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S&T POST

JAN-MAR 2020

Science Resiliency

Special Feature on

COVID-19 PRIMER

EDITORIAL

Science Resiliency

The year 2020 will forever be etched in our history as it marked the eruption of Taal volcano after 42 years of dormancy. Months after the country gradually recovers from its eruption, we were then struck by the Coronavirus disease (COVID-19)a– n invisible enemy that affected not just our country but the entire world.

Since then, we have been living in a rather peculiar timei— n a "new normal", so they say. In spite of these uncertainties, one thing remains certain: our nation's resiliency.

According to the website of "Resilience", a program of the non-profit organization Post Carbon Institute, resilience is defined as the "capacity of a system to absorb disturbance and reorganize so as to retain essentially the same function, structure, and feedbacks; that is, it is to have the same identity." In other words, it is the "ability to cope with shocks and keep functioning in much the same kind of way as before."

If there is one thing the Filipinos are well-known for, that would be our resiliencyo– ur ability to get back up, stronger than ever, no matter what the circumstance is. But our resilience lies greatly on how well we are able to manage disaster risks. We have witnessed how the Department of Science and Technology-Philippine Institute of Volcanology and Seismology (DOST-PHIVOLCS) led us in achieving that during the Taal volcano eruption on 12 January 2020. In this first issue of S&T Post for 2020, we featured the stories of our dedicated team of volcanologists and geologists from the DOST-PHIVOLCS who worked tirelessly at the frontlines while monitoring the activities of Taal volcano. We also have inspiring stories of DOST-PHIVOLCS Officer-in-Charge Dr. Renato U. Solidum Jr., and Ma. Antonia V. Bornas, chief of Volcano Monitoring and Eruption Prediction Division who led the country in providing timely, relevant, and accurate updates about the eruption.

Featured also in this issue is a special section dedicated to COVID-19 as a primer on what to ep ect on the nek issue of the magazine. We have stories on *Pinoy*-made COVID-19 test kit, R ox or the portable medical device which can help lessen person-to-person contact for patients and doctors, re-washable face masks, and RapidPass.ph or the QR-code based identification system to provide ease of passage for frontliners, and other combined efforts of DOST during the first few months that the country was hit by COVID-19.

In time of crisis, DOST recognizes that now, more than ever, is the time for us to stand true and firm to our science, to continuously deliver accurate and relevant information, and to provide technology-based innovations to our fellow Filipinos. As we inculcate science and technology to the people, we lead them to data-driven decisions and policies, which would help us to be more resilient as one nation.

Richard P. Burgos
Director, STII

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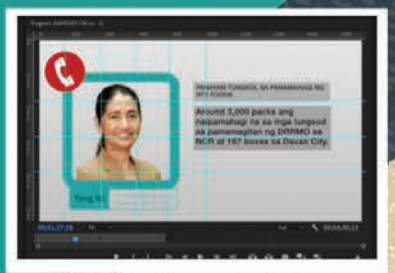

DOSTv
Science For The People

S&T POST

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ABOUT THE COVER

The 1st quarter issue of S&T Post highlights disaster resiliency of the country with the help of significant efforts from the Department of Science and Technology (DOST). Our cover photo depicts the hard work of the dedicated team from the DOST-Philippine Institute of Volcanology and Seismology (PHIVOLCS) led by DOST-PHIVOLCS Officer-in-Charge Dr. Renato U. Solidum Jr. and DOST-PHIVOLCS Division Chief Ma. Antonia V. Bornas as they continue to study and monitor geological hazards, like the recent Taal Volcano eruption. In addition, this issue features a primer of the upcoming 2nd quarter issue, focusing on the programs and projects that DOST developed and funded to help combat COVID-19.

PH, Japan, UK eye collaboration for sustainable coastal communities

By Raissa Jean A. Ancheta, *DOST-PCIEERD*
Photos from DOST-PCIEERD

In-situ (on-site) measurement of seagrass leaf area in Busuanga, Palawan is part of the lAMBIueCECAM program or the Integrated Assessment and Modelling of Blue Carbon Ecosystems Conservation and Adaptive Management—one of the DOST-supported programs on coastal management.

IN A bid to come up with technologies that support sustainable coastal communities, the science agencies of Japan, the United Kingdom (UK), and the Philippines initiated the crafting of a framework for a multi-funder cooperation among the three countries.

The Japan Science and Technology Agency (JST), UK Research and Innovation (UKRI), and the Philippines' Department of Science and Technology (DOST) convened researchers and stakeholders from Southeast Asian countries to discuss recent studies on coastal communities and brainstorm on ideas for possible research collaboration.

The JST, UKRI, and the DOST are focused on resolving global challenges, propelled by the United Nation's Sustainable Development Goals (SDGs) agenda. Collaboration among these institutions is encouraged as it increases the complementarity and impact of investments in terms of research funding, people, equipment, data, and other resources.

Dr. Enrico C. Paringit, executive director of the DOST-Philippine Council for Industry, Energy, and Emerging Technology Research and Development (PCIEERD), stressed that the cooperation between Japan, UK, and the Philippines should benefit coastal communities that face threats of climate change.

"Having a multilateral approach to support research initiatives is a way for us to optimize resources. There are research resources available in other countries that may be beneficial in the implementation of research projects here in the Philippines," he said.

The multilateral cooperation will focus on sustainable coastal communities as several projects in the Southeast Asian region were identified as having a thematic focus on water, coastal communities, and aquaculture—topics that are relevant to the SDGs. One major discussion during the workshop was the participants' experience with funding agencies that will be the basis for the development of an effective multi-funder mechanism.

The JST, UKRI, and the DOST will consolidate the inputs from the workshop and come up with a framework for a multi-funder cooperation that may take effect in the following years.

From left to right: Osamu Kobayashi, director of the Department of International Affairs, JST; Dr. Mark Claydon-Smith, deputy director of the UK International Development, UKRI; and Dr. Enrico C. Paringit, executive director of DOST-PCIEERD, lead the multilateral cooperation on sustainable coastal communities.

Talaandig tribe, other IP groups benefit from DOST-FPRDI's R&D program

By Apple Jean C. Martin-de Leon, *DOST-FPRDI*
Photos from DOST-FPRDI

DATU RODELIO "Waway" Saway is not called tatay for nothing. A teacher at the Talaandig School of Living Traditions in Bukidnon and a well-known performing artist, Saway has been keeping the Talaandig musical heritage intact by mentoring young members of their tribe. Community artists would always go to their "Tatay Waway" to learn how to play and craft their indigenous musical instruments.

"We use our traditional instruments to pray and connect with the Divine. Playing them is like opening a portal to the spiritual world," explained Saway, who traveled the world flaunting the Talaandig's own brand of music.

"Despite the availability of tools that makes the production of bamboo musical instruments (BMI) easier, there are still issues affecting the durability of the instruments. There are times when our BMIs crack when brought to temperate countries. Some get infested by powder-post beetle (*bukbok*)," he noted.

Through the initiative of the Department of Science and Technology-Forest Products Research and Development Institute (DOST-FPRDI), a research program is now being implemented—aimed at making better-quality BMIs. The program, in partnership with the University of the Philippines Diliman's Center for Ethnomusicology and the Philippine Normal University, aims to develop technologies that can help people like Saway and other local BMI makers and users.

"We have been going around various indigenous communities and BMI production sites in the country to talk to key people and understand how important BMIs are in their local culture. We want to know how we can work together with them to improve these instruments," shared Aralyn L. Quintos, program leader of the research and development program.

This R&D program seeks to develop technologies that will prolong the life of bamboo without negatively affecting the musical instruments' sound quality; standardize the production of selected BMIs; develop prototype design; analyze raw material sources and existing markets; and build a BMI processing facility.

According to Saway, long before their BMIs have been mass produced, they have crafted numerous kinds of BMIs such as the *pulala* (lip valley notch flute), *tumpuy* (chip-on-ledge flute), *hulagteb* (side-blown flute), *takumbo* (parallel-stringed zither), and *bantula* (slit drum).

"We have a lot of creative people here. The Talaandigs have been producing BMIs for a long time already, and I think we are ready for their mass production. What we lack, however, are technologies, particularly a treatment facility for bamboo," ended Saway.

Datu Rodelio "Waway" Saway playing the pulala

(Left) A datu plays the takumbo (parallel-stringed zither). (Right) Ornate patterns etched on a bamboo flute

Living at the foothills of the Kitanglad Mountain Ranges in Bukidnon, the Talaandigs create music reminiscent of the rustling of leaves and the chirping of birds. Realizing the importance of music to the lives of the Talaandigs, the DOST-FPRDI—together with its partners—is fully dedicated to helping them preserve their rich musical tradition.

DOST-FPRDI's Transit Testing Laboratory acquires new machines

By Juliemar V. Purificacion, *DOST-FPRDI*
Photos from DOST-FPRDI

THE DEPARTMENT of Science and Technology-Forest Products Research and Development Institute (DOST-FPRDI) Transit Testing Laboratory (TTL) recently acquired new machines to meet the local furniture industry's growing demand for package product testing. The TTL is one of the FPRDI Furniture Testing Center's (FFTC) laboratories.

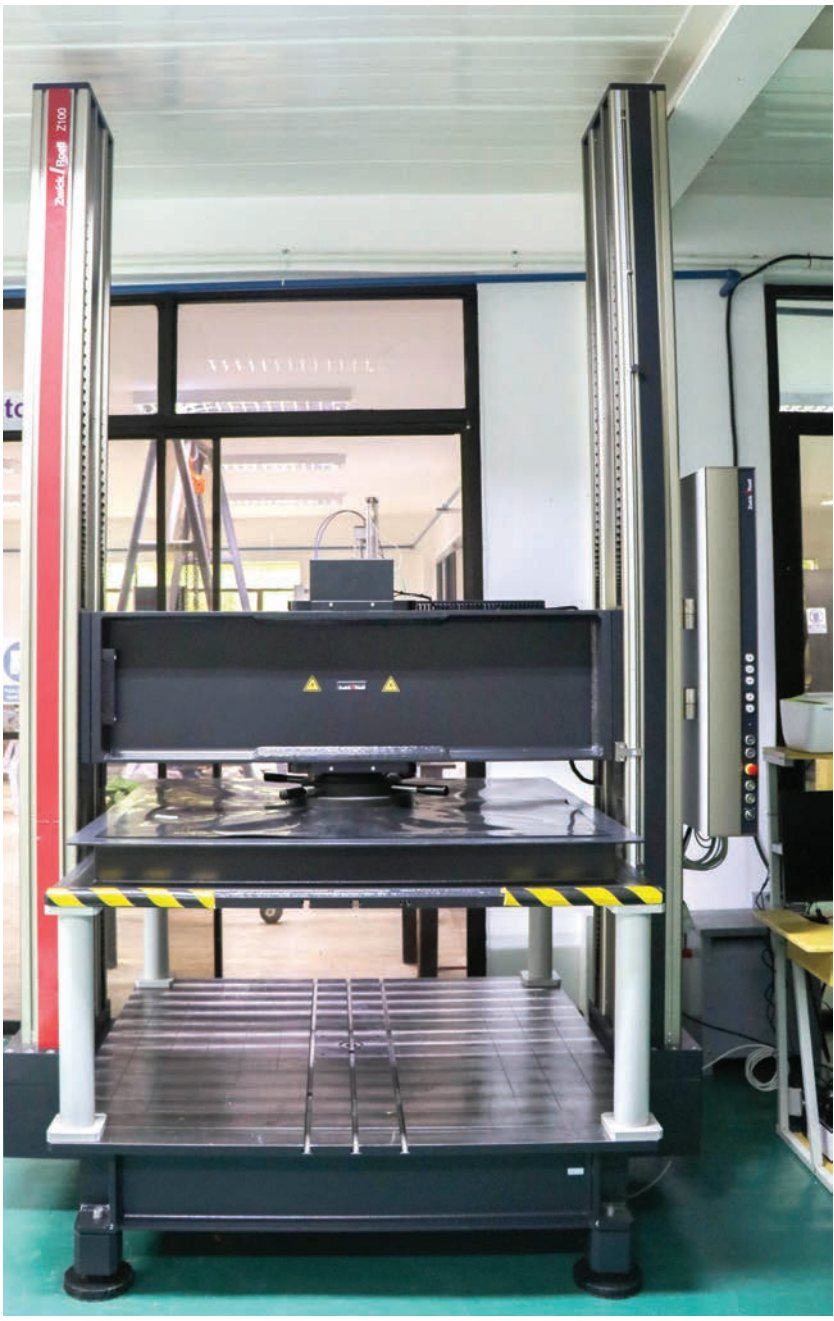
According to FFTC's Technical Manager Engr. Victor G. Revilleza, the newly acquired compression machine is designed to determine the behavior of a package under compression force. It simulates resistance of packaged products to warehouse stacking load.

The humidity chamber, on the other hand, is designed to test the shelf life and stability of packaging materials, chemicals, food, drugs, and cosmetics, among others.

The TTL currently offers five laboratory tests: drop, incline impact, horizontal impact, vertical impact, and vibration tests. With the new machines, the center now also offers compression and atmospheric tests.

The newly acquired equipment are meant to better serve not only local furniture manufacturers but also other industries that require testing services to improve protective packaging effectiveness.

Humidity chamber



Compression machine

DOST bags FOI Awards

Text and photo by Louella D. Labasbas, *DOST-STII*

(From left to right): PCOO Assistant Secretary Kristian R. Ablan, together with DOST-STII Director Richard P. Burgos who received the FOI Special Award for STARBOOKS and DOST Assistant Secretary for Administration and Legal Affairs Teodoro M. Gatchalian with the FOI Portal Award for Top Requested Agencies during the 2019 FOI Awards held on 12 December 2019 at The Peninsula Manila, Makati City.

ANOTHER ROSTER of champions in the government has been recognized in the 2019 FOI Awards, including the Department of Science and Technology (DOST) and two of its agencies—DOST-Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA) and DOST-Science and Technology Information Institute (STII).

The Freedom of Information (FOI)—issued as Executive Order No. 2, series of 2016—operationalizes the people's constitutional right to information and state policies to full public disclosure and transparency in public service. With this, access to information serves as one of the key indicators of good governance.

In his speech, Presidential Communications Operations Office (PCOO) Secretary and FOI Champion Jose Ruperto Martin M. Andanar emphasized that implementing a new program and embedding new culture in public governance involved immense challenge to weave government agencies together in delivering government information and rebuilding of trust.

"The government and people are interdependent to each other—that the government cannot achieve a great cause without citizen participation," added Secretary Andanar.

During the ceremony, DOST Assistant Secretary for Administration and Legal Affairs Teodoro M. Gatchalian received the 2019 eFOI Portal Award on behalf of DOST Secretary Fortunato T. de la Peña. This recognition is conferred to national government agencies for exceptional performance in processing and responding to the requests in the eFOI portal—with above 50 eFOI requests and with at least 80% of resolved transactions.

The DOST-PAGASA, represented by Jose Daniel C. Suarez and Rosalina G. de Guzman, also received an award for top requested agencies with at least 250 eFOI requests and with at least 80% of resolved transactions.

Meanwhile, the DOST-STII—led by Director Richard P. Burgos—received a special award for STARBOOKS for its efforts in providing the first Philippine science digital library. The partnership between PCOO and DOST-STII establishes another platform to disclose information and data, which would be disseminated through STARBOOKS.

The 2019 FOI Awards was held on 11–12 December 2019 at The Peninsula Manila, Makati City.

DOSTv wins in "OSCARS of PR in PH" at the 55th Anvil Awards

By Karl Raven A. Ramon, *DOST-STII*

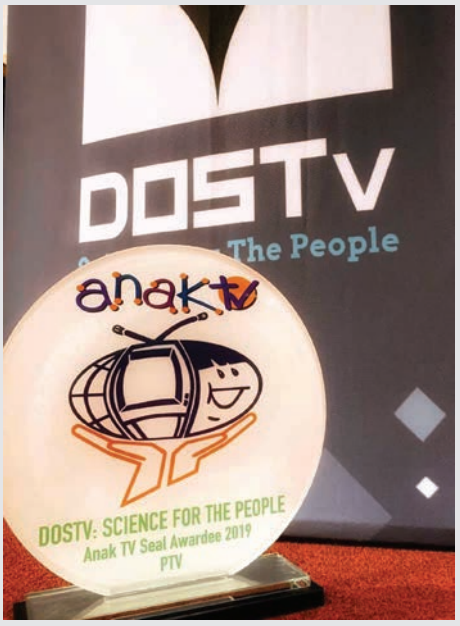
EVEN IN the midst of all uncertainties DOSTv under the Department of Science and Technology-Science and Technology Information Institute (DOST-STII) has every reason to catch the mood for celebration when it bagged three Anvil Awards from Public Relations Society of the Philippines. Anvil Award is the most prestigious award for public relations in the country, considered by many as the Oscars of the PR industry here in the Philippines.

Two Silver Anvils for DOSTv being an excellent PR PROGRAM on science and technology (S&T) and for excellent PR TOOL (online/multimedia). Thrilled to receive the first two accolades DOSTv went on to receive the Gold Anvil for being an excellent PR PROGRAM on S&T during the 55th Anvil Awards on 28 February 2020 at the Manila Hotel.

Just a year ago, DOSTv received the Anak TV seal in 2018 for 2019 but receiving it again in 2019 for 2020 as a child-safe, family-friendly TV fare did not diminish the excitement. (see below pictures of 2018-2019 Anak TV Seal recognition respectively)

Not to forget public service in government, DOSTv stood out to be one of the finalists during Development Academy of the Philippines' (DAP) Government Best Practice Recognition in 2019.

Gel Miranda, DOSTv's multi-awarded female science host covering various S&T stories since 2016, proudly holds one of their Anvil Awards (Photo by Jeffrey Centeno, DOST-STII)



DOSTv's Anak TV Seal award in 2019 (Photo from Henry A. de Leon, DOST-STII)

DOST-STII Director Richard P. Burgos (leftmost) and Mona Carina E. Montevirgen (rightmost), officer-in-charge of DOST-STII's Communication Resources and Production Division during the Anak TV seal awarding in 2018. (Photo from DOST-STII Facebook page)

DOSTv's plaque of recognition from DAP in 2019

Photo by Ma. Lotuslei P. Dimagiba, *DOST-STII*

DOSTV CONTINUES to dominate your daily science cravings loaded with news and developmental oriented stories. These stories were recognized by UPLB's 2020 Gandingan Awards in four (4) categories:

1. GANDINGAN NG KAUNLARAN: Most Development Oriented Radio/TV/ Online Platform— Submitted entry featured separate stories about Septic Waste in Siargao, How Science and Math are being taught in A Deaf School, Livelihood Program inside a Prison, and A laboratory that stimulates Halal market
2. MOST DEVELOPMENT-ORIENTED SCIENCE AND TECHNOLOGY—The submitted entry was a featured scientific breakthrough in DNA identification used for sexual crimes investigations
3. MOST DEVELOPMENT ORIENTED LIVELIHOOD PROGRAM—It one feature episode, it tackles SWABE Herbal Tea as the Mystique Tea produced by a Women Group in Siquijor.
4. MOST DEVELOPMENT-ORIENTED FEATURE STORY—The submitted entry was an in-depth story of inmates in a prison baking breads and pastries for additional income.

