2019 ANNUAL REPORT

DEPARTMENT OF SCIENCE & TECHNOLOGY

Philippine Atmospheric, Geophysical & Astronomical Services Administration

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ACRONYMS AND ABBREVIATIONS

AIMS	APCCs Integrated Modeling Solutions
AMSS	Aeronautical Meteorology Services Section
APCC	APEC Climate Center
ASI	Advance Solutions Inc.
ASTI	Advanced Science and Technology Institute
BFP-NCR	Bureau of Fire Protection-National Capital Region
BRBFFWS	Bicol River Basin Flood Forecasting and Warning System
BSP	Bangko Sentral ng Pilipinas
BTMS	Budget and Treasury Management System
CAD	Climatology and Agrometeorology Division
CAMANAVA	Caloocan, Malabon, Navotas, Valenzuela
CAMP2Ex	Cloud, Aerosol, and Monsoon Processes Philippines Experiment
CCC	Climate Change Commission
COF	Climate Outlook Forum
COMCOT (Storm Surge Model)	Cornell Multi-grid Coupled Tsunami
CReSS Model	Cloud Resolving Storm Simulation
CSC	Civil Service Commission
CSI	Civil Service Institute
DA-ATI	Department of Agriculture-Agriculture Training Institute
DBM	Department of Budget and Management
DFAT	Department of Foreign Affairs and Trade
DOST	Department of Science and Technology
DTI	Department of Trade and Industry
ENSO	El Niño-Southern Oscillation
EOS	Executive Outlook Survey
FAO – NAP-AgS	Food and Agriculture Organization National Adaptation Plans-Agricultural Sector
FAST talk	Facts for Awareness on Science and Technology
FFWS	Flood Forecasting and Warning System
FMIS	Financial Management Information System
FOI	Freedom of Information
FPMD	Financial, Planning and Management Division
GEFS	Global Ensemble Forecast System
GOCCs	Government-Owned and Controlled Corporations
GOP	Government of the Philippines
HKO	Hong Kong Observatory
HRMO	Human Resource Management Officer
IAU	International Astronomical Union
IDDR	International Day for Disaster Reduction

IEC	Information, Education and Communication
ISO	International Organization for Standardization
ITDI	Industrial Technology Development Institute
JICA	Japan International Cooperation Agency
JMA/TCC	Japan Meteorological Agency / Tokyo Climate Center
L&D	Learning and Development
LDS	Lightning Detection System
LGU	Local Government Units
MBC	Makati Business Club
MCW	Magna Carta of Women
MDIES	Meteorological Data and Information Exchange Section
MDRIMS	Meteorological Data Relay and Information Management System
MDRRMO	Malabon Disaster Risk Reduction and Management Office
MECO-TECO	Manila Economic and Cultural Office - Taipei Economic and Cultural Office
MMSS	Marine Meteorology Services Section
NASA	National Aeronautics and Space Administration
NAW	National Astronomy Week
NCAR	National Center for Atmospheric Research
NCEP-CFS	National Centers for Environmental Prediction-Climate Forecasting System
NCR	National Capital Region
NEDA	National Economic and Development Authority
NGA	National Government Agencies
NGAS	New Government Accounting System
NGO	Non-Governmental Organization
NMS	Numerical Modeling Section
NRL	Naval Research Laboratory
NSTW	National Science and Technology Week
NWP	Numerical Weather Prediction
ODA	Official Development Assistance
PAGASA	Philippine Atmospheric, Geophysical and Astronomical Services Administration
P-CLIFS	PAGASA-Climate Forecast System
PCOO	Presidential Communications Operations Office
PFM	Public Financial Management
PHIVOLCS	Philippine Institute of Volcanology and Seismology
PNRI	Philippine Nuclear Research Institute
POTEKA	Point Tenki Kansoku
PPDU	Plans and Programs Development Unit
PRA	Program Review and Analysis
PRFFWC	Pampanga River Flood Forecasting and Warning Canter
PRIME-HRM	Program to Institutionalize Meritocracy and Excellence in Human Resource Management
PRSD	PAGASA Regional Services Divisions
PSA	Philippine Statistics Authority
RA	Republic Act

RADAR	Radio Detection and Ranging
RDTD	Research and Development and Training Division
RIC	Resilience and Innovation Cluster
RIDF	Rainfall Intensity Duration Frequency
SDG	Sustainable Development Goals
SEA-RCC	Southeast Asian Regional Climate Centre
STEM	Science, Technology, Engineering, and Math
SUC	State Universities and Colleges
SWIRLS	Short-Range Warning of Intense Rainstorms in Localized Systems
SyCoder	Synoptic Decoder
TASS	Techniques Applications and Satellite Section
TC	Tropical Cyclone
TFAW	Typhoon and Flood Awareness Week
TTCSS	Technical Training Center Support Services
UNDP	United Nations Development Programme
VOW	Values Orientation Workshop
WD	Weather Division
WFS	Weather Forecasting Section
WRF	Weather Research and Forecasting
WTC	World Trade Center

CITIZEN'S CHARTER

I.Mandate/Mission/Vision/Values/Functions

1.Mandate

Provide adequate, up-to-date data, and timely information on atmospheric, astronomical and other weather-related phenomena using the advances achieved in the realm of science to help government and the people prepare for calamities caused by typhoons, floods, landslides, storm surges, extreme climatic events, and climate change, among others, to afford greater protection to the people.

Provide science and technology-based assessments pertinent to decision-making in relevant areas of concern such as in disaster risk reduction, climate change adaptation and integrated water resources management, as well as capacity building.

Ensure that the country fulfills its commitments to international meteorological and climate change agreements.

2.Mission

We deliver reliable and relevant weather-related information, products and services to develop communities resilient to typhoons, floods, rain-induced landslides, storm surges, extreme climatic events, climate change and astronomical hazards.

3.Vision

The Center of Excellence for weather-related information and services helping develop a disaster and climate-resilient nation

4.Values

Spirituality	Patriotism	Integrity
Innovation	Commitment	Excellence

5.Functions

•Maintains a nationwide network pertaining to observation and forecasting of weather and flood and other conditions affecting national safety, welfare and economy;

•Undertake activities relative to observation, collection, assessment and processing of atmospheric and allied data for the benefit of agriculture, commerce and industry;

•Engage in studies of geophysical and astronomical phenomena essential to the safety and welfare of the people;

•Undertake researches on the structure, development and motion of typhoons and formulate measures for their moderation; and

•Maintain effective linkages with scientific organizations here and abroad and promote exchange of scientific information and cooperation among personnel engaged in atmospheric, geophysical, astronomical and space studies.

II.Performance Pledge and Feedback and Redress Mechanisms:

1.Performance Pledge

We, the professional and dedicated officials and employees of the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), commit to:

Provide service promptly, efficiently and with utmost courtesy by authorized personnel with proper identification from Mondays to Fridays. 8:00 AM to 5:00 PM, without noon break; for Administration support and other similar services and **24/7 whole year round for forecasting services,**

Adhere to strict compliance with service standards, with written explanation for any delays in the services we offered;

Give timely response to complaint about our services the soonest and take corrective measures accordingly;

Assure that every client's comments, suggestions and needs are given importance.

Satisfy our customers' needs by acting on their feedback and informing them of any developments first hand;

Allow the public access to information on our programs, activities and services through our website (http://bagong.pagasa.dost.gov.ph) or through SMS, and our trunk line (02) 8284-0800, follow us on twitter @dost-pagasa, https://twitter.com/dost_pagasa. Like us on facebook DOST_pagasa https://www.facebook.com/PAGASA.DOST.GOV.PH

Above all, we pledge to serve everyone with utmost honesty, dedication, respect and understanding, for we believe that in so doing, we are also serving and honoring our country and God Almighty.

2.Feedback and Redress Mechanisms

Please let us know how we have served you by:

a.Accomplishing our Feedback Form available at the lobby and put in the drop box located at the front desk or give the form to the division concerned.

b.Sending your feedback through our website **(http://bagong.pagasa.dost.gov.ph)** or call our trunk line **(02) 8284-0800**, follow us on twitter @dost-pagasa, https://twitter.com/dost_pagasa. Like us on facebook DOST_pagasa https://www.facebook.com/PAGASA.DOST.GOV.PH

Your written/verbal complaints shall immediately be attended to.

Thank you for helping us improve our service.

SERVICE STANDARDS

I. Processed Data (Daily Summaries, rainfall maps, etc.)

Who May Avail of the Services : General Public

Fees : Minimum of P1,000 weather certificate first 3 pages
: Php 36.00/yr/parameter for monthly data
: Php 360.00/yr/parameter for daily data

How to Avail of the Services

Step	Client/Customer	Activity	Maximum Duration	Person In Charge
1	Register with the guard and seek the assistance of the personnel from the Section concerned.	Attend to the inquiries/needs of the client	30 minutes	Guard/Personnel from Section Concerned
2	A written request from the party. Fill out required form.	Inquire from climate databank the availability of the data	30 minutes	Personnel from the Section concerned
3	Pay at the Cashier	Process the request and the customer of the appropriate charges by preparing the Order of Payment	30 minutes	Personnel from the Section concerned
4	Execute conforme that data is to be used only for specified purpose.	Release data/maps to client upon presentation of receipt	15 minutes	Personnel from the Section concerned
5	Accomplish Feedback Form	Solicit client's appraisal of services provided	15 minutes	Personnel from the Section concerned

II. Other Services (Calibration, Planetarium Services)

Who May Avail of the Service : General Public

Fees : Minimum of P510 depending on the instrument calibrated
: P25 per person for planetarium services

How to Avail of the Service

Step	Client/Customer	Service Provider	Maximum Duration	Person In Charge
1	Register with the guard and seek the assistance of the personnel from the Section concerned.	Attend to the inquiries/needs of the client	30 minutes	Guard/Personnel from Section Concerned
2	A written request from the party. Fill out required form	Consult with the Division in charge of the desired services	30 minutes	Personnel from the Section concerned
3	Conform with the arrangements discussed.	Discuss and finalize arrangement like fees, date services can be provided, the equipment and services needed, etc.	1 hour	Personnel from the Section concerned
4	Pay the Charges at the Cashier	Provide the services agreed upon	1 - 2 hours	Personnel from the Section concerned
5	Accomplish Feedback Form	Solicit client's appraisal of services provided	5 minutes	Personnel from the Section concerned

III. For weather forecast/reports/updates proceed to Weather Division at WFFC Building located a few meters from the PAGASA Main Office

MESSAGE BY THE DOST SECRETARY

I take pride of the Philippine Atmospheric, Geophysical and Astronomical Services Administration'as (PAGASA) continuing work towards achieving its vision of developing a disaster and climate-resilient nation. The Agency brings honor to the entire DOST System as it earns the trust and confidence of the public and stakeholders once more through the various awards and recognitions it received in 2019.

The 2019 Makati Business Club (MBC) Executive Outlook Survey (EOS) showed that 42 agencies received positive satisfaction ratings from the business sector. We are honored by the fact that PAGASA secured the 3rd spot out of the 10 most trusted government agencies in the country. The survey provides a snapshot of how the industry leaders perceives public service. The Bangko Sentral ng Pilipinas (BSP) recognized PAGASA as Outstanding Partner for Sources of Information for Monetary Policy for three years already. Also the Presidential Communications Operations Office (PCOO) honored PAGASA as one of the top requested and performing agencies in the eFOI portaland for its exceptional and significant contribution to the Freedom of Information program's progress and development.

PAGASA has also made its presence felt stronger in various social media platforms through the latest innovations in presenting viewer friendly weather broadcast to its millions of followers who in turn provided positive responses and appreciations.

PAGASA's performance can be gauged by the impressive average of 89 kilometer forecast track error or otherwise known as distance of forecast over actual track at a 24-hour lead time against the 120 km target during occurrence of Tropical Cyclones (TCs). Of equal importance is the 100% timely weather and TC warnings issued within 15 minutes of scheduled time. These are definitely far better than most agencies with the same mandate all over the world.

I extend my warmest compliment and greetings to PAGASA for its concrete achievements which elevates their level of public service quality. DOST remains supportive of its endeavors.

FORTUNATO T. DE LA PEÑA
Secretary

MESSAGE BY THE DOST UNDERSECRETARY

It is my privilege to extend my warmest salutation and commendation to the men and women of PAGASA for their determined and committed efforts in providing relevant and timely information on climate, weather, and other related hazards.

In the past few years, under the PAGASA Modernization Program, we have seen PAGASA build its physical and human resource capabilities to better address the needs of the public for reliable, relevant and timely climate and weather-related information, and early warning messages. Through nationwide information, education and communication campaigns, generation of comprehensive warning devices such as wind hazard and risk maps, and expansion of networks of modern radars and flood forecasting and warning centers, PAGASA has generated and provided more accurate weather and flood forecasts and guidance to make appropriate decisions for disaster mitigation and preparedness.

To complement its information generation capability, PAGASA redesigned its information distribution system to include popular social media platforms, aside from the formal and traditional information dissemination routes. Therefore, while it provides nationwide Information, Education and Communication campaigns as its long-standing information delivery stream, it also continues to explore more avenues for real-time communication to the public.

Aside from its own modernization program, PAGASA also leverages its partnerships with various regional and international weather organizations and research institutions for enhancing its institutional capabilities, but also at the same time, firmly establishing its contribution to global climate and weather knowledge.

All the hard work it extended to be dependable in its endeavors and furtherance of the services it offers to its stakeholders is testimony to PAGASA's aspiration of and commitment to excellence in public service. I strongly believe that the men and women of PAGASA will continually give their best to outperform themselves, in service to the Filipino people.

Mabuhay ang Bagong PAGASA!

RENATO U. SOLIDUM JR.
Under Secretary

MESSAGE BY THE ADMINISTRATOR

The year 2019 was tumultuous but still a noteworthy year for the agency. A pair of deadly typhoons – Tisoy and Ursula, lashed the country in December and left paths of destruction in their wakes. Despite the agency's timely and accurate forecasts, a number of casualties had still been reported.

It is in this light that the agency continues to establish modern and state-of-the-art weather equipment all throughout the country and create partnerships with both the government and the private sectors, to further enhance our capacity to provide timely, accurate and localized weather forecasts.

This year, PAGASA completed the country's first nationwide severe weather monitoring and alerting network. This enables faster localized storm alerts and improves our near-term forecasts, now-casts and severe weather warning capabilities. We also completed and established the country's 16th Doppler Radar in Bohol. The establishment of three more radar stations are on-going in Agno, Laoang and Masbate, while the reconstruction of the radar station in Basco, which was destroyed by Super Typhoon Ferdie in 2016 will be undertaken during the year. We will also establish regional weather and flood forecasting offices in critical points across the country to broaden the agency base and expand its scope and functions for the delivery of actionable, early warnings to communities at risk of natural hazards.

PAGASA's efforts to provide quality service to the Filipino people were recognized by the Makati Business Club – Executive Survey for 2nd quarter of 2019, when we ranked 3rd Best Performing Government Agency. We were also recognized at the 2019 FOI Awards given by the Presidential Communications Operations Office (PCOO), as one of the top requested and performing agencies in the eFOI portal.

In the days to come, by God's mercy, we will act as the lead executing agency of the Green Climate Fund (GCF) supported project to establish an impact-based forecasting and early warning system. This aims to translate hazard forecasts into warnings and send tailored climate risk information directly to LGUs and local communities.

