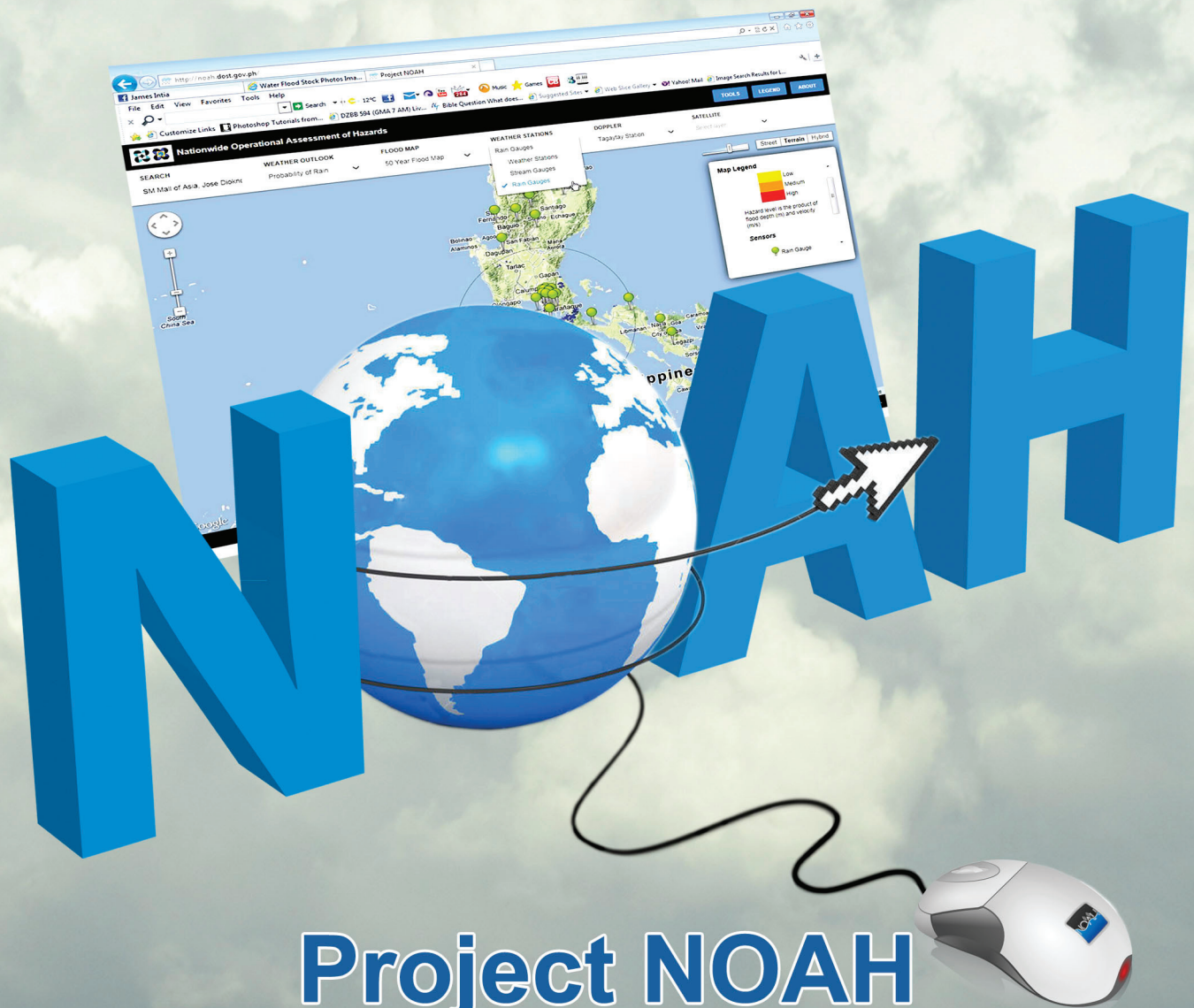


S&T POST

SPECIAL EDITION



Project NOAH
delivers its promise

The Lesson of Yolanda

A whole lot of stories are told about the tragic significance of typhoon Yolanda, but the single most important lesson should not skip us – the need to have a culture of preparedness.

Almost a year ago, the most powerful typhoon to ever hit the country showed its wrath and brought Central Visayas to its knees with several localities in shambles. In Tacloban which suffered the worst, several houses, utility poles and trees were either knocked into rubbles by strong winds, or washed away by the strong rush of seawater that heaped even cars on top of each other. That event saw unimaginable toll on lives and properties, and left a tough scar on the economy.

It is indeed a disaster when people do not take government warnings seriously and simply rely on past experiences, feeling invulnerable. And it becomes worse when local authorities would merely react with complacency, instead of doing what is supposed to be done.

Yolanda is a disaster Camotes Islands never had. At the height of Yolanda, when the region was being pummeled with heavy rains and strong winds that triggered storm surge in several areas, the people in this group of islands in the east of Cebu have braced up themselves for the worst.

The impact of Yolanda contrasted Camotes Island and Tacloban City where responses to warning differed. The first modeled readiness after a quick and organized response to the warning of PAGASA DOST. The second had another story to tell.

Former Mayor Alfredo Arquillano of Camotes Island recalled they immediately convened a meeting after the warning issued on Yolanda, and rushed all 1,000 residents to safety. Yolanda came wiping out their homes, but spared lives.

In Tacloban, some local folks refused to leave their homes in the face of danger despite warnings from President Aquino himself. Some quarters were

even quick to blame the government, saying it failed to give a clearer picture on what Yolanda can actually do to them.

On the eve of Yolanda's devastation, the President did not hesitate to go on-air to warn about the impending landfall of Yolanda on Samar and Leyte, giving much emphasis on the gravity of the calamity.

Yolanda may have ravaged a greater part of Central Visayas, but it left us a moral to value, one that can save more and more lives in the future amid the worsening impacts of climate change.

To say "we need not prepare because we are used to this and that kinds of hazards" is pointless as climate has gone more and more unpredictable. We should rather do a Camotes Islands and start adopting a culture of preparedness, i.e., doing early action once a warning is issued.

While the government has invested a lot to improve its scientific warning system against disaster, it is best that we make use of it to embracing the culture of preparedness we so urgently need. We may not achieve zero casualty amid a calamity at one fell swoop, but adopting a science-oriented scenario-based approach of dealing with natural hazards would do a lot for the purpose.

This is the reason we have been conducting disaster preparedness trainings for local authorities and disaster managers in every region. Titled *Iba na Ang Panahon: Science for Safer Communities*, our regional workshops done across the country are aimed at enhancing the decision-making capabilities of local executives and disaster managers. We see it important in ensuring that adequate plans are in place for any hazard that comes our way, and we have the capability to execute them.

A synergy between the government and the people should spell the country's success in ensuring preparedness against calamities and disaster resiliency.

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Sword and shield

With the DOST anchoring its main thrust on the 8 Outcomes that includes among others disaster preparedness, the S&T Post comes with a special issue to bring to fore DOST's different programs and initiatives in this area. These science-based tools help our communities well-prepared during calamities, both natural and human-induced, thereby ensuring that the people remain safe.

In our past issues, we had featured scientific innovations and inventions that made a difference in the lives of our countrymen, stories of success of our partner entrepreneurs whose ventures were scaled up by various technologies, and scientists and researches whose commitment and dedication to science and technology helped buoy up the level of S&T in the country. These stories are told not only to inform but also to inspire and motivate our readers to embrace S&T as a way of life.

Now, for this special issue we want it to be a progressive medium of communication that is attuned to the changing times. We want our readers to be well informed so they can act accordingly. In the process, we made our stories relevant to disaster preparedness in the light of the changing weather patterns in the country.

As Secretary Mario G. Montejo says, "We cannot prevent natural calamities but we can surely prevent disasters from happening by using science-based tools and knowledge to create products and technologies like high resolution flood hazard maps to better equip highly vulnerable communities in disaster preparedness, thus minimizing the loss of lives and destruction of properties."

As we have been experiencing obvious changes in our environment, this special issue showcases the different programs of DOST pertaining to disaster management in the face of climate change. Most of these stories is about the well espoused Nationwide Operational Assessment of Hazards or more popularly known as Project NOAH. To tell the story about Project NOAH is to let our readers know how it works and how it can save lives in the event of calamities.

We are also featuring the story behind the creation of the Disaster Risk and Exposure Assessment for Mitigation or DREAM project using the light detection and ranging technology, or LiDAR for flood hazard mapping and modeling; a joint undertaking of the DOST and the University of the Philippines. In this story, we will tell our readers the hard work that goes with creating flood maps, most of which are now accessible to our local government leaders so that they can make intelligent decisions in times of crisis.

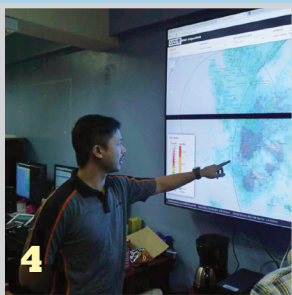
Because information is very vital to disaster preparedness, we are also sharing with you the experiences we had by telling heart-warming stories of resiliency and triumphs over adversities like those in Marikina City, Cagayan de Oro, and Camotes Islands. These are not mere accounting of the facts of the event but speak more on real human experiences that are told from the heart, making us truly learn from their travails.

We also feature new developments in disaster preparedness, such as the MOSES Tablet, the DOST's Intelligent Operations Center, and the work being done by the Advanced Science and Technology Institute or ASTI on producing and installing locally fabricated weather monitoring equipment all over the country as part of the monitoring system.

Lastly, this special issue includes some very practical tips on disaster preparedness that the DOST has compiled over the years. We believe that by providing this information we can contribute in the overall efforts of the DOST, our local government units, our people, and other stakeholders.

We hope to use the S&T Post as communications tool that will serve as our shield and protection when calamities strike. May this issue serve its purpose in feeding our minds with useful information about disaster preparedness and may our stories serve as valuable lessons to make us aware of the importance of cultivating a culture of safety. Happy reading to all!


Aristotle P. Carandang, Ph.D.
Executive Editor



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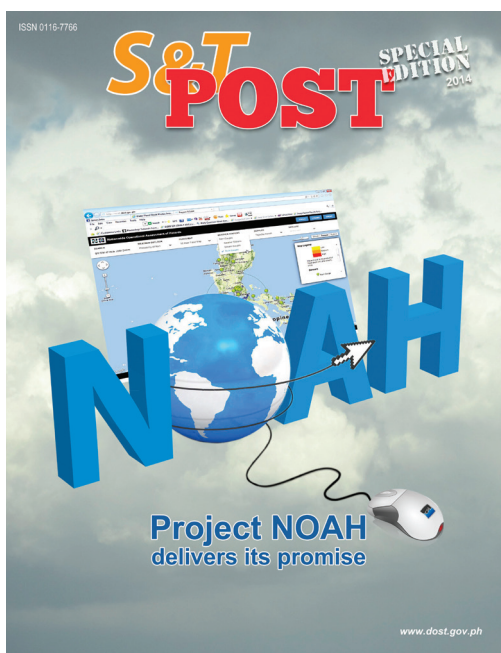


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OUR COVER



Project NOAH is a responsive disaster preparedness and mitigation tool aimed at providing important life saving information in times of natural calamities. The cover design reflects the very nature of Project NOAH - a potent digital platform using state-of-the-art technology and advanced software programs to gather weather data and hazard information, process it and package it for delivery to communities and decision makers around the world. The visualization supports the unique character of Project NOAH as an empowering medium of communication to prompt local leaders and vulnerable communities to espouse a culture of preparedness and safety.

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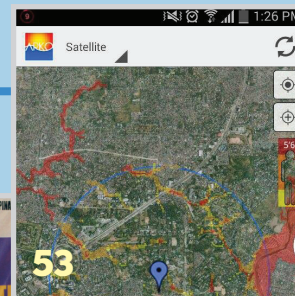
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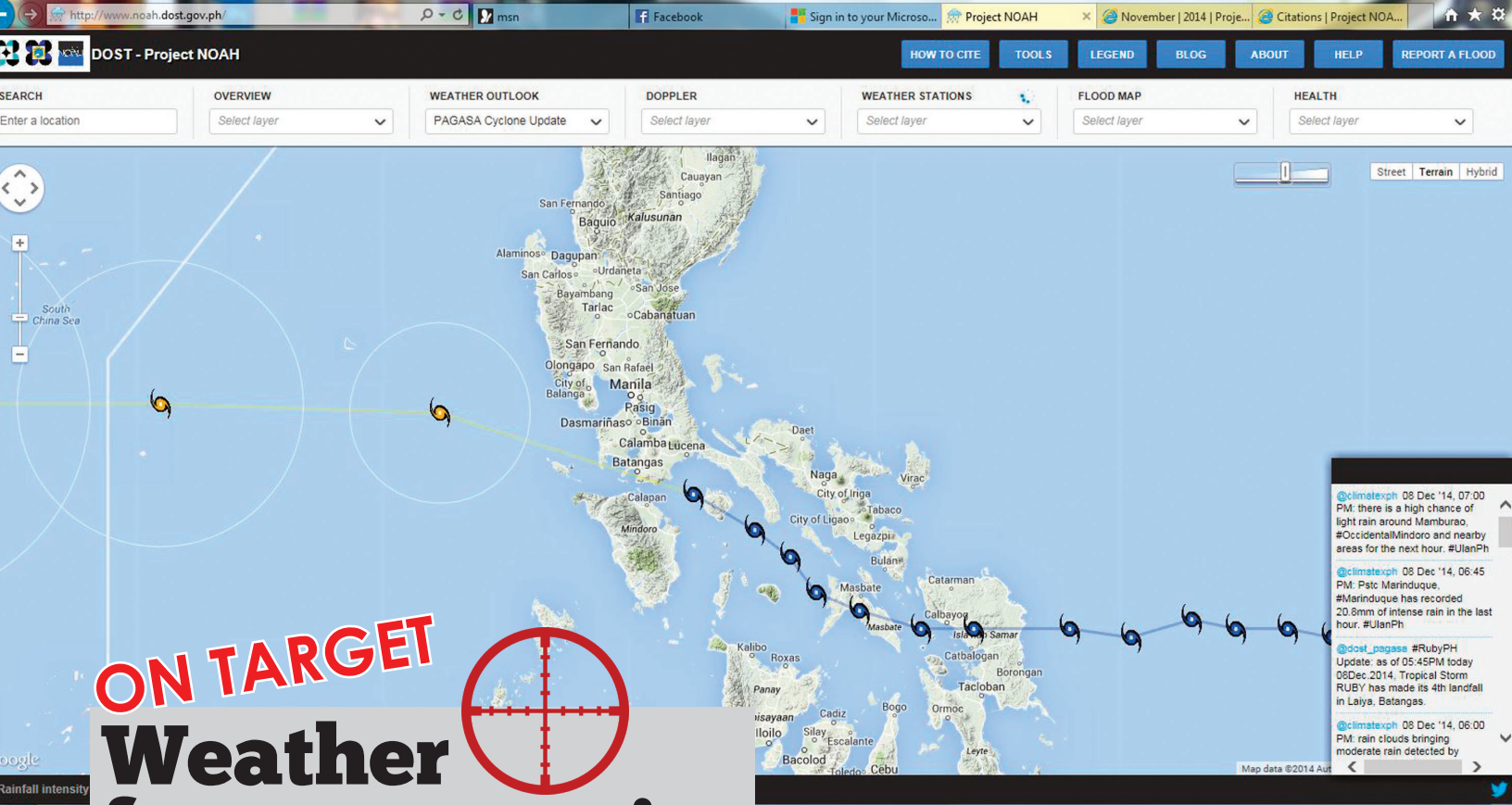
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Disaster Preparedness Posters



Right on target. This most accurately describes the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) regular weather bulletins and forecasts even days before Typhoon Ruby (international code name 'Hagupit') traversed the Visayas region.

Forecasters from PAGASA, the warning agency of the Department of Science and Technology (DOST), precisely marked and plotted the track of the typhoon days in advance using science-based knowledge and sophisticated weather equipment. PAGASA's arsenal of weather facilities include 10 Doppler radars stationed in strategic locations across the country, rain gauges, automated weather stations, and water level sensors.

By collating several data reports and models from different weather agencies like the Japan Meteorological Agency (JMA) and the

Joint Typhoon Warning Center based in Hawaii, PAGASA meteorologists are able to compute and predict to a high degree of accuracy the characteristic of the weather disturbance.

In an interview at ANC, Dr. Mahar Lagmay, executive director and project leader of the Nationwide Operational Assessment of Hazards or Project NOAH, lauded our local forecasters' capability for being precise in their calculations.

"It depends on the quality of data you put into the model," Lagmay said. "Example, PAGASA has an assimilation of Doppler data, sensor data, pressure data from the ground. The weather bureau has that, which other agencies don't (have)."

Forecast models are created to determine the possible track of the typhoon considering all factors that may affect the typhoon's behavior. In the case of Typhoon Ruby, two forecast scenarios were generated.

By RODOLFO P. DE GUZMAN
S&T Media Service, DOST-STII



Project NOAH Executive Director Dr. Mahar A. Lagmay (seated, center) instructs his team at the Project NOAH Operations Center at the UP-National Institute of Geological Sciences on the track and strength of typhoon Ruby in preparation for possible storm surge in the eastern portion of Visayas where Typhoon Ruby was expected to make landfall on Dec. 6, 2014. (Text by Rodolfo P. de Guzman/Photo by Alan C. Taule, S&T Media Service)

TWO SCENARIOS FOR RUBY

The first scenario points to Ruby moving west - northwest towards the direction of Eastern Samar and Leyte and then traversing Central Visayas towards Mindoro province. The second scenario was Ruby moving northward towards the direction of Southern Japan and will not make landfall in the Philippines. These scenarios were made on December 2, Tuesday.

By December 4, Thursday, PAGASA was able to generate more data as the low pressure area moved closer to the Philippine Area of Responsibility or PAR and accurately detected by the Doppler radars in Guiuan, Eastern Samar and Cebu. This time, the likelihood of Ruby hitting the country was pegged at 75 percent.

Moving at a speed of about 20 kph with maximum sustained winds of around 170 kph and gustiness of about 205 kph, PAGASA forecasters braced themselves for possible super typhoon category. However, as more data started coming in, our forecasters got a clearer picture of Ruby's behavior and its characteristics are now more definite.

By December 5, Friday, the weather bureau was more confident that Ruby will really hit the country on the similar path of Typhoon Yolanda (international code name "Haiyan").

RED ALERT SOUNDED OFF

No less than President Benigno Simeon Aquino III called an emergency meeting at the office of the National Disaster Risk Reduction and Management Council or NDRRMC with all government



NOAH 1-Project NOAH WebGIS Chief Oscar Lizardo points on the monitor showing the Doppler data highlighting the coverage of clouds during the typhoon Ruby episode on December 5, 2014.

agencies under the disaster management cabinet cluster, such as the science and technology, local government, social welfare, defense, transportation, and public works departments, and other support agencies.

As President Aquino gave his marching orders to his cabinet secretaries, PAGASA forecasters continued to monitor Ruby as it moved closer to the country's eastern seaboard.

am and 10:00 am on December 7 in Cataingan, Masbate. On December 8, at 11:05, Ruby hit land the third time in Torrijos, Marinduque. It then hopped on to Laiya, Batangas the same day at 5:45 pm and for the fifth time it crossed Lubang Island on Sunday December 9 at 5 am.

RIGHT ON TARGET

As Ruby moved farther away from the country, PAGASA expected it to pass by Metro Manila in the evening of December 8. However, Ruby once again showed a different behavior as it slowed down to a speed of just 10 kph. From the initial forecast of Ruby's exit on Wednesday, she was now expected to say her farewell on December 11, Thursday.

Ruby's unpredictable character, though, was expected by our weather bureau experts, that is why several scenarios were presented together with the so-called "cone of uncertainty" -- the probability of deviation from the projected forecast as

PAGASA ran its forecast models again and did the pencil pushing. It predicted that Ruby will hit the country by December 6, Saturday and make six landfalls before it goes out of the PAR.

First landfall occurred in Dolores, Eastern Samar at 9:15 pm of December 6. Second landfall was registered between 8:00



to track and wind speed due to other weather systems.

In the case of Ruby, the northeast monsoon, locally known as *amihan*, that blows from the northern part of the country pushed it down a few degrees off its projected track. This phenomenon is prevalent during the cold season from November to February.

WELL-TRAINED PAGASA FORECASTERS

During separate interviews with ABS-CBN's ANC channel and radio station dzMM, Lagmay stated that PAGASA forecasters are well trained and are working hard despite the other financial constraints and encouraged everyone to trust PAGASA.

"Let us not ruin the institution. Scientists are also human, they can make mistakes. If PAGASA loses credibility, they will not be followed by the public. Some groups will make use of weather forecasting for purposes of profit."

Lagmay clarified that weather forecasting, even in other countries, is not 100 percent accurate because of many variables. PAGASA forecasters are still on target with their predictions and are equally capable of standing side by side with their foreign counterparts. He even said that different government agencies use PAGASA reports to determine and assess their next steps in relation to evacuation plans, prepositioning of assets and many others.

During the said interviews, Lagmay further stressed that PAGASA never made a mistake in the past few years, specifically during the onslaught of major

storms from Pablo to Glenda.

In the case of Typhoon Ruby, Lagmay revealed that the weather bureau saw Ruby making its landfall in Borongan and then later in Dolores in Eastern Samar and will slightly weaken thereafter.

In the news telecast of GMA-7 resident meteorologist Nathaniel Cruz on December 8 in the State of the Nation (SONA) program of Jessica Soho, PAGASA was given the thumbs up for its accurate forecast.

"PAGASA has the homecourt

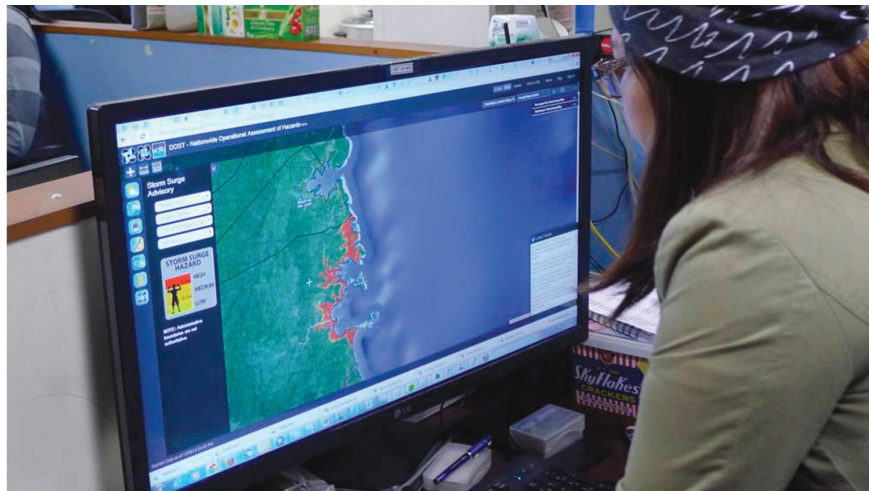
advantage because we have the models, weather stations here that provide data on atmospheric pressure, wind and others as basis for forecasts as to where the typhoon will move. Also, PAGASA has the climatology or historical data on typhoons during this period like December," Cruz said.

