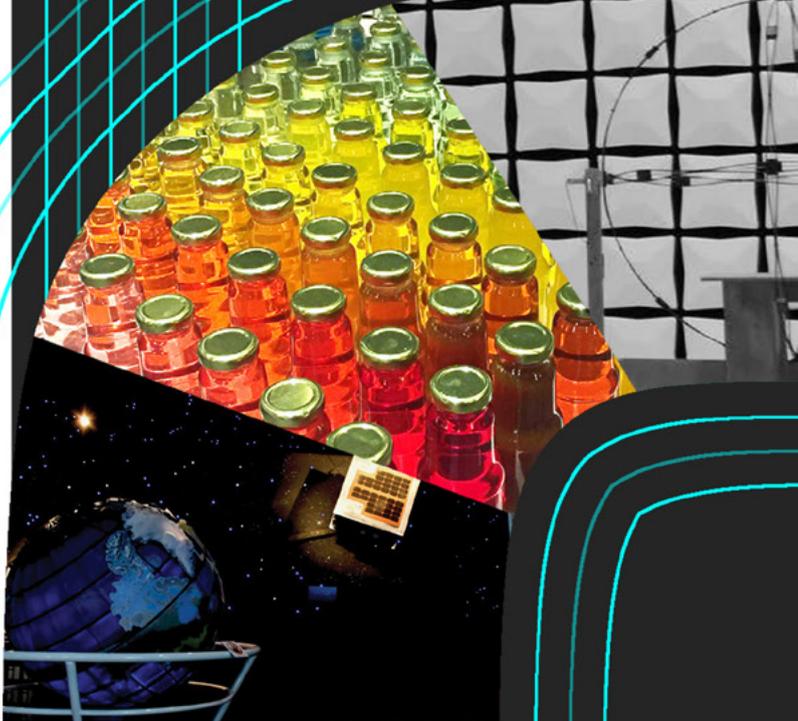


INNOVATIONS

ANNUAL REPORT 2020





ABOUT THE COVER

The 2020 PCIEERD Innovations cover highlights the 10th Anniversary of the Innovation Council, celebrating a decade of progress, resilience, and innovation. We take pride in our work of supporting our emerging technology sectors and empowering our Filipino artists, scientists, students, and entrepreneurs. Our leaders and visionaries.

The number "1" is highlighted with a white solid color to emphasize how The Council forges the path and leads the way in advancing the nation through research and development, while the "0" features a collage of photos, a visual representation of our divisions in action and their valuable contributions.

When brought together, "10" stands as a bold and robust testament of The Council being one of the prime movers of progress and development in science and technology, along with the collaborative work with our partners. These allowed us to grow with our stakeholders, as we took giant leaps and reached significant milestones in the past 10 years.

Finally, there are seven (7) ripples surrounding the "10," representing each of the divisions of PCIEERD and their never-ending potential. The ripples extending outward also signify the promising future of The Council and its projects, and how all the work that we do goes beyond us, driven by our vision of contributing to the productivity and competitiveness of the Philippines.

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Writing and Design:
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www.drinkph.com

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PROFILE

The Philippine Council for Industry, Energy and Emerging Technology Research and Development (PCIEERD) is one of the three sectoral planning councils of the Department of Science and Technology (DOST).

It is mandated to serve as the central agency in the formulation of policies, plans, and programs as well as in the implementation of strategies in the industry, energy, and emerging technology sectors through the following S&T programs:

- » Policy Development and Advocacy Support for Research and Development
- » Human Resource and Institution Development
- » S&T Information Dissemination and Promotion
- » Support for Technology Transfer and Commercialization

CORE VALUES

The PCIEERD core values describe who we are and the way we conduct ourselves. While the Council's goals and strategies may evolve to adapt to changing times, our core values remain the bedrock of our existence.

- » **Innovativeness:** We foster innovation by seeking to continually improve and keep better at what we do.
- » **Integrity:** We adhere to ethical standards, honesty, and fairness in all we say and do.
- » **Excellence:** We cultivate and demonstrate an environment of competence, quality, and positive attitude.

MISSION

Provide strategic leadership in enabling innovations in industry, energy, and emerging technology sectors.

PCIEERD commits to:

- » Formulate national policies, plans, programs, and strategies for S&T development in the industry, energy, and emerging technology sectors
- » Allocate government and generate external funds for research and development
- » Monitor research and development (R&D) projects

VISION

A recognized leader and preferred partner in Science, Technology, and Innovation on industry, energy, and emerging technologies contributing to the nation's productivity and competitiveness.

MESSAGE FROM THE DOST SECRETARY

The COVID-19 pandemic has heavily tested the resilience of the Philippines with its unprecedented challenges that brought major disruptions in our daily lives, livelihoods, systems, and services.

With challenges in the way we conduct research and development activities, the Department of Science and Technology (DOST) believe that innovations should be leveraged now, more than ever, to assist and boost Philippines' efforts in pandemic monitoring, control and treatment, virus tracking, and resource delivery.

We commend the DOST Philippine Council for Industry, Energy and Emerging Technology Research and Development (DOST-PCIEERD) for giving Filipinos the fighting chance to adapt and remain thriving amid this global health crisis as they pivoted their focus and resources to make sure that innovations from research and development (R&D) are available and beneficial to the vulnerable public.

DOST appreciates and celebrates the projects and technologies featured in this annual report that are developed by brilliant Filipino scientists, engineers, and researchers—from pandemic essentials like 3D-printed face shields, water-repellent masks, nanotechnology-enhanced filters, specimen collection booths, affordable ventilators, and AI thermal scanners to cutting-edge systems that track available medical resources for hospitals, distributed relief goods for local government units (LGUs), transport systems for seamless travelling, and many more game-changing solutions.



Congratulations to DOST-PCIEERD for remaining committed to putting the needs of Filipinos first by always fulfilling their mandate to generate science and technology (S&T) policies, strategies, and innovations that boost the quality of life of Filipinos, leading to the swift recovery of the nation.

HON. FORTUNATO T. DE LA PEÑA
SECRETARY

MESSAGE FROM THE DOST UNDERSECRETARY FOR R&D

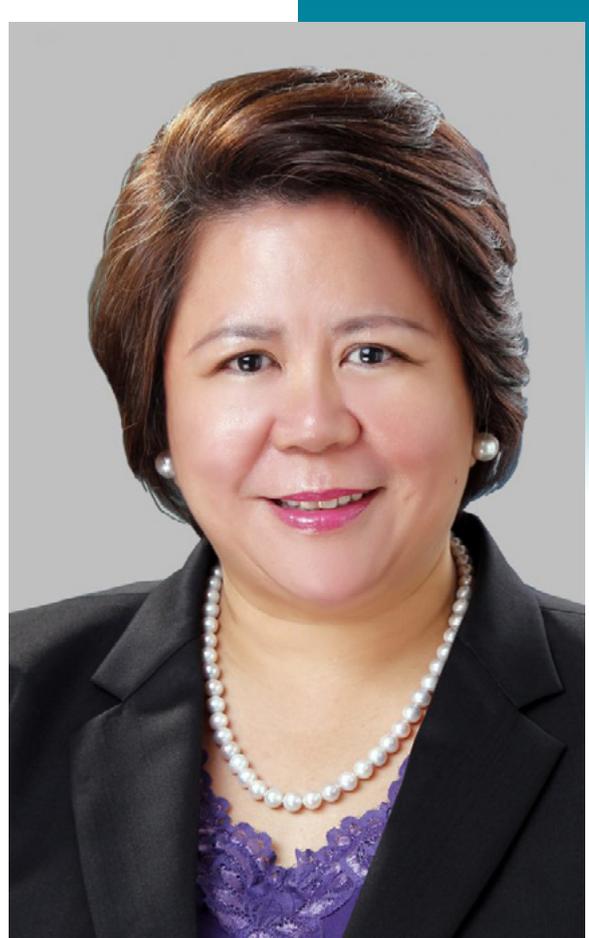
The year 2020 was no ordinary year. Remarkably a challenging year for all of us. 2020 posed serious threats to humanity and dragged the economy to a near standstill. Despite the crippling effect of COVID-19. The Department of Science and Technology (DOST) through Philippine Council for Industry, Energy and Emerging Technology Research and Development (PCIEERD) remained steady in its course on providing service and fulfilling its mandate by launching several innovative solutions that helped Filipinos fight the pandemic and adjust in the new normal.

DOST takes pride in the Council's accomplishments as these have helped many Filipinos address the most pressing problems of our society. We also take our hats off to Filipino scientists, engineers, researchers, industry partners, and various key stakeholders from private and public sectors for becoming catalysts for change that bring science and people together to make innovations work for the people.

We are confident that this comprehensive annual report will inform the public on the critical role of science, technology and innovation in providing innovative, responsive and relevant programs and interventions that helped us transition to and hopefully thrive in the new normal.

Together, let us build a resilient economy and sustainable community where prosperity is shared and enjoyed by all Filipinos.

Wishing DOST-PCIEERD more productive and fruitful years ahead!



ROWENA CRISTINA L. GUEVARA, PH.D.
UNDERSECRETARY FOR
RESEARCH AND DEVELOPMENT

MESSAGE FROM THE EXECUTIVE DIRECTOR

Welcome to the “Now Normal” Resilience, Growth, and Innovations amid the COVID-19 Pandemic



2020 marked the 10th anniversary of the Philippine Council for Industry, Energy and Emerging Technology Research and Development (PCIEERD). This is also the year that the pandemic COVID-19 happened, changing everyone’s lives in just a matter of weeks. From seeing our colleagues in the office every day, in a snap, most of us found ourselves working from home and attending virtual meetings. And it is also in this digital space that the significant anniversary milestone of PCIEERD was held. This is one of the many accomplishments that we are proud of and in fact, this has set a good precedent for future activities and events for PCIEERD.

There were major adjustments in celebrating our 10th anniversary, starting with the 10-part Webinar series. With our virtual 10th Anniversary Celebration, we were able to continuously engage our stakeholders and the different sectors we work with. Our online platform even provided us with a bigger audience and wider demographics for us to share the stories of our stakeholders and the Council’s as well.

Included in our top innovations from the last decade are the Infrastructure Development Programs (IDP) that provided researchers upgraded and newly built laboratories, the DOST Halal program for the Filipino-Muslim community, several food innovation centers

and food safety programs, cutting-edge manufacturing facilities including the OneLab integrated virtual network of laboratories, and more investments on renewable energy products.

We also take pride in working with brilliant teams to develop more infrastructure projects including intelligent transport systems and electric vehicles, achievements in space programs and being part in the creation of the Philippine Space Agency (PSA), creation of disaster-response and safety mapping projects, commercialization, and technology transfers with the industry, and support for startups through Technology Business Incubators (TBIs) and universities, generating a total revenue of Php 460 million.

Looking back at 2020, we are proud that we made strides in our core activities despite the challenges:

- » The number of proposals we have received, indicating that despite the lockdown and the drawbacks of the pandemic, our key metric of engaging researchers remains on the rise. In 2020

alone, we have received a total of 757 proposals, and almost half of these are already approved, enabling PCIEERD to be instrumental in helping bring forward the vision of our stakeholders.

» The support PCIEERD has provided and continuously providing to the different sectors in managing the current pandemic, through 22 different projects including the development of prototypes for ventilators, development of specifically designed swab testing booths, thermal scanners, rapid pass systems, and deployment of traffic monitoring systems to name a few. In line with this, we have also supported several programs under The Science and Technology Resilience Against Pandemic Program, also known as The STRAP Program.

Additional stories that we want to highlight are the developments in our state-of-the-art laboratories including the Additive Manufacturing Research Laboratory (AMReL), the Advanced Mechatronics, Robotics, and Industrial Automation Laboratory (AMERIAL), and the Nanotechnology R&D Laboratory, as well as advancements in urbanizations of cities outside Metro Manila, and thrusts in the data science and space technology sectors.

True to our core, amid the pandemic, The Council continues to innovate. Our initiatives are not specifically planned for a pandemic, but being at the forefront of innovation puts us in a unique



situation where we can strongly utilize and apply on a much bigger scale the practices in our workplace.

In this report, we will also lightly touch on the future of PCIEERD and the projects that we are all so excited about, including rolling out more Artificial Intelligence (AI) programs in the country, development of Smart Cities, more investments in space programs and space technology, more support for small to medium businesses, empowering women social entrepreneurs, and developing smarter food value chain programs.

We also aim to encourage more young researchers and scientists, establish more Science Communication Fellowship Programs, and build a compendium of business where we can bring our stakeholders and their breakthroughs together with national and global investors, providing more opportunities for innovation and businesses to thrive.

Moving forward, it is our goal to develop a stronger online presence for PCIEERD to reach a bigger audience and to remain relevant and ahead of the curve. 2020 was a year for us to slow down, to re-assess and re-visit our projects and processes. It was a time for us to think and prepare for the rise and recovery that is 2021.

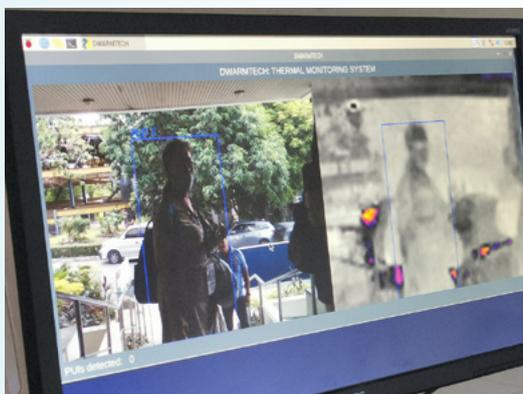
As we all journey towards this “now normal” – since it is already happening, we have to adjust. We had and we have to continue with the necessary tweaks for us to move forward in a more agile and adaptive manner. The future of work, the future of public service, and the future of science and technology will continue to be challenged, but we will change along with these. And these changes will be for the better. It will make us more adaptive, more productive, and more resilient to the times that are always changing.

In 2021 and beyond, we continue to explore more opportunities in science and technology, to maximize all platforms and develop programs for us to timely respond to the urgent needs of the community we are a part of. We will continue to find and create ways to innovate on how we can meet, how we exchange information, and how we can connect with each other. That’s what we are, after all. This is all part of our greater mission of being change-makers and innovators. **WE ARE THE COUNCIL.**

DR. ENRICO C. PARINGIT
EXECUTIVE DIRECTOR



THE NOW NORMAL: INNOVATIONS AMID THE COVID-19 PANDEMIC



The COVID-19 pandemic was a public health emergency that turned into a global health crisis in a matter of weeks. In a snap, what the world thought would be a few months of lockdowns and quarantine turned into half a year and, as of writing, officially a year. Like the rest of the world, the Philippines was not spared.

In the early months of the COVID-19 pandemic, the Department of Health (DOH) called on support from all sectors for assistance in any way possible. As part of the Department of Science and Technology (DOST), it was expected and crucial for PCIEERD to heed this call. We focused on what we do best—working with researchers and scientists toward innovations through science and technology (S&T). For 2020, a total of 22 COVID-response projects were launched, with an overall budget of PHP176 million.

The battle is far from over, however. With vaccine development on the horizon, new strains are being discovered and new cases are still being reported. The challenges are not stopping any time soon, but the same can be said for us—together, we are not stopping any time soon as we brave this now normal.

This section of the report would cover the different projects supported by PCIEERD in response to the COVID-19 pandemic.

SPECIMEN COLLECTION BOOTH

The Specimen Collection Booth was designed to help frontline workers collect specimens from suspected COVID-19 patients, while also protecting them from being exposed. The final design was conceptualized in consideration of the safety of both patient and tester, the monitoring of patient temperature, mobility, compactness of the design for ease of transport and deployment, and good ventilation.

A total of 132 units were manufactured and deployed to 92 hospitals throughout the Philippines. The blueprint of the final design was uploaded online, currently with 97 downloads from government agencies and academic institutions in the Philippines, as well as four downloads from the United States, Ethiopia, Nigeria, and India. Twenty-two local fabricators are looking to produce more of these collection booths.

The booth design may be downloaded for free at <https://pcieerd.dost.gov.ph/library/fame-design>



The Specimen Collection Booth designed by the FAME Technologies, Inc. with support from DOST.



Some of the features of the SCB are: water-proof acrylic window, equipped with aircon and ventilator with filter, heavy-duty wheel for mobility, a pressure sensor, and bluetooth speaker.