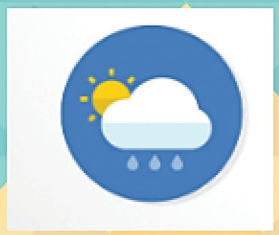
I urge everyone to carry on with the good work and to continue to inspire each other to make PAGASA's vision a reality.

Thank you, mabuhay and God bless.

VICENTE B. MALANO, Ph.D.
Administrator

2019 PAGASA

THE WEATHER AND CLIMATE AUTHORITY



WEATHER

730 Public Weather Forecasts

730 Shipping Forecasts

49 Weather Advisories

347 Gale Warnings

1,459 Sigmet Information

FLOOD

1,221 General Flood Advisories for the non-telemetered river basins

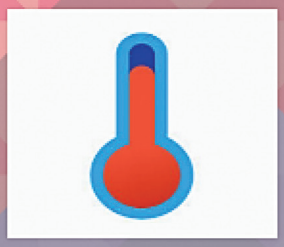
68 Flood Bulletins for the telemetered Pampanga, Agno, Bicol and Cagayan (PABC) and Tagum-Libuganon river basins

TROPICAL CYCLONE

30 Advisories

295 Severe Weather Bulletins

279 Tropical Cyclone Warning for Shipping (TCWS)



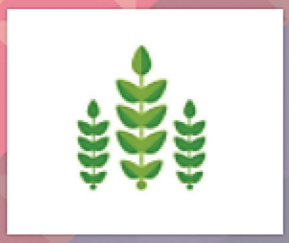
CLIMATE

11 National Climate Outlook Forum with **749** participants

20 Provincial Climate Outlook Forum with **1,898** participants

5 Monthly Assessment and Outlook

2 Seasonal Climate Outlook



AGRI-WEATHER

730 Daily Farm Weather Forecasts and Advisories (FWFA) to **193,086** recipients

36 Ten-day Regional Agri-Weather information

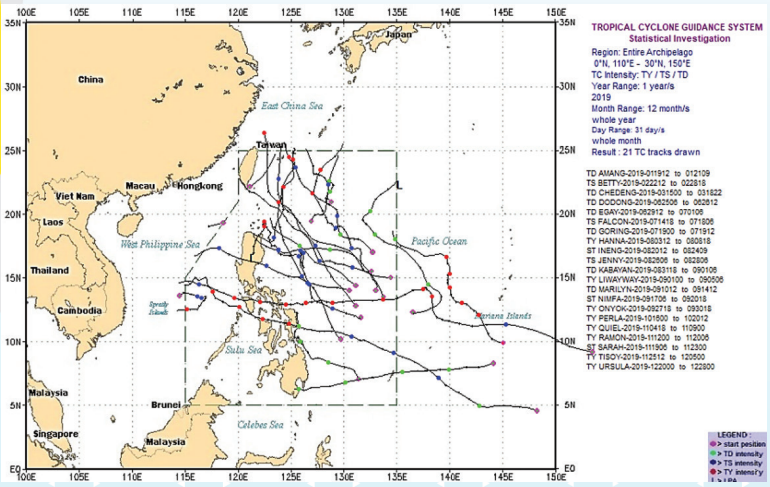
TRAININGS

11 Technical in-house training courses with **349** participants

19 Non-technical in-house training courses with **415** participants

I.WEATHER AND CLIMATE MONITORING, FORECASTING AND WARNING PROGRAM

Delivery of Timely and Accurate Forecasts/Warnings



Forecast track shows the probable path of the center of a tropical cyclone (TC). Track forecast error is the difference between the predicted and actual position of a TC center at a given lead time (e.g. 24 hours in advance) . In summary, an impressive average of **89km forecast track error or distance of forecast over actual track of TCs** was delivered by the Agency at a 24-hour lead time in 2019. Dedication in service has once again proven when 100% timely weather and tropical cyclone warnings issued within 15 minutes of scheduled time were provided to clients and beneficiaries.

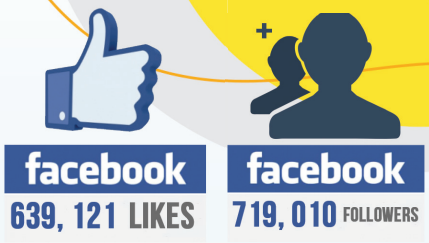
Old format

New format

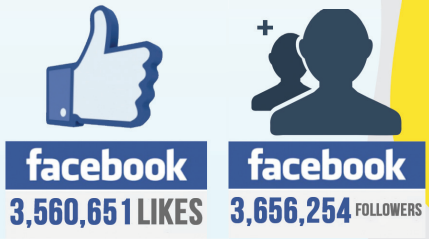
Delivery of Timely and Accurate Forecasts/Warnings

Furthermore, a partnership has been inked between PAGASA and MetraWeather to provide an improved weather video reporting enhancing weather graphics. This provides more sophisticated and understandable video reports. MetraWeather is a global leader in providing innovative weather information services.

As the Agency recognized the influence of social media platforms, it began to establish social media accounts few years ago for vast information dissemination. Since PAGASA created social media accounts, various social media users have been following PAGASA with remarkable numbers of 3,656,254 followers and 3,560,651 likes on Facebook; 6.1M followers on Twitter; and 244,000 subscribers on YouTube.



January to December 2019



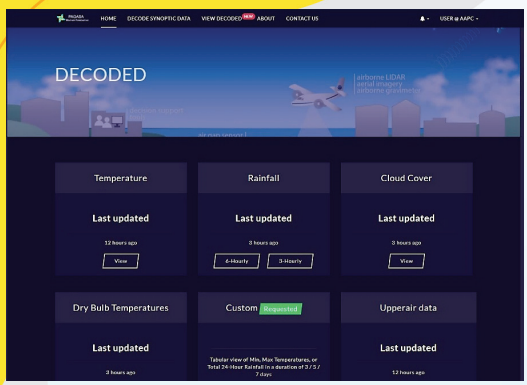
Dissemination of Climate-Related Information

During the year, seven El Niño advisories were issued including other climate information such as El Niño Watch, Climate Assessment and Outlook, Dry Spell/Drought Assessment and Outlook and Briefer on El Niño. The information was briefed and coordinated to several climate focal agencies/committees such as the National Disaster Risk Reduction and Management Council (NDRRMC), Philippine Council for Agriculture and Fisheries (PCAF) Committees, National Water Resources Board (NWRB)-TWG for Angat Dam operation, Committee on Public Service and Climate Change Cabinet Cluster meetings.

Several stakeholders also received updates and thorough information on climate with the conduct of climate outlook forums in different scopes: in-house and external (regional and national).

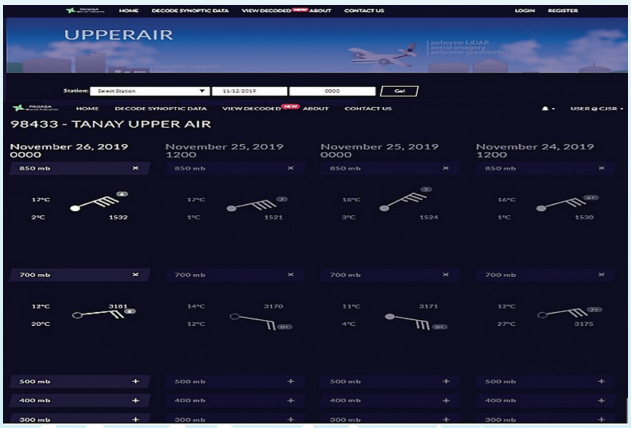
Notably, improved climate monitoring products and diagnostics and bulletins were made available on the official PAGASA website.

Synoptic Observation Report Decoder (SyCoder)

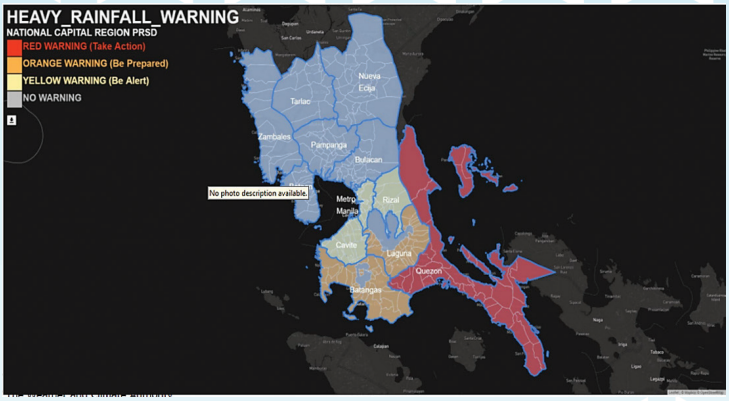


The SyCoder (Synoptic Decoder) is an in-house developed web-based tool by the Weather Forecasting Section of the Weather Division. It is a user-friendly system that decodes surface observational reports from field stations and transmitted to the Meteorological Data and Information Exchange Section (MDIES). It was first implemented in the first quarter of 2018 and had continuous improvement to include other observational data. The SyCoder is working in-connection with Meteorological Data Relay and Information Management System (MDRIMS) that features real-time receive-decode operations-plot operation.

Version 2.0 was released in 2019 to align with the PAGASA Modernization Program. The new version includes full automation of maps, Numerical Weather Predictions (NWPs), and other tools used in the generation of forecast products. It also includes the decoding of all local upper-air observation reports and plotting of those data in different pressure levels.



Color-Coded Maps



Developed color-coded map enhances the heavy rainfall warning information. The photo at the left shows the color-coded map issued during the onslaught of Typhoon Tisoy: where Metro Manila, Cavite, and Rizal in Yellow Warning; Batangas and Laguna in Orange Warning; and Quezon Province in Red Warning.

2018-2019 El Niño Event

The El Niño conditions that caused massive drought and dry spell in most parts of the country lasted from the last quarter of 2018 until August 2019. PAGASA closely monitored this event and issued regular updates/advisories. It also conducted Provincial Climate Outlook Forums in cooperation with Climatology and Agrometeorology Division (CAD), PAGASA Regional Services Divisions (PRSD), Department of Agriculture, Local Government Units (LGU), other concerned National Government Agencies (NGA), and Rice Watch Action Network Inc. (R1), as support communication drive of the said activity.

Various media interviews provided by Climatologists from the Climate Monitoring and Prediction Section (CLIMPS) of Climatology and Agrometeorology Division (CAD) aired in radio and television local channels

Chronology of Initiatives for the 2018-2019 El Niño

July 2018	•PAGASA-DOST issued El Niño Watch
August 2018 - January 2019	•Issued Monthly Climate Assessment and Outlook (under El Niño Watch) •Issued Monthly Dry Spell/Drought Assessment
February 20, 2019	•Press Statement – Weak El Niño •Issued El Niño Advisory No. 1 •Issued Drought Assessment and Outlook
March 2019	•El Niño Advisory No. 2 (Issued 08 March) •Issued Drought Assessment and Outlook 01 March •Issued PAGASA Briefer on El Niño• •Conduct of Regular Climate Outlook Forum monthly •Provincial Climate Outlook Forum (on-going) Quirino, Isabela, Pangasinan (conducted) Tarlac, Nueva Ecija, Siquijor, Bohol, Albay, Zamboanga del Sur, Occidental Mindoro, Cotobato, Sarangani, Sultan Kudarat, Zambales (to be conducted) •National Forum on El Niño (March 22) •Regular attendance to meetings and special briefings to various government agencies (TMG thru NDRRMC, DA- various PCAF Committees, NWRB- TWG for Angat, RAIN Task Force) •Monthly assessment of dry spell situation and outlook at possible affected areas •Dissemination of forecasts and advisories thru press briefing/quad-media

Climate Outlook Forums

Climate Outlook Forum (COF) is one of the PAGASA's flagship activities and a platform to disseminate climate information and El Niño-Southern Oscillation (ENSO) update and outlook in the coming seasons. It provides an opportunity to enhance understanding of forecast products and services, including their limitations and uncertainties, and for PAGASA to have a better appreciation of user's information requirements.

For this year, aside from the monthly COF conducted at the central office, in Amihan Conference Room, PAGASA was able to organize twenty (21) Provincial El Niño Forum detailed below:

PLACE	DATE
Quirino	March 11
Isabela	March 12
Pangasinan	March 13
Pagadian	March 28
Legazpi	March 28
Cebu	April 2
North Cotabato	April 10
Sultan Kudarat	April 11
Sarangani	April 12
Tarlac	April 26
Negros	April 29
Antique	September 2
Ilocos Norte	September 3
Masbate	September 9
Sorsogon	September 12
Guimaras	October 8
Antique	October 10
Capiz	October 25
Batangas	October 25
Aklan	October 30
San Francisco, Quezon	May 16 and November 27-29

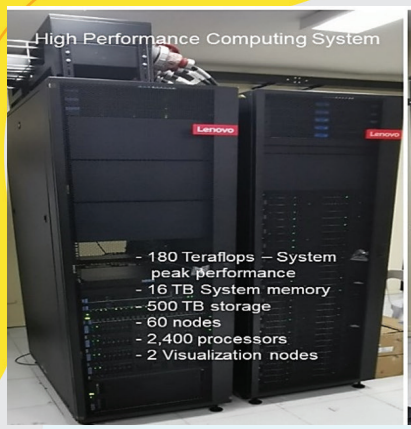
Provincial COF at Quirino, Isabela and Pangasinan with 342 participants

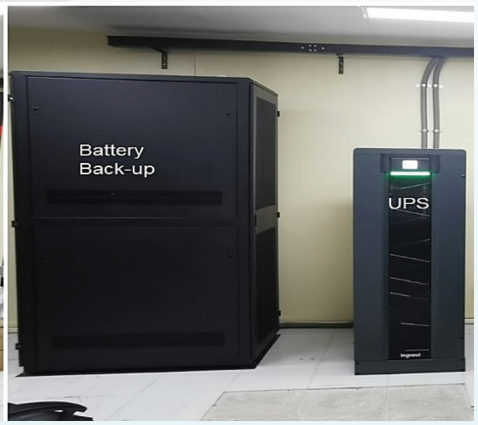
Provincial COF at Legazpi, Bicol with 200 participants

Provincial COF at Pagadian with 73 participants

2019 El Nino Forum and Contingency Planning at Bantayan, Cebu with 92 participants

PAGASA Climate Forecast Computing System





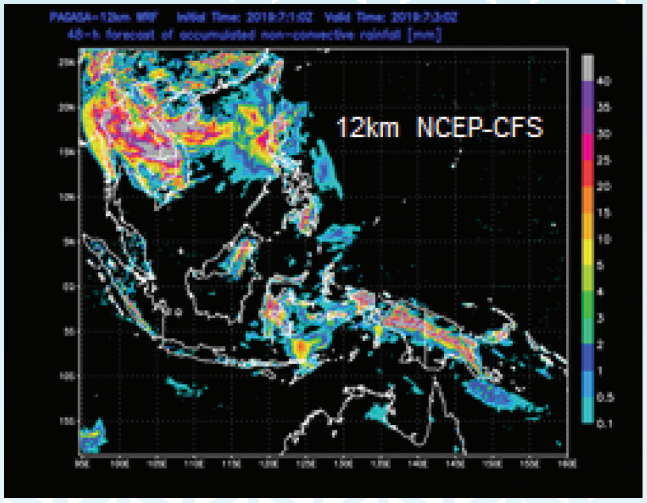
PAGASA Climate Forecast Computing System is a project that aims to: improve PAGASA's seasonal forecast system, and develop and operate a PAGASA-Climate Forecast System (P-CLIFS) that will deliver extended short-range, sub-seasonal to seasonal climate forecast, products, and services.

