PAMPANGA RIVER BASIN FLOOD FORECASTING & WARNING CENTER

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PRFFWC IN YEAR 2021

(Programs, Activities, Events and Accomplishments)

Front / Back Cover Design by: M. S. Joson Year 2021 was yet another stressful year for the PRFFWC and to a lot of other services as the whole country remained under pandemic state. Though there were already improvements in the virus-related community status levels during the later parts of the year, still another variant is looming that may set another surge and force another tightened restriction on community activities.

With the ongoing situation that we are in at the moment, the PRFFWC, as a public hydrological information service office, is also taking a lot of measures and innovative ways to continue its services to the target community areas within the Pampanga River Basin. Although a lot of the river basin center's hydrological activities have to be waived especially streamgaging measurements and other related field works, the PRFFWC was still able to perform a lot of its services particularly its 24/7 hydrological monitoring, related information such its daily hydrological forecasts and flood warning issuances during the year 2021.

A year-end report of the PRFFWC is regularly prepared, presented and shared to everyone. Our aim is to let everyone know of our continued services, our duties and responsibilities, and most particularly our desire to serve them especially the target communities in the Pampanga River Basin, even during these times of community restricted movements.

This annual report gives a summary of the significant activities and accomplishments of the PRFFWC during the year 2021.



Highlights for the year 2021

Hydrological Operational Services:

- Hydrological Information:
 - Issued 22 and 17 Flood Advisories (FAs) and Flood Bulletins (FBs), respectively, in 5 flood-related events within the Pampanga River Basin;
 - 365 days issuance of hydrological forecasts and updating of the status of the rainfall and water levels (AM & PM) in PRB in the center's website & in its other social media platforms;
 - Issued 18 river basin weekly outlooks (this started around mid-August);
 - Initiated the new infographic format of daily hydrological forecast in the last quarter of the year as one of the center's innovative outputs for 2021.
- Streamgaging activities & other related works during the year:
 - Joint team measurements with requesting provincial DRRMO partners (Bulacan & Pampanga PDRRMOs) produced a total of 10 river cross-section at their respective areas of concern;
 - The center was also able to update the river cross-sections at 2 forecasting points, Mexico and Sasmuan streamgaging stations. Unfortunately, WL data transmitted at both of these stations are still problematic at the moment;



River cross-sectioning activities with partner PDRRMOs (Left pic) with Pampanga PDRRMO personnel at Lubao, Pampanga; (Middle & Right pics) with the Bulacan PDRRMO at the Bagbag Bridge in Calumpit, Bulacan.

- Updated the "0" gage elevation of the following WL stations: Mexico, San Isidro, Zaragoza, Peñaranda, Arayat, Candaba, Sasmuan, and Sapang Buho;
- There were 6 WL validation trips conducted during the year (Zaragoza on Apr 14; Candaba on Apr. 15; Sapang Buho on Jul 14 & Aug 18; Mexico on Sept 08; & Sasmuan on Dec 02);
- Repainted the lower staff gages of 4 WL stations (Zaragoza, Candaba, San Isidro, & Sapang Buho).
- Hydrological maintenance:
 - Conducted 4 quarterly maintenance of all telemetry stations which was carried out by the center's technician team;



Telemetry maintenance activities (L to R) A visual check of staff gages at San Isidro streamgaging site; Checking & cleaning of the rain gage at Arayat station; Cleaning and refitting the staff gages at Sasmuan streamgaging site.

- There were 4 telemetry emergency works that included WL offsets / adjustments and cleaning of clogged rain gage receiver of Candaba station during event TC "Jolina";
- 17 resets and transfer of A/C units at San Rafael Repeater station including cleaning of said A/C units and clearing of station surroundings;

- Assisted and supported the HMTS in 2 major maintenance activities replacement of WL sensor and replacement of station Batteries of San Isidro station;
- Major undertaking: Desilting and declogging of the sensor pipes of Sapang Buho Telemetry station and restoring back the sensor device inside the pipes.
- Hydrological Data Management:
 - Completed 12 Annual Hydrological Data Summary (AHDS) Reports (2009 to 2020) and a Compendium Report for the 12 AHDS (2009-2020);
 - Encoded about 254 RR station-years and 160 WL station-years (1986 to 2007) of the PRFFWC teleprinter output but are still subject for quality-control;
 - Encoded and summarized 12 station-months of center (PRFFWC) rainfall observations (Jan-Dec 2021).