AMCEN 3D-PRINTED FACE SHIELDS

As part of its national contribution to manage the pandemic, the Additive Manufacturing Center (AMCen), together with the Research on Advanced Prototyping for Product Innovation and Development using Additive Manufacturing Technologies (RAPPID-ADMATEC), started printing frames for face shields, with an initial target of 1,000 pieces for the Philippine General Hospital (PGH).

A collaboration with the Department of Science and Technology - Metals Industry Research and Development Center (DOST-MIRDC) also resulted in the mass production of face shields through an injection mold. The DOST-MIRDC has a production capacity of 2,500 face shields per day. The agency further worked with AMCen for 3D-printing the face shields, producing 50 pieces per day.

DOST-MIRDC's partner Omnifab fabricated a second injection mold, while the Megasamsotite Plant in San Pedro, Laguna, offered its facility for mass production, thereby increasing the total output of face shields at 5,000 pieces per day.

Furthermore, the AMCen - Multiple Materials Platform for Additive Manufacturing (MATDEV) project was also able to produce and donate the following medical parts and components - 2,767 pieces of face shields, 2,580 pieces of ear relief bands, 14 pieces of 3D-printed Venturi Valves to six hospitals, namely, Philippine Children's Medical Center (PCMC), National Children's Hospital (NCH), Rizal Medical Center (RMC), San Lazaro Hospital (SLH), Pasig City General Hospital (PCGH), and the Armed Forces of the Philippines General Hospital (AFP GH).

Additional donations to various beneficiaries include four AeroChamber / Diffuser Prototypes to PCMC, 3D-printed parts for the Telepresence Terminal Units in collaboration with DOST-Philippine Council for Health Research and Development (PCHRD) Sibol Project together with University of the Philippines-Manila, and characterization of alternative filter materials for Heat and Moisture Exchanger Filters (HMEF) together with the University of Santo Tomas Hospital (USTH).

In progress is the development of ventilator prototypes in collaboration with NCH and PCMC, with the team currently canvassing for electronic parts. The design for the 3D-printed modified oxygen concentrator mask with a 3D-printed filter cartridge attachment was improved as well. ability to track vehicle types, traffic volume and density, speed of movement, and concentrations of vehicular and human activities.



AMREL 3D-PRINTED FACE SHIELDS, EAR GUARDS, COUPLINGS, AND SPRAY NOZZLES



Representatives from DOST-PCIEERD and AMReL Project Team during the facility launch in 2019. From left: Ms. Joann Villarias (DOST-PCIEERD), Ms. Glenda Dorcas Sacbibit (DOST-PCIEERD), Executive Director Dr. Enrico C. Paringit (DOST-PCIEERD), Project Leader Dr. John Ryan Dizon (AMReL Project), Ms. Ermie Bacarra (DOST-PCIEERD), Ms. Eidel Quinn Eda (DOST-PCIEERD), and Deputy Executive Director Engr. Raul Sabularse (DOST-PCIEERD).

The Additive Manufacturing Research Laboratory (AMReL) in Bataan Peninsula State University (BPSU) assisted in producing personal protective equipment (PPE) for Filipino frontliners through 3D-printed face shields, with a target of producing 1,000 pieces of face shields for the local community in Bataan.

Through Bayanihan Bataan, a total of 1,383 face shields were donated to 16 hospitals and medical institutions, along with 2,878 ear guards which provide relief for the frontliners who have to wear face shields and face masks for extended periods of time daily. The DOST-MIRDC provided 2,000 faceshield frames that were assembled and distributed as well.

To add, the Bataan local government unit (LGU) along with the Bataan Provincial Hospital tapped the BPSU for assistance in 3D printing coupling, spare parts, or phased out parts of hospital beds, while the Bataan Provincial Health Office requested assistance in printing 3D spray nozzles to be used by the locality in its COVID-19 initiatives.



3D printing of face shield frames at the AMReL facility. Below are the outputs from this initiative.



TITAN: VISION-BASED TRAFFIC INFORMATION AND ANALYSIS



To provide accurate data beneficial in monitoring and creating guidelines on social distancing during the COVID-19 crisis, the vision-based Traffic Information and Analysis (TITAN) was conceptualized. The Artificial Intelligence-based (AI-based) system monitors vehicular and pedestrian activities from the vantage point of traffic surveillance cameras, with the ability to track vehicle types, traffic volume and density, speed of movement, and concentrations of vehicular and human activities.

This provides stakeholders with affordable computing hardware and a conveniently accessible intuitive web interface. In times of crisis such as the COVID-19 pandemic, this is beneficial in monitoring activities in densely populated areas, enforcing social distancing, and creating guidelines for future policies.



Sample footage from the TITAN surveillance camera

OPTIMAL LOCATIONS AND ALLOCATION OF PERSONNEL (OLAP)

In the first month of the lockdown in Metro Manila, a total of 65 checkpoints were established. The Optimal Locations and Allocation of Personnel (OLAP) system was created to provide leaders with information relevant to the allocation of medical and military personnel at each checkpoint.

The OLAP segments each road depending on the number of zones it serves within and outside Metro Manila, the number of hospitals providing care to COVID-19 patients, and the number of major supermarkets and public markets in each zone. A collaboration with the Department of Transport (DOTr) also resulted in the development of 22 radial bus routes covering an estimated service route of 674 kilometers (km).

E-TRIKES INTELECT: INTELLIGENT ELECTRIC TRANSPORTATION NETWORK PROGRAM



Photo: <https://www.chrg.tech/e-mobility>

E-trikes in UP Diliman were used to deliver goods around the campus in the height of the pandemic.

For assistance in transportation during the pandemic, the Intelligent Electric Transportation (IntElecT) Network Program, or smart electric tricycles (e-trikes), was envisioned to develop a network of energy-aware charging stations for electric vehicles. The charging stations are designed to process information such as vehicle routes, schedule of vehicles, when and where to charge, and charging time, all of which aim to improve energy optimization and efficiency.

The charging stations can also collect information, including the present location of the vehicles, the number of passengers, temperature, battery state, and vehicle speed, along with the amount of energy collected from solar panels. This can help predict the day-ahead solar energy available, and then instruct the charging stations to source energy from utility on days with minimal solar energy available.

The e-trikes are designed as well to be an "Online-Enabled Transportation System", or a ride-hailing platform, which is integral to the future of smart cities and emission-free communities. The e-trikes can be used for immediate deployment in disaster situations. Pilot-tests on the Cagayan province and within UP Diliman are currently being proposed.

As of this writing, the installation of fast chargers in Cagayan has been completed, with a capacity to serve 10 e-trikes. The Hatid Mobile app was also launched for online transactions and reservation systems in using the e-trikes.

BAYAN KO-OPS UNIFIED MARKET INVENTORY SYSTEM

The Bayan Ko-Ops was designed to be a unified system that integrates available inventory data from all participating retail service providers. The system will keep real-time data on the on-shelf and stock items currently distributed in the market, informing government agencies and local government units (LGUs) for improved decision-making. There is currently an ongoing simulation using dummy data, awaiting real data from retailers.

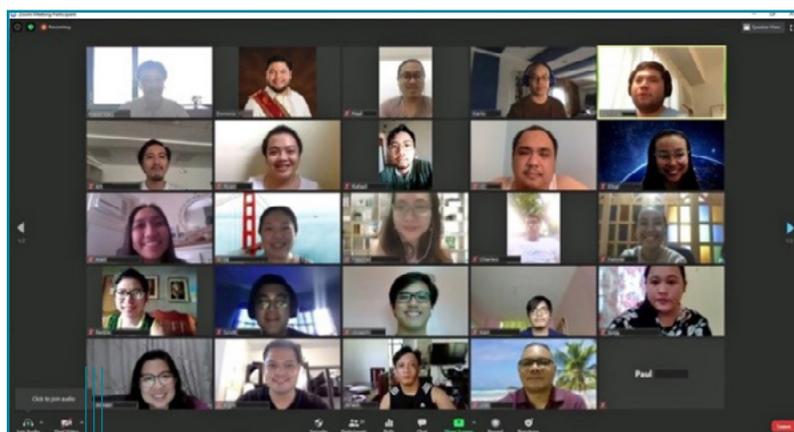
REWEAR (REUSABLE, WASHABLE, AND RE-WEARABLE) FACE MASKS



The REwear Face Mask was designed as a quick response to the demand for reusable, washable, and re-wearable facial masks with protection against infected liquid droplets. The mask is designed with two detachable pieces, the outer protective piece is water-repellent and washable with water alone for up to 50 washes. The inner piece completes the protection layer, washable with soap and water for an indefinite number of times. The REwear Face Masks passed the safety tests of acute dermal irritation, acute dermal toxicity, and acute inhalation toxicity.

As of December 2020, the following orders of the REwear Face Masks have been completed: 48,000 pieces for the Office of Civil Defense; 72,000 pieces for the Department of Health; and an additional 100,000 pieces for the Office of Civil Defense. To date, the total number of masks produced is 446,493 pieces, with 424,306 pieces already distributed to several beneficiaries.

IMBUE TRAINING PROGRAM



Some of the participants and organizers from the 5th batch of training of PGC under the IMBUE project.

The Philippine Genome Center (PGC), together with PCIEERD, launched the Internship program for increased local Bioinformatics Utility and Expertise (IMBUE) program to encourage and prepare students to pursue higher education and build careers in bioinformatics and computational biology.

The IMBUE training program covers a comprehensive course across multiple disciplines, with 25 interns per batch. A total of 125 individuals were trained nationwide and, for the fifth batch, a module on Viral Metagenomics and Protein Structure was added specifically for biologists and healthcare professionals responding to the COVID-19 pandemic.

AMERIAL ADULT VENTILATORS

To aid in the efforts of the medical community in managing the COVID-19 pandemic, the Advanced Mechatronics, Robotics, and Industrial Automation Laboratory (AMERIAL), in support of the DOST-MIRDC, developed a prototype adult pressure-and-volume-controlled ventilator using the OstreaVent™ Technology.

In partnership with the Breath of Life Foundation, the DOST-MIRDC, through its AMERIAL project, worked on developing ventilators suitable for adult use. Originally, the foundation has been creating ventilators for children. But with the increasing rate of adult COVID-19 positive patients, there was an immediate need for more adult ventilators and a need to modify the existing design of the pediatric ventilators.

The Medical Equipment Healthcare Group, Inc. (MEDEQUIP) was tapped to handle the testing and certification of the product. Once certified, it needs to undergo clinical trials at the Philippine General Hospital (PGH). To date, all of its research and development (R&D) components, particularly in the programming portion, have been completed.

MOBILE AI THERMAL SCANNER

Prototype of the Mobile AI Thermal Scanner as deployed in DOST.



The artificial-intelligence-based (AI-based) mobile thermal scanner attached to a drone is designed to easily scan and pinpoint people with high body temperature. The drones provide real-time data transmission, equipped with a Global Positioning System (GPS), and a communication capacity within the range of 2 km. This technology is especially useful in shortening queues, minimizing contact at checkpoints, and immediately identifying individuals for monitoring.

The mobile AI thermal scanner is a collaboration between the Far Eastern University (FEU) Institute of Technology Innovation Center and its spin-off company DWARM Technologies, UPSCALE Innovation Hub, Orbital Exploration (OrbitX) Technologies, and PLDT Innohub. A total of six units were developed, three of which have already completed testing and deployment to the LGUs.

LISA ROBOT: LOGISTIC INDOOR SERVICE ASSISTANT TELEPRESENCE ROBOT

To assist patients who tested positive for COVID-19, all while minimizing contact with medical personnel, the Logistic Indoor Service Assistance (LISA) Telepresence Robot was developed. It is a remote-control wheeled device that offers wireless connectivity and virtual communication through a computer, tablet, or smartphone screen attached to the robot.

This facilitates safe, efficient, and interactive communication between the patient and the medical personnel, as well as the patient's loved ones, whenever necessary. The LISA Robot features a device holder, a compartment box for medicine, bumper switches, an emergency safety button, a main control system, a monitor, a power source, a mobile base, and a handheld remote controller.



Prototype of the LISA Robot

PINOY ANIMATION LABAN SA COVID-19 WITH TOON CITY ACADEMY (TCA)



Watch the videos at <https://tinyurl.com/2s44rewf>

To further spread awareness and engage the public, the Pinoy Animation Laban sa COVID-19 was launched, in coordination with the Toon City Academy (TCA). A total of six animated infomercials were developed and aired over CNN, GMA News TV, YouTube, and the DOST-PCIEERD social media channels. The animations feature infographics for public health awareness about the current pandemic, including the topics of social distancing, proper hygiene, proper verification of information, and community quarantine.

CLSU NANOTECH ZINC OXIDE WITH TURMERIC EXTRACT ALCOHOL AND SANITIZERS

An effective way to minimize the spread of COVID-19 is through regular disinfection with alcohol and sanitizer. To aid its local community, the Central Luzon State University (CLSU) Nanotech Laboratory produced nanotech-enhanced ethyl alcohol and hand sanitizer. It has been infused with zinc oxide with turmeric extract, adapted from the previous mixture that was proven effective against the H1N1 influenza and SARS viruses, both of which are related strains to the coronavirus.

The team produced 8,488 liters of ethyl alcohol and sanitizers infused with turmeric extract and distributed it to 31 barangays in Nueva Ecija, with a minimum of five liters per barangay. Clinics and offices were prioritized in the distribution of the ethyl alcohol, while the LGU further tapped CLSU to produce more nanotech-enhanced alcohol and sanitizers for distribution throughout the province. The laboratory is also developing a washable face mask with a nanofiber filter, with a total of 450 pieces already distributed to frontline medical workers.

GOCLEAN DISINFECTION BOOTH

A mobile disinfection chamber that sanitizes the entire body of the person entering the enclosure, the GoClean Disinfection Booth comes in single and dual chamber variants. The booth is equipped with a wet chamber for disinfectant fog and misting. It can also be equipped with a built-in thermal scanner, automatic alcohol dispenser, and a rack for disinfecting materials. Further developments would include a breathing pattern determination and a coughing detection system. What makes the chamber unique is the HOCLOMAC technology, developed by USHER Technologies, Inc., that allows it to produce its disinfection solution, a first in the world.

USHER Technologies, Inc., is a spin-off company from MAPUA University and DOST-PCIEERD. To date, 11 units of the GoClean Disinfection Booth have been developed and two were deployed through PCIEERD. Recipients from USHER Technologies include Quezon City, Santiago City, Camp Crame, Camp Aguinaldo, the Development Bank of the Philippines (DBP), the Lung Center of the Philippines (LCP), and the DOST Science Heritage Building.



A mobile disinfection chamber as deployed at the Lung Center of the Philippines in Quezon City.

TRACING FOR ALLOCATION OF MEDICAL SUPPLIES (TRAMS+)



TrAMS+ is an online geographic system for tracking information regarding the medical resources of health facilities. It's mostly reliant on crowdsourced and volunteered information that can be used by government agencies, donors, and other parties interested to donate much-needed medical resources. To date, 84 hospitals are regularly providing updates in the system, with data collection and verification processes in place.

Interface of the TrAMS website which may be accessed at: trams.com.ph

MATHPLUS APPS



Sample interface of the Mathplus apps.
Download it for free through Play Store.

To make learning mathematics more fun and engaging, the Ateneo de Manila University (ADMU), together with the DOST-PCIEERD, developed an online platform to make math more interesting and compelling for students. The project, called "Technology Innovations for Mathematical Reasoning, Statistical Thinking, and Reasoning", aims to create a digital learning environment that can transform Filipino students into proficient problem solvers through interactive digital mobile apps.

Also included in the program are large-scale database assessment results and a database for statistical learning, also known as Census-at-School. To add, several apps have been developed for Grades 1-10, along with the Senso Eskwela project. There are ongoing works on the project as well, including updating and improving the app versions and evaluating the effects of using the apps on student engagement and learning, particularly in the context of distance or online learning.

PROJECT RAMDAM (RESOURCE ALLOCATION MANAGEMENT, DISTRIBUTION, AND MONITORING)



Project RAMDAM, short for Resource Allocation Management, Distribution, and Monitoring, was launched to share accurate information regarding relief packs and cash assistance during the pandemic. It is a system designed to provide efficient data management and monitoring for the LGUs, as well as provide feedback and requests from the residents.

The system was developed by Geographic Innovations for Development Solutions, Inc. (GrIDS) in partnership with the DOST. It can be accessed via a mobile app or through a web portal. Field testing was done in 14 barangays in Laguna, with 495 users. Plans for the system include pilot-testing preparations for nationwide implementation.