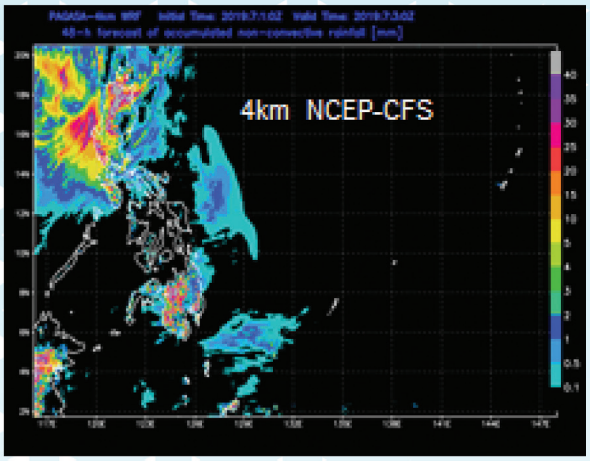
Advance Solutions Inc. (ASI) joint ventured with MSI-ECS Phils., winning bidders of the project, invited some of the PAGASA project focal personnel to attend the Factory Acceptance Test and Factory Training on HPC on 25 February to 04 March 2019 in Shenzhen, China.

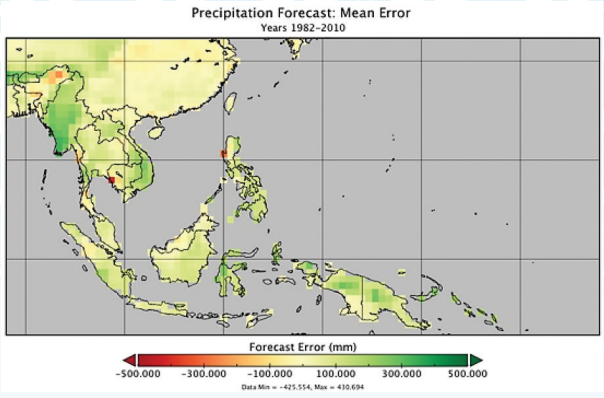
ASI and MSI-ECS also conducted several training/ workshops as part of their commitment/responsibility in the project:

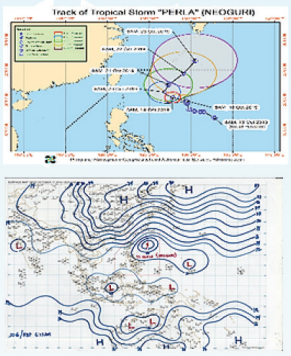
Title of Training/Workshop	Venue	Date
Technical Training on APCC-PAGASA Regional Prediction System	APEC Climate Center, Busan, South Korea	06-10 May 2019
Weather Research and Forecasting Model (WRF) User's Training and Technical Meeting	NCAR Center Green Drive, Colorado, USA	10-14 June 2019
WRF for Seasonal Climate Forecast	PAGASA, CAD Conference Room	28 June – 03 July 2019
APEC Climate Center – PAGASA Regional Prediction System (APCC-PRePS) Training	PAGASA, CAD C onference Room	03-05 July 2019
Training – Workshop on APCCs Integrated Modeling Solutions (AIMS)	B-Hotel, Quezon City	08-10 July 2019
Training – Workshop on Weather Research and Forecasting for Seasonal Climate Forecast (WRF-SCF): 3V (Verification, Validation & Visualization) / Workshop on WRF-SCF 3V for end-user's Interaction	CAD Conference Room	05-08 August 2019

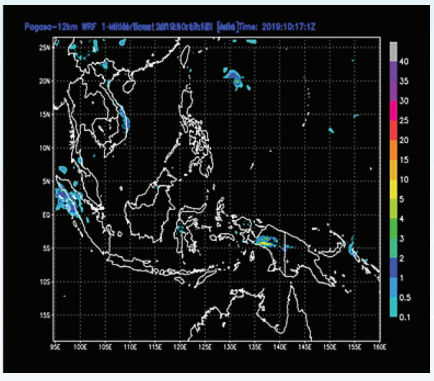
The project has able to install imperative models, namely WRF for Seasonal Forecast (NCEP-CFSv2 180-day), WRF for Sub-Seasonal to Seasonal Prediction (S2S) (GEFS 16-day forecast), RegCM4.5 (CFS 180-day), and GRIMS (RSM version).











II. FLOOD MONITORING, FORECASTING AND WARNING PROGRAM

Flood Forecasting and Warning System (FFWS)

One of the major services of PAGASA, as mandated by law, is the provision of adequate, up-to-date and timely information on flood. This responsibility was signified, as early as 1973, through the establishment of FFWS with Pampanga as the pilot river basin. FFWS comprise of monitoring and communication facilities, as well as river centers that serve as hubs for flood operations. With the completion of FFWSs for the four major river basins (Pampanga, Agno, Bicol, and Cagayan) in the early 90s and initiatives for the Pasig-Marikina-Laguna de Bay river basin, there was a growing need to address the rest of the 18 major river basins of the country.

At present, PAGASA established an additional eight operational FFWSs. These are in Abra, Panay, Jalaur, Cagayan de Oro, Tagoloan, Buayan-Malungon, Davao and Tagum Libuganon River Basin. These add to the five existing FFWS in Pampanga, Agno, Bicol, Cagayan and Pasig-Marikina. Overall, the Agency established 13 FFWS since realization of its importance.

These FFWSs contribute to the generation and issuance of flood advisories in the year 2019. Overall, PAGASA provided 1,221 general flood advisories and 68 detailed/localized flood bulletins for the entire year.

Establishment of FFWS in the remaining five major river basins (Abulog, Ilog-Hilabangan, Agus, Mindanao, and Agusan) and one FFWS in Aklan (principal river basin), will soon start their operation upon fulfillment of required system components such as monitoring equipment, river centers (building) and their personnel requirement.

Project Inauguration of the Bicol River Basin Flood Forecasting and Warning System (BRBFFWS)

Establishment of FFWSs is proven beneficial as timely dissemination of flood warnings and its effectiveness during TC occurrences aided not only the agriculture sectors but also the affected communities as well, especially in rescue operations and in the development of local flood mitigation programs.

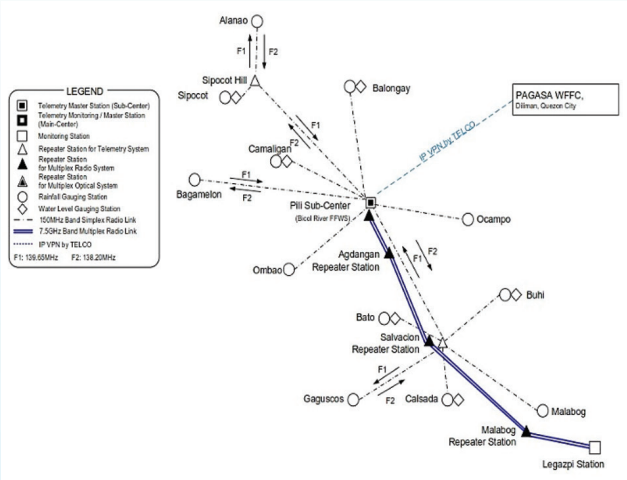
With the expansion of PAGASA's flood forecasting and warning services, the Government of Japan granted an Official Development Assistance (ODA) to establish the Bicol River Basin FFWS. It officially started its operation in 1983, however, after 30 years of its continuous function, most of the equipment and facilities have surpassed their intended maintenance lifespan, an issue that challenged PAGASA.

Fortunately, the request of PAGASA for another Grant Aid Program of the Government of Japan was approved under the Programme for the Improvement of Capabilities to Cope with Natural Disasters Caused by Climate Change. It is a cooperative undertaking between the Government of Japan and the Philippines to address the devastating impacts of changing climate patterns. Encapsulated in the said programme is the project entitled Rehabilitation of Equipment for the Project to Strengthen FFWS in the Bicol River Basin.

The project aims to improve the existing FFWS for the Bicol River Basin thru the replacement of all operational and non-operational monitoring stations, installation of additional gauging stations, and improvement of the telecommunication facilities and backbone multiples radio network system for voice and data transmission. The project was inaugurated on 29 April 2019.

Early Activities of the Project

Calzada Rainfall and Water Level Station



The Bicol River Basin FFWS Telemetry Subsystem consists of one (1) Telemetry Master Station at the BRBFFWC, one (1) Telemetry Monitoring/ Master Station at the Main Operation Center for Flood Forecasting and Warning (Weather and Flood Forecasting Center), two (2) repeater stations (Sipocot Hills and Salvacion), five (5) rainfall gauging stations (Alanao, Bagamelon, Ocampo, Caguscos and Malabog) and seven (7) combination of rainfall and water level gauging stations (Sipocot, Balongay, Camaligan, Ombao, Buhi, Bato and Calzada).

The monitoring station established at the Southern Luzon-PAGASA Regional Services Division (SL-PRSD) in Legazpi City can view all the real-time data gathered at BRBFFWC thru the installed IP radio link. It consists of four (4) hops: from the BRBFFWC, data will pass thru the microwave repeater stations located at Agdangan, Salvacion, and Malabog, before finally ending at Legazpi Monitoring Station.

Calzada Rainfall and Water Level Station

Also, the Weather and Flood Forecasting Center (WFFC) can monitor all data from BRBFFWC thru the established IPVPN (Internet Protocol Virtual Private Network), a dedicated link between the BRBFFWC and WFFC.

The improved FFWS consists of a network of telemetered gauging stations, supervisory and monitoring offices. Tipping bucket rain gauge and pressure-type water level gauge respectively measure rainfall and water level at a pre-set observation time interval. Then, the BRBFFWC receives data via the telemetry observation system. The telemetry system will transmit the observed data thru a 150 MHz band radio.

These data are likewise stored in data memory equipment, thereby ensuring its availability in the event of network failure. Each gauging station is powered by solar cell unit that will guarantee the continuous operation of the system and a sensor for the opening and closing of doors for security purposes

III. ASTRONOMICAL OBSERVATION AND MONITORING PROGRAM

Celebration of 100 Years of the International Astronomical Union (IAU)

The celebration of the 100 Years of the International Astronomical Union, with a central theme "100 Years: Under One Sky", aims to increase the awareness of a century of astronomical discoveries as well as to support and improve the use of astronomy as a tool for education, development, and diplomacy.

In support of this, PAGASA, in collaboration with the Provincial Government of Virac through Vice Governor Shirley A. Abundo, organized several activities in the Provincial Capitol Building on 3-5 April 2019. Public school Science teachers attended the seminar/ workshop in Basic Astronomy and Observation. Similarly, public school students participated in free mobile planetarium shows/lectures, telescoping and stargazing sessions, and competition entitled *"Star Party Contest"*.

Said activities aimed to enhance knowledge on new astronomical information, instrumentation and observation

Name Your Own Planet and its Host Star

PAGASA and the National Organizing Committee of Name Exoworld Philippines spearheaded this competition, which started in August 2019. It directed participants to name an exoplanet and its host star through the National Outreach Coordinator, Ms. Ma. Rosario C. Ramos of the PAGASA, who is the Philippine National Outreach Coordinator of the IAU since 2018

The said competition creates awareness of our place in the universe and reflects on how other civilization on another planet would potentially perceived the earth. Its first year of implementation ran from August to December 2019 and gathered more than 5,000 entries from each country member of the IAU through online submission. Five panels of judges who were from the University of the Philippines – National Institute of Physics, Komisyon ng Wikang Filipino, National Museum, and Matanao National High School in Davao del Sur carefully evaluated each entry.

From 5,000 entries, ten shortlisted names were open to the public for voting. The Steering Committee of the IAU received three name pairs with the highest number of votes for final vetting. Mr. Paul Go of San Pablo City of Laguna won with the winning name *Aman Sinaya* as Host Star and *Haik* as the Exoplanet. The winner was announced on 17 December 2019 by the IAU with a prize of 127mm Celestron Telescope (Reflector).

National Astronomy Week

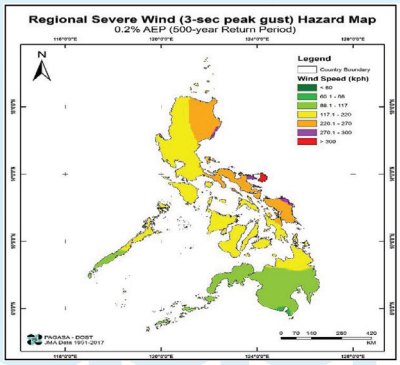
National Astronomy Week (NAW) is annually conducted by PAGASA to enhance the promotion of astronomy, which basically involves teachers and students in a selected province. In 2019, the Agency commemorated NAW from 21-23 February, with 59 public Science teachers lectured. Also, seven public high schools with 55 students/teachers joined in astronomy-inspired contests, and 760 students and enthusiasts participated during the conduct of mobile planetarium and telescoping sessions.

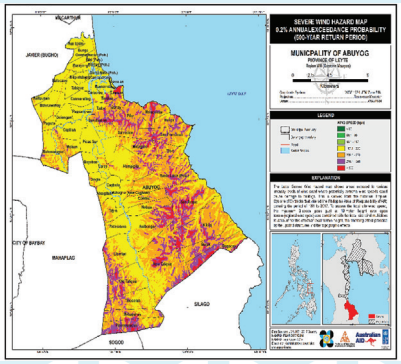
IV. RESEARCH AND DEVELOPMENT PROGRAM FOR WEATHER AND ALLIED SCIENCES

Severe Wind Hazard and Risk Assessment in Selected Super Typhoon Yolanda Affected Areas in Visayas Project

This project is collaborated with and funded by the Australian Embassy Department of Foreign Affairs and Trade (DFAT), supported by the United Nations Development Programme (UNDP) and implemented by the Climate Change Commission (CCC). It aims to generate **regional** severe wind hazard maps for the provinces of Leyte, Samar and Eastern Samar as well as **local** severe wind hazard maps for the 12 partner LGUs namely:

- 8 LGUs in Leyte (city of Tacloban, municipalities of Palo, Tanauan, Dulag, Tolosa, Mayorga, MacArthur and Abuyog)
- 2 LGUs in Western Samar (Basey and Marabut), and
- 2 LGUs in Eastern Samar (Lawaan and Balangiga)





These probabilistic severe wind hazard maps (both regional and local wind hazard maps) and risk maps will convey areas of the community exposed to severe wind hazards.

The results of the project will guide city planners/managers in building a wind-proof community and minimize the damaging effects of tropical cyclone winds. The beneficiaries of this project are the researchers, emergency managers, planners, stakeholders and the general public

IEC workshop held at Municipal Annex Building, Tolosa Leyete, on 27 February 2019 with PAGASA focal persons, UNDP-PMO, and LGU representatives from municipality of Tolosa, Palo, Tacloban and Tanauan, Leyte.