Cruz, a veteran meteorologist, also said that different weather agencies produced different forecasts like that of the Joint Typhoon Warning Center of the United States which later on adjusted its forecast to that

of PAGASA's.

"Kaya bilang official weather forecasting agency we must put our trust and confidence on PAGASA," Cruz concluded.

The valuable lessons learned from Yolanda and now Ruby has further strengthened the reputation of PAGASA as the country's reliable weather forecasting agency. Not only has PAGASA shown its capability and competence in hitting its target bullseye with Typhoon Ruby but has earned for itself the seal of good marksmanship in weather forecasting in the country. ●



Staff members of Project NOAH work on a simulation model for storm surge at the height of Typhoon Ruby.

Working DOST chief is behind active weather forecasting -PAGASA

By SUZETTE J. DALUMPINES
S&T Media Service, *DOST-STII*

While earning praises for its accurate forecast on typhoon

Ruby, government weather bureau PAGASA acknowledged Science Secretary Mario Montejo for diligently working behind the scene to make sure their forecasts are accurate and effectively communicated to the people.

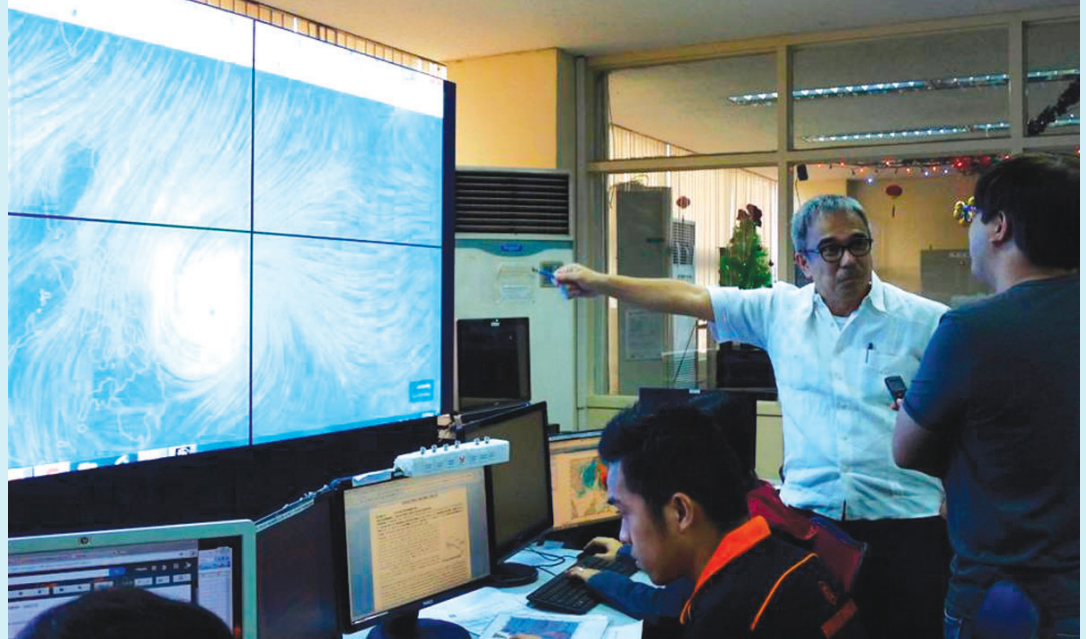
"Secretary Montejo had played a big role in our forecasting operation. For this, we also have to be thankful to him," PAGASA Deputy Administrator for Operations and Services Dr. Landrico Dalida said.

"One thing that many missed out during the coverage of typhoon Ruby was the frequent visit of Secretary Montejo to PAGASA. The media may not have noticed it because he behaved as if he's just one of the ordinary people working in our team. He blended with us and chose to work behind the scene to be able to move around in the building."

He said even before Ruby entered the Philippine Area of Responsibility, the secretary had been going to PAGASA, working closely with them.

Such, he said, had provided them a great deal of support.

"The fact that the secretary had been with us at the PAGASA operations center, had been enough to boost our morale



DOST Secretary Mario G. Montejo (standing, center) explains to Gabby Mabutas of the Project NOAH StratComm (right), the changing behavior of TY Ruby, reflected in the monitor in real time, as the eye of the storm seems to dissipate which was quite unusual. (Text by Rodolfo P. de Guzman/Photo by Alan C. Taule, S&T Media Service)

especially when people would hastily criticize us just because our forecasts differed from those of our counterparts," Dalida said.

"You know the feeling is different when the secretary works with you in the operation center because you know he would defend your forecasts. After all, he had been part of our team and he knew the accuracy of the information we were providing," he added.

Dalida said the secretary was actually part of their forecasting team as he would see to it that the forecasts are accurate before they were released, and the contents of their advisories and warnings were easily understood by ordinary people.

"As far as I know, Secretary Montejo is the first DOST secretary to go to PAGASA and blend with them at work whenever there is a typhoon that threatens to cause disaster in any part of the country," he said.

Dalida said Secretary Montejo was also responsible for the frequent release of weather advisories and warnings, which had been designed to give the people ample time to prepare whenever there is an impending disaster in a particular area.

"I also have to mention the fact that with the full support of the secretary, PAGASA's weather and flood forecasting capabilities have been significantly enhanced. Before, we had 10 Doppler Radars. Now we have 15. We

have also been able to acquire two X-band radars which we put in place if any of our 15 stationary radars malfunctions," Dalida said.

He added, if before, PAGASA only had 59 Automated Weather Stations (AWS), it now has more than a thousand because DOST was able to fabricate its own.

"Probably because he was an inventor, the secretary had been very practical about acquiring equipment we can use to improve our forecasting capabilities. Imagine, we used to buy AWS from abroad, ranging from P800,000 to P1.2 million. With guidance from the secretary, the DOST's Advanced Science and Technology Institute was able to manufacture our own AWS at much lower costs," Dalida explained. ●

Pushing towards precision

PAGASA works beyond limits to get zero casualty

By RODOLFO P. DE GUZMAN
S&T Media Service, DOST-STII

Among the forecasts on Typhoon Hagupit (Ruby) released by other weather forecasting agencies, the forecast track of the country's weather bureau, the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) on Typhoon Ruby proved to be the most accurate.

Based on PAGASA's web posts, the agency started issuing weather advisories three days before Ruby entered the Philippine Area of Responsibility (PAR). This was going beyond their protocol of issuing advisories only when a tropical cyclone enters PAR. PAGASA was monitoring the typhoon as early as a week before its expected entry to PAR because of the typhoon's observed strength and foreseen impact.

Working on the forecasts from PAGASA, the government started its preparation for the typhoon – from the national level all the way down to the local government units (LGUs). This was despite the possibility of the typhoon not actually hitting the country and moving towards Japan.

Led by no less than President Benigno Simeon Aquino III, different agencies did their own preparations for the respective areas of concern in anticipation of the strong typhoon. Most of the LGUs in areas expected to be directly hit by the typhoon implemented forced evacuation so as to ensure zero casualty.

Aside from the PAGASA weather bulletins, information coming from PAGASA's very reliable partners helped the country prepare for the typhoon 24/7.

DOST formed Task Force Ruby consisting of PAGASA, Advanced Science and Technology Institute (ASTI) and its flagship program, the Nationwide Operational Assessment of

Hazards (Project NOAH) that worked closely with PAGASA for a round-the-clock monitoring of the typhoon.

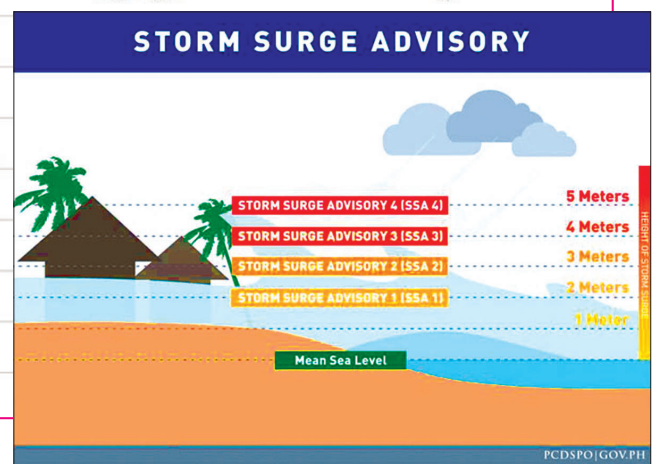
Project NOAH's Storm Surge component, which was created in 2013, provided storm surge simulations for the typhoon Haiyan two days before it made landfall in November last year. This year, two days before Ruby made actual

landfall, it released storm surge advisories to areas that would be directly hit by the typhoon.

The storm surge team made a list of specific municipalities that would experience storm surge and the corresponding height of the waves, based on their simulations. Alongside this list are the corresponding storm surge hazard maps for the specific coastal

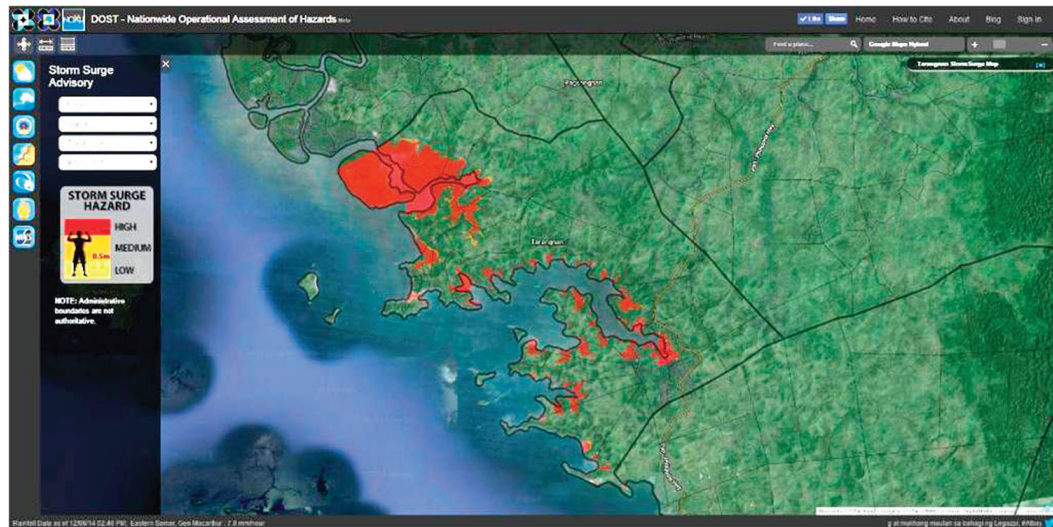
Click on the municipality name to view the storm surge map.

MUNICIPALITY	SURGE HEIGHT (meters)	STORM SURGE ADVISORY (SSA)
Tarangnan, Samar	3.6 – 4.6	4
Sta. Margarita, Samar	3.6 – 4.6	4
Gandara, Samar	3.6 – 4.6	4
Catbalogan, Samar	3.6 – 4.6	4
Uson, Masbate	3.4 – 4.4	3
Mobo, Masbate	3.4 – 4.4	3
Dimasalang, Masbate	2.9 – 3.9	3
Batuan, Masbate	2.9 – 3.9	3
Placer, Masbate	2.6 – 3.6	3
Daram, Samar	2.6 – 3.6	3
Cawayan, Masbate		
Palanas, Masbate		
Esperanza, Masbate		
Zumarraga, Samar		
Jiabong, Samar		
San Remigio, Cebu		
Ormoc, Leyte		
Merida, Leyte		



Project NOAH's Storm Surge component provided PAGASA storm surge advisory list of municipalities in Samar, Masbate, Cebu and Leyte that could be hit by storm surge days before typhoon Ruby made landfall in Eastern Samar.

Project NOAH's web portal shows the storm surge map of Taranan, Samar that is on the path of typhoon Ruby with areas marked in red color signifying storm surge advisory No.4 as shown in the legend on the lower left corner of the screen.



Official list of localities: Landslide susceptible municipalities for Typhoon Ruby

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This list of landslide susceptible areas is based on the forecasted accumulated rainfall which exceeds 100 mm in 24 hours during Typhoon Ruby.

There is no list for 6 December 2014 since none of the areas with landslide hazard will experience more than 100mm rainfall on that day.

Updates to this list shall be made available as soon as a new severe weather forecast is made.

5 December 2014

REGION 2

Province	Municipality
Isabela	Divilacan
	Maconacon
	San Pablo

REGION 10

Bukidnon	Kitaotao
	Quezon
Misamis Oriental	Alubijid

areas. (Note: complete list can be found on the NOAH website beta. noah.dost.gov.ph)

Project NOAH's landslide component also released a list of areas susceptible to landslides that can be caused by heavy rains brought about by the typhoon. This was released a day before Typhoon Ruby made landfall in Dolores, Eastern Samar on December 6.

The LIDAR-mapping component of the program,

Disaster Risk and Exposure Assessment for Mitigation (DREAM), also worked round-the-clock to monitor water level in the 18 major river basins and released a list of areas susceptible to flooding.

Using its latest technologies and with the expertise of the scientists in this program, DOST is able to offer more than the bulletins issued by its warning agency. DOST now has the tools that provide information needed in forecasting the typhoon track

and giving early warning for other hazards such as storm surge, landslide and flooding.

For typhoon Ruby, DOST's teamwork indeed paid off with zero casualty reports coming from cities, including those that were directly hit by the typhoon.

Governor Carmencita Reyes of Marinduque, where Typhoon Ruby made its second landfall, attributed their success

in achieving zero casualty to PAGASA's early warning.

"Wala kaming casualty. Walang-wala. Ang galing ng PAGASA dahil maaga pa ay nag-warning na sa'min kaya December 4 palang ay nag-meeting na kami para sa kanyang (Ruby) pagdating," said Reyes in an interview on GMA 7's News To Go. (<http://www.gmanetwork.com/news/video/228114/newstogo/marinduque-zero-casualty-matapos-ang-bagyon-ruby>). ●

Official list of localities: Flood susceptible municipalities for Typhoon Ruby

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This list of flood susceptible areas is based on the forecasted accumulated rainfall which exceeds 100 mm in 24 hours during Typhoon Ruby.

Updates to this list shall be made available as soon as a new severe weather forecast is made.

AGUSAN PROVINCE	MUNICIPALITY
AGUSAN DEL NORTE	BUENAVISTA
AGUSAN DEL NORTE	BUTUAN CITY (Capital)
AGUSAN DEL NORTE	CARMEN
AGUSAN DEL NORTE	CITY OF CABADBARAN
AGUSAN DEL NORTE	JABONGA
AGUSAN DEL NORTE	KITCHARAO
AGUSAN DEL NORTE	LAS NIEVES
AGUSAN DEL NORTE	MAGALLANES
AGUSAN DEL NORTE	NASIPIT
AGUSAN DEL NORTE	REMEDIOS T. ROMUALDEZ
AGUSAN DEL NORTE	SANTIAGO



Thousands of Tacloban residents remain homeless after Typhoon Yolanda ravaged Leyte province. (Photo courtesy of www.philstar.com)

YoRInfo Center as data hub for Yolanda rehab

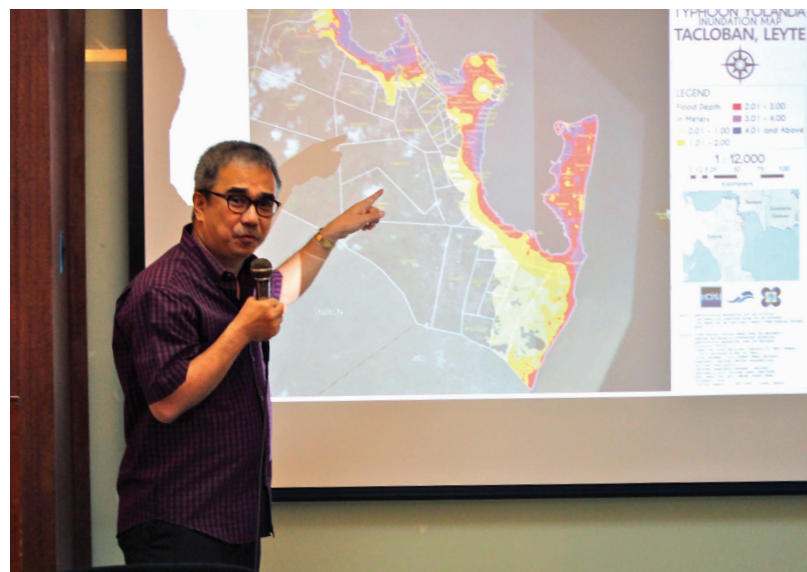
By GABBY MABUTAS
S&T Media Service, *DOST-STII*

The Department of Science and Technology has eased those concerned with the rehabilitation of Yolanda-stricken areas of the burden of going to different government agencies just to secure all scientific information they need in their rehabilitation efforts.

With support from the Department of Environment and Natural Resources, Science Secretary Mario Montejo created the Yolanda Rehabilitation Scientific Information Center (YoRInfo Center) to make it easier for other government agencies,

including local government units, and humanitarian organizations to get scientific data that could help them in their rehabilitating Eastern Visayas and its environs affected by the typhoon.

Since its launch on May 17 this year, the YoRInfo Center has facilitated the release to stakeholders of scientific data, such as LiDAR topographic maps and multi-hazard maps from both the Department of Environment and Natural Resources - Mines and Geosciences Bureau and the DOST, and the latest satellite images of the Yolanda-devastated areas.



DOST Secretary Mario G. Montejo points to a map of Tacloban, Leyte showing inundation during Typhoon Yolanda.

Montejo said the creation of YoRInfo Center is part of the DOST's commitment to make sure that the people are benefitted by its technological and research outputs. The Center was established in partnership with the DENR.

"We continue to process many of the data to produce hazard maps for flood, landslide and storm surges. Just recently, we completed the new multi-hazard map for Tacloban and other areas."

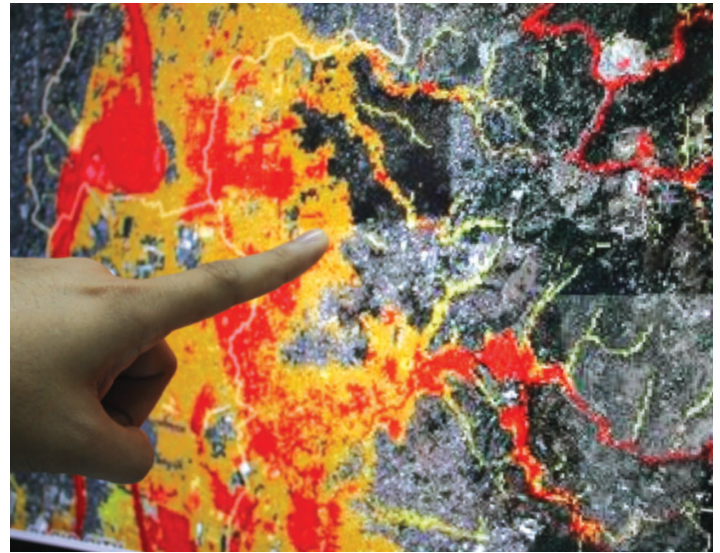
"The DOST and the DENR have been using these information for the Yolanda effort but we have been getting numerous inquiries from many groups for these data that's why we have decided to come up with this center as a one-stop information shop," the DOST chief explained.

Geodetic Engineer Sarah Jane Samalbuero of Project NOAH-DREAM Project, who was tasked to take charge of YoRInfo Center's operation, said they have been able to help a lot of government and private entities in securing hazard maps.

She said that while they have received numerous requests from government agencies and the private sector, only a few have come from local government units.

The YoRInfo Center urges local government units to get copies of their maps so that they may be able to identify the most vulnerable and the safest points in their areas.

These maps, she said, could help in drawing effective strategies



YoRInfo center provides high resolution hazard maps and other related data that can be used in the rehabilitation efforts of the government and other foreign agencies.

for disaster preparedness and resiliency in Eastern Visayas.

The YoRInfo Center is manned by experts from DOST-Project NOAH and DREAM, PAGASA, PHIVOLCS, and the Mines and Geosciences

Bureau of the DENR. It can also be consulted for information, data and any other technical support relative to the scientific datasets it is providing for the on-going rehab of areas devastated by typhoon Yolanda. ●



The wrath of Typhoon Yolanda. (Photo courtesy of www.npr.org)

Technological self-reliance with Project NOAH

By ANNA THERESA P. VALMERO
S&T Media Service, *DOST- STII*

THE DEPARTMENT of Science and Technology (DOST) spearheaded the Nationwide Operational Assessment of Hazards (Project NOAH) to answer the Philippines' need for a responsive and near real-time flood early warning system (EWS).

Over the last decade, typhoons and even monsoons have become stronger and can carry a month's worth of rains as shown by typhoon Ondoy in 2009. Realizing the strong need to adapt to these global changes, the DOST teamed up with experts of the University of the Philippines (UP) to create a system on disaster risk reduction and management that will shift the paradigm from a reactive stance to one of vigilance.

"The DOST is taking the lead in advocating for a science-based approach to disaster preparedness and help national agencies and local government units with better tools and information as we aim to create safer, more resilient communities," said DOST Secretary Mario G. Montejo.

The Secretary also sits as the Vice Chairman for Disaster Preparedness in the country's National Disaster Risk Reduction and Management Council (NDRRMC).

A country at risk

Among 173 countries, the Philippines is No. 3, globally, in two categories – Highest Risk and Most Exposed—to disasters resulting from extreme natural events, according to the World Risk Index updated list.

In its 2012 report, the Asian Development Bank noted that 85.2% of the Philippine economy faces risks and threats from natural disasters.

About half (50.3%) of the country's land area is economically at risk from multiple hazards such as floods, typhoon, and earthquakes, according to ADB's report on *Response to Natural Disasters and Disaster Risks*.