AUTOMATED EMERGENCY VENTILATOR BY TIP-VENTSFORPHIL

The Technological Institute of the Philippines (TIP), together with its collaborators from "Vents for the Philippines", hope to save lives through safe-to-use and reasonably priced automated emergency ventilators. When hospitals are more equipped to care for their patients, the public will have an increased sense of confidence and security that is beneficial to the community at large.

Through targeted research publications, the design of these ventilators is made available as an open-source material for other cities, provinces, and even other countries that are interested. The Medical Equipment Healthcare Group, Inc. (MEDEQUIP) manages the testing and calibration of these ventilators.

SPIRITUS VITAE: DESIGN, DEVELOPMENT, AND TESTING OF 10 UNITS OF LOW-COST VENTILATORS

To aid the medical community during the COVID-19 pandemic, the Don Bosco Technical College (DBTC) Mandaluyong designed a ventilator that automates a manual resuscitator, the balloon used by nurses during health emergencies, to help patients breathe when their lungs are unable to do so.

The idea was inspired by the project of the Massachusetts Institute of Technology (MIT) that became popular back in 2010. Taking after this, the DBTC team modified the design and added

features and flexibilities to better address current needs concerning COVID-19.

The project is dubbed "Spiritus Vitae", or the Breath of Life, which is a multi-featured ventilator, with the capacity to force a fixed amount of air into the lungs or a certain amount of oxygen as required by the doctor. Sensors are in place as well to ensure that the patient is well-assisted to breathe on his own, along with protective devices to contain the virus for the safety of health workers.

TESTING, CALIBRATION, AND FABRICATION OF NEURONVENT SYSTEM

The NeuronVent System is a step towards the development of a machine for patients needing 24/7 ventilator care. This machine is highly beneficial in situations that include transporting patients; performing cardiopulmonary resuscitation (CPR) on COVID-19 patients; avoiding aerosolization to health care workers; replacing big, bulky ventilators in quarantine areas; and during circumstances that involve emergency ventilation.

The NeuronVent project also plays a critical role in improving the capacity of Neuronmek, Inc., as well as the DOST - Electronics Product Development Center (EPDC), along with its stakeholders. Through this project, the facilities are able to develop fast tract solutions despite the

challenges of the pandemic. It also encourages resiliency among Filipino researchers and Filipino research institutions to support the efforts of the Philippine government in advancing the production of high-quality innovations through research.

Overall, the project aims to finalize the NeuronVent design and prepare it for testing, calibration, and fabrication while simulating it in a lung simulator machine. The project also aims to test and calibrate the NeuronVent system in collaboration with EPDC. After the fabrication of NeuronVent, it is expected to be tested for accreditation and inspection by the Food and Drug Administration (FDA).

DOST-PCIEERD STRAP PROJECTS

In addition to these efforts, the DOST allotted a budget of PHP60 million through PCIEERD to support research initiatives under the project, “Science and Technology for a Resilient Community against the Pandemic”, or the STRAP Block Grant. This project is aimed to help Filipinos combat the pandemic and adapt to the changes brought by the current health crisis.

Approved projects under the STRAP Block Grant are:

PROJECTS FUNDED UNDER THE STRAP BLOCK GRANT INCLUDE:

- » Work from home tools
- » Workplace safety and ergonomics
- » Safe mobility and transport (air, sea, and land)
- » Response and coping up with the new normal
- » Testing and calibration of locally developed medical devices
- » New devices, products, and high-quality medical devices
- » Protective coatings for surfaces and PPEs
- » Detection and disinfection technologies
- » Emergency food for COVID-19 affected families, communities, and frontliners
- » Geospatial and Information and Communications Technology (ICT) solutions to address COVID-19

Nanocellulose Self-Disinfecting (NACS) Low-Cost Face Mask Filter

The Nanocellulose Self-Disinfecting (NACS) Filter is a nano-reinforced, reusable, self-cleaning filter that people can use together with ordinary cloth face masks to promote health and safety during the COVID-19 pandemic. The project covers three phases, namely: (1) the preparation of the filter composites extracted from indigenous materials, (2) the design of a self-cleaning filter via light activation to make it reusable, and (3) the combination of these materials to create a face mask that can be deployed as well to frontline medical workers.

To date, the project was able to extract and isolate cellulose nanocrystals from 12 raw materials and prepare samples of the face masks to be sent to the Philippine Textile Research Institute (PTRI). The next steps include laboratory characterization of other indigenous materials and agricultural waste and synthesizing the nanomaterials with the nano-reinforced filters. Renewable sources are used as materials for this project, including corn and rice husks, durian rinds, mangosteen peels, pineapple leaves, banana peels, and water hyacinth stems, to name a few.

Printed Electronics and Nanotech Materials for the New Normal: Cough Sensor, Antiviral Nanotech for Air Circulator Filters, and Non-Invasive Health Monitoring through Sensor Array Patch

The Printed Electronics Project under the STRAP Block Grant intends to produce antiviral nanomaterial coatings for air filters, breath and cough sensors patch for non-invasive health monitoring, and a printed sensor array patch for face masks.

The latest accomplishments of the project include the implementation and deployment of machine learning on the Arduino BLE Senseboard, with a capacity to distinguish cough from noise, perform initial experiments and fixes, complete the literature review of microbiology testing protocols, compute for sampling quota and research strategies, and continue the testing of the market questionnaire. The project aims to monitor and protect human health during the pandemic as the community moves toward the new normal.

Stunt Science Physics Mobile Simulator Game

The Stunt Science Mobile Simulation Game helps the students remain engaged through interactive lessons, while also learning remotely. It features a physics simulator mobile game where motion-based physics problems are presented to the user as game objectives.

As the student chooses an answer, the result is simulated through real-time animations, confirming whether or not the answer is correct. This interactive experience allows the student to visualize the potential outcome of the problem, making learning fun and engaging.

Project development includes content planning and gathering, conceptualizing the mechanics and design of the game, developing the game itself, and evaluating the impact and effectiveness of the learning process among secondary-level students taking up physics.

Game-based Mobile Learning Platform for Social Science

As part of the initiative to make online learning more interactive for students, a game-based application focused on the subject of social studies, or araling panlipunan (AP), is in the works.

In interviews with AP teachers, it was discovered that it was challenging to engage students on the subject via online learning due to the quantity of information that needs to be memorized. To address this, the game is envisioned as an effective tool that can help motivate the students and guide the teachers towards a better appreciation of social studies

Haynayan AR: An Augmented Reality-based Lesson for the Improvement of Learning Achievement in Cell Biology for the STEM Curriculum

In line with the interactive initiatives to aid in online learning for students, the Haynayan Augmented-Reality (AR) Cell Biology technology focuses on complex biology topics, such as cellular respiration, but presented to students in a more engaging manner.

Through AR technology, students can visualize the lesson, understand it better, and retain information. The immersive environment proves beneficial not just to students, but to teachers as well, as it aids them in explaining the lessons and providing a more visual presentation. This is especially relevant to students and teachers in the STEM curriculum.

iJuanderer: An Augmented Reality-based Gamified Local Tourism and Cultural Heritage Promotion and Preservation

The iJuanderer is an augmented reality-based (AR-based) mobile application designed to promote the destinations in the Philippines virtually to travelers and tourists. The app further engages the user and introduces the rich culture of the Philippines through "collectibles" that can be gathered as a game objective in the app.

A 3D-scanning technology will be used to scan the artifact exhibits, to preserve them while also promoting their rich cultural value. To add, the world-famous biodiversity of the Philippines will be highlighted, including beaches, mountains, rainforests, diving spots, islands, heritage towns, and monuments. The national festivals, along with the indigenous traditions, are essential parts of the virtual experience as well.

IR (Infrared) Thermal Scanner Wearable Technology

The IR (Infrared) Thermal Scanner is a wearable technology designed for frontline workers to protect them from exposure to COVID-19. The project involves a medium-ranged IR thermal scanner attached to a helmet, with a screen or a mini-projector that displays and monitors body temperature in real-time.

This is an alternative to the clinical forehead scanners that frontliners utilize, as the relatively short distance does not conform to the minimum health standard required by the Department of Health (DOH) and poses risks to everyone involved.

SpaceBetweenUs: A Computer Vision Application for Physical Distancing Monitoring in Public Areas

SpaceBetweenUs is a computer vision application which monitors physical distancing in a place or area that is generally open and accessible to people. The application will utilize computer vision technology in enforcing and keeping track of the required physical distance between individuals. SpaceBetweenUs will emulate the human vision system in monitoring physical distancing in public areas. With this initiative, the project aims to contribute in reducing the risk of spreading COVID-19 or other infectious diseases to protect people and save lives.

Citizen's Logistics and Early Assessment Reporting Tool (CLEAR) Pilot Testing: Post-Quarantine Health Monitoring and Contact Tracing Online System for the IT-BPM Sector

The CLEAR project was initially developed by Spring Valley Tech Corp and CMI Tech, as an online application for medium to large companies employing hundreds of employees. The system enables companies to track the health of their employees on a daily basis. Using Global Positioning System (GPS) and bluetooth technologies enabled on smartphones, the CLEAR system is able to do automatic contact tracing and monitoring designed for businesses. The data gathered are then made available to the Human Resource (HR) Dashboard. The CLEAR system comes with a Near Field Communication (NFC) card scanners as well that can be installed on the doors of the buildings to detect the movement of employees within company premises.



**INDUSTRIAL
TECHNOLOGY
DEVELOPMENT
DIVISION (ITDD)**

The Industrial Technology Development Division (ITDD) formulates S&R sectoral plans, as well as coordinates, evaluates, and monitors R&D programs and projects in industrial processes, chemical foods and feeds, texture and wood-based sectors, metals and engineering, mining, minerals, and environmental sectors.

Part of its projects involve the Robust Optical Aerosol Monitor (ROAM), Bio-based Polyols, Nickel Pig Iron from Laterite Ores, Salt Harvesting Equipment, and upgrades on the traditional Bamboo Musical Instruments.

With an important role in bringing Filipino talents and innovations to the world, the ITDD ensures access to new technology and facilities. As industries are propelled to grow, so is the local economy.

In line with the roadmaps for environment, process, and mining, these projects are on their way to completion and are designed to care for the environment, improve the lives of the communities they serve, maximise technology to preserve culture and tradition, and provide alternatives to rapidly diminishing resources, while bringing in revenue for the local economy and shining light on the Filipino talent and ingenuity on a global landscape.

ROAM ROBUST OPTICAL AEROSOL MONITOR

Design Review, Design Finalization, and Production Assessment of a Locally Fabricated Optical Aerosol Monitor

Dr. Len Herald V. Lim
Project Leader,
Institute of Chemistry,
Implementing Agency

TECHNICOM,
Funding Agency
Department of Science
and Technology (DOST)

Driven by the DOST Sustainable S&T Clean Air Roadmap (Air Quality), with a vision of **Malinis na Hangang Dahil sa Akin**, the Robust Optical Aerosol Monitor (ROAM) is a promising innovation that addresses the various needs for the prevention and control of air pollution. The ROAM is a portable device for air quality monitoring that promises great benefits to various institutions including the academe, private institutions, commercial entities, government, and non-government organizations.

The ROAM plays an important role in achieving the goal of upgrading the quality of air ecosystems in the country by 2023.

The latest version of the ROAM comes with the following features: laser light scattering and imaging, mass concentration measurement, temperature, and humidity measurement, touch screen user interface, 1x USB port, and 1x sampling

inlet. With Wi-Fi connectivity and enclosed in an aluminum casing, the ROAM is further equipped with additional overcurrent and overheat protection, high-performance camera and CPU, laser thermal isolation, tele centric lens system, and a rubber footing.

To create a network of potential clients, product demonstration advertising was conducted in the middle of 2020. As of May 31, 2020, a total of 19 organizations have expressed interest in trying out the ROAM. Included in these organizations are six from the academe, three LGUs, two government agencies, two private companies, and six NGOs and other private organizations.

However, as of this writing, the letters of interest (LOI) for the organizations are not yet available due to the 10 devices still in the process of finalization. The official LOIs are yet to be released.



The latest version of aerosol monitor unit developed by the University of the Philippines Diliman

BIO-BASED POLYOLS AND POLYURETHANES FOR INDUSTRIAL APPLICATIONS

Production of Bio-based Polyols and Polyurethanes for Industrial Application

Project 1: Production of Bio-based Polyols from Lignocellulosic Biomass

Arnold A. Lubguban
Ph.D.

Project Leader

Project 2: Development of Polyurethane-based Packing Materials and Anti-Corrosive Coatings from Vegetable Oil

Arnold C. Alguno Ph.D.

Project Leader

Mindanao State University-Iligan of Technology (MSU-IIT) Department of Chemical Engineering and Technology,
Implementing Agency

The Philippines is set to take the lead in developing organic by-products as alternative sources for anti-corrosion materials such as polyols and polyurethane (PU) foams used for industrial purposes. This project is a promising opportunity for farmers to convert their usual farm waste of coconut, rice straws, and pineapple leaves into a revenue-generating project, while at the same time ensuring the sustainability of resources.

Researchers from the Mindanao State University - Iligan Institute of Technology developed a process that converts coconut oil into a bio-based polyol, a chemical essential in anti-corrosion products used for coating surfaces. These polyols are typically sourced from petroleum, a rapidly declining resource in the environment.

Along with this, another subproject is the conversion of rice straw and pineapple leaves into rigid PU foams. By breaking down the components

of plants, lignocellulosic biomass is created. These are then produced into PU foams for various industrial and commercial purposes.

With a booming market for anti-corrosion coating agents, mainly led by the marine industry, these opportunities for bio-based polyols and PU foams are set to bring economic growth to local communities as well.

To date, notable accomplishments for the project include the impressive performance of bio-based polyols and PU foams exceeding industry standards and fostered collaboration with commercial partners in the market.

This innovation on organic polyols is aligned with the DOST Process Roadmap and vision of developing local products as global players with a Filipino branding. It aims to produce innovations that are culture-sensitive, robust, sustainable, profitable, and is anchored on the Filipino knowledge of utilizing locally available raw materials. It is also the objective of the organization to supply to the growing domestic and international market demands through its highly skilled, competent, and talented human resources.



Project staff performing optimization experiments on the production of rigid foams

PILOT SCALE PRODUCTION OF NICKEL PIG IRON FROM LOW GRADE LATERITE ORES

Pilot Scale Production of Nickel Pig Iron from Low Grade Laterite Ores

Engr. Bernardo B. Bitangga

Project Leader
Mines and Geosciences Bureau, Department of Environment and Natural Resources (DENR),
Implementing Agency

Nickel pig iron (NPI) is a combination of iron, coke, sinter, and limestone, processed through a blast furnace. This method produces a more affordable alternative to pure nickel, an important element in creating stainless steel.

This ferronickel got its name from the traditional sand molds it was casted from. The iron ingots are lined next to each other attached to a central channel or a runner, resembling a sow or a mother pig nursing her litter of piglets. Once cooled, these iron ingots are broken off from the runner for remelting. Typically, the iron content of an NPI ranges from 70% down to 20% or even less, with a composition of iron oxides such as magnetite, hematite, and limonite.

In the Philippines, low-grade laterite ores are abundant in the provinces of Surigao del Sur, Surigao del Norte, Palawan, Zambales, and Isabela. Together with PCIEERD, the Mines and Geosciences Bureau of the Department of Environment and Natural Resources (DENR) aims to increase the value of laterite

ores in the country by utilizing it for the production of NPI.

With this project, the farming of NPI sets to provide a sustained mining and mineral processing industry. It also effectively increases the employment rate and overall revenue for the local community and national economy.

Should the government make the decision to ban direct shipping of nickel laterite ore in the future, the local production of NPI positions the industry at an advantage.

In addition, value-adding to laterite ores before shipment will save freight costs, create more jobs and give additional revenue for the country. This is further backed by the Mining and Minerals Sector Roadmap with the vision of producing valuable and competitive metallic products supporting global demands by 2025.