DOSTv has partially halted its episodes on PTV4 due to the COVID-19 pandemic, but the team easily took on the online platform to continue bringing science and technology news to people's mobile devices. Established in 2016, DOSTv is the official weather, science and technology Television program of the DOST to communicate Science For The People, promote a culture of science and technology, and raise the aspirations of our youth to pursue careers in Science, Technology, Engineering, and Mathematics (STEM), and be the leaders of the future.

To cap the joyous season of awards and recognitions, DOSTv took another much coveted spot at the NEDA's list of this year's National Priority Projects (NPP) along with STARBOOKS (also an innovation from DOST-STII) besting various big projects in other government agencies. An NPP lister accords tax credits to any entity that supports DOSTv activities and projects.

With enough resources and opportunities for creativity, and perhaps after the COVID-19 crisis, DOSTv will continue exploring new grounds on how to best deliver information straight to homes and presenting a variety of benefits to its growing tribe of viewers.

And while recognitions and awards provide a huge motivation to do better, the sweeter reward would be to see people using science and technology information to solve problems, increase income, help the less fortunate and in becoming an enhanced version of ourselves.

DOST, LGU eyeing to increase S&T interest among Isabela youth via Science Centrum

Text and photos by Allan Mauro V. Marfal, *DOST-STII*

CAUAYAN CITY—THE Cagayan Valley Science Centrum at the Hacienda San Luis in Cauayan City, Isabela has formally opened on 28 January 2020 as the Department of Science and Technology (DOST)-Region II aims to explain the benefits of science and technology (S&T) among young students in a more meaningful and easy to understand ways.

In partnership with the Philippine Foundation for Science and Technology (PFST) and the City Government of Cauayan, the Cagayan Valley Science Centrum in Isabela features interactive exhibits on various science concepts and processes, wherein making it experiential for student-visitors and would not only see the explanation of each exhibit but could also enjoy doing activities related to them.

The said learning facility contains 25 units of interactive exhibits that are curriculum-ready as per the aligned with Department of Education's (DepED) K-12 program. Some of the exhibits include "Gravity Well", "Finger Tingler", "Anti-Gravity Mirror", "Laser Harp", "Rope Puzzle", "Following Faces", and "Whisper Dish", among others.

According to Engr. Sancho A. Mabborang, regional director of DOST-II, the said science centrum could inspire and encourage elementary and secondary students in Isabela to become scientists, engineers, geologists, or agriculturists in years to come.

"Among the goal of the Cagayan Valley Science Centrum is to help in strengthening the pool of S&T workers and experts, not only in the province of Isabela but also in the entire region. These future scientists could spearhead various researches and innovative projects that would address the existing problems in the region and in the province," Engr. Mabborang emphasized.

Meanwhile, Cauayan City Mayor Bernard Faustino L. Dy said that the city government has been always putting prime considerations in attaining good education, especially access to innovative schools and available training facilities.

"Our [City Government of Cauayan] efforts to provide permanent area for the Cagayan Valley Science Centrum in Isabela is anchored on wanting to promote awareness and appreciation of STEM (science, technology, engineering, and mathematics) principles among our pupils and students," said Mayor Dy.

Mayor Dy also shared that the total cost for the establishment of Cagayan Valley Science Centrum is PhP 13,965,000—62% of which came from the City Government of Cauayan while the remaining 38% was shouldered by DOST Central Office and DOST-II. He also said that the city government will charge minimal fee to support the maintenance of the Cagayan Valley Science Centrum.

One of the staff of the Cagayan Valley Science Centrum in Cauayan City, Isabela demonstrates how the "Van de Graaff Generator" works.

Also in the attendance during the inauguration of Cagayan Valley Science Centrum were DOST Secretary Fortunato T. de la Peña, DOST Undersecretary for Regional Operations Brenda L. Nazareth-Manzano, and Isabela State University President Dr. Ricmar P. Aquino.

A staff of the Cagayan Valley Science Centrum in Cauayan City, Isabela facilitates several interactive activities for the student-visitors after it formally opened on 28 January 2020.

Several students in Cauayan City enjoy one of the featured interactive exhibits in Cagayan Valley Science Centrum.

DOST promotes 'punctuality' as a key driver for success and unity

By Allan Mauro V. Marfal, *DOST-STII*

FOR EVERY one of us, dealing with time, schedule, and deadlines are things that we could not avoid of. From the deliverables that we need to submit to our client or colleagues until to our obligatory appointment to our partners, all of these have required specific hour, time, and second for us to attend it.

The habit of being on time in all kinds of businesses and activities is what the Department of Science and Technology (DOST) would like to instill in the mind of every Filipino, especially as the New Year and new decade kicked-off.

From 01-07 January 2020, the Department led the observance of the National Time Consciousness Week. This is at the core of Republic Act (RA) No. 10535 better known as "the Philippine Standard Time (PhST) Act of 2013". It was signed into law by former President Benigno C. Aquino III in May 2013, declaring the first week of every year to hold the said observation.

The law requires all national and local government agencies as well as broadcasting companies to adhere to and display the PhST in their respective offices. This makes these entities not only united but also in sync with each other, a perfect gesture of synergy needed to efficiently run a bureaucracy.

The Philippine Atmospheric, Geophysical and Astronomical Services Administration or PAGASA of the Department of Science and Technology is tasked to be the official timekeeper.

In his statement, DOST-Science and Technology Information Institute (STII) Director Richard P. Burgos said that in the digital age that we live in right now, we can say that time is indeed gold; a precious commodity that all of us, rich or poor, educated or not, have in our hands.

"Time is a resource that is finite. We only have 60 seconds in one minute. We only have 60 minutes in an hour. And we only have 24 hours in a day. As time passes us by, we can no longer bring back what has been done or what has not been done. So, time is a valuable resource that we must spend wisely," said Dir. Burgos.

The GPS and the atomic clock

The PhST must be kept according to the Coordinated Universal Time (UTC)—the world's official time. How does this office ensure that we get the correct time all the time?

Since 2003, DOST-PAGASA has been using a very accurate clock—specifically a rubidium atomic clock—for time keeping. The rubidium clock is one of the two most widely-used atomic clocks in the world (the other one being the cesium clock, which is more accurate).

The rubidium clock in the DOST-PAGASA station is equipped with a receiver that receives timing signals from at least four orbiting satellites in the Global Positioning System (GPS) within its range. These satellites are each equipped with up to four atomic clocks that are periodically updated from a cesium atomic clock based in Boulder, Colorado, USA.

This system keeps the DOST-PAGASA clock synchronized to the UTC. GPS is the same technology being used for modern navigation consisting of 24 satellites that broadcast their location, status, and precise time.

Precise time is necessary for the GPS to work, as this will be used to compute for the exact location of a receiver using geometry principles.

"Juan Time for Every Juan" Campaign

The passage of the RA 10535 started in 2011 as a advocacy campaign that was called "Juan Time", a wordplay on "One Time" (single or unified time) and "Juan" being the common name for Filipinos.

Spearheaded by DOST-STII and DOST-PAGASA, a network of partners then supported the movement that includes the Metro Manila Development Authority, SM Supermalls, Nido Fortified Science Discovery Center, Timex, Petron, Chevrolet, Sagittarius Mining Corporation, Team Manila, Lamoiyan Corporation, PICAR Development, Inc., and AMA Universities, as well as media partners Discovery Channel, Business World, and People's Television Network, Inc.

In 2011, one of the country's leading pizza chain jumped into the Juan Time campaign as Pizza Hut adopted the use of the PhST as its reference for its pizza delivery service.

FireCheck makes Lapu-Lapu LGU safer

By Deane Yase, *FireCheck Project*

Fire Supt. Crispulo Eusebio Jr. (third from left) receives the fire hazard map for the whole Lapu-Lapu City. The map is handed over by (from left to right): FireCheck Project Leader Aileen Vicente, Chief LDRRMO Dr. Nagiel Bañacia, Lapu-Lapu City Mayor Junard Chan, DOST-PCIEERD Project Manager Ariadne Pada, DOST-VII Asst. Regional Director Engr. Jesus F. Zamora Jr., and UP Cebu Vice Chancellor Dr. Weena Gera. (Photo from DOST-PCIEERD)

THE CITY of Lapu-Lapu is now safer from fire. After about two years of intensive research, FireCheck—a fire hazard mapping and fire spread simulation project—turned overfire hazard and risk maps and evacuation plans to the local government of Lapu-Lapu City on 29 January 2020. The project was funded by the Department of Science and Technology-Philippine Council for Industry, Energy, and Emerging Technology Research and Development (DOST-PCIEERD).

Blazing a trail

FireCheck project's systems and technologies benefitted 19 of Lapu-Lapu City's mainland barangays, as well as the city's strategic planners, response units, and policy-makers.

Aside from mapping out fire hazards to preemptively stop fires and proactively manage risks, the FireCheck project also created 3D maps of high-risk communities rendered in a mobile application called "Blaze". The app is a Waze-like navigation app for firefighters to help facilitate speedy navigation and response around highly congested urban areas. Further, the project developed fire spread models and simulation that can provide predictive information on the possible extent of the fire and its potential damage. The fire spread simulation model will aid firefighters in determining the best course of action should a fire disaster unfold, thus giving them a distinct advantage. All of the mentioned technologies were also turned over to the city's fire district.

The innovations born out of the proactive initiative of experts from the University of the Philippines (UP) Cebu were first of their kind and were developed in close collaboration with the Bureau of Fire Protection-Lapu-Lapu, City Planning and Development Office, and Local Disaster Risk Reduction and Management Office (LDRRMO).

Information from the said maps, models, and simulations were used to improve—if not create—pre-fire plans, evacuation plans, and investment and mitigation plans for each of the city's mainland barangay.

Outsmarting Fire Through Modern Tech

The maps and technologies developed can converge to help make predictions about the likelihood of a fire scenario occurring in a specific community with more speed and accuracy than ever before. With timely and targeted information at hand, more synergistic plans and response strategies can be expected from local authorities, firefighters, responders, and other emergency services.

Spark

The same systems and technologies were turned over earlier to the local government of Mandaue and its 27 barangays on 29 November 2019. These innovations, coupled with traditional fire prevention methods, further strengthened BFP's existing Oplan Ligtas na Pamayanan program.

With smart solutions at their fingertips, cities of Lapu-Lapu and Mandaue—and soon, more cities across the Philippines—can now extinguish the increasing threat of urban fires, putting them out before they happen.

DOST, DOH to fight fake medical products online

By Geraldine B. Ducusin, *DOST-STII*

"THE PROBLEM on fake and substandard medical products is a clear and present danger. A large part of these products are being peddled online."

This was emphasized by Rolando Enrique D. Domingo, MD, DPBO—Department of Health (DOH) Undersecretary and Officer-in-Charge (OIC) Director General of Food and Drug Administration (FDA) Philippines—during the forum on the Issue of Furthering the Fight Against Falsified and Substandard Medical Products.

He added that they are looking forward to collaborating with the Department of Science and Technology (DOST) to develop a device that could swiftly detect fake medical products sold online. He cited the initiative of some pharmaceutical companies that produced such devices but exclusive to detecting counterfeits of their own brand. He recommended that DOH and DOST's collaboration would involve the development of a device that could detect counterfeits of any brand.

Domingo added that PhP 1.2 Billion worth of seized medicines and cosmetics were lost to counterfeiting in the past years, and this increased to PhP 2.2 Billion in 2019.

According to the "Special Law on Counterfeit Drugs" or Republic Act No. 8203, counterfeit drugs or medicines are those which "do not contain the amount as claimed; with wrong ingredients; without active ingredients, which result in the reduction of products' safety, efficacy, quality, strength, or purity."

A couple of popular online stores were among those ordered by the FDA to cease selling medicines online. To this day, the FDA continues to monitor these sites to ensure the safety of the buying public.

OIC Director General of FDA Philippines and DOH Undersecretary Rolando Enrique D. Domingo, MD, DPBO speaking during the DOST-NAST forum on "Furthering the Fight Against Falsified and Substandard Medical Products." (Photo by Joseph Bautista)

In 2018, some 145 countries were affected by pharmaceutical crime. Every region except Europe experienced an increase in pharmaceutical crime.

Academician Edward H.M. Wang cited that falsified medicines and cosmetics are not the only problem. There is also a problem on substandard medical devices. There are instances when the doctors themselves have no idea that the devices are below standard, only to discover later when some patients' safety was already compromised.

The forum—attended by various stakeholders from the pharmaceutical industry and the academe, medical practitioners, and health and consumer groups—was organized by the DOST-National Academy of Science and Technology (NAST) to help address locally the global problem on counterfeit medical products.

DOST, DAP tie up for Project SPARTA to produce data science graduates

By Mary Anne D. Lorenzo, *DAP*

RESEARCH SHOWS an increasing demand for data science and analytics workers in the Philippines both for local and global markets in the coming years. Asia-Pacific Economic Cooperation (APEC) projects 340,880 data science and analytics (DSA) workers will be needed in the Philippines alone by 2022. There is also a pressing need for data-driven modes of decision-making in all sectors when it comes to creating and implementing policies and strategies.

In line with this, the Department of Science and Technology - Philippine Council for Industry, Energy, and Emerging Technology Research and Development (DOST-PCIEERD)—in partnership with the Development Academy of the Philippines (DAP)—launched the Smarter Philippines through Data Analytics Research and Development (R&D), Training, and Adoption (SPARTA) on 24 February 2020 at the Green Sun Hotel in Makati City.

Project SPARTA aims to establish the necessary online education, R&D mechanisms, and infrastructure to develop the industry of data science and analytics and to mainstream it in both private and public sectors.

DAP—together with its partners, Analytics Association of the Philippines (AAP) and Coursebank—will jointly develop and launch localized massive online courses on data science, analytics, and related fields.

The Academy is also expected to train and produce 30,000 graduates in various learning pathways in the field of data science and analytics through the developed online courses for the three-year project. These courses will be aligned to the challenges of specific localities and to certain national issues.

This project will not only equip the students with knowledge and skills in data science and analytics, but will also train them and make them aware that this area of study exists and will be of great help in nation-building.

DOST Secretary Fortunato T. de la Peña (left) and DAP President and CEO Engelbert Caronan Jr. lead the launching of Project SPARTA or Smarter Philippines through Data Analytics R&D, Training, and Adoption geared to train and produce 30,000 graduates on data science and analytics by 2022. (Photo from Gerardo G. Palad, DOST-STII)

KISS AND TELL:
DOST presents KISS on Valentine's Day

Enticing KISS videos launched. *(From left to right) DOST Undersecretary for Regional Operations Brenda L. Nazareth-Manzano, DOST-STII Director Richard P. Burgos, DOST Undersecretary for R&D Dr. Rowena Cristina L. Guevara, DOST Undersecretary for Disaster Risk Reduction and Climate Change Dr. Renato U. Solidum Jr., DOST-TAPI Director Edgar I. Garcia, DOST Director for Internal Audit Service Maria Teresa B. de Guzman, and DOST-V Regional Director Rommel R. Serrano during the DOST KISS Launching on 14 February 2020 at the DOST-STII Mini Theater, Taguig City. (Photo from DOST-TAPI)*

By Jund Rian A. Doringo, *DOST-TAPI*

WITH THE goal of bringing science closer to the people, the Department of Science and Technology (DOST) launched the Knowledge and Inspiration in Science Stories (KISS) on 14 February 2020 at the DOST-Science and Technology Information Institute (STII) Mini Theater, Bicutan, Taguig City.

DOST KISS is a series of promotional videos that features the DOST projects as well as funded and generated technologies by the DOST's research and development institutes and councils, the academe, and small and medium entrepreneurs.

"To be honest, R&D (research and development) is challenging to explain for the public to fully understand and appreciate. With the DOST KISS, we hope that people will love the Department's efforts in R&D through likes, shares, and hearts on our social media accounts," said DOST Undersecretary for R&D Dr. Rowena Cristina L. Guevara.

Developed by DOST-STII and the DOST-Technology Application and Promotion Institute (TAPI), the promotional videos are uploaded to the DOST official Facebook page including the Facebook pages of DOST-STII and DOST-TAPI.

Twenty-five videos were produced by DOST-TAPI in support to the Technology Transfer Day project that provides a venue to fast-track the commercialization of DOST technologies through adoption or transfer.

Subsequently, the Technology Transfer Day offers opportunities to invest in business solutions provided by local technologies to improve agriculture productivity, industry competitiveness, and quality healthcare.

The project is an initiative to ramp up the innovative ecosystem referenced in Republic Act No. 10055 or the Philippine Technology Transfer Act of 2009, making science and technology more significant and responsive to the needs of the local market.

Among the featured technologies and services are the Biotek-M Dengue Aqua Kit, Fish-i: Smart Solutions for Sustainable Seas, and the Philippine Earth Data Resource and Observation or the PEDRO Center.

Filipinnovation poised to improve PH ranking in GII

By Jund Rian A. Doringo, *DOST-TAPI*

(From left to right) Ambassador Evan P. Garcia, permanent representative of the Philippines to the United Nations and Other International Organizations in Geneva; DOST Sec. Fortunato T. de la Peña; Andrew Michael S. Ong, director of the Regional Bureau for Asia and the Pacific of WIPO; and Dr. Sacha Wunsch-Vincent, section head of the Economics and Statistics Division of WIPO and co-editor of the GII during the GII Technical Meeting held on 17 February 2020 at the PICC, Pasay City. (Photo from DOST-TAPI)

THE DEPARTMENT of Science and Technology (DOST) Secretary Fortunato T. de la Peña cited "Filipinnovation," the Philippine National Innovation Strategy as key to sustain and improve the innovation ranking of the Philippines in the Global Innovation Index (GII).

Initially launched in 2007, Filipinnovation envisions a competitive and multidisciplinary workforce competent in producing value-added knowledge-based products and services of global standards.

The science chief's fearless forecast was revealed during the Technical Meeting and High Level Conference on GII in the Philippines on 17–18 February 2020 held at the Philippine International Convention Center, Pasay City.

