

ANNUAL REPORT 2022

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  PRFFWC



PAMPANGA RIVER BASIN FLOOD FORECASTING AND WARNING CENTER

DIOSDADO MACAPAGAL GOVERNMENT CENTER (DMGC)
DOST Region 3 Compd. Brgy. Maimpis, City of San Fernando,
Pampanga 2000

PRBFFWC in 2022

(Activities, Events, Programs & Accomplishments)

Front & back Cover concept & edit by M. S. Josen, Jr.

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Introduction

The year 2022 started out a bit slow for the PRBFFWC as pandemic restrictions remained imposed in many areas of the country with still a lot of restrained social activities. But about mid-year, however, pandemic-related limitations were eased up. Apart from its continuing basin hydrological monitoring and operational flood forecasting & warning services, it was mostly during the second half of the year that the PRBFFWC opened up its usual actual direct river basin center hydrological activities that included streamgaging fieldwork, initiate and participate in face-to-face (F2F) meetings, conferences & workshops, post-flood surveys, and many other related activities.

As usual, the river basin center conducted various operational hydrological activities throughout the whole year-round of 2022 but with several setbacks particularly in its monitoring activities as its overall data observation downtimes (d/t) for rainfall and water level for the year was 5.90% and 34.11%, respectively. Rainfall d/t was relatively small as compared to the water level but to consider that, of the 65.89% WL observations received during the year, around 6.72% of these are so far considered erroneous already and validation is still ongoing. There were other center concerns particularly in the operational flood forecasting & warning activities specifically during Super Typhoon “KARDING” with at least half of the monitoring stations down for most of the entire event. Nevertheless, the PRBFFWC was still able to provide its mandated objectives to its target recipients and partner entities.

This year-end report gives a brief summary of the significant activities, events, programs, accomplishments, some issues and concerns of the PRBFFWC during the year 2022. There is a saying that goes - *“Life doesn’t require you to be the best but just needs you to do your best”*, and precisely this is what we, at PRBFFWC, have always been hoping and trying to achieve.



PRFFWC Year 2022 Highlights

Operational Hydrological Services:

- Hydrological Information:
 - A total of 13 Flood Advisories (FAs) and 20 Flood Bulletins (FBs) were issued in 4 monitored flood events;

Year-round issuances and updating of the center’s website prffwc.synthasite.com with the following breakdown:

- Issued 365 infographic hydrological forecasts
- 730 updated “status of rainfall & water level” within PRB (daily AM & PM)
- 52 River Basin Weekly Situational Outlooks shared through e-mails & FB posts
- Streamgaging & other related activities:
 - 22 river cross-sections conducted in the 10 PRBFFWC forecasting points, 7 auxiliary stations (IWRMIS project, etc.), and 2 river stations in Bulacan as per PDRRMO-Bulacan requested undertaking in connection with their flood monitoring program in the province;
 - Conducted 83 streamgaging activities (river velocity measurements) in 17 streamgaging sites;
 - About 8 WL validation trips conducted during the year;
 - Established and painted staff gages at 5 auxiliary streamgaging sites;
 - Established and painted vertical point for river sounding locations at 16 streamgaging site bridges
 - Some 9 Coordination meetings, of which 6 involved field surveys and streamgaging activities, with NWRB-KOICA on the Integrated Water Resources Management Information System (IWRMIS) for Pampanga River Basin (below shows pictures of various streamgaging activities)



- Hydrological maintenance:
 - Center technician team conducted 3 regular maintenance activities in all telemetry stations of PRBFFWC; (picture below shows cleaning and reinstalling the staff gages in Samuan station)



- There were 3 telemetry emergency works that included WL offsets / adjustments and minor station communication checks;
- 15 resets / transfer of A/C unit operation at San Rafael Repeater station including cleaning of the said A/C units and clearing of station surroundings;
- Assisted and supported the HMTS in 2 major undertakings: (1) installation of new radar-type WL sensors at Candaba and Sulipan stations (July 12-13); (2) installation of a CCTV unit at Mayapyap station (July 20)

- Supported Job Order technicians of the Optimization project in their hydrological maintenance activities (Bulacan area, April 06-09)
- Hydrological Data Management:
 - Partial data quality of 119 rainfall station-months & 63 water level station-months (Jan to Jul of year 2021);
 - Collated about 204 RR station-months and 108 WL station-months of PRBFFWC System (for year 2022) from the supervisory system and are still subject for data validation & quality control;
 - Encoded and summarized 12 station-months of center (PRFFWC) rainfall observations (Jan-Dec 2022)
- Flood Reports & Modelling:
 - Continuing development (an on-and-off activity) on the RRI (Rainfall-Runoff-Inundation) model;
 - Ongoing development of simple correlation method, e.g., stage-to-stage (updating of correlation coefficients) for several of the forecasting points of PRBFFWC;
 - Conducted 2 post-flood surveys (Tropical Cyclones “KARDING” and “PAENG”) with initial survey reports already submitted



Upstream view of the Pampanga River at Arayat station just after the passage of Super Typhoon “KARDING” over the PRB; the river view shows an estimated staff gage reading of 7.98 meters (above ALARM WL) at that time of the photo, 1100H, 26 Sept. 2022.

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

- Resource person in 61 event presentations (41 events via VTC and 20 face-to-face appearances) with an aggregate estimated participants / attendees of about 2,927 persons;
- Attended / participated in some 102 events (lectures, presentations, meetings, seminars, conferences, trainings, etc.) in regional and local undertakings mostly related to DRRM and CCA issues, hydrometeorological related concerns, IWRMIS, RDC, DMGC, etc.;



Various pictures from top to bottom (L to R): Attendees during the 4th Quarter RDRRM Full Council meeting on a F2F setup; Online video feed of interview by ABS-CBN field reporter during event TC “KARDING”; Resource speaker on SHINE Program to teachers of Pampanga Province; Provision of “geopictorial” map to MDRRMO of DRT, Bulacan; Live media interview via zoom platform with CLTV 36 reporter during the special coverage of event TC “KARDING”.

- Around 14 Media related interviews and interactions (Regional Radio, TV, phone, vlog - recorded / live streaming) particularly during flood-weather events affecting the basin in which 8 interviews were done on a live feed and the rest prerecorded;
- Proponent in the conduct of the 4th PAGASA River Basin Flood Forecasting & Warning Centers Conference and 2nd Streamgaging Field-Workshop held in Villa Caceres, Naga City on October 17 to 21.
- Accommodated the needs of some 147 center walk-in clients from various sectors during the whole year; Provision of hydrological data to HMDAS or HMD for data requests (PRB RR data 2018-2020, WL data 2019-2020, RIDF, rating equations); and issuance of 2 data certifications to project contractors and related entities with a total of ₱ 2,500 collected amount;
- Provided online internship training program to 10 Environmental Science (200 hours) Students of Bulacan State University as part of their school curriculum requirements (Jul 04 to Aug 05);
- Attended and participated in about 8 workshops and trainings during the year
- Provided the “geopictorial” maps of PRB (elevation & flood susceptibility maps) to several MDRRMOs who were not given last 2021, e.g., DRT, Apalit, Masantol, etc.

Other Initiatives & Special Activities during the year:

- The PRBFFWC supported the NCR-PRSD in the celebration of the World Meteorological Organization (WMO) Day in the Regional virtual tour program by coordinating with partner agencies in Region 3 for their respective video messages with regards to the event (March);
- Assisted PAGASA inventory-property personnel in their 3-day inventory of the PRFFWC instruments, equipment, etc. (March);
- Participated in the kick-off ceremonies of the National Disaster Resiliency Month (NDRM) 2022 which was spearheaded by the RDRRMC 3 held at the NEDA 3 compound area, DMGC (July);
- Attended, as member of the PDRRMC, the opening event of the 3-day DRRM Festival Exhibit of the Province of Pampanga in connection with the celebration of NDRM (July 20 at SM City, Pampanga);
- Hosted and facilitated the Provincial (NCR) Climate Forum on La Niña (Provinces of Region 3) following the coordinated efforts with the Climatology and Agrometeorology Division (CAD) and the National Capital Region of PAGASA Regional Services Division (NCR-PRSD) on Nov. 24 with a total of 122 attendees;
- Facilitated the coordination of survey and development assessment of the construction of the San Ildefonso Synoptic station building with the officials of the Municipality of San Ildefonso and the ETSD on 2 occasions;
- PRFFWC actively participated, as member of the TWG, in the Updating of Regional DRRM Plans; supported the draft plan by providing various information, e.g., various maps, PRB post-flood reports, technical data about PRB and dams w/in the basin, and other related information;
- Attended and participated in the 1st General Assembly of the Mt. Arayat community Safety Task Force of which the PRFFWC is a member of its task force (Oct. 07)
- 3 center personnel attended and actively participated, one as a resource person, in the NCR-PRSD CMO conference held in Camayan Beach resort, Subic Bay Freeport from Oct 26-27;
- Conducted SHINE reorientation to the Bajet-Castillo High School SHINE group in Pulilan, Bulacan (Nov 29); Provided support, and as a resource speaker, in the conduct of the 14th SHINE Conference held in Bulacan Provincial Capitol (Dec 12)



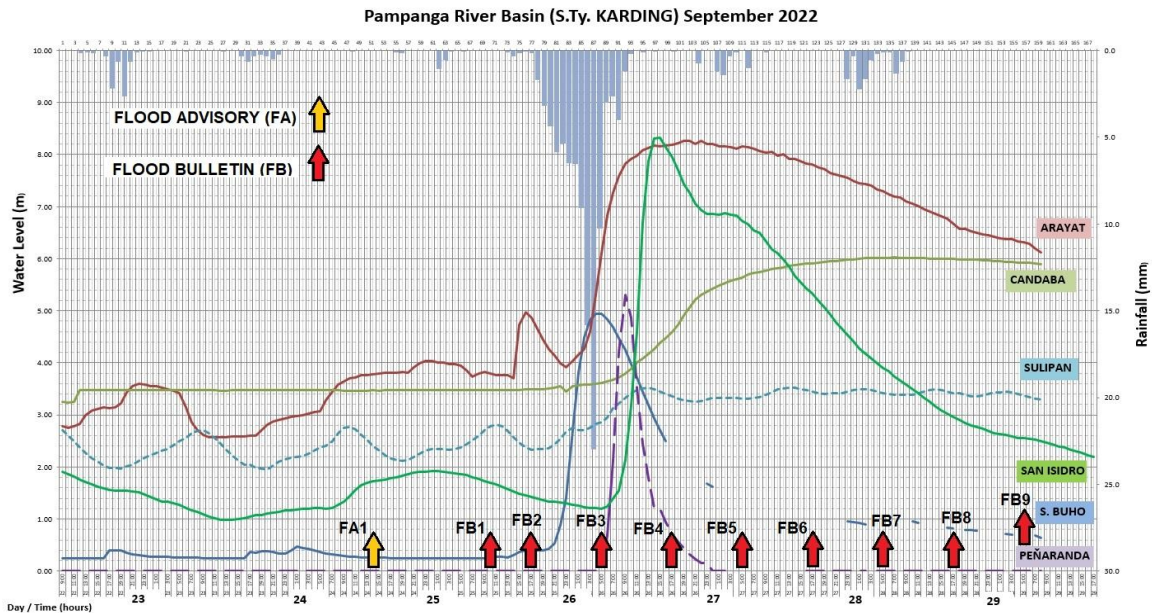
L to R: SHINE reorientation of the Bajet-Castillo High School in Pulilan, Bulacan; SHINE teachers / advisers in the 14th SHINE Conference.

I. Operational Activities

1.1 Flood Monitoring and Warning Activities

There were 4 flood-related events in PRB that were monitored and given appropriate warnings for year 2022:

2022 Events	Highest TC Category reached	Period	FA issued	FB issued
TC "FLORITA" (MA-ON)	Tropical Storm	August 21-25	5	
TC "KARDING" (NORU)	Super Typhoon	Sept 24 to Oct 01	1	13
TC "MAYMAY"	Tropical Depression	October 11-19	3	
TC "PAENG" (NALGAE)	Sever Tropical Storm	Oct 28 to Nov 01	4	7
		Total	13	20



Above is the basin hyetograph and various hydrographs (as per forecasting point) during event TC "KARDING" (graph is from September 23 to 29) showing the estimated time / day (arrows) of issuances of FAs & FBs; note the more than a day of lead time from the first issuance of information (FA1) to the rise & eventual peaks (hydrographs), FB3 & FB 4, of various WL forecasting points during the said event.

PAMPANGA RIVER BASIN ASSESSMENT LEVELS (meters) (as of October 2022)

color code	YELLOW	ORANGE	RED
STATION	ALERT	ALARM	CRITICAL
Sapang Buho	3.70	4.50	6.50
Mayapyap			
Zaragoza	3.00	4.00	5.00
Penaranda	2.50 **	3.50 **	4.50 **
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 **	3.50 **
Sasmuan			3.50
Sulipan	2.60	3.20	3.80

Table on the left shows the latest adjusted Assessment Levels (as of October 2022) for the various forecasting points of the PRBFFWC. These assessment levels will be regularly adjusted as per latest river cross-sections and also as per reports of flood in the channel sections for which the said forecasting points are focused.



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

PAMPANGA RIVER BASIN FLOOD FORECASTING & WARNING CENTER (PRFFWC)
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 websites: bagong.pagasa.dost.gov.ph / prffwc.synhasite.com

FLOOD ADVISORY No. 1
PAMPANGA RIVER BASIN & ALLIED RIVERS
 ISSUED AT 2:00 PM, 24 SEPTEMBER 2022
 (VALID FOR THE NEXT 24-HOURS UNTIL THE NEXT ISSUANCE TOMORROW AT 2PM OR UNLESS THERE IS AN INTERVENING ADVISORY OR AN INITIAL FLOOD BULLETIN TO BE ISSUED)

PRESENT & 24-HR FORECAST BASIN HYDROLOGICAL SITUATION:

AS OF 1:00 PM TODAY:

- THE STRETCH OF MAIN PAMPANGA RIVER STILL REMAINS BELOW ALERT WL STATUS; IT WILL REMAIN BELOW ALERT WL UNTIL TOMORROW NOON;
- TRIBUTARY RIO CHICO RIVER AT ZARAGOZA IS NOW ABOVE ALERT WL AND WILL REMAIN WITHIN ALERT WL LIMITS;
- CANDABA SWAMP IS JUST BELOW ALERT WL; SLOW FLUCTUATING RISE TO REACH ALERT WL IS LIKELY WITHIN THE NEXT 24HRS
- AND THE ALLIED RIVERS / TRIBUTARIES WITHIN THE PASAC-GUAGUA SUB-BASIN ARE STILL AND TO REMAIN GENERALLY BELOW ALERT WL THROUGHOUT THE FORECAST PERIOD.

BASIN SITUATIONAL OUTLOOK ON HYDROMET HAZARDS (AND ITS POSSIBLE IMPACTS):

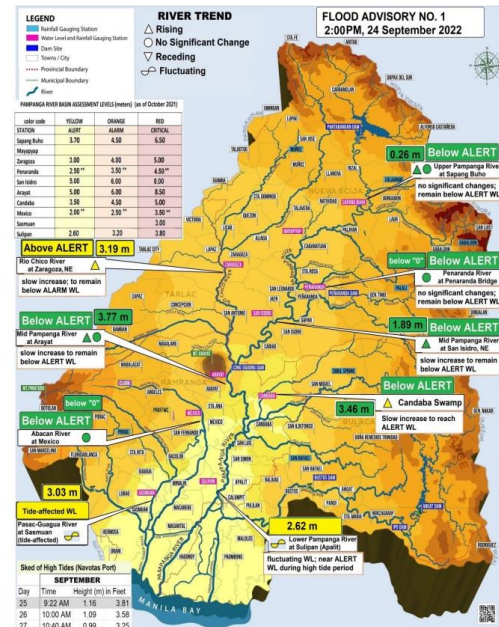
- Light to moderate to at times heavy rains as enhanced by S.T.S. KARDING are likely to occur at the north and east side portions, particularly in the province of Nueva Ecija, of the PRB beginning tomorrow morning;
- Possible Flash floods and Landslides (Large debris and floodwaters can cause structural damage to bridges and roadways, and even houses situated just adjacent to mountain slopes) likely possible at the following areas beginning tomorrow noon: North and East side of Nueva Ecija Province (Carranglan, Laur, Bongabon, Gabaldon, Rizal)
- Pluvial flooding (ponding / accumulation of rainwater at low-elevated areas which can result to impassable streets / roadways, croplands submerged) likely possible at the following areas especially those with poor drainage system beginning tomorrow noon: other areas of Nueva Ecija (Within PRB: San Jose City, Lanera, Gen. Natividad, Palayan City, Cabanatuan City, Gen Tinio, Guimba, Quezon, Aliaga, Licab, Zaragoza, other adjacent areas) and Tarlac (Within PRB: La Paz)

For awareness, preparedness and mitigation purposes, the public and the Local Disaster Risk Reduction and Management Councils (LDRRMOs) within the Pampanga River Basin are advised to start to take precautionary measures to mitigate the adverse immediate impacts of the possible hazards associated with moderate to heavy rains particularly at the above mentioned areas; to continue monitoring for heavy rainfall warnings, thunderstorm / rainfall advisories, and other severe weather information specific to your area, other related products issued by local PAGASA Regional Services Division.

Prepared by: RPY / GHH Checked by: HTH



Pampanga River Basin HYDROLOGICAL SCENARIO MAP



The usual 2-page Flood Advisory was maintained by the PRBFFWC as shown above with its issuance of FA No. 1 during Event TC "KARDING" and with the following features: 1st page shows the flood advisory text format while the 2nd page is an illustrated map which shows the present water level station status and a trend forecast.



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 DMCG, Bgy. Mainpilis, City of San Fernando, Pampanga 2000, Tel. (045) 652-5175; CP: 0999 336 6416

FLOOD BULLETIN NO. 6
PAMPANGA RIVER BASIN & ALLIED RIVERS
 ISSUED AT 5:30 AM, 01 NOVEMBER 2022
 (VALID UNTIL THE NEXT BULLETIN AT 5:30 PM TODAY)

Average Basin Rainfall as of 5:00 AM today	Past 24-hr observed	Forecast 24-hr basin rainfall
10 millimeters	Less than 10 millimeters	Less than 10 millimeters

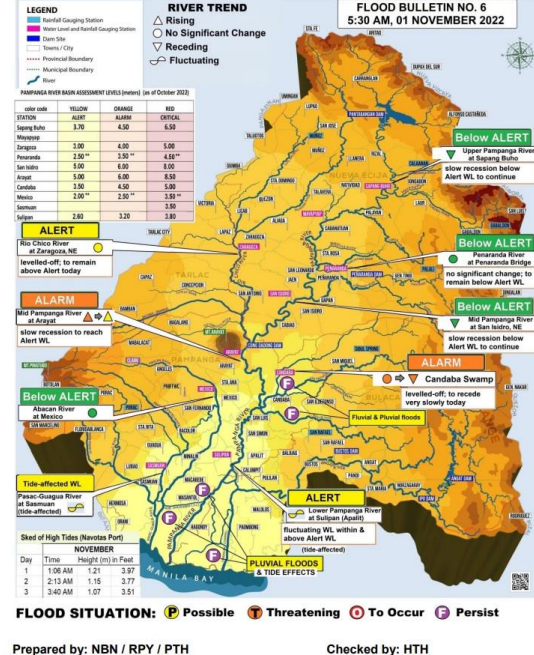
BASIN'S LIKELY RESPONSE / RELATED IMPACTS

WATER LEVEL STATION	RIVER / SWAMP WATER LEVEL (WL) TREND AT STATION	POSSIBLE FLOOD SITUATION MESSAGE (POSSIBLE IMPACTS) & AREAS LIKELY TO BE AFFECTED
Tributary Rio Chico River at Zaragoza Station (Nueva Ecija)	Still above the 3.0m Alert WL; has partly levelled-off way below 4.0m Alarm WL; to remain above Alert WL until this afternoon	Pluvial flooding (submerged roads, croplands, possible riverside erosions) partly remain in some areas for a few days: La Paz, Licab, Aliaga, Quezon, Zaragoza, San Antonio
Swamp Area at Candaba station (Pampanga)	Now at 4.95m (above the 4.50m Alert WL); has levelled-off just below 5.0m Critical WL; a very slow recession is very much likely in the next few hours; to remain above Alarm WL until this afternoon	Pluvial flooding (submerged roads, croplands, possible riverside erosions) to remain for several days: Candaba, San Simon, San Luis, Apalit, portions of San Miguel (win the swamp area)
Pampanga River at Arayat Station (Pampanga)	Now at 6.01m (above the 6.0 Alarm WL); continued slow recession to reach below Alarm WL in the next 1 or 2 hours. Further recession to reach below Alert WL later today	Pluvial flooding (submerged roads, croplands, possible riverside erosions) to remain for a few days – Cabiao, Arayat, San Simon, San Luis, Apalit, Calumpit
Pampanga River at Sulipan Station; Tributary Angat River & Pampanga Delta areas	Just within the 2.60m Alert WL; very slow fluctuating rise (tide-influenced) just within Alert WL until this afternoon; no significant changes in Angat River WL.	Possible Coastal / Riverine or Fluvial floods (possible riverside erosion) at riverside areas; Pluvial flooding (submerged roads, croplands) to remain for a few days: Apalit, Masantol, Macabebe, Hagonoy, Calumpit, Paombong, Malolos City; Riverside areas along Angat River: Bustos, Baliuag, Plaridel, Pulilan
Pasac-Guagua River Sub Basin: Abacan, Porac-Gumain, Pasig-Potero Rivers; Sasman Station (Pampanga)	Now at 3.54m (3.0m Critical WL); fluctuating WL (tide-influenced) to recede slowly below Critical WL until this afternoon	Riverine / Fluvial flooding (possible riverside erosion) at riverside areas; Pluvial flooding (submerged roads, croplands) to remain for a few days: Sasman, Guagua, Lubao, Minalin, Mexico, Sto. Tomas, Sta. Ana, City of San Fernando, Bacolor, Sta. Rita, Macabebe, Masantol, Floridablanca

The public and the Local Disaster Risk Reduction and Management Councils (LDRRMOs) within the Pampanga River Basin are advised to maintain all the necessary measures to mitigate the adverse impacts of the hazards still associated with T.C. "PAENG" particularly in the above-mentioned areas; to keep monitoring for heavy rainfall warnings and other severe weather information specific to your area, and other related products issued by PAGASA.



Pampanga River Basin HYDROLOGICAL SCENARIO MAP



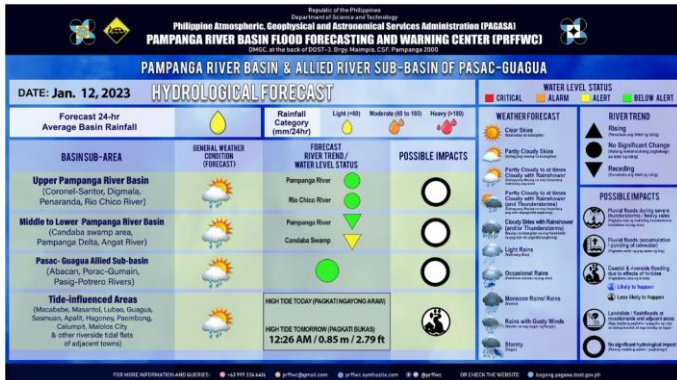
A similar 2-page Flood Bulletin (above) was maintained by PRBFFWC in their operational flood information similar to the flood advisory format. The 1st page discusses a more specific forecast of WL trend and a list of towns that are likely to be affected; while the 2nd page is a map showing the present WL assessment status at every forecasting point with a summarized expected reaction at that point including flood situation represented by letters as to P for possible, T – Threatening, O – to Occur, and F – Persist. The sample above (FB No. 6) was issued during the event TC "PAENG" (Oct 28 to Nov. 01).

1.2 Daily Hydrological Forecast / other issued information materials

The PRBFFWC maintained its infographic format of its issued daily hydrological forecast (left pic below) for the whole year 2022, and in the later part of the year other river basin centers have already followed suit by coming out with their own infographic format of daily hydrological forecasts. Another info shared on a daily basis, which is on a separate webpage, is the “status of rainfall and water level” of the PRB and said format remains as is for now (right pic below). The said format is expected to be updated.

<http://prffwc.synthasite.com/hydro-forecast.php>

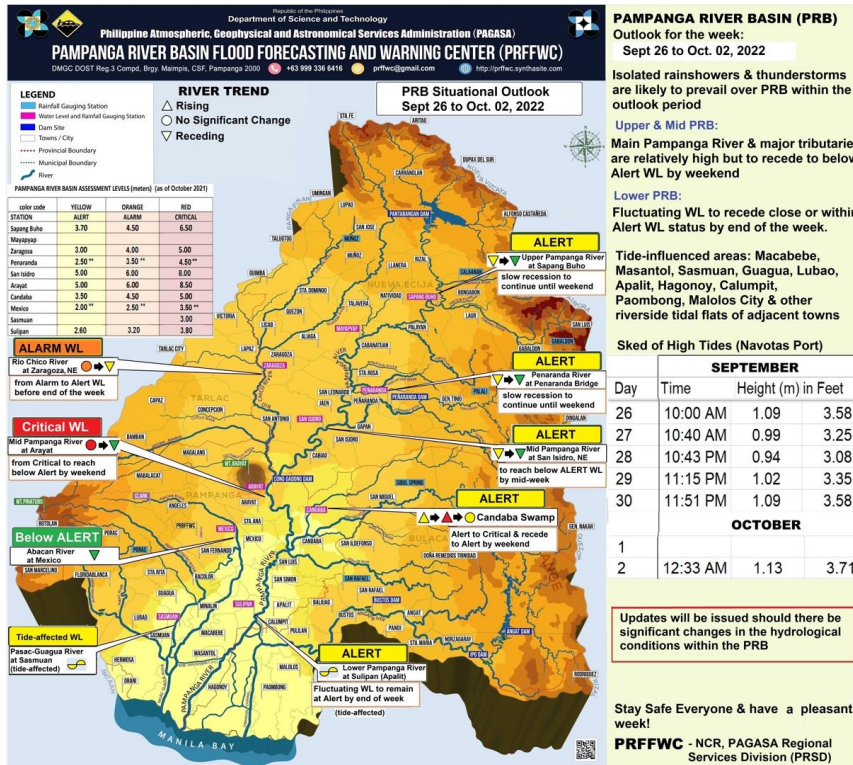
<http://prffwc.synthasite.com/status-of-pampanga-river-basin.php>



DATE: January 12, 2023
TIME UPDATE: 5:00 AM (LST)

Observed Values
(Past 24-hr Rainfall Ending at 4:00 AM (LST)
(Instantaneous Water Level Data at 4:00 AM (LST))

PRFFWC Telemetry Stations					
Station	Rainfall (mm)	WL (meters)	WL Status	Station	WL Status
Muñoz	0			Sibul Spring	0
Sapang Buho	0	0.09	Below Alert	Arayat	0
Calaanan	0			Candaba	0
Mayapayap	0	**		Porac	0
Gabaldon	0			Mexico	0
Palali	0			San Rafael	0
Zaragoza	0	1.47	Below Alert	Sasmuan	0
Periaraña	0	0	Below Alert	Sulipan	0
San Isidro	0	*	Below Alert	PRFFWC	0



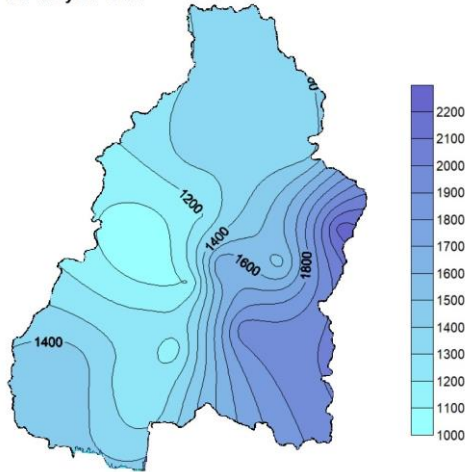
(Above picture) Another information that the PRBFFWC regularly share is the “River Basin Situation Outlook for the week”. This is still a rather new information shared by the river basin center and adjustments and changes are still ongoing to further enhance the said information.

1.3 PRB station data summary

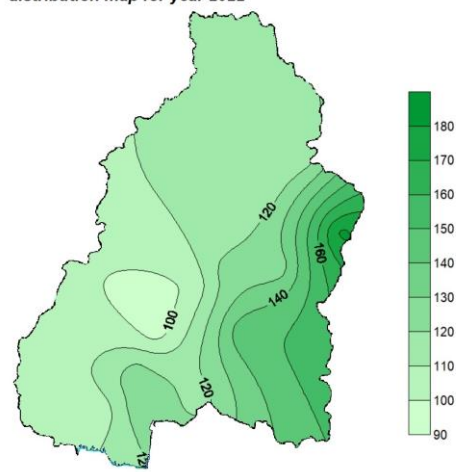
Monthly Rainfall Summary for 2022														Total for the year	Number of RR days	Max 24-hr RR (Met day)
PRB Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Muñoz	18	5	10	2	148	261	207	250	193	219	42	8	1363	117	65	
Sapang Buho	69	9	15	33	205	168	186	170	382	100	49	26	1412	112	93	
Gabalдон	52	94	31	68	217	130	296	309	314	500	177	60	2248	182	218	
Zaragoza	44	3	26	6	138	69	141	191	206	156	21	3	1004	104	60	
Mayapyap	36	9	9	57	180	150	190	168	210	132	63	1	1205	115	67	
Peñaranda	48	13	10	31	305	142	252	305	409	103	74	11	1703	122	91	
Calaanan	35	15	21	11	106	126	208	155	337	210	48	42	1314	112	78	
Palali	27	35	49	79	299	113	205	113	253	175	78	31	1457	125	75	
San Isidro	28	6	3	19	86	34	209	247	291	110	69	6	1108	102	112	
Arayat	0	3	5	81	55	90	197	318	320	131	71	12	1283	94	134	
Candaba	7	0	4	0	88	61	182	245	266	193	77	11	1134	111	70	
Sibul Spring	15	30	39	159	268	124	166	396	379	239	118	28	1961	148	166	
Sasmuan	0	3	15	71	65	236	135	367	204	257	19	9	1381	103	104	
Sulipan	7	6	9	56	161	83	202	282	176	182	29	14	1207	130	86	
Mexico	8	0	18	61	126	122	255	284	193	149	48	6	1270	122	96	
Porac	8	1	57	28	162	179	179	357	227	240	45	7	1490	108	85	
San Rafael	5	9	48	100	286	113	291	131	194	241	59	19	1496	115	101	
PRFFWC	13.2	1.3	37.8	52.6	57.7	132.6	206.0	222.3	223.8	261.6	48.3	4.1	1261.1	122	91.7	

Table above represents the initial monthly RR totals for each of the RR telemetry stations of PRFFWC. The summary totals in red are yet to be validated and quality-controlled.

Pampanga River Basin: Estimated RR distribution map for the year 2022



Pampanga River Basin: Estimated number of RR days distribution map for year 2022



Above shows the estimated RR distribution map (top left), and estimated number of RR days' map (top right) for PRB for the year 2022. The above maps are based from initial annual results with still on pending evaluation & quality control with the data loggers from all telemetry stations.

Highest Water Level received & observed during the Year 2022

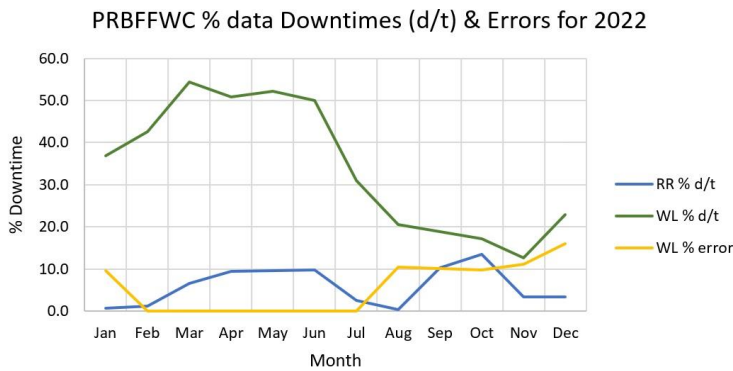
Station	Max WL observed for the year (meters) *	Time / Day of Max WL	Remarks (event of maximum WL for the year)
Sapang Buho	4.40 (Above Alert)	0400H / 30 Oct	Severe Tropical Storm "PAENG"
Zaragoza	3.67 (Above Alert)	2300H / 27 Sept	Super Typhoon "KARDING"
Mayapyap			
Peñaranda	2.03 (Below Alert)	2200H / 29 Oct	Severe Tropical Storm "PAENG"
San Isidro	8.32 (Above Critical)	0600H / 26 Sept	Super Typhoon "KARDING"
Arayat	8.26 (Above Alarm)	1900H / 26 Sept	Super Typhoon "KARDING"
Candaba	6.03 (Above Critical)	0700H / 28 Sept	Super Typhoon "KARDING"
Sasmuan	3.63 (Above Critical)	0500H / 30 Oct	Severe Tropical Storm "PAENG"
Sulipan	3.52 (Above Alarm)	0900H / 26 Sept	Super Typhoon "KARDING"
Mexico			

*As per available received data (still for validation & Quality control)

For final validated hydrological data for the year, an Annual Hydrological Data Summary (AHDS) covering the year 2022 will be prepared and hopefully to be completed within the year 2023. As of now, AHDS 2021 is still being processed and has yet to be completed.

1.4 Telemetry System and Station Physical Maintenance

Telemetry data transmission downtimes have been a recurrent problem for PRBFFWC even prior to year 2022. As per year-end average, the data transmission downtimes for RR and WL were 5.88% and 34.17%, respectively. There were 4 months, March to June, where downtimes for WL was 50% or more. RR downtimes were highest on the months of September and October at 10.2% and 13.5%, respectively. The 2 months of RR d/t that were highest was at the time when the 2 Tropical cyclones (KARDING & PAENG) affected the PRB and it was a period where such information is practically vital to the river basin center. On the other hand, data error is another problem for the river basin center. WL data error average for the year was 5.59% and to think that validation is still ongoing at the moment.



The graph on the left shows the monthly data transmission downtimes for both RR and WL for the year 2022. Also shown is the percentage of immediate errors identified from the received transmitted data for WL. Rainfall data errors are yet to be identified and validated from the respective station’s data loggers. These average d/t and error are expected to change significantly once a thorough data quality-control has been applied to the immediate center’s dataset.

River Basin Flood Forecasting and Warning Centers are dependent on the hourly data received especially during inclement weather conditions affecting the basin. It is important that the received telemetry data be adequate (quantity) and valid (quality) for the center to be able to issue correct, timely and accurate hydrological information.

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

- Conducted only 3 of the supposed 4 (Quarterly period) Maintenance by the PRFFWC technician team (Mar 25-30; Jun 10-16; and Sept 22-28);
- Supported and assisted the HMTS personnel in the installation of radar-type WL sensors at Candaba and Sulipan stations, and installation of an online enabled CCTV at Mayapyap station area (Jul 12-13, and 20). The CCTV operation was relatively short as the concrete post in which it was attached was toppled down during the passage of S.Ty. “KARDING” and as of end of the year the monitor has not yet been recovered;
- General cleaning of the air conditioning units in placed at the PRBFFWC equipment room (Jan);
- River stage validation of Sulipan (Aug 16, Sept 01, Dec 08); Arayat, Candaba & San Isidro (Sept 02); Mayapyap & Zaragoza (Sept 03);
- Emergency maintenance trip to San Rafael repeater station which includes clearing of station surroundings, support to HMTS and Japanese consultants in the checking and possible restoration of the station repeater’s generator set (Sept 07);
- Supported in the cleaning and upgrading of the PRBFFWC system by HMTS & Japanese consultants (Sept 15 to 19);
- Emergency maintenance trip to Sulipan station that included river stage validation, offsetting / adjustment of WL telemetry reading to coincide with staff gage reading (Nov 30); the WL monitor system was shut-off eventually as offsetting did not work-out properly. Possible issue / problem with the equipment;
- 15 resets and transfer of A/C units at San Rafael Repeater station including the cleaning of A/C units and clearing of station surroundings (year-round)



Above pictures shows some of the various activities being carried-out during quarterly maintenance of the technician group of PRBFFWC. Maintenance activities includes, among others, cleaning of station surrounding (top left pic & bottom row right); cleaning and installation of staff gages (top middle and right, 2nd row middle & bottom middle); cleaning of instrument (2nd row right); cleaning of air conditioning units (3rd row left); declogging / desilting of sensor pipes (3rd row right); backup of logger data and checking of telemetry power (bottom left & 3rd row middle, respectively)

Considering the operational continuity of the PRBFFWC throughout the whole year, it is imperative that periodic maintenance of the PRBFFWC telemetry station network be conducted on a quarterly basis due to the following reasons:

- The system had last been totally rehabilitated and started its new operation way back in March 2009. By March 2023 it will already be 14 years of continuous operation;
- All stations are unmanned and operational 24/7 whole year-round. Hence, it is subjected to continuous stresses of heat / humidity, wear and tear, other weathering effects, aside from the usual theft and vandalism of the station, particularly on the instruments that are situated outside the station housing, e.g., rain gauges, water level sensors, solar panels, tower, cables, and other external parts;

What necessitates a regular periodic maintenance is the fact that data reception downtimes are a regular / normal condition in every remote or telemetry transmission system. For example, the Rainfall and Water Level (WL) data transmission downtimes in the last 3 years for the PRBFFWC system were as follows: 25.56% and 41.34% in 2020; 14.89% and 26.85% in 2021; 5.90% and 34.11% in 2022. For the year 2022 stats, of the 65.89% of WL data received that

year, 6.72% of these were already validated as erroneous data and yet the validation and quality control is still ongoing. Downtimes / erroneous data transmitted by the system are more likely higher were if not for the quarterly maintenance that were carried-out regularly.

The main objective of a telemetry system maintenance is really to prevent and mitigate the downtimes and transmission of erroneous information. As the system grow old, the more it is necessary to carry-out regular checks and extensive maintenance. Considering the present condition of the PRBFFWC telemetry system and the fact that the data received from the said system is vital in the center’s daily operational hydrological monitoring & for its flood forecasting & warning services, hence, it is seriously important that a quarterly maintenance of its telemetry system be regularly carried-out.

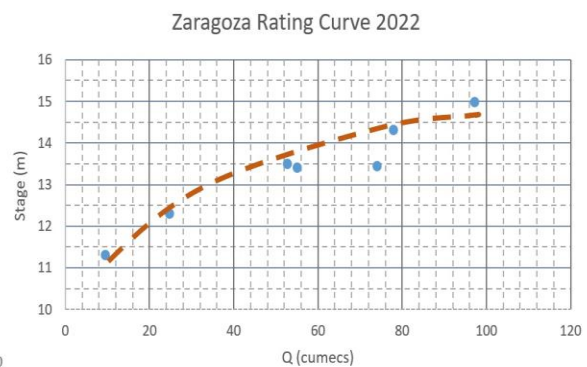
1.5 Streamgaging / other hydrological related measurement activities

Streamgaging is probably the most neglected hydrological activity in almost all of the River Basin Centers of PAGASA. Mainly because most of the PAGASA River Basin Centers do not have the proper equipment for streamgaging, lack of personnel to carry-out the activity (at least 4 persons are needed to do the activity), simply do not have the appropriate knowledge in conducting the activity, or plainly not totally supported by the PAGASA management or their respective regional divisions because of lack of awareness and understanding for the need of the said activity. Flood forecast are formulated using river flow models, by trends using present and past hydrological data values, forecast by use of prevailing and previous weather conditions, etc. One of the basic requirements in running and calibrating river flow models is a rating curve or a stage-discharge relationship. Streamgaging results are also required in updating the water level assessment levels, i.e., Alert, Alarm, and Critical water levels, at forecasting points in the river basin.

Streamgaging was probably the main highlight activity of the PRBFFWC for the year 2022 with more than 80 streamgaging activities conducted throughout the year. The focus was to be able to update the 2009 rating curves (and equations) of the various forecasting points of the river basin center. Further, auxiliary streamgaging sites were now included as part of the ongoing IWRMIS program of the NWRB-KOICA of which the PRBFFWC is member of its TWG. To date, there are a total of about 17 station sites that are being handled by the center for now.

Below is a summary rundown of the various streamgaging and other hydrological related activities of the PRBFFWC for the year 2022:

- Identification and selection of RR & WL stations in connection with the IWRMIS project which also included selection of stations for streamgaging activities (1st half of year 2022)
- Joint river cross-section with Bulacan PDRRMO for updating of their assessment levels in Sta. Maria Bridge in Poblacion, Sta. Maria, Bulacan and at F. Cadiz Bridge, San Jose Del Monte, Bulacan near SJDM NHS (Mar 10)
- About 83 Streamgaging activities at the 17 PRBFFWC focused station sites from April to September which included update of river cross-sections, a number of river velocity measurements, and some emergency river velocity measurements just after passage of Super Typhoon “KARDING”
- Established river water levels by painting staff gages at 4 IWRMIS sites (Bangkerohan, Apo Esquivel, Sta. Isabel, & Atate)



The latest river x-section of Rio Chico River at Zaragoza station (top left) and an initial estimated rating curve for the station with several points of discharge results (top right)



(from Top to bottom, L to R) Various streamgaging activities for the year 2022: River x-sectioning and velocity measurement by wading at Sapang Buho station; using the radar profiler (RP30) for river velocity measurements at Pampanga River at Sta. Isabel, Cabiao and at the Apalit bridge; establishing / installing staff gages at Mayapyap station; river velocity measurements at a relatively high flow in Atate bridge, Palayan City just after event TC “KARDING” passage; and river x-sectioning in one of the IWRMIS stations in Cabiao, N.E.; measurement of river velocity at medium flow in Arayat, staff gage reading at 6.90m (1300H; 28 Sept); establishing positions for vertical points for sounding by painting on the bridge walk at one of the IWRMIS station, in Bangkerohan, Palayan City; doing night time measurements using the RP30 in Candaba station.

The main purpose of streamgaging in PAGASA River Basin Flood Forecasting & Warning Centers is to provide specific discharge values during flood forecasting and warning activities. Therefore, it is important and necessary for river basin centers to regularly conduct streamgaging activities in order to enhance further their operational flood forecasting & warning services. As of now, the PRBFFWC is focused on continuously getting more measurements during medium and high flows, particularly for the year 2023.

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

2.1 Presentations & lectures in events, various occasions and functions

The PRBFFWC rendered some presentations / lectures in about 61 events with estimated participants / attendees totaling 2,927 individuals. About a third, or 20 to be exact, of these events were already done in a face-to-face setup. The usual presentations that were provided during these events covered the various topics that included as follows:

- Latest & Updated Climate & Weather Outlook
- Hydrological Updates on Pampanga River Basin and status of major Dams – Angat & Pantabangan
- Hydrometeorological Hazards Awareness & Mitigation
- Climate Change and Early Warning System (mostly in the DOT3 trainings and seminar to Provincial Tourism Officers and DRRMOs)
- Tropical Cyclones updates during PDRA meetings. There were some 19 Pre-Disaster Risk Assessment (PDRA) meetings that the PRBFFWC participated in and 12 of these were meetings by the PDRA Analyst group while the rest were core group meetings of the Regional, DRR thematic clusters, and Provincial DRR councils

- “Flood Mitigation Approaches” presented the Flood Summit organized by LGUs and concerned regional government offices for Masantol-Macabebe areas
- Orientation on the SHINE Program
- Rainfall and Rainfall Observation presented in the 14th SHINE Conference
- Special topics presented to Bulacan State University Environmental Science students who did an online internship program with the river basin center:
 - UV Light & Natural Disinfection to
 - Common weather systems affecting the Philippines



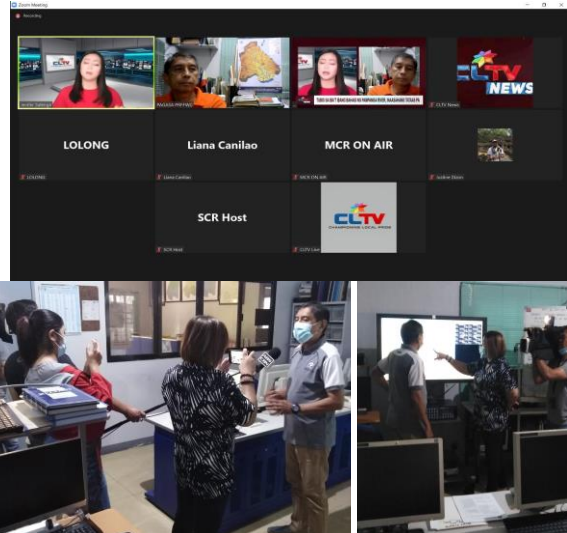
- Streamgaging-related topics covering the basics of streamgaging, various methods of taking river velocity measurements, computations of rating equations, etc.; topics relating to hydrological data buildup and analyses, and other river basin center and operational hydrological related topics.

(left picture) Attendees in the 4th PAGASA RBFFWC Conference & 2nd Streamgaging Field-Workshop (Oct 17 to 21)

The abovementioned topics / presentations can be requested directly from the PRBFFWC if one is interested.

2.2 Public Information and Briefings (Multi-media)

There were a number of media interviews that were accommodated for year 2022. Many of these interviews were mostly done online (via zoom platform) and there were few live (face-to-face) interviews as well. A total of 14 interviews were attended to during the year with topics mostly covering the status of the main Pampanga River particularly during the events Super Typhoon “KARDING” and Severe Tropical Storm “PAENG”; flood issues during the 2 said events; and Dam situations. As always, the PRBFFWC regarded media interviews and briefing as a part of its enhancement on its information and dissemination campaigns within the Pampanga River Basin and, therefore, all requests for interviews have always been considered.

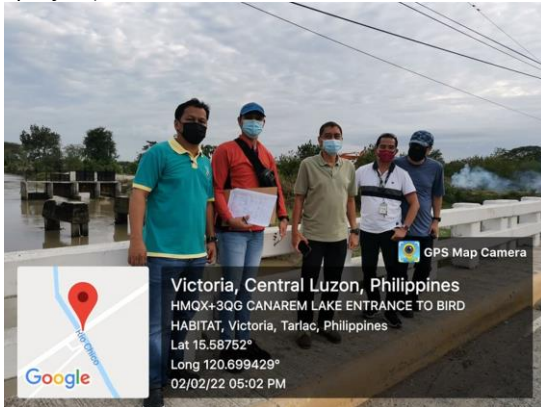


(Top, L to R) Zoom platform live interview with CLTV 36 program anchor, Ms. Jennifer Salenga, during event TC “KARDING” & another follow-up live online interview of the same event; (below, L to R) face-to face (F2F) interviews with CLTV 36 field reporter Mr. JM; and joint F2F interviews with field reporters Gracie Rutao of ABS-CBN and her daughter, Ms. Louise Rutao of GMA-7, during event TC “KARDING”.

III. Participation and interaction in various events, occasions, other inter-agency undertakings (meetings, seminars, workshops, conferences, etc.)

Attended and participated in more than 100 various events (meetings, seminars, conferences, trainings, etc..) many of which were done via VTC:

- More than 50 DRRM-related meetings (PDRA analyst group / core group, Regional /Provincial / Local (LGU) DRRMC meetings, briefings during Tropical Cyclone events, etc.; Kick-off Ceremonies of the National Disaster Resiliency Month; attended DRRM exhibits of PDRMMO-Pampanga; Updating of the DRRM Plan for Region 3; and participated in the Mt. Arayat Task Force;
- More than 10 meetings, including field validation, in the River basin & hydrological-related international coordinated projects, e.g., NWRB-KOICA on the IWRMIS project; ICHARM-UPLB-JICA on the HYDEPP-SATREPS project)



(Top L) With KOICA and NIA-UPRIIS personnel in station validation for IWRMIS; (Top R) With ICHARM-UPLB-JICA team on a visit to PRBFFWC for the HYDEPP-SATREPS program.

- Supported various PAGASA activities, particularly the NCR-PRSD, in the following:
 - arrangements of virtual tour messages of various regional / provincial partner agencies during the celebration of WMO day;
 - in hosting the Provincial Climate Outlook Forum on La Niña (Region 3) together with CLIMPS, CAD;
 - coordination meetings with ETSD and the LGU of San Ildefonso in the ongoing construction of the Synoptic station in the said town;
 - Optimization project;
 - Support in organizing and arranging the 4th PAGASA RBFFWC Conference & 2nd Streamgaging Field-Workshop, together with SL-PRSD, Training Section of RDTD;
 - Attended and participated in the CMO Conference;
- Participated as resource person in 2 Flood Summits within PRB: Flood Summit for Guagua Municipality (Jun 2022) and a much enhanced Flood Summit for Macabebe-Masantol Areas (Oct 2022)
- The rest of the events attended and participated included the following: meetings relating to DMGC / CLARO (Diosdado Macapagal Government Center / Central Luzon Association of Regional Offices) issues;
- With Bulacan PDRRMO in the 14th SHINE Conference; also with Pulilan MDRRMO in the reorientation of SHINE activities in the Bajet-Castillo High School in Pulilan, Bulacan;
- Several coordination activities (meetings and field surveys) with NIA-UPRIIS, as a partner agency, in the enhancement of hydrological monitoring in the upper Pampanga River Basin
- Provided online internship program to 10 Bulacan State University Environmental Science students for a total aggregate time of 200 hours (5 weeks) as part of their school requirements (Aug 2022)

There were also several trainings that were attended and participated to by PRBFFWC personnel during the year 2022:

- 3 center personnel attended the 2-day online seminar for Senior Citizens (Apr 07-08)
- 1 center personnel actively participated in the HYDEPP-SATREPS e-learning 2022 organized by ICHARM and in coordination with HMD (Jul - Aug)



- 2 center personnel actively participated in the Climate Workshop for NCR-PRSD via online (Aug 17-19); (left picture)
- 1 center personnel attended the online training on Manager’s role in Capacity Building (Sept 5, 9, 20, 23 & 27)
- 2 center personnel attended via F2F the training / workshop on PHILAWARE (Oct 13-14)

- 6 center personnel attended and actively participated in the online training on Hydrological Data Management System Project, i.e., End-Users Training re: WISKI (6-day training program)
- Attended and participated in another 8 various echo seminars, workshops, and short trainings that included topics on “Basic Cybersecurity & Awareness”, “Global Flash Flood Guidance System”, Disaster Risk reduction to Implement the Sendai Framework, and a lot of other topics;
- Finally, 5 center personnel attended and actively participated in the 4th PAGASA RBFFWC Conference and 2nd Streamgaging Workshop as resource person / lecturers and the rest as participants and support personnel in the field-workshop; a total 36-hours credit was given to those who actively participated in the said event.



(Top to bottom, L to R) Flood Summits organized by Guagua LGU and (next pic) at Masantol-Macabebe Area; Coordination meeting with NIA-UPRIIS in their OpCen; Streamgaging field-workshop in a bridge at Naga City; Online internship program for BulSU Environmental Students; NCR-PRSD CMO Conference at Camayan Point in Subic; SHINE reorientation with students and teachers of Bajet-Castillo High School in Pulilan, Bulacan; and during the 14th SHINE Conference for Bulacan Province; Online training on WISKI system by PRBFFWC personnel.

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

There were not much reports produced by the PRFFWC for the year 2022:

- Activity report on the 4th PAGASA RBFFWC Conference and the 2nd Streamgaging Field-Workshop (bottom left picture)
<http://prffwc.synthasite.com/resources/activity%20rep-4th%20RBCConf-2nd%20SG-wrkshp-oct2022.pdf>
 Video presentation link: <https://www.youtube.com/watch?v=BaPPzkdrsCw>
- 14th SHINE Conference proceedings (produced with the support of Bulacan-PDRMO) (bottom right picture)
<https://bulacanshine.yolasite.com/resources/14th%20SHINE%20Conference%20Proceedings%202022-1.pdf>





PRBFFWC year-end picture (Enhancing the inter-agency rapport during a get-together gathering with Bulacan-PDRRMO, MGB-3, and OCD-3, Dec. 27, 2022)

PRFFWC production 2022-23

Previous annual reports available at the following link:

<http://prffwc.synthasite.com/annual-reports.php>

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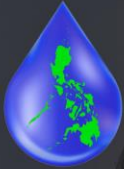
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