The production of NPI from low grade laterite ores further addresses the R&D requirements for mining and mineral sectors, including:

- » Nickel Pig Iron (NPI) for stainless steel and for other industrial application
- » Ferronickel for stainless steel and for other industrial application
- » Pellets for Ironmaking
- » Extraction of Nickel, Cobalt, and Lithium for batteries and other applications
- » Extraction of rare-earth elements (REE) and Trace Elements for emerging technology application

Pig Iron Product



SALT HARVESTING EQUIPMENT

Collaborative Research and Development to Leverage Philippine Economy (CRADLE) Design and Prototyping of Salt Harvesting Machine

Dr. Annabelle V. Briones

Project Leader
Industrial Technology
Development Institute
(ITDI)
Department of Science
and Technology (DOST)

Cooperating Agency:
JALD Industries
Corporation

One of the most basic needs of any home is salt and with this perennial demand, there is a continuous need to improve efficiency and the quality of salt.

In its salt farm in Occidental Mindoro, JALD Industries Corporation, developed a new technology for salt crystallization resulting in a thick deposit of salt bed. These deep crystallizer salterns run six feet into the soil bed, with a yield of harvestable salt cake as much as six inches. With the salt situated deep into the saturated brine, the salt cake is protected from dissolution during periods of heavy rainfall.

Currently, the farm has six deep crystallizer salterns with a capacity of producing 20,000 metric tonnes annually. For each deep crystallizer, 25 laborers working for a total of 30 days are required to harvest salt, resulting in a long harvest period and production losses of 494 metric tons of salt per hectare per month.

Typically, the conventional method of salt harvesting is as follows:

1. Crushing the crystallized salt using grubbing hoes



2. Scraping and piling using rakes
3. Collecting the salt crystals in wooden baskets
4. Transporting to the salt heaps using a wheelbarrow

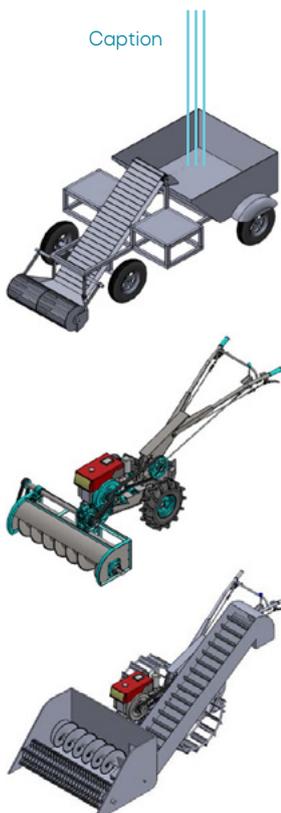
This tedious and laborious traditional salt harvesting process proves to be counterintuitive to the expected productivity and efficiency.

To address this, JALD, with a project backed by PCIEERD, set out to design and prototype a salt harvesting machine to improve farm productivity. With the newly designed salt harvester, the farm will be able to:

- » Shorten the harvesting cycle from one month to less than five days
- » Reduce the personnel working on salt harvesting from 50 to five and assign them to other tasks such as bagging and screening
- » Increase productivity by at least 15%
- » Prevent contamination of the salt from foreign material due to shorter exposure to the environment, ensuring its quality

The salt harvester is a significant milestone as well towards the vision of the Metals (Machining and Fabrication) Sector Roadmap, with a machining and fabrication industry providing globally competitive products, machinery and services by 2025. Once completed, this technology can be adopted by other solar salt producers providing opportunities not only to the local salt industry but to the local fabrication industry.

Caption



BAMBOO MUSICAL INSTRUMENT

Bamboo Musical Instrument Innovation R&D Program

Forest Products
Research and
Development Institute
(FPRDI),
Implementing Agency

Fernando C. Pitargue

Project 1 Leader
UP Center for
Ethnomusicology (UPCE),
Co-implementing
Agency
UP Diliman College
of Music, Phil. Normal
University, Cooperating
Agency

Aralyn L. Quintos

Project 2 Leader
University of the
Philippines Diliman
and Philippine Nuclear
Research Institute,
Cooperating Agency

Emelyne C. Cortiguerra

Project 3 Leader

Franz A. de Leon, Ph.D.

Project 4 Leader
Electrical and Electronics
Engineering Institute
UP Diliman,
Implementing Agency

With its rich culture and history, it is no surprise that the Philippines is blessed with a variety of indigenous musical instruments to enjoy. These musical instruments play a crucial role in passing along Filipino culture and traditions to the next generation, ensuring its vibrant legacy lives on.

On top of this, the creative industries in the country also contributed Php 661 billion or 7.34% into the total Gross Domestic Product (GDP) of the country and employed 14.4% of the Filipino labor force in 2010. In 2006, the United Nations Conference on Trade and Development (UNCTAD) Creative Economy Report placed the Philippines' creativity industry World Market Share at 0.2% or USD 658 million.

The Bamboo Musical Instrument (BMI) project is conceptualized to innovate the existing bamboo musical instruments in the Philippines and to further empower its creative industries. The BMI project is divided into four parts, as follows:

1

Documentation of Philippine Bamboo Musical Instruments

An important part of innovating is preserving what is in existence and it is in this philosophy that the documentation for the existing Philippine bamboo musical instrument draws from. In preserving the Philippine indigenous-musical culture, the project is also able to promote it to the younger generations who are more exposed to foreign music influences nowadays.

The project involves identification and documentation of the bamboo musical instruments (BMIs) produced and used by the target IPs and those produced commercially; analysis of the value chain of the bamboo musical instrument industry; and identification and characterization of the bamboo species being used and with potential for musical instruments in the industry.

The Kawayan 7 RizalInno Band. Kawayan 7 is an acronym for "Kawayan para sa Kalikasan, Kabuhayan, Kaunlaran, Kalusugan, Kasaysayan, Kultura at Kapayapaan. They have performed locally and internationally with top artists from the Philippines, Indonesia, Malaysia, Vietnam, Singapore, Thailand, Hongkong, Japan, Taiwan, South Korea, India, Italy, Africa, South America and USA.





2 Development of Protective Processing Technology for Bamboo Musical Instruments

Along with preserving the culture of the BMIs, it is also important to ensure the longevity and durability of the bamboo instruments. This part of the project includes the seasoning, preservation, thermal modification, and finishing of the bamboo. Different bamboo species were collected along with insects, molds, and fungi for isolation and identification.



The activities are designed to acquire knowledge, information, and technologies on how to extend the service life of the bamboo instruments, both for the indigenous and contemporary bamboo musical instruments. The making of the tuning of the bamboo instruments is included as well, featuring indigenous musical instruments such as the tongatong, pan flute, marimba/xylophone, and angklung.

a. Prior to actual making into musical instruments, bamboo is prone to attack of fungi, molds and insect which could affect the durability and sound quality of musical instruments.

b. Ms. Flordeliza Ursua, the owner of King Flute was interviewed to identify the problem and challenges in making flutes.



3 Processing Facility for Bamboo Musical Instruments and other Lignocellulosic Material

To house all the existing and future information, materials, instruments, and technologies related to the Bamboo musical instruments and other related lignocellulosic materials, a processing facility was necessary. This covers a range of bamboo musical instruments such as idiophone, chordophones, membranophones, and aerophones for the innovations or technologies generated.



The renovation of the facility is currently at 65% completion, with the ground floor as a workshop area, the lobby intended for mini exhibits featuring instruments from different parts of the Philippines, and a cemented roof deck.



Architectural design of the Bamboo Musical Instruments Processing Center lobby which will be house the mini-museum (making/innovation on the BMIs)

4 Development of Prototype Design and Standardization of Instrument Making Process for Nontraditional Bamboo Instruments using Select Philippine Bamboo Species

With the bamboo instruments being part of the new K-12 curriculum as well as recent activities, bamboo instruments are becoming more relevant than ever. The challenges on improving these native instruments remain, however, with the need to fine-tune the timbre or tone, improve playability, accurate tuning, enhance durability, and craft instruments from higher quality raw materials. Other areas for improvement include management of fungi and insect infestation on raw materials, improvement of the overall construction, and standardization of design.

Some of the instruments highlighted in the project are the bamboo tube (bumbong), the bamboo marimba (talungating), and the bamboo musical rattles (Philippine angklung). These are commonly used as well in the Himig Kawayan ensemble for musical and cultural performances.

Upon the completion of the project, the manual, blueprint, and technology will be made available to existing local and aspiring bamboo instrument makers. The project hopes to improve the overall bamboo quality instruments industry in the country. These innovations will benefit the bamboo farmers too, contributing to the economic growth of their communities and the country.

These innovations do not just bring forth the rich cultural and musical heritage of the Philippines, but also contribute significant milestones to the Metals Machining and Fabrication Sectors Roadmap. The breakthroughs of the Bamboo Musical Instrument project paves the way for establishing Regional Innovation Centers throughout the country and introducing to the world globally-competitive products locally sourced and fabricated in the Philippines.



The youth performed using bamboo-made marimba during the Karatong Festival in Dulag City, Leyte.



From top-left:
a. BMI Program personnel after completing the 5-day in-house training work shop on BMI making and tuning.

b. DOST Secretary Fortunato dela Peña and Usec for R&D Maria Cristina Guevara played the marimba and bamboo tubes prototypes made by DOST-FPRDI during the virtual concert on "Musika ng Kawayan, Yaman ng Bayan" held 27 November 2020.



c. DOST-FPRDI Himig Agham Kawayan was formed to showcase the locally and FPRDI made bamboo musical instruments

NEW ITDD PROJECTS APPROVED IN 2020

PROJECT TITLE	IMPLEMENTING AGENCY	PROJECT LEADER	PROJECT MANAGER
Application of Natural Antioxidants Derived from Sugarcane for Food, Food Supplement and Cosmetics Production Formulations	University of the Philippines - Los Baños, National Institute of Microbiology and Biotechnology	Nico Dumandan	Mary Grace Buenavides
Production of Dietary Fiber using Sugarcane Bagasse from Raw Sugar Manufacturing	DOST-Industrial Technology Development Institute Department of Science and Technology (DOST)	Norberto Ambagan	Fatima Ibarreta
Development of Draft Standards and Recommended Code of Practice for Processing of Peanut Butter	DOST-Industrial Technology Development Institute Department of Science and Technology (DOST)	Lourdes Montevirgen	Fatima Ibarreta
PROTex (Protective, Re-engineered, Occupational Technical Textiles) Research and Development: Establishment of the PTRI Medical Textile Testing Laboratory	DOST-Industrial Technology Development Institute	Donna Uldo	Mary Grace Buenavides
CRADLE 2020: Valorization of Carabao's Milk Produced in Western Visayas for the 'New Normal'	Waffle Time Inc. Technological University of the Philippines - Visayas	Jihan Santanina Alumbro	Fatima Ibarreta
CRADLE 2020: SMART MINE: Development of Sediment Monitoring and Analysis for Rehabilitation Tool in a surface MINE area	Central Mindanao University (CMU)	Einstine Opiso	Katrina Landicho
Development of Mobile Modular Food Processing Facility (MMFPF)	DOST-Industrial Technology Development Institute	Norberto Ambagan	Fatima Ibarreta
Pilot Testing of Packaging Technology Developed for frozen Durian using Locally Produced Packaging Materials		Daisy Tanafranca	Aleah Orendain
"Waste to Wealth": Value-Adding Approaches to Transform Cacao (<i>Theobroma cacao</i> L.) Pod Husk Towards Economic Development	DOST III - LGU II - Cagayan Valley - Isabela State University Main	Perlita Raymundo	Katrina Landicho



**EMERGING
TECHNOLOGY
DEVELOPMENT
DIVISION (ETDD)**

An important part of innovation is harnessing the latest technology for impacts, breakthroughs, and discoveries in alignment with organizational objectives and contributing to society. With these emerging technologies, improvements are promised while also paving the way for discoveries.

PCIEERD considers these critical steps toward progress and is more than happy to provide support and assistance on projects that can bring the Philippines further in these exciting sectors.

The works included in this section feature projects in advanced materials and electronics, information and communications technology, artificial intelligence, smart cities, and space technology applications.

MICRO IC: MICROCONTROLLER INTEGRATED CIRCUIT

μC-IC: Design of Microcontroller Integrated with Energy Harvesting and Power Management

Prof. Allenn C. Lowaton
Program Leader

Dr. Olga Joy L. Gerasta
Project 1 Leader

Prof. Allenn C. Lowaton
Project 2 Leader

Prof. Chinet M. Overstreet
Project 3 Leader

Mindanao State University - Iligan Institute of Technology
Implementing Agency

Considered as the principal driver of the electronics industry, the Integrated Circuit (IC) technology runs the core operations of modern electronics. From smartphones to gadgets and appliances, advancements on IC and keeping abreast with the trends in this industry is crucial for society, not just on the technological aspect but as well as social and economic.

To address the need of the Philippines to have its own R&D for IC design, Dr. John Richard Hizon of EEEI UP-Diliman, launched the EYE-C: Design of a Vision-Capable Microcontroller IC for a Mobile Robot Explorer program. It was through this project that paved the way for the Microelectronics Laboratory of Mindanao State University - Iligan Institute of Technology (MSU-IIT) to be recognized by DOST as the Center of Innovation in Microelectronics in Mindanao.

In addition, the EEEI together with DOST-PCIEERD established the Philippine Institute for Integrated Circuits (PIIC) to meet the human resource requirements of the IC Design Industry. The local talents can be more equipped and capable in IC design through enhanced facilities and technological support from local and international affiliates. With these the Microelectronics IC design expertise in Mindanao and the rest of the Philippines stands at a promising scale.

MSU-IIT upgrades its academe as well through the Microelectronics Laboratory Faculty Affiliates, six active faculty members from the institute were able to acquire their Master's Degree in Integrated Circuit Design from the National Taipei University in Taiwan.

From this venture, a new proposed project, the "Design and Fabrication of Low Footprint Optimized Wireless Sensor Network (WSN) Node Integrated Circuit for Disaster Risk Reduction" emerged, to improve public safety in times of unexpected natural disasters.

In line with the vision of the Technology Roadmap, the Philippines is geared towards the more advanced future of cognitive computing, quantum computing, artificial intelligence, and information communication technology.

Included in its 2022 - 2024 visions are the establishments of data centers with High Performing Computers in various areas in Visayas and Mindanao, operation and maintenance of an open data platform, and enhancing the embedded/ladderized program and upskilling courses for AI for non-STEM graduates that will benefit in these skills and knowledge on their specific industries.

For Cognitive Computing, visions also include enhanced intelligent technologies in applications, as well as new generations of smart robots and virtual assistants.

Through partnerships with the IC design industry, the academe, government institutions, and other related stakeholders, Filipino engineers can further showcase their expertise in IC design. This puts the Philippines at par with the world in technological capabilities and consequently increases foreign investments as well.

Test Run of the Power Management Unit (Boost and Buck-Boost Converter)



PATURO: PLATFORM FOR ASSESSMENT AND TRACKING OF URBANIZATION-RELATED OPPORTUNITIES

Erika Fille T. Legara,
Ph.D.

Project Leader

Asian Institute of
Management
Implementing
Agency

In line with the UN Sustainable Development Goals (SDGs), particularly Goal 11: Sustainable cities and communities, the need for smarter cities that provide quality life to their residents while also ensuring the sustainability of resources is needed now more than ever.

To contribute to this, the project “PATURO: Platform for Assessment and Tracking of Urbanization-Related Opportunities” aims to formulate a Smart Index that will be used to reliably and accurately capture a city’s “health.” The tool will identify the current relationships between the city’s people, land, transportation system, as well as the overall economy. The testbed of this project is the City of Cauayan, in the province of Isabela.

Data gathered will be used to create a city simulator acting as a “real-world sandbox” for testing various urbanization models in relation to the city, its people, and its environment. This, together with the Smart Index will provide city policymakers with data-driven scenario planning that are beneficial in decision-making and responsive governance.

The PATURO project is also expected to deliver a Data Hub and a data visualization tool with all data related to the City of Cauayan including geospatial, road networks, barangay-level demographic, and economic data to name a few. The interface should allow interactive access that would enable the city policymakers to acquire insights on the city’s economic goals paralleled against real-time performance. To add, a city dashboard with different levels of analytics both descriptive and prescriptive is expected, along with the mentioned Scenario and Impact Modeling Platform and the Smart Index.

PATURO is one of the pilot projects of DOST in the Development of Smart Sustainable Communities and Cities in the Philippines. In this context, DOST developed a framework to serve as a guide in creating smart and vibrant, more livable cities, with a focus on data infrastructure integrated into the community, bringing the Philippine economy and society towards a more technologically-advanced environment.

At its core, the desired outcomes for a Smarter City are Government Efficiency, Sustainability, Health and Wellness, Mobility, Economic Development, Public Safety, and Quality of Life.