Co-organized by the DOST through the Technology Application and Promotion Institute (DOST-TAPI) and the World Intellectual Property Organization (WIPO), the event brought together government heads and experts who deliberated on key policy issues, challenges, and opportunities in areas that are critical for the further improvement of the Philippine ranking in the next GIIs.

"It is with our utmost sincerity that this platform provides a broad exchange of expertise and experiences to create innovation frameworks and tools, national support systems for innovation, and government and industry collaborations to fulfill an innovative ecosystem," said DOST Sec. de la Peña.

The GII provides a summary of where an economy stands in innovation as a reference for the creation of innovation policies or amendments that promotes a synergistic relationship among the government, industry, as well as the academe—gearing towards long-term growth and sustainable productivity including employment opportunities.

It can be recalled that the Philippines' ranking made a very huge leap—indicating an improvement, from 73 in 2018 to 54 in 2019, breaking into the top 55 among 129 participating countries all over the world.

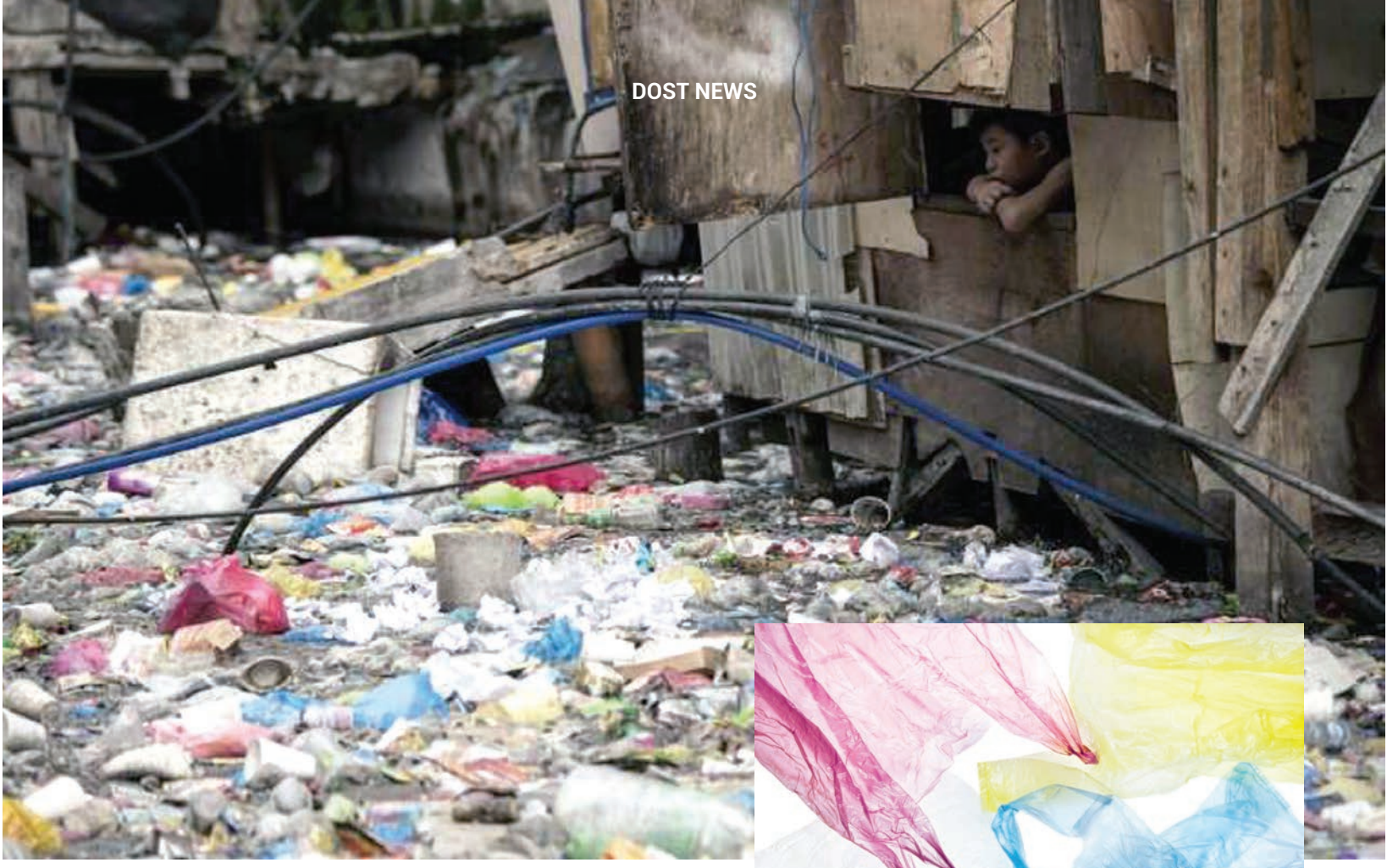
Moreover, the improvement is further signified in the GII's sub-pillars, such as trade, competition, and market scale; creative goods and services; innovation linkages; knowledge absorption; and university/industry research collaboration.

"The Science for Change Program may have contributed to the improvement in innovation ranking as the program establishes research and development (R&D) centers in the regions, facilitate the acquisition of technologies to local companies, create synergistic academe-industry relationship, and engage experts in strengthening research capabilities," said DOST Undersecretary for R&D Dr. Rowena Cristina L. Guevara.

On the other hand, the Department committed to improve the ranking in the following years by choosing an area of focus in allocating financial resources, developing a yard stick measurement of innovation, and strengthening of information dissemination.

"We also need to include technology transfer in our intellectual property programs as well as promote open innovation system to start-ups and small and medium entrepreneurs, and absorb inbound innovation as a way to brand our innovation strategies as Filipinnovation," added Sec. de la Peña.

In closing, Sec. de la Peña predicted that in the next two years, the Philippines will be in the thirty-third percentile in the GII with the concerted efforts in pursuing the Filipinnovation brand in the global arena.



Plastic pollution clogs Philippine rivers and waterways. (Photo from phys.org)

Plastic sando bags (Photo from www.kqed.org*)*

Recycling industry, retailers ask for "reasonable phase-out period" in plastic ban

By David Matthew C. Gopilan, *DOST-STII*

WHILE THE country's top science recommending body calls for crafting science-based laws on single-use plastic ban, various sectors consequently responded.

In a science legislative forum participated in by sectors advocating the banning of single-use plastics, the recycling and retailing industries proposed a gradual implementation of plastic ban in the country.

"Our appeal is for the government to have reasonable phase-out period in collaboration with industries to ensure smooth transition and integration," as recommended by Crispian N. Lao, president of the Philippine Alliance for Recycling and Materials Sustainability (PARMS). PARMS is a coalition of organizations and individuals involved in waste management value chain.

This recommendation was put forth during the science legislative forum hosted by the Department of Science and Technology – National Academy of Science and Technology (DOST-NAST) on 27 January 2020 at Hotel Jen, Pasay City. It was put up to heed opinions of various stakeholders to find holistic strategies in managing single-use plastics.

Examples of single-use plastics are *sando* shopping bags, plastic *labo* (translucent bag), and sachets, among others. The 2019 report of the Global Alliance for Incinerator Alternatives revealed that in a year, an average Filipino uses 591 pieces of sachets, 174 shopping bags, and 163 plastic labo bags. The report then critiqued not only the enormous production of single-use plastic wastes, but also how it is managed.

Lao cited the European Union (EU) as an example, where it allowed the countries to adjust in a three-year period. "Banning was not implemented overnight. Sadly, the banning of the local government units was abrupt and no alternatives were spelled out," Lao said.

Lao then recommended the following—putting recycling facilities in place before

"Plastic was made to save the planet. We just became lazy," Steven T. Cua explains. He added that the plastic bag's inventor Sten Gustaf Thulin envisioned it in a way people would have only one plastic bag and draw it out from their pockets when needed.

executing the ban; increasing the demand for recycled materials; and giving incentives to those who are already compliant.

On the other hand, Steven T. Cua, president of Philippine Amalgamated Supermarkets Association, called for citizen action in plastic ban effort. "Banning has to be in stages. Everyone should be engaged. Government could not work out without citizenry," he emphasized.

"If you suddenly ban, it will tilt the consumer-based economy of our country," Cua added as he explained that abrupt plastic ban will cause confusion among the consumer sector.

Academicians' take on single-use plastic ban

DOST-NAST President Academician Rhodora V. Azanza said that the government must not suddenly eliminate nor ban plastic use in the industry sectors and communities. "We need to fight the exponential growth of plastic use," she added while pointing out the negative aspects of sachet culture in the country.

For his part, DOST-NAST Vice President Acd. Fabian M. Dayrit said that Filipinos are now much aware of using plastics and assumed support on plastic ban. He added that a recent survey showed that seven out of 10 Filipinos agree on nationwide ban of single-use plastics. In the survey, the respondents were also asked which single-use plastics should be banned. Results showed that 71% of the respondents chose *sando* bags, plastic *labo* bags (65%), styrofoam (64%), sachets (60%), carton packaging like those in fruit juices or tetra packs (59%), plastic drinking cups (56%), utensils (54%), plastic juice bottles (49%), and plastic water bottles (41%). The survey was conducted by the Social Weather Stations, commissioned by an environmentalist group Global Alliance for Incinerator Alternatives.

Global statistics show that 75% of plastics people use are discarded as waste and non-reusable. In addition, only 15% of plastics are recycled.

Plastic pollution does not end with dealing with those visible to the naked eye or termed as macroplastics. Acd. Dayrit argued that macroplastics becoming microplastics and nanoplastics later on are an "inevitable process". Both microplastics and nanoplastics are only observable through powerful microscopes as their sizes can be as small as 100 nanometers—even smaller than a strand of human hair, which is 100,000 nanometers wide. The sparkling glitter used in arts and crafts is an example of a microplastic.

Acd. Dayrit cautioned that nanoplastics can be ingested by the fish that we eat. Once ingested, it can damage our body cells. He then recommended that a multisectoral approach in dealing with plastics is necessary and the country can start dealing with single-use plastics first.

In another front, Acd. Agnes C. Rola mentioned that the legislative branch has recently became more aggressive in managing single-use plastics. She mentioned that Senators Juan Miguel F. Zubiri, Aquilino Martin DLL. "Koko" Pimentel Jr., Loren B. Legarda, and Cynthia A. Villar have their respective bills under review to address plastic pollution.

DOST-NAST's academicians have previously emphasized during the 41st Annual Scientific Meeting held from 10–11 July 2019 the alarming levels of plastic pollution in the country. One resolution submitted was the demand for management of plastic waste. This includes accelerating research and development on single-use biodegradable packaging materials; crafting more systematic collection, reuse, and disposal of recyclable materials; and enacting and funding legislations that would dictate the phaseout of plastics in the local and national levels.

"Various stakeholders should talk or else, investments will fail," says Crispian N. Lao, president of the PARMS. (Photo by Henry A. de Leon, DOST-STII)

Acd. Fabian M. Dayrit, professor emeritus of the Ateneo de Manila University – Department of Chemistry, said that seven out of 10 Filipinos agree to implement the ban on single-use plastic.

Special Report on

Taal Volcano

ALERT LEVEL 3

Infograph from DOSTv

UP makes available map data of Taal eruption affected areas

By Mark Ivan C. Robles , DOST-PCIEERD

To help hasten the rehabilitation of affected areas devastated by the eruption of Taal volcano, the University of the Philippines (UP) opens up its map data to the public for free.

Through the UP Training Center for Applied Geodesy and Photogrammetry (UP TCAGP), the premiere state university is opening up to the public its map data of the Taal volcano and its surrounding areas generated from the Disaster Risk and Exposure Assessment for Mitigation (DREAM) and the Philippine Light Detection and Ranging 1 (Phil-LiDAR 1) programs.

Using Light Detection and Ranging (LiDAR) technology, the group was able to generate maps with resolution of up to 1x1 meter, which can be used for planning and reconstruction of areas damaged by Taal Volcano's eruption.

UP TCAGP Assistant Professor Mark Edwin A. Tupas stressed the importance of using data in conducting planning and reconstruction activities in the areas affected by the eruption.

"With the Philippines being at constant risk from natural disasters, adequate data is needed for disaster risk reduction planning and operations. We are opening up our LiDAR map database to help in the rehabilitation of those affected by the Taal Volcano eruption," he said.

According to Tupas, with the data acquired by LiDAR technology between the years 2014 to 2017, the produced dataset can be used for geomorphologic modelling (representations of Earth surface processes and landforms) of areas pre-disaster. This also includes the accurate determination of the height of buildings mapped out from satellite imagery.

The DREAM and Phil-LiDAR 1 programs are projects funded by the Department of Science and Technology (DOST) and monitored by the DOST-Philippine Council for Industry, Energy, and Emerging Technology Research and Development (PCIERRD). These projects previously mapped river basins all over the country. He said users of the map data would need to properly cite UP TCAGP and the PHIL-LIDAR Program as the source of the information.

The datasets can be accessed through https://phillidar-dad.github.io/taal-open-lidar.html and can be opened using the most modern geographic information system software.

For further inquiries, contact the data archiving and distribution team of UP TCAGP at lipad@dream.upd.edu.ph .

From our DOSTv Lens: Bantay Taal

A DOSTv Exclusive

By Karl Raven A. Ramon, *DOST-STII*

Volcanic ash emissions, flowing toxic gas (sulfur dioxide), waves of anxiety and fear, even mindless finger-pointing—these were the vignettes on 12 January 2020 as Taal Volcano suddenly took center stage bringing forth rain, mud, and ash all over Tagaytay, parts of Metro Manila, Batangas, and nearby provinces.

That Sunday afternoon, while the social media community was bursting with random photos of the volcanic activity and people were on the verge of panic,a team from the Philippine Institute of Volcanology and Seismology (PHIVOLCS) of the Department of Science and Technology (DOST) went about its usual yet crucial monitoring of Taal volcano. The observations date back to as early as March 2019, when "activity" was already detected around the volcano, hence placing the area on Alert Level 1. Some establishments were even forewarned to evacuate as early as the last quarter of 2019. It would be 10 months later when the small but smoldering Taal volcano began spewing dust or ash upward, triggering a series of earthquakes on 12 January 2020. The phenomenon did not come as a surprise among the DOST-PHIVOLCS monitoring team, hence immediately prompting the local government units (LGUs) and residents to be ready for possible evacuation anytime soon. Warning was then raised to Alert Level 2.

As a reporter and producer for DOSTv, the official broadcasting channel of DOST, I had mixed feelings of excitement and apprehension as we were about to set out on a mission to Batangas. I can still remember Mt. Mayon a couple of years back when our team covered the forced evacuation of residents in the nearby villages and we had to be hauled off in a military truck together with the homeless evacuees whom we were interviewing at that time.

When the alert level for Taal Volcano was raised to Level 4, it seemed that the anxiety was back all over again. Majority of the area were practically off limits to the people. But this did not hinder the DOST-PHIVOLCS monitoring team and the DOSTv coverage team to brave the affected area. Armed with N95 face masks, we were able to pass through several lockdown areas in Batangas. Getting in the vicinity was not even the difficult part since we have the authorities' permission to do so. Setting up our huge equipment (cameras and tripods) for the shoot was challenging since we were allowed only 10 minutes of videotaping at a time. This left us with no choice but to let our mobile phones do the work instead. A couple of takes and a few hours of editing later and we were able to produce an exclusive coverage right at the heart of the Taal eruption.

DOST's MULTI-PRONGED APPROACH TO DISASTERS

Like the famous "stormchasers" of our weather agency, DOST-Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) who must exercise vigilance in such times, we are often expected to come close to "where the action is", so to speak, regardless of the possible dangers these areas might pose for us. It felt surreal as the DOST-PHIVOLCS monitoring team along with the DOSTv crew led by our host, Gel Miranda, trooped towards the so-called "ground zero" vicinity. But while we are feeling a great sense of wanting to serve the country, we are, at the same time, wary about everyone's safety—not only from the threat of the Taal eruption but also from thieves who were then reported stealing some monitoring devices in the area. The loss of data from these equipment could impact people's lives.

The said incident all the more prompted the experts from DOST-attached agencies to collaborate in helping mitigate, monitor, and even offer support in relief operations.

1. DOST- PHIVOLCS FIELD TEAM

Geologist Jerome De Lima leads his team from DOST-PHIVOLCS to conduct Ground Deformation Survey inside the 14-km radius danger zone.

Even before the ash explosion or the phreatic explosion that has now become a more popular phrase, our resident experts from the Taal Observatory have been on high alert in monitoring ground deformation, sulfur emissions, fissures, magma indications, among others 24/7, all essential to give volcano bulletins daily. What may look like a simple one-pager bulletin is an effort of approximately more than 25 field experts combining their data obtained from Tagaytay alone.

Evacuated from the Taal Observatory in Talisay (within the 14-km radius danger zone), the field teams relocated to Tagaytay Office wherein teams of three to five people are deployed in several observation points daily. In our exclusive field report, geologist Jerome De Lima explains the importance of measuring different points along Taal Volcano to detect magma indications. The Ground Deformation Survey, a monitoring tool that studies swelling of volcano parts, indicates the existence of magma or other fluids associated with volcanic activity. *"Kadalasan ang namamaga o lumulobong lupa ay hudyat ng nalalapit na pagputok o pagsabog,"* he said.

For DOSTv story about the Ground Team in Talisay, Batangas, look for DOSTv Exclusives: BantayTaal in Facebook. ***(www.facebook.com/DOSTvPH/videos/2191164024511823/)***

2. DOST-PHIVOLCS DATA RECEIVING CENTER

Aside from DOST USec. Renato U. Solidum Jr., one expert was particularly visible during DOST-PHIVOLCS press conferences that happened almost daily. Meet the DOST-PHIVOLCS' Chief on Volcano Monitoring & Eruption Prediction Division, Ma. Antonia 'Mariton' Bornas who patiently and intelligently answered questions from the media about Taal Volcano. In our exclusive interview with Ms. Bornas regarding the reliability of volcanic equipment, she reassured the public that both Taal and Mayon volcanoes are well-monitored.

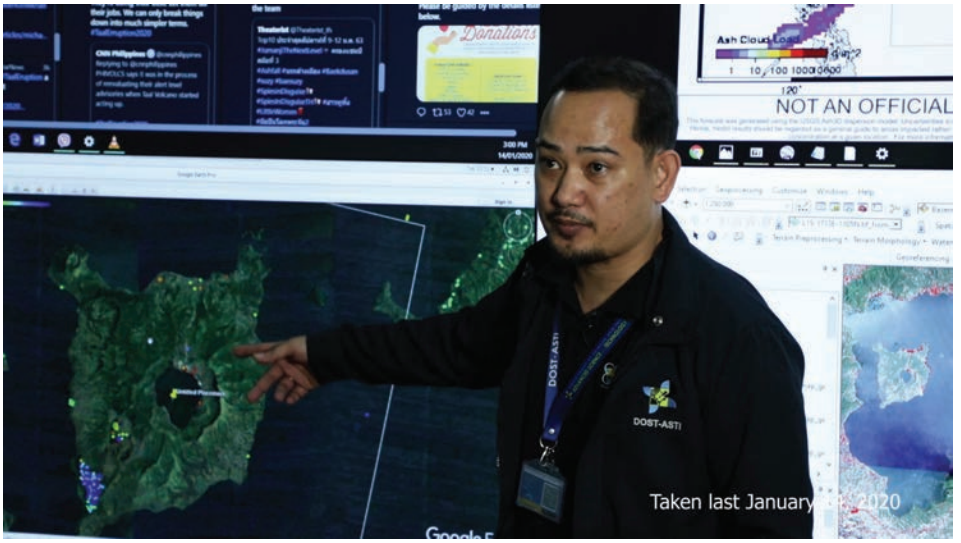
Bornas also added that devices installed near the volcano can transmit crucial information to the data receiving centre in PHIVOLCS main office in Quezon City even before they are damaged or knocked down by ash once the volcano erupts. These damaged devices are considered as *"alay"* (offering) to collect vital information. Bornas said, *"Hindi kami bulag, nakikita natin yung mga volcanic earthquakes at narerecord pa nila* [Philippine Seismic Network]." Operated by PHIVOLCS, the Philippine Seismic Network is an international network tasked to do backup monitoring.

She also attests to the sufficiency of state-of-the-art equipment in monitoring Taal Volcano, *"Meron tayong mga backup na seismometer ready for deployment once na may masira* [We have seismometers ready for deployment once these get damaged]," Bornas said.

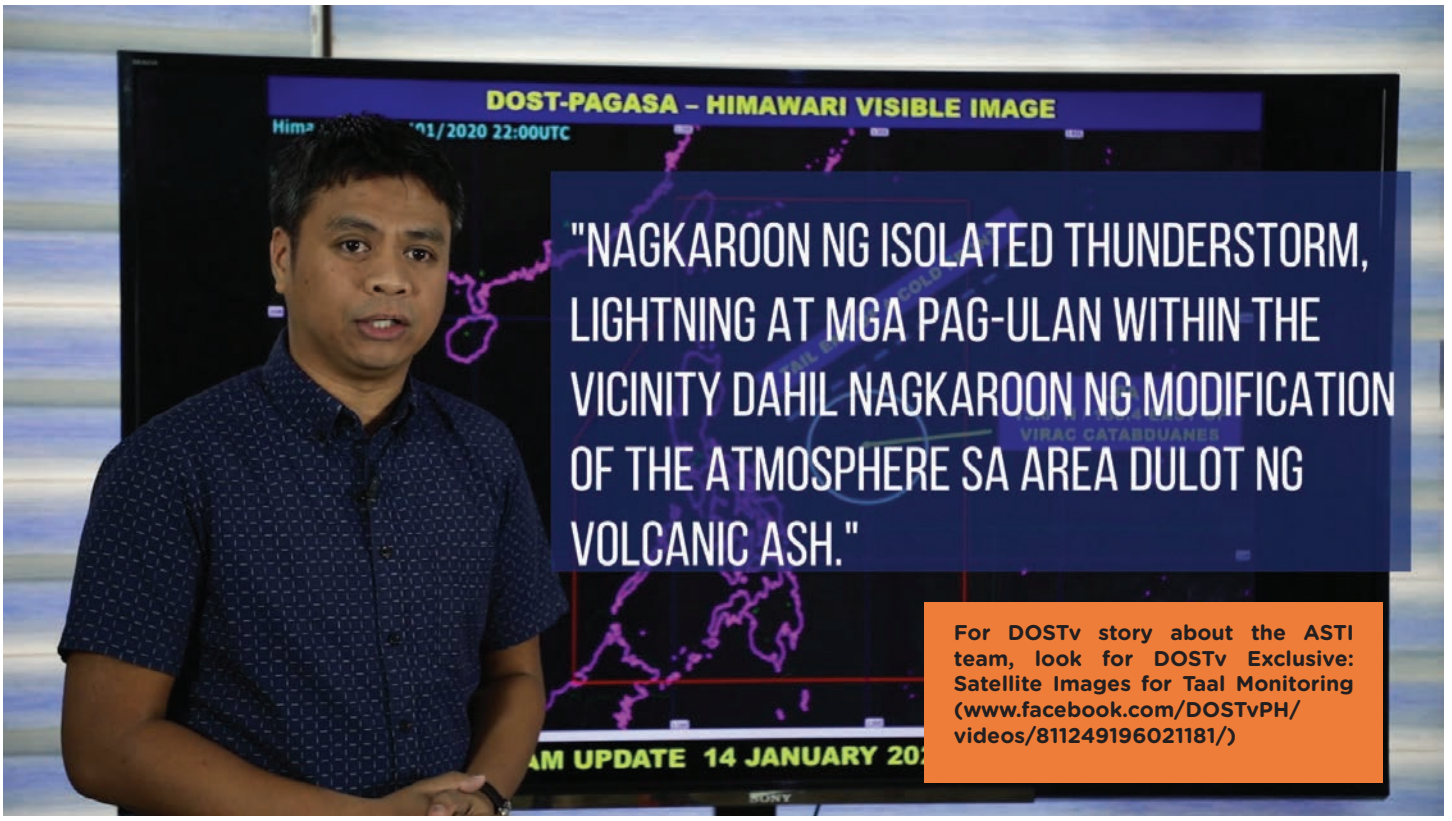
Need more information about the exclusive interview? Please look for DOSTv Exclusive: PHIVOCLS in DOSTv Official Facebook Page. ***(www.facebook.com/DOSTvPH/videos/620731868695112/)***

3. SATELLITE TEAM

While door-to-door checking for evacuation and rescue operations may seem heroic, time is crucial. DOST, through the Advanced Science and Technology Institute (ASTI), now utilizes satellite images to move people and save lives. Satellite images from DOST were distributed to Office of the Civil Defense. These images suggest where to find evacuees by highlighting possible infrastructures in a given area. Moreover, a team in ASTI is assessing satellite images captured by our first microsatellites DIWATA to evaluate damages and the condition of volcano from above.



For DOSTv story about the ASTI team, look for DOSTv Exclusive: Satellite Images for Taal Monitoring (www.facebook.com/DOSTvPH/videos/811249196021181/)



4. REPORTS ON THE ATMOSPHERE FROM DOST-PAGASA:

Strong winds during the most active times of Taal last January had brought the ash all the way to the north reaching not only Manila but also Central Luzon and some parts of Northern Luzon, but due to the sudden change of wind direction during the succeeding week as well as the waning of ash emissions, ashfall eventually headed south west of Taal Volcano, worsening the scenario in Lemery, Agoncillo, among others. In our exclusive interview with Christopher F. Perez, PAGASA's Senior Weather Specialist, he explains the phenomenon that caused the scary and picturesque lighting *"nagkaroon ng isolated thunderstorm, lightning at mga pag-ulan within the vicinity dahil sa nagkaroon ng modification ng atmosphere sa area dulot ng volcanic ash."*

5. EMERGENCY FOODS FROM DOST- ITDI: PACKS OF HOPE

Canned goods and instant noodles are the usual food items during relief operations. But can you possibly think that a *Pinoy*-favorite, the chicken *arroz caldo* would pass up as ready-to-eat (RTE) "tummy satisfiers" in times of disasters?

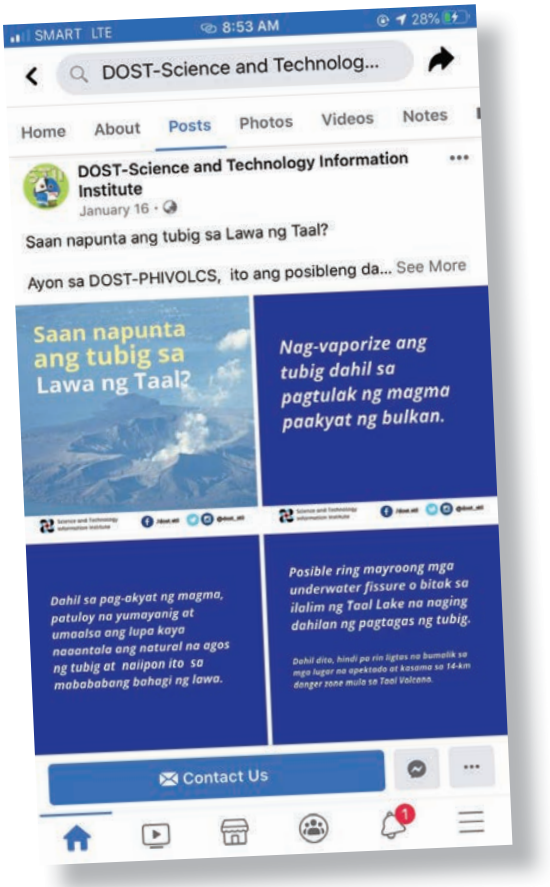
The Industrial Technology and Development Institute (ITDI), also from DOST, developed the packaging of this emergency food to alleviate hunger during and after disasters. Even when submerged in water, as in floods and rivers, germs cannot penetrate its special packaging. RTEs can also withstand 800-1,000ft freefall – just perfect for aerial distribution. Aside from the packaging's impenetrable feature, RTEs are made nutritious, can be eaten without cooking and water, and what may be most important to our Filipino Muslims, it doesn't contain pork. There is a plan to integrate this product in the Halal market.

Named by Kai-Anya Foods, Inc. (technology adoptor) as "Pack of Hope", it is being purchased by the Department of Social Welfare and Development and other agencies and non-government organizations involved in relief operations.

During the Taal relief operations, DOST itself distributed this emergency food to the evacuees.

6. S&T INFORMATION VIA SOCIAL MEDIA

The DOST-Science and Technology Information Institute helped ease panic from the public during the first weeks of the Taal volcano eruption. Basic knowledge on volcanoes and earthquakes, alert level meanings and advisories, as well as safety tips and reminders were put out to the public through various social media channels to enlighten, clarify, and counter fake news that seemed to spread that time.



When the going gets tough,
the tough lady volcanologist gets tougher

By Rodolfo P. de Guzman, *DOST-STII*
Photos from Henry A. de Leon, *DOST-STII*

Big challenges were not new to Ma. Antonia V. Bornas, a seasoned volcanologist and head of the Volcano Monitoring and Eruption Prediction Division at the Philippine Institute of Volcanology and Seismology of the Department of Science and Technology (DOST-PHIVOLCS).

So, when Taal Volcano started acting up on the morning of 12 January 2020, being a Sunday, Bornas was doing her usual household chores. But when she got the call from her team at the Taal Volcano Observatory, in Talisay, Batangas, she sensed the urgency and tension that was building up; not only of Taal but for her team on the ground who were face to face with imminent danger.

Quickly, she abandoned her laundry, stuffed a five-day supply of clothes in her to-go bag, and drove to the DOST-PHIVOLCS office in Quezon City.

When asked what was going on in her mind at that particular moment, she said she was concerned for the safety of the people living in the volcano island and her team who were very vigilant in continuously giving updates on Taal's activity.

With that thought in mind, knowing too well of Taal's complex "personality", Bornas had to psyche herself up, to toughen her stance and lead her team and the people to safety.

The following is a one-on-one interview by S&T Post (P) with Ma. Antonia V. Bornas (B), or Mariton for short, where the tough character of this seemingly fragile lady volcanologist was put to the test.

Ma. Antonia V. Bornas, chief of Volcano Monitoring and Eruption Prediction Division (VMEPD), stands behind a replica of Taal volcano

P: Being the chief of the Volcano Monitoring Division, what are your primary tasks and how do you do this?

B: My primary task is to drive and oversee the scientific, technological, administrative and human resource performance of the VMEPD (Volcano Monitoring and Eruption Prediction Division) and the effective implementation of PHIVOLCS' National Volcano Monitoring and Warning Program (VM-WarP).

P: Can you describe the typical day of Ms. Bornas as a geologist, from the time you wake up to the time you sleep?

B: I usually drive from the southern Metro Manila to the office and spend the day handling numerous operational issues of the VMEPD, mainly dealing with the 24/7 operations of volcano observatories and their vast networks of remote autonomous stations, stakeholder concerns, and requests related to active volcanoes, scientific and administrative meetings, etc. I spend at least five days of two months on fieldwork typically for site inspections and physical volcanology research on the deposits of past eruptions.

P: What was the first thing you did on January 12, 2020 when Taal acted up? Were you surprised or have you anticipated it to have the phreatic eruption on that day? If so, what were the things that you did immediately?

B: Taal had been in unrest on and off since 1990 and had been going through another cycle of abnormality since March 2019 , so it was not really surprising that I received a call from our colleague at Taal Volcano Observatory (TVO) around 11:30 am informing me that successive earthquake events have been occurring since 11:00 am and that people were panicking. Since I was in the middle of my laundry, I had to sort out my things, then grabbed a ready pile of clothes for five days and left the house without taking a bath or lunch. I drove to the office but it took me sometime due to Sunday noon traffic,

Grace under pressure. *Ma. Antonia V. Bornas calmly shares updates on the status of Taal volcano.*

but was in constant communication by phone with DOST Usec. Solidum and VMEPD and TVO Duty Officers. We had decided to raise the alert and recommend evacuation before 1 pm while I was still in EDSA.

P: First, can you describe what kind of volcano is Taal and how would you compare this recent event to other volcanic activities it had in the past?

B: Taal is a complex volcano with two general edifices: Taal Caldera and Volcano Island. It is one of the 16 Decade Volcanoes and one of the deadliest worldwide due to hazards posed to many people. Its most recent eruption is among the weakest from the Main Crater, comparing with historical eruptions.

P: Can you give us an account of what happened on January 12, when you had to raise the warning from Alert Level 2 to Alert Level 3, then to Alert Level 4? Can you give us more or less the chain of events?

B: So, before 1 pm as I was conferring with VMEPD staff on the phone, we decided to raise the alert level and I instructed TVO to advise residents to evacuate from Taal Volcano Island. USec Solidum had advised the province of Batangas and Office of the Civil Defense (OCD) similarly. We also respectively instructed all VMEPD staff and the DOST-PHIVOLCS senior staff to report to the Main Office. So, this is why the main phase of evacuation of the Island occurred at 1 pm, earlier than the alert level raised to 2 at 2:30 pm. I arrived before 2 pm and Usec. Solidum arrived ahead of me, and saw the record of continuous tremor and the IP camera view of the new phreatic vents in the Main Crater. We issued the bulletin at 2:30 pm but as it was being sent out, we noticed that a huge steam plume had begun to issue from the Main Crater Lake and phreatomagmatic activity began before 2:40pm. We prepared the Alert Level 3 Bulletin; arranged the deployment of our Quick Response Team who was attending to many inquiries while monitoring for developments. Communications from our stations on Volcano Island began failing at 3 pm due to ash burial and increased temperature as recorded by one of our tilt-meter stations, but the earthquake activity was being recorded at the same time by the Philippine Seismic Network. We issued the Alert Level 3 bulletin at 4 pm but again had advised the Batangas province and OCD of the Alert Level raise and evacuation of the high-risk areas of Agoncillo and Laurel ahead of bulletin actual issuance. Peak activity began before 6:00 in the evening, with the eruption column reaching 15 km in height and volcanic lightning began around 7 pm. We issued Alert Level 4 at 7:30 pm, but again with advanced notice to our principal stakeholders.

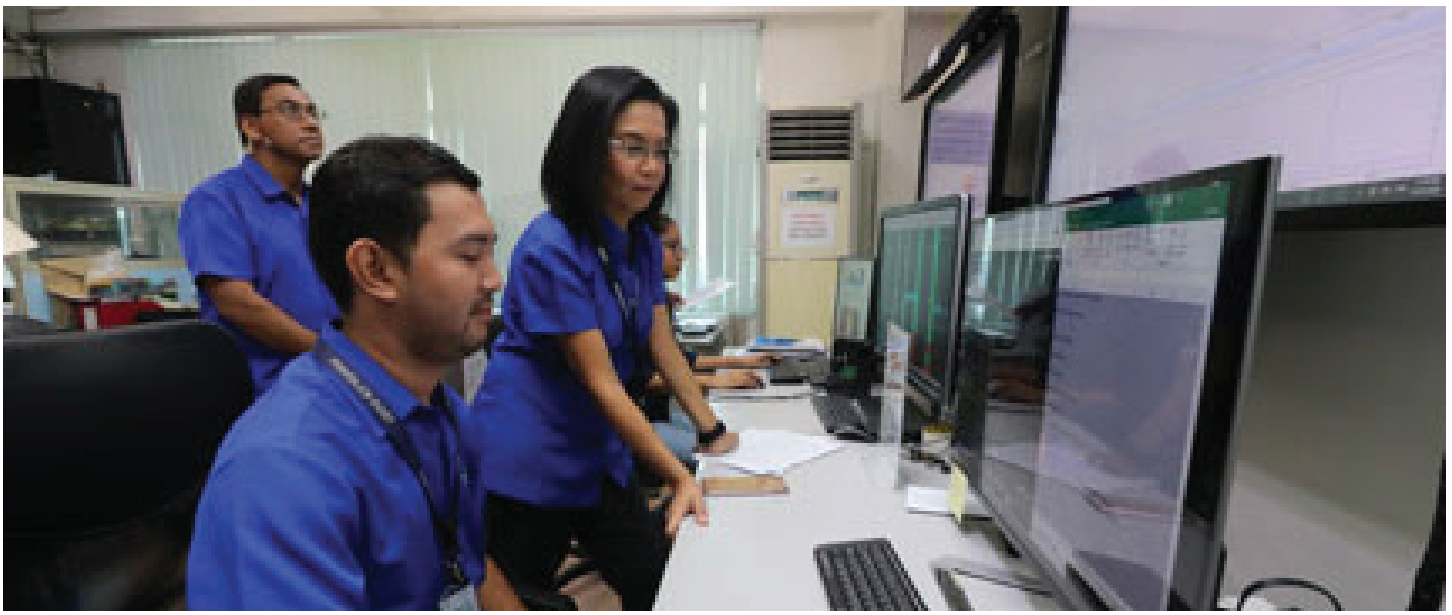
P: There was a time that your equipment in Taal are still working and transmitting data. So what was in your mind during those hours? Were you anticipating something big to happen already?

B: Yes, Taal had been steadily inflating or swelling since March last year, so we knew that any phreatic activity at the crater could depressurize the magmatic system and trigger a magmatic eruption. But we had not expected the speed of events, since historically it took hours to days for Main Crater eruptions to reach the climactic phase.

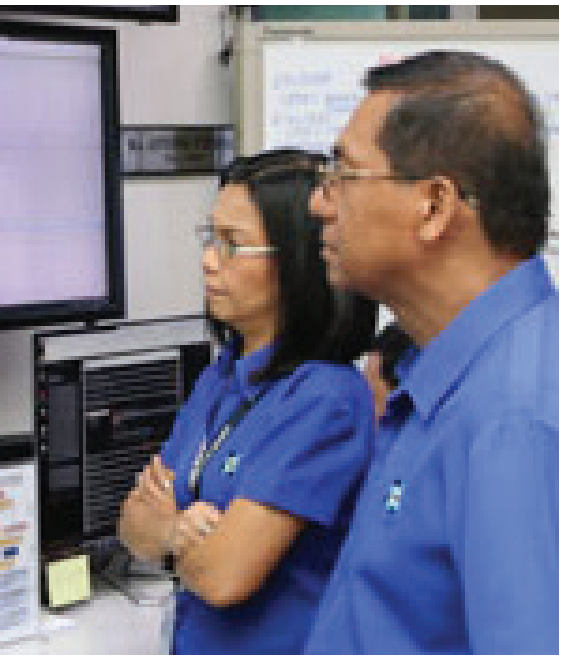
P: Moving back, when you started seeing volcanic activity as early as March 2019, what procedures, protocols or initiatives did you do? Did you start to build certain scenarios in your mind of what might or might not happen?

B: DOST-PHIVOLCS has been in constant interaction with the local government units and people of Batangas province since the unrest in 2010. In 2011, we conducted the first series of education seminars for the province, which was sustained through collaborative projects with Universite Libre de Bruxelles and in-house projects in DOST-PHIVOLCS. There was even a teacher training and evacuation drill for a mock eruption in the middle of last year. We have also developed and expanded the Taal Network from eight to 14 stations and added the very first borehole seismic station in February 2019 in Tanauan, Batangas and an auxiliary receiver station in Palace-in-the-Sky in Tagaytay in December. Paolo Reniva, the resident volcanologist of TVO, represented DOST-PHIVOLCS in monthly meetings of the Taal Volcano Protected Landscape or TVPL, reiterating that Volcano Island is a PDZ (Permanent Danger Zone) and will be very dangerous for residents at that time of unrest, and his push led to the closing down of the elementary schools on Volcano Island in October, which likely contributed to an egress of residents from the island. PHIVOLCS also issued an advisory on 01 December 2019 reminding the public that Taal is at unrest and that the island is a PDZ.

P: As the head of the VMEPD, how did you mobilize and utilize your staff in monitoring its activity and how did you go about doing and sending bulletins? How did you work with other divisions to help you out in monitoring Taal? How did other divisions help you in your work?



Usec. Solidum (leftmost) together with Ma. Antonia V. Bornas (third from left) lead their team at VMEPD in monitoring the activities of Taal Volcano.



B: I have already explained that earlier, but in terms of other divisions of PHIVOLCS, everyone already knew naturally the assistance and work they had to extend at the time of eruption, so the Seismology Division assisted us with earthquake monitoring, the Geology R&D with hazards and risk data and ash and fissure mapping, the Disaster Preparedness Division with coordinating media and official engagements and our Administrative division with logistics and support. It was an amazing coming together of PHIVOLCS as one team.

P: How many are you in the team? Briefly describe what are the duties and responsibilities of your team members?

B: Too many and the roles are very varied; duty officers conducting earthquake signal processing, information requests, operational protocols; and ground deformation monitoring teams conducting GPS surveys with geophysics teams conducting gravity and electromagnetic surveys; electronics/ electrical engineers reviving and trouble-shooting the remote stations; geologists mapping the ash and fissures; documentation team taking videos and photographs; and TVO staff participating in all these plus handling the Operations Center in Batangas Capitol. Maybe at least 100 people were involved.

P: Were there times that you had disagreements with your team members on certain findings or decisions? If so, what were these and how were they resolved?

B: We had science meetings where all opinions and points of views were discussed and it was a great scientific experience especially for the young staff who need to learn to be always analytical and open to the collision of ideas as demanded by a healthy science environment.

P: With your good performance in monitoring Taal, what do you think was the secret in having a good team?

B: It all boils down to the example of leadership from DOST Usec. Solidum and the late former DOST-PHIVOLCS director Dr. Raymundo S. Punongbayan, who are great enablers and challengers of ideas and champions of the great strength of science in decision-making. As leaders, we need to enable and support our young scientists and let them contribute in the decision-making process, even in the smallest ways, so that they can experience and understand the importance of their roles and work to save the lives of our stakeholders in times of volcanic crises.

P: During these critical days, of not really knowing if there will be a big explosion or not, what were the difficulties or challenges you and your team encountered in monitoring Taal?

B: In all cases of volcanic unrest, there is always the uncertainty of the next phase of activity that the volcano will exhibit. We addressed this by using a probability tree that we assessed daily, to see based on 24-hour monitoring parameters how the chances of certain scenarios are unfolding day-by-day. It was very instructive and useful and ultimately guided us well in decision-making. The nightly science meetings were also very important to this.

P: Was there a time that you had doubts about your findings or observations on Taal? If so, how did you resolve or handle that?

B: There was a minor question of whether the main eruptive phase was subplinian or phreatomagmatic, but we examine the ashfall deposits and the earthquake record. And then we concluded it was the latter. Some international scientists were calling it the former by the way. There was also a question of why Taal Lake receded, if it was due to uplift or extension of the caldera or if the eruption actually vaporized part of the lake. GPS data showed it was the former.

One of the experts at DOST-PHIVOLCS studies the composition of rock particles and fragments retrieved from the site of Taal volcano

P: As the team leader, what learnings did you acquire from the Taal Volcano incidence? How did this affect you positively or negatively?

B: The greatest lesson is that the long-term pay-off of early preparation and community linkages are immense and ultimately proved crucial to evacuation and saving the lives of people. Eruptions also can happen very quickly that criteria in established Alert Level Schemes may not apply. For example, the temperature and pH of the Main Crater Lake did not even change right before our stations on the Main Crater were destroyed, which showed us that with this speed of escalation of eruption, the lake did not even get sufficient time to mix with magmatic heat and gases released into it for our sensors to detect. We have to review many of our protocols, as well as the family preparedness plans of our own staff in TVO after the eruption so we can revise according to what we have experienced. I learned never to waste time given because volcanoes do not wait. My ongoing PhD thesis topic is the eruptive history of Taal Main Crater, and I have not finished last year as scheduled. So when the eruption happened, a lot of the ideas I was going to introduce in my thesis, including the trace of fissures and the likelihood of a magmatic dike feeding Taal Volcano Island eruptions, they all became self-evident. I have to rewrite a chapter of my work already! But on the other hand, my research has served our people well; I know the behavior of Taal Main Crater eruptions better than anyone else and it could help steer our teams to the correct courses of action.

P: During the TV interviews you had, you were very composed. So, how did you do that? Was it a protocol or were you, as a geologist, trained that way?

B: Everyone can say that I can get very impatient sometimes because the bulk of my work is operational and there is a mountain of concerns and issues and decisions that I have to make every hour of the day that I typically need quick answers. But during the TV interviews, I understand from my long experience with volcanic crises that people need to hear simple explanations of volcanic processes in order for them to understand the message, so to be honest, my calmness stemmed from the fact that I was always thinking and concentrating on how to best explain the answers to questions. I have also encountered most of the annoying questions before and already knew how to navigate these. As a public servant, I also believe and stress this with my staff that during times of crisis, we need to focus on how best to serve the stakeholders' needs because they need assurance and clarity at such fearful times. When you are focused on this, everything else is background noise.

Taal, indeed, tested the resolve of Mariton Bornas. Her training at DOST-PHIVOLCS gave her the opportunity to learn from great mentors to which she considered a rare chance that not all geologists and volcanologists can experience. But this "iron lady", forged in fire with her love affair with volcanoes, has another side. The Post was fortunate to know the other side

of this exceptional lady volcanologist, about her thoughts, her aspirations and the nuggets of wisdom she unselfishly shared.

P: On a lighter note, how would you describe Mariton at work and at home? What or who is the real Mariton?

B: I'm a simple person who comes from a very big and close family of eight siblings and we value our privacy a lot, this is all I have to say.

P: Who influenced you to become a scientist and in particular to be a volcanologist? Who would you say are your mentors or idols when it comes to earthquakes and volcanoes?

B: I became a scientist by accident, but decided to be a volcanologist because I was inspired by Dr. Punongbayan and USec. Solidum. I also discovered I have a natural aptitude for volcanology, having a background both in civil engineering and geology.

P: If Mariton is not a geologist or volcanologist what would she be doing now? What are your other passions aside from volcanoes?

B: I would be a journalist or a singer in a rock band!

P: If you are to name just two things, one that you are proud of and another one that you regret doing or not doing?

B: I am proud of being part of DOST-PHIVOLCS and what it stands for, especially that during the volcanic crisis, things happen that we get to compare the professional culture we have and nurture with those of other scientists and government organizations. I regret not finishing my thesis ahead of the eruption. Operationally there were also plans such as drills for the transfer of TVO operations to Tagaytay that we pushed into 2020 that we should have done earlier.

P: Lastly, what can you advise our students and young scientists who would like to pursue careers in science particularly as a geologist or volcanologist? Is there a formula they need to follow to be a good geologist?

B: To be a good geologist or volcanologist is to put in all the hard work in the field, in developing technical skills, in reading and writing. If you love volcanoes and have passion for the very difficult kind of work that needs to be done in order to be an effective volcanologist, go ahead and be the best you can be! But always, always be professional.

DOST-PHIVOLCS chief finds fault to perfection

Text by Rodolfo P. de Guzman, *DOST-STII*
Photos by Henry A. de Leon, *DOST-STII*

Usec. Renato U. Solidum Jr. (second from right) discusses with the division chiefs at DOST-PHIVOLCS.

12 January 2020 was a day to remember.

The people of Batangas and Cavite woke up to a nightmare they could never have imagined. It was a quiet Sunday, people were preparing for church while others, particularly the local and foreign tourists, were just leisurely savoring the last hours of their weekend vacation in scenic Tagaytay.

Then that morning came when multiple earthquakes were felt from the diminutive Taal Volcano Island. Was it a sign of something big to happen? Maybe yes or maybe no because the characteristic of Taal Volcano is complex.Just like a person, one can never precisely tell what is happening inside.

But those signs of abnormal activity in Taal were enough reasons for the man at the helm of the Philippine Institute of Volcanology and Seismology of the Department of Science and Technology (DOST-PHIVOLCS) to have an inkling of what might possibly happen. So, after being informed of the occurrence of the volcanic earthquakes in the middle of doing the groceries, he rushed to his office in Quezon City to see for himself the recording of volcanic earthquakes in Taal and steaming activity inside the Main Crater of Taal Volcano Island, which are some of the data being gathered in near real-time by volcanologists involved in monitoring the volcano's activity

For the "Fault Finder", a monicker tagged by media to Dr. Renato U. Solidum Jr., Officer-in-Charge of DOST-PHIVOLCS and concurrently Undersecretary in charge of Scientific and Technical Services and Disaster Risk Reduction and Climate Change, the frequent earthquakes and the steam coming out of the crater of Taal Volcano Island monitored from the observatory in Talisay and the DOST-PHIVOLCS Main Office were proof enough that something big might happen at any moment.

The Post was lucky to be given the chance to talk even for just half an hour to USec. Solidum and get the real score on Taal, several weeks after it showed its wrath.

As a "fault finder", USec. Solidum was considered as an expert on studying the many faults in the Philippines and about earthquakes and volcanoes. Since he practically live and breathe these natural hazards day in and day out, Dr. Solidum tries to find "perfection" in terms of ensuring that all findings and records on earthquakes and volcanic activities are based on reliable data and hard evidences from the ground.

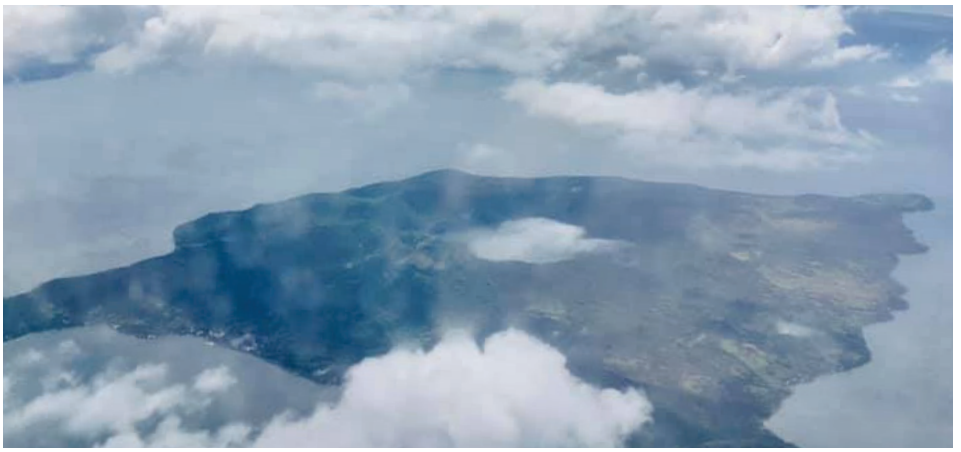
Volcano with multiple personalities

"Taal Volcano is so different from other volcanoes in the Philippines. If we compare Pinatubo with Taal, Pinatubo erupts like every 500 to 1,000 years and so it is what we call a closed system volcano that it would show precursors or signs that can definitely provide you with enough information. But Taal is a volcano within a volcano, meaning Taal Volcano is within what we call Taal Caldera or a bigger volcano and it exhibits various types of eruption, and some of its eruption would last for only a few days or sometimes for a few weeks or sometimes for several months," relayed USec. Solidum.

After 43 years of deep slumber, except for some minor activities, the seemingly calm and tranquil Taal Volcano finally woke up a little upset as if it was coming out from a bad dream. But it was not a surprise for volcanologists at DOST-PHIVOLCS because they are monitoring the most active volcanoes in the Philippines on a 24/7 basis and Taal happens to be the second most active of the 24 active volcanoes. Mayon Volcano in the Bicol region is on top of the heap.

What is difficult about Taal Volcano is its characteristic and its own unique persona.

"Essentially Taal Volcano is like a person that it can exhibit multiple personalities and there are certain eruptions that maybe difficult to exactly tell when this will happen. There might be signs but as to when that eruption would exactly happen is very difficult because some of the activities would escalate within a few days and some like last January escalated within a few hours," said USec. Solidum.



According to the fault finder, Taal Volcano started to manifest abnormal activities in the 1990s, long before Pinatubo Volcano had its most devastating eruption in recent history. But since it had several attempts to erupt, it never accomplished its desire to erupt.

Usec. Solidum recounted that in 1994, Taal was marked with increased temperature and other parameters like earthquakes and steaming. During those volcanic episodes, the agency was forced to elevate the warning to Alert Level 3, but Taal did not erupt.

Usec. Solidum said that as early as 28 March 2019, they already raised the Alert Level from 0 to 1 in Taal. This meant that there were some activity going on and based on several parameters, there was no definite trend when it might escalate and lead to an eruption.

Although, the agency paid particular attention to any changes and noticed that prior to January 12 or even hours before it, there was no change in temperature or acidity of Taal Volcano Island main crater or significant change in earthquake activity. Yet DOST-PHIVOLCS remained alert and on its toes for any shift in Taal's erratic "personality".

"Starting 11 in the morning of January 12, the duty officers noticed the increased number of earthquake events and this alerted us to the possibility of Taal escalating its activity," recounted Dr. Solidum.

So, without any hesitation, the Fault Finder had to answer the call of duty. Dr. Solidum felt his gut that there was something wrong that particular day because the steaming activity increased rapidly as captured in the Internet Protocol cameras installed in the Main Crater and within the vicinity of Taal Volcano Island. With the increased steaming accompanying increased earthquake activity, a decision was made to raise Alert Level 2 and Taal Volcano Island had to be evacuated.

Then, the typical Sunday became the longest day for the men and women of DOST-PHIVOLCS.

DOST-PHIVOLCS team monitoring the activities of Taal volcano

Call of duty

Answering the call of duty, the entire DOST-PHIVOLCS working as one team started trooping to their respective workstations and do what they do best, that of monitoring volcanoes.

At the center of all the action was the petite but tough lady chief Ma. Antonia V. Bornas of the Volcano Monitoring and Eruption Prediction Division, one of the five divisions in the agency. She remained on top of the situation from the time Taal manifested unrest up to this day.

With instructions from USec. Solidum, the entire volcano team wasted no time in gathering important data, as well as calculating and analyzing the reports from the field and other relevant information that came in from the Philippine Seismic Network.

Other divisions played the important role of supporting each other to ensure that all data are generated, that they are accurate and precise, and that they have the logistics needed both in the office and in the field. The other divisions that joined the cavalry were the following: Seismological Observation and Earthquake Prediction Division; Geology, Geophysics, Research and Development Division; Geologic Disaster Awareness and Preparedness Division; and the Finance and Administration Division.

So, when the phreatic explosion occurred, it served as a confirmation that Taal really meant business and the entire DOST-PHIVOLCS team stayed on red alert just to monitor the escalating activities of the volcano. A phreatic explosion is a steam driven explosion characterized by the spewing of smoke that happens when water beneath the ground or on the surface gets boiled by heat from the hot magma below.

"We have a system, we have a Quick Response Team system that whenever there are big events, the major player would be the mandated division but others would support the mandated division. So if it's an earthquake event, we support the earthquake group through the different divisions like the geology and even the volcano monitoring group who assisted in Mindanao, and then the awareness and preparedness team and also the finance and admin division, and now for the volcano, we just change the lead group," Dr. Solidum added.

According to the chief geologist, the system has been going on for a long time now and the teams had been prepared to do their respective jobs like, for instance, when the volcano team had to evacuate the volcano observatory, the Philippine Seismic Network operated by the Seismology Division became the back-up system and would monitor the large earthquake events until communications were recovered from the different sites for the Taal Volcano network to operate back again.

Fast forward, by 4:00pm, Sunday, DOST-PHIVOLCS raised the warning status to Alert Level 3 because of the fast progression of activity; an indication that there was already "magmatic unrest", with ash column that had reached one-kilometer high. Magma was rapidly ascending. Residents within 7-km radius from Taal Volcano Island main crater had to evacuate.