- Flood Reports & Modelling:
 - Continuing development of simple appropriate models for river and flood forecasting such as stage-to-stage correlation method (still ongoing) and also the "on-andoff" calibration of the RRI (Rainfall-Runoff-Inundation) model;
 - Compilation of more than 20 flood events for flood modelling application as per its effects on the river basin (e.g., SW events as one set, TC from the east of the basin, etc.);
 - Final Draft of the Post-Flood Report on Typhoon "Ulysses", Nov. 2020 (Completed on Jan 2021) http://prffwc.synthasite.com/resources/PRB%20flood-2020-Ulysses.pdf

DRRM, Information & Education, Coordinated activities & other related center activities / services:

- Resource person in some 71 event presentations (almost all via VTC with only 1 face-to-face activity) and with an estimated total participants / attendees presented to of about 2,414 persons;
- Attended and actively participated in about 76 events (meetings, seminars, conferences, trainings, etc.) regional and local undertakings mostly related to DRRM and CCA issues; other issues and concerns relating to Optimization Project stations; San Ildefonso Synoptic Station construction inspections; etc.



VTC participations (L to R) As a resource speaker in the DOT-3 led Online Seminar on DRRM; Online media interview regarding PRB updates; Resource person in a face-to-face seminar with MDRRMC Hermosa, Bataan

- Around 9 Media related interviews and interactions (Regional Radio, TV, phone, vlog recorded / live streaming) particularly during flood-weather events affecting the basin;
- Accommodated the needs of some 122 center walk-in clients from various sectors during the whole year; Provision of hydrological data and issuance of 5 data certifications to various project contractors and related entities with a total of P 13,260 collected amount;
- Conducted and hosted 1 in-house on-the-job training to 4 NIA-UPRIIS FFWSDO personnel on Center Operations and Telemetry Systems maintenance (Feb 08 to 12);
- Provided online internship program to 20 Environmental Science (240 hours) and 4 Broadcasting (200 hours) Students of Bulacan State University as part of their school curriculum requirements;
- 3 center personnel attended and participated in a 1-week training-workshop via VTC entitled "Basic Training on Developing Hydrological Models for Flood Forecasting" conducted by RIMES (Nov 08-12); also 2 center personnel attended the HR seminar entitled "Orientation for new PAGASA entrants"

PREFWC Survey Insen: HTH, NBR, RPV, and IRD (Dec 07 to 11, 2020)

Other Initiatives during the year:

- Installed a plyboard sized "Geopictorial" Maps (Elevation & Flood Susceptibility maps) of PRB which was wall mounted in the PRFFWC lobby. These "Geopictorial" maps were designed, developed and produced by the PRFFWC in 2020;
- Distributed more than 70 sets of PRB "Geopictorial" maps to various regional agencies & LDRRMOs within the PRB area;
- Represented PAGASA in the Municipal-led ceremonial ground breaking for the start of the Construction of the Synoptic Station on the 1,500 square meter lot provided by the town of San Ildefonso, Bulacan (Feb 23);
- Actively participated in the RDRRMC3 face-to-face meeting on critiquing and finalization of Contingency Plan on Hydromet Hazards (Feb 19); Formulation of RDRRM Operations Center Standard Operating Procedures and Guidelines 2021 (Nov 25-26);
- Hosted the 140th Regional-Provincial Climate Outlook Forum for Central Luzon as per coordinated efforts with the Climatology and Agrometeorology Division (CAD) through the National Capital Region of PAGASA Regional Services Division (NCR-PRSD) with a total peak zoom platform participant of 245 persons and 26 in FB online (Nov 15).

https://www.facebook.com/prffwc/videos/199894132279423

• Initiated a VTC-webinar entitled "Sustaining PAGASA's River Basin Flood Forecasting & Warning Centers Operational Flood Forecasting & Warning Services". It was the only program focused for RBFFWCs for the year. The event was successfully held through the endorsement of the NCR-PRSD, and support of the Training Section of RDTD and the HMD (Dec 15).

http://prffwc.synthasite.com/resources/Proceedings-VTC%20for%20River%20basin%20centers-2021.pdf



(L to R) A plyboard sized Geopictorial Maps of PRB wall mounted in the PRFFWC lobby; PRFFWC hosted the Regional-Provincial COF for Central Luzon; PRFFWC initiated the only VTC-webinar program focused for RBFFWCs during the year.



Other extracurricular office activities: Personnel of the PRFFWC have all been fully vaccinated and some have already had their booster shots (Left pic); PRFFWC personnel also participated in the PAGASA Christmas celebration by sending an entry in the event's TikTok challenge (Right pic).

Operational Activities I.