COMING TOGETHER. Different personalities from the academe, government and private sector unite to launch on Feb. 5, 2020 the Project Paturo (Platform for Tracking and Assessment of Urbanization Related Opportunities), which aims to formulate a robust and reliable index of a city’s status. In the photo are Department of Science and Technology (DOST) 2 Director Sancho Mabbirano, (standing from left) Aboitiz chair in data science Christopher Monterola, DOST-Philippine Council for Industry, Energy and Emerging Technologies Research and Development Executive Director Enrico Paringit, Cauayan City Mayor Bernard Dy and Project Paturo head Erika Fille Legara.

DATOS: REMOTE SENSING AND DATA SCIENCE

Engr. Roel M. dela Cruz
Project Leader
* on behalf of Dr. Joel Joseph S. Marciano, Jr.

DOST -
Advanced
Science and
Technology
Institute (DOST -
ASTI)
Implementing
Agency

DATOS is a 24/7 remote sensing and data science helpdesk that provides national and local governments and agencies with real-time information before, during, and after a disaster. These on-demand data are critical in managing and mitigating damage and casualties during times of disaster and calamity.

The DATOS artificial intelligence (AI), together with the Convolutional Neural Network (CNN), also can detect various features from satellite images ideal for large-scale land mapping, detection and digitization of buildings and roads, identification of damage after a disaster, infrastructure mapping for critical regions, and monitoring of high-value crops, to begin with.

This puts AI as an effective and innovative tool that can drive the country towards further progress, covering a wide range of sectors from disaster management to agriculture and even infrastructure building and development, as well as area rehabilitation and maintenance.

This information also provides leaders and stakeholders with additional reliable information about environmental disasters and climate change, in line with the actions required to achieve the UN's Sustainable Development Goals (SDGs).

In addition, DATOS's Artificial Intelligence for Earth Observation (AI4EO) project offers Remote Sensing (RS) and Geographic Information System (GIS) applications for the stakeholders below, including various national agencies and organizations such as the Department of Tourism, Sugar Regulatory Agency, Armed Forces of the Philippines, Department of Social Welfare and Development, Bureau of Fisheries and Aquatic Resources, Coast Watch, Philippine Institute of Volcanology and Seismology, and National Disaster Risk Reduction and Management Council, to name a few.

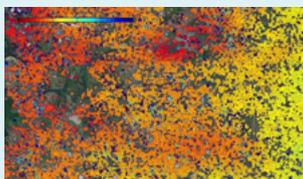
The wide implementation of the DATOS technology and services proves the promise of artificial intelligence in the country and how it can be used to further strengthen and advance the research and innovation sectors in the Philippines.

DATOS also plays a significant role in the Roadmap and Sectoral Plan for the Five Emerging Technologies, with a focus on Space Technology Applications. Its AI4EO project is a crucial milestone for 2020-2021, providing solutions for environmental assessment and monitoring, precision agriculture, maritime object identification, and domain awareness, as well as disaster management.

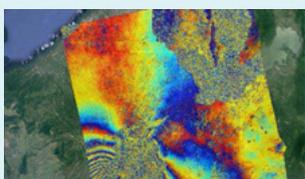
The project is also in line with the Technology roadmap objective of the increased capability in SAR image capture and processing by 2024.



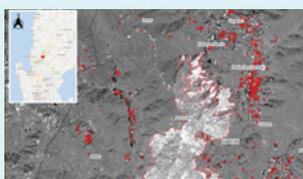
Rapid detection and mapping of earthquake-induced landslides in Makilala, Cotabato



Land Subsidence



Interferogram



Rapid detection of affected areas in Kabayan, Benguet

GUHEAT: GEO-SPATIAL ASSESSMENT AND MODELING OF URBAN HEAT ISLANDS

GUHEAT: Geospatial Assessment and Modeling of Urban Heat Islands in Philippine Cities

Dr. Ariel C. Blanco

Project Leader

University of the Philippines Diliman (UP TCAGP) - Geodetic Engineering and Training Center of Applied Geodesy and Photogrammetry
Implementing Agency

The GUHEAT project assesses the development of urban heat islands in the rapidly modernizing areas in Metro Manila, as well as the rest of the Philippines. The project also intends to develop models for estimating land surface temperatures (LST) and predicting urban heat islands (UHIs) by relating the LST with various environmental factors including land-use - land cover distribution.

To date, reported accomplishments of the GUHEAT projects are as follows:

- » Examine the general relationship of LST-UHI with energy consumption, air quality, and health in key cities based on existing data and statistics;
- » Conduct data analytics, LST-UHI modeling, and prediction modeling of urban heat islands and future scenarios
- » Automate LST mapping process utilizing the High-Performance Computing server of DOST-ASTI CoARE and develop a geospatial toolbox evaluating land use land cover change scenarios and options for mitigating the development of UHIs
- » Develop geo-visualization tools, methods, and products to effectively communicate data and information about the thermal environment and UHIs, as well as the results and feedbacks related to urban planning for UHI mitigation; and
- » Disseminate to all LGUs the assessment of thermal environmental conditions and related factors in their respective municipalities and cities
- » Build and enhance the capacity of LGUs in incorporating thermal environmental conditions in planning and development.

The GUHEAT initiative serves as one of the early springboards toward the Space Applications Technology Roadmap of the Technology sector. Its primary goals and significant target milestones include:

- » 2021: Launch the National Open Data Platform for Remote Sensing
- » 2022: Begin construction of the Philippine Space Tech Center in Clark City for production of small satellites
- » 2022 - 2023: Manufacture smaller satellites, locally available materials for spacesuit application, and further developments on Global Satellite Navigation (GNSS)
- » 2024 onwards: Launch small satellite vehicles, propulsion systems, and Attitude and Orbit Control Systems (AOCs), and increase capability in SAR image capture and processing



GUHEAT Mobile App

AMCEN: ADVANCED MANUFACTURING CENTER

Dr. Blessie A. Basilia
Program & Project
Leader

Project Title: Project 1 -
Development of Multiple
Materials Platform for
Additive Manufacturing
(MATDEV)

Project Title: Project 2 -
Research on Advance
Prototyping and
Product Innovation and
Development using
Additive Manufacturing
Technologies (RAPPID-
ADMATEC)

DOST - Metals
Industry Research and
Development Center
(DOST-MIRDC)
Implementing Agency

Tapping into the latest technology of 3D Printing, the Advanced Manufacturing Center (AMCen) aspires to be the nation's leader in research and application of innovative 3D printing processes, and materials.

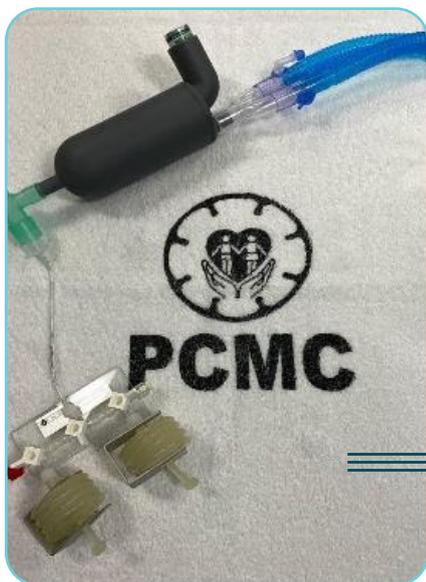
The AMCen is conceptualized to harness, strengthen, and expand the 3D printing technology in the Philippines. These innovations will then be utilized to further advance the following sectors: (1) Aerospace and Defense, (2) Pharmaceutical/ Healthcare, (3) Novel Electronics, (4) Agriculture, and (5) Automotive.

The Multiple Materials Platform for Additive Manufacturing (MATDEV) project is geared to undertake research and development on materials commonly used in 3D printing and determining which ones are best suited for a particular purpose. Using raw sources from local and indigenous sources, materials to be tested include polymers, plastic, metals, ceramics, and composites.

With this, materials for 3D printing are significantly reduced while also bringing in revenue for the local communities and allowing high-end utilization of local resources.

On the other hand, the Research on Advanced Prototyping and Product Innovation and Development using Additive Manufacturing Technologies (RAPPID-ADMATEC) project delves more into the application of these innovative ideas. This phase of the AMCen initiative brings to life product design and ideas, using the materials tested by MATDEV. Further collaborative work will be done between the two institutes to fully actualize the potential of the locally sourced materials for 3D printing.

The AMCen is an integral part of the Advanced Materials R&D Roadmap for 2020-2024, driven with the main vision of preparing the workforce for opportunities with multinational partners in Aerospace, ICT/Semiconductor, and Automotive.



3D printed diffuser



3D printed N95 mask

NEW ETDD PROJECTS APPROVED IN 2020

PROJECT TITLE	IMPLEMENTING AGENCY	PROJECT LEADER	PROJECT MANAGER
Systematized Mining Operations using Automation and Real-Time Telematics Platform towards a Paradigm Shift in Surface Mines of Caraga Region (SMART Mines)	Cagdianao Mining Corporation Caraga State University-Main	Alexander Demetillo	Katrina Landicho
Design, Development, and Testing of 10 units of Low-cost Ventilators based on DOST-PCIEERD specifications			May-Rose Parinas
Metal Oxide Hybrid Structured Barriers for Stale Energy Devices (SEA-EU)	De La Salle University (DLSU)	Ryan Corpuz	Alloyssius Gorospe
Fabrication of Nanostructured Silica-based Nanocomposite Membranes for Proton Exchange Membrane Fuel Cells (PEMFCs) Applications	Mining, Geology, and Ceramics Dept.-Adamson University (MGC-AdU) University of Santo Tomas, Research Center for the Natural and Applied Sciences Mapua Institute of Technology-Manila	Dahlia Apodaca	Desiree Vera
Development of Plasma Coating Processes for the Furniture Industry	Chamber of Furniture Industrie of the Philippines, Inc. University of the Philippines-Diliman, Department of Mining, Metallurgical, and Materials Engineering Department of Science and Technology (DOST)	Magdaleno Vasquez Jr.	Kristene Mendoza
Nanocellulose Self-Disinfecting (NACS) Filter: R&D Validation of an Innovative Low-Cost Nanotech-based Face Masks	Caraga State University (CSU)	Rey Capangpangan	Desiree Vera
iJuanderer: An Augmented Reality-based Gamified Local Tourism and Cultural Heritage Promotion and Preservation	DOST-Philippine Science High School Philippine Council for Industry, Energy and Emerging Technology Research and Development (PCIEERD)	Joel Bautista	May-Rose Parinas
SpaceBetweenUs: A Computer Vision Application for Physical Distancing Monitoring in Public Areas	Mindanao University of Science and Technology (MUST) PCIEERD	Wencil Jean Carranza-Dacay	Dianne Remae San Pedro
Chemical Synthesis and Characterization of Conducting Polymer/Metal Nanoparticles Composites, and Their Application as a Chemiresistive Gas Sensor Array for H ₂ S and CO ₂	Philippine Council for Industry, Energy and Emerging Technology Research and Development (PCIEERD)	Karen Santiago	Marietta Valdez
Helmet-Integrated Medium-Range IR Thermal Scanner	Local Government Unit, Pangasinan San Carlos City San Carlos College PCIEERD	Romulo Olalia	Dianne Remae San Pedro

**ENERGY AND
UTILITIES
SYSTEMS
TECHNOLOGY
DIVISION**

With the Philippines continuously developing as a nation, it is important to also ensure that alternative and sustainable sources of energy are being maximized, along with explorations of opportunities in the construction, infrastructure, and transportation sectors.

The Energy and Utilities Systems Technology Division (EUSTDD) coordinates, evaluates, and monitors R&D programs and projects related to energy conservation, renewable energy and energy storage. The EUSTDD is also responsible for programs and projects related to disaster mitigation and management helping provide early signs and detection for disaster-prone areas in the country, construction and development of roads and infrastructures to help improve and build communities, transportation technologies to make public transport efficient and accessible, as well as support initiatives related to utilizing, managing, and monitoring water as a basic resource.

Included in these projects are the improvement of rubber asphalt roads through recycled plastic and rubber, further urbanization of cities outside the metro, development of the GeoRiskPH technology for hazard and risk assessments, establishment of micro-grid solar energy on off-grid communities, and installation of groundwater resource facilities and monitoring sensors.

The division also provides access to the latest technologies, facilities, and equipment, advancing the expertise of Filipino researchers, scientists, and engineers to new horizons.

RUBBERS AND WASTE PLASTICS ASPHALT FOR PAVEMENT INFRASTRUCTURES

Rubbers and Waste Plastics as Reinforcement Additives to Asphalt Binder-based Pavement Infrastructures

Asst. Prof. Kevinilo G. Perez

Project Leader

Institute of Chemistry,
College of Arts and Sciences University of the Philippines Los Baños
Implementing Agency

Part of promoting infrastructure efficiency is the constant monitoring and maintenance of roads, both in urban and rural areas. Looking into the materials commonly required in road maintenance, the rubber asphalt project aims to recycle plastic and rubber waste as alternative asphalt additives. The plastic waste will be sourced from bags and bottles, while the rubbers are recycled from used tires and cup lumps (low-quality raw rubber) from trees.

The natural components and renewable additives are expected to create longer-lasting and better-performing pavements. With better roads, there will be less maintenance costs and increased axle load capacity, leading to a more efficient transportation system. The local

communities can also enjoy pavements that are resistant to extreme weather conditions as well as roads equipped with shock support during earthquakes. Through the counterpart funding of the Department of Public Works and Highways - Bureau of Research and Standards (DPWH - BRS), an actual pavement demonstration of using the optimized additives will be initiated.

Along with the reduction of single-use plastic waste and improvement of pavements, the project also aims to give the local rubber industry a boost. At present time, the local production of raw rubber and the cup lump are focused on export and sale to commercial institutions that have the technology to process the materials. With a purpose for local use and access to technology, the project aims to provide rubber farmers with the motivation to increase their rubber harvest and eventually promote growth in the Philippine rubber industry.

Repurposing plastic waste and rubber is also in line with the Construction Sector Roadmap to 2025, with the vision of **Advanced and reliable construction materials and techniques towards safer and sustainable infrastructures.** One of the R&D needs is the utilization of indigenous, industrial, recycled, and agricultural waste into value-adding construction products and applications, as well as the application of advanced technologies in constructional practices, techniques, and tools.

The project also addresses the significant milestone targets for 2024 for cost-effective rubber-based products and for 2025, the development of waste-based industrial products, derived from industrial, recycled, and agricultural waste.

Application of 150-m PET- and Crumb Rubber-modified prototype roads (Calamba Laguna)



Optimization of binder amount per mass pavement mixture (job mix optimization) through the Marshall Test



FORMULATION OF A SETTLEMENTS DEVELOPMENT MODEL IN NEW GROWTH AREAS IN THE PHILIPPINES

Carmeli Chaves
Project Leader

Project 2: Development of Polyurethane-based Packing Materials and Anti-Corrosive Coatings from Vegetable Oil

Arnold C. Alguno Ph.D.
Project Leader

Planning and Development Research Foundation (PLANADES) Implementing Agency

The Formulation of a Settlements Development Model in New Growth Areas in the Philippines is a modelling study conducted by the Planning and Development Research Foundation (PLANADES), as supported by DOST-PCIEERD. The objective of the study is to come up with a model that can predict new growth areas throughout the country, coupled with a tool to match the housing demand and supply.

Another objective is the consideration for a balanced spatial development, where cities surrounding the National Capital Region (NCR) will be provided with adequate support for further urbanization and growth.

The PLANADES model enables LGU users to forecast, identify or plan on how settlements develop in relation to new growth areas. The settlements development model provides a tool for estimating new housing requirements

in suitable areas and an estimation of projected housing finance requirements in the new growth areas.

In estimation of the model, the following drivers of urban growth were considered: IRA , Average Provincial Family Income , Expenditure of the Province , Away from areas with High Hazard to Flooding, Distance to Economic zones/ areas, Distance to Nearest port/s, Groundwater Allocation, Proximity to Existing Road Network, Not within/near Protected Areas.

The identified top 20 growth provinces for 2020 are Cebu, Cavite, Bulacan, Negros Occidental, Laguna, Pangasinan, Rizal, Davao del Sur, Batangas, Pampanga, Iloilo, Nueva Ecija, Quezon, Leyte, Zamboanga del Sur, Camarines Sur, Isabela, South Cotabato, Misamis Oriental, and Negros Oriental.