Then, just after a few more hours, the agency raised the warning status to Alert Level 4 (hazardous eruption imminent) at exactly 7:30 pm. The ash and rock fragments column now reached the height of 10-15 kilometers up due to continuous eruption. This was also accompanied by frequent volcanic lightning and felt earthquake events. Areas considered to be at high risk to volcanic hazards, like base surges described as fast horizontally moving clouds of ash, rocks, and gas, within a 14-km radius from Taal Volcano Island main crater, need to evacuate.

By Sunday night, ashfall from Taal Volcano had reached the CALABARZON area and even parts of Metro Manila and Central Luzon. Several areas near Taal Volcano also experienced power outages due to the ashfall.

What was left of Taal Volcano the day after were thick piles of gray ash that blanketed the terrain, leaving it virtually like a ghost town. But it must be noted that there were no deaths reported that could be attributed to the volcanic activity, although damage to property was rather massive.

Learning insights

With the intensity of volcanic activity still on the rise, the DOST-PHIVOLCS team had to remain vigilant and equally heighten all their senses to stay on top of the game; to monitor Taal's behavior every minute, every hour.

Unlike the forecast of weather disturbances like typhoons, the escalating volcanic activity was hard to predict because the chain of events happened so fast that there were significant changes observed and recorded in just a matter of hours.

Dr. Solidum stressed that the key to adapting to this kind of natural hazard lies on preparedness, to be vigilant at all times, on how fast people can react and respond. Also, he reiterated the importance of getting the right information from credible sources and for people to be more discerning in processing information to avoid undue panic and not to be deceived by "fake news" particularly coming from social media.

"This January 12 event in Taal happened within six or five hours, very fast, that is the lesson we need to evaluate how we can actually help people understand that this can happen and how they should match their preparedness with the rapid change in the volcano," said Dr. Solidum.

According to the chief geologist, the cone of uncertainty for the track of typhoons is way different and cannot be applied to volcanic eruptions. For volcanoes, the uncertainty is built in the alert level. He further explained that the issue is about how fast the people can react to the rapid change in the condition of the volcano and so they had to balance that technology.

"The phreatic eruption may be very difficult to warn but we were able to have a sense that it can occur that is why we asked the people to evacuate but phreatic eruption by itself is used to forecast or anticipate larger eruptions. So for Taal Volcano, the larger and life threatening eruption is when the base surge forming event would happen, so yun ang delikado, hindinamannangyari yon," shared Dr. Solidum.

Base surge is a rapidly moving current of ash, rocks, and gases that can move as above ground, move on the ground, and across the water that occurs during the eruption. USec. Solidum continued by saying that sometimes the volcano will have lots of solid materials and at some point instead of having the ash and rocks thrown up vertically as there are in previous events, at some point if the eruption is kind of fast there is nowhere to go because the succeeding ash and rocks are still up there and so the explosion will go horizontally.

Part of the preparedness is that each branch of government had their own role to play. It is the role of DOST-PHIVOLCS to conduct regular monitoring of volcanic activity and to disseminate warning messages to local government units and other stakeholders.

On the other hand, Dr. Solidum stressed that the role of disseminating the information to the people is already the responsibility of the Office of Civil Defense of the National Disaster Risk Reduction and Management Council and the local governments which are under the Department of Interior and Local Government (DILG).

Accidental geologist

Just like Taal Volcano, with the eruptions that are hard to predict when it will happen, USec. Solidum also was not able to foresee his destiny for he was bent on pursuing an engineering course when he applied at the premier state university.

"I wanted to be a civil engineer but unfortunately, I am not sure why, but I only took an entrance exam at the University of the Philippines Diliman, no other school, and I was not part of the quota. When I arrived there at

Usec. Solidum (leftmost) together with Ma. Antonia V. Bornas (third from right) and the DOST-PHIVOLCS team

Usec. Solidum (middle) together with the division chiefs of DOST-PHIVOLCS (from left to right): Marilou V. del Rosario (OIC-FAD), Arturo S. Daag (OIC-GGRDD), Ishmael C. Narag (Chief-SOEPD), Ma. Antonia V. Bornas (Chief-VEMPD), and Ma. Mylene M. Villegas (Chief-GDAPD)

around 8:30 am all non-quota degree blocks were filled up. So I panic and I looked at the brochure which courses are not quota. Geology was one and I remembered that the line was short. I was accepted and I was second to the last," narrated USec. Solidum.

But fate was kind to this accidental geologist. USec. Solidum later found geology to his liking and decided to finish the course, and set aside his initial dream of becoming a civil engineer for good. In fact, he found the course very interesting and from then on, he poured out all his time and effort to excel in his accidental course.

But just like any other *probinsiyano* that came to the big city to study, he had his share of trials and challenges. However, his perseverance and determination to excel in whatever endeavor he enters into gave him the strength to continue and to become successful.

For a young man from Odiongan, Romblon, USec. Solidum attributed his success not only to hard work but also to the lessons he learned from his mentors who influenced him one way or another.

"Well sa college, *wala naman akong* idol, I just try to be knowledgeable in the subject and try to do the best I can. But of course here in PHIVOLCS and later on I could say there were many people who contributed to what I learned like Dr. Ray Punongbayan, former director of DOST-PHIVOLCS; Dr. Kelvin Rodolfo who was my adviser in masters degree; Dr. Pat Castillo; and Dr. James Hawkins who were my advisor when I got my PhD at the University of California San Diego; and of course Christopher Newhall who is a very good friend and also a very knowledgeable volcanologist," shared Dr. Solidum.

Defining moment

As the Taal Volcano event continues to unfold before our eyes, Usec. Solidum shared his experience as a young volcanologist with Mt. Pinatubo eruption which greatly affected him as a geologist.

"For me, what changed me was the Pinatubo eruption. You see me now as a person who talks a lot, explains a lot or expresses himself but before that I was really quiet. Because of Pinatubo I realized that if I know something, I have to speak out and especially if what I know can help a lot of people or what I know can correct things to make it right," Dr. Solidum said.

When asked if he even get scared because of the dangers attached to being a geologist, he said that the eruption of Pinatubo in June 15, made him realize the perils of his chosen profession. He admitted that his work indeed has risks and at any given time one can be in an accident of be mistaken for someone else especially if one is on field in remote towns or in the mountains.

"One of my closest friends told me, it was nice knowing you Rene, well that was sort of saying goodbye and if you hear that from your friend, as a volcanologist you can actually envision the scenario that can happen, scenarios that can be very, very dangerous and that was when we were in Olongapo City trying to track the ash and rocks that were falling," narrated Dr. Solidum.

That event became a defining moment for the Fault Finder.

But, instead of backing down, he become bolder despite the risks of dying because he would not want to waste what he knows by not say them to people. He has learned to believe that he can explain certain things better so that people can understand the phenomenon and be prepared.

There is no question that this accidental geologist has done a lot for his profession, for DOST-PHIVOLCS and for the millions of Filipinos who had remained informed and safe because of his burning passion to do his best.

So, as Taal Volcano still continues to make its presence felt, Dr. Solidum, although far from retiring from the service, has his own legacy to leave behind.

"Together with my colleagues we have raised the awareness of people, we have developed certain things that were not there before to make hazard information easily accessed; I just give ideas and my colleagues try to do that, the Fault Finder application, HazardHunter tool. But what is more important is to make sure that people work together as a team so that the performance is maximized which is for the benefit of the country. And for me it is not simply science but developing a team," Usec. Solidum concluded.

4 DOST researchers among newly conferred and upgraded career scientists

By David Matthew C. Gopilan, *DOST-STII*

Dr. Imelda A. Agdeppa (second from left) of DOST-FNRI and Charito T. Aranilla (fifth from left) of DOST-PNRI were among the seven SCS awardees honored on 09 August 2019 during the oath-taking ceremony. With them are (from left to right): Dr. Mario V. Navasero, Dr. Fe M. dela Cueva, Dr. Olivia P. Damasco, Dr. Sofronio C. Camacho, and Dr. Reynante L. Ordonio. (Photo from businessmirror.com.ph)

THE YEAR 2019 ended on a high note for four researchers of the Department of Science and Technology (DOST) who were conferred and upgraded as career scientists through the Scientific Career System (SCS).

Charito T. Aranilla and Sotero S. Resilva were conferred the title of Scientist I while the ranks of Dr. Imelda A. Agdeppa and Dr. Lucille V. Abad were upgraded to Scientist II and Scientist III, respectively. Aranilla, Resilva, and Dr. Abad are from the DOST-Philippine Nuclear Research Institute (PNRI) while Dr. Agdeppa is from the DOST-Food and Nutrition Research Institute (FNRI).

Carageenan Champions

Dr. Lucille V. Abad and Charito T. Aranilla both developed useful technologies from carrageenan—a natural substance extracted from red seaweed. Using applied radiation technology, Dr. Abad was able to turn carrageenan into a plant-food supplement that has nanoparticles, making it easier for plants to absorb. She and her colleagues have found out that applying the carrageenan-based plant food supplement led to the increase of pod and seed yields in mung beans or *munggo*. They also found out that rice can become more resistant to diseases like bacterial leaf blight and tungro bacilliform virus infestations. Dr. Abad currently heads the DOST-PNRI's Atomic Research Division.

On the other hand, Dr. Aranilla was recognized for the industrial and medical applications she developed from kappa-carrageenan—a type of carrageenan that has varying chemical properties when used as a thickener, gelling, or emulsifying agent. Aside from this, Aranilla is also known for using her expertise in the field of radiation chemistry and technologies to develop anti-hemorrhagic or blood-stopping materials. This innovation has been found useful in biomedical devices and emergency situations. Together with Dr. Abad and colleagues, she recently reported her biocompatibility study of locally developed anti-hemorrhagic materials in laboratory mice.

Passion for Nutrition

The studies of Dr. Imelda A. Agdeppa on nutrition assessment led to the development of policies aimed at improving the overall nutrition of Filipinos. Some of them are the National Supplementary Feeding Law and local ordinances on the sale and consumption of iron-fortified rice. Other government agencies have used iron-fortified rice in their supplementary feeding programs and relief operations. It also gained traction in technology transfer efforts.

The Crop Protector

Last but not the least, Sotero S. Resilva is an internationally recognized expert in the field of pest control using the sterile insect technique. SIT is a pest control method in which a huge population of insect pests are made sterile—or unable to reproduce—through radiation released in a specific environment. He was commissioned by the International Atomic Energy Agency (IAEA) to go to various countries to document pupal eye colors of 17 Tephritid fruit fly species at different holding temperatures, which are now being used as a reference guide by different mass-rearing facilities in SIT operations. A few of his works are the SIT on the Mexican fruit fly that damages citruses and on mango pulp weevil, which has previously prevented the country from exporting mango. Resilva is presently involved in a project entitled "Development of Handling, Transport, Release, and Trapping Methods for Dengue Mosquito Vector, *Aedes aegypti* in the Philippines," which is funded by the IAEA.

Emil Q. Javier proclaimed National Scientist

National Scientist Dr. Emil Q. Javier receiving his citation from President Rodrigo R. Duterte. (Photo from PCOO)

IN ANOTHER development, Dr. Emil Q. Javier was conferred the Order of National Scientist on 07 January 2020 by President Rodrigo R. Duterte.

According to Proclamation No. 781 signed by President Duterte, "the work of Emil Q. Javier, Ph.D., in the field of agriculture, through spearheading the Institute of Plant Breeding, University of the Philippines (UP) Los Baños, which popularized high-yielding crops and disease-resistant varieties in the country and in Asia, evinces his outstanding contributions to the progress of science and technology in the Philippines and the world."

Dr. Javier earned his bachelor's degree in agriculture from UP Los Baños, master's degree in agronomy from the University of Illinois, and doctorate degree in plant breeding and genetics from Cornell University. He was instrumental in the reorganization of the National Science Development Board to the National Science and Technology Authority, which later on became DOST. He also served as president of the University of the Philippines System (1993–1999), and DOST-National Academy of Science and Technology (2005–2012).

The title Order of National Scientist is given by the President of the Philippines in recognition of Filipinos with exemplary achievements and contributions in science and technology.

Dr. Lucille V. Abad and Sotero S. Resilva (fourth and fifth from left, respectively) receiving their award during the oath-taking ceremony on 16 December 2019. Joining them are DOST Secretary Fortunato T. de la Peña (second from left), DOST-PNRI Technology Diffusion Division Chief Ana Elena Conjares (leftmost), and Civil Service Commission Chairperson Alicia dela Rosa-Bala (middle). (Photo from DOST-PNRI)

The SCS is a system of recruitment, career progression, recognition, and reward of scientists in the government. It seeks to develop a pool of highly qualified and productive researchers. Conferred scientists are entitled to higher salary grade levels, additional benefits like representation and travel allowance, and rewards for publishing journal articles, among others.

At present, the Philippines has 172 scientists under the SCS and the DOST-National Academy of Science and Technology administers this merit system.

Other scientists who were conferred as Scientist I in 2019 were the following: Dr. Jose Alan A. Castillo from Ecosystems Research and Development Bureau; as well as Dr. Fe M. dela Cueva, Dr. Olivia P. Damasco, For. Sofronio C. Camacho, and Mario V. Navasero from the University of the Philippines Los Baños. Other Scientist I recipients were Dr. Reynante L. Ordonio, Dr. Jonathan M. Niones, and Dr. Jesusa C. Beltran from the Philippine Rice Research Institute (PhilRice). Lastly, Ricardo F. Orge from PhilRice was upgraded to Scientist II.

DOST exec to head PH Space Agency

By Neyzielle Ronnique Cadiz, *DOST-ASTI*
and Nikki Ignacio, *STAMINA4Space DOST-ASTI*

THE NEWLY created Philippine Space Agency (PhilSA) will have as its first ever Director General—the project leader of the team that developed the country's first small satellites.

Dr. Joel Joseph S. Marciano Jr., current acting director of the Department of Science and Technology-Advanced Science and Technology Institute (DOST-ASTI) has been selected by President Rodrigo R. Duterte as the first Director General of the recently created Philippine Space Agency (PhilSA).

On 08 August 2019, President Rodrigo R. Duterte signed into law the Republic Act No. 11363 or the Philippine Space Act. Under said law, the PhilSA shall be the central government agency for national issues and activities related to space science and technology applications.

Dr. Marciano is also a professor of electrical and electronics engineering at the College of Engineering of the University of the Philippines Diliman and is currently on secondment to DOST-ASTI.

He led the DOST-funded program, Development of Philippine Scientific Earth Observation Satellite or PHL-Microsat, which was the country's first foray in developing small satellite technology. The program successfully launched the 50-kg microsatellites Diwata-1 in 2016 and Diwata-2 in 2018, and deployed the 1-kg nanosatellite, Maya-1, also in 2018.

"Our efforts in building small satellites are aimed at mobilizing space-borne data as scientific evidence or basis for more responsive policies and programs; developing a robust space industrial base; and building interdisciplinary teams for tackling societal-scale challenges," says Dr. Marciano.

"These serve as the foundation and pillars for further local innovations in space technology and downstream data utilization that contribute to a knowledge-based economy and a resilient Filipino society," he emphasized.

PHL-Microsat is succeeded by the STAMINA4Space, whose project leader was Dr. Marciano as well. The program is undertaking research on the localization of relevant small satellite technologies and enhancements in the operations, processing, and distribution of satellite data.

As DOST-ASTI acting director, Dr. Marciano supervises other various initiatives in space technology, electronics, and computing such as the Philippine Earth Data Resource Observation (PEDRO) Center; the Remote Sensing and Data Science Help Desk (DATOS Project); the Synthetic Aperture Radar (SAR) and Automatic Identification System (AIS) for Innovative Terrestrial Monitoring and Maritime Surveillance (SAR with AIS) project; the Electronic Products Development Center (EPDC) as a Platform for Innovation and Collaboration (EPIC) program; the Computing and Archiving Research Environment (CoARE) facility; the Philippine Research, Education, and Government Information Network (PREGINET); and the Understanding Lightning and Thunderstorms (ULAT); among others.

DOST-ASTI Acting Director Joel Joseph S. Marciano Jr. introduces the PEDRO Center to the audience during the Davao Ground Receiving Station Inauguration held 08 November 2019. (Photo from DOST-ASTI)

Dr. Marciano also oversees the Advanced Space Technology Research, Operation and Services (ASTROS) team, which was recently recognized by the Civil Service Commission and President Duterte as a Lingkod Bayan awardee in 2019 for contributions to Philippine space technology development.

Recently, Dr. Marciano—together with DOST-ASTI colleagues—won first prize in the 6th Mission Idea Contest in Tokyo, Japan for their entry, "Spectrum Monitoring in Space using i-SEEP (SMoSiS) – Capturing and Mapping the Digital Divide from Space through Radio Frequency Spectrum Measurements" under the IVA-replaceable Small Exposed Experiment Platform category. This entry bested research topics from different countries during the 7th University Space Engineering Consortium-Global Meeting.

As a cabinet-rank position, the President's nomination of Dr. Marciano as PhilSA's Director-General is still subject to confirmation by the Commission on Appointments.

DOST-MIMAROPA brings Regional S&T Week in Palawan

By Athena Colline L. Verdey, *DOST-MIMAROPA*
Photos from DOST-MIMAROPA

Centerpiece of the 2019 Changing Lives through Science

Individuals from all walks of life gathered at the so called "People's Coliseum" to witness and experience wide-range of innovations for a sustainable future at the 2019 Changing Lives through Science—the annual Regional S&T Week celebration held in MIMAROPA that brings S&T initiatives and outputs closer to the people for better appreciation and utilization and participation of the stakeholders in the community.

Banking on the theme, "Enabling technologies for Sustainable Development", the three-day event held last 27-29 November 2019 at the Puerto Princesa City Coliseum in Palawan was jampacked with S&T- themed activities and attractions including interactive exhibits, technology forums, science caravan, invention contests, and awarding ceremonies that bare the Department of Science and Technology's (DOST)

DOST Undersecretary Brenda L. Nazareth-Manzano shares the significance of RSTW celebrations in the regions

programs, services, and technologies available to support the achievement of the sustainable development goals.

DOST Undersecretary for Regional Operations Brenda L. Nazareth-Manzano together with DOST-MIMAROPA Regional Director Dr. Ma Josefina P. Abilay and Puerto Princesa City Mayor Lucilo Bayron, formally opened the annual celebration. Dr. Abilay emphasized that

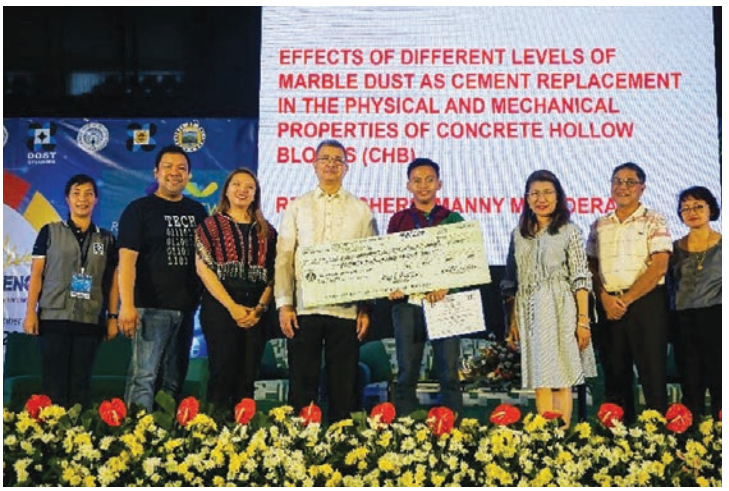
Mayor Bayron (second from the right) as he receives the Science Ambassador Award from DOST-MIMAROPA for championing S&T in Puerto Princesa City. The award was given by DOST Undersecretary Brenda Nazareth-Manzano (second from left), DOST- Technology Application and Promotion Institute Director Edgar Garcia (leftmost), and DOST-MIMAROPA Regional Director Dr. Ma Josefina P. Abilay (rightmost) during the 2019 Changing Lives through Science Opening Ceremonies

Dr. Ma. Josefina P. Abilay as she delivers her opening remarks for the 2019 Changing Lives through Science Opening Ceremonies

DOST-TAPI Director Engr. Edgar Garcia as he formally opens the 2019 RICE

Photos taken at the exhibits during the 2019 Changing Lives through Science

Photos taken during RICE judging and exhibits which took place from 27-29 November 2019



Winners of the 2019 RICE

Resource speakers from different backgrounds from all over the country flew all the way to Palawan to share knowledge on various topics to attendees

DOST Secretary Fortunato T. de la Peña with the DOST-Scholars and DOST-assisted MSMEs at the meet and greet held during the celebration

the activities lined up for the celebration aims to unite the scientific community and the general public as well as mobilize science, technology, and innovation to improve the lives of people most especially those of the furthest behind.

"Sa ika-apat na taon ng Changing Lives through Science, muli naming itatampok ang iba't ibang programa ng DOST gayundin ang mga bagong kaalaman at teknolohiya na makakatulong hindi lamang sa pagpapadali at pagginhawa ng pamumuhay ng bawat isa, kundi maging sa paglaban sa kahirapan sa ating lipunan/bansa, di pagkakapantay pantay, at pagiging handa/masigasig laban sa pababago-bagong klima na nagdudulot ng iba't ibang sakuna sa ating bayan/bansa… Nais naming ilapit ang agham at teknolohiya sa mas maraming tao, mas maraming komunidad para kanilang maramdaman na ang siyensya ay para sa lahat." said Dr. Abilay in her opening remarks.

Exhibits were participated by 11 DOST agencies, six (6) MIMAROPA State Universities and Colleges, Provincial Government of Palawan, City Government of Puerto Princesa, Department of Education-Palawan and Puerto Princesa. Products of DOST-MIMAROPA assisted micro, small and medium enterprises (MSMEs) and community-based enterprises (CBEs) are also showcased through the exhibits and technology bazaar enjoyed by attendees during the celebration.

2019 Regional Invention Contest and Exhibits

Happening concurrently with the 2019 RSTW is the biennial Regional Invention Contest and Exhibits or RICE. RICE is a nationwide activity conducted in different regions to showcase and recognize the creativity and indispensability of Filipino inventors in the society.

DOST-Technology Application and Promotion Institute (DOST-TAPI) Director Engr. Edgar Garcia was also present to open the 2019 RICE. Engr. Garcia reiterated the importance of creative individuals in the society as well as protecting intellectual property. He mentioned several TAPI programs that may help Filipino inventors assert intellectual property rights.

A total of 79 entries competed across four different categories of the 2019 RICE. Inventors from Mindoro State College of Agriculture and Technology emerged as regional winner for the Outstanding Utility Model category with their entry "Process of Making Stingless Bee Propolis Jam". Another set of inventors from the same university won first place for LIKHA Creative Research category for their entry "Sensory Characteristics of Vacuum- fried Saba Banana (*Musa balbisiana*)". High school students from Bansud National High School-Regional Science High School topped the Student Creative Research for High School (SIBOL) Category with their invention "Ag- Chitochin Nanodrop Solution". Lastly, for the SIBOL College category, inventors from Romblon State University were hailed as Regional Winner for their entry "Effects of Different Levels of Marble Dust as Cement Replacement in the Physical and Mechanical Properties of Concrete Hollow Blocks".

Technology Forums

More than 340 stakeholders from the region, especially from the agriculture, tourism, environment, DRRM, ICT, and business sector were able to participate in various technology forums prepared by DOST-MIMAROPA. Scientists and experts from all over the Philippines flew all the way to Palawan to shed light on topics such as smart agriculture, artificial intelligence and mechatronics, disaster risks, Halal, sustainable ecotourism and wastewater treatment. DOST's newest Advanced Manufacturing Centre Technology— which is eyed to be the country's leading research center in innovative 3D printing technologies, processes, and materials was also introduced during the celebration.

DOST Secretary Fortunato T. de la Peña also spent time with MIMAROPA DOST Scholars and assisted MSMEs who shared their stories on how DOST helped them achieve their dreams and aspire to serve not only themselves, their families, but also their communities and the country.

Aside from technology forums, DOST-MIMAROPA also conducted special activities such as R&D conference, launchings, science caravan, and awarding ceremony during the celebration.

Launching of the MIMAROPA Stars Volume 4 and Transponder Technology

During the press conference attended by various DOST Officials, line agencies, and partners from the local and national media held last 29 November 2019, DOST-MIMAROPA launched the newest addition to the MIMAROPA Stars volume series, the MIMAROPA Stars Volume 4— a collection of 30 success stories of different firms and community-based enterprises from the region's five island provinces who have achieved success through the adoption of technology through DOST's flagship program, the Small Enterprise Technology Upgrading Program (SETUP) and Community Empowerment through Science and Technology (CEST). Compared in the previous volumes wherein all stories are compiled in a single book, MIMAROPA STARS Volume 4 is a collection of five (5) different books representing each of the MIMAROPA provinces.

An offshoot of the partnership between DOST-MIMAROPA and Futuristic Aviation and Maritime Enterprises (FAME), DOST-MIMAROPA also launched the LoRaWan Technology or the Long-Range Wide Area Network for the Local Government of Coron. LGU- Coron is the first among the five (5) identified priority LGUs to receive the technology. The transponder technology equips weather monitoring and early warning equipment transmit information even from areas with intermittent cellular signal or no-signal at all. This will help LGU-Coron make informed decisions and take action to ensure their preparedness and resilience to disasters. Present during the launching ceremony was LGU-Coron Municipal Disaster Risk Reduction and Management Officer and Office of the Civil Defense Regional Director.

Addressing Industry R&D Needs: A Conference

In a bid to actively engage the industry, government, and academe into collaborative science, technology, and innovation undertakings, DOST-MIMAROPA initiated the Addressing Industry R&D Needs: A Conference held last 28 November 2019 at the Palawan Uno

Hotel, Puerto Princesa City Palawan.

DOST Undersecretary for Regional Operations Usec. Brenda L. Nazareth-Manzano expressed her support to the activity as she delivered the welcome remarks. DOST-TAPI Director Engr. Edgar Garcia, and Dr. Luis Sison, director of the University of the Philippines Technology Transfer and Business Development Office, project leader for the UPSCALE Innovation Hub as well as the lead mentor of MIMAROPA researchers during the Technopreneurship Training, also graced the event.

The conference was attended by a total of 90 participants from the industry, government, higher education institutions (HEIs), and media. Several technologies developed by HEIs were pitched during the conference for possible partnership with the industries. The participants were able to identify and prioritize industry R&D needs under agriculture, eco-tourism, processing, and mining sectors.

2019 Best Technopreneur Awards

Exemplary DOST-assisted MSMEs and CBEs in the region took the centerstage in the Best Technopreneur Awards in recognition to their contribution to the regional economy. Three Sisters Homemade Banana Chips from Marinduque, Bahag Footwear and Repair Shop from Oriental Mindoro, and Samahang Mandaragat ng Banilad emerged as this year's best technopreneurs under the SETUP Food, SETUP Non-Food, and CBE Category, respectively

Turn-over of MIMAROPA Stars Volume 4 to DOST Sec. de la Peña during the press conference held on the last day of the event

A symbolic ceremonial turn-over of the Transponder Technology by FAME to LGU-Coron

Dr. Abilay as she formally opens and welcomes guests of the Addressing Industry R&D Needs: A Conference

Health Science on the Go!: Travelling Science Centrum

About more than 40 interactive exhibits were enjoyed by attendees from all over the Province of Palawan at the Health Science on the Go!" Travelling Science Centrum which run as part of the 2019 Changing Lives through Science from 27 November to 13 December 2020 in Palawan.

DOST Undersecretary Brenda L. Nazareth- Manzano (leftmost), Mayor Lucilo Bayron (rightmost), and Dr. Ma. Josefina P. Abilay (middle) tries the interactive exhibit at the Health Science on the Go!: Travelling Science Centrum

Health Science on the Go! Travelling Science Centrum was brought to Palawan in cooperation with the Philippine Foundation for Science and Technology to promote awareness and appreciation of S&T in health while bringing a combination of learning and fun-filled experience to the public.

Dr. Steve R. Swanson (in blue space suit on the front line, middle) poses with the participants of the First Integrated STEM Leadership Summit in Asia, right after his talk on the role of space technology in building a better future. (Photo from Facebook page of Unilab Foundation)

Former NASA astronaut headlines STEM leadership summit

By Rosemarie C. Señora, *DOST-STII*

It is not every day that we see astronauts. The closest we see them is on television shows, sci-fi movies, documentaries, and science books.

So imagine everyone's excitement upon seeing and hearing an actual astronaut talk about space exploration and give his thoughts on the Philippines joining the world's spacefaring nations. This scene surely gets the younger generation interested in science and technology.

The astronaut who actually did this was Dr. Steven Swanson, former National Aeronautics and Space Administration (NASA) astronaut and commander of Expedition 40 to the International Space Station. Dr. Swanson was the featured speaker at the recently concluded First Integrated STEM Leadership Summit in Asia.

Attended by government, industry, and education leaders as well as STEM (science, technology, engineering, and mathematics) advocates, the summit was held 21–24 November 2019 at the Shangri-La Mactan Resort and Spa in Cebu.

Like a rock star

Dr. Swanson was all smiles while accommodating requests for photo opportunity from summit participants who were simply stunned seeing a man wearing a blue NASA space camp flight suit. He looked like a rock star with all his giddy

DOST-STII Director Richard P. Burgos (leftmost) poses with Dr. Steven Swanson (middle) along with representatives from DOST-STII (from left to right): Rosemarie C. Señora, Alan C. Taule, and Benedict P. Cagaanan. (Photo from Dir. Richard P. Burgos, DOST-STII)

fans waiting to have their chance encounter with him.

When asked about his special suit, Dr. Swanson said that it is actually pretty comfortable. He said that it was made from a fire retardant piece of fabric made up of Nomex (a flame-resistant material), which makes it a suitable choice of clothing for flying an aircraft.

Adaptability is the key

Being an astronaut is obviously not just about wearing a suit and floating in space. It takes a lot of education, work, training, and skills to become one.

After receiving his master's degree in computer systems from Florida Atlantic University, Dr. Swanson joined NASA in 1987 as a systems engineer and a flight engineer working on the Shuttle Training Aircraft. Then in 1998, with a doctorate in Computer Science from Texas A&M University in his credentials, he was selected as an astronaut.

Dr. Swanson said becoming an astronaut is a very long process. From 10,000–18,000 applicants, only 20 make it to the last selection phase. The selection process is tough because he said that NASA is looking for people who know how to learn and adapt to various environments.

"The job of being an astronaut is many different things, you change your hat everyday depending on what you're doing. The work changes all the time so you really have to be adaptable to your new environment," he shared.

On PH space agency

Speaking of something new, Dr. Swanson is hopeful that the recent establishment of the Philippine Space Agency (PhilSA) "will address all national issues and activities related to space science and technology applications."

"I hope it works out wonderfully for you people. I think it's a great way to go. From what I read on, it already has some space activities going on. Now it's under one or involved with one organization, and I think that can help make it more focused and help it grow better with that idea," he said.

On 08 August 2019, Republic Act No. 11363 or the "Philippine Space Act" was signed into law by President Rodrigo Roa Duterte, providing for the establishment of the said national space agency of the Philippines.

Commenting on public skepticism regarding the PH space agency, especially with the budget allotted for it, he said that every country goes through that.

"For United States, we have a huge return of investment because of the money spent on NASA. We are really indeed a research and development organization. We're trying to make new things and we can take these new things and develop it for consumer products," said Dr. Swanson.

He added that the PhilSA should also devote an area for education to encourage students to pursue careers in STEM, while also admitting that making the younger generation interested in science is a hard work itself.

Dr. Swanson said that NASA is doing a lot of programs to help students realize how science really works. According to Dr. Swanson, there is no doubt that science is fun and exciting. "But the goal is to make humanity better," he continued.

"That's what I really love about working at NASA. Nobody there works at NASA just for the money. This whole idea of space exploration and making the world a better place is what drives everybody, and it's wonderful to be part of that," he emphasized.

Transforming seaweed into savings through S&T

By Bon Rafael A. Padayhag, *DOST-IX*
Photos from DOST-IX

Seaweed farming has long been a reliable source of income for coastal communities in the Philippines; fringed by waters of the Sulu Sea and the Moro Gulf, the city of Zamboanga is no stranger to the seaweed trade.

Only recently, four communities in the city, namely *barangays* of Sta. Catalina, Mampang, Arena Blanco, and Tigtabon, have moved to adopt technologies that target seaweed efficient drying process and quality dried seaweed.

Sun-drying agar-agar using conventional method at Tigtabon, Zamboanga City

Sun-drying agar-agar using conventional method at Tigtabon, Zamboanga City

The Gap

While seaweed type is a factor in determining value, the quality of the dried seaweed is what ultimately dictates price.

The current drying practice, which is basically open area sun-drying, can take up to a number of days, and puts the seaweeds at the mercy of the elements. Farmers resort to covering or storing stocks at the first hint of rain or bad weather, but this does little good for the dehydration process.

This usually translates to poor seaweed quality, which in turn greatly reduces the farmers' command on the commodity's price.

The Intervention

The University of the Philippines Los Baños (UPLB) has developed a seaweed drying system that is capable of drying newly harvested stocks at a faster rate, while protecting the

Floating-type Solar Seaweed Drying Tech

Permanent-type Solar Seaweed Drying Tech

Conventional seaweeds drying practice at Arena Blanco, Zamboanga City

seaweeds from unpredictable weather.

At present, two types of the solar seaweed drying tech are available—the floating-type and the permanent-type. The floating-type drying technology stays on the water surface, allowing farmers to tow the structure close to their production area for faster harvesting, while the permanent-type doubles as a storehouse, sturdy enough to withstand harsh weather conditions and provide easy, all-around access for farmers.

The structures are also designed to reduce direct exposure to sand, dirt, and other contaminants during the harvesting and hauling of fresh seaweeds to the drying area.

Aside from the greenhouse and UV-treated sheets that cover both facilities, they are also fitted with built-in solar-powered exhaust fans for the quick and uniform drying of stocks.

At present, studies have shown the structures to be capable of drying two tons of high quality fresh seaweeds in a matter of three days, without any inconsistency in the production.

Through the Department of Science and Technology-Region IX, the abovementioned communities can expect the technologies to be on their shores as early as the second quarter of 2020.

For more information, kindly email us at dost9info@gmail.com or visit our Facebook page at www.facebook.com/DOSTRegion9.

Disaster resiliency in the time of pandemic

A prologue and an epilogue

By Rodolfo P. de Guzman, *DOST-STII*

This special section serves as an epilogue to the 1st Quarter 2020 issue of the S&T Post and at the same time gives a sneak preview of what to expect in the next issue as it continues to bring the relevant S&T news, the stories of human strength and triumphs, new enabling technologies, and science discoveries.

Primarily envisioned as an issue that showcases the science, technology, and innovation at work, the 1st Quarter 2020 issue of the S&T Post also serves as a prologue to the next, carrying the theme, "Disaster Resiliency".

Of course, our main feature focused on how our Filipino scientists and researchers from the Philippine Institute of Volcanology and Seismology of the Department of Science and Technology faced imminent danger as they monitor and continue to monitor the abnormal activity of Taal Volcano from 12 January 2020 up to the present.

Little did we know that another twist of fate, this time threatening our health, was brewing as early as December 2019. Three months later, we woke up to a nightmare as we faced an invisible enemy, the "severe acute respiratory syndrome coronavirus 2" that causes the deadly COVID-19 disease.

Once again, our Research and Development Institutes (RDIs) together with our Filipino scientists, researchers, and engineers wasted no time to act and help the government fight COVID-19.

During these trying times, the Department of Science and Technology-Science and Technology Information Institute, as the information and promotion arm of the DOST, remains to vigilantly document and make known to our audiences the initiatives of our RDIs and the entire DOST system that use science, technology, and innovation to find solutions to mitigating the negative impact of natural disasters that now include COVID-19.

We know too well that accurate and timely information is vital to educate and engage the citizenry to act as one to win the battle against this pandemic. So, as a finale to this issue, feed your mind with the initial stories of our gallant men and women of science battling COVID-19 in various fronts, and watch out for more inspiring stories in the next.

UP NIH spin-off begins mass distribution of DOST Pinoy-made COVID-19 test kits

By Christine Jane M. Gonzalez, *DOST-PCHRD*
Photos from DOST-PCHRD

Manila HealthTek, Inc. CEO Dr. Raul V. Destura (right) expressed gratitude to DOST-PCHRD for funding the production of the test kits and its delivery to the different health facilities in the country.

"As we heal as one in fighting this global pandemic, we thank DOST for its unwavering support in the production of these test kits. We hope that we can serve more Filipinos through this endeavor and help in saving more lives against the scourge of COVID-19," said Dr. Raul V. Destura said, the researcher behind the GenAmplify™ COVID-19 test kit.

Dr. Destura said the *GenAmplify™ COVID-19 test kit* has advantage against its foreign counterparts as it is packaged completely with an RNA extraction device and viral transport medium that is not found in other testing kits.

Aside from the complete testing kit package, Dr. Destura guarantees provision of full technical support from their team and assured that their assistance doesn't stop in delivering the test kits but extends to providing training for laboratory personnel on how to conduct the tests using the *GenAmplify™ COVID-19 test kit.* In fact, his team already conducted training with the laboratory personnel of Philippine General Hospital, The Medical City Ortigas, Makati Medical Center and University of San Agustin in Iloilo City in collaboration with Western Visayas Medical Center and the Philippine Genome Center (PGC) in Iloilo.

Dr. Destura also emphasized that *GenAmplify™ COVID-19 test kit* can be used in any RT-PCR machine as the codes used to read the sample is open source. The complete package of the locally-made test kits inclusive of VAT costs only Php 1,828.40, almost four times cheaper compared to other kits in the international market with a price that may exceed Php 8,000.

Currently, Manila HealthTek's production capacity is at 6,000 to 8,000 tests per day, but they target to increase its capacity to produce 16,000 tests by 01 May 2020. Several institutions have already availed of the *GenAmplify™ COVID-19 test kit* including: The Office of the Vice President, Philippine Genome Center, Bataan General Hospital, Araneta Foundation, and the LGUs of Iloilo, Antipolo, and Pulilan.

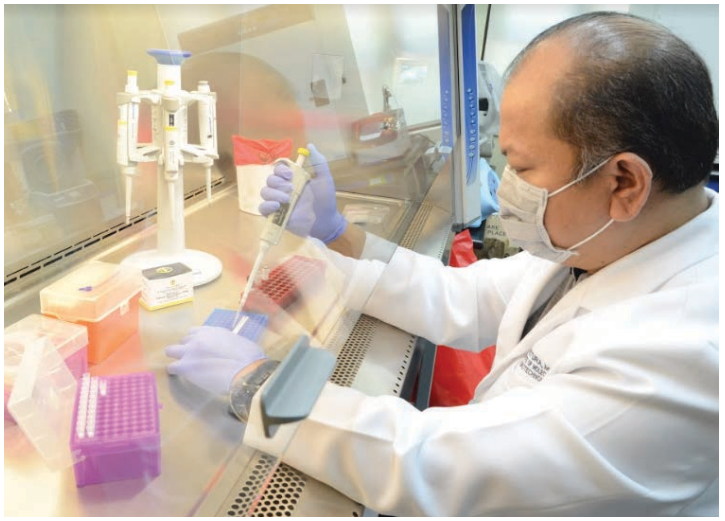
*"We at the UP Manila NIH are overwhelmed with gratitude for the support given by DOST and the PCHRD. This is a big step for our country to show that Filipinos can be self-sufficient like the other co*untries in addressing this pandemic." Dr. Eva Cutiongco-de la Paz, NIH Executive Director. NIH stands for National Health Institutes of the UP Manila.

"Engaging in the research and development of biotechnology is one our country's best investment in creating diagnostic tools," says DOST Undersecretary for R&D Rowena Cristina L. Guevara.

"Through R&D, we have the opportunity to enable our local health sector to be independent, efficient, and be given access to low-cost solutions in managing infectious diseases like COVID-19. I call on our officials and health administrators to support our Pinoy-made test kits."

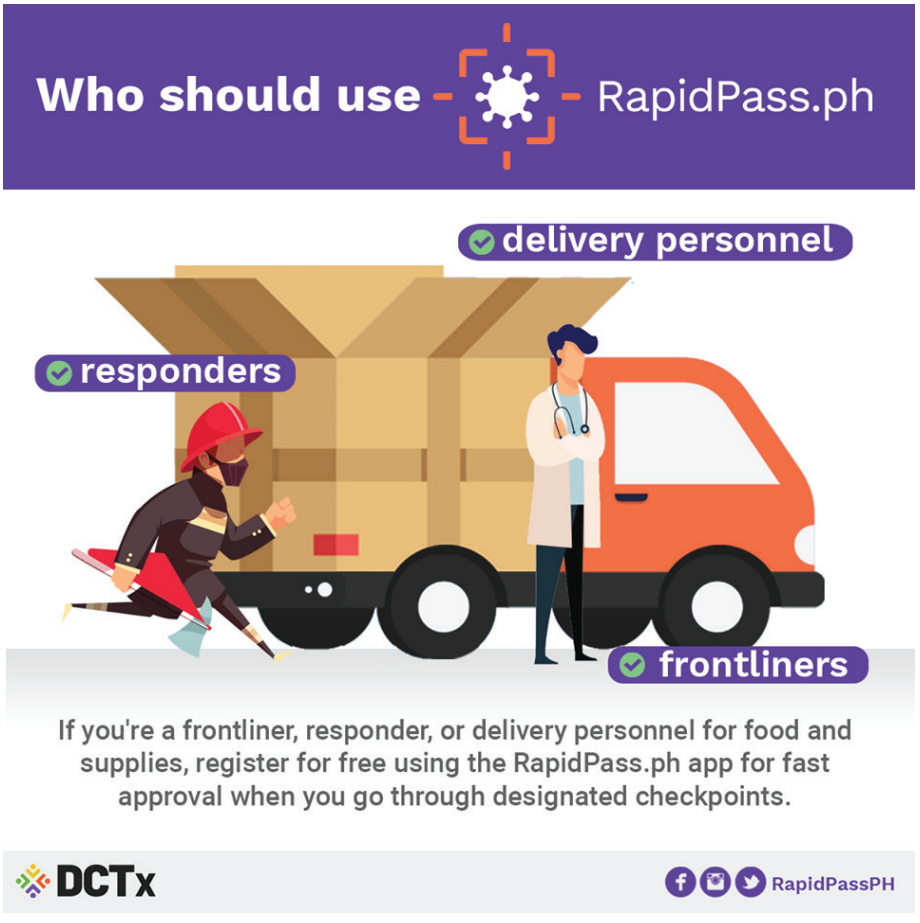
DOST Secretary Fortunato T. de la Peña congratulated the DOST-PCHRD and the Manila HealthTek, Inc. spin-off for responding immediately to the pandemic and coming up with a valuable diagnostic kit.

"The long wait for local test kits is over. We are glad that our very own technology is ready for distribution. With the deployment of the test kits, UP-NIH will increase its capacity to run more tests per day, as each unit of the GenAmplify™ COVID-19 test kit can run 25 tests at once and provide results within two hours," he said.

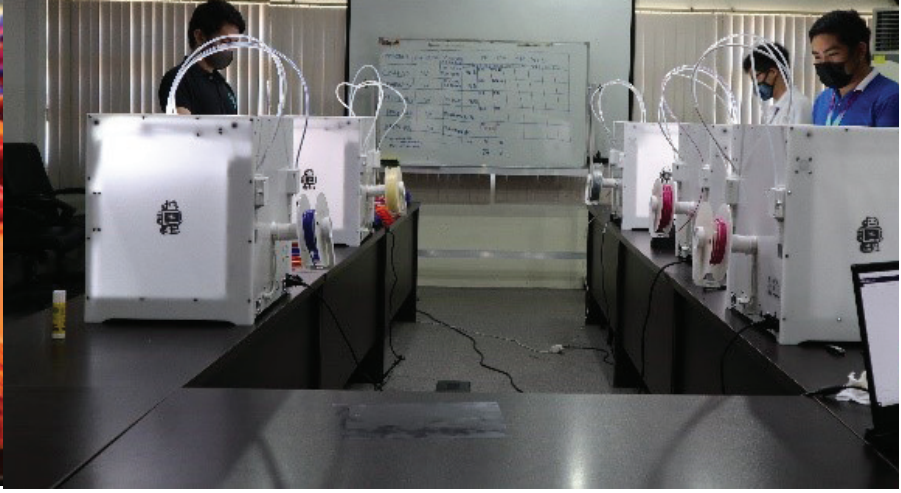


DOST partners with local software team to develop RapidPass.ph

To assist our frontliners in their battle against the COVID-19 crisis, the Department of Science and Technology (DOST) has partnered with a non-profit local software developer organization to devise a system that can help decongest our checkpoints. The RapidPass.ph is a virtual identification system developed by Developers Connect (DevCon Philippines) that utilizes QR-code based technology to provide ease of passage for frontliners and priority vehicles. The Inter-Agency Task Force for the Management of Emerging Infectious Diseases (IATF-EID) has officially approved the use of the RapidPass.ph on 27 March 2020. On the same day, the system was tested within Mandaluyong area to facilitate fast and simple travel through quarantine checkpoints. To use the system, users (people under the "Authorized Persons Outside of Residence" category as per IATF-EID's mandate) must register online, then a QR code will be sent to them once approved. Print the QR code and place it on your car window and checkpoint personnel will scan it. Through this system, there will be less contact between users and checkpoint personnel. The DevCon team will provide training and support to our Checkpoint front-liners and agencies. The developers of the RapidPass.ph system are also working with the Philippine National Police (PNP) and the Armed Forces of the Philippines (AFP) for field testing and operations deployment. For further information on how front-liners can register online, stay tuned for future updates and announcements from RapidPass.ph's official Facebook page, https://www.facebook.com/rapidpassph/.



(Information from Enrico A. Belga Jr., DOST-CO; Photo from RapidPass.ph's Facebook page)



DOST produces COVID-19 face shields for health workers

By Dannieline Solis, *DOST-PCIEERD*
Photos from DOST-PCIEERD

To support frontline health workers in their battle to prevent the spread of COVID-19, the Department of Science and Technology (DOST) is currently producing 3D-printed face shields for distribution to the Philippine General Hospital, and will soon be extended to other hospitals.

Operating for 24 hours since 23 March 2020, the team of Engr. Fred P. Liza, project leader of the Research on Advanced Prototyping for Product Innovation and Development using Additive Manufacturing Technologies (RAPPID-ADMATEC), started printing frames with an initial target of 1,000 pieces for the Philippine General Hospital (PGH).

"We are humbled by the opportunity to help in the urgent need of face shields, to cease the spread of this contagious disease. It will protect the face whenever a patient coughs or sneezes. Currently, we can print ten frames every 1.5 hours," says Engr. Liza.

Using cutting-edge technology, the design for the 3D-printed frames will further be optimized to reduce the production time and shorten the process to be able to manufacture more face shields.

"Currently, we are looking for ways to hasten production, such as using a larger nozzle size and modifying our printing parameters. Additional 3D printers are being reconfigured to augment our production volume. We are also looking into fabricating molds through DOST–Metals Industry Research and Development Center (MIRDC) and our technology partner, particularly Omnifab, for faster production of these frames using injection molding. Our goal is to deliver to the Philippine General Hospital every week via courier service," he added.

RAPPID-ADMATEC is one of the projects under Advanced Additive Manufacturing R&D Program (AMCen), being supported by the DOST and is monitored by DOST-Philippine Council for Industry, Energy, and Emerging Technology Research and Development (DOST-PCIEERD). It focuses on advanced prototyping and speeds up its process by reducing the time it takes to fabricate components and products.

DOST Undersecretary for Research and Development Dr. Rowena Cristina L. Guevara lauded the group for going the extra mile and contributing to the needs of our frontliners in battling COVID-19.

"As we make change happen through research and development, we maximize our assets to do our part in fighting COVID-19 with innovative solutions. We support our health workers with these visor shields that are products of our R&D facility," she emphasized.

DOST-PCIEERD Executive Director Dr. Enrico C. Paringit commended the group for their dedication during the enhanced community quarantine period.

"As strong believer and willing partner in enabling innovation, we will continue to support endeavors like this to meet the urgent needs of the public especially during this outbreak," he said.

DOST delivers biomedical devices to PGH for COVID-19 in-patient monitoring

Text and Photos by Enrico C. Belga Jr., *DOST-CO*

The Department of Science and Technology (DOST) delivered 106 units of RxBox to the Philippine General Hospital (PGH) on 31 March 2020 as part of its ongoing efforts to respond to the COVID-19 crisis.

RxBox was developed by researchers from University of the Philippines (UP) Manila and UP Diliman with support from the Department of Science and Technology (DOST) through the DOST-Philippine Council for Health Research and Development (PCHRD). It is a multi-component biomedical device capable of measuring a patient's temperature, blood pressure, heart rate, oxygen saturation, uterine contractions, and electrocardiogram readings. It can reduce contact between patients diagnosed with COVID-19 and healthcare workers.

The delivered devices will be used for bedside monitoring of the vital signs, oxygen saturation, and electrocardiogram readings of patients diagnosed with COVID-19, especially those in severe or critical conditions who need continuous monitoring. It will also provide an efficient way for healthcare workers to monitor multiple patients at once.

DOST's RxBox comes with the following features—Blood Pressure Monitor (measures the patient's blood pressure to detect cardiovascular problems especially hypertension); Pulse Oximeter (measures the level of oxygen in the patient's blood and can help detect lung and cardiovascular problems); Electrocardiogram (monitors the heart's movement to pump blood throughout the body, helpful for those with acute and chronic heart problems); Fetal Heart Monitor (measures the baby's heart rate while in the womb); Maternal Tocometer (measures the strength of a mother's uterine contractions during labor and delivery); and Temperature Sensor (measures a patient's body temperature. It can help detect fever, a common sign of infection and other disease conditions).

The regional office of DOST-CALABARZON is the implementing agency that coordinates with other regional offices in distributing of the remaining 894 RxBox units to selected healthcare facilities.

DOST-PTRI REwear™ Face Mask:
The Smart Protective Barrier to Reduce the Risk of COVID-19

By DOST-PTRI

With the recent Taal volcano eruption and the current COVID-19 pandemic, different kinds of face masks became in demand as it provides protection and security to its wearers. Since most of the protective masks available in the market are single-use and with the increasing cases of COVID-19, the gap between the supply and demand for such products has kept widening.

As a response to this need, the Department of Science and Technology - Philippine Textile Research Institute teamed up with private companies (Power Fashion Foundation/NE Noveau Star, Saffron Philippines Inc., Reliance Producers Coop, D&L Industries, and Chemrez Technologies, Inc) to produce 500,000 pieces of reusable, washable, and re-wearable face masks as a quick response to the ongoing COVID-19 pandemic. It is branded as REwear, Face Mask Made Smart.

COVID-19 virus and other respiratory diseases can be transmitted by respiratory droplets over a short distance through direct contact with an infected person's secretions. Face mask protects its wearer from infection as it serves as a barrier against the liquid droplets. A face mask is a loose-fitting device that creates a physical barrier between the mouth and nose of the wearer and potential contaminants in the immediate environment. If worn properly, a face mask can help block large-particle droplets, splashes, sprays or splatter that may contain viruses and microbes from reaching ones mouth and nose.

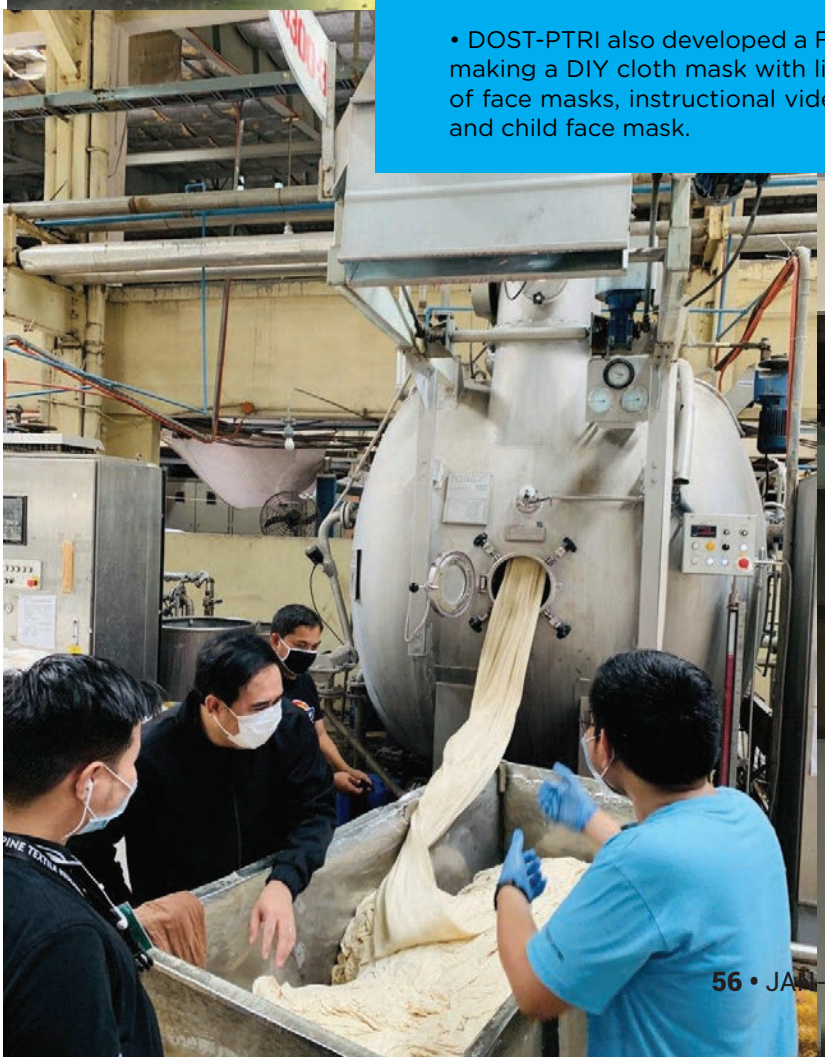
The REwear mask combines the best features of various types of face masks to ensure that appropriate protection, breathability, fit, and reusability. It is a two-piece, three- to four-layer mask. It is fully detachable with the outer layer as the first piece, made of water-repellent fabric, and the inner layer as the second piece, made of absorbent fabric. Through the water-repellent textile finishing technology developed by DOST-PTRI, the fabric is rendered impermeable to liquid. When used, liquid droplets will slide down the REwear mask thereby protecting the wearer. It is breathable and designed for a close fit to ensure comfort and protection. More importantly, it is reusable which can be used up to 50 times if washed according to the guidelines provided. One REwear mask is equivalent to 50 disposable masks; thus, the 500,000 total pieces to be produced means 25 million reductions in the need for masks.

It is recommended that the following people use masks:

- People who care for patients with respiratory infection symptoms
- People visiting clinics or hospitals
- Workers handling food
- Public transport operations staff
- People in crowded or poorly ventilated places.

- A call for fabric donations for the production of face masks has been started to mobilize the production and distribution. The REwear face masks are continuously produced and the first batch of the masks is expected to be released within April.

- DOST-PTRI also developed a Face Mask Resource Kit – a guide to making a DIY cloth mask with links to studies on the effectiveness of face masks, instructional videos, and patterns to make an adult and child face mask.



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PJS impact factor jumps 562%

The **Philippine Journal of Science** grew by a whopping 562.6% or 0.530 in its Journal Impact Factor (JIF) which refers to the number of citations its articles received at a given time. the 114-year Journal's dramatic JIF increase levelled up its importance in the academic circle.

The journal is published quarterly through the guidance of its editorial board led by Acd Caesar Saloma of UP. The publication is managed by **DOST-STII**.

114 years

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