IEC workshop held at Judge Bar Restaurant, Abuyog, Leyte on 26 February 2019 with PAGASA focal persons, UNDP-PMO, and LGU representatives from municipality of Abuyog, Mayorga, MacArthur and Dulag

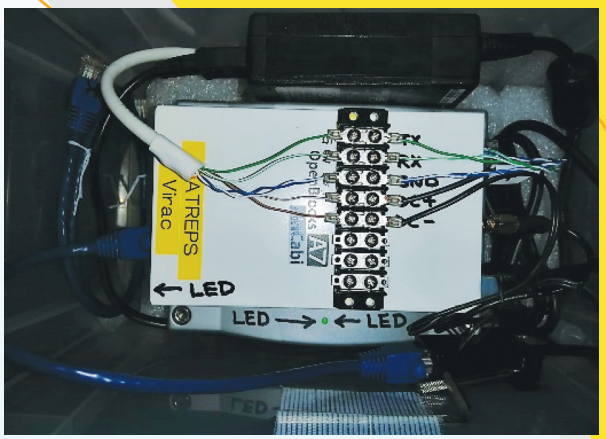
IEC workshop held at Balangiga Gymnasium, Eastern, Samar on 28 February 2019 with PAGASA focal persons, UNDP-PMO, and LGU representatives from Basey, Balangiga, Marabut and Lawaan

Understanding Lightning and Thunderstorms for Extreme Weather Monitoring and Information Sharing (ULAT) Project

The project aims to carry out research and development of a dense lightning detection network scattered throughout Metro Manila to gather, analyze and archive lightning data to provide thunderstorm "now-casting" and supplement weather-related research and disaster response studies and strategies. It also seeks to enable the study of the correlation between lightning activity and localized severe weather disturbances.

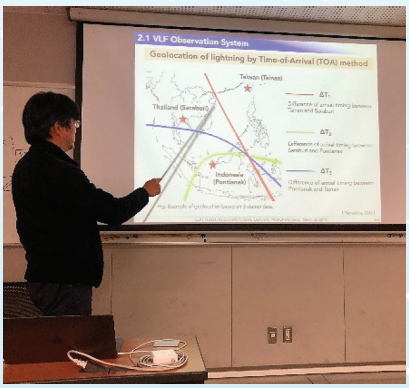
ASTI, as the lead agency, and PAGASA along with UPD, as co-implementing agencies, realized this project. DOST funded this three-year project, which officially started in April 2019

In July to September 2019, PAGASA assisted the conduct of Radiosondes and Cloud Particle Sensor Sondes at PAGASA Tanay Station.



Established were the dense lightning detection networks in targeted areas particularly 33 P-POTEKA in Metro Manila and five V-POTEKA in selected PAGASA's Regional Services Divisions (PRSDs) namely in UP-LB Agromet Station, Davao Synoptic Station, Puerto Princesa, Palawan Synoptic Station, Legaspi, Albay Synoptic Station, and Dagupan Synoptic Station.

Also installed were digital barometers in three PAGASA Stations, particularly in Aparri, Virac and Guiuan.

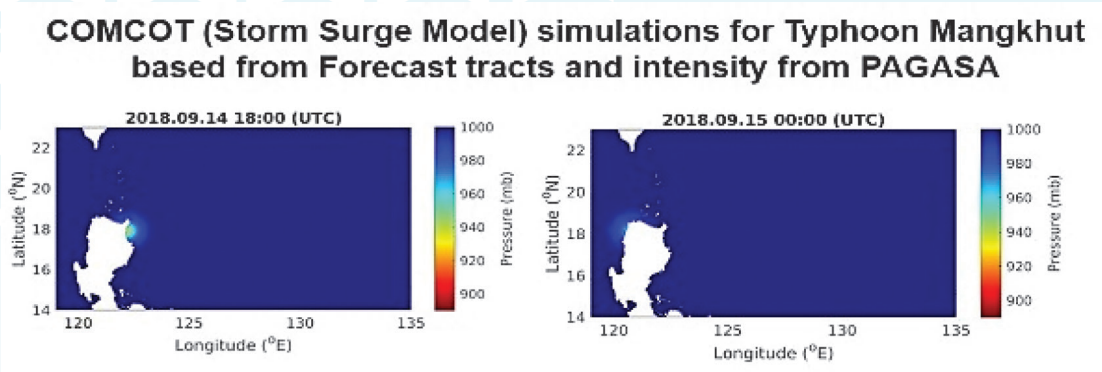


Some PAGASA ULAT project members acquired knowledge and skills on the operation of POTEKA through trainings/ seminars at the Hokkaido University in Sapporo, Japan, on 25-27 March 2019.

Completed PAGASA Research and Development Projects

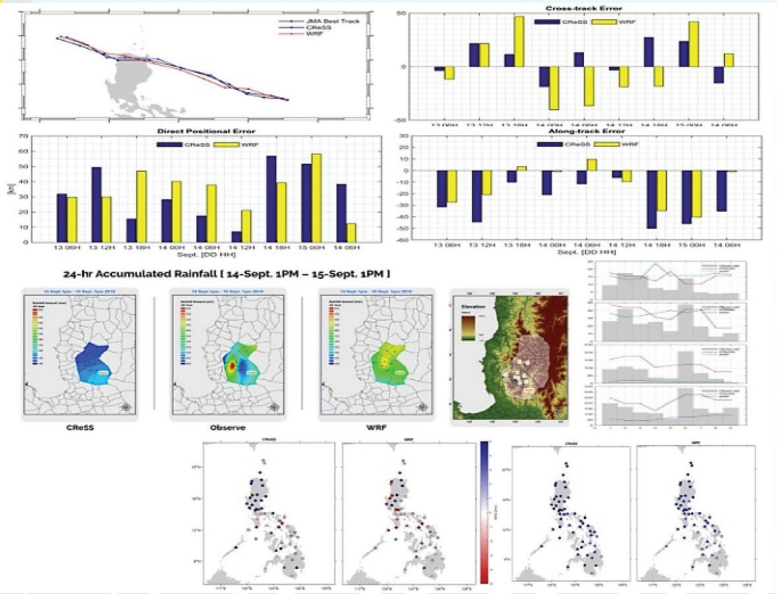
The research arm/group of the Agency has intensified Research and Development through the conduct of various R&Ds for further enhancement of products, services, and operational processes.

In 2019, PAGASA completed the MECO-TECO Program for the Improvement of Forecast Capability on Weather, Marine Meteorology, and Short-Range Climate. It aimed to conduct research collaboration between the Philippines and Taiwan to improve the capability of observation and forecasting of severe weathers to reduce damages and casualties. The program has three project-components.



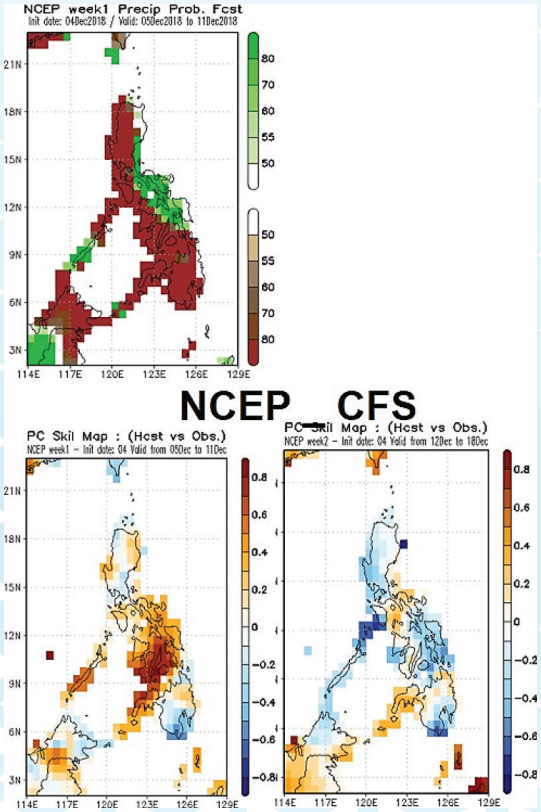
The first project under the program is entitled Typhoon Formation, Structure and Intensity Change in Western North Pacific and Wave Observation and Modeling. It simulated storm surge and wave model for historical events such as Typhoon Nitang in 1984, Pablo in 2012, and Santi in 2013 using COMCOT Storm Surge Model.

The second project under the said program is Heavy Rain Monitoring and Forecasting in the Mountainous Area and Early Warning Landslides. Two TCs, Typhoon Ompong occurred in September 2018 and Usman in December 2018, were simulated using Weather Research and Forecasting (WRF) and Cloud Resolving Storm Simulation (CReSS) model. The project utilized CReSS operationally in forecasting and monitoring heavy precipitation focused on the mountainous area for early landslide warning.



Analysis of heavy rainfall event in Mt. Makiling using CReSS modelz

The third project of the program is Observations and Dynamical Downscaling of Seasonal and Sub-Seasonal Forecast. It obtained the APHRODITE2 dataset from 1951-2014 and compared it with the operational OK method by PAGASA for climate monitoring and rainfall assessment. The APHRODITE2 gridded precipitation data is being updated and ready for utilization for model evaluation.



Developed S2S model guidance utilizing MJO products, GEFS and CFS data

Another R&D Project completed in 2019 is the Short-Range Warning of Intense Rainstorms in Localized Systems (SWIRLS). SWIRLS is the operational rainstorm nowcasting system of Hongkong Observatory (HKO). Using HKO's GitLab, the community version of SWIRLS (Com-SWIRLS) is currently being co-developed by the Numerical Modeling Section (NMS) of PAGASA. The objective is to create a prototype operational Com-SWIRLS QPE and a case study of an event with heavy rainfall. Prototype QPE in Metro Manila, using blended RADAR and rain gauge, has already been developed and accepted by HKO into the model codebase.

V. PHYSICAL RESOURCES AND OPERATIONAL TECHNIQUES PROGRAM

PAGASA's mandated function is to provide accurate and reliable information on weather-related phenomena and make it available to the public anytime, anywhere. The Agency's effort in acquiring state-of-the-art physical resources facilitated the continuous automation and strengthening of the execution of said mandated function.

C-Band and S-Band Doppler Weather Radars

Doppler Weather Radars provide better information regarding the movement and intensity of incoming extreme weather systems such as TCs, thunderstorms, and monsoons, which may cause heavy rains that may result to flash floods.

Overall, PAGASA established 17 Doppler Weather Radars Stations. These are in Subic, Tagaytay, Mactan, Hinatuan, Iloilo, Tampakan, Quezon in Palawan, Zamboanga, Aparri, Virac, Guiuan, Baguio, Basco, Busuanga, Daet, Baler and the recently completed Doppler Radar in Bohol. Twelve of which are operational, and two are under maintenance (Zamboanga and Daet).

Completion of Bohol Radar Station in Bohol

Tampakan Doppler Radar was affected by series of earthquakes in Mindanao, hence, scheduled for further testing/evaluation.

Tagaytay Doppler Radar is for upgrading, including building rehabilitation.

Three more stations are being established by the Agency, in Agno, Laoang, and Masbate, as it targets 20 Doppler Radar Stations in 2020.

X-Band Radars (Mobile and Stationary)

Coverage of each Radar Station

The establishment of stationary X-Band Radars will enhance the mosaic radar images, including those of S and C-Band Radars. In addition to the existing three mobile X-Band Radars, PAGASA currently establishes seven stationary X-Band Radars. These are in Echague, Kabankalan, Cuartero, Esperanza, Panabo, Kabacan, and Davao. Included in the JICA-grant ***project "Improvement of the Flood Forecasting and Warning System for Cagayan de Oro River Basin"*** are two more stations to be established in Talakag and Libona. Overall, nine X-Band Radars (stationary) will be operational in the next two to three years that will boost the rainfall forecasting capability of PAGASA and subsequently enhance its flood early warning services.

Lightning Detection System (LDS)

LDS enhances monitoring and tracking of weather disturbances such as thunderstorms and clear air turbulence crucial to airport operations. Overall, 28 LDS were established nationwide by PAGASA.

Commencement of Operation of Tacloban City Synoptic Station

In November 2013, the devastating Typhoon Yolanda destroyed the old Tacloban synoptic station. On 18 June 2019, after its rehabilitation, the said synoptic station resumed its operation.

Commencement of operation of Tacloban Synoptic Station on 18 June 2019

Groundbreaking Ceremony of Planetarium in El Salvador, Misamis Oriental

Ground-breaking ceremony of Planetarium in El Salvador, Misamis Oriental

The initiative to bring astronomy near to the hearts of astronomical enthusiasts and to capture students/learners' interest to astronomy has been the inspiration of PAGASA to establish planetariums in Cebu and El Salvador, Misamis Oriental. The ground-breaking ceremony in El Salvador was held on 15 March 2019. Misamis Oriental Governor Bambi Emano, DOST Undersecretary Renato Solidum, and PAGASA top officials enthusiastically attended the said event

Establishment of Various Significant Buildings/Facilities

In the year 2019, PAGASA managed to accomplish the establishment of key/significant buildings and facilities. These contributed to the Agency's pursuit of strengthening/improving assets and resources for better service to the public.

SYNOP (Surface Synoptic Station)

The majority of meteorological elements are monitored and observed at fixed and specified schedules in a surface synoptic station. The station then transmits the observed data/information to the PAGASA Central Office.

Constrction of Bataan Synoptic Weather Station is 95% completed.

Cagayan De Oro River Basin Flood Forecasting & Warning Center

Establishment of Iligan Flood Forecasting and Warning Center

Establishment of Camiguin Synoptic Station

Radar stands for Radio Detection and Ranging. A transmitter sends out radio waves that bounce off the nearest object and then return to a receiver. Weather radar can sense many characteristics of precipitation: its location, motion, intensity, and the likelihood of future rainfall

Establishment of X-Band Radar at Panabo City

ISU Agromet / Synoptic Station – Radar (Upgrading)

radar can sense many characteristics of precipitation: its location, motion, intensity, and the likelihood of future rainfall.

VI. CLIMATE CHANGE ADAPTATION, DISASTER PREPAREDNESS AND RISK REDUCTION PROGRAM

Information, Education and Communication (IEC) Campaigns

IECs aim to disseminate, update and enlighten all hydro-meteorological information and hazards such as heavy rainfall, strong winds, floods, rain-induced landslides, storm surges, droughts, extreme weather, and climatic events and climate change including their corresponding impacts, risks, and vulnerability. IECs of the Agency also delivers information on astronomy.

During the year, weather products were developed, such as translation of pamphlets in Bicol dialect in collaboration with the LGU of Tabaco. This method uses local dialects, non-technical terms and familiar graphical presentations for public awareness and to draw appropriate response to hydro-meteorological hazards.

Developed additional weather products system

Other IECs conducted were Oplan Balik Eskwela, Media Seminars, and as the resource speaker to various DRRM activities

Weather on the GO! – IEC on PAGASA Mobile App

In the fast pacing world of technology, who would not like to access the weather at their fingertips? Here at PAGASA, it is our fervent desire to make weather and climate information accessible to ALL, anytime, anywhere. Throughout the year, IECs on mobile app are being encouraged to provide comprehensive understanding and awareness of how we could be an agent of information wherever we go

The conduct of IEC is in collaboration with the regional Department of Agriculture-Agriculture Training Institute (DA-ATI) in a group of a set of farmers and agricultural extensions workers in particular regions

The app delivers to users the information on weather, flooding, and associated hazards, which can aid them during stints of disasters and typhoons. It specifies the weather forecasts it offers by pinpointing down the information depending on the user's location. The fact that people cannot avoid natural hazards like flooding from happening, the public can at least help decrease its hostile effects through disaster preparedness – an idea the app aims to emphasize.

All useful information are accessible to users through several social media platforms such as Facebook and Twitter.

DOST-PAGASA Joins the 2019 DOST's Science and Technology Fair

Every 3rd week of July, the Department of Science and Technology commemorates the National Science and Technology Week to highlight how science and technology (S&T) contributes to national development. With this year's theme, "Science for the People: Enabling Technologies for Sustainable Development" reinforces innovations in research and development, products and services, and updated technologies to attain the 2030 Agenda of United Nations Sustainable Development Goals (SDGs).

This years' NSTW was conducted from 17 to 21 July 2019 at the World Trade Center in Pasay City.

Interactive displays

Through exhibit invitations, DOST-PAGASA, as a warning service agency, seizes the opportunity to inform and familiarize the general public about the agency's latest and useful products and services via interactive simulators. These provide the platform for the audience to navigate and discover the various information therein.

3D Map of Pampanga River Basin

To visualize the Pampanga River Basin, the Pampanga River Flood Forecasting and Warning Center (PRFFWC) showcased a diorama, including the instruments and equipment used by DOST-PAGASA in observing the status of the river basin.

Philippine Climate Presentation

Using archived climatological data, the presentation of the Philippine Climate gives an overview of the weather disturbances experienced by the country throughout the decades, such as comparison among the amount of rainfall or frequency of tropical cyclone formation. The presentation can also function offline; be made accessible to those who prefers to explore more about the historical data on weather.

Augmented Reality Terrain and Flood Simulator

Using kinetic sand and motion sensor, the Augmented Reality Typhoon and Flood Simulator digitally demonstrates how a tropical cyclone can produce rainfall and flood, down to streams and low-lying areas. It can help the audience envision how hydrometeorological hazards can trigger disasters. Various stakeholders and students find it stimulating since they can create terrain with kinetic sand and produce digital rain using hand gestures.

Rainfall Intensity Simulator

To provide visualization of the amount of rainfall generated in a minute, DOST-PAGASA came up with a Rainfall Intensity Simulator. It is made up of four 2-liter bottles to show the possible hazards of accumulated rainwater. One bottle each for light rainfall warning and moderate rainfall warning, and two bottles for heavy rainfall warning. These help the audience understand the possible hazards of heavy rainfall and how they may respond to it.

Tropical Cyclone Simulator

The Tropical Cyclone simulator features the classifications of a tropical cyclone based on its wind strength. The audience may be able to identify the difference using the touch screen menu on the simulator. Also, provinces where signal numbers were raised, during onslaught of Super Typhoon Yolanda, are featured in the simulator.

Storm Surge Simulator

Storm Surge simulator works by using Kinect, a motion-sensing gadget that makes a person visible in the interface of the display. As an audience clicks on buttons such as yellow, orange or red rainfall warning, the software creates a visualization of the abnormal rise of water along with the person in the display. The simulator can help the audience to estimate how hazardous a storm surge can be. Alongside the interactive buttons, the audience can see and use detailed background information about storm surge, which can be easily understood by school children and stakeholders.

A vast number of visitors during the 2019 NSTW received various copies of PAGASA brochures and posters. In total, the Agency disseminated 2,649 IEC materials for the five-day activity.

Regional Participation

PAGASA took part in regional fairs, as well. In 2019, the agency participated in 11 Science and Technology Weeks, as follows:

•2019 Regional Science and Technology Week III in Balanga, Bataan (July 30-August 1, 2019)
•2019 Regional Science and Technology Week VIII in Tacloban, Leyte (August 9-11, 2019)
•2019 Regional Science and Technology Week VII in Siquijor, Siquijor (August 14-16, 2019)
•2019 Regional Science and Technology Week II in Tuguegarao, Cagayan (August 27-30, 2019)
•2019 Regional Science and Technology Week I in Laoag, Ilocos Norte (September 17-20, 2019)
•2019 Regional Science and Technology Week IV-A in Sta. Rosa, Laguna (September 24-27, 2019)
•2019 Regional Science and Technology Week NCR in Pasig City (September 30-October 3, 2019)
•2019 Regional Science and Technology Week V in Naga, Camarines Sur (October 8-10, 2019)
•2019 Regional Science and Technology Week VI in Iloilo, Iloilo (October 21-24, 2019)
•2019 Regional Science and Technology Week in Bontoc, Mountain Province (November 19-22, 2019)
•2019 Regional Science and Technology Week in Puerto Princesa, Palawan (November 27-29, 2019)

Road to Resilient Communities

The Resilience and Innovation Cluster (RIC), including PAGASA, organized a series of disaster preparedness lectures that focused on cultivating the audience on how to familiarize and prepare for various disasters and hazards during the 2019 National Science and Technology Week in World Trade Center (WTC), Pasay City.

Start them young

RIC believes that a way to a resilient and safer community involves a generation of fledgling minds.

On 18 July 2019, RIC led the Resilience Summit for Kids, a two-session activity held at the Main Stage of WTC. Both PAGASA and PHIVOLCS taught children on the basics of hydrometeorological hazards such as tropical cyclones and floods and preparations on earthquake hazards.

Resilience Summit for Kids attendance 18 July 2019			
	MALE	**FEMALE**	**TOTAL**
AM SESSIION (08:00 AM - 11:45AM)	166	189	355
PM SESSION (01:00 PM - 4:45 PM)	132	223	355
GRAND TOTAL			**710**

Mr. Bernard R. Punzalan II, a Weather Specialist from PAGASA, discussed Tropical Cyclone in a nutshell and experimented using a cloud formation kit called pit bottle. On the other hand, Mr. Jeffrey S. Perez, Supervising Science Research Specialist from PHIVOLCS, discussed the hazards of earthquakes and preparations during this disaster.

Despite the rainy weather brought by Tropical Depression Falcon, 355 students, teachers, and employees from public and private agencies attended each session. Around 225 students from grades 1 to 12 participated in the morning session. Twenty-three percent (23%) of which are grades 4 to 5 students – the target audience for the event. Students from grades 7 to 10 dominated the entire sessions, with an estimated population of 233.

Aside from information materials, RIC gave Disaster Preparedness Kit to the participants, including whistles, penlight, and a hanky with information on earthquake and its associated hazards.

Facts for Awareness on Science and Technology (FAST) Talk

The cluster supports the campaign that encourages all Science, Technology, Engineering, and Math (STEM) students to take Science courses as they enter the collegiate level. The Facts for Awareness on Science and Technology (FAST) Talk is a sharing session about the journey of Science experts from different Science and Technology (S&T) agencies and what their motivations were to pursue a career in the field of Science.

Facts for Awareness on Science and Technology (FAST) Talk 19 July 2019 (AM), Luna Hall, World Trade Center			
	MALE	FEMALE	TOTAL
(08:00 – 11:45 AM)	89	82	171

Engr. Benison Jay N. Estareja, a Weather Specialist and Forecaster of PAGASA, was one of the speakers of the session. Being the youngest among the bunch, he started directly by sharing his humble beginnings as a budding professional and government servant, up to where he is at present. He is a scholar on both of his undergraduate and graduate degrees, with the latter earned by pursuing studies in the United Kingdom, thanking PAGASA for the opportunity.

Other officials from various DOST attached agencies joined Engr. Estareja in the sharing session for STEM students. In attendance were the DOST Undersecretary for Disaster Risk Reduction and Climate Change and Director of DOST-PHIVOLCS, Dr. Renato U. Solidum, Jr., DOST-ASTI Acting Director, Dr. Joel Joseph S. Marciano, Jr., DOST-PNRI Director, Dr. Carlo A. Arcilla, and DOST-ITDI Director, Dr. Annabelle V. Briones.

One hundred seventy-one (171) audience participated in the event, 79% of which are STEM students.

The First Responders

The cluster also organized a half-day Resilience Summit for Stakeholders for various organizations, specifically the Local Government Units (LGUs), on 19 July 2019.

Resilience Summit for Stakeholders attendance 19 July 2019 (PM), Main Stage, World Trade Center			
	MALE	FEMALE	TOTAL
(01:00 PM – 05:00 PM)	42	48	100

Mr. Christopher F. Perez, a Senior Weather Specialist and Weather Forecaster, gave the audience an overview of PAGASA products and services, discussion on end-to-end early warning system, as well as standard operating protocols for the issuance of forecast and warnings for the public and other specialized end-users. Mr. John A. Manalo, a Weather Specialist and Climatologist, talked about climate variability and change. He brushed up against the difference in both two concepts, as well as the products and services of PAGASA from their end, particularly on climatological data, El Nino/La Niña updates, climate change projections and impact assessments and researches, among others.

Also discussed in the said activity were technologies and innovations from DOST-ASTI, DOST-PNRI, and DOST-PHIVOLCS.

Disaster Preparedness Promotions

PAGASA joined DOST-National Capital Region, CAMANAVA (Caloocan, Malabon, Navotas, Valenzuela) Cluster in promoting Disaster Preparedness.

On 14 March 2019, DOST-PAGASA took part in the DRR Caravan 4 in Malabon City Ampitheather as one with the Disaster Preparedness and Response, Information and Education Campaign of the City of Malabon and Malabon Disaster Risk Reduction and Management Office (MDRRMO). PAGASA showcased the Augmented Reality Terrain/Flood Simulator, Tropical Cyclone Simulator, Storm Surge Simulator, and Interactive Display Information System to students from grade 3 to 8. Students also learned the various products and services of the agency and were able to familiarized with the different hazards and disaster preparedness.

In line with the 2019 Brigada Eskwela campaign of the Department of Education, DOST-NCR invited PAGASA to conduct a short lecture and mini-exhibit for students of Dela Paz Elementary School, Malabon on 13 June 2019. Students from grades 3 to 6 experienced first-hand the Augmented Reality Terrain/Flood Simulator and Tropical Cyclone Wind Signals. They also learned the various products and services of the agency and the different hazards and disaster preparedness. Aside from this, PAGASA also participated in "Siyensiya't Saya sa Taguig: Science for the People," held on 04-06 September 2019 in Senator Renato Cayetano Memorial Science and Technology High School, Ususan, Taguig City. Ms. Sharon Juliet Arruejo of PAGASA conducted an IEC lecture on clouds and bagyo.

Partners from the Bureau of Fire Protection-National Capital Region (BFP-NCR) also invited PAGASA in their massive campaign, Fire Square Road Show. They held the said activity in Taguig on 25 September 2019 and in Pateros on 15 November 2019. Through its auxiliaries in Taguig and Pateros Fire Stations, BFP-NCR requested PAGASA to promote safer and resilient communities against weather and climate disasters and emergencies by showcasing the latter's products and services.

Moreover, PAGASA participated in the Makati City Disaster Risk Reduction and Management Office International Day for Disaster Reduction (IDDR) 2019: Year III on 11 October 2019 in Makati City Hall grounds. The event aims to build the capacity of individuals and the community through fun-filled activities designed not only for adults but for children as well.

Typhoon and Flood Awareness Week

Every third week of June, PAGASA commemorates the Typhoon and Flood Awareness Week (TFAW) in observance of Proclamation No. 1535 series of 2008. With this year's theme, "Resiliency: Bridging Science, Filipino Ingenuity and Preparedness," PAGASA focuses on resiliency as a vital component in disaster preparedness for Filipino families and communities.

Seven Days of Awareness

PAGASA kicked-off the activity through press launch of the Storm Surge Warning System together with the 2019 Resilience and Innovation Cluster presentation in the Amihan Conference Room. Partners in disaster preparedness and RIC displayed exhibits in PAGASA Central Office lobby to spread awareness and familiarize visitors on the different hazards and disaster preparations. Aside from the exhibits, the open house for TFAW included free Planetarium shows for the whole week and a tour of PAGASA facilities.

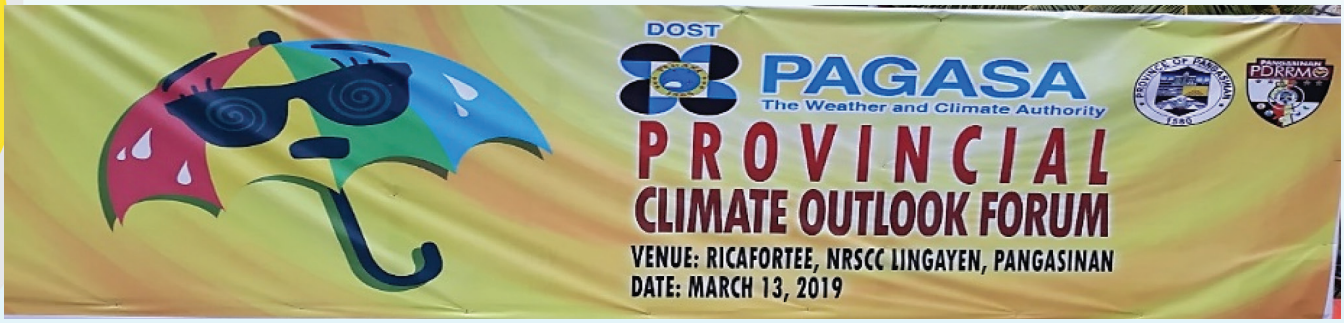
The Agency initiated a weather-related quiz bee entitled ***"STEM Tagisan ng Talino,"*** where students from grades 4 to 6 competed in the event. Winners bagged cash prizes, and the rest received a token SOS kit, the Agency's disaster preparedness kit.

Also conducted were two sessions of 114th Climate Outlook Forum at the Amihan Conference Room – one session for stakeholders and another for the media.

The Media Seminar-Workshop for NCR, aimed to strengthen relations between the agency and its media partners, concluded the awareness campaign. The three-day workshop fortified the partnership of PAGASA with media colleagues from print, radio and television, and internet blog/ news writers.

Climate Forums Strengthened

The Philippines is highly susceptible to the effects of climate change, including but not limited to sea level upsurge, amplified frequency of extreme weather events, increasing temperatures and heavy rainfall. Reliance on climate-sensitive minerals/fuels and vast stretches of coastlines rich in natural resources exposed towns/cities, where the mainstream of the population lives, to natural hazards (typhoons, landslides, floods, and droughts).



It is in this setting that PAGASA conceptualized the Climate Forum to link concerned and devoted people from the different sectors to mitigate the catastrophic, indefinite, and tragic consequences of climate change.

Nationwide, PAGASA conducted extensive climate forums with representatives from the different sectors of the society, local government officers, government units, educators, journalists, student leaders, nongovernmental organizations (NGOs), and other concerned people. The activity seeks to enlighten and inform participants on the different facets of climate change, comprising of the scientific basis, environmental and social impacts, policy and strategy options, and operational measures to address climate change effects. It also serves as a venue to discuss and express participants' concerns regarding climate change-related problems.

Symposiums and Simple Science Research Forum and OJT Commencement Program

Science and Technology Caravan 2nd Congressional District

In collaboration with the LGU of Rosario, La Union, PAGASA held the Science and Technology Caravan on 27 June 2019. It aims to showcase different tools, provide information, and educate students and the public on some weather-related information. Present in the said activity were representatives from DOST, PAGASA, Local Government sector of Rosario, La Union, together with selected students and teachers.

PAGASA Hopes for a Climate-Resilient Agriculture

Training of Trainers on Climate Smart Agriculture
Carmen, Agusan del Norte 16 October 2019

As climate change directly affects our daily life, PAGASA looks forward to aiding an agriculture-resilient country by providing accurate weather information necessary for future planning and preparation in the field of agriculture.

The Agency looks beyond ensuring food security available for all by cooperating in critical measures with the sector of agriculture. There is a necessity to progress and stimulate existing management strategies for dealing with climate variability. These will boost farmers' capacity to strategize and deal with extreme events (droughts, floods, fire, hail, etc.) in the medium and longer-term. Using climate forecasts at a range of time scales will help in tracking the early stages of climate change, and make preemptive tactical management adjustments until the longer-term trends and necessary adaptations in particular regions become clearer.

Strengthening Media Relations

DOST-PAGASA maintains its partnership with media through various activities that further promotes the products and services of the agency.

In 2019, the Agency conducted 11 press conferences on extreme weather events and the 2019 Annular Solar Eclipse on December 26 in Balut Island, Sarangani.

The media participated and received a series seminar-workshops that serve as a refresher course to further inform them about the products and services of the agency. These enable the media to translate in layman's terms the weather-related information in their reports and articles. Participants include members of national, local, and government media.

The two Media Seminar-Workshops conducted aimed to strengthen relations between the Agency and its media partners. These three-day workshops fortified collaboration between PAGASA and media partners from print, radio, television and online.

Conduct of Media Seminar-Workshop for NCR was in line with the Typhoon and Flood Awareness Week (TFAW) on 21-23 June 2019 in Silang, Cavite. In Region V, the seminar-workshop was held on 30 April to 01 May 2019 in Pili, Camarines Sur, which was timely as several provinces in the Bicol Region were declared under a state of calamity during the onslaught of Tropical Depression Usman in December 2018.

Aside from lectures, also featured in the workshop were other activities/exercises such as typhoon tracking, forecast interpretation and delivery, and role-playing.

A year-end accomplishment report and thanksgiving for the media wrapped up the activity.

Images below show some of the interviews conducted by media in some of the PAGASA Regional Services Division.


Media Interview by ABS-CBN (Dec. 2, 2019) Legazpi City


Media Interview, Sorsogon


During TY Ursula

VII. HUMAN RESOURCE DEVELOPMENT PROGRAM (HRDP)

Orientation on PRIME-HRM

PAGASA conducted a series of seminars as per the Civil Service Commission (CSC) Memorandum Circular No. 2, series of 2012, Program to Institutionalize Meritocracy and Excellence in Human Resource Management (PRIME-HRM). It assesses the agency's human resource management competencies, systems, and practices toward HR excellence. PRIME-HRM presents a more progressive system of assessment as it entails greater engagement not just of the human resource management officer (HRMO) but also of the officials and the rank-and-file employees of the Agency.

Five batches of seminars were completed and catered to selected PAGASA Central Office and Regional Services personnel. Conduct of the activities was in April, May, July, August, and November 2019.

Participants were able to broaden their knowledge on PRIME-HRM and the relevance of its mechanism for the improvement of the Agency's human resource functions. It also highlighted the importance of each individual's role in the attainment of goals.




Workplace Learning and Development (L&D)

Workplace Learning and Development, in collaboration with the Civil Service Institute (CSI) of the CSC, was conducted to provide leaders the knowledge in making a systematic approach in promoting and managing organizational and individual growth. It involves PAGASA leaders, particularly Chiefs/OICs, for them to acquire the needed knowledge and capability to support the Agency in pursuing/ achieving strategic goals through continuous development of mission-critical competencies.

The three-day activity was conducted from 9 to 11 September 2019 at the Training Room in PAGASA Central Office.

Stress Management for Leaders

Stress, if unmanaged, could negatively affect our lives. Whether at home or work, we can never eliminate stress, but we can manage if we understand how to handle it properly.

PAGASA values the overall health of its stakeholders. More so, the Agency treasures the well-being of its leaders who make pertinent decisions for the welfare of the organization.

From 28 to 29 November 2019, leaders and managers of PAGASA attended a workshop on Stress Management for Leaders. It discussed emotional intelligence and how it will help in managing workplace pressures at individual and organizational levels. Moreover, workshop participants acquired the knowledge and techniques in creating a healthy and balanced working environment and further improve personal effectiveness, which is one of the Agency's core competencies

Updates on Policies and Issuances and Values Orientation Workshop

To inform the employees of latest issuances, guidelines and protocols, the Agency conducted the seminar updates on the Agency's Policies and Issuances alongside with the Values Orientation Workshop (VOW). Implementation of the activities was on 27-30 August 2019 at The Mansion in Iloilo City.

VOW is also in consonance with the Moral Recovery Program, Republic Act 6713, of the Office of the President. VOW aims to clarify that some individual values and norms serve as an essential requisite of an efficient and effective public service

Harmonization of the PAGASA Strategic Plan

Harmonization means working on those parts that are complementary to have the plans puzzle together for the achievement of an overall strategic objective. Harmonization helps different departments in local authorities share the same vision, work together and optimize the use of resources.

On October 24-26 2019, the Agency conducted the writeshop Harmonization and Improvement of the 2018-2022 PAGASA Strategic Plan at the First Pacific Leadership Academy, Antipolo City, Rizal. It emphasized the need to realign and improve the existing set of the PAGASA strategic plans and strengthened the Agency's delivery of its mandated tasks.

List of 2019 Masteral and Post Graduate Diploma Course from PAGASA

Albert Einstein once said, "Wisdom is not a product of schooling but of the lifelong attempt to acquire it." PAGASA always believes that there is hope in a continuous attempt to learn while opportunities are available. In the worthwhile pursuit of acquiring and achieving excellence, it is an honor to present our scholars for the year 2019.

Jan Ivy L. Bausa
Course: Master in Public Administration
Date covered: June 2017 to March 2019
School: University of the East
Graduated December 2019

Jhunace Planea
Course: MS Meteorology
Duration: August 2014 – June 2019
School: University of the Philippines, Diliman

John Lester Sia
Course: Post Graduate Diploma Course in Satellite Meteorology and Global Climate (SATMET-II)
Date covered: August 2018 to April 2019
Conducted at the Space Application Center (ISRO), Ahmedabad, India with third rank of merit

List of Technical Courses Conducted

Training Workshop on Radar Observation and FM-20 Coding
18 to 20 March 2019
PAGASA Training Room

Multi-Hazard Early Warning System in the Philippines Multi-Stakeholder
27 to 28 March 2019
La Breza Hotel, Quezon City

Workshop on Stream Gauging and Hydrographic Survey
01 to 05 April 2019
Bliss Hotel, Villa Victoria St., San Fernando, Pampanga

WCSSP Forecaster Training in Southeast Asia
06 to 10 May 2019
PAGASA Training Room

Capacity Building on Data Processing, Visualization and Mapping of Severe Wind Hazards using Qlick Sense
14 to 17 May 2019
PAGASA Training Room

Chief Meteorological Conference for NCR-PRSD
20 to 23 May 2019
Estancia Resort Hotel, Tagaytay City

National Rainfall Warning System Conference
27 to 29 May 2019
Hotel Carmelita, Tuguegarao City

Meteorological Technicians Training Course (MTTC)
05 May to Oct 2019
PAGASA Training Room

Meteorologist Training Course
23 October to 2020
PAGASA Training Room

Workshop on the Best Practices and Standard Operating Procedures of the Impact-Based Forecasting System
11 to 13 November 2019
PAGASA Training Room

Government Radio Operator Course and Radio Land Mobile Seminar
19 December 2019
PAGASA Training Room

List of Non-Technical Courses Conducted/ Attended

Formulation of GAD Agenda and IEC Review
01 to 02 April 2019
PAGASA Amihan Conference Room

Orientation on PRIME-HRM (1st batch - CO)
03 to 04 April 2019
PAGASA Amihan Conference Room

HR Learning Session/Meeting
16 April 2019
PAGASA Amihan Conference Room

Orientation on Disability Laws and Sensitivity Trainings & Psychosocial Awareness
25 to 26 April 2019
PAGASA Amihan Conference Room

Orientation on Senior Citizen Laws and Pre-retirement and Orientation on PRIME-HRM (1st batch Regional)
29 to 31 May 2019
Cebu

Gender Analysis and Mid-Year Assessment
10 to 11 July 2019
PAGASA Amihan Conference Room

Orientation on PRIME-HRM
30 to 31 July 2019
PAGASA Amihan Conference Room

Orientation on PRIME-HRM (Central Office)
8 to 9 August 2019
PAGASA Amihan Conference Room

DOST Gender Analysis
22 to 23 August 2019
Tagaytay City

Updates on Policies and Issuance and Values Orientation Workshop
27 to 30 August 2019
The Mansion, Iloilo

Workplace Learning and Development
09 to 11 September 2019
PAGASA Training Room

Orientation for New Employees with Gender Sensitivity Training
17 to 19 September 2019
The Pinnacle Hotel, Davao City

DOST Focal Point Assembly
05 to 07 November 2019
Puerto Princesa, Palawan

HGDG/Gender Analysis (Year-End 0Assessment)
06 to 07 November 2019
PAGASA Amihan Conference Room

Orientation on PRIME-HRM (2nd-batch Regional)
11 to 14 November 2019
Legazpi City

Film Showing "Bagahe" (18-day Campaign to End-Violence Against Women)
25 November 2019
PAGASA Amihan Conference Room

Stress Management for Leaders
28 to 29 November 2019
PAGASA Amihan Conference Room

Echo Seminar on Leave Administration Course for Effectiveness
11 December 2019
PAGASA Amihan Conference Room

18-day Campaign to End-VAW - Solidarity Walk "Kilos Lakad: Wakasan ang Karahasan sa Kababaihan"
12 December 2019
Camp Gen. Emilio Aguinaldo, Q.C.

List of International Meetings/Conferences Attended

Technical Conference on Future Hydrological Priorities and Arrangement
11 to 13 February 2019
Geneva, Switzerland

Extraordinary Session of the Commission for Hydrology
13 to 14 February 2019
Geneva, Switzerland

51st Typhoon Committee Annual Session
26 February to 01 March 2019
Guangzhou, China

UM Partnership Celebration of Science and Service Delivery and UM Associate Partnership Meeting
05 to 06 March 2019
Wellington, New Zealand

InterMet Asia 2019
26 to 29 March 2019
Singapore

WMO Second Multi-Hazard Early Warning Conference
13 to 14 May 2019
Geneva, Switzerland

UNISDR Sixth Session of the Global Platform for Disaster Risk Reduction 2019
15 to 17 May 2019
Geneva, Switzerland

Eighteenth World Meteorological Congress (Cg-18)
03 to 14 June 2019
Geneva, Switzerland

WRF User's Training and Technical Meeting
10 to 14 June 2019
Boulder, Colorado, United States of America

23rd Meeting of the Meteorology Sub-group (Met SG/23) of the Asia Pacific Air Navigation Planning and Implementation Regional Working Group (APANPIRG)
17 to 20 June 2019
Thailand

6th Meeting of the ICAO Asia and Pacific Volcanic Ash Exercises Steering Group
20 to 21 June 2019
Thailand

VOTE Meteorology Section Conference
18 to 20 July 2019
Taipei City, Taiwan

Verification of Independent Flood Forecasting System Using AI-base Flood Prediction Algorithm Meeting (Advisory Council) Information
22 to 26 July 2019
Korea

APEC Climate Symposium 2019 and Annual APCC WG Meeting
20 to 22 August 2019
Punta Arenas, Chile

2nd Meeting of the Steering Group for Space-Based Weather and Climate Extremes Monitoring (SWCEM) Demonstration Project (SEMDP)
21 to 23 August 2019
Tokyo, Japan

Expert Dialogue on Scaling Up Regional Cooperation in Multi-Hazard Early Warning Systems in Asia-Pacific with a Focus on Flood and Drought
26 to 28 August 2019
Bangkok, Thailand

Project Meeting and Workshop of the EXperiment on Typhoon Intensity Change in Coastal Area (EXOTICCA) and the Understanding and PreDiction of Rainfall Associated with landFalling Tropical cyclones (UPDRAFT) and the Typhoon Landfall Forecast Demonstration Project (TLFDP)
03 to 05 September 2019
Nanjing, China

American Meteorological Society's 39th International Conference on Radar Meteorology
16 to 20 September 2019
Nara, Japan

Joint CALMET XIII & Eumetcal Conference
17 to 20 September 2019
Germany

Annual Working Group Meeting on Tropical Meteorology Research
17 to 19 September 2019
Geneva, Switzerland

Annual International Training Centre in Astronomy Colloquium 2019 on Big Data for Southeast Asian Development
23 to 24 September 2019
Thailand

World Meteorological Organization (WMO) Regional Association V Workshop on the WMO-IATA Collaborative Aircraft Meteorological Data Relay (AMDAR) Programme (WICAP) and Meeting of the Task Team on Aircraft-Based Observations
24 to 26 September 2019
Singapore

Meeting of the Regional Subproject Management Team (RSMT) of SWFDP-SeA
24 to 27 September 2019
Bangkok, Thailand

2019 Taiwan-Southeast Asian Countries International Conference on Slopeland Disaster Prevention
29 September to 03 October 2019
Taipei, Taiwan

Regional Specialized Meteorological Centre (RSMC) Tokyo Typhoon Committee (TC) Center 30th Anniversary
07 to 09 October 2019
Tokyo, Japan

Working Group on Meteorology of the TC
07 to 09 October 2019
Tokyo, Japan

High-level Dialogues on Tropical Cyclones: A 10-year Vision to Protect Life and Property
10 to 11 October 2019
Tokyo, Japan

8th Working Meeting of the Typhoon Committee Working Group on Hydrology
15 to 18 October 2019
Seoul, Korea

Flash Flood Guidance System Regional Centres Meeting
03 November 2019
Ankara, Turkey

Technical Meeting on Regional Weather Radar Network for Southeast Asia
13 to 15 November 2019
Tokyo, Japan

Deliberation of funding proposal entitled Multi-Hazard Impact-Based Forecasting and Early Warning System for the Philippines
10 to 15 November 2019
Republic of Korea

13th ASEAN Climate Outlook Forum (ASEANCOF-13) and Training
18 to 21 November 2019
Thailand

Implementation Coordination Meeting of Southeast Asia Regional Climate Centre (SeaRCC) Network
15 to 21 November 2019
Thailand

Weather Radar Seminar 2019
18 to 22 November 2019
Japan

2nd Expert Mission for the AOP Projects related to ESCAP/WMO Typhoon Committee
25 to 29 November 2019
Thailand

Advisory Council Meeting for the project Verification of Independent Flood Forecasting System Using Artificial Intelligence (AI)-based Flood Prediction Algorithm
03 to 07 December 2019
Korea

International Conference on Laws and Regulations for Water Resources Management in Southeast Asian Countries
12 to 14 December 2019
Thailand

The 2nd ASEAN Hydroinformatics Data Centre Official Meeting
15 December 2019
Thailand

Annular Solar Eclipse
26 December 2019
Singapore

11th Southeast Asia Astronomy Network (SEAAN) Meeting
27 to 28 December 2019
Singapore

List of International Trainings Attended

Factory Acceptance Test for the Project "Supply, Delivery, Installation, Testing, Training and Commissioning of One (1) Lot Upgrading of Interactive Data Processing System"
07 to 11 January 2019
France

Technical Workshop on Hydrological System on Data Processing & Telemetry
21 to 25 January 2019
Vienna, Austria

Seminar on Radiosonde and Weather Radar Data Analysis Course
13 to 22 February 2019
Japan

Severe Weather Forecasting Demonstration Project – Southeast Asia (SWFDP-SeA) Regional Training
19 February to 01 March 2019
Vientiane, Lao People's Democratic Republic

Workshop on Severe Weather and Impact Based Forecasting and Warning Services
25 February to 01 March 2019
Vientiane, Lao People's Democratic Republic

Factory Acceptance and Factory Training for the Project "Supply, Delivery, Installation, Testing, Supervision, Training and Commissioning of PAGASA Climate Forecast Computing System"
24 February to 04 March 2019
Shenzhen, China

Factory Acceptance and Factory Training for the Project "Supply, Delivery, Installation, Testing, Training and Commissioning of Defender S1000 S-Band, Dual Polarization Doppler Weather Radar System"
25 February to 01 March 2019
Alabama, United States of America

Operation Evaluation of Fuzzy Logic Algorithm Based Radar Data Quality Control, Radar Qualitative Precipitation Estimation (QPE), and Lightning Application
04 March to 03 May 2019
Chinese Taipei

Collaborative SIGMET Issuance (CSI) Workshop 2019
04 to 08 March 2019
Tokyo, Japan

Regional Association II WIGOS Workshop – Regional WIGOS Center and Its Services
06 to 09 March 2019
Tokyo, Japan

Workshop on the WMO Information System (WIS)
11 to 12 March 2019
Tokyo, Japan

Training for the Installation of POTEKA (Automatic Weather System)
25 to 26 March 2019
Japan

Second Workshop on ASEAN Regional Climate Data, Analysis and Projections (ARCDAP-2)
25 to 29 March 2019
Singapore

Testing the Methodology for the Cataloguing of High-Impact Weather, Water and Climate Events
28 to 29 March 2019
Jakarta, Indonesia

11th International Training Workshop Climate Variability and Predictions in the NOAA-USAID Series
15 to 26 April 2019
Ankara, Turkey

4th Monsoon Heavy Rainfall Workshop
16 to 18 April 2019
Shenzhen, China

Pre-final Evaluation Meeting for VOTE Project on Advanced Wave Simulation Session
22 to 26 April 2019
Taiwan

Pre-final Evaluation Meeting for VOTE Project on Satellite Data Processing Technique
24 April to 03 May 2019
Taiwan

NARIT International Astronomical Training Workshop 2019
05 to 10 May 2019
Thailand

Technical Training on APEC Climate Center –PAGASA Regional Prediction System (APCC-PRePS)
05 to 11 May 2019
Busan, Republic of Korea

International Training Course on Short-term Climate Prediction and Its Application in Disaster Prevention and Mitigation
06 to 16 May 2019
China

Factory Acceptance Test for the Project "Rehabilitation of Aviation Weather Observation System at the Ninoy Aquino International Airport"
20 to 25 May 2019
Vaisala Factory, Finland

Typhoon Committee Research Fellowship Scheme for 2019
20 May to 14 June 2019
Jeju, the Republic of Korea

Radar and Satellite Training Session
27 May to 06 June 2019
Taiwan

Unified Model User Tutorial and Unified Model User Workshop
10 to 21 June 2019
Exeter, United Kingdom

UM User Workshop and the GC Teleconnections Workshop
17 to 27 June 2019
Exeter, United Kingdom

The 2nd NARIT-STFC Summer School in Radio Astronomy and Technology
17 to 28 June 2019
Thailand

Factory Acceptance and Factory Training for the Project "Supply, Delivery, Installation, Testing, Training and Commissioning of Defender S1000 S-Band, Dual Polarization Doppler Weather Radar System for the Agno Radar"
24 to 28 June 2019
Alabama, United States of America

International Training Course on Modern Weather Forecast Technologies
24 June to 05 July 2019
Nanjing, China

Training Workshop on Asian Aviation Hazardous Weather Coordination
30 June to 05 July 2019
Beijing, China

3rd Training Workshop on Subseasonal to Seasonal Predictions for Southeast Asia
22 to 26 July 2019
Singapore

Training on Understanding of Cloud Nature and Weather Modifications for Water Resources Management in ASEAN
22 to 26 July 2019
Bangkok, Thailand

Regional Workshop on Climate Advisory Services, Advanced Assessment and Planning Technologies and Country Experience in Implementing MOSAICC
15 to 19 July 2019
Bangkok, Thailand

Factory Acceptance and Factory Training for the Project "Supply, Delivery, Installation, Testing, Training and Commissioning of a Coordinated Network Composed of Six (6) Pulse Compression and Dual Polarization Doppler X-Band Radar Raingauge"
14 to 26 July 2019
Japan

Understanding Natural Disasters (UND) Project Training Event
19 to 20 August 2019
Yangon, Myanmar

Leadership and Management Programme for Senior Management of National Meteorological and Hydrological Services in Regional Association II and V
26 to 30 August 2019
Singapore

WMO/Eumetcal Training Development Workshop
16 September 2019
Germany

China-ASEAN Disaster Prevention and Reduction Science Communication Forum
16 to 18 September 2019
China

Super Thermometer Factory Acceptance and Training
16 to 19 September 2019
Singapore

Weather and Climate Science for Service Partnership (WCSSP) Programme Science Workshop
23 to 24 September 2019
London, United Kingdom

International Training Course for Weather Radar Operation
23 September to 04 October 2019
Korea

Weather and Climate Science for Service Partnership (WCSSP) Programme Science Workshop
23 to 24 September 2019
London, United Kingdom

International Training Course for Weather Radar Operation
23 September to 04 October 2019
Korea

Training Program on Reinforcement of Meteorological Services
25 September to 07 December 2019
Japan

Training on Quality Control Techniques and Data Assimilation for Numerical Weather Prediction (Philippines)
13 to 26 October 2019
Korea

Asia Pacific Climate Service Workshop 2019
28 to 30 October 2019
Taipei, Taiwan

Asia-Oceania Group on Earth Observations (AOGEO) Symposium and the 12th AOGEO Symposium
02 to 04 November 2019
Canberra, Australia

14th Integrated Workshop
04 to 07 November 2019
Guam, United States of America

Global Flash Flood Guidance System Workshop
04 to 08 November 2019
Ankara, Turkey

2nd International Workshop on Waves, Storm Surges and Coastal Hazards
10 to 15 November 2019
Melbourne, Australia

Global Dialogue Platform on Anticipatory Humanitarian Action
12 to 14 November 2019
Berlin, Germany

Factory Acceptance Testing and Factory Training for the Project "Supply, Delivery, Installation, Testing, Training and Commissioning of Nationwide Network of High-Frequency Radars for Remote Sensing Observation of Coastal currents circulation including integration of all HFDR
17 to 23 November 2019
California, United States of America

Global Multi-Hazard Alert System in Asia (GMAS-A) Workshop
18 to 19 November 2019
Haikou, China

Training course on Weather Prediction by Numerical Methods Module 1 (WPNM-M1)
18 to 22 November 2019
Singapore

TCC Training Seminar on Climate Analysis Information on Extreme Climate Events
25 to 29 November 2019
Japan

10th Asia-Oceania Meteorological Satellite Users' Conference (AOMSUC-10)
02 to 07 December 2019
Melbourne, Australia

WMO VCP Workshop on Now casting, Seamless Forecasting and Warning Services
03 to 06 December 2019
Hong Kong, China

Meteorological Organization (WMO) Severe Weather Forecasting Programme for Southeast Asia (SWFDP-SeA) Second Training Desk at Regional Forecast Support Centre (RSFC)
09 to 20 December 2019
Hanoi, Vietnam

Collaborative SIGMET Issuance (CSI) Workshop
16 to 19 December 2019
Tokyo, Japan

VIII. REGIONAL AND INTERNATIONAL COOPERATION PROGRAM

Participation in the Cloud, Aerosol, and Monsoon Processes Philippines Experiment (CAMP2Ex)

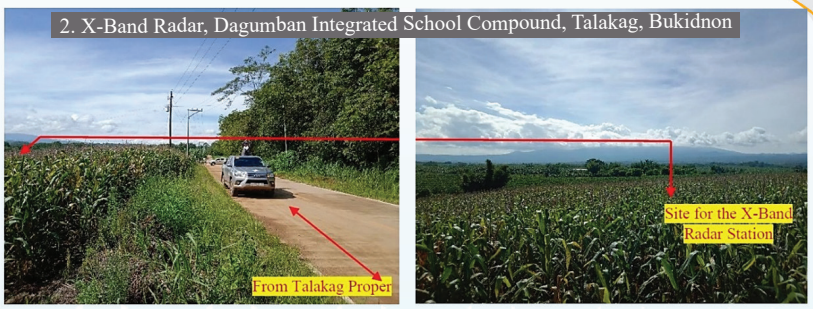
The Cloud, Aerosol, and Monsoon Processes Philippines Experiment (CAMP2Ex) is an airborne campaign conducted in September 2019 at Clark Air Field, Pampanga. It aims to investigate essential unknowns in the Southwest Monsoon climate and weather using satellites, aircraft, and models. PAGASA participated in the said campaign sponsored by the National Aeronautics and Space Administration (NASA), Manila Observatory, and Naval Research Laboratory (NRL).

The PAGASA weather forecasters joined the weather briefing by giving the weather conditions in Clark Air Field during the takeoff and landing of the aircraft (NASA P-3B and SPEC Lear 35). The Agency also provided radar imageries whenever the scientists requested radar data during their in-flight and to pilots during their return flight. The participants had the chance to join discussions with the Manila Observatory researchers led by Ed Fukada, Chief Forecaster of the CAMP2Ex. He shared some of his experiences as a forecaster and taught PAGASA how to interpret the numerical weather models and satellite imagery. Some best practices of tropical cyclone forecasting were also shared.

Official Development Assistance (ODA) Project "Improvement of Flood Forecasting and Warning System for Cagayan De Oro River Basin"

Another Official Development Assistance (ODA) project was granted to PAGASA by the Japan International Cooperation Agency (JICA). The project is entitled Improvement of FFWS for Cagayan De Oro River Basin. Based on the grant agreement, the project effectivity date is on 25 June 2018. However, it was in 2019 when the Agency performed most of its initial works.

The project aims to minimize the flood-related disasters in the Cagayan De Oro river basin through effective flood forecasting and warning. These include the installation of Flood Forecasting and Warning System (FFWS) hydro monitoring equipment and two new X-Band Radars in Talakag and Libona, rehabilitation and upgrading of the computer system, development of flood forecasting model, and training of selected Mindanao PAGASA Regional Services Division hydrometeorologists and observers.



In 2019, acquisition of permits for lot utilization, including necessary certificates/evaluation reports/ clearance from concerned agencies, were secured.

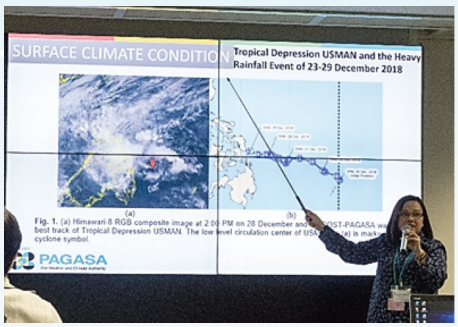
Food and Agriculture Organization National Adaptation Plans-Agricultural Sector (FAO – NAP-AgS) Completion Workshop

PAGASA received the Certificate of Appreciation for the exemplary support, assistance, and contribution in the implementation of NAP-Ag Philippines program and in leading the process of mainstreaming climate change concerns into the agriculture and fisheries sectors of the country. This event was held on 18 December 2019 at the Crown Hotel in Ortigas

OTHER PARTNERSHIPS AND COOPERATION ACTIVITIES

Factory Acceptance and Training for the S-Band Doppler Radar System on 24-28 June 2019 in Alabama, USA

Third Training Workshop on Sub-seasonal to Seasonal Prediction for Southeast Asia on 22-26 July 2019 in Singapore



Japan Meteorological Agency / Tokyo Climate Center (JMA/TCC) Training Seminar on Climate Analysis on Extreme Climate Events on 25-29 November 2019 in Tokyo, Japan

WMO RA V Southeast Asian Regional Climate Centre Network (SEA RCC) Meeting on 15-16 November 2019 and 13th ASEAN Climate Outlook Forum (ASEANCOF-13) and Training on 18-22 November 2019 in Bangkok, Thailand

Action Ready Climate Knowledge to Improve Disaster Risk Management for Small Holder Farmers in the Philippines (ACIAR-ASEM Project) Project Team Meeting and Workshop on Rapid Climate Decision Analysis on 26-27 March 2019 in UPLB, Laguna

11th International Training Workshop Climate Variability and Predictions / Turkish State Meteorological Service on 15-22 April 2019 in Ankara, Turkey

International Training Course on Short-Term Climate Prediction and Its Application in Disaster Prevention and Mitigation on 06-17 May 2019 in Nanning, China

IX. GENERAL ADMINISTRATION AND SUPPORT PROGRAM

Orientation Seminar with Gender Sensitivity Training

PAGASA held an orientation seminar and gender sensitivity training last 17-19 September 2019 at The Pinnacle Hotel, Davao City. It aims to acquaint new employees with workplace rules, regulations, protocols, and understand individual roles and align them to the Agency's vision.

The design of the seminar encourages uninhibited communications between sexes to bring mutual understanding and respect of each other's roles in the organization. Brainstorming sessions produced ideas that may influence bring change in fostering an environment of respect, dignity, and understanding for both genders.

Purple Wall: National Women's Month Celebration

Under Republic Act (RA) 6949 series of 1990, declaring March 8 of every year as National Women's Day, PAGASA observes the celebration of National Women's month by encouraging employees to engage and participate in various activities prepared by the office.

According to the Philippine Women's Commission, the elements of this year's theme, **"We make change work for women"** implies that

• **W**e stands for **W**omen **E**mpowerment – empowering women enables them to confidently and meaningfully engage with appropriate institutions to ensure that they contribute to and benefit from development and changes. Thus, women's empowerment will make the change that we are espousing or any development effort responsive of women's concerns.

• Make Change Work = **MCW** = **Magna Carta of Women** – making change work for women necessitates strengthening the implementation of the MCW at all levels. It means putting in place functional mechanisms as well as implementing and making known to citizens, programs and services that address strategic gender needs of women.

•**Change** – also means **C**ompassionate and **H**armonized **A**ctions and **N**etworks for **G**ender **E**quality.

• **We** / us or **"kami / tayo"** in Filipino – who is going to pave the way for an enabling environment for women to be empowered? Who is going to ensure that the MCW is implemented at all levels? Who is going to make change work for women? It all of us, in our various capacities whether as government officials and employees, members of the private sector, the academe, non-government organizations, or as private individuals can be partners for a change that is gender-responsive. It emphasizes our collective effort, collaboration and participation to ensure that women will not be left behind in the pursuit of change.

The theme emphasizes that women should be active drivers in bringing about positive changes, and that they should also reap from fruits of development efforts. This can be made possible by empowering women – enabling them to meaningfully engage with other development stakeholders, and by fully implementing the MCW.

Indeed, employees of PAGASA had increased knowledge, awareness, and appreciation of the role and influences of women in nation-building.

Mid-year Program Review and Analysis

The mid-year performance review is an important activity that allows leaders/executives to conduct a semi-annual evaluation of the organization's accomplishments vis-a-vis targets upon the implementation of various plans and programs. It also serves as a venue for a constructive discussion and exchange of ideas/ perspectives that will address the challenges and issues serving as roadblocks in the accomplishment of goals.

On 18-19 July, the Plans and Programs Development Unit (PPDU) hosted the 2019 Mid-Year Program Review and Analysis (PRA) to assess significant accomplishments of the harmonized programs and projects of each division under the 2018-2022 Strategic Plan. Members of the executive staff, planning officers, and other concerned officers/personnel attended the activity at the PAGASA Amihan Conference Room.

eNGAS Implementation and Data Build Up

eNGAS is a government accounting software that is intended for the recording of financial transactions and is capable of generating financial reports appropriate with the requirements of the New Government Accounting System (NGAS).

It is programmed to generate real time financial reports in the latest standard formats, and also features adequate security mechanisms for data integrity and security.

As part of PAGASA's commitment to integrity and excellence, the Financial, Planning and Management Division (FPMD) – Accounting Section already accomplished 91% of eNGAS data build-up, which started 13 April 2019.

It is the earnest desire of the Agency to provide accurate, reliable and timely financial information pertinent to management in its decision-making process, to comply with various government oversight and regulatory agencies, and cultivate transparency in the utilization of public funds thru eNGAS.

Budget and Treasury Management System (BTMS) Power User Training

"The Budget and Treasury Management System (BTMS) is a common, modern, integrated, accurate, reliable and secure information system for the public financial management (PFM) operations of the Government of the Philippines (GOP). It provides a sustainable government resource planning solution that is extensible, flexible thereby supporting a range of public financial requirements, and adaptable to reform and modernization." [2]

As per the Department of Budget and Management (DBM) Circular Letter No. 2019-4, the BTMS aims to standardize and automate the budget utilization of the spending agency and serves as the core and foundation of an integrated Financial Management Information System (FMIS) and the sole means for obligating, disbursing, and reporting of all government expenditures. Also stated are the main features of the BTMS are as follows:

- ✓ An integrated and web-based FMIS built on a centralized database to support the Public Financial Management (PFM) processes of the government.
- ✓ Covers the budget execution and the budget utilization phases of the National Budget cycle and supports the following PFM functions: budget management, commitments management, payments management, receipts management, cash management, debt management, property, plant and equipment (i.e., fixed assets), accounting, and fiscal reporting.
- ✓ Provides standard workflow and signing authorities ensuring proper segregation of duties and enforcement of budget execution controls.
- ✓ Secure and compliant with digital documents enforceability as prescribed under Republic Act No. 8792, also known as the Electronic Commerce Act of 2000

Thirty-five (35) selected PAGASA personnel (9 male and 26 female) attended the BTMS workshop on 12-13 September 2019. Most of the attendees are directly involved in the procurement and financial activities of the Agency.

[2]https:// www.btms.gov.ph/what-is-btms

ISO 9001:2015 Certification

In 2015, the Weather Division (WD) obtained its first ISO 9001:2008 certification with TUV Rheinland as the certifying body. It has a three (3) year validity period that is justified by an annual surveillance audit. Scope of the certification includes the Weather Forecasting Section (WFS), Marine Meteorology Services Section (MMSS), Techniques Applications and Satellite Section (TAMSS), Meteorological Data and Information Exchange Section (MDIES) and the Aeronautical Meteorology Services Section (AMSS).


Certificate

Standard ISO 9001:2015
Certificate Registr. No. 01 100 1534769

Certificate Holder: PHILIPPINE ATMOSPHERIC, GEOPHYSICAL, AND ASTRONOMICAL SERVICES ADMINISTRATION - WEATHER DIVISION and TECHNICAL TRAINING CENTER SUPPORT SERVICES
Weather and Flood Forecasting Center, BIR Road, Diliman, Quezon City, Philippines
including the locations according to annex

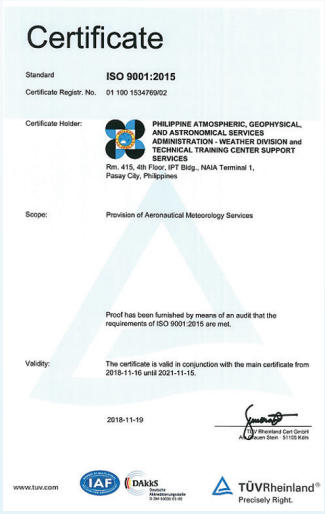
Scope: Provision of Meteorological Data and Information Exchange Services, Techniques Application and Meteorological Satellite Services, Marine Meteorology Services and Weather Forecasting Services

Proof has been furnished by means of an audit that the requirements of ISO 9001:2015 are met.

Validity: The certificate is valid from 2018-11-16 until 2021-11-15.
First certification 2018

2018-11-19

www.tuv.com TÜVRheinland® Precisely Right.


Certificate

Standard ISO 9001:2015
Certificate Registr. No. 01 100 1534769/02

Certificate Holder: PHILIPPINE ATMOSPHERIC, GEOPHYSICAL, AND ASTRONOMICAL SERVICES ADMINISTRATION - WEATHER DIVISION and TECHNICAL TRAINING CENTER SUPPORT SERVICES
Rm. 415, 4th Floor, IPT Bldg., NAIA Terminal 1, Pasay City, Philippines

Scope: Provision of Aeronautical Meteorology Services

Proof has been furnished by means of an audit that the requirements of ISO 9001:2015 are met.

Validity: The certificate is valid in conjunction with the main certificate from 2018-11-16 until 2021-11-15.

2018-11-19

www.tuv.com TÜVRheinland® Precisely Right.

Before its expiration in October 2018, the Weather Division (WD) made a renewal of the certification, adopting the newer version ISO 9001:2015. An external audit was done in November 2018 covering the same scope but with the addition of the Technical Training Center Support Services (TTCSS) of the Research and Development and Training Division (RDTD). After the demanding validation process, TUV Rheinland certified the renewal of the certification for another three (3) year validity period, from 2018 to 2021 of November.

Performed last October 2019 was the surveillance audit, and again the WD and TTCSS passed, thereby certification is maintained and remained valid. Such feat is noteworthy and kudos to the men and women behind this undertaking.

AWARDS AND RECOGNITIONS RECEIVED

PAGASA, an Outstanding Partner for Sources of Information – Bangko Sentral ng Pilipinas (BSP)

PAGASA once again took pride and honor when BSP recognized and awarded PAGASA, during its 16th Awards Ceremony and Appreciation Lunch for BSP stakeholders last 10 July 2019 at BSP Assembly Hall, BSP Complex, Manila.

The BSP acknowledged its salient partners that have substantiated its various initiatives and advocacy programs in 2018. This year's awards ceremony theme is **"One Team One Goal: Resilient Partnership towards Inclusive Economic Growth."**

Among the 44 awards given to the categories under Information Support, Advocacy Support, Special Recognition, and Hall of Fame and 14 special citations for Prudential Reporting Innovation, PAGASA accepted the award as **Outstanding Partner for Sources of Information** under the category of **Monetary Policy.** Mr. Jose Daniel C. Suarez, Chief Administrative Officer of the FPMD, received the award from BSP Governor Benjamin E. Diokno.

This is just one of the attestations of our reliability in delivering our service to the public. Indeed, it is another milestone to celebrate and cherish as we maintain our standards when it comes to dependability and dedication at work. It is public service at its finest.

PAGASA Notched Third in 2019 Makati Business Club (MBC) Survey

"The MBC is a private non-stock, non-profit business association organized as a Forum for Constructive Ideas." [3]

In 2019, the MBC, in partnership with the Management Association of the Philippines, conducted the Executive Outlook Survey (EOS) wherein the survey asked respondents whether or not they were satisfied with the performances of government agencies in the past year ranging from July 2018 to June 2019. Not all of the government agencies surveyed had promising results. Only 42 got a positive satisfaction rating.

The business sector noticed the steadfast performance of PAGASA. Pleased with the active response in the provision of weather, climate, and flood information, MBC included PAGASA in the top 5 list of agencies and placed third highest in the survey.

The other top agencies are the Bangko Sentral ng Pilipinas (BSP) at the first spot, the National Economic and Development Authority (NEDA) at the second spot, the Department of Trade and Industry (DTI) at fourth and the Philippine Statistics Authority (PSA) at fifth spot.

PAGASA as one of the top awardees in 2019 Freedom of Information (FOI) Awards

On December 12, 2019, the Presidential Communications Operations Office (PCOO) held its 3rd edition of the FOI (Freedom of Information) Awards. PCOO recognized PAGASA as one of the top requested and performing agencies in the eFOI portal (www.foi.gov.ph) and for its exceptional and significant contribution to the Freedom of Information program's progress and development. Mr. Jose Daniel C. Suarez, Chief Administrative Officer and Ms. Rosalina de Guzman, Supervising Adminstrative Officer received the award in behalf of PAGASA.

PCOO Secretary Martin Andanar opened the awarding ceremony with the current figures for FOI requests as of 30 September 2019, where there has been an increase in manual submissions to compliant national government agencies, government-owned and controlled corporations (GOCC), state universities and colleges (SUC) and local water districts.

[3]https:// mbc.com.ph/about-mbc/

"Based on submitted FOI reports, 29, 490 paper-based requests were made personally, while 18,036 requests were lodged at the FOI ePortal. Out of these online requests to 447 participating government agencies, 47 percent have been successfully facilitated and processed. This means out of 10 FOI requests, half are disclosed to the public," Andanar said.

Emphasizing the importance with making government information available in the fight against misinformation, he noted that "proliferation of false news corrupts state-people relations, and delays if not obliterate development while dissemination of accurate information empowers the people, connects them to the government through the rebuilding of trust, which in turn inspires progress."

The FOI Awards were first done in 2017 following the signing of Executive Order No. 02 by President Rodrigo Duterte a year before. It mandates the disclosure of public records and other relevant information, subject to exceptions, for all government offices under the executive branch should a request be made by the member of the public. The said awarding was held at The Peninsula Manila, Makati. *(Source: https://www.pna.gov.ph/articles/1088651)*

PUBLISHED RESEARCH PAPERS

TITLE	AUTHORS	PUBLICATION / JOURNAL
Evaluation of the Spatial Distribution of Evacuation Centers in Metro Manila, Philippines	E. P. Cajucom – 15% G. Y. Caho Jr. G. A. Constantino J. A. Ejares S. J. Quillope H. M. Solomon R. Ringor	The International Archives of Photogrammetry, Remote Sensing and Spatial Information Sciences. Volume XLII-3/W8, 2019 Gi4DM 2019- Geoinformation for Disaster Management, 3-6 September 2019 Prague Czech Republic https://doi.org/10.5194/isprs-archives-XLII-3-W8-79-2019! ©Authors 2019. CC BY 4.0 License pp79-85
Projected Changes in Rainfall and Temperature Over the Philippines From Multiple Dynamical Downscaling Models	M. Q. Villafuerte – 15% I. Macadam J. Daron J. Katzfey T. Cinco – 3% E. D. Ares R. G. Jones	Climatic Change Copy of Paper published at International Journal of Climatology, 2019; 1-21 ©2019 Royal Meteorological Society wileyonlinelibrary.com/journal/joc int J Climatol. 2019 1-21 Received: 14 December 2018 Revised: 25 July 2019 Accepted: 31 August 2019

AGENCY'S INCOME FROM ITS PRODUCTS AND SERVICES

PAGASA PRODUCTS AND SERVICES	GENERATED INCOME
Hydromet/Hydrologic Prediction and Frequency Analysis and Other Information (Rainfall Intensity Duration Frequency – RIDF)	92,000.00
Customized Climatological Data/Weather Publications	1,956,155.00
Weather Certifications	9,249,635.30
Accommodation of visitors to planetarium lectures and shows at Central Office	291,350.00
Mobile Planetarium Lectures/Stargazing/Telescoping on Tour to Schools in Luzon	31,000.00
Viewers to Stargazing and Telescoping Sessions	14,800.00
Astronomical Publications, Information, and Certifications	17,040.00
Number of assorted meteorological instruments calibrated for various clients	617,868.00
TOTAL	**12,269,848.30**

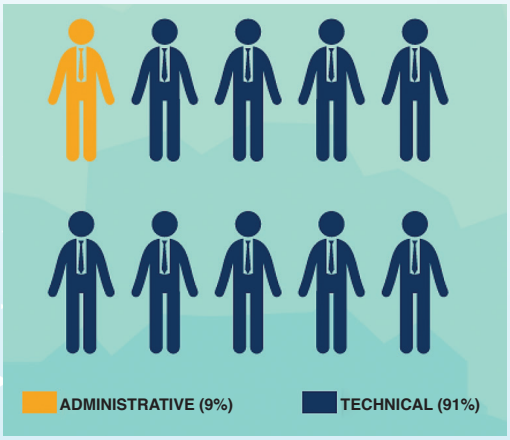
COMPARATIVE EXPENSES
Actual Obligations

	2018	2019	% Increase/ Decrease
PS	537,647	565,022	5%
MOOE	436,695	535,492	23%
Regular	436,695	483,395	11%
Locally-Funded Projects (LFPs)	-	52,097	100%
CO	987,244	932,852	-6%
Regular	985,445	648,491	-34%
Locally-Funded Projects (LFPs)	1,799	284,361	15,707%
TOTAL	1,961,586	2,033,366	4%

DISTRIBUTION OF PERSONNEL BY JOB CLASSIFICATION

Reference: PLANTILLA OF PERSONNEL as of 31 DECEMBER 2019

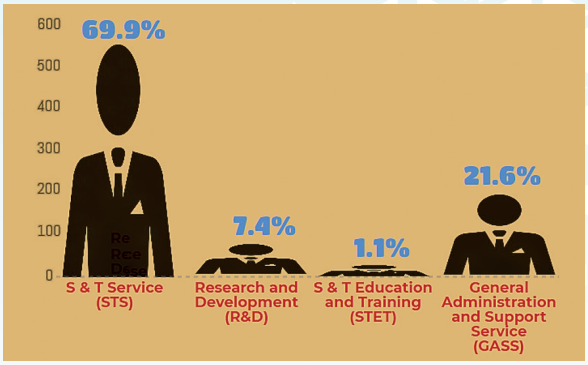
	FILLED	VACANT	TOTAL	%
ADMINISTRATIVE	79	11	90	9%
TECHNICAL	733	211	944	91%
TOTAL	812	222	1,034	100%



DISTRIBUTION OF PERSONNEL BY S&T FUNCTION

Reference: PLANTILLA OF PERSONNEL as of 31 DECEMBER 2019

CATEGORY OF PERSONNEL	LEVEL OF EDUCATION				TOTAL	%
	Below BS	BS/BA	MS/MA	PhD		
S&T Service (STS)	158	369	36	3	566	69.9%
Research and Development (R&D)	2	37	18	3	60	7.4%
S&T Education and Training (STET)	2	6	1	0	9	1.1%
General Adminis-tration and Support Service (GASS	46	104	22	3	175	21.6%
TOTAL	208	516	77	9	810	100%



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