January 2020 - 1st Training



Steering Committee Meetings

GEORISKPH: GEOSPATIAL INFORMATION MANAGEMENT & ANALYSIS PROJECT FOR HAZARDS & RISK ASSESSMENT IN THE PHILIPPINES

Mabelline Cahulogan
Project Leader

Philippine Institute
of Volcanology and
Seismology
Implementing Agency

Using the technology implemented by Central American countries like El Salvador, Guatemala, Honduras, and Nicaragua for risk assessments on natural hazards, the multi-agency initiative GeoRisk Philippines (GeoRiskPH) was established.

Driven by innovations to resilience, GeoRiskPH aims to facilitate National Government Agencies (NGAs) to work together and share data through a robust interface, for collaborations on improving hazard and risk assessments on different sectors and areas.

Included in GeoriskPH are the following applications:

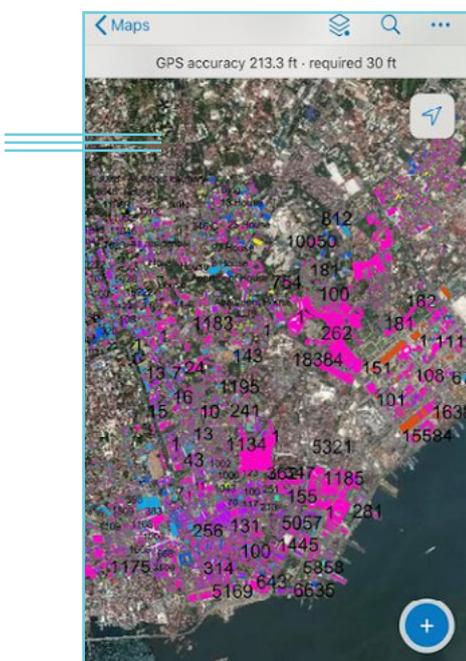
- » HazardHunterPH: For a quick generation of initial seismic, volcanic, and hydro-meteorological hazards assessments in select locations
- » GeoAnalyticsPH: To generate summaries of hazards and risk assessments, as well perform analysis

- and visualizations of exposure and elements at risk to natural hazards
- » GeoMapperPH: Data collection of Hazard and Exposure Information for an up to date and accurate database
- » Map and Feature Services: Acquire accurate and updated information from mandated agencies

Furthermore, GeoriskPH developed a 16-digit numeric code for all information contributed to the centralized database, known as the GeoriskPH Integrated System. The data is then incorporated to the GeoMapperPH's Exposure Data Mapper interface displayed through information dashboards, allowing local and national governments to determine effects of natural disasters for better allocation of resources.

At the moment, GeoriskPH provides real-time data for earthquake, volcano, and weather-related hazards, working together with DOST-PHIVOLCS, DOST-Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), and Mines and Geosciences Bureau.

GeoRiskPH plays a critical role as well in the S&T Roadmap for Disaster Risk Reduction and Climate Change Adaptation (DRR-CCA), with the vision of establishing a collated and updated readily accessible data for natural disasters including tsunami, earthquake, volcano eruption, landslide, typhoons, floods, and heavy rains, as well as climate-related hazards. This information will allow possible early detection and warning systems for natural disasters commonly experienced in the Philippines.



Geomapper Cebu
Mobile Application

DEVELOPMENT OF GROUNDWATER RESOURCE MANAGEMENT PLAN AND MONITORING SYSTEM

Dr. Maria Aileen Leah G. Guzman
Project Leader

Ateneo de Manila University
Implementing Agency

As a basic need, it is important to ensure that everyone is getting access to clean water. A groundwater management study in Zamboanga City, through Ateneo de Manila University and PCIEERD, launched the Groundwater Management Plan (GMP) project to evaluate and map groundwater resources in the city.

The information gathered in the study was used to improve existing policies and plans, as well as develop new technologies that will determine the impact of different water levels, climate change, and interactions between ground and surface water.

A near-real-time sensor will also be developed and deployed to measure water pH, dissolved oxygen, conductivity, turbidity, temperature, and water level in selected groundwater observation areas in Zamboanga city. Data gathered are made available to the public through <https://admuwater.com/>.

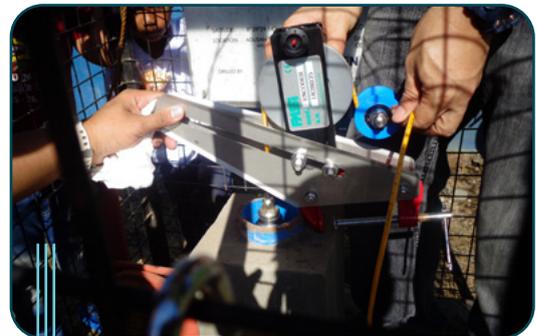
To date, the project constructed two observation wells with monitoring

sensors in Calarian and Tuguan in Zamboanga City. Thirteen out of the 22 target ground monitoring sensors were also already installed in target areas in Metro Manila, Iloilo, Cagayan, and Bukidnon.

The groundwater monitoring system was also installed and feeds data into a web-based platform that can be accessed through a computer or a mobile device, at <https://admuwater.com/gmp>. The site identifies where the monitoring wells with sensors are located, as well as water parameters from all the monitoring wells.

To add, the GMP project is also one of the key steps in the Water Resource Management Roadmap to 2025, with the vision of developing S&T-based management for sustainable water resources. One of the main objectives of the roadmap is to build green infrastructures throughout the country, along with system integration of developed technologies for smart cities, and a standardized design for effective water resource management.

Marikina Well Site



Cagayan De Oro

50 KW MICRO-GRID SOLAR PV SYSTEM

Dr. Randell U. Espina
Project Leader

Ateneo de Davao
University
Implementing Agency

Bringing light to the Indigenous People (IP) communities, the Micro-grid Solar Photo-voltaic (PV) system is designed to support rural electrification in Compostela Valley, Mindanao. The project features a 50-kilo-Watt (kW) micro-grid system, using solar energy to provide electricity to the off-grid communities. Along with the micro-grid, the project also aims to introduce battery banks and a diesel-powered generator set to store solar energy during months with minimal sun.

A solar PV energy management system (EMS) will also be in place to determine the demand requirement, system output, efficiency, and capability of the micro-grid solar PV system.

The vision for this micro-grid solar PV system is to empower the communities and provide them with their own energy, distributed to different households through a renewable source. With the generated

energy, the communities can enjoy lit-up houses, street lights, school lights, electricity-powered education equipment, agricultural machines, and other similarly related devices and equipment.

To date, the project has provided renewable energy (RE) supply to 50 households allowing the use of electrical lighting, radio, cellphone charging, and electric fans. Access to electricity also provided the community with street lighting and power to computers in a small school in the area.

Along with helping the local community, the micro-grid solar PV project plays an instrumental role in meeting the Renewable Energy Roadmap to 2025, driven by the vision of enhancing the local RE capability and improving RE penetration to wider areas. Other aspects of the RE Roadmap include solar, wind, micro-hydro, ocean, and biomass.



clockwise from top: inverter-combiner and energy storage; beneficiary community in Manurigao, New Bataan, Compostela valley; inter agency collaboration for the micro grid project

NEW EUSTDD PROJECTS APPROVED IN 2020

PROJECT TITLE	IMPLEMENTING AGENCY	PROJECT LEADER	PROJECT MANAGER
Water for Tourism: A Science-Based Water Resource Monitoring and Management Planning Guide for Tourist Destinations in the Philippines	Ateneo de Manila University (ADMU)	Ma. Aileen Leah Guzman	Carluz Bautista Alissandra Pauline Mariano
Integration of Machine Learning Inference on Home Energy Storage System (HESS) to deliver long-term optimized self-consumption with low probability of power loss	Techno Philippines Innovation Corporation Edge-Systems Engineering Services Holy Angel University - Angeles City, Pampanga	Jabel Jay Abella	Patrick E. Montero Julius Mayorga Agerico Bautista
Integrated Flywheel Energy Storage Management System	Amber Kinetics Philippines De La Salle University - Manila	Roy Francis Navea	Patrick E. Montero Julius Mayorga Agerico Bautista
Deployment of Energy Monitoring Application and Network at DOST (DEMAND) as Demonstration Sites	DOST-Philippines Textile Research Institute DOST-Metals Industry Research and Development Center National Academy of Science and Technology (NAST) Department of Science and Technology - Industrial Technology Development Institute - Advanced Device and Materials Testing Laboratory	Apollo Victor Bawagan	Patrick E. Montero
Unmanned Aerial System (UAS) with Passively Rotating Spherical Shell for Close-proximity Inspection of Infrastructure	Mindanao State University - Iligan Institute of Technology (MSU-IIT)	Carl John Salaan	Elisa Santos

PROJECT TITLE	IMPLEMENTING AGENCY	PROJECT LEADER	PROJECT MANAGER
System for Optimized Routing for Transport (SORT)	Local Government Unit, City of Mandaluyong Department of Transportation and Communications (DOTC) De La Salle University - Manila	Jose Bienvenido Manuel Biona	Rachel Habana
Pilot Study for Integrating Microgrid and Distributed Renewable Energy Sources for an Electric Cooperative	UPSCALE Innovation Hub DPJ Engineers & Consultants - Bulanao Hydroelectric Power Plant University of the Philippines - Diliman, Electrical and Electronics Engineering Institute	Carl Michael Odulio	Patrick E. Montero Julius Mayorga
AQUADRONE: UAV Assisted Deployment System for Water Quality Monitoring	University of Santo Tomas	Anthony James Bautista	Elisa Santos
DRIVER.PH Drivers Roadworthiness Improvement Verification Education & Readiness for the Philippine logistics industry	Technological Institute of the Philippines Quezon City	Felizardo Reyes	Rachel Habana
Determination of Optimal Placement of Electric Vehicle Charging Stations in a Local Public		Lew Andrew Tria	Rachel Habana
Integrated Flood and Water Resources Management in ASEAN Basins for Sustainable Development	Isabela State University		Carluz Bautista Alissandra Pauline Mariano
Geotechnical Mapping of Metro Manila Subsoil (GEMMMS)	De La Salle University - Manila	Jonathan Dungca	Carluz Bautista CA Managa
Green Fiber-reinforced Polymer (FRP) Composites as an Innovative Repair System for Earthquake-prone Historical Buildings	De La Salle University - Manila	Jason Maximino Ongpeng	Carluz Bautista CA Managa



**HUMAN
RESOURCE AND
INSTITUTION
DEVELOPMENT
DIVISION**

All these innovations will not be possible without the dedicated and talented individuals who are relentless in bringing their craft and industry further into progress, as well as contributing to their communities and the country. The DOST-PCIEERD Human Resource and Institution Development Division (HRIDD) focuses on programs and projects that tap into these rich pools of human resources and institutions. Projects featured in this section include innovations in the S&T fields, industry, and energy.

The HRIDD is divided into the Human Resource Development Program (HRDP) and Infrastructure Development Program (IDP), along with standalone programs including the Young Innovators Program (YIP), Balik Scientist Program, and the Regional Consortia.

In 2020, the inclusion “Publication of scientific papers in Scientific/ Technical journals,” has been approved, providing financial support to Filipino experts for the publication of their papers that have been accepted by reputable scientific journals or publications. The topic of the paper being requested for publication funding support must be within the PCIEERD priority areas and the Harmonized National R&D Agenda of Industry, Energy, and Emerging Technology. Priority is given to International Scientific Indexing (ISI) and Scopus-indexed journals.

HRDP is open to all researchers and faculty from both academic and research institutions.

HRDP: HUMAN RESOURCE DEVELOPMENT PROGRAM

The focus of the HRDP is to complement the human resource needs and requirements of the industry, energy, and emerging technology sectors. The program aims to enhance the R&D capabilities of Filipino individuals and institutions, through support for the dissemination of outputs in local and international platforms. Also part of the HRDD programs are grants for visiting experts, research attachment, paper presentations, attendance to seminars/training, and hosting seminars/training/conferences.

Part of the Visiting Expert Program are:

HRDP COMPONENT	2020 APPROVALS
Visiting Expert Program	3
Research Attachment	10
Attendance in Conference (Paper Presentation)	1



Expert: Dr. Mohd Shahir Liew
Affiliation: Universiti Teknologi Petronas
Host Institution: Palawan State University (PSU)
Expertise: Alternative Sources of Energy, Energy Efficiency



Expert: Dr. Lawrence Ilag
Affiliation: LBiotech, Inc.
Host Institution: Technology Application and Promotion (TAPI)
Expertise: Technology Transfer, Intellectual Property



Expert: Dr. Gonzalo Serafica
Affiliation: Consultant
Host Institution: Technology Application and Promotion (TAPI)
Expertise: Technology Transfer, Intellectual Property

YOUNG INNOVATORS PROGRAM (YIP)

It is agreed that the youth plays a significant role as the future of a nation and one of the best ways to celebrate this is to provide the youth the support that they need. As part of its seventh anniversary celebration in 2017, PCIEERD launched the Young Innovators Program (YIP), encouraging youth researchers, as young as high school students, to do independent research and develop innovative ideas.

As a springboard for the future scientific workforce, the program provides support to students looking to gain independent

research experience, specifically in the PCIEERD sectoral areas. Funding is provided to promising young researchers with innovative research projects.

Since the launch of the project, PCIEERD received a total of 325 applications from all over the country, 191 of which are from high school students, 117 from undergraduate students, and 17 from postgraduate students. From these applications, a total of 29 were approved, composed of 19 high school students, 9 undergraduate students, and 1 postgraduate student.

2020 PCIEERD-YIP Awardees:

- » SPHERE: An Ultra-wideband Technology-based Innovation for Search and Rescue Operations in the Philippines
- » Fungal chitosan- based Microbeads: A Heavy Metal Soil-based bioborbent
- » iTrashBin (Intelligent Trash Bin) Internet-of-Things Trash Bin for Quarantine and Isolation Facilities
- » Shock Electrodialysis Apparatus (S.E.A.)
- » PROJECT LINGAP LANGHAP: Low-cost 3D Printed Air Purifier System using Agricultural Waste-Based Activated Carbon Filter
- » Proton-Exchange Membrane (PEM) Fuel Cell Using Electrode Processed from Kaong Waste Product
- » Hg and Pb Detection Kit Utilizing D-Limonene from Sweet Orange (Citrus sinensis) Peelings
- » LaBioRem: Landfill Bioremediation through Biodegradative activities of Pleurotus ostreatus (Oyster Mushroom) to High Density Polyethylene (HDPE) and other biodegradable polymers
- » Synthesis of nanocellulose from durian rinds for the preparation of a self-healing smart concrete with augmented mechanical properties



Team KAIZEN conducted testing of their project SPHERE in a demolished building in Metro Manila, where the environment is comparable to earthquake debris, to determine its efficiency.



On the photo are the prototype of the PROJECT LINGAP LANGHAP: Low-cost 3D Printed Air Purifier System using Agricultural Waste-Based Activated Carbon Filter



Mr. Ivanbert Y. Damasco doing experimentations for his project, Synthesis of nanocellulose from durian rinds for the preparation of a self-healing smart concrete with augmented mechanical properties



During the 2020 YIP Grantees Contract Signing Ceremony

The members of PUP-Team FunGIE. From the left is Ms. Ms. Irah Faye B. Garzo, Mr. Ghimel P. Espinosa (Top Center), Dr. Lourdes Alvarez (Center) and Ms. Raven Elyze E. Laurella



Mr. Steph Kier S. Ponteras conducting laboratory works for his project titled, Hg and Pb Detection Kit Utilizing D-Limonene from Sweet Orange (Citrus sinensis) Peelings



SMARTER PHILIPPINES THROUGH DATA ANALYTICS R&D, TRAINING AND ADOPTION (SPARTA)

Dr. Alan Cajes
Project Leader

Development
Academy of the
Philippines
Implementing Agency

Department of
Science and
Technology (DOST)
Funding Agency

Fitting to times and the changing landscape of education, Project SPARTA or Smarter Philippines through Data Analytics R&D, Training and Adoption was launched through the partnership of the Department of Science and Technology (DOST) and Development Academy of the Philippines (DAP).

Providing training focused on online education, research and development mechanisms, and infrastructure, the project aims to produce a total of 30,000 graduates in three years. The trained professionals will be key contributors

to move forward the industry of data science and analytics, as well as smart governance practices in the Philippines.

Through DAP, the project will provide offerings such as certification courses for public administrators, including data and R&D initiatives on productivity analytics, data analytics for smart city consulting works, and the creation of the Government Center for Data Science and Analytics (GCEDSA).

Interested Filipinos can still apply for the SPARTA scholarship at <https://sparta.dap.edu.ph/>.



Project SPARTA promotes Data Science and Analytics (DSA) initiatives through its cooperation with the Asia Foundation, United States Agency for International Development (USAID), and other agencies and organizations during the Bangsamoro Autonomous Region in Muslim Mindanao's (BARMM) Data Challenge.



The project also held DSA events such as its one-day Analytics Overview Workshop led by SPARTA Subject Matter Expert Mr. Dominic Vincent Ligot and site visit in Butuan for the establishment of the city's Hackathon and Open Data Challenge.



SPACE SCIENCE AND TECHNOLOGY PROLIFERATION THROUGH UNIVERSITY PARTNERSHIPS (STeP-UP)

Paul Jason Co
Project Leader

UP Diliman Electrical and Electronics Engineering Institute
Implementing Agency

Department of Science and Technology (DOST)
Funding Agency

The Space Science and Technology Proliferation through University Partnerships (STeP-UP) was conceptualized to establish a university consortium for Space Science and Technology Applications (SSTA), with a focus on amateur radio communications and nanosatellite development.

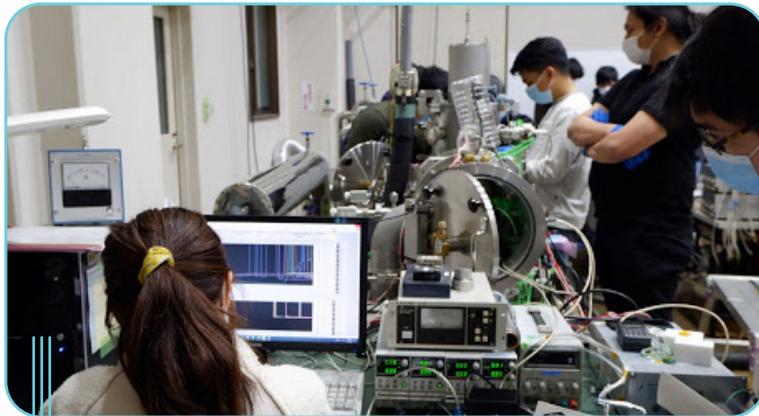
By bringing together academics and professionals through nationwide Space Science & Technology (SS&T) activities, the consortium is envisioned to lead the country's participation in the global SS&T university consortium.

As part of the STeP-UP project, its objectives include:

- » Providing opportunities for graduate studies on S&T with hands-on experience on nanosatellite development
- » Training and guidance in the development and utilization of amateur radio and satellite ground station
- » Providing materials and teaching notes for SSTA course that can be delivered to the member universities

The graduate program will be done locally and at the Kyushu Institute of Technology (KIT), at the Fukuoka Prefecture on the island of Kyushu, Japan. At the end of the project, the local students are expected to produce four flight-ready 1U cube satellites based on the BIRDS-2 bus, while KIT students will produce one flight-ready 1U based BIRDS-4 cube satellite.

This joint project is expected to support 19 MS/Ph.D. students specializing in space science and technology studies. The STeP-UP Project is funded by DOST and monitored by DOST-PCIEERD.



Preparations for the Thermal Vacuum Testing



Preparing the Vibration Test Machine



IMBUE: INTERNSHIP PROGRAM FOR INCREASED LOCAL BIOINFORMATICS UTILITY AND EXPERTISE

Dr. Jan Michael Yap
Project Leader

Philippine Genome Center
Implementing Agency

Department of Science and Technology (DOST)
Funding Agency

The Philippine Genome Center (PGC) together with DOST through PCIEERD, devised the IMBUE or Internship program for increased local Bioinformatics Utility and Expertise program, to encourage and prepare students to pursue higher education and eventually enter or build careers in bioinformatics and computational biology, in a manner that would be beneficial to meet the research and infrastructure needs of the Philippines.

The center has developed validated methods toward bioinformatics education and successfully trained 101 bioinformaticians. Relevant to the current global challenge, bioinformatics can help significantly in tracing viral transmission patterns, allowing medical professionals to make better epidemiological decisions.

Further training on viral metagenomics is also in place, with a focus on next-generation sequencing of SARS-CoV2 samples, protein structure analysis, and molecular dynamics. The new training will provide medical researchers and professionals with knowledge and skills that will aid in drug discovery and development to address the current health crisis.

An intensive, comprehensive training course in bioinformatics and computational biology across multiple disciplines was developed and 4 batches of interns from all over the Philippines were invited and underwent the training. A special 5th batch of training was devised specifically for biologists and healthcare professionals working on COVID-19.



Virtual group photo of training participants and organizers

IDP: INFRASTRUCTURE DEVELOPMENT PROGRAM

The role of the HRIDD - IDP is to elevate the R&D capabilities of academic and research institutions as well as relevant DOST-attached agencies, through the development or upgrades on research laboratories and facilities.

Its functions include setting up research laboratories, purchasing laboratory equipment including highly specialized software, and providing small research grants. Since 2015, IDP has helped set up and upgrade 23 laboratories throughout the country, with the total investment amounting to PHP125.41 million.

Projects for 2020 include:

Establishment of a Solid Freeform Fabrication Research Laboratory (SoFFReL)	Center for Green Nanotechnology Innovations for Environmental Solutions (CGNIES)
<p>Implementing Agency: Pangasinan State University (PSU)</p>	<p>Implementing Agency: University of Mindanao (UM)</p>
<p>The SoFFReL will be the first laboratory in the province of Pangasinan to employ 3D printing in metalcraft fabrication.</p> <p>This laboratory will serve as a playground for student-researchers, faculty researchers, engineers, and industry partners to do collaborative research to create ideas and generate new products, technology, and research projects in the field of additive manufacturing, metal fabrication, and process machine automation.</p> <p>Concept modeling, prototyping, rapid tooling, and digital manufacturing are some of the activities that can be done in the laboratory.</p>	<p>The Center for Green Nanotechnology Innovations for Environmental Solutions (CGNIES) is a timely and necessary project to increase research outputs that are beneficial to society and promote environmental sustainability.</p> <p>A research center that will involve collaborations between industries, government and academia, its focus is on research and development of producing safer nanomaterials from indigenous materials, primarily wastes. The center utilizes clean technologies with minimal potential environmental and human health risks (green nanotechnology). These new nano-products will be incorporated in technological innovations that address environmental concerns in the region.</p> <p>Additionally, it is also the vision of CGNIES to develop sustainable, scalable, and economical routes to functional nanostructured materials. The center's research trajectory is to promote green innovations in Mindanao, a solution that cares for both the environment and humanity.</p>

REGIONAL CONSORTIA

One of the functions of PCIEERD is to establish, develop, and maintain local and international technical cooperation linkages to drive the country towards its national development goals. For this to be truly effective, the regions of the Philippines need to work together. The Regional Consortia aims to advance the R&D sectors in S&T by providing research funding to fitting projects throughout the country, thereby encouraging more Filipino experts to take an active role in bringing forward the country to its goals.

To further facilitate collaboration, a holistic approach is taken among the member institutions, with representatives from the academe, the government, and the private sectors.

Currently, 16 regions in the Philippines are participating in the program. The regional consortia are as follows:

REGION		REGIONAL CONSORTIUM	
1	CAR	Cordillera Industry, Energy and Emerging Technology Research and Development (CIEERDC)	CIEERDC
2	REGION 1	Ilocos Consortium for Industry, Energy and Emerging Technology Research and Development (ICIEERD)	ICIEERD
3	REGION 2	Cagayan Valley Industry, Energy and Emerging Technology Research and Development Consortium (CVIEERDC)	CVIEERDC
4	REGION 3	Central Luzon Consortium for Industry, Energy and Emerging Technology Research and Development (CLIEERDC)	CLIEERDC
5	NCR	Metropolitan Manila Industry, Energy and Emerging Technology Research and Development Consortium (MMIEERDC-NCR)	MMIEERDC-NCR
6	REGION 4A	Southern Tagalog Consortium for Industry, Energy and Emerging Technology Research and Development (STCIERD)	STCIERD
7	REGION 4B	Southern Tagalog Islands Research and Development Consortium (STIRDC)	STIRDC
8	REGION 5	Bicol Consortium for Industry, Energy and Emerging Technology Research and Development (BCIEERD)	BCIEERD
9	REGION 6	Western Visayas Consortium for Industry, Energy and Emerging Technology Research and Development (WVCIEERD)	WVCIEERD
10	REGION 7	Central Visayas Consortium for Industry, Energy and Emerging Technology Research and Development (CVCIEERD)	CVCIEERD
11	REGION 8	Eastern Visayas Consortium for Industry, Energy and Emerging Technology Research and Development (EVCIEERD)	EVCIEERD
12	REGION 9	Zamboanga Industry, Energy and Emerging Technology Research and Development (ZIEERDC)	ZIEERDC
13	REGION 10	Northern Mindanao Consortium for Industry, Energy and Emerging Technology Research and Development (NoRMinCIERD)	NoRMinCIERD
14	REGION 11	Davao Region Industry, Energy and Emerging Technology Research and Development Consortium (DRIEERDC)	DRIEERDC
15	REGION 12	Cotabato Region Industry, Energy and Emerging Technology Research and Development Consortium (CRIEERDEC)	RIEERDEC
16	REGION 13	Eastern Mindanao Industry, Energy and Emerging Technology Research and Development (EMIEERALD/CARAGA)	EMIEERALD/ CARAGA

ADVANCED MECHATRONICS, ROBOTICS, AND INDUSTRIAL AUTOMATION LABORATORY (AMERIAL)

Establishment of the 'Advanced Mechatronics, Robotics, and Industrial Automation Laboratory' (AMERIAL) in Support of the Metals and Engineering Industry

Engr. Robert O. Dizon
Project Leader

DOST-Metals Industry
Research and
Development Center
(MIRDC)
Implementing Agency

Department of Science
and Technology (DOST)
Funding Agency

Project Title: Establishment of the 'Advanced Mechatronics, Robotics, and Industrial Automation Laboratory' (AMERIAL) in Support of the Metals and Engineering Industry
Project Leader: Engr. Robert O. Dizon
Implementing agency: DOST-Metals Industry Research and Development Center (MIRDC)
Funding Agency: Department of Science and Technology (DOST)

To support the Philippine metals and engineering industry, the Department of Science and Technology - Metals Industry Research and Development Center (DOST-MIRDC) established the Advanced Mechatronics, Robotics, and Industrial Automation Laboratory (AMERIAL). Envisioned to be the national facility for capability development, AMERIAL aims to develop talents in mechatronics and robotics for industrial automation application.

Along with this, AMERIAL is set to amplify the training of the local workforce,

improving the overall process of manufacturing and industrial practices through automation and the use of smart technology, especially to micro, small, and medium enterprises (MSMEs) in the country. One of the projects of DOST together with AMERIAL is the Small Enterprise Technology Upgrading Program (SETUP), which supports MSMEs in increasing their productivity and product competitiveness.

AMERIAL also serves as one of the main pillars supporting the country as it transitions to the fourth industrial revolution or Industry 4.0. This so-called Industry 4.0 encompasses the process manufacturing, logistics, and supply chain sectors, together with the chemical industry, utilities, energy, transportation, oil and gas, mining and metals, as well as smart cities.

At the start of the COVID-19 pandemic, the AMERIAL team from the MIRDC together with The Breath of Life Foundation, worked together in developing prototype pressure- and volume-controlled ventilators for adults.



Originally, the foundation has been designing and producing ventilators for pediatrics use, however, there was a sudden surge of need for adult ventilators due to the pandemic, with the demand still present as of writing. This prompted the foundation together with MIRDC to modify the existing designs to make it suitable for adults.

BALIK SCIENTIST PROGRAM (BSP)

DOST - PCIIEERD
Implementing Agency

With the influx of Filipinos immigrating overseas, there has been a need to expand the scientific workforce in the country. With the Balik Scientist Program (BSP) initiative of the Department of Science and Technology (DOST), experts based outside the Philippines are encouraged to repatriate and take a role in developing the S&T capabilities of the country.

By working together with local researchers in the academe, private and public sectors, and various industries, the technological advancements of the Philippines toward national development can be further accelerated.

Due to the current COVID-19 situation, the BSP project continues to uphold the exchange of ideas and sharing of knowledge, without compromising the safety of its scientists. To address this, alternative

modes of engagement and incentives are provided to the scientists, in short-term and medium-term engagements.

In 2020, the BSP initiatives took on the virtual platform with several activities such as the Online Kumustahan with Balik Scientists, Online Discussions with Host Institutions, Balik Scientists COVDEo Encounter and Website Launch, and the BSP Online Forum.

From 2013 to 2020, there have been a total of 80 BSP awardees. Some of the new Balik Scientists for 2020 include an expert on analytical chemistry from the United States of America (USA), an expert on physical metallurgy from Canada, an expert on volcanology from Fiji, an expert on materials and polymer science from South Korea, as well as an expert in organic synthesis and nanotechnology, also from South Korea.



DOST-PCIIEERD BSP Team with Balik Scientist Dr. Leonel M. Santos (left), whose expertise is on Analytical Chemistry, and his host researcher, Dr. Drexel H. Camacho (right) from the De La Salle University.





DR. LEONEL M. SANTOS

Affiliation	Eastern Analytical Symposium and Exposition, USA
Host Institution	De La Salle University (DLSU)
Expertise	Analytical Chemistry



DR. MYRNA O. NISPEROS

Affiliation	Consultant
Host Institution	Technology Application and Promotion Institute (TAPI)
Expertise	Technology Transfer



DR. LAWRENCE A. LIMJOCO

Affiliation	Myongji University and National Research
Host Institution	Ateneo de Davao University (AdDU)
Expertise	Materials Science



DR. LAURENCE L. DELINA

Affiliation	The Hong Kong University of Science and Technology
Host Institution	University of Science and Technology of Southern Philippines (USTP)
Expertise	Sociotechnical Energy Transition



DR. CLODUALDO M. ARANAS, JR.

Affiliation	University of New Brunswick, Canada
Host Institution	(1) University of the Philippines Diliman - Department of Mining, Metallurgical and Materials Engineering; (2) Metals Industry Research and Development Center (MIRDC)
Expertise	Metallurgical and Materials Engineering



DR. ENGIELLE MAE R. PAGUICAN

Affiliation	University of South Pacific, Fiji
Host Institution	Caraga State University (CSU)
Expertise	Earth Science (Volcanology)



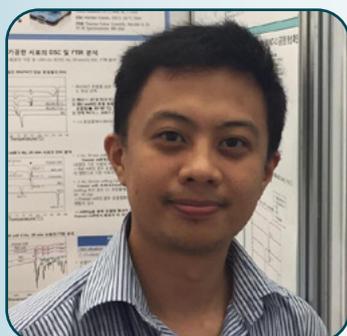
ENGR. VICENTE E. DY REYES

Affiliation	Consultant
Host Institution	(1) FEATI University; (2) National University (NU)
Expertise	Finite Element Analysis



DR. CARLITO R. ALETA

Affiliation	Consultant
Host Institution	Philippine Nuclear Research Institute (PNRI)
Expertise	Nuclear Engineering and Nuclear Regulation



DR. RAMUEL JOHN I. TAMARG

Affiliation	Yeungnam University, South Korea
Host Institution	UP Diliman Department of Chemical Engineering (DChE)
Expertise	Organic Synthesis and Nanotechnology



DR. IDELINA B. MATEO-BABIANO

Affiliation	University of Melbourne, Australia
Host Institution	(1) University of the Philippines Visayas - Tacloban College (UPVTC); (2) Eastern Visayas State University (EVSU)
Expertise	Transport and Urban Planning

NEW HRIDD PROJECTS APPROVED IN 2020

PROJECT TITLE	IMPLEMENTING AGENCY	PROJECT LEADER	PROJECT MANAGER
PhilRice Data Analytics Initiative - RiceLytics	Department of Agriculture - Philippine Rice Research Institute (PhilRice)	Dr. Jesusa Beltran	Roxanne Delps Reyes
Establishment of a Solid Free Form Fabrication Research Laboratory (SoFFReL)	Pangasinan State University (PSU)	Engr. Rex C. Basuel	Roxanne Delps Reyes
Development of Iloilo Province Employment Portal and Services (IPEPS) with Data Analytics	Iloilo Science and Technology University (ISAT-U)	Dr. Yvette G. Gonzales	Lynnel Olpot
Center for Green Nanotechnology Innovations for Environmental Solutions (CGNIES)	University of Mindanao (UM)	Dr. Chosei P. Lawagon	Roxanne Delps Reyes
Establishment of Mold Technology Support Center (MTSC)	Metals Industry Research and Development Center	Dr. Agustin M. Fudolig	Lynnel Olpot
Hundred Islands National Park Management System: Implementation of Smart Tourism	Pangasinan State University	Mr. Paul Andrew V. Roa	Lynnel Olpot
Prescriptive Navigation through Vision-based Traffic Monitoring for City of San Fernando, La Union	Don Mariano Marcos Memorial State University	Ms. Sheena I. Sapuay	Lynnel Olpot
Development of Urdaneta City Bagsakan Market Tariff Information Systems	Urdaneta City University (UCU)	Mr. Richard Myrick T. Arellaga	Lynnel Olpot
Dagupan City Garbage Monitoring System	Lyceum Northwestern University (L-NU)	Engr. Baby Hideliza Castillo	Lynnel Olpot
SPHERE: An Ultra-wideband Technology-based Innovation for Search and Rescue Operations in the Philippines	Mapua University	Engr. Marvin Norona - Mentor	Ederlyn Rogelio
Fungal chitosan- based Microbeads: A Heavy Metal Soil-based biobiosorbent	Polytechnic University of the Philippines - Sta. Mesa	Dr. Lourdes V. Alvarez - Mentor	Ederlyn Rogelio
iTrashBin (Intelligent Trash Bin) Internet-of-Things Trash Bin for Quarantine and Isolation Facilities	Navotas National Science High School	Mr. Don King O. Evangelista - Mentor	Ederlyn Rogelio
Shock Electro dialysis Apparatus (SEA)	Philippine Science High School - Main Campus	Engr. Boon Kristoffer P. Lauw - Mentor	Ederlyn Rogelio



**RITTD:
RESEARCH
INFORMATION
TECHNOLOGY
TRANSFER
DIVISION**

Along with achievements and reaching milestones, another important aspect of breakthroughs is making its promise available for all.

The Research Information Technology Transfer Division (RITTD) division ensures the use of resources and sharing these within the community to strengthen programs within the Council.

CHARGE IN MINUTES: RAPID ELECTRIC VEHICLE CHARGING

Leo Allen Tayo
Project Leader

University of the
Philippines - Electrical
and Electronics
Engineering Institute
Implementing Agency

CharM or Charging in Minutes is a rapid charging system for electric vehicles (EV) using Lithium-ion battery storage technology. It is an ideal alternative to the traditional method that requires around four to six hours of charging, shortening it to just an hour for a regular electric vehicle or even a few minutes for smaller vehicles.

Since its first phase in 2013, several stakeholders have expressed interest in CharM. As of 2017, there are 28 EV manufacturing firms, 11 parts and components manufacturers, and seven existing importers in the Philippines.

In 2020, there is a total of 12,0000 EVs in the country, including bikes and scooters, 8,000 of which are electric tricycles (e-trikes), electric jeepneys (e-jeeps), and electric buses (e-bus) that use either lead acid or lithium-ion (Li-Ion) batteries.

With the growth of the EV industry, one might expect that its service sector is following through, however, there has been a lag. Public utility EVs require overnight charging for a half to full-day of transportation service, decreasing the overall efficiency of the initiative. To

address this, the CharM was developed as a rapid charging system. For its first phase, the concept proved successful but was not perfectly suited for Low-Speed Vehicles (LSVs). In response, a conceptualization for a rapid charging system for LSVs is in the works.

In 2017, as a support for the “Smarter and More Progressive City” vision of the local government of Cauayan City, Isabela, the first EV charging station in the Philippines was installed to service local e-trikes. A couple of years later, in 2019, a spin-off from the CharM project, the CHRG EV Technologies Inc. started its commercial operations. The establishment of CHRG INC was also jumpstarted by the FASTRAC program of DOST-PCIEERD.

In 2020, CHRG continued with its efforts to provide EV fast-charging solutions through multiple deployments all over Luzon. The company, in cooperation with the E-Mobility Group, also extended its support to help the fight against Covid-19 through relief operations, PPE fabrication, and special transport services.

Learn more about CHRG at <https://www.chrg.tech>.

Electric Vehicles Charging Station in UP Diliman



FASTRAC: COMMERCIAL DEVELOPMENT OF PRODUCTION, APPLICATION AND FULL MARKET STUDY OF MONASCUS RED COLORANT

Ms. Fides Marciana Z. Tambalo, MSc
Project Leader

University of the
Philippines Los Baños
Implementing Agency

An exciting innovation in the food technology industry, the Monascus Red™ is a non-toxic natural bio-based colorant, with high antioxidant and cholesterol-lowering properties. Along with providing a bright red color from organic sources, the Monascus Red™ is infused with Monacolin K, a cholesterol-lowering compound and a higher antioxidant content than most commercially available Vitamin E supplements.

The "Monascus Red" colorant is an excellent alternative for consumer goods such as snacks, candies,

chocolates, beverages, biscuits, noodles, and cosmetics as well as agro-industrial commodities such as flour, meat products, eggs, and animal feed.

In the middle of 2020, CTC Group Philippines launched En-Tend Red, an enzyme-based meat tenderizer infused with Monascus Colorant. Different applications of the colorant were also used on popular Filipino snacks such as gulaman (agar), guava juice, puto (steamed rice cakes), bangus (milkfish), and lambanog (distilled palm liquor). The colorant was also used in supplying essential animal nutrition through baked treats for pets.



Cosmetic applications for the Monascus Red(TM) Colorant

PRODUCTION OF NANOCELLULOSE CRYSTALS: POWDER, ADVANCED AND DERIVATIVE PRODUCTS FOR VARIOUS INDUSTRY APPLICATIONS

Dr. Jerome Palaganas
Project Leader

Philippine Genome
Center
Implementing Agency

A Philippine-based technology company, Nanotronics Inc., produces nanostructured materials and technical solutions for industrial use. Its locally produced products include the Emtex, a cellulose nanocrystal (CNC) derived from indigenous plants that create high-value materials with applications to almost any industry. On top of its super strength enhancement functions, Emtex is also biodegradable and biocompatible. The biocompatibility characteristic of the Emtex makes it a suitable choice as well for medical applications. When added to a biodegradable polymer matrix, Emtex

minimizes pollution at product end-of-life, unlike its petroleum-based counterparts.

Another innovative product of Nanotronics Inc. is the Filmet, which is a pristine graphene oxide (GO), considered as a “wonder material” for its thermal, mechanical, thermomechanical, and electrical capabilities. Filmet is an effective electrical conductor, deemed to be stronger than steel and can repel fire, with antibacterial and antiviral properties, making it applicable to any industry. Filmet is also biodegradable and biocompatible, making it ideal for medical application use.

Nanotronics, Inc. also provides nanostructured material products and custom product development in advanced and nanocomposite polymer and additive manufacturing or 3D printing technologies. Technical training services in the areas of materials science, polymer science, polymer nanocomposite, 3D printing, and other related industries, are offered as well.

Discover more about Nanotronics at www.nanotronics3.com.



Nanotronics' main product line: locally-produced nanocellulose crystals and graphene for various industrial applications



INTEGRATION OF DATA SCIENCE AND SCALING UP OF PAYRULER, A COMPREHENSIVE HUMAN RESOURCE MANAGEMENT SYSTEM

Warlito de Jesus
Project Leader

DOST-Technology Application and Promotion Institute (DOST-TAPI)
Implementing Agency

The Technology Innovation for Commercialization (TECHNICOM) is one of the flagship programs of DOST, under Technology Application and Promotion Institute (TAPI), with the goal of accelerating the transfer and commercialization of locally-developed innovations and technologies through financial and technical support.

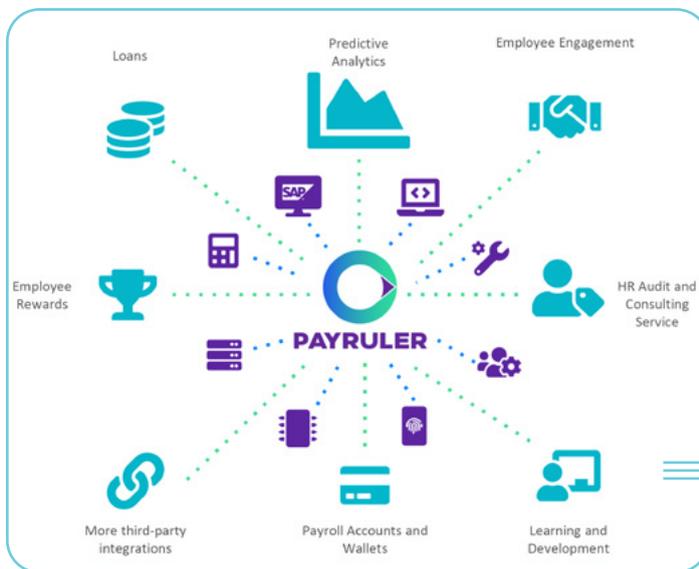
Under the TECHNICOM program of DOST-TAPI was Payruler, a locally-developed comprehensive and customizable Human Resource Management System (HRMS) with the capacity to handle all HR concerns for businesses, with a payroll system built for the Philippine landscape.

Its features include accurate payroll in minutes, easy and reliable timekeeping for work-at-home setup, Employee Self Service (ESS) portal geotagging (GPS), and more. The platform can also be accessed web-based through computers or apps available both on iOS and Android devices.

A full-suite Human Capital Management System, Payruler covers six modules in the employee lifecycle, namely - recruitment, employee information, timekeeping, payroll, employee self-service, and data analytics. It is offered either as a Software as a Service (SaaS) or in-house Deployment.

To date, Payruler is servicing 88% of the overall industry in the Philippines, including the following sectors: human health and social work; education; administrative support service; real estate and accommodation; food services; wholesale and retail; transport and storage; agriculture; information and communication; professional, scientific, and technical; financial and insurance, as well as construction.

Discover Payruler at <https://payruler.com/>.



Payruler's latest version to be rolled out soon.



CROPITAL: DEVELOPMENT OF AN ALTERNATIVE CREDIT SCORING MODEL APPLYING MACHINE LEARNING IN FINANCING FARMER

Ruel Amparo
Project Leader

DOST-Technology
Application and
Promotion Institute
(DOST-TAPI)
Implementing Agency

With Agriculture being one of the main sectors of the Philippines, it is crucial to provide farmers with as much support as possible. To bring together individuals who want to help finance Filipino farmers, Cropital, a crowdfunding platform was developed under Technology Innovation for Commercialization (TECHNICOM). To date, Cropital has raised around PHP70 million, supported 1,200 farmers, and has reached 10 provinces.

TECHNICOM is one of the flagship programs of the Department of Science and Technology (DOST) together with the Technology Application and Promotion Institute (TAPI). TECHNICOM aims to provide financial and technological support to locally-developed innovations and technologies.

Working together with local and international partners, Cropital is an innovative social enterprise that is globally recognized by institutions in the U.S.A, the Netherlands, Malaysia, and the Philippines.

Its main objective is to provide local farmers with sustainable and scalable financing solutions. At the same time, impact makers, investors, and users enjoy a net profit-sharing scheme. Cases and historical statistical data show rates of returns for users, ranging from 3% to 30% in less than six months.

Individuals who want to be part of the social enterprise just need to choose a farm to invest in from the ones available on the website and once the farm has been fully funded, the farmers will be provided with the resources for production.

Cropital manages the funds and ensures the financial support is allocated to the right resources, a risk management system is in place as well. After a few months (depending on the farm), when the crops have been harvested and sold, the capital with the shared profit will return to the investor's virtual wallet.

Learn more about Cropital at <https://www.cropital.com>.



App launch and turnover of Smartphones to Farmer Leaders

TECHNOLOGY TRANSFER PROGRAMS

A sub-division under the RITTD, the Technology Transfer Program provides support for DOST-PCIEERD generated technologies and innovations, as well as developed network institutions, partners, and/or stakeholders, to accelerate transfers to commercialization.



FASTRAC PROGRAM

To bridge the gap between R&D and commercialization of the PCIEERD-funded innovations, FASTRAC Program was created. As of 2020, there are 5 out of 10 companies registered at the Security and Exchange Commission (SEC), 4 out of 10 confirmed license agreements, 46 signed client contracts, 139 units and services deployed, and a total of PHP26.6 million income for 2020 alone. From 2018 to 2020, the total FASTRAC fund support was at PHP125 million.

To date, there are six company spin-offs from the projects and another six in the pipeline.



Four technologies developed by UP Diliman launched for commercialization in 2019





KTTO-IMPACT TRAINING PROGRAM

The KTTO Impact Training Program capacitates Technology Transfer Offices (TTOs) from Universities, DOST RDIs, and non-DOST RDIs (PhiMECH and RITM) in preparation for commercialization and utilization.

As of 2020, the KTTO-Impact Training Program has assessed 213 technologies, signed 21 license agreements, institutionalized 12 Intellectual Property and Technology Transfer policies, as well as filed and protected a total of 159 Intellectual Property rights.

Currently, there are 13 ongoing license non-spin off negotiations, 2 state/private university spin-off policy templates, and 122 intellectual property rights granted by the Intellectual Property Office of the Philippines (IPOPPL), 13 of which are patent and utility models.

The total fund support from the KTTO-IMPACT Program from 2018 to 2020 is at PHP34.4 million.

IMPACT PROGRAM

The IMPACT or IP Management Program for Academic Institutions Commercializing Technologies Program of DOST-PCIEERD aims to provide funding to university-based researchers to increase the utilization and commercialization of their innovations.

Key elements of the program include support in technology protection and transfer policies/processes, capability building of university technology transfer officers, the conduct of audit/assessment of the results of researches, disclosure, and protection of intellectual properties, promotion, and licensing of technologies.



The Pioneering Batch of the KTTO IMPACT Training Workshop who successfully completed the four modules. The pioneering batch is composed of 9 mentors and 89 technology transfer officers from 44 institutions all over the country.

TECHNOLOGY BUSINESS INCUBATORS

One of the DOST strategies to promote technopreneurship in the country is the Technology Business Incubation (TBI) program. This provides innovators with the support that they need to bring their breakthroughs further, while also giving the Philippine socio-economic development a boost, eventually being at par with the world's best at the knowledge-based global economy.

The TBI ecosystem promotes innovation to commercialization by providing resources, services, and facilities as needed. It is the goal of TBI to produce firms that will enable the incubation program to be financially viable, with the capacity to sustain operations and compete in the global market.

From 2018 to 2020, the TBI program was able to provide incubation to 501 startups wherein

107 have grown into full-blown companies, created a total of 1,723 jobs for Filipinos, acquired PHP512 million worth of private investments for the startups, and achieved PHP490 million startup revenue.

As of 2020, the total fund support from the TBI is at PHP34.3 million. There are currently 19 universities under the Higher Education Institution Readiness for Innovation & Technopreneurship (HEIRIT) program of DOST-PCIEERD, as well as 10 universities and 2 private organizations under the TBI 4.0 TBIs.

Within the PCIEERD TBI network, 159 new startups were incubated in 2020, along with acquired new investments worth PHP290 million, with PHP250 million of which is for Kumu, a live stream and community platform designed for Gen Z and millennial Filipinos around the world.



EasyBus



EduSuite

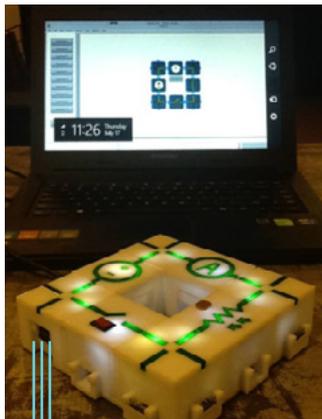


FAME Technologies

STARTUP RESEARCH GRANT PROGRAM



Farmwatch



Tactiles



Retailgate



The Startup Research Grant program is conceptualized to provide support for startups in overcoming R&D challenges, strengthening intellectual property, establishing initial market traction, and refining business models.

Awardees of the grant will have access to financial backing, the S&T network, and TBI services.

From 2019 to 2020, the Startup Research Grant was able to help 15 startups acquire a total of PHP64 million initial fund support, create 45 jobs, receive PHP28 million worth of capital investment, acquire 328 clients, and generate PHP85 million in revenue.

Some of the grant awardees are Nanotronics, Wