. This exceeded the long-term average of 19-20 TCs frequency per year.

Of the 21 TCs that entered the PAR, eight made landfall. The 2019 TCs collectively affected more than six million people and caused a total of PhP 9.6 billion in agricultural and infrastructure damages.

ENSO

The weak El Niño event that commenced in October 2018 lasted until July 2019. It reached its peak Oceanic Niño Index (ONI) of 0.9 °C in the October-November-December 2018 season. An ONI of 0.8 °C was sustained from the November-December-January 2018 season to the March-April-May 2019 season.

✱ Temperature and rainfall anomalies are based on 1981-2010 mean.

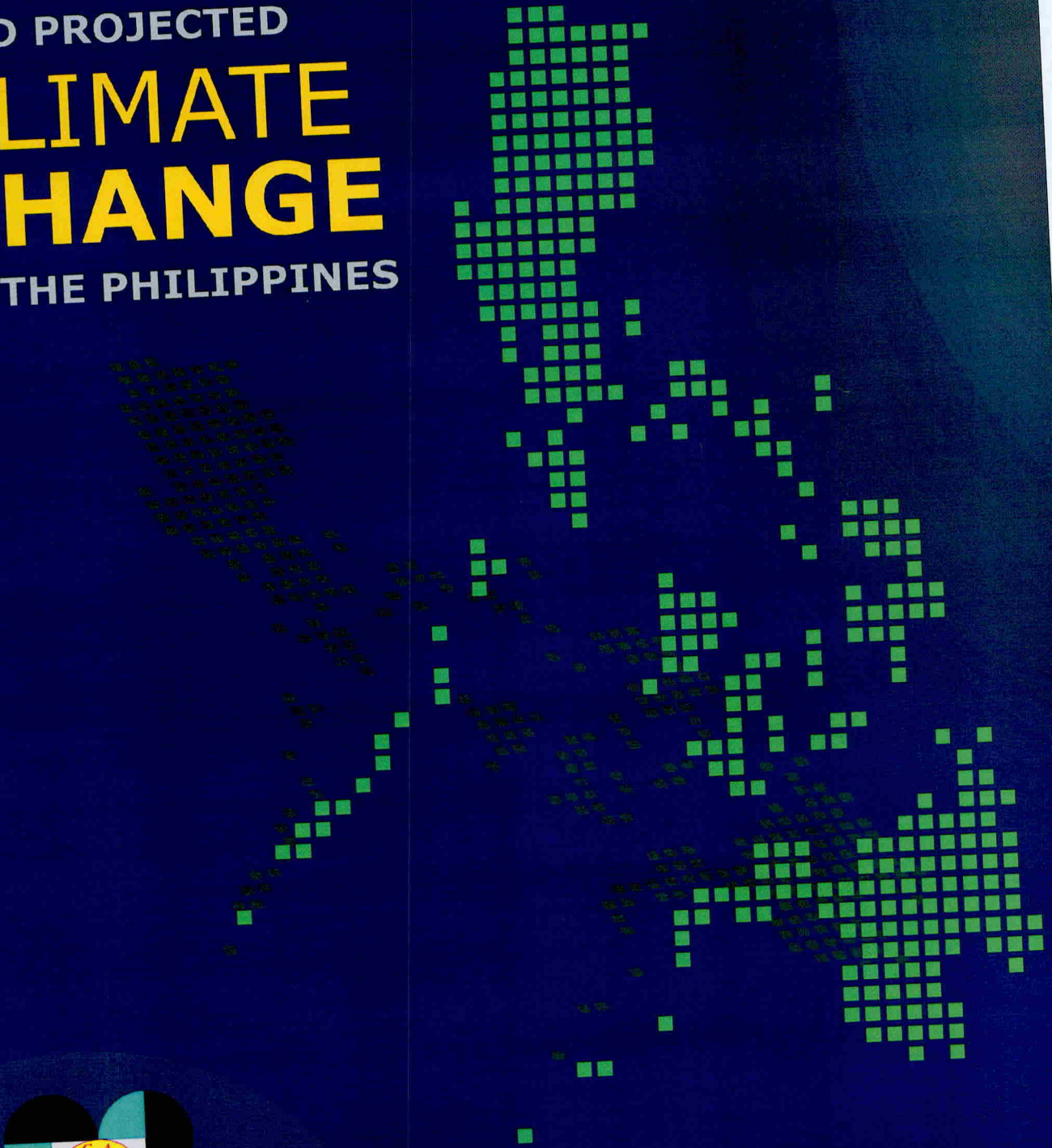
OBSERVED

CLIMATE TRENDS

AND PROJECTED

CLIMATE CHANGE

IN THE PHILIPPINES



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PAGASA, 2018: Observed and Projected Climate Change in the Philippines. Philippine Atmospheric, Geophysical and Astronomical Services Administration, Quezon City, Philippines, 36 pp.

Observed Climate Trends and Projected Climate Change in the Philippines

Department of Science and Technology

Philippine Atmospheric, Geophysical and Astronomical Services Administration

Key Findings

Temperature

Observed temperature in the Philippines is warming at an average rate of 0.1°C/decade. Climate projections suggest continuous warming in the future. It is projected that the country-averaged mean temperature could increase by as much as 0.9°C–1.9°C (assuming the moderate emission scenario, RCP4.5) and 1.2°C–2.3°C (considering the high emission scenario, RCP8.5) in the mid-21st century (2036–2065). Warmer conditions are further expected by the end of the 21st century (2070–2099), which could range from 1.3°C–2.5°C (based on the RCP4.5) to 2.5°C–4.1°C (based on the RCP8.5) increase in mean temperature relative to the baseline climate.

Rainfall

Increasing trends in annual and seasonal rainfall were observed in many parts of the country. Such trends were found to be associated with extreme rainfall events. Multi-model projections suggest a range of increase and decrease in seasonal-mean rainfall exceeding 40% of its historical values. Nevertheless, the multi-model central estimate of projected changes in rainfall could be within the natural rainfall variations, except for the projected rainfall reduction over central sections of Mindanao that are beyond the observed rainfall variations in the past.

Tropical Cyclone

In the past 65 years (1951–2015), a slight decrease in the number of tropical cyclones (TCs) and a minimal increase in the frequency of very strong TCs (exceeding 170kph) were observed over the Philippine area of responsibility (PAR). These trends are projected to continue in the future. It has to be noted, however, that the high year-to-year variations in the frequency of occurrence and intensity of TCs remain to be dominant in the future Philippine climate conditions.

Sea Level Rise

The sea level has risen by nearly double the global average rate of sea level rise over certain parts of the Philippines from 1993 to 2015. Projections reveal that sea level in the country is expected to increase by approximately 20 cm by the end of the 21st century under the RCP8.5 scenario. Such projected increase in sea level might worsen storm surge hazards particularly on coastal communities.