The Nationwide Operational Assessment of Hazards or Project NOAH consolidates and analyzes various weather and hazard data from PAGASA, UP-Disaster Risk and Exposure Assessment for Mitigation (UP-DREAM) and ClimateX for uploading to the Project NOAH website (www.beta.noah.dost.gov.ph) with features like rainfall forecast, satellite imagery and historical flood hazard maps. (Text by Rodolfo P. de Guzman/Photo by Henry de Leon, DOST-STII)

This translates to some 81.3% of the country's population or 76.6 million Filipinos who face economic impacts brought by natural disasters such as typhoons, earthquakes and volcanic eruptions, according to the same report.

Based on the typhoon-related losses from typhoons that visited the country from 2009 to

2013, it was clear that natural disasters could significantly set back the country's national and local development.

Jerry Velasquez, coordinator for the Asia-Pacific region of the United Nations International Strategy for Disaster Reduction (UNISDR), noted that direct costs resulting



Table 1. Philippine GDP annual growth rate and losses from typhoons.

Source: www.tradingeconomics.com | Philippine National Statistical Coordination Board and Trading Economics.com

“Investing in prevention not only increases the resilience of countries to future disaster, but protects economic growth and other development achievements from being lost in a single catastrophic event.”

Helen Clark
United Nations Development
Program

from natural disasters lower annual gross domestic product by 0.8 percent.

An archipelago located along the Pacific typhoon belt, the Philippines has been receiving an average of 20 typhoons each year, with at least one or two causing severe damages in regions. It is also located at the Pacific Ring of Fire, with active volcanoes as well as faults that can cause ground shaking and quakes.

It should be noted that just a few weeks before typhoon Yolanda hit the Visayas region, the same region was hit by a massive quake (magnitude: 7.2) that toppled to the ground even centuries-old churches that are major tourist spots in Bohol and Cebu. This shows the risk profile of the country to both weather-related and geological hazards.

Better approach

According to Helen Clark, United Nations Development Program administrator, a dollar spent in reducing people's vulnerability to disasters saves around seven dollars in economic losses

“Investing in prevention not only increases the resilience of countries to future disaster, but protects economic growth and other development achievements from being lost in a single catastrophic event,” noted Clark.

The country's framework for DRRM identifies four stages: a) disaster prevention and mitigation, b) disaster preparedness, c) disaster response, and d) disaster rehabilitation and recovery.

Under the NDRRMC law, the DOST sits as Vice Chairman for Disaster Prevention and Mitigation, while providing scientific advice on the weather disturbances that the country faces through the state weather bureau, the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA) and geo-hazards covering earthquakes, landslides and volcanic eruptions via the Philippine Institute of Volcanology and Seismology (PHIVOLCS).

LESSONS FROM PROJECT NOAH

A clear lesson from Project NOAH is that an effective early warning system leads to early action that can save lives and reduce damage in communities.

Achieving technological self-reliance in DRRM requires the use of critical technologies, training of local experts, and open collaboration with the international community.

Below are the lessons from the implementation of Project NOAH, according to Executive Director Dr. Mahar Lagmay:

- **Barangay level maps are more useful.** Detailed barangay level hazard maps produced from high resolution topography are more necessary rather than regional maps (i.e., Lidar, IFSAR).
- **Bottom up approach works.** Government provides resources and vital information but it is still the community that needs to initiate disaster mitigation efforts.
- **Local capacity and local resources should be used in disaster mitigations plans.** Filipinos are the ones vulnerable in the country and it is Filipinos that can best help themselves.
- **Practice open data policy.** By openly sharing, local and foreign scientists can work with the data and produce the best product to put in the forefront of battle against disasters. We need the best products to counter the adverse impacts of natural hazards.
- **Make data accessible to the public using all available tools to disseminate information.** It is the right of people to get access to data and information that concerns their safety and well-being.
- **Use the best technology and cutting edge science.** Research and development will not end because hazards will always be there and there will always be new lessons in every disaster. Mistakes should not be repeated and learning should be applied or put into operation immediately.
- **Develop a culture of safety and preparedness.** No amount of technology and science will be effective unless the people embrace them. There must be a paradigm shift from a reactive or passive approach to disaster risk reduction to one of vigilance.
- **Bridge the communication gap.** We need to understand the mindset of the Filipino people in order to effectively communicate. To do this, it is not only physical scientists that need to work on disaster preparedness but also social scientists. Creative ways to engage and encourage the Filipinos is critical.
- **Business and services continuity is imperative.** Resilience to natural hazards is important and we should be able to recover at the soonest possible time (hours if possible) after a calamitous event.
- **The best preparedness effort takes place long before hazards strike.** Preparing for an imminent hazard can save lives but slow development into areas that are safe moves people away from the hazard itself. Hazards will always be present, but disasters will not happen if people are not in harm's way.
- **Everybody must participate in the disaster effort.** Private sector, civil society organizations, religious groups, the academe, and the government must help because our disaster problem is huge. After all, everybody is affected by the impacts of hazards.
- **There is a need to build an army of disaster prevention and preparedness advocates.** Hazards are here to stay and we need to counter the impacts with the best possible minds and as many scientists and advocates as possible.



Staff of the Nationwide Operational Assessment of Hazards or Project NOAH work on hazard maps for flood monitoring using data provided by the UP-Disaster Risk and Exposure Assessment for Mitigation project generated through the light detection and ranging technology or LiDAR. (Text by Rodolfo P. de Guzman/Photo by Henry de Leon, DOST-STII)

Seeing the devastation from a series of typhoons that battered the country year after year since Ondoy in 2009, it was clear that the old way of doing things are not enough, noted DOST Assistant Secretary Raymund E. Liboro.

DOST then took the initiative to bring about a project that resembles a transformational change in the country's approach to DRRM, with a strong focus on installing an effective early warning system while building a culture of preparedness among communities. The seeds for Project NOAH were planted.

After Typhoon Sendong hit Iligan and Cagayan De Oro City in Southern Philippines in 2011, President Benigno Aquino III decided to put in place a responsive program that will address the disaster problems of the Philippines.

DOST was tapped for this particular task: to provide a six-hour lead time to enable communities located in flood-prone and hazard-prone areas to evacuate to safe areas and take measures that will limit loss of lives and damage to property, according to DOST Secretary Mario G. Montejo.

"Project NOAH harnesses the technical expertise and the best science and tools available to create an integrated system that

national agencies, local governments and individuals in communities can use to move from hazard-prone areas to areas of safety in the face of imminent disasters," said Sec. Montejo.

Sec. Montejo, who believes in the power and talent of local innovation to create projects that can benefit Filipinos, envisioned the project to tap local Filipino scientists. The DOST worked closely with the University of the Philippines-Diliman and appointed Dr. Mahar Lagmay to be the project's executive director.

The strength of Project NOAH can be traced to its humble beginnings: one that relies on the work of local scientists with their foreign counterparts, the use of the best combination of technologies and collaboration with international counterparts to share open data and lessons. These three elements are crucial to pave the way for technological self-reliance in the country's flood early warning system.

Technological self-reliance

Technological self-reliance is a strategy that harnesses the power of local ingenuity to come up with solutions for pressing national problems. It has been used by South Korea and Singapore for example to transform into more developed economies. For the first time, the Philippines is doing it as a strategy for implementing its national R&D Plan, explained Sec. Montejo.

Sec. Montejo first tapped local scientists and developers to work on Project NOAH, including the local development of automated or unmanned weather stations and rain gauges that will be deployed across the country to help feed real-time weather information to the project's website.

Local development of these weather sensors helped bring costs down, with sensors developed at only a quarter (26 percent) of costs when development is outsourced. This brings in the second element of technological self-reliance, which taps local resources for development of tools.

Finally, another important factor for the project is open collaboration with international experts to help further exchange of knowledge and lessons. This proved vital after the country got the help of national weather bureaus in the US and UK, among others.

Among its major achievements is the installation of an integrated flood early warning system covering the 18 major river systems of the country. Through the project, some 5,060 barangays in the country now have available multi-hazard maps. These maps are useful to identify areas prone to flooding and assess the safety of the location of evacuation centers and shelters.

Between 2012 and today, the DOST has advocated for the use of science-based scenarios to understand the impact of disasters in communities and guide decision makers. This is also core in the Department's national IEC campaign called *Science for Safer Communities*.

In the Philippines, such IEC efforts on emphasizing effective early warning systems resulted in mitigating losses from **disasters that did not happen** during: Habagat 2012, Habagat 2013 and Typhoon Pablo, according to Dr. Mahar Lagmay.

Mobile and social apps

Open data is a key component of Project NOAH. Near real-time weather information is delivered to the public through the website, social media, and mobile apps or systems (for public and local government units' DRRM offices), according to Dr. Lagmay.

CONTINUED ON PAGE 16

Science chief shows off Project NOAH milestones

5,060 barangay flood hazard maps done, more mobile apps available

By RODOLFO P. DE GUZMAN
S&T Media Service, DOST- STII



DOST Sec. Mario G. Montejo delivers his message for the Project NOAH team and the media on its second anniversary. He emphasized how it has helped the government's effort in disaster preparedness and mitigation through locally developed technology and the expertise of our very own scientists. (Photo by Gerry Palad/Text by Suzette Dalumpines)

PROJECT NOAH or National Operational Assessment of Hazards, with its very useful website, is now working on the portal to allow more features that will enable users to access more data about the weather and other similar occurrences. Undergoing development is the NOAH Version 2.0 which will include, aside from the regular features on satellite images, typhoon tracks, rainfall data, sensors data and flood history, new features on landslide and storm surge maps.

After the onslaught of Typhoon Yolanda in November 2013, the storm surge component of Project NOAH gathered more data to generate more scenarios and models that will be very useful in future events.

"It is the aim of Project NOAH to provide accurate and timely weather information that will allow us a six-hour lead time and rainfall forecast to give the people enough time to evacuate and do the necessary actions to

prevent damage to properties and loss of lives," Secretary Mario G. Montejo said during the 2nd anniversary celebration of Project NOAH at the PAGASA Main Lobby.

On the same occasion, Marikina City Disaster Risk Reduction and Management Office (DRRMO) Head Dr. Val Barcinal gave his testimony on how NOAH was instrumental during the Habagat 2013 episode and succeeding typhoon events in achieving zero casualty in the city.

"The Project NOAH website is one of the information dissemination platforms designed by the government to mitigate and prevent disaster. These benefits were obtained from Project NOAH. Like in the Book of Genesis, it was a saving grace for the City of Marikina," said Dr. Barcinal.

On the other hand, the Disaster Risk and Exposure Assessment for Mitigation or DREAM

project under Project NOAH, has completed the surveying and data gathering for all the 18 major river systems to create flood hazard maps. To date, 5,060 barangays already have flood hazard maps out of the 18,000 barangays covered by the LiDAR data gathering. The flood hazard maps will help barangays pinpoint the specific areas in their locality that are safe and unsafe for evacuation and relocation sites.

The DREAM project, after completing the 18 major river basins including Infanta and Lucena, is now in full speed mode for the next phase called PhilLidar 1. It is targeting the other 285 river systems not covered in the first phase.

PhilLidar 2, which will cover surveying of areas for non-disaster related activities like agriculture, aims to provide comprehensive information that will lead to increased agricultural productivity and other commercial use like urban planning, real estate development, infrastructure, and others.

CONTINUED NEXT PAGE

SCIENCE CHIEF...from p15

A big bonus for Project NOAH comes from one of its components, the Weather Information-Integration for Systems Enhancement or WISE. NOAH WISE, using state-of-the-art technology and sophisticated softwares, is now providing seven-day weather forecasts enhanced by data gathered from PAGASA, with the use of the IBM Blue Gene Computer.

"With the seven-day forecast we are able to provide valuable information to the public that will be very useful in the everyday life of Mang Juan and Aling Maria," said DOST Secretary Mario G. Montejo. "Later when we can do seasonal forecasts, our farmers will be informed of what crops to plant and when is the best time to plant, thereby increasing agricultural productivity."

NOAH WISE will soon come up with seasonal forecast six months in advance. As such, planting schedules can be adjusted to weather conditions so that farmers can

maximize their time and resources and increase crop yield and productivity.

The bottom line is, with this science-based knowledge, farming will again be a very lucrative enterprise and the consequent benefits will trickle down to consumers with more products to choose from at affordable prices.

During Project NOAH's 2nd anniversary celebration, Sec. Montejo also disclosed that Project NOAH was created using local technology and developed by Filipino scientists.

"We are able to harness Filipino talent in Project NOAH particularly in the hydromet sensors that we have installed all over the country. The Advanced Science and Technology Institute of the DOST is the one responsible for the local fabrication of almost 1,000 automated rain gauges, water level sensors and weather stations installed in the 18 major river basins," Montejo said.

TECHNOLOGICAL SELF...from p12

The MOSES tablet was developed by Project NOAH as a two-way communication device with the local government units throughout the country for DRRM efforts. It allows users to send and receive information to and from the disaster risk reduction officers before, during and after disasters. It also has other features like a radio, TV, the Project NOAH mobile applications, and geo-tagging photography capabilities. The last feature can allow for geographic map information gathering of important structures like evacuation centers, hospitals, schools, and other facilities.

This is the Project NOAH mobile application available on the Apple and Google app stores for free. It enables the different satellite data and visualization capabilities on the website to be accessed through a smart phone. The app was developed by Rolly Rolet, the son of a fisherman in the southernmost island of Mindanao. His participation in the project is more than a representation of the less privileged relaying the message that they also have the opportunity to help in the national effort against disasters.

There is also the Flood Patrol mobile application available on the Apple and Google stores for free. It allows users to report a flood in their area at specific dates and times. Through this crowd sourcing tool, validation of the NOAH flood maps can be done during different rain events. Scientist volunteers from Ateneo de Manila University developed the application.

The ARKO mobile application is also available in the Apple and Google stores and downloadable for free. It was created by DOST Project NOAH in collaboration with a private volunteer developer group called Pointwest Technologies. Our disaster problem is huge and no single government agency or group of agencies can handle it alone. At Project NOAH, we encourage volunteers from the private sector, civil society organization, religious groups and even individuals to help in the disaster mitigation efforts of government in any way they can. This application has recently won the award for inclusion and empowerment in the 2014 World Summit Awards for mobile technologies.

Two years down, more to go

As Project NOAH moves forward to developing more features, it also provides more platforms for information to reach more people anytime they want it.

Mobile applications for smart phones in Android and IOS are now working for Project NOAH with information available anytime, anywhere. Aside from the NOAH website, there are the Flood Patrol, Raincheck.ph and ARKO for flood monitoring.

Recently, the ARKO mobile app was recognized as one of the most innovative and responsive mobile apps in the world. It was conferred an award under the Inclusion and Empowerment category of the World Summit Awards Mobile Content 2014 which will be given on February 2015 to coincide with the world conference in Abu Dhabi. ARKO was one of the five winners in that category that bested some 456 entries from 98 countries. ●

Simplifying early warning is also key in Project NOAH. For example, it tapped one of its Disaster Information Ambassadors, boxing champ Manny Pacquiao, and used his height to become a reference for showing flood depth in hazard maps so that Filipinos can relate to the colored flood depth warnings on the maps.

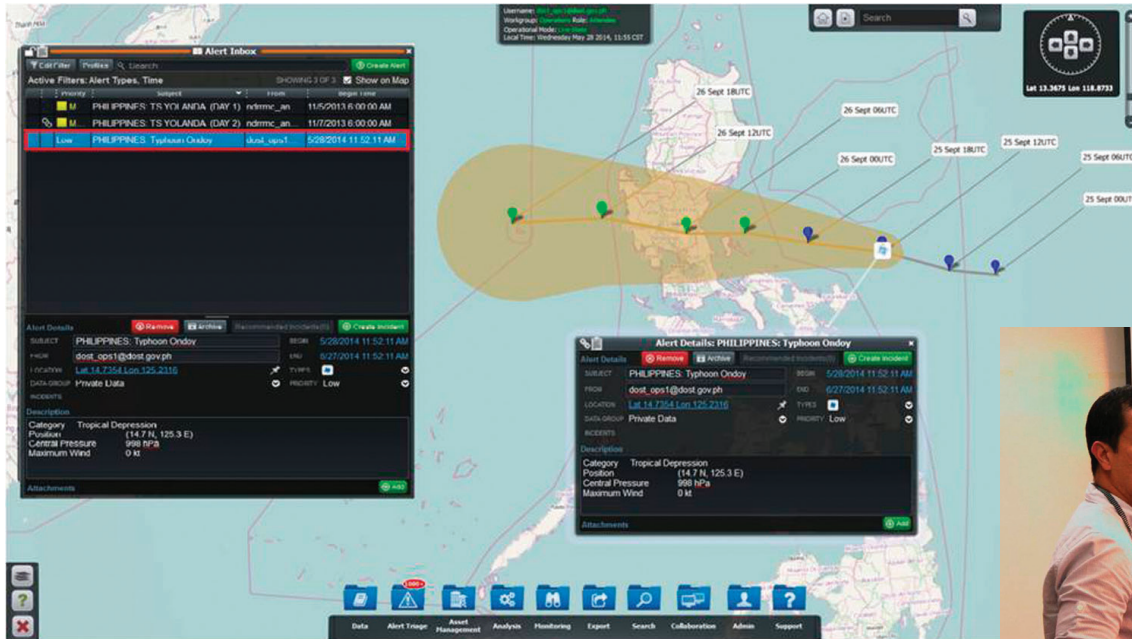
"Beyond the project's implementation, I believe that Project NOAH proved to the world the mettle of the Philippines and our local scientists to successfully adopt advanced technologies such as LiDAR (light detection and ranging) for the creation of high resolution maps, a big leap from the existing base maps in the country, most of which are at least 50 years old with a resolution of 1:10,000," noted Sec. Montejo.

Montejo added: "Our experience in Project NOAH opened up opportunities for international collaboration with scientists and global institutions. And we want to leverage on the momentum generated by this project to further push our work on this area, and see its potential applications in related areas such as climate-smart agriculture, traffic management and health, among others." ●

Intelligent Operations Center with Blue Gene Computer

Your one-stop weather info shop

By SUZETTE J. DALUMPINES
S&T Media Service, DOST-STII



The above diagram shows the expected output of the Intelligent Operations Center (IOC), a one-stop-shop for weather information as presented by Dr. Carlos Primo David during the last leg of **"Iba na ang Panahon: Science for Safer Communities"** on May 29, 2014 at the Philippine International Convention Center. (Text by Rodolfo P. de Guzman/Photo by DOST-STII)

ALL THE local weather information you want, you may find in this one-stop shop currently being set-up by the Department of Science and Technology (DOST) with the help of computer giant International Business Machines Corporation (IBM).

Called the Intelligent Operations Center or IOC, the one-stop shop aims to consolidate information from PAGASA as well as the different components of the Nationwide Operational Assessment of Hazards (Project NOAH).

Formally unveiled during the last leg of DOST's nationwide information campaign dubbed as **"Iba na ang Panahon: Science for Safer Communities"** at the Philippine International Convention Center in May 2014, IOC will also provide analysis of a disaster's possible impact.

In particular, IOC will provide emergency managers with critical information such as advance warning for extreme weather events, feedback from first responders on the

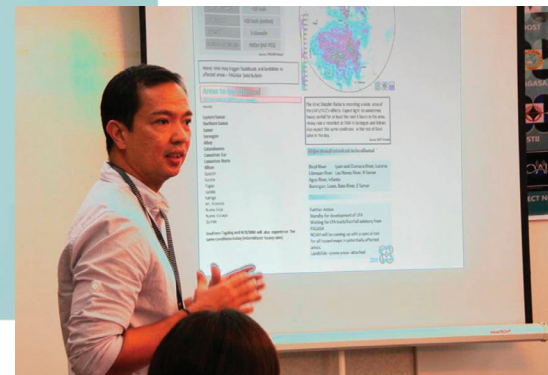
number of casualties and affected families, and conditions of buildings and infrastructures among others.

"All of these [consolidated information] will be forwarded to DOST and NDRRMC (National Disaster and Risk Reduction Management Council)," said Dr. Carlos Primo David, IOC's project leader.

IOC also comes with an Integrated Communications Center to facilitate better and more coordinated disaster management efforts with the DOST and across various government agencies.

Currently stationed at DOST's Information and Communications Technology Office (ICT Office) in Diliman, Quezon City, IOC is being manned by ICT Office engineers and developers from the University of the Philippines.

IBM provided the equipment and training of IOC personnel while some of the tech giant's staff were also temporarily assigned to help the center until it becomes fully operational in 2015.



Dr. Carlos Primo David of the University of the Philippines National Institute of Geological Sciences (UP-NIGS) and founder of ClimateX explains to media practitioners during one of the press briefings how the Nationwide Operational Assessment of Hazards or Project NOAH collects and analyzes data for generating rainfall forecasts. (Text by Rodolfo P. de Guzman/Photo by DOST-STII AV Unit)

"IOC will run 24/7 once it gets fully operational by 2015," said Dr. David.

Since IOC is an IBM proprietary system albeit being turned over to DOST, Dr. David said they are developing in-house and web-based software tools as it will be the Department's command center in times of extreme weather events.

The overwhelming impact of Typhoon Haiyan (Yolanda) when it hit the country in November 2013 was what pushed IBM to develop the IOC.

"Given as a response to Typhoon Yolanda, IBM is honored to be an enabler in building a Smarter Philippines," said IBM in a statement. ●

How to go about the website



www.dost.noah.gov.ph

TEXT BY ALAN C. TAULE & GABBY S. MABUTAS
ARTWORKS BY CHARMAGNE FIDELINO

PROJECT NOAH WEBS

 **PAGASA button**
goes to the PAGASA website

 **DOST button**
goes to the DOST website

 **NOAH button**
goes to the homepage

 **Take Map Screenshot**

 **Toggle Draw**

 **Get Distance**

 **Get Area**

 **Weather**

 **Flood**

 **Sensors**

 **Landslide**

 **Storm Surge**

 **WebSAFE**

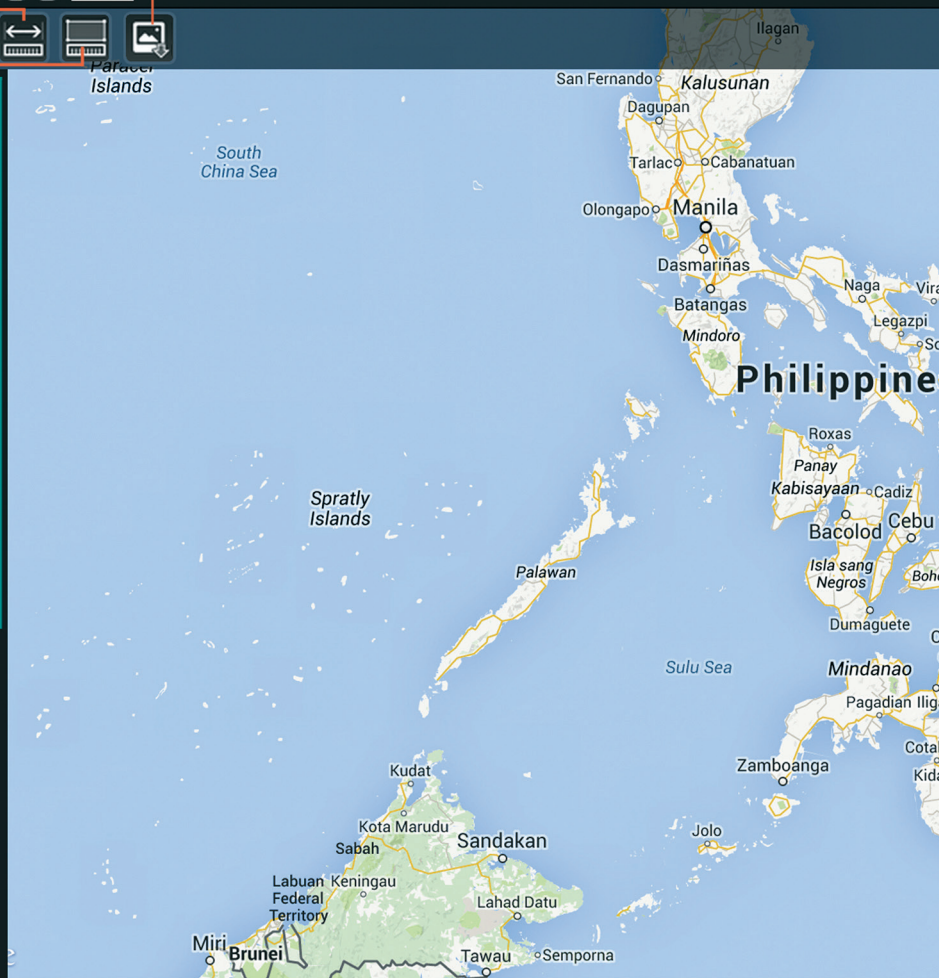
 **MOSES**

NAVIGATION

INFORMATION

Rainfall Data as of 09/24/14 10:35 AM:

DOST - Nationwide Operational Assessment of Hazards



SITE WALKTHROUGH

Share **SHARE** button
shares the Project Noah facebook
page on your timeline

Like **LIKE** button
likes the Project Noah
facebook page

Home button
goes to the homepage

About button
goes to the About page

Blog button
goes to the NOAH blog

Sign In button
opens a log in page

Zoom Tab
controls the view of the map
from long shot to close up
+ -
Zoom Out Slider Zoom In

Maps Drop Down
choose which map to use

Search Bar
type a location to search for it

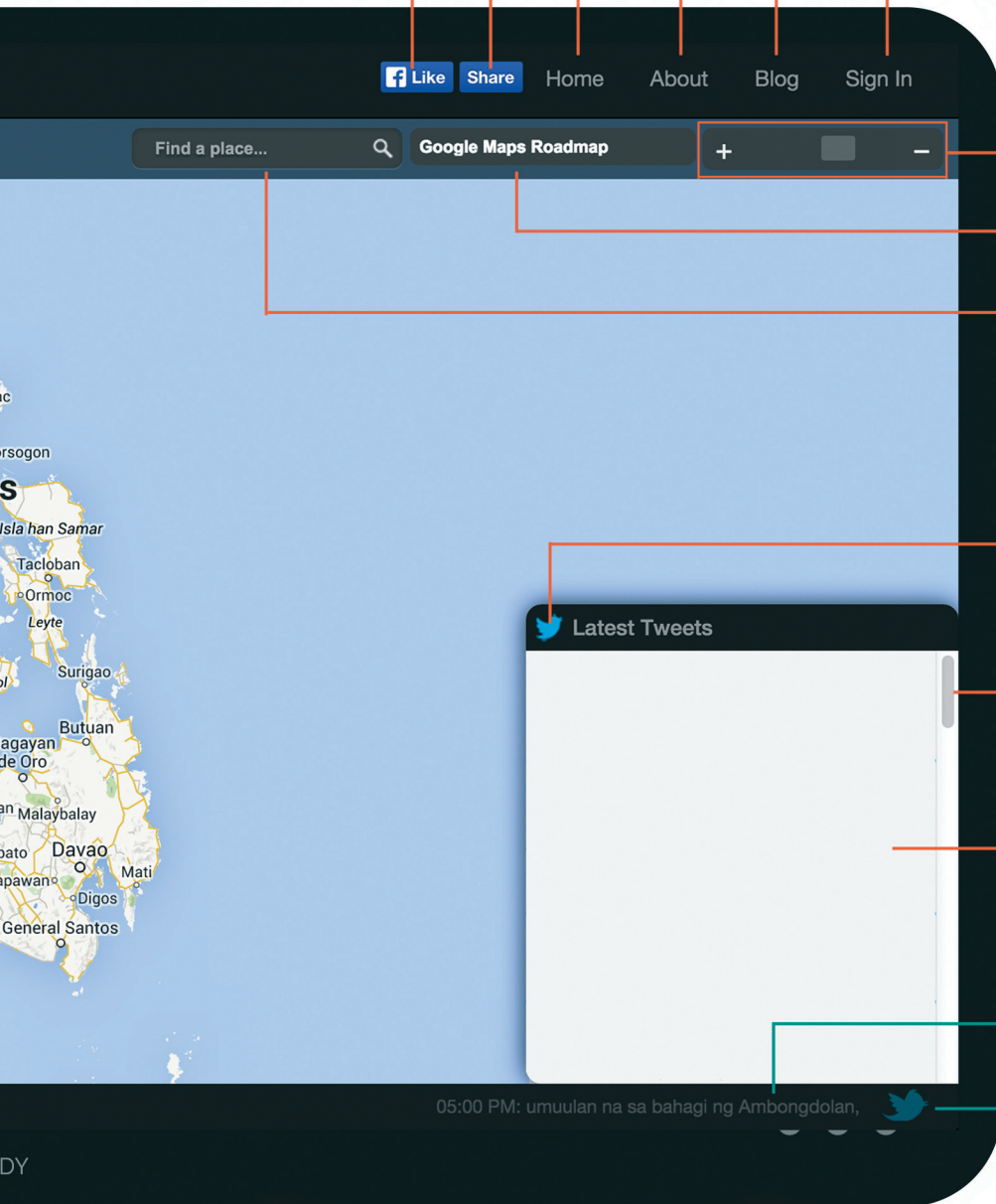
 **Twitter Icon**
minimizes the twitter feed

Slider
scrolls the frame up or down

Twitter Feed
real time twitter feed from PAGASA
& Climate X's accounts

Twitter Feed
will show here when minimized

 **Twitter Icon**
maximizes the twitter feed
will show here when minimized



Suzette

Solidum

WEATHER

Temperature, Pressure, Humidity & Rainfall Contours



Click the WEATHER ICON to show the Weather Drop Down Menu.



Contour

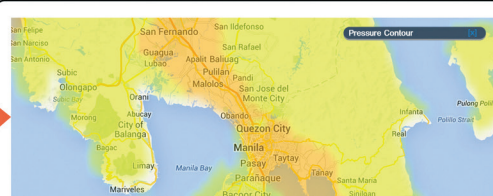
Click Contour to show the Contour Drop Down Menu.

Temperature Contour Pressure Contour Humidity Contour

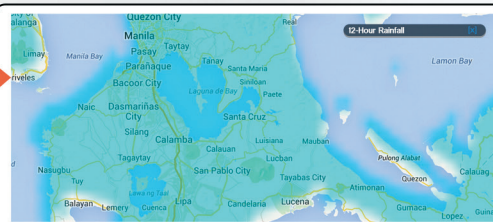
Temperature, Pressure and Humidity are used to check additional weather parameters.

Rainfall Contour 3-Hour Rainfall 6-Hour Rainfall 12-Hour Rainfall 24-Hour Rainfall

Rainfall Contours give the latest rainfall accumulation in any area using the rainfall color scale as guide. Make sure you get the latest information by checking the time stamp, which is updated every 15 minutes. It displays 3, 6, 12 and 24 hour rainfall readings.



The Pressure Contour map can be used along with the typhoon track of PAGASA to validate if the storm or typhoon is going to pass through the region where atmospheric pressure is lowest. There is normally a drop in the atmospheric pressure before a storm arrives.



Track Incoming Typhoons or Weather Disturbances

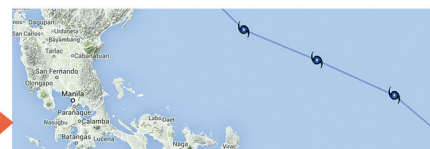


Click the Weather Icon to show the Weather Drop Down Menu.

Weather Outlook

PAGASA Cyclone Update

Click Weather Outlook. Click PAGASA Cyclone Update.



PAGASA Cyclone Update shows the cyclone track across the Philippine Area of Responsibility (PAR).



represents the actual track of the typhoon

NONET

HERDIE

Cloud Formations

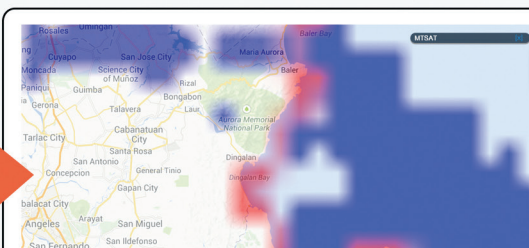


Satellite

Click the Weather Icon.
Click Satellite

MTSAT
Processed MTSAT
MTSAT VIS

Click the satellite of your choice. The MTSAT shows the temperature of the cloud formations. The Processed MTSAT shows white clouds that can bring rain.



During instances when there are cyclones within the Philippine Area of Responsibility (PAR), clouds are often seen swirling around the eye of the typhoon or storm.

4-Hour Rainfall & 4-Day Weather Forecast



Click the Weather Icon to show the Weather Drop Down Menu.

4-Hour Rainfall Forecast

Click 4-Hour Rainfall Forecast. Click on any of the icons on the map to show the rain forecast for that location in the next four (4) hours.

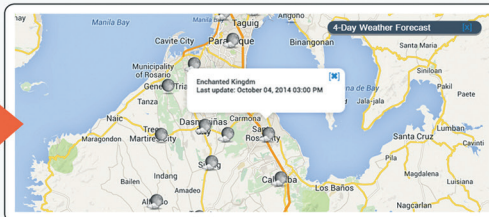


Weather Outlook

Click Weather Outlook.

4-Day Weather Forecast

Click 4-Day Weather Forecast. Click on any of the icons on the map to show the rain forecast for that location in the next four (4) days.



WEATHER

Processed MTSAT

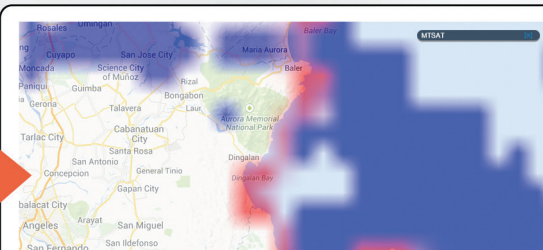


Satellite

Click the Weather Icon.
Click Satellite

MTSAT Processed MTSAT MTSAT VIS

Click the satellite of your choice. The MTSAT shows the temperature of the cloud formations. The Processed MTSAT shows white clouds that can bring rain.



During instances when there are cyclones within the Philippine Area of Responsibility (PAR), clouds are often seen swirling around the eye of the typhoon or storm.

4-Hour Rainfall & 4-Day Weather Forecast



Click the Weather Icon to show the Weather Drop Down Menu.

4-Hour Rainfall Forecast

Click 4-Hour Rainfall Forecast. Click on any of the icons on the map to show the rain forecast for that location in the next four (4) hours.

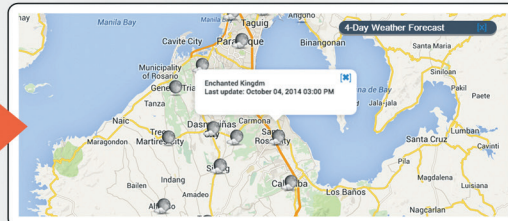


Weather Outlook

Click Weather Outlook.

4-Day Weather Forecast

Click 4-Day Weather Forecast. Click on any of the icons on the map to show the rain forecast for that location in the next four (4) days.



FLOOD

Know worst flooding incidents, flood levels and safest area



Click the Flood Icon to show the Flood Drop Down Menu.

Flood Hazards

Click on Flood Hazards.

-- Region --

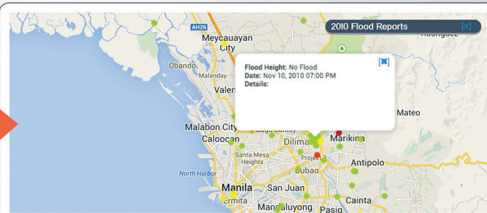
-- District --

-- Municipal --

-- Return Rate --

Flood Reports

Click on Flood Reports to show Flood Reports Drop Down Menu. Choose from 2009 to 2014 to show Flood Reports for specific year.



SENSORS

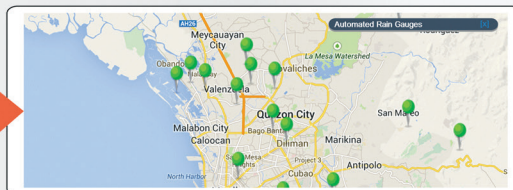
Index-Sensors



Click the Sensors Icon to show the Sensors Drop Down Menu.

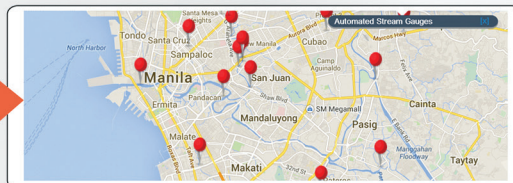
Rain Gauges

Rain Gauges
blue push pins



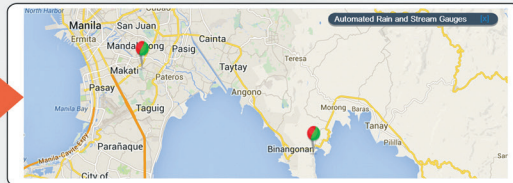
Stream Gauges

Stream Gauges
red push pins



Rain and Stream Gauges

Rain and Stream Gauges
red and green push pins



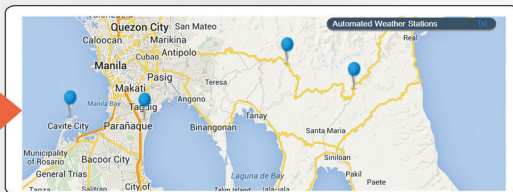
Index-Sensors



Click the Sensors Icon to show the Sensors Drop Down Menu.

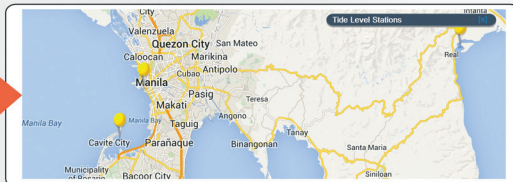
Weather Stations

Weather Stations
blue push pins



Tide Levels

Tide Levels
yellow push pins



LANDSLIDE

Index-Landslide



Click the Landslide Icon to show the Landslide Drop Down Menu.

Unstable Slopes
Landslide Hazards
Debris Flow Hazard Maps
Alluvial Fans
Landslide Inventory

Click the desired feature.

-- Region --

-- Province --

-- Municipal --

STORM SURGE

Index-Storm Surge



Click the Storm Surge Icon to show the Storm Surge Drop Down Menu.

Historical Inundation Maps
Historical Simulations
Observation Point Forecast
Probability of Exceedance
Regional Forecast
Storm Surge Advisory

Click the desired feature.

Historical Inundation Maps
Historical Simulations
Observation Point Forecast
Probability of Exceedance
Regional Forecast
Storm Surge Advisory

Sa bibliya, si Noah ang bumuo ng arkong nagsilbing kanlungan laban sa sakuna. Ang Project NOAH naman po ang tugon ng ating panahon sa delubyong dulot ng pangamba at kapahamakan, at siyang magtitimon sa mga Pilipino sa direksyon ng kahandaan at kapanatagan. Ito po ang magsasagwan sa atin tungo sa kaligtasan.

(In the Bible, Noah made the ark that served as refuge against the deluge. In the same manner, Project NOAH is our modern-day response to the deluge of fear and danger. It will serve as guide to Filipinos towards the direction of preparedness and security. It will propel us towards safety.)

MOSES

Tablets for life-saving information

By RODOLFO P. DE GUZMAN
S&T Media Service, DOST-STII



The Mobile Operational System for Emergency Services or MOSES is a Filipino innovation of the popular electronic device called tablet that is used to access weather and hazard information using the 3G platform and internet. It is equipped with camera, radio and television that come in handy in monitoring news and documenting calamity events like floods. The Project NOAH website can be accessed using the MOSES tablet for tracking typhoon movement, monitoring amount of rainfall and water level in rivers and flood hazard maps. Other applications like ARKO and Flood Patrol can also be used. (Text by Rodolfo P. de Guzman/Photo by Henry de Leon, DOST-STII)

WHEN MOSES, a biblical character of the Old Testament, cast his staff, the Red Sea parted and the Israelites were able to flee Egypt. The shackles of bondage were broken. Freedom from oppression was the reward and a better life awaited the people of God in the Promised Land.

That momentous event, real or imagined, happened thousands of years ago and now in this age of digital computing, another Moses emerged as an instrument of safety for people who are exposed to natural hazards like flood.

MOSES in current time is an acronym for Mobile Operational System for Emergency Services, a handy electronic device that can be used to access information instantly in real time.

Technology for safer communities

Because unpredictable natural hazards can pose imminent danger in a matter of hours, the Department of Science and Technology (DOST) together with the Nationwide Operational Assessment of Hazards (Project NOAH) developed MOSES. The device comes in a tablet form, a take off from the biblical Moses who carried a tablet of stone.

MOSES was born out of the necessity to make readily available basic weather information, including flood events, to the public where they need it, when they need it. MOSES is now the modern-day bearer of important information to ensure the safety of communities during typhoons and other calamities.

"Information can help save lives and with the introduction of the MOSES tablets, we hope to streamline a two-way communication between warning agencies and local responders, thus enhancing the disaster preparedness in communities," said Dr. Alfredo Francisco Mahar Lagmay, executive director of Project NOAH.

Local MOSES

The 8-inch tablet is designed and assembled locally so that the chipset and circuit boards are readily available when replacement is needed. It carries with it a dual-SIM function; has a television and radio component and is packaged in a rugged shell for extra protection. Likewise, it is equipped with long-life battery set that can last up to three days without charging.

The tablet works on a platform where two-way communication is possible. Thus local government units (LGUs) can receive warning advisories from PAGASA during typhoons, and, if they are affected by floods, they can send photos and data to a central command center. This procedure enables government agencies to respond faster.

Photos documenting floods, fire, landslides and other hazards can be uploaded using 3G or WiFi technology.

Mobile lifeline

With the use of MOSES, disaster risk reduction and response have now been upgraded to the next level. Gone are the days when communities are caught unaware of impending flood because there is limited means of transmitting information from warning agencies. This was especially true during power outages when radio and television, often the main source of information and news, no longer function.

With the use of this tablet, LGUs and disaster risk reduction managers can monitor water levels in rivers during heavy rains brought by typhoons and southwest monsoon. The installed rain gauges, water level monitoring stations and automated weather stations can collect data every 15 minutes. These information are then processed and analyzed to give out accurate readings that are uploaded to the NOAH website that communities access through the MOSES tablet.

Likewise, MOSES can be used to take photos of actual events like flooded communities, possible evacuation areas, and emergency access routes to keep the residents, particularly those living in low lying areas, safe and protected. These photos are sent to the central command center so that appropriate government agencies can provide the needed assistance like rescue and relief operations.

Through the use of MOSES, first responders can get up-to-date information on weather hazards and gain access to hazard



The Mobile Operating System for Emergency Services or MOSES tablet is a handy electronic tool for monitoring weather and hazards using the internet. Some 20 MOSES kits have been distributed to barangays in Marikina City as pilot area for testing. This device is equipped to receive information from the message board during typhoons and other calamities like flood as well as access information from the Project NOAH website. (Text by Rodolfo P. de Guzman/Photo by Henry de Leon, DOST-STII)

maps. In fact, mobile apps like the “Arko” and “Flood Patrol” provide historical flood data in selected areas like in Metro Manila to determine the extent of flood occurrences, providing vital information in conducting evacuation operations.

Reality of zero casualty

Marikina City is one of the LGUs that received some 20 units of the MOSES tablet. The city bounced back prepared and ready when Habagat caused the Marikina River to swell again due to dumping of about 68 feet of floodwater in August 2012.

Aside from having a disaster management plan, Marikina City made use of MOSES to get real time information about the typhoon track and the amount of rainfall during the time when heavy rains were pouring nonstop. This gave them the lead time to prepare the residents for evacuation to safer grounds and provide for appropriate provisions for food, clothing, and other essentials.

During the turnover ceremonies for the 20 units of MOSES tablet last June 9, 2014 at the Marikina City Freedom Park, DILG -NCR Director Renato Brion emphasized the importance of communication and the crucial

role of local government officials in times of natural calamities.

“The key here is the active involvement of local leaders by tapping them to provide accurate visual information of what is happening in the barangay in the event of the disaster and most importantly, what are the preparations currently being undertaken so we can identify gaps and remedy it ahead of the disaster,” Brion disclosed.

The visual information mentioned by Director Brion is what MOSES is all about; providing LGUs the tools to get weather advisories, document actual situations from the ground and enable them to relay important messages for assistance in terms of rescue, relief and evacuation operations.

As any other technology, MOSES is continuously undergoing field testing to ensure that the targeted 42,028 barangays all over the country will get the full benefit of this digital tool for disaster preparedness.

Though the name MOSES may sound archaic, this tablet indeed carries a lot of promise for all of us who could be affected by the ever changing weather patterns now and in the near future. ●

SAIL ON TO SAFETY

Project NOAH delivers its promise

By SUZETTE J. DALUMPINES
S&T Media Service, DOST-STII



Project NOAH, with its partner warning agency, the DOST-Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), have been at the forefront of providing information in times of extreme weather events in the country.

A responsive program for disaster prevention and mitigation, Project NOAH provides six-hour lead time warning to vulnerable communities against impending floods. It also uses advanced technology to enhance current geo-hazard vulnerability maps and provide rainfall forecasts, typhoon tracks, and flooding scenarios.

Project NOAH has dramatically changed how the public, especially the local government units, deals with weather disturbances.

“Ngayon po, hindi na palad ang panukat sa lakas ng ulan. Tiyak ang datos na makakalap natin sa ating rain gauges (Today, we no longer have to measure the amount of rainfall with our palms. We now have accurate data from our rain gauges.),” Pres. Aquino assured the public of the reliability of information that will come from Project NOAH.

“Hindi na po tuhod, baywang, at ulo ang panukat natin sa lebel ng tubig-ulan; eksaktong sukat na ang hatid sa atin ng water level sensors” (We no longer have to measure flood using the knee, waist or head-- the water level sensors will give us the exact measurement.), he went on.

“Hindi na rin po padadaanin sa hula ang lagay ng panahon at kung saan babagsak ang ulan; real time na datos at impormasyon na rin ang hatid sa atin ng Doppler radars.” (We will no longer have to guess weather conditions and where it will rain because we now have real-time data and information from our Doppler radars.)

Living up to its mandate, Project NOAH has changed and saved a number of lives – only two years since its birth.

SAVING GRACE FOR MARIKINA

Marikina City has witnessed how this program turned its promises to realities.

The city was one of the hardest hit areas when Tropical Storm Ondoy (international name: Ketsana) submerged



**Nationwide Operational
Assessment of Hazards**



source: asianjournal.com

“Project NOAH would serve as the Philippines’ ark against deluge. We would put an end to the ordeal that people have been accustomed to in rainy weather. Hindi na puwede ang ‘bahala na,’ sawa na tayo sa kaba.”

- **President Benigno Aquino III** during the launch of the Nationwide Operational Assessment of Hazards or Project NOAH on July 6, 2012 in Brgy. Balubad, Concepcion Uno, Marikina City.

almost the entire Metro Manila and its neighboring provinces. Of the hundreds of casualties of TS Ondoy, 70 were from Marikina, according to news reports.

“You are all aware Marikina City serves as a catch basin of rainwater coming from San Mateo and Montalban, Rizal and the cities of Antipolo and Quezon. During typhoons and heavy monsoon rains, Marikina river overflows, affecting 10,000 residents,” Dr. Val Barcinal, head of the city’s disaster and risk reduction management office (CDRRMO) explained.

Barcinal thanked the program for its invaluable contribution to Marikina’s battle against calamities, especially typhoons and weather disturbances.

“Project NOAH was a saving grace for the city of Marikina,” he said.

When *habagat* (outhwest monsoon) inundated most parts of Metro Manila in August 2012, just a month after Project NOAH’s launch, Marikina recorded zero casualties.

The city government attributes its improved disaster preparedness efforts to Project NOAH and PAGASA. Barcinal said that aside from the regular bulletins and updates from PAGASA, Project NOAH is their “most vital operational tool in monitoring the track of a typhoon.”

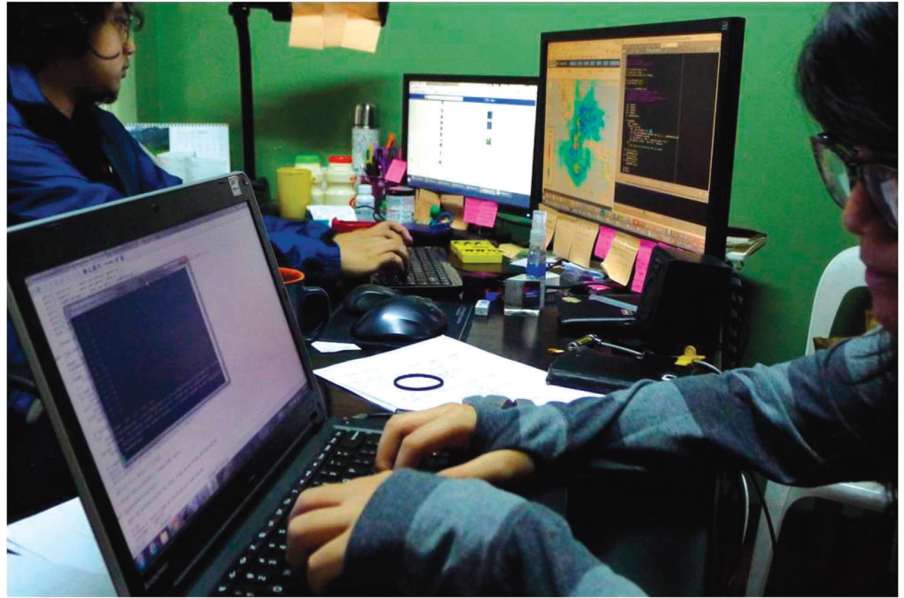
“The website contains detailed weather and disaster information that, when used properly, can avoid loss of lives and damages to properties due to the impacts of natural hazards,” he said.

“Project NOAH is our reliable partner to make Marikina City a disaster-resilient city,” Barcinal added.

Last June, Marikina was also the pilot testing area for the Mobile Operational System for Emergency Services (MOSES) tablet, an 8-inch Internet-based, two-way communication tool between warning agencies and disaster responders – another innovation from Project NOAH. Each of Marikina’s 16 barangays received one MOSES tablet, while the CDRRMO received two units.

ZERO CASUALTY IN CAGAYAN DE ORO

Like Marikina City during the onslaught of TS Ondoy, Cagayan de Oro City in Mindanao also made the news when Tropical Storm Sendong (international name: Washi) washed out hundreds of homes in December 2011 and left more than a thousand people dead and hundreds missing.



source: asiacms.blogspot.com



www.cesarapolinario.com



For people who rarely experience typhoons, it was indeed a nightmare for residents of CDO and other neighboring cities when TS Sendong – the world’s strongest tropical cyclone for that year – robbed them of their homes, their loved ones, and their lives, in just one night.

A year later, Typhoon Pablo (international name: Bopha) with gustiness reaching 314kph – the strongest typhoon to hit Mindanao – also battered the city and its neighboring provinces in the region.

But it was a different story for CDO – a way better tale that they are very proud to share.

“Can you imagine? A thousand casualties in the previous year and then zero, with adequate warning, zero ‘tong Pablo,” Engineer Elpidio Paras of CDO said.

Paras explained that with the information from PAGASA and Project NOAH, they were able to evacuate their residents on time and was able to avoid a repeat of what happened the previous year.

“Just before 1pm, nakatanggap na po kami ng impormasyon, dahil yung sensors ng Project NOAH ay nailagay sa Bubunawan River, a major tributary. Automatic, nagpadala via SMS ng warning ng level ng water. Seven meters ang expected na pagtaas ng tubig. By 2:30 pm, since we have at least two hours early warning, nailikas na po lahat ng tao (Just before 1pm, we already received information because Project NOAH’s sensors were already installed in Bubunawan River, a major tributary. An SMS warning on water level was automatically sent to us. The expected water level was seven meters. By 2:30PM, since we have at least two hours early warning, all people have been evacuated.),” he said.

He added that the experience proved that with sufficient information and early warning, it is possible to prevent disasters from happening, or at least to minimize the impact of the hazards.

“In behalf of the people of Cagayan de Oro, I’d like to thank DOST-PAGASA and Project

NOAH for providing us that early warning because what happened during Sendong was not replicated,” Paras said.

DELIVERING ITS PROMISE

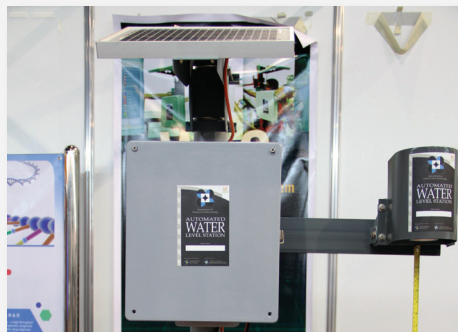
These testimonies from CDO and Marikina cities only proved that Project NOAH delivered its promise – timely and accurate weather information that is most critical in times of calamities.

A saving grace, a reliable partner, an efficient tool – Project NOAH proved to be all these. Two years of making science and technology work for its people. Two years of saving lives through science and technology – just what the President promised during Project NOAH’s launch.

“In the Bible, Noah created the ark that served as shelter in the midst of disaster. Today, Project NOAH is our refuge from the deluge caused by worry and danger, and will lead this country to the path of preparedness. Project NOAH will lead us to our safety.”

With this work interface, disasters can be managed to a certain degree to lessen its negative impact.

Photos: ARGs, AWLMS, AWS



Of weather sensors and partnerships for safer PH

By RODOLFO DE GUZMAN
S&T Media Service, DOST-STII

With the abundance of highly capable scientists and engineers in the country, it is not surprising to know that we now have almost 1,000 weather sensors installed all over the country particularly concentrated near the 18 major river systems in the Philippines.

These sensors are locally produced and designed by experts from the Advanced Science and Technology Institute (ASTI), a research and development institution of the Department of Science and Technology (DOST). The institute designed, fabricated, and installed these sensors, namely automated water-level monitoring stations (AWLMS), automated rain gauges (ARG), and automated weather stations (AWS).

DOST- ASTI's initiatives on sensors is just part of its many projects that support DOST's program on disaster preparedness and risk reduction. ASTI has thus become a vital cog in the efforts of DOST to promote disaster awareness and preparedness among the most vulnerable communities not only in Metro Manila but in the provinces as well.

Moreover, the projects showcased the ingenuity and world-class caliber of Filipino scientists and engineers who form the backbone of ASTI.

Local talent, global excellence

ASTI, in developing these ingenious devices for weather monitoring, helps empower local government units and high-risk communities by providing them with low-cost, high standard weather equipment that can be used to monitor natural hazards and help prevent disasters from happening.

For several years now, ASTI-based experts have been conducting intensive research to produce weather equipment.

From the design phase to its completion, the ASTI team conducts field testing to ensure that the equipment are working well and are of the highest standard because the safety of the people is at stake.

ASTI-produced weather equipment are used in tandem with the Philippine Atmospheric, Geophysical and Astronomical Services Administration or PAGASA. The equipment, installed in rivers and streams, monitor the amount of rainfall and water levels during typhoons and heavy rain events like the southwest monsoon (*habagat*). In a nutshell the sensors serve as early warning devices to alert local officials and communities of possible flood.

Filipino-made products at par with global standards

Along with the weather sensors, ASTI experts also developed the Agromet, a monitoring station geared with multi-parameter weather sensors. The Agromet station can simultaneously monitor wind speed and direction, air temperature, air humidity, air pressure, rain amount (plus duration and intensity), soil moisture and temperature, solar radiation and sunshine duration.

Each Agromet station is equipped with the ASTI-developed data logger platform, the GSM Data Acquisition Terminal (GDAT) that works like a mini-computer and controls all the functions and data communications of the station.

Meanwhile, the AWLMS uses ultrasonic sensors to determine and measure the rate of water level change, particularly in streams and rivers. The brain that controls the AWLMS is the same as that with the Agromet.

Ruggedly designed to withstand the harshest conditions in remote areas, the AWLMS can also operate continuously using solar power and a back-up internal rechargeable battery. It is equipped with the ASTI-developed data-logger platform GDAT, acting as a mini computer that controls all the functions and data communication of the station.

As of the second half of the year, ASTI was able to deliver 267 AWLMS, with 236 of these installed all over the country.

The Automated Rain Gauge or ARG gathers and records the amount of rainfall over a set period of time. The rainfall data is then relayed



DOST CARAGA has already installed 28 automated water level sensors or AWLS (in photo) in strategic areas near the Agusan River Basin. (Text by Rodolfo P. de Guzman/Photo courtesy of caraga.dost.gov.ph)



An AWLS installed in a river basin in Davao.

Services Office. Two METBUOYS were deployed during the first half of the year: one in Matnog, Sorsogon and the other one in Aborlan, Palawan.

The NOAH-PAGASA-ASTI interface

With locally produced equipment now at the disposal of DOST, disaster preparedness has been elevated a notch higher. This partnership among Project NOAH, ASTI and PAGASA shows that the interface of technology and scientific expertise can be harnessed to address a more impending need – disaster preparedness.

With the use of weather equipment, the amount of rainfall and water levels in rivers and streams can be extensively monitored, thereby providing early warning especially to communities vulnerable to flooding. In the end, the appropriate action will spell the difference between surviving a storm surge and being swallowed by giant waves.

The sensor readings that produce data are recorded and processed by ASTI and then uploaded to the Project NOAH website. These sensors can be accessed thru the Sensors tab of the Index menu. Other data for stream gauges and tide levels are also embedded in the menu.

The sensors, most of which are installed in Regions 6, 8 and 11, and CAR, churn out real time data every 15 minutes. However, there are instances when data is not received by the server at ASTI due to technical problems in text messaging or cut transmission due to pilferage of the cables and equipment itself.

PAGASA, on the other hand, maintains a number of weather stations and instruments and the data generated from them are also uploaded to the Project NOAH website, now a portal for weather and hazard information for disaster preparedness.

Yet, what is important is the fact that national government agencies are working closely together to address the common problems posed by natural hazards. With this work interface, disasters can be managed to a certain degree to lessen its negative impact; thereby ensuring that more communities-at-risk become safe and protected. ●

wirelessly through cellular network and then collected on a central database server for analysis.

The processed data are available in the Project NOAH website and can be easily accessed over the Internet in real time. As of the first semester of 2014, ASTI has delivered 502 ARGs, with 454 of these already installed across the country.

The AWS, on the other hand, is a monitoring station equipped with different sensors capable of measuring the following weather parameters, such as: Wind speed and direction, Air temperature and humidity, Air pressure, Rain amount, Rain duration, Rain intensity.

In some instances, the AWLMS are installed in tandem with the ARG--129 units of these combo have been delivered, and 117 of them were already installed as of June 2014.

Moreover, ASTI has also developed the Meteorological Buoy. Called METBUOY for short, the equipment is capable of monitoring real-time weather disturbances at sea. METBUOY gathers data to be used in providing accurate and timely information to sea vessels to enable them to respond to different weather conditions.

The METBUOY is equipped with different sensors that measure the wind, relative humidity, air temperature, barometric pressure, rainfall, wave height and direction, and sea temperature.

METBUOY was developed by DOST-ASTI in collaboration with PAGASA and DOST's Metals Industry Research and Development Center (MIRDC) and the Project Management and Engineering Design

When Typhoon Yolanda (Haiyan) hit most of the Visayas last November 8, 2013 it left a great devastation, including the ravage of schools, libraries, and other institutions. But just like the phoenix rising from the rubble, libraries in the Yolanda corridor are being rebuilt not just for students but for everyone who thirsts for knowledge. This is the story as penned by Framelia V. Anonas sourced from DOST offices in the regions that suffered most from Yolanda.

Build Back Libraries for folks in the Yolanda corridor



Asst. Secretary Raymund E. Liboro relates to the media how the “Build Back Libraries for Typhoon Yolanda-Stricken Areas” campaign was borne out of the great desire to help typhoon victims in the Yolanda corridor build back their washed-out libraries. Conceptualized by the DOST-STII, the campaign solicits books and other library materials from concerned donors here and abroad for identified public schools in Regions IV-B, VI, VII, and VIII. Donors can also donate STARBOOKS computer and pod to enable school children to access S&T information even without Internet. (S&T Media Service)

Desolate. That is the first word that comes to the mind of anyone who saw what happened to affected areas at the heels of Yolanda. The miserable condition of Yolanda-struck school libraries raised the concern of the Department of Science and Technology – Science and Technology Information Institute (DOST-STII) which handles the country’s prime S&T library.

Led by Assistant Secretary Raymund E. Liboro, concurrent DOST-STII officer-in-charge, the Institute came up with a campaign called “Building Back Libraries for Typhoon Yolanda-Stricken Areas.”

Launched in March this year, the campaign aims to help rebuild libraries that were washed out by Yolanda. DOST-STII believes that one way of helping rebuild the lives of Yolanda-affected communities is to rekindle their passion for knowledge, particularly on S&T.

Thus, the Build Back Libraries project engages concerned individuals, institutions, organizations, sectors, and the public to donate books in

print or electronic format, videos and other reference materials to beef up the libraries in the Yolanda path.

Another way of helping in the campaign is by donating hardware for the free installation of STARBOOKS or the Science and Technology Academic and Research-based Openly Operated Kiosk Station. Developed by the DOST-STII, this instant library-in-a-box is a pod where students can browse and read books in digitized format even without internet connection. As of the first week of September 2014, there are already 322 STARBOOKS kiosks serving in Philippine libraries, according to Annie Lyn Bacani, project leader.

Meanwhile, Rosie R. Almocera, STII-Information Resources and Analysis Division chief, said that through the campaign, the Institute “helps the Yolanda victims overcome the trauma from the calamity through reading books and watching informative films and documentaries.”

Library calamity

Yolanda literally trampled on vaults of knowledge when it tore down library buildings, scattered and soaked their contents, and shattered the hearts of people young and old who know the value of libraries.

In Western Visayas or Region VI, some 670,619 textbooks and 10,339 teachers’ manuals are needed for the region’s 1,153 elementary and secondary schools.

Capiz State University in Pontevedra alone lost P2M-worth of books, P75,000-worth of journals and magazines, and P50,000-worth of audiovisual equipment, according to the report of DOST-VI Regional Director Rowen Gellonga.

“CapSU’s nine campuses lost a total of P 5,345,000 due to damaged books and other materials,” he said.

Currently, DOST-VII is spearheading a P2M project that will establish S&T digital libraries in Capiz province through STARBOOKS.

Meanwhile, a report from the Department of Education in Cebu province of Central Visayas showed that damages in both elementary and secondary levels totaled P 657,628,000.00.

“To help address library needs in the area, DOST-VII installed

STARBOOKS kiosks in identified public high schools to make digital information available and accessible to the students and the public,” Regional Director Edilberto Paradela said.

DOST-VII also facilitated the training of library staff and kiosk administrators in the operation and maintenance of the STARBOOKS facilities.

In Region VIII, the region most ravaged by the super typhoon, DOST Regional Director Edgardo Esperancilla identified 184 schools in the region (from elementary to college) which need support through the Build Back Libraries campaign.

Yolanda also badly hit Region IV-B, with Palawan Province incurring the most damages in schools amounting to P143M out of P154M. A report from DOST-MIMAROPA Regional Director Josefina Abilay revealed the following cost of damages in some schools: Concepcion Elementary School in Palawan (P110K), Anahao Elementary School in Romblon (P100K), Quinomay Elementary School in Oriental Mindoro (P1M), and Caminawit Central School in Occidental Mindoro (P1.3M).

DOST-MIMAROPA has already installed a number of STARBOOKS in the region to help in the rebuilding of libraries in the region.

Giving back from the heart

As a response to DOST-STII’s call, many organizations and individuals sent books and other information materials for distribution to identified schools in the Yolanda corridor. These include the International Rice Research Institute, Don Alejandro Roces Sr. Science and Technology High School in Quezon City, and Electronics Information Solutions Inc. (EISI), among others, as well as DOST agencies.

EISI, for one, stepped forward with close to a thousand assorted books in 13 boxes to crowd the shelves in libraries being built back in Samar, Leyte, and nearby affected provinces.

EISI is a products and services provider for better management system of various information resources of libraries in the Philippines. Its donation of high-quality US-based books which included K-12 materials is part of EISI’s 21st anniversary celebration.

“We are honored that EISI celebrated its anniversary by being part of STII’s ‘Building Back Libraries for Typhoon Yolanda-Stricken Areas’



BOOK DONATION TO DOST LIBRARY REBUILDING PROJECT. Dr. Aristotle P. Carandang, Rosie R. Almocera, and Arlene E. Centeno (fourth to sixth from left) of the Department of Science and Technology-Science and Technology Information Institute receive 13 boxfuls of assorted books from Reuel Avila, head of the Electronics Information Solutions Inc. EISI, a products and services provider for better management system of various information resources of libraries in the Philippines, donated close to a thousand books for the DOST-STII project “Building Back Libraries for Typhoon Yolanda-Stricken Areas.” (S&T Media Service, DOST-STII)

The donation was initiated by Reuel T. Avila, EISI founder and former employee of the DOST - Philippine Council for Health Research and Development (PCHRD). Avila established EISI in 1993.

Avila, who read about the DOST-STII library rebuilding project, decided to have his “pay back” to DOST by contributing to DOST’s library through his company. “Libraries represent sharing. Libraries represent lifelong learnings. Libraries are for world peace,” Avila said.

Book donation is part of EISI’s corporate social responsibility, added Avila who was once part of an IT team that gave technical support to PCHRD and other DOST libraries.

Interested donors may email Ms. Almocera at rosie@stii.dost.gov.ph or call (02) 837-20-71 local 2133, and 837-21-91 local 109. (With report from Ryan Kester Mansion) ●



Damages in Capiz State University libraries (Photos from DOST-VI)



The library of Tanauan National High School in Leyte (Photos from DOST-VIII)



A shipping vessel is washed inland destroying houses along the coast in Leyte. (Photo courtesy of www.mb.com.ph)

Project NOAH Lecture Series

A look back at Yolanda

By SUZETTE DALUMPINES
S&T Media Service, *DOST-STII*

Contrary to the perception of the public, the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) provided sufficient warning during the passage of Yolanda in the country in November 2013.

According to Dr. Esperanza Cayan, officer-in-charge of PAGASA's Weather Division, they issued warnings on possible storm surge of 5 to 7 meters the day before the typhoon made landfall. They also issued auxiliary bulletins and held press briefings after every six hours, or as soon as they had new information. At the same time, they posted all updates on social media.

"PAGASA started monitoring Yolanda long before it entered the Philippine Area of Responsibility, as early as November 1," Cayan narrated.

However, one problem persisted.

At that time, the attention of the public and media was divided between the typhoon and a political event.

"On November 7, we issued advance warning on storm surge," related Cayan. "But that was also the first day of the Naples case hearing. We didn't know that we had a competition when it came to TV shows' airtime."

Clearly, audience attention was drawn more to the highly-sensational case.

"The media is our best partner and they are our communicators," admitted Cayan. Eventually, however, it is the audience who will decide what to focus on.

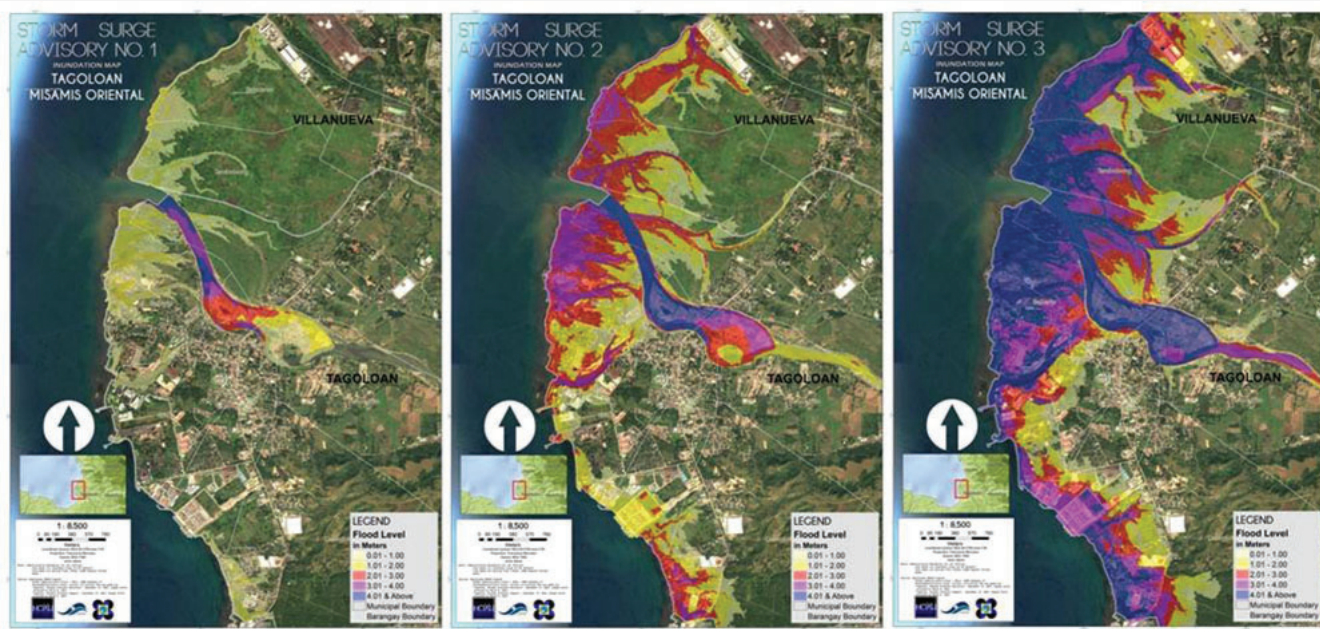
Getting audience attention is the core of the problem in the case of Yolanda. The timely transfer and receipt of information, and pushing the first receivers to relay the information to the public did not happen as planned because of divided attention.

This, Cayan revealed, was one glaring lesson they learned from the Yolanda experience.

Cayan shared these facts during a forum at the University of the Philippines – National Institute of Geological Sciences (UP NIGS) a few days before the first year anniversary of Yolanda's havoc. Conducted by the Nationwide Operational Assessment of Hazards (Project NOAH), the forum was the third installment of the Project NOAH Lecture Series which started on October 13.

The areas on its path were severely beaten. Yolanda likewise knocked down 11 PAGASA stations, including meteorological equipment amounting to P74.24 million. But the greatest loss for the agency was the death of its weather observer in Tacloban, Salvacion Avestruz, whose body remains missing to this day, as she stayed on her post at the height of Yolanda.

Aside from PAGASA, Project NOAH also released storm surge warning two days before Yolanda made landfall.



Proposed Storm Surge Advisory

At the forum, Project NOAH Science Research Specialist II Rojeelee Agaton presented a review of these storm surge warnings. She said that the forecast gave enough time to warn affected areas and to implement evacuation plans. However, Agaton admitted that their forecasted height of the surges were short of 0.5 to 1 meter.

“Although the results were underestimated, the forecast is still able to determine the areas that will likely be affected by storm surges and people should have heeded the warning” Agaton said.

Meanwhile, Engr. John Philip Lapidez, also from the storm surge component of Project NOAH, discussed the proposed storm surge advisory (SSA) system. He explained the warnings as follows:

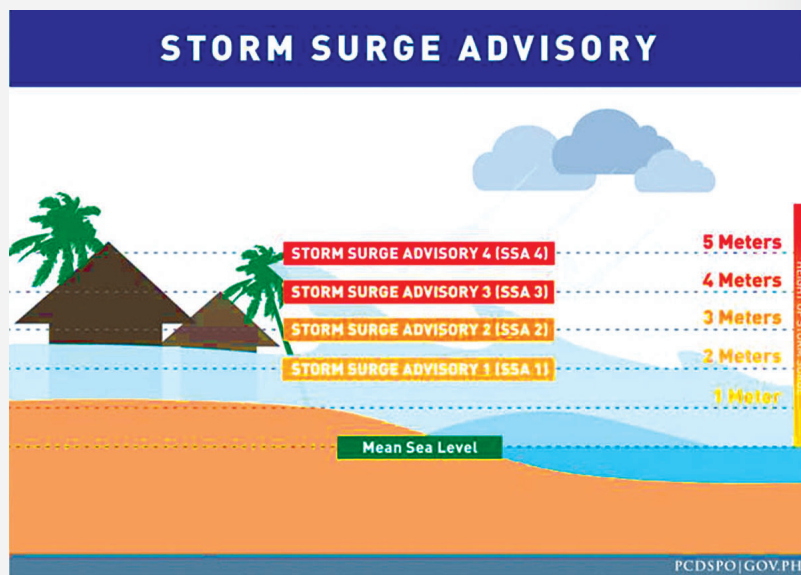
SSA No. 4 = up to 5 meters

SSA No. 3 = up to 4 meters

SSA No. 2 = up to 3 meters

SSA No. 1 = up to 2 meters

He said that storm surge hazard maps will be provided to the local government units so they could check which areas will be affected by the storm surge.



The Storm Surge Advisory (SSA) intensity scale produced by the Nationwide Operational Assessment of Hazards (Project NOAH) shows the possible height in meters to aid local government units in preparing for disasters (Photo courtesy of www.blog.noah.dost.gov.ph)

“That’s what caused the tragedy in Tacloban. They knew that storm surge will happen but they didn’t know where to go because there weren’t detailed hazard maps then,” Lapidez said.

At the end of the day, it is very important to access accurate information about disasters and hazards. This lecture series aim to provide the opportunity in our efforts to imbibe the culture of safety. (S&T Media Service)

In November 2013, Yolanda put the island of Tulang Diyot in the news. It was the “death toll” that made this possible: it was zero. Yet, the island lays on the path of the world’s strongest typhoon. How did that happen? In this article, the people share their stories, as told to S&T Post’s **Espie Angelica A. de Leon.**



Photos by Gerardo Palad
S&T Media Service, DOST-STII



Mayor Alfredo Arquillano, Jr.

Triumph over Yolanda

A small island rises above the world’s fiercest typhoon

Ruping. The mere mention of the name caused residents of Tulang Diyot to shiver. “Sabi nila, mas malakas pa daw kaysa Ruping (They said it will be stronger than Ruping),” some of them recalled.

Ruping is the name of a fierce typhoon (Super Typhoon Mike) that battered many areas in the Philippines in 1990 including Central Cebu Island. Moving at 220 kilometers per hour, Ruping barrelled into the Philippine area of responsibility on the 12th of November 1990, claiming 748 lives and incurring P 10.8 B worth of damage.

Along this path of destruction lay Tulang Diyot, a 1.5 kilometer long by 500 meter-wide islet in Cebu’s Camotes Islands, in the town of San Francisco.

“Yung dumaan ditong bagyong Ruping, nakatikim na kami ng pinakamabagsik na hangin (When Ruping passed our island, we had a taste of the strongest winds),” related Ricardo Almacin, president of the fisherfolks group in Tulang Diyot.

Joyce A. Wenceslao who teaches Grade 1 students at the Tulang Diyot Integrated School remembers Ruping’s strength as well though she was only five years old at that time.

Indeed, memories of the typhoon’s ferocity rushed back as newscasts announced the impending arrival of yet another super cyclone: Yolanda, expected to enter the Philippines on Friday, November 8, 2013.

They considered the possibility of the water rising and rushing toward their tiny island, wreaking havoc on their homes. “Yun ang naisip namin kasi sabi sa mga balita, may storm surge daw (We thought about those things because according to the news, there was going to be a storm surge),” said Areli Alao. “Natatakot kami kasi napalibutan kami ng dagat (We were scared because we are surrounded by water).”



FEATURES

Life is back to normal at Tulang Diyot in Camotes Islands, Cebu.

Despite their fears however, Tulang Diyot residents were more alert and better prepared than they were when Ruping descended on their community in 1990.

Preparing for Yolanda

Five days before Yolanda made landfall, they already heard from radio and television news that a typhoon was coming. In addition, somebody from their local government unit (LGU) as well as their purok president, Rey Lucero, went around announcing to everyone that a super howler was on its way and, therefore, they had to move to higher, safer ground.

Rey, who has been living in Tulang Diyot for 26 years, narrated, “Lunes, pinatawagan ako ni Mayor (Mayor Aly Arquillano) ‘Rey, sabihan mo yung mga tao na Friday daw aabot dito sa atin yung malakas na bagyo.’ So pinaalam ko sa lahat ng mga bahay na pinuntahan ko (Monday, the Mayor called for me and told me to tell everyone that the typhoon will arrive on Friday, and that’s what I did in every house I visited.)”

On Tuesday, he was told to remind the people once again that a typhoon was coming so that nobody will forget.

“Sinabihan ko sila na ‘mag-prepare kayo ng mga gamit, pagkain, flashlight, damit, unan, banig, lahat-lahat na magamit natin pag nag-evacuate na tayo. Miyerkules, nagsi-alisan na. Ang iba, nandun sa kabilang nayon [kay Ricardo Almacin]. (I told them to prepare food, flashlight, clothes, pillows, mat and everything they need for evacuation. On Wednesday, they were already evacuating. The others went to the mainland),” he said.

Ricardo, who has another house in the mainland that also served as an evacuation center, also went from house to house in Tulang Diyot. Aside from receiving advice from the Philippine Coast Guard, his group also determined the direction of Yolanda by monitoring the Global Positioning System.

He gave them ropes so they can tie the roofs of their houses and prevent the houses from collapsing under the strength of the typhoon. They placed nets over roofs made of nipa. They also tied their fishing boats. In the afternoon, he brought the elderly to his home in the mainland.

Farmer and Catechism teacher Nita Endico and her husband brought the emergency items with them to the evacuation center but left

their pig and piglets inside the pen. “Hayaan mo na yung mga baboy, ang importante buhay tayo (Never mind the pigs, what’s important is we’re safe),” she told S&T Post when asked if they came back down to check on the animals. Ricardo Almacin



Even the kids of Tulang Diyot were ready to evacuate. As a mother, Analyn Luchavez taught her two children (ages 9 and 5) the importance of disaster information and preparedness. She narrated, “Pag sinabi ko sa kanila, ‘may bagyo, maghanda tayo,’ execute agad sila (Whenever I tell them there’s going to be a typhoon and we should prepare, they would execute immediately).”



Nita Endico

By Thursday afternoon, many of them, like Areli and her family, were already at the Tulang Diyot Integrated School, located on higher ground and perched atop hard, sturdy rocks.

Aside from clothes, canned goods, pillows, sheets, mats, and cooking utensils, they also had with them generators, candles and *lamparilla* for electricity was not available in the island.

Other *purok* (small community within a barangay) and LGU officials were likewise going around the tiny island, carrying sirens, cutting trees to prevent further damage, and continuously telling people it was time to evacuate.

“Sinabihan namin sila ‘buhay natin nakataya dito. Lagi tayong handa. Kasi ang lugar natin, maliit lang eh. Pag nag-overflow, washed out tayo. Kaya pag matigas kayo, kayo na bahala (We tell them that our lives are at stake, that we should always be prepared because our island is small and if the water overflows, we’ll be washed out. So I tell them that if they’re stubborn, it’s up to them),” said Rey.



Rey Lucero



(From left) Municipal disaster risk reduction officers Rosalinda C. Serion, Monica Piquero and James Herda narrate their experiences during Yolanda.

Fortunately, no one was stubborn. All 181 households in the island left for higher ground. The wind was strong, cutting off branches from trees. The frightening scene made some children cry. Generally however, evacuation was orderly.

Purok system for disaster preparedness

According to Rosalinda C. Serion, municipal disaster risk reduction and management (MDRRM) officer in San Francisco, Camotes Islands, MDRRM council members convened for a meeting to discuss preparations for the coming typhoon. They always have a meeting immediately whenever there is an announcement or typhoon advisory from PAGASA, she said.

She explained the flow of information. “Ang meeting ay presided by the mayor with the members of the MDRRMC. Dini-discuss namin kung ano ang ipapadala na early warning at mga advisory sa bawat barangay. Pagkatapos ng meeting, ang early warning advisory ay pinadala namin agad sa punong barangay at mga lider sa komunidad, so kung ano ang nakasulat dun na advice, yun ang ipapagawa namin sa mga Barangay Disaster Risk Reduction & Management Committee (BDRRMC) - kung kailangang mag-trim ng mga kahoy, o walang papayagang mangingisda na pumapalaot o maghanda ng evacuation center. (The meeting was presided by the mayor with the MDRRMC members. We discuss what type of early warning or advisory shall be sent to the barangay captains and different community organizational leaders. After the meeting, we sent the early warning advisory immediately to the barangay. The BDRRMC will follow the instructions written in the advisory – whether they need to trim the trees, or if fishermen are not allowed to go to sea, or if they have to prepare an evacuation center.)”

Monica Piquero, research and planning officer of San Francisco under the MDRRMO, emphasized that their group focused on Yolanda's strength and route by studying the different Typhoon Tracking References such as PAGASA, Project NOAH and Typhoon 2000. They analyzed the possible impact brought by the typhoon and the vulnerabilities of the place such as presence of people living along the coastal shores, houses and vulnerable groups.

Knowing that the islet is very prone to typhoon hazards, they set and finalized plans for evacuation and for the evacuation center itself.

Aside from the school and Ricardo's home in the mainland, a cave was also used as an evacuation center. Monica revealed that they cleaned up the cave three days before the landfall.

She also stated that early warning should be brought down to the grassroot level. “We are at an advantage because we have the purok system where information is properly disseminated. In the absence of the megaphone, officials should really do house to house,” she said.

Indeed, the purok system and their monthly drills contributed significantly to their sense of preparedness.

Regular drills prepared them for hazards

Since the early part of 2013, the community has now been conducting typhoon drills and earthquake drills twice a year. They also have follow-up activities during their purok monthly meeting. At first they found it difficult to implement.

According to Areli, carrying their heavy belongings during the simulated evacuation made the drill difficult and inconvenient for them. But now they know the drill by heart. “Kung talagang kailangan na, kayanin mo lahat (If you really have to do it, you can do it),” Areli claimed.

The same drills are being done in schools every two months.

The drills are part of Tulang Diyot's purok system which started in 2004 during the term of then mayor and now Vice Mayor Alfredo Arquillano Jr.

Purok system

The purok system is an indigenous method of guiding a community to work together down to the purok or sub-village level to make easy communication easier and rapid evacuation possible when disaster occurs, according to Vice Mayor Arquillano.

In particular, the system involves the following: organization and coordination to reduce risks from disasters based on participation of citizen groups and civil society, risk assessment and using this as basis for decisions in connection with urban development, investing in infrastructure critical to disaster risk reduction (DRR) and making necessary adjustments, DRR education and training in communities and schools, protection of ecosystems and natural buffers to mitigate hazards, a solid waste management system to help reduce the onset of flooding caused by clogged waterways, and regular public drills, among others.

San Francisco also subscribes to the Hyogo Framework for Action (HFA), a 10-year plan for the significant reduction of disaster losses by 2015 – not just in terms of people's lives but also economically, socially, and environmentally. Developed by governments, disaster experts, international organizations and others as a result of the World Conference for Disaster Risk Reduction in Hyogo, Japan in 2005, the HFA details the responsibilities of the different sectors to achieve resilience in times of disaster.

Monica also mentioned the importance of stockpiling. “Stockpiling should be inculcated sa mga families na hindi sila dapat mag-rely sa

mga food packs doon sa local government. Dapat sila mismo they have their own (Stockpiling should be inculcated in families. They should not rely on food packs from the local government alone. They should have their own resources)."

She reminded them that no matter how much food is provided by the local government during evacuation, when the typhoon is over, they will eventually be left with no food if they don't have their own stockpile. She added this is especially true if the roads are no longer passable and delivering food packs and other relief goods becomes difficult to administer.

DRR advocates also helped. James Herda, retired teacher, was one of them. DRR advocates go to the puroks to teach the folks about the Hyogo Framework and what to do in times of calamities.

"Tinuruan din namin sila sa pag-iimbak ng makakain para sa mga disaster, at yung Family Preparedness Kit (We also taught them how to store food for calamities and acquainted them on the Family Preparedness Kit)," James said.

All safe inside

At the evacuation center, things went just as smoothly. Though part of the school's roof was torn off because of Yolanda's strength, the evacuees still felt safe. There was no problem with the water supply and no one got sick. They also helped one another.

"Sinabihan ko sila, 'kung sino ang walang pagkain, mag-sharing kayo. Tumawag lang kayo sa akin pag wala na kayong bigas (I told them, 'Share your food with those who don't have enough food. If you run out of rice, let me know),'"

"Mga kapitbahay ko yan eh, mga kadugo ko yan. Para na kaming magkakapatid dito lahat ("They're my neighbors, my blood brothers. We're like brothers and sisters here)," he added.

According to Areli, they did not go back to their homes immediately when the rains stopped. They were still scared to go back down. They

left the school the following day, when the skies were clearer. All in all, she, her husband and five children spent four days inside Tulang Diyot Integrated School. "Tiniis po namin lahat yon," she said. "Basta safe kami (We endured all those. As long as we're safe)."

Heavy damage outside

Indeed, everyone was safe. But their homes and sources of livelihood were not.

Said Joyce, "Hindi nahagip yung bahay namin kasi tinali na po namin (Our house was not hit because we tied it)." She shared though that it was the bathroom, made of hollow blocks, which was heavily affected.

High school student Nazel Espina and her family were not as lucky. Their house toppled, though the roof was not destroyed.

Many schools were damaged as well.

And the fishermen did not go out to sea for several days. "Yung mga tao namin binigyan na lang namin ng bigas (We just gave rice to our people)," Ricardo told S&T Post.

For Alan Cubos, farmer and sari-sari store owner, the stakes were high. "Bali ang saging, bali ang mais. Yung mais, kabubunga pa lang, hindi pa makain, bali (The banana crops were torn off, corn crops were torn off. Corn had just sprouted, before it can even be eaten, it already got destroyed)," he lamented.

What did they learn from Yolanda?

For Nita, the answer is preparedness.

"Pag dumating ang bagyo, huwag matigas ang ulo," explained Alan. "Kailangang agad-agad ay kung ano ang sinasabi doon sa taas ay susundin lang (When a typhoon comes, don't be stubborn. Follow orders immediately)."

Nita added, "Part ng preparation is yung nagdadasal ka sa Panginoon na kahit mawala yung mga ari-arian, basta buhay lang kayo (Part of the preparation is to pray to the Lord that you will come out of it alive, even if you lose your possessions)."

Tulang Diyot's triumph

As the afternoon hours marched into evening, the children of Tulang Diyot rushed to the shore to play. Their smiles were back on their faces, their laughter back in the air. Nearby, young men were enjoying a game of basketball. A year after Yolanda, they have recovered and their lives are back to normal, so they said.

But, the Philippines is a typhoon country and the possibility of another Ruping or Yolanda slamming into the tiny island is not farfetched. Yet, they've learned their lesson, and more. Whatever calamity comes their way, Tulang Diyot folks will always be ready.

This, for certain, is their triumph over Yolanda. ●



Alan Cubos (right) being interviewed by S&T Post staff.

Turning **DREAM** into reality



PEGASUS	
PRF	500 khz
alt	4000m
FOV	60 deg

GEMINI	
PRF	167 khz
alt	4000m
FOV	50 deg

AQUARIUS	
PRF	70 khz
alt	600m
FOV	25 deg

DREAM airplanes bear code names Pegasus, Gemini, and Aquarius.

Two years since it took off, DREAM has indeed become a reality.

The Disaster Risk Exposure and Assessment for Mitigation (DREAM) program first made headlines when its two Cessna planes carrying the state-of-the-art Light Detection and Ranging (LiDAR) equipment, an active remote sensing technology that measures distance with reflected laser light, took off in November 2012 to kick off the scanning of the 18 major river systems in the country.

A pioneer and big-ticket program under the Department of Science and Technology's Project NOAH (Nationwide Operational Assessment of Hazards), DREAM was tasked to generate 3D high-resolution, detailed, and up-to-date flood models for the country's 18 river systems in order to create a country-wide integrated flood early warning system, which the team has accomplished in the first half of 2014.

Last year, this breakthrough project of the government's science department was recognized internationally at the Geospatial World Policy Awards. DREAM program leader Dr. Enrico C. Paringit and DOST Secretary Mario G. Montejo received on May 8

the Geospatial World Excellence in Policy Implementation Award for 2014 in the awarding ceremony held in Geneva, Switzerland.

With its receipt of the award, the DREAM program joins the roster of other high-profile international science and technology agencies, such as the National Aeronautics and Space Administration (NASA) of the United States, Standards Agentschap voor Geografische Informatie Vlaanderen (AGIV) of Belgium, and Indonesia Geospatial Information Agency (BIG), among others.

The Geospatial World Policy Awards are presented to organizations for "exemplary formulation and implementation of geospatial policies which directly or indirectly encourage the geospatial industry."

But how did they actually do it? How was this team of young scientists able to come up with these fine-resolution flood hazard maps that are now a powerful tool for communities to save lives in times of intense weather occurrences?

DREAM's 107 warm bodies work in its four components, namely: Data Acquisition, Data Validation, Data Processing, and Flood Modeling.



Data Acquisition team of DREAM prepares to take off for scanning using LiDAR.

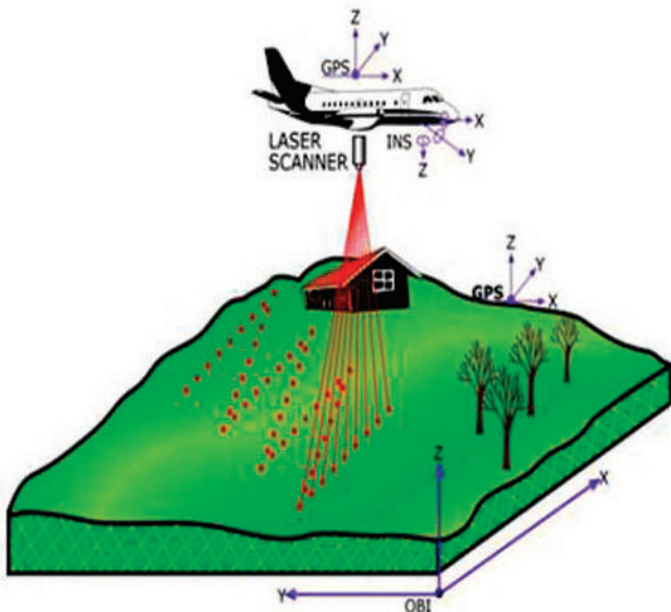
Data gathering

On a typical field day, four members of the Data Acquisition component of DREAM – one supervising officer, one ground personnel, two LiDAR operators – would meet with their pilot and co-pilot at Asian Aerospace for their scheduled flight.

Given a good weather, they would fly over a scheduled block of area along one of the 18 major river basins in the country. The flights, one in the morning and one in the afternoon, would last an average of four hours, according to the team's Chief Engr. Christopher Cruz.

On board a Cessna 206 plane, being leased for approximately P35,000 per hour from Asian Aerospace, one DREAM staff member sits behind the pilot and co-pilot to operate the LiDAR equipment that scans the area through its sensors. DREAM now uses three Cessna planes, named Pegasus, Gemini, and Aquarius.

After a day's flight, all raw data collected from the LiDAR scanning are then turned over to the data processing team.



Data validation

Unlike the Data Acquisition Component, the Data Validation team also gathers data but without a plane or a LiDAR equipment – and they work from the ground. Headed by Engr. Joemarie Caballero, one of the team's tasks is to survey the ground and juxtapose their data with those acquired through LiDAR by the Data Acquisition component. When compared and differences are noted, the data manually gathered by the Data Validation Component would be deemed more reliable.

Since the sensors of the LiDAR cannot pass through water, any body of water is a blind spot. DREAM depends on the Data Validation Component to do bathymetry survey of the rivers – to measure the water depth and characteristics (longitude, latitude and elevation) of the river bed. These data are vital for flood modeling and simulation of flood scenarios, and most importantly, to come up with flood hazard maps.

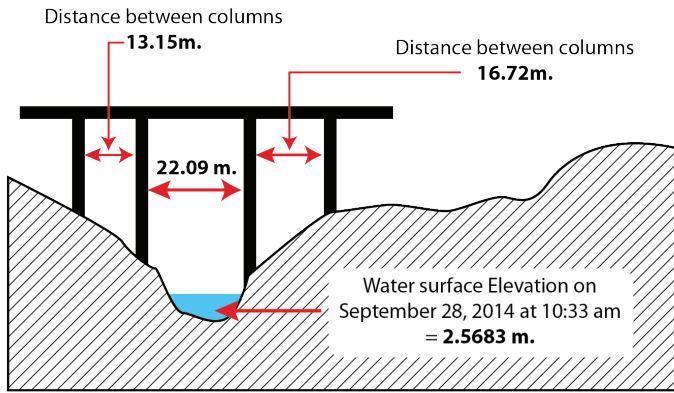
This team is also in charge of getting the cross section, or survey of certain parts, of rivers with installed automated water level sensors (AWLS) to be able to compute the discharge given a specific water level. Discharge is the total volume of water flowing through a channel at a given point in the river. This would help them make simulations of possible flooding when there is heavy downpour that could cause the water level to rise.

If the Data Acquisition is always praying for good weather to obtain good data, the Data Validation team on the other hand is always hoping for rain whenever it is on field.

"Mas gusto namin na may ulan [kapag nasa field] kasi kailangang malaman yung pagtaas ng tubig para ma-compute yung discharge," said Engr. Jimson Calalang, a senior science research specialist. (We always want it to rain when we're on field because we have to know the changes in the water level to be able to compute the discharge.)



Data Validation team in one of the routine ground validation work using motorized sea craft.



ALUBIJID BRIDGE

Alubijid River Basin

Lat: 8d34' 13.6564" N Long: 124d 28' 34.70438" E

All data they acquire are also submitted to the Data Processing team.

Data processing

Divided into three subteams, Engr. Sarah Jane Samalburo's team, the Data Processing Component, uses a number of software tools to process data from the Data Acquisition and Data Validation components.

The three subteams were named after the software to come up with their three outputs: digital terrain model (DTM), digital elevation model (DEM) and orthophotos.

The first team, the LiDar Mapping Suite team, works on calibration of raw LiDAR data. The team is in charge of adjusting LiDAR points captured by the sensors and making sure that the points are in the right position, including the elevation. The team's outputs are unclassified (not yet broken down into ground, buildings, etc.) laser points.

The next team, the Terra team that uses Terra Solid Suite, breaks down the unclassified point clouds into ground, low vegetation, medium vegetation, high vegetation and first return (i.e., power lines). They then come up with one of the component's major outputs: the digital elevation model (DEM) which has two kinds, namely the digital terrain model (DTM) that shows only the ground, and the digital surface model (DSM) that shows the ground and everything on its surface.

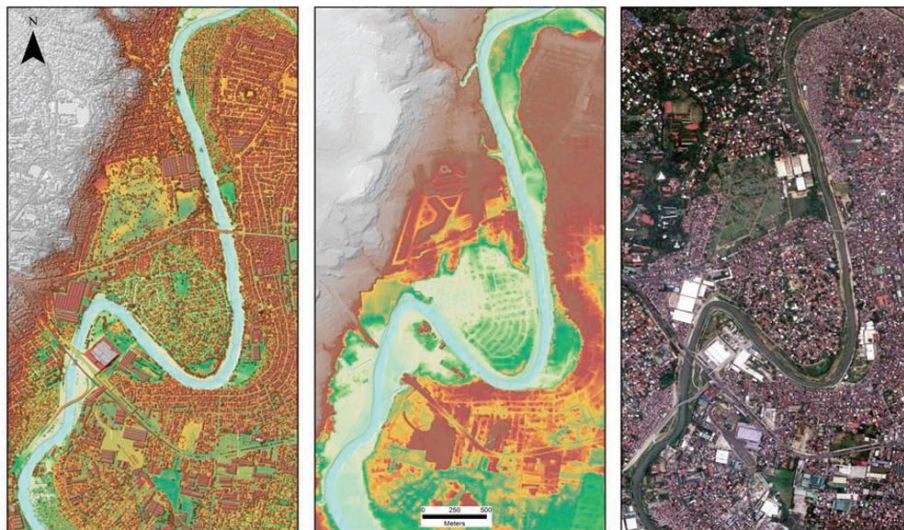
The Terra team is also in charge of stitching orthophotos (images captured by the camera attached to the LiDAR equipment) together to come up with a whole image of a specific area. A single flight takes an average of 1,000 orthophotos. But to come up with a complete image of the area, the team will have to wait for the output of the Data Validation team who is in charge of ground survey of the rivers – which are blind spots for the LiDAR scanning.

"We are given at least a month to process everything after the Data Acquisition and Data Validation teams have submitted the data to us," said Engr. Samalburo.

Flood modeling

After all data have been gathered and processed by the first three teams, the Flood Modelling Component would then work on these data to come up with models for water level forecasting, real time inundation monitoring, and flood hazard / flood depth maps.

Headed by Mr. Christopher Noel Uichanco, the Flood Modelling team uses the cross section and discharges data from Data Validation component to simulate a model to be able to provide water level forecast for the river basins. Knowing the features of a river and with automated rain gauges and automated water level sensors installed, they can already make a water level forecast with at least 6 hours lead time – enough time for communities that could be affected by the flood to do the necessary actions.



Marikina City (Digital Surface Model, Digital Terrain Model, Orthophotograph)

Lidar & Orthodata Source:
Collective Strengthening of
Community Awareness for
Natural Disaster (CSCAND)



Left photo: DOST Secretary Mario G. Montejo (left) and DREAM program leader Dr. Enrico Paringit (right) receive the prestigious Geospatial World Excellence in Policy Implementation Award for 2014 on May 8 in Geneva, Switzerland. Right photo: DOST Asst. Secretary Raymund Liboro (center) and Dr. Paringit (right) receive the equally prestigious Asia Geospatial Excellence Award during the Inaugural Ceremony of the Asia Geospatial Forum 2014 held in Jakarta, Indonesia last Nov. 25. Also in photo is Dr. Fidel Nemenzo, UP Diliman vice-chancellor for research and development.

In times of extreme weather events, like Typhoon Ruby on December 6, 2014, the Flood Modeling team works round the clock to monitor the water level of these rivers and give out flood warnings when necessary.

The Flood Modelling component also does real-time inundation monitoring, which can be found in the Project NOAH website. Compared with the water level monitoring, this model only focuses on the channel itself and with the help of the installed automated rain gauges and water level sensors, it could provide information if a river is swelling, meaning its water level is rising and nearing its spilling level. This update is posted automatically on the website, with a time stamp showing the last update.

Lastly, the Flood Modelling component uses all the data acquired by the different teams to come up with the DREAM's most important output: the three-dimensional, high-resolution flood hazard maps. Using the LiDAR-based digital elevation maps, the Flood Modeling Component maps flood-prone areas, based on historical data from the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA). They do hazard maps for 5-year,

10-year, 25-year, 50-year and 100-year return periods. What do these return periods mean? A five-year rain return period hazard map shows the possible flooding given a specific amount of rainfall that happens every five years.

These hazard maps don't only serve as visual representation of flooding scenarios, but also as guide for local government units for long-term planning, explained Uichanco.

"Eto na yung pwede nilang magamit para mag-assign ng evacuation sites, and also, magagamit nila para sa kanilang comprehensive land use planning," Uichanco said. (They can use these maps to decide where to put evacuation sites, and also, for their comprehensive land use planning.)

With the help of cutting-edge technologies, these four teams of young scientists are definitely making a huge contribution in making this county safer and more prepared for disaster. Their world-class products and innovations are definitely a DREAM come true, not only for the science community, but for the Filipino people. ●



DOST's Project NOAH vital in key gov't, industry operations

By RODOLFO P. DE GUZMAN
S&T Media Service, DOST-STII

DOST's Project NOAH elicited significant interest and attention from key quarters in the government and industry, proving its usefulness in vital operations of said sectors.

Recently, the Department of Public Works and Highways (DPWH) deemed it prudent to conduct an orientation briefing on geo-hazard mapping and disaster preparedness last October 2, 2014 at the DPWH Central Office. Secretary Rogelio L. Singson's inspirational talk set the tone for the program attended mostly by DPWH accredited contractors and public works officials.

Just like human lives, vital installations and infrastructures must also be protected from natural hazards because they are part of the socio-economic lifelines that will ensure early recovery after a catastrophic disaster.

Thus, the DPWH is currently looking for more information on adapting to natural hazards so that it can adjust its plans particularly in constructing bridges, roads, dams, dikes and other similar projects. By knowing the hazards, the agency will be able to identify suitable areas for infrastructure projects or implement engineering interventions most appropriate so as not to waste public funds.

"It is very important for government to have a plan for its infrastructure projects; of where to build bridges that are not prone to landslides or adjust engineering designs to make dams or dikes resistant to strong earthquakes and drainage systems that will withstand flooding," said Dr. Alfredo Francisco Mahar Lagmay, executive director and project leader of Project NOAH.

Contact centers call on Project NOAH

Meanwhile, speaking before representatives of member companies of the Contact Center Association of the Philippines (CCAP) during its general membership meeting at the Manila Peninsula on October 23, 2014, Dr. Lagmay highlighted the importance of Project NOAH as a tool to get information beneficial to the call center industry.

Contact centers are practically in business 24/7 catering mostly to foreign clients. By using the website, Dr. Lagmay said that the contact and call center companies can monitor in real time weather situations where they are located and advise their employees of flooded areas. This helps contact and call center offices continue operations even in inclement weather.

Jojo Uligan, co-chairman of CCAP, said that the industry is continuously posting positive growth and they have to implement disaster management plans to protect their investments as well as their employees. To date, there are around 650,000 employees working for CCAP member companies.

Said meeting of call center companies in the country is an annual event participated in by BCP leads/directors, senior managers, operations managers, administrative officers, safety and security managers.

For this event, CCAP focused on the topic of disaster preparedness primarily to aid contact centers in formulating industry-level solutions for business continuity and disaster recovery in times of calamities.

"Project NOAH may sound biblical but it is really an acronym for Nationwide Operational Assessment of Hazards and we owe that to DOST Assistant Secretary Raymund Liboro who thought of that name," Dr. Lagmay said.

Hazard-free property locations

For the Real Estate Brokers Association of the Philippines (REBAP), it is very important

to know if the properties they are selling are free from flooding or are not sitting on top of active faults.

REBAP members are very particular in offering real estate properties that are considered prime and “safe” from any hazard because it can spell a difference between making the deal and losing it.

According to REBAP Greenhills Chapter President Arlyn V. Santos, the association believes that Project NOAH is one great program that could provide real estate brokers the necessary tools and information that would ensure correct appraisal, solutions and recommendations to their clients.

Santos added that with information about Project NOAH, REBAP will be more in sync with government efforts in disaster mitigation.

Moreover, historical data can be used as basis for land acquisition and development as well as in implementing appropriate construction systems and engineering interventions to minimize the negative impact for existing projects. Likewise, information from Project NOAH would enable REBAP members to accurately and realistically make property appraisals and valuations considering the risk factors involved.

Power coops plug on Project NOAH too

The continuous supply of electricity is the main concern of electric cooperatives (ECs) in

the country, during times of natural calamities like strong typhoons or habagat (southwest monsoon) episodes which topple power lines and put entire communities in darkness. Similarly, this is every housewife’s nightmare, when electricity is out and she has to prepare the day’s meal.

Because of these fortuitous events, the National Electrification Administration (NEA), the government agency overseeing the electric cooperatives, consulted DOST and Project NOAH for information regarding the changing weather patterns, natural hazards and their impact and disaster preparedness. The consultation is an important input in the formulation of the NEA’s contingency plans.

During NEA’s 45th anniversary celebration recently, Asec. Raymund E. Liboro who is also the co-project leader of Project NOAH, presented to more than a thousand representatives of ECs the DOST’s disaster preparedness programs aimed at addressing the problems brought about by climate change.

Asec. Liboro emphasized that the ECs serve as the vital “lifelines” that will keep the community going and act as the important link in restoring normalcy after devastation by strong typhoons or earthquake. Thus, they have to prepare for the worst scenarios. It is then important for them to get the correct and timely information about the hazards. Aside from this, they must also know what they should do before, during and after a calamity in order to minimize the ill-effects of disasters.

“Project NOAH is a digital platform of weather and hazard information that provides us a six-hour lead time before the occurrence of flood thereby allowing us ample time to prepare,” Asec. Liboro informed the group. “Likewise, with this tool we can track the path of the typhoon and anticipate the extent of possible damage strong winds and heavy rainfall may cause.”

NEA Administrator Edita S. Bueno said that by tapping Project NOAH, they hope to sustain the success of the Sitio and Barangay Energization Program. She further underscored the need to synchronize their work plans with those of DOST in developing initiatives and strengthening capabilities of the member ECs in adapting to the risks involved.

Foreign groups seek Project NOAH

In a forum on disaster preparedness hosted by the American Chamber of Commerce of the Philippines and the Overseas Security Advisory Council (OSAC), Manila Country Council which is associated with the U.S. State Department together with the Security and Disaster Resources Group Committee, Dr. Lagmay, showed the hosts how the project can aid them in their strategies.

Dr. Lagmay presented them with flood maps in Metro Manila and Metro Cebu - two areas where American businesses are concentrated. Dr. Lagmay indicated to the participants the importance of knowing the hazards present in their business locations so they can plan ahead or at least consider these information when formulating their long-term business plans and strategies.

“The flood hazard maps will be very useful in planning for the construction of your warehouses or facilities in Metro Manila and Cebu to avoid undue losses brought about by flooding,” he told them.

Additionally, he emphasized in his presentation the importance of getting the right information at the right time because it can spell the difference between safety and a disaster. With the more than 1,000 sensors installed all over the country, incidence of flooding can be monitored regularly.” ●



source: www.mb.com.ph

Confab highlights DOST's modernized weather tools

By ALAN C. TAULE
S&T Media Service, *DOST-STII*

MORE MODERN weather tracking and forecasting technology equals fewer casualties and less property damage. This, according to Department of Science and Technology Asst. Secretary Raymund Liboro, is one of the notable contributions of science and technology in the country for the past few years under the Aquino administration.

In the forum “1st Manila Disaster Preparedness and Crisis Management Conference” held recently at the World Trade Center in Pasay City, Asec Liboro highlighted the role of DOST's Project NOAH or the Nationwide Operational Assessment of Hazards, the country's great leap in the area of disaster preparedness. Project NOAH was thrust into the public eye when Pres. Aquino asked DOST for a more proactive early warning system that

would finally put an end to the vicious cycle of typhoons and widespread destruction.

According to the assistant secretary who is also co-executive director of Project NOAH, since the launch of Project NOAH, the number of river systems being monitored for early flood warning has expanded dramatically not only to include the country's 18 main river basins but all 258 rivers throughout the archipelago.

He also added that the large-scale installation of ground weather equipment such as automated weather stations, automated rain gauges, and water level sensors—all possessing the ability to feed real-time data to PAGASA—had been the key to the enhanced weather forecasts stretching to four days by the country's weather monitoring agency.

Asec. Liboro also expects the introduction of the Blue Gene supercomputer, now housed at the Information and Communications Technology Office in Diliman and which will translate into more accurate and visually stunning graphic simulations of flood and landslide behavior, to be a big boost in the country's local disaster planning measures especially in high-risk areas.

“What we wish to achieve at the DOST is to be able to save lives and property using brainpower and the latest tools. Kung ito ay sasamahan ng pakikipagtulungan ng bawa't mamamayan, mas marami pang buhay ang ating maililigtas (If this will be combined with cooperation from each citizen, we will be able to save more lives,)” Liboro said. ●



DOST Assistant Secretary Raymund E. Liboro at the 1st Manila Disaster Prevention and Crisis Management Conference

KBP ties up with DOST for responsible weather reporting

By LOTUSLEI P. DIMAGIBA
S&T Media Service, *DOST-STII*



Broadcaster Ted Failon at the Davao leg of the seminar-workshop held at the Grand Regal Hotel in Davao City last November 21-22, 2014.

MEDIA PRACTITIONERS especially broadcasters play a major role as prominent mediators in early warning to elicit early action. Thus the Department of Science and Technology (DOST) together with the Kapisanan ng mga Brodkaster ng Pilipinas (KBP) collaborated to hold a workshop on responsible weather reporting for KBP members nationwide. The workshops were held in Tuguegarao, Davao, Cebu, and Butuan Cities.

Media's role

"My advocacy is to convince you guys (media) that your role is not an ordinary role," said Assistant Secretary Raymond E. Liboro during the KBP workshop in Cebu City.

Asec. Liboro also cited that the big role depends on the person who is in the area. "The media is very critical in establishing context," he remarked.

During the workshop, a four-point agenda was discussed as a guide for community disaster awareness.

According to Asec. Liboro, the first step towards preparedness is awareness, for the people to have local risk knowledge in their municipality. The second is to capacitate to monitor hazard in their surroundings. The next step is to test warning and communications protocol. This is where the media comes in, he stressed to participants, what to do to warn them. Finally, the fourth step, he stated, is to build response capability in communities.

"Adding them all up, it will result to higher state of community disaster awareness," Asec. Liboro remarked.

"Media's role during severe events and to reduce disaster risk is to help us warn," he continued. "Our objective is to establish that context, that our early warning can be translated to early action."

Mr. Angelo B. Palmones, anchor of Manila Broadcasting Company's DZRH, commented during the workshop that the role of the host is to listen. "The host should listen so that there

is an organization into his/her questions," he pointed out. "When you are the host offering information, there might be something that they (officials) missed out. That is the importance of understanding what you are going to ask."

Mr. Palmones also advised that broadcasters should always stay cool in times of disaster. "You should catch the attention of the audience, because what you have to do is educate them and warn them," he added.

PAGASA's role

Meanwhile, Ms. Sharon Juliet M. Arruejo, a senior weather specialist of DOST-PAGASA gave an overview about understanding terms, hazards, signals and warnings for better weather reporting.

During the workshop, she highlighted that the role of PAGASA is to identify the three basic aspects of meteorology namely, observation of weather, understanding the weather, and prediction of weather.



DOST-STII-KBP media seminar/workshop participants in Cebu learn to read and understand the different weather advisories and bulletins that the PAGASA generates especially during the occurrence of typhoons to help them disseminate accurate information to the public.

Meteorology, she explained, is “the science that deals with the earth’s atmosphere and its phenomena,” or simply “the study of weather, including weather forecasting.”

The following weather parameters namely, atmospheric pressure, temperature, relative humidity, wind speed and direction, visibility, cloud, and precipitation are observed by PAGASA to forecast typhoons.

PAGASA’s data gathered by experts using advance technologies have been made available to the public and all the data are available in their website.

She cited as example the storm surge that happened during typhoon Yolanda when PAGASA warned of an impending storm surge that “may reach up to seven-meter wave height.” The people did not really understand what that meant because “people hate numbers.”

“A seven-meter wave height can be converted to as high as a two-storey building,” she explained in a way that people could imagine clearly how high such a wave can get.

“What we need for you (media) is to interpret the data in a way the people will understand and visualize it clearly,” Arruejo advised.

She also mentioned during the workshop that the problem comes when broadcasters

mention the warning at the last part, which is given less importance. “The point is, it is still part of the warning so we should give emphasis to it and see to it if the information is needed by the public,” Arruejo said.

In 2009, she said that PAGASA held an information and education campaign in Eastern Samar, Leyte and Southern Leyte, wherein the term storm surge was explained. “We produced a map... a storm surge hazard map, and we

presented that to all the barangay captains,” she stated.

“They can’t say that they have no idea about storm surge,” said Arruejo. She concluded that the problem may lie on the local leaders who were not able to cascade the information about the storm surge hazard map to the general public during that time.

She added that their survey shows that the general public’s source of information is either the radio or television. “That is their first source of information, so you are the ones who should know and understand firsthand the information we provide,” Arruejo explained.

“This is what we need to build to our general public together with you because we need to tell them and remind them about prevention, if not total prevention, then mitigation, because mitigation means lessening the impact of the disaster,” she added.

Arruejo then announced that PAGASA has a mobile application that can be downloaded from their website www.pagasa.dost.gov.ph

Meanwhile, Dr. Landrico U. Dalida Jr., OIC-Office of the Deputy Administrator of DOST-PAGASA, said, “We keep on developing and adding equipment to help in our forecast, to give you an accurate, timely, weather forecast.” ●



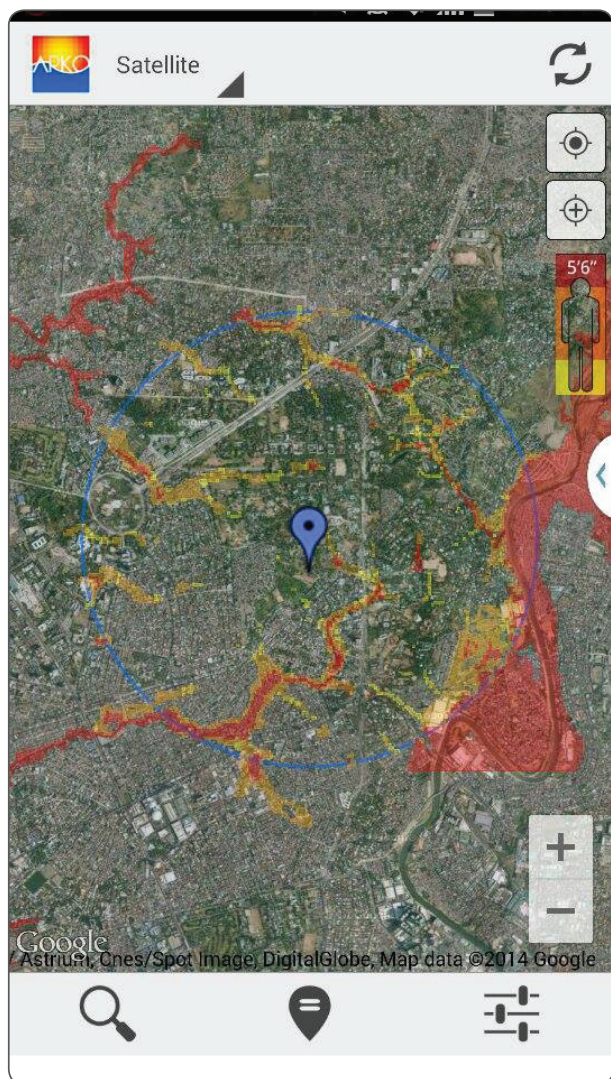
Ms. Sharon Arruejo (standing), senior weather specialist of PAGASA, briefs participants of the Visayas leg of the DOST-STII-KBP Media Seminar/Workshop on how the agency analyzes weather data and produces weather and hazards information.

Project NOAH's mobile app ARKO wins World Summit Awards

THE DEPARTMENT of Science and Technology's (DOST) flagship program for disaster risk reduction and mitigation called Nationwide Operational Assessment of Hazards or Project NOAH once again showed its multi-faceted benefits when its mobile app ARKO recently grabbed an award conferred only to a select few by the World Summit Awards Mobile Content 2014 (WSA Mobile).

The ARKO mobile app was chosen as one of five winners under the e-Inclusion and Empowerment category, besting hundreds of participants from all over the world. This prestigious international award recognizes the best mobile content solutions in the world where it shows innovativeness, creativity and impact.

"ARKO serves as a vehicle to deliver important information regarding floods to ensure the safety of our



communities-at-risk and this app proves one thing: it shows that Filipino talent is world class," said DOST Secretary Mario G. Montejo.

Overall, ARKO was one of 40 winners of WSA Mobile from a total of 456 projects submitted by 98 countries.

"The creation of the ARKO mobile app for Project NOAH is one clear example of the innovativeness and ingenuity of our Filipino scientists and software engineers who developed a very important tool in disaster preparedness by providing information about floods that will enable our communities to prepare ahead of time," reiterated Montejo.

Other winners alongside the Philippines' ARKO are the following: ColorADD from Portugal, Braille Board from Palestine, SnooCode of Ghana, and LIVOX of Brazil.

The winners of WSA Mobile, which works in cooperation with the UN's World Summit on the Information Society and in collaboration with UNESCO, UNIDO and UN GAID, will be invited to receive their awards in Abu Dhabi on February 1-3, 2015 to coincide with the WSA Mobile Global Congress. (S&T Media Service)

WHAT TO DO DURING **FLOOD**

MGA DAPAT GAWIN KAPAG MAY BAHA



- 1** Keep informed on the news about the flood situation and weather information.

Regular na alamin ang balita tungkol sa sitwasyon ng baha at ulat ng panahon.



- 5** If you need to evacuate:
Keep drawers, cabinets, windows, doors, and gates locked. Wear long pants, boots or any protective foot gear to avoid being wounded.

Bring ropes, whistle, ID, and emergency survival kit (food, water, flashlight, clothes, transistor radio, cellphone, batteries, money, medicines, etc).

Kung kailangang lumikas:

Isara o susian ang aparador, cabinet, bintana, pinto, at gate. Magsuot ng pantalon, bota, o anumang proteksyon sa paa upang maiwasang masugatan. Ibalot sa plastik ang mahalagang dokumento.

Magdala ng lubid, pito, ID at emergency survival kit (pagkain, tubig, damit, transistor radio, cellphone, baterya, pera, gamot, at iba pa).



- 2** Be alert on the advice of local government and instructions for possible evacuation.

Maging alerto sa anunsyo ng lokal na pamahalaan at tagubilin tungkol sa posibleng paglikas.



- 3** Avoid going outdoors, especially to places that are usually flooded.

Iwasang lumabas ng bahay, lalo na ang pagpunta sa mga lugar na madalas bahain.

- 4** If passing through flooded areas cannot be avoided:
Be familiar with the location of canals and open manholes. Avoid passing through the area and passing through the road going to the river.

Kapag hindi maiwasang dumaan sa baha:

Alamin at iwasan ang lugar kung saan may kanal at bukas na imburnal. Iwasan ang daan patungo sa ilog.



- 6** To prevent contaminating disease caused by flood:
Eat only well-cooked food. Boil water before drinking. Avoid plunging into floodwater to prevent diseases like leptospirosis. Consult your doctor if you feel any symptoms of diseases like diarrhea, typhoid fever, hepatitis A, pneumonia, or dengue fever.

Upang makaiwas sa sakit na dulot ng baha:

Kumain lamang ng mga pagkaing nalutong mabuti. Pakuluan ang tubig na iinum. Huwag lumusong sa baha upang maiwasan ang mga sakit gaya ng leptospirosis. Kumunsulta sa doctor kung may sintomas ng mga sakit tulad ng pagtatae, typhoid fever, hepatitis A, pulmonya, o dengue fever.

LANDSLIDE

It is the sliding down of soil, rocks, or mud from an elevated place such as a mountain or a cliff.
Ito ang pagbaba ng lupa, bato o putik mula sa mataas na lugar.

PREPARING FOR A LANDSLIDE

PAGHAHANDA SA LANDSLIDE

Learn the condition in your area and watch out for signs of an impending landslide such as fissuring of the ground or sudden appearance of springs.

Alamin ang kundisyon ng kapaligiran at matyagan ang mga senyales ng landslide katulad ng pagbitak ng lupa o biglaang pagbukal ng tubig sa lupa.

Keep posted on threats of landslide through the barangay landslide threat advisory, reports, and landslide hazard map.

Alamin ang banta ng landslide sa lugar sa pamamagitan ng mga anunsiyo at ulat tungkol dito at sa mapang tumutukoy kung saang lugar maaring magkaroon ng panganib ng landslide.

Learn the fastest and safest way going to the nearest evacuation center.

Alamin ang pinakamabilis at pinakaligtas na daan tungo sa pinakamalapit na evacuation center.

Evacuate immediately in cases of non-stop rainfall and landslide threat in your area.

Lumikas sa lalong madaling panahon kung walang tigil ang ulan at may panganib ng landslide sa lugar.



WHAT TO DO DURING LANDSLIDE

MGA DAPAT GAWIN HABANG MAY LANDSLIDE

If inside the house or building and evacuation is not possible: Stay inside. Get under a sturdy table.

Kung nasa loob ng bahay o gusali at hindi makalikas: Huwag lumabas, manatili sa loob. Magtago sa ilalim ng matibay na mesa.

If outside: Avoid areas that may be affected by landslide. Head to an elevated and safe place.

Kung nasa labas: Iwasan ang lugar na maaring daanan ng landslide. Magtungo sa mataas at ligtas na lugar.

Do a fetal position and protect your head if landslide can no longer be avoided.

Ibaluktot ang katawan at protektahan ang ulo kung hindi na maiiwasan sa landslide.

If driving: Don't cross collapsed bridges or roads. Avoid falling rocks and soil.

Kung nagmamaneho: Huwag tumawid sa tulay o bahagi ng kalsada na may guho. Iwasan ang nahulog na malalaking bato at lupa.



WHAT TO DO AFTER A LANDSLIDE

MGA DAPAT GAWIN MATAPOS ANG LANDSLIDE

Avoid places affected with landslide as the hazard might recur.

Iwasan ang lugar na may guho dahil maari itong muling gumuho.

Watch out for possible flashfloods if the landslide blocked the water flow.

Matyagan ang posibleng biglaang pagbaha kung ang landslide ay nakapagbara sa daluyan ng tubig.

Check for missing persons and report it to authorities so that rescue operations can start immediately.

Alamin kung may nawawalang tao at ipagbigay-alam ito sa kinauukulan upang masimulan ang paghahanap sa kanila.

Monitor the latest advisories and warnings. Report damaged power, water, and telephone lines.

Subaybayan ang pinakahuling babala. I-report ang nasirang linya ng kuryente, tubig, at telepono.

Check for damaged foundation and other parts of the house or building. Have these repaired when condition is clear and there is no more landslide threat.

Alamin kung may sira ang pundasyon at iba pang bahagi ng bahay o gusali, at ayusin kapag wala nang banta ng landslide.



STORM SURGE

is the abnormal rise of seawater due to the low pressure, high winds, and high waves associated with a tropical cyclone.

ay ang hindi normal na pagtaas ng tubig dagat dahil sa mahinang pressure, malakas na hangin, at mataas na alon na kadalasang kaakibat ng bagyo.

WHAT TO DO BEFORE AND DURING STORM SURGE - FOR INDIVIDUALS:

ANG MGA DAPAT GAWIN BAGO AT KAPAG MAYROONG STORM SURGE PARA SA MGA INDIBIDWAL:

Monitor the public weather forecasts, bulletins and warnings issued by DOST-PAGASA.

Alamin ang pinakahuling impormasyon hinggil sa taya ng panahon mula sa DOST-PAGASA.



Make plans for evacuation to higher grounds or evacuation centers before the storm surge happens.

Bago pa man magkaroon ng storm surge ay magplano na tungkol sa paglikas sa mga matataas na lugar o evacuation center.



Secure your home. Move essential items to the upper floor. If you have time, bring your outdoor furniture inside the house.

Siguraduhing ligtas ang inyong tahanan laban sa storm surge. lakyat ang mga mahahalagang kagamitan sa mas mataas na parte ng inyong bahay. Kapag may panahon pa, ipasok sa loob ng bahay ang mga kagamitang nasa labas.



Turn off utilities, main switches, and valves. Disconnect electrical appliances. Do not touch electrical equipment if you are wet or standing in water.

Patayin ang main switch ng kuryente. Tanggalin sa saksakan ang mga appliances at huwag hahawakan ang mga ito kung kayo ay basa o nakatayo sa may tubig.



If you are to evacuate, bring essential items like food, water, flashlight, clothes, transistor radio, cellphone, medicines, and vital documents. Make sure that these are wrapped in plastic or water-resistant containers.

Kung kayo ay lilikas, siguraduhing dalhin ang mga mahahalagang bagay tulad ng pagkain, tubig, flashlight, damit, radyo, cellphone, gamot, at mga mahahalagang dokumento. Siguraduhing ito ay nakabalot sa plastic o anumang lalagyan na hindi nababasa o napapasok ng tubig.



WHAT TO DO BEFORE AND DURING STORM SURGE - FOR COMMUNITIES:

ANG MGA DAPAT GAWIN BAGO AT KAPAG MAYROONG STORM SURGE PARA SA KOMUNIDAD:

Leaders should prepare evacuation plans and procedures, and review all aspects of disaster preparedness plan.

Dapat magplano ang mga namumuno sa lugar hinggil sa paglikas at mga hakbang upang maipatupad ito ng tama. Dapat ding suriin ang lahat ng aspeto ng plano ukol sa paghahanda ng pamayanan laban sa sakuna.



Conduct periodic drills and exercises to familiarize every community member with actual storm surge situations.

Magsagawa ng regular na drill at pagsasanay upang maging pamilyar ang bawat miyembro ng komunidad sa mga dapat gawin kung mayroong banta ng storm surge.



Evacuate people as soon as possible to higher grounds when a storm or typhoon approaches your coastal community.

Agarang ilikas ang mga taong nakatira malapit sa baybaying dagat patungo sa matataas na lugar kung paparating na ang bagyo sa komunidad.



Ensure systematic safekeeping of valuables, efficient transport system, rescue operation procedures, and relief and rehabilitation activities.

Siguruhaing maayos ang pamamaraan ng mga sumusunod: pagtatago ng mga mahahalagang bagay, pagdadala ng mga lumilikas na tao sa evacuation site at pagsasagawa ng rescue operations, relief at rehabilitation.



TSUNAMI

is a series of waves usually caused by an earthquake that happens under the sea. It is different from a storm surge.
ay ang sunod-sunod na pag-alon na kadalasang likha ng lindol sa ilalim ng dagat. Ito ay iba sa storm surge.

THREE SIGNS OF AN INCOMING LOCAL TSUNAMI: TATLONG SENYALES NG PARATING NA LOKAL NA TSUNAMI:



1. Earthquake that is strong enough to be felt.
Lindol na may sapat na lakas para maramdaman.



2. Sudden drop or rise of sea water.
Biglaang pagbaba o pagtaas ng tubig-dagat.



3. Roaring sound of incoming waves.
Dagundong na likha ng papalapit na alon.

WHAT TO DO: ANO ANG DAPAT GAWIN:

ADVISORY: No tsunami threat
Paalala: Walang banta ng tsunami

A large earthquake happened but will not cause a tsunami or if it will produce a tsunami, it will not reach the Philippines.

Nagkaroon ng malaking lindol ngunit walang kakayahang lumikha ng tsunami o kung mayroon man ay di makakaabot sa Pilipinas.

No evacuation needed.
Hindi kailangang lumikas.



ADVISORY: Minor sea level disturbance
Paalala: Bahagyang pagbabago sa antas ng tubig sa baybaying-dagat

There is minor sea level change in coastal areas with wave heights of less than one meter above the expected ocean tides.

May bahagyang pagtaas sa antas ng tubig sa mga ilang baybaying-dagat; ang mga alon na ito ay mas mababaw sa isang metro dagdag sa inaasahang ocean tide.



Stay away from the beach and don't go to the coast.
Lumayo at huwag magtungo sa dalampasigan.

Keep boats away from the dock, shore, and shallow parts of the sea.
Ilayo ang mga bangka sa daungan, wawa, o mababaw na bahagi ng dagat.



Fishermen whose boats are already out in the seas should stay in deep waters as tsunamis in those parts are not very high.
Pag pumalao't na ang bangka bago ang paalala, manatili sa malalim na bahagi ng dagat kung saan ang tsunami ay hindi mataas.



TSUNAMI WARNING: BABALA NG TSUNAMI:

A destructive tsunami is expected with life threatening wave heights of greater than one meter above the expected ocean tides.
Inaasahan ang mapanganib na tsunami sa mga baybaying dagat. Ang mga alon nito ay may taas na isang metro o higit pa dagdag sa inaasahang ocean tide.



Immediate evacuation of coastal communities that may be affected is strongly advised.
Dapat agarang lumikas ang mga komunidad na nasa baybaying-dagat na maaaring maapektuhan.



Keep boats away from the dock, shore, and shallow parts of the sea.
Ilayo ang mga bangka sa daungan, wawa, o mababaw na bahagi ng dagat.



Fishermen whose boats are already out in the seas should stay in deep waters as tsunamis in those parts are not very high.
Pag pumalao't na ang bangka bago ang babala, manatili sa malalim na bahagi ng dagat kung saan ang tsunami ay hindi mataas.

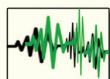


Don't go back to the shore until DOST-PHIVOLCS issues an advisory stating that the tsunami threat has passed or local authorities give an "all clear" advisory meaning it is safe to go back.
Huwag bumalik sa baybaying-dagat hangga't walang advisory mula sa DOST-PHIVOLCS na wala nang banta ng tsunami o "all clear" advisory mula sa mga lokal na namumuno na nagsasaad na ligtas nang bumalik sa inyong lugar.



ADVISORY: Sea level change monitoring
Paalala: Pagbabantay sa pagbabago ng antas ng tubig sa baybaying-dagat

Stay informed of updates coming from DOST-PHIVOLCS.
Bantayan ang mga pahayag ng DOST-PHIVOLCS.



PHIVOLCS does not issue an "all clear" advisory. It is the local authorities who should do this especially when there is a tsunami which affects the coastal area. PHIVOLCS will lower or cancel alert if there is no more tsunami threat.

Ang "all clear" advisory ay magmumula sa mga lokal na awtoridad at hindi sa PHIVOLCS, lalo na kapag ang tsunami ay makakaapekto sa mga baybaying-dagat. Ang PHIVOLCS ay nagbababa o nagkakansela lamang ng babala kapag wala nang banta ng tsunami.

TYPHOON BAGYO

WHAT TO DO DURING PUBLIC STORM SIGNAL NO. 1:

ANG MGA DAPAT GAWIN KAPAG MAY BABALA NG BAGYO BILANG 1:

Follow latest information on the weather disturbance on the radio, television or the internet. Sundan ang pinakahuling impormasyon hinggil sa bagyo sa radyo, telebisyon o internet.



Check the stability of the house to withstand strong winds and strengthen it if necessary.

Suriin ang istruktura ng bahay kung ito ay may sapat na kakayahan na makakatagal sa malakas na unos. Dagdagan ng suporta ang mga haligi kung kinakailangan.



Monitor the latest severe weather bulletin issued by DOST-PAGASA every six hours. In the meantime, business may be carried out as usual except when flood occurs.

Alamin ang pinakahuling impormasyon hinggil sa bagyo mula sa DOST-PAGASA kada anim na oras. Samantala, maari pa ring ipagpatuloy ang mga karaniwang gawain maliban kung mayroon nang pagbaha.



WHAT TO DO DURING PUBLIC STORM SIGNAL NO. 3:

ANG MGA DAPAT GAWIN KAPAG MAY BABALA NG BAGYO BILANG 3:

Keep your radio on and listen to the latest news about typhoon.

Ugaliing makinig sa radyo para sa pinakahuling impormasyon hinggil sa bagyo.



Stay in safe and strong houses. Evacuate from low-lying areas to higher grounds.

Manatili sa loob ng bahay o sa ligtas at matatag na gusali. Lumikas sa matataas na lugar.



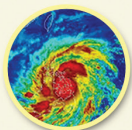
Stay away from riverbanks and coastal areas for possible storm surge and flash flood.

Lumayo sa tabing dagat o sa mga pampang ng ilog upang makaiwas sa storm surge at biglaang pagbaha.



Watch out for the passage of the eye of the typhoon where areas become temporarily calm and may even have clear skies. As the eye passes, however, the bad weather resumes.

Antabayanan ang pagdaan ng mata ng bagyo kung saan pansamantalang nagiging kalmado ang paligid, subalit pagkatapos nito ay muling makakaranas ng masamang panahon.



WHAT TO DO DURING PUBLIC STORM SIGNAL NO. 2:

ANG MGA DAPAT GAWIN KAPAG MAY BABALA NG BAGYO BILANG 2:

Give special attention to the latest position, direction and speed of the storm as it intensifies.

Alamin ang kasalukuyang posisyon, direksyon, at bilis ng bagyo habang ito ay papalapit sa mga apektadong lugar.



Avoid unnecessary risks, especially in travelling by sea and air.

Ipagpaliban ang paglayag o pagbiyahe upang makaiwas sa panganib.



Protect properties before signals are upgraded.

Siguraduhing nasa ayos ang mga ari-arian bago pa man itaas ang babala ng bilang ng bagyo.



Board up windows or put storm shutters in place and securely fasten them. Stay at home.

Siguraduhing maayos ang pagkakasara ng mga bintana. Manatili sa loob ng bahay.



WHAT TO DO DURING PUBLIC STORM SIGNAL NO. 4:

ANG MGA DAPAT GAWIN KAPAG MAY BABALA NG BAGYO BILANG 4:

Stay in safe houses or evacuation centers.

Manatili sa loob ng bahay o evacuation centers.

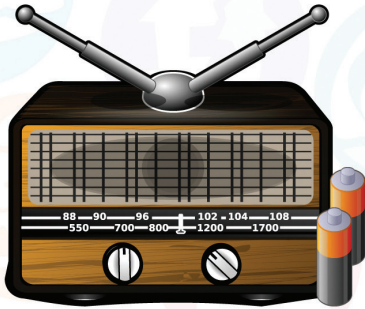


All travels and outdoor activities should be cancelled.

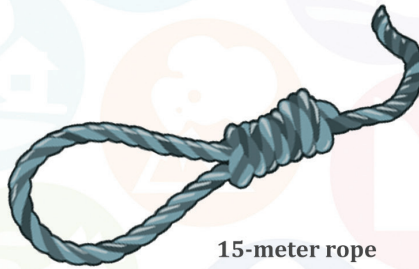
Ipagpaliban ang lahat ng byahe at mga panglabas na aktibidad.



SURVIVAL KIT



transistor radio and batteries



15-meter rope



first aid kit



matches



flashlight and batteries



canned food



drinking water



important documents



sanitary napkin



extra clothes



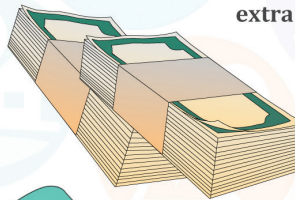
waterproof bag



cellphone



pocket knife



money



whistle



watch



SCIENCE NATION

Philippines: A Science Nation Meeting Global Challenges

exhibits • events • inventions • exhibits • events • inventions • exhibits • events • inventions

REMOTE SENSING

SCIENCE, TECHNOLOGY &
INNOVATION

INVENTIONS

GENOMICS

BIOTECHNOLOGY

APPLICATIONS

FIBER OPTICS

S&T DISASTER PREPAREDNESS

LIDAR

NOAH



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