1.1 Flood Monitoring and Warning Activities

There were 5 flood-related events monitored within the PRB and were given appropriate warnings for the year 2021:

2021 Events	Period	FA issued	FB issued
TC "Dante" (Choi-Wan)	June 02-03	3	
TC "Fabian" (In-Fa)	July 21-26	4	4
Habagat / Southwest Monsoon 2021	July 29-31	6	
TC "Jolina" (Conson)	September 07-14	2	13
TC "Maring" (Kompasu)	October 11-14	7	
	Total	22	17



Republic of the Philippines DEPARTMENT OF SCIENCE AND TECHNOLOGY Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)

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FLOOD ADVISORY # 2

PAMPANGA RIVER BASIN & ALLIED RIVERS ISSUED AT 5:30 AM, 08 SEPTEMBER 2021 (VALID FOR THE NEXT 12:HOURS UNLESS THERE IS AN INTERVENING ADVISORY OR AN INITIAL FLOOD BULLETIN TO BE ISSUED)

BULLEINI TO BE RSUEU) AS OF 500 AMI TODAY, MAIN PAMPANGA RIVER IS STILL BELOW ALERT LEVEL WITH A GENERALLY VERY SLOW RISING TREND. CANDABA SWAMP AREA REMAIN CLOSE TO ALERT LEVEL WHILE TRIBUTARY RIO CHICO RIVER IS JUST ABOVE ALERT LEVEL. MIDILE AND LOWER SECTIONS OF THE STRETCH OF PAMPANAG RIVER AND SOME OF ITS MAJOR RIBUTARIES (PEIARANDA, SAN MIGUEL-SAN LIDEFONSO STREAMS, ANGAT) ARE LIKELY TO INCREASE STATING TODAY BUT TO REMAIN WITHIN BAINFUL CAPACITY UNTL TORINGH. LIKEWSE, SLOW FILLUP OF CANDABA SWAMP TO CONTINUE. RESPECTIVE

RES AND TRIBUTARIES WITHIN THE PASAC-GUAGUA SUB-BASIN ARE ALL BELOW THEIR RI RET LEVELS AND TO LIKELY REMAIN WITHIN BANKFUL CAPACITY UNTIL THIS AFTERNON.. erage Basin Rainfall as of Past 24-hr observed Forecast 24-hr bas O AM today Less than 10 millimeters 20 to 50 millimete in rainfall Average basin Frankram as of 5:00 AM today Less than 10 millimeters 20 to 50 minut WATERWAYS AND AREAS OF CONCERN / RELATED IMPACTS

Sub-basins: River Channels, Tributaries, Swamp	Areas likely to be affected (starting early tonight until tomorrow morning)	Related Impacts (possibly starting early tonight)
Upper & Eastern paortions of the basin (Peñaranda, Rio Chico,; Eastern Bulacan waterways; San Miguel / Angat Sub-basins)	Nueva Ecija Province: Zaragoza, San Antonio, Jaen, San Isidro, Gapan, Cabiao; Tarlae Province: La Paz, Bamban, Capas, Concepcion & Tarlae City, Bulacan Province: DRT, San Miguel, San Ilderonso, San Rafael Angat River: Norzagaray, Angat, Bustos, San Rafael, Baliuga, Putilan, Piaridel	Likelihood of flash floods and landslides particularly at mountainside areas of Nueva Ecija and Eastern Bulacan area; possible pluvial floods
Lower / Middle Main Pampanga River Basin: Candaba Swamp area	Bulacan-Pampanga area: Candaba swamp, Arayat, San Luis, San Simon, Apalit, Calumpit, Malolos, Hagonoy, Paombong, Macabebe, Masantol	Possible pluvial floods at low- lying areas and those with poor drainage system; possible riverside erosions.
Pasac-Guagua River Sub Basin: Abacan, Porac-Gumain, Pasig- Potrero Rivers	Sasmuan, Guagua, Lubao, Minalin, Mexico, Sto.Tomas, Sta. Ana, City of San Fernando, Bacolor, Sta. Rita, Macabebe, Masantol, Floridablanca; other adjacent towns	Possible pluvial floods at low- lying & riverside areas (affected by tides) and those with poor drainage system.
 Light to moderate sections of Pampa Tropical Cyclone later today. For a Disaster Risk Redu to undertake proc 	with at times heavy rains are likely to be exp nga River Basin today. "JOLINA" is likely to pass south of Pampal wareness, preparedness and mitigation pur ction and Management Councils (LDRRMOs) wit autionary measures to mitigate the adverse im	erienced over the middle & lower nga River Basin (PRB) starting poses, the public and the Local hin PRB are advised to continue mediate impacts of possible flash

to undertake precautionary measures to mitigate the adverse immediate impacts of possible flash floods, rain-induced landslides at mountainside areas, pluvial and possible river (fluvia) floods within their area of concern; to continue monitoring for updates particularly Heavy Rainfall Warnings to be issued by PAGASA Regional servoices Divisions (NCR-PRSD). PRFFWC: HTH / RPY / PTH / LADU



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POSSIBLE PLUVIAL FLOODS (ACCUMULATION OF RAINWATER / PONDING) TO OCCUR AT AREAS WITH POOR DRAINAGE CONDITIONS.

Above is the latest format 2-page Flood Advisory issued during event TC "Jolina" which have the following features: 1st page (L) shows the usual flood advisory text matrix format while the 2nd page (R) shows a "geopictorial" map of the PRB enhanced with color-coded present assessment levels and river trend indicators for the forecast as stated in the flood advisory text format.



Above is the latest format of a 2-page Flood Bulletin issued during event TC "Jolina". Similar to the flood advisory matrix format, the 1st page (L) discusses the forecast of WL and specific towns likely to be affected; the 2nd page (R) shows the PRB "geopictorial" map showing the color-coded WL status at every forecasting point with a summarized message of likelihood reaction at that point. Likewise, areas that are already focused with regards to flood situations have designated letter descriptors, e.g., P for possible, T for Threatening, etc.



Above graph shows the basin hyetograph (top horizontal axis) and various hydrographs (as per forecasting points) during event TC "Jolina" (September 07 to 14). Shown further are the estimated time / day of issuances of FAs & FBs as designated by arrows pointed upwards (yellow for FA and red for FB); note the more than a day of lead time of the first issuance of information to the first set of basin RR, and the eventual rise & peaks (hydrographs) at the various WL forecasting points.

PAMPANGA RIVER BASIN ASSESSMENT LEVELS (meters)	(as of October 2021)
FAMIFANGA RIVER DASIN ASSESSMENT LEVELS (meters)	las of October 2021)

color code	YELLOW	ORANGE	RED
STATION	ALERT	ALARM	CRITICAL
Sapang Buho	3.70	4.50	6.50
Мауаруар		0	
Zaragoza	3.00	4.00	5.00
Penaranda	2.50 **	3.50 **	4.00 *
San Isidro	5.00	6.00	8.00
Arayat	5.00	6.00	8.50
Candaba	3.50	4.50	5.00
Mexico	2.00 **	2.50 **	3.00 *
Sasmuan			3.00
Sulipan	2.60	3.20	3.80

** Initial value (for validation)

Latest forecasting Point Assessment Levels (as of October 2021). Further adjustments and changes of river assessment levels at several forecasting points in the basin were made after the TC "Jolina" event.

Some of the assessment levels (with * & **) are still for validation and will be further updated based on succeeding events and / or maybe from the latest river cross-sections.

1.2 Daily Hydrological Forecast / other related info

There were several innovative changes initiated by the center during the year in terms of its hydrological information outputs in general.

The daily hydrological forecast format has been changed significantly and updated from the usual ٠ previous matrix text format to a newly developed infographic format shown in the picture below. The design was originally conceptualized by the Bulacan State University Broadcasting students doing online internship with the PRFFWC. The format was further refined by PRFFWC later. (http://prffwc.synthasite.com/hydro-forecast.php)



Assessment WL in Flood Advisories and Flood Bulletins have been color-coded as to alert, alarm and critical levels (see picture below); further, a situational map (present and forecast situations) has been added to the text format of these information / warning issuances. For the year 2022, PRFFWC hopes to revert and incorporate a Filipino version (or translation) to the presently issued FAs & FBs during flood watch status. This was as per request by some sectors within the PRB and also the to the fact that the basin has a majority of Filipino (or Tagalog) speaking population.

BASIN'S LIKELY RESPONSE / RELATED IMPACTS							
WATER LEVEL STATION	RIVER / SWAMP WATER LEVEL (WL) TREND AT STATION	FLOOD SITUATION MESSAGE & AREAS LIKELY TO BE AFFECTED					
Tributary Rio Chico River at Zaragoza Station	Now at 4.13m (above 3.50m Alarm WL) slow recession in progress & likely to reach below Alarm WL by tonight or tomorrow before noon	Riverine (Fluvial) flooding / possible erosion is still threatening the riverside areas of La Paz bab Aliaga, Zaragoza, San Antonio					
Candaba Swamp Area at Candaba station	Now at 5.11m (above 5.00m Critical WL) had levelled-off since noon today; slow recession to start later tonight	Flogg (nveme) to persist at relatively low-lying areas of Candaba & other towns w/in the swamp area: San Luis, San Simon, Apalit					
Pampanga River at Arayat Station	Now at 6.18m (above 6.00m Alarm WL) had crested around noon today way below the 8.50m Critical WL; very slow recession in progress	Possible Riverine (Fluvial) & Pluvial floods (during severe thunderstorms), riverside erosions: riverside areas of Cabiao, San Simon, San Luis, Apalit, Calumpit					
Pampanga River at Sulipan Station	Now at 2.70m (above 2.60m Alert WL) very slow fluctuating river stage (tide-influenced) but likely to remain below 3.20m Alarm WL until tomorrow morning	Riverine (including pluvial floods during severe thunderstorms) flooding is still threatening the riverside areas of Apalit, Masantol, Macabebe, Hagonoy, Calumpit, Paombong, Malolos City					

yellow shade); Alarm (red text w/ yellow shade); Critical (white text w/ red shade)

• A new information output (below), Pampanga River Basin Weekly Outlook, was started in the middle of August as another of the center's hydrological information product. The output product may undergo several changes in the coming months.



A sample output of the Pampanga River Basin Weekly Outlook on the left showing the following features:

- The PRB "geopictorial" map with the forecasting points having color-coded present WL status based on the assessment levels;
- River trend using colorcoded indicative icons at forecasting points as either rising, no significant change, or receding (Δ , O, ∇)
- A color-coded forecasting points assessment level table at mid-left of the page Schedule of high tides for
- Schedule of high tides for the following week period (below right)
- and other information in text format at the right side of the document

1.3 Flood Modeling & Related Activities

For year 2021, flood modeling related activities included arrangement & compilation of more than 20 flood events for evaluation, for separation and distribution as to the tropical disturbance's orientation effect over the basin – all SW / Habagat events as one set; TC coming from the East, and those passing at the NE side of the basin as another set; and possibly the frontal systems (shear lines) effects mostly coming from the eastside of the basin. The center is hopeful to come out with some simple flood model applications for the year 2022.

	Monthly Rainfall Summary for 2021				2021										
PRB Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total for the year	Number of RR days	Max 24-hr RR (Met day)
Muňoz	42	1	7	2	0	74	63	318	257	203	26	15	1008	87	86
Sapang Buho	72	1	29	0	0	166	40	213	242	120	31	34	948	83	68
Gabaldon	160	28	17	5	11	84	110	177	406	268	62	184	1512	143	196
Zaragoza	32	1	1	10	13	232	81	176	221	98	50	11	926	90	66
Mayapyap	41	7	23	0	25	120	197	406	213	271	7	80	1390	99	125
Peňaranda	39	1	7	8	0	204	101	147	176	131	10	68	892	98	49
Calaanan	65	2	7	0	0	118	76	247	392	161	25	38	1131	90	117
Palali	52	2	14	3	37	190	57	298	344	200	21	85	1303	123	84
San Isidro	24	0	7	9	0	179	302	87	192	154	19	48	1021	98	57
Arayat	70	3	3	4	53	154	289	214	191	89	18	40	1128	101	56
Candaba	51	0	9	0	69	160	372	203	160	108	12	37	1181	107	83
Sibul Spring	56	6	10	6	22	238	414	222	232	117	14	70	1407	134	65
Sasmuan	50	30	9	26	49	54	594	258	236	132	12	23	1473	99	126
Sulipan	63	7	10	23	31	106	445	243	216	178	6	36	1364	105	122
Mexico	60	6	8	0	43	203	438	142	323	105	5	47	1380	93	91
Porac	88	26	5	12	23	91	584	257	267	184	23	63	1623	96	89
San Rafael	56	5	6	0	30	152	410	186	330	129	22	49	1375	121	70
PRFFWC	84.3	8.9	0.3	6.6	12.4	137.9	447.8	170.7	322.3	111.3	0.5	28.2	1331.2	117	97.8

1.4 PRB station data summary

Above table shows the monthly RR total for each of the telemetry stations of PRFFWC as received in the center. Values in red are still to be quality-controlled from the data loggers of the stations.

Peak Water Level observed during the Year 2021

Station	Max WL observed for the year	Time / Day of Max WL	Remarks (event of maximum
	(meters) *		WL for the year)
Sapang Buho	3.91 (Above Alert)	0500H / 09 Sept	TC "Jolina"
Zaragoza	4.19 (Above Alarm)	2100H / 12 Sept	TC "Jolina"
Мауаруар			
Peñaranda	1.78 (Below Alert)	0400H / 11 Aug	
San Isidro	4.99 (Just Below Alert)	1700H / 09 Sept	TC "Jolina"
Arayat	7.14 (Above Alarm)	0100H / 10 Sept	TC "Jolina"
Candaba	5.14 (Above Critical)	0500H / 14 Sept	TC "Jolina"
Sasmuan	3.20 (Above Critical)	0200H / 09 Nov	
Sulipan	3.91 (Above Critical)	0200H / 23 Aug	
Mexico			

*As per available transmitted data only (subject for updating after quality-control)

The hydrological information (RR & WL) presented in this annual report are initial values and will still be validated and quality-controlled. The Annual Hydrological Data Summary (AHDS) for the year 2021 will be prepared related to this and expectantly to be completed by mid-year 2022.

1.5 Telemetry System and Station Physical Maintenance

There are 2 major problems encountered by the PRFFWC with regards to hydrological data transmitted to the center. The first issue is the data transmission downtimes. This problem has continually plague the PRFFWC dataset almost every year. The second issue is the quality of the data received during uptime

situations. This second issue is a major concern as it requires tedious analyses and continuous actual data validation at station sites.

River Basin Flood Forecasting and Warning Centers rely heavily on its hourly data received particularly during inclement weather conditions affecting the basin. It is imperative that the received telemetry data be adequate (quantity) and valid (quality) in order for the center to be able to issue timely and accurate hydrological information. The graph on the right is a summary of the monthly % downtimes of the PRFFWC system and the estimated % data error.



For the year 2021, the annual average downtimes for RR & WL were 14.8% and 26.8%, respectively. While initial average estimated errors (obvious ones only) were 0.02% for RR and 11.4% for WL. The estimated errors are expected to change significantly once data quality-control has been applied to the center's dataset.

PRFFWC Systems maintenance and emergency activities for the year included as follows:

- Conducted four Quarterly Maintenance by the PRFFWC technician team (Mar 22-27; Jun 24-31; Oct 15-20; & Dec 17-22)
- Assisted HMTS in the installation of radar-type WL sensor of San Isidro station (Mar 22-27)
- Emergency trips to San Isidro and Cabanatuan Repeater stations (May 19 & May 27)
- Replaced station batteries of San Isidro station (Jun 11)
- Desilting & declogging of Sapang Buho WL sensor pipes; and repainting of the lower staff gages at the site (Jul 14-17)
- Emergency station checks and WL validation of Sapang Buho station (Aug 18-19)
- Emergency cleaning and restoration of Candaba rain gage during TC "Jolina" (Sept 08)
- 17 resets and transfer of A/C units at San Rafael Repeater station including cleaning of said A/C units and clearing of station surroundings (year-round)



Various telemetry maintenance activities (Top L-R) Related desilting-declogging activities at Sapang Buho; Emergency maintenance of Candaba RR gage at the height of TC "Jolina"; Replaced station batteries of San Isidro; (Bottom L-R) Check rain gage at Palali; & clearing of its station surroundings; Declogging of sensor pipe of Sapang Buho; Cleaning & refitting the aluminum staff gages at Sasmuan; Emergency maintenance of San Isidro Telemetry station together with the HMTS personnel.

The PRFFWC telemetry system and all of its stations will be 13 years of continuous operations by year 2022. Serious systems operational problems are expected and at the moment are being experienced already. For year 2022 the target is to replace some of the WL devices from its originally installed pressure gages to radar-type sensors. As always, the PRFFWC technician team will require the assistance of the HMTS of HMD for this activity.

1.6 Streamgaging and other related hydrological measurement activities

Several streamgaging activities were carried-out in year 2021. Most of these activities carried out involved requests from partner PDRRMOs, Bulacan and Pampanga provinces. Bulacan PDRRMO streamgaging activity request was the usual updating of the river cross-sections where they have monitoring CCTVs. Likewise, Pampanga PDRRMO requested the center for the establishment of assessment levels at the remaining river sections that they have been monitoring. Last year there were already similar activities carried-out on this premise. No river velocity measurements were carried-out during the year mainly due to the continued restrictions imposed by various LGUs covering most of the PRFFWC streamgaging sites.

- Activities with Pampanga PDRRMO: River cross-sectioning along Pasig-Potrero River at Mancatian Bridge, Porac, and at Porac-Gumain River at Sta. Cruz Bridge, Lubao (Jan 19)
 - Activities with Bulacan PDRRMO for updating of their assessment levels:
 - Dulong Bayan & F. Cadiz Bridges in San Jose Del Monte (Feb 02)
 - o Loma de Gato & Northville in Marilao (Feb 02)
 - Angat River at Matictic, Norzagaray & Sta. Lucia, Angat (Feb 03)
 - Angat River at Alejo Santos Bridge, Bustos (Feb 24)
 - Angat River at Plaridel-Pulilan Bridge (Feb 24)
 - Bagbag River at Bagbag Bridge, Calumpit (Feb 24)
 - Sta. Maria River at Sta. Maria Bridge in Poblacion, Sta. Maria (Feb 25)
 - Dukma area in Candaba (Mar 09)



(Above pics) Elevation measurement survey being undertaken at Zaragoza Telemetry station & at its streamgaging site. The activity involved the updating of the station's elevation profile and the '0" of gage of the staff gage at the streamgaging measurement area (top right diagram).

The PRFFWC only streamgaging related activities during the year involved mainly the updating of the elevation of "0" gage of staff gages at the following stations – Mexico, San Isidro, Zaragoza, Peñaranda, Arayat, Candaba, Sasmuan, and Sapang Buho stations (Aug 16-17). River cross-sections at Sasmuan and Mexico were carried out as well (Aug 17). A compiled report of river velocity measurements and river cross-sections for the streamgaging points of PRFFWC is currently being arranged and likely to be completed by midyear 2022.



On the left is a graph of the latest river cross-section result of Abacan River at Mexico streamgaging site undertaken last Aug 17, 2021.

II. Public Information, Data provision, Trainings and other related Center Functions

2.1 Presentations & lectures in events, various occasions and functions

PRFFWC was able to participate and provided presentations in some 71 events for the year 2021. An estimated total participation of 2,414 individuals were provided PowerPoint presentations covering the usual topics as follows:

- Latest & Updated Climate & Weather Outlook
- Hydrological Updates on Pampanga River Basin
- Hydrometeorological Hazards Awareness & Mitigation
- Climate Change
- Orientation on Tropical Cyclone Tracking
- Updates on Tropical Cyclones within PAR during PDRA meetings. There were about 20 PDRA meetings that the PRFFWC participated in 2021.
- Early Warning System
- Flooding in the Province of Pampanga
- Orientation on SHINe Program
- Rainfall Observation using Prototype Rain gages
- Special topics presented in other events are as follows:
 - UV Light & Natural Disinfection to online interns of Bulacan State University students
 - Hydrological Data Management & Improvement of Hydrological Information in the PRFFWC led VTC-webinar for PAGASA River Basin Flood Forecasting & Warning Centers
- Resource person in all of the Quarterly Regional DRRM Full Council Meetings (RDRRMC-3) and Provincial DDRM & LDRRM Council meetings including Prevention & Mitigation and Preparedness Clusters (Pampanga Province) for the whole year of 2021.

All presentations that the PRFFWC delivered were done via Video Teleconferencing except for 1 event where a face-to-face setup was initiated. Below are some screenshots of the VTC events that PRFFWC have been able to attend to and participated in as resource person.



2.2 Public Information and Briefings (Multi-media)

The PRFFWC was still able to provide hydrological information to the media even at a restrictive situation. Media briefings and interview interactions via live streaming reporting through the internet (VTC), vlogs and by phone calls were done mostly during tropical cyclone occurrences and flood events affecting the Pampanga River Basin.

- Pre-recorded interview by Mr. Paulo G. Santos, CLTV36 reporter for vlog updates on effects of TC Dante and PRB hydrological situations, see picture below at the left (June 03);
- Online recorded interview on updates of PRB during Habagat by CLTV36 reporter/vlogger Paulo Gee Santos (Jul 21);
- Recorded interview via phone call re: Updates on PRB during Habagat by Pampanga PIO reporters, L. Nuñez on Jul 22 and L. Rutao on Jul 23;
- Online live interview by CLTV 36 reporter Paulo G. Santos re: updates on PRB hydrological situation and other related issues, see the picture below at the right (Jul 26);
- Recorded interview by Pampanga PIO-Balita reporter Jasmine (Jul 26);
- Online live video streaming interview by CLTV 36 reporter Jennifer Salenga re: updates on PRB hydrological situation and other related issues (Jul 29);
- Personal interviews via phone with Ms. Ina Teves of Exenews / PNA regarding issuances of flood information during TC "Jolina" (Sept);
- Live radio interview on updates on PRB as per effects of TC "Maring"-Habagat in the program Brigada News 92.7 FM Pampanga as hosted by John Susi & Alvin Masangkay (Oct 13).





III. Interaction, Participation in various events, occasions & other undertakings (meetings, seminars, workshops, conferences, etc.) with other agencies, LGUs within the Basin

Attended and participated in more than 76 various events (meetings, seminars, conferences, trainings, etc..) many of which were done via VTC and highlights of which include as follows:

- About 50 DRRM-related meetings (PDRA analyst group, R/P/M DRRMC quarterly meetings, Press briefings during TC events, etc);
- Some 9 webinars and trainings attended of which 5 were international webinars (Asian Disaster Reduction Center online seminars & 1 sponsored summit) and the rest either PAGASA initiated webinars or by partner agencies;
- Attended and participated meetings relating to DMGC / CLARO (Diosdado Macapagal Government Center / Central Luzon Association of Regional Offices) issues; Optimization Project with HMD & DOST-3 officials;
- Active participation in the NWRB-KOICA program on the Integrated Water Resources Management Information System (IWRMIS) Phase II on Oct 05; Conducted initial station field validation of about 5 proposed station sites (Oct 27);
- Hazard Formulation & SOP guideline updating workshops of RDRRMC-3;
- PRFFWC hosted the Regional / Provincial Climate Outlook Forum (Nov 15); coordination meeting with Bulacan State University (BulSU) officials and with Bulacan PDRRMO relating to SHINe program; and also with the latter in the organizational meeting for the 12th SHINe conference.

- Represented PAGASA in the groundbreaking ceremony & staged MOA signing for the proposed Synoptic station in San Ildefonso, Bulacan (23 Feb); Further, the PRFFWC coordinated and arranged meetings between municipal engineers with the ETSD personnel (May 04 & Nov 15)
- Coordination activities (meetings and field surveys) with NIA-UPRIIS in the enhancement of hydrological monitoring in the upper Pampanga River Basin (Jun 8-10; Jul 14-15).





(Top L) RDRRMC-3 face-to-face initiated meeting on critiquing and finalization of Contingency Plans on Hydromet Hazards; (Top R) Represented PAGASA in the ceremonial ground breaking of the construction of proposed PAGASA Synoptic station in San Ildefonso, Bulacan. (Bottom L) Coordination meetings and surveys with NIA-UPRIIS personnel for possible program on the enhancement of hydrological monitoring in the Upper Pampanga River Basin area.

IV. Reports (In-house), features and other hydrological-related materials

There were quite a number of reports that were produced by the PRFFWC for the year 2021:

• Final Draft of the Post-Flood Report on Typhoon Ulysses of November 2020 (completed as of Jan 2021)

http://prffwc.synthasite.com/resources/PRB%20flood-2020-Ulysses.pdf

- Completed 12 reports of Annual Hydrological Data Summaries (AHDS) from year 2009 to 2020
- Final draft Compendium report of Annual Hydrological Summaries 2009-2020
- Event proceedings of the PRFFWC led VTC-webinar entitled "Sustaining PAGASA's River Basin Flood Forecasting & Warning Centers Operational Flood Forecasting & Warning Services" http://prffwc.synthasite.com/resources/Proceedings-VTC%20for%20River%20basin%20centers-2021.pdf



Finally, to everyone... our colleagues, friends (who have always been with us and to those who are no longer (†) with us), partner agencies, families, groups, networks, ...

Our heartfelt thanks for believing & staying with the PRFFWC throughout the year 2021 & also even in the previous years. Here's hoping to a more productive yet peaceful years ahead.

Stay Healthy, Stay Safe; Stay Strong, and have FAITH. GOD bless.

For more online information on PRB & the PRFFWC:

- Who we are & background information
 https://prffwc.webs.com/whowearebackground.htm
 - Pampanga River Basin info http://prffwc.synthasite.com/basin-info.php https://prffwc.webs.com/thebasinsystem.htm
- Hydrological info and other basin-related reports http://prffwc.synthasite.com/site-docs.php https://prffwc.webs.com/siterelateddocuments.htm
- PRFFWC Station Location http://prffwc.synthasite.com/station-info.php
 Daily Hydrological Forecast
- http://prffwc.synthasite.com/hydro-forecast.php
- Flood Advisory (issued as need arises)
- http://prffwc.synthasite.com/flood-advisory.php
 Flood Bulletin (issued as need arises)
- http://prffwc.synthasite.com/flood-bulletin.php
 PRB Map http://prffwc.synthasite.com/prb-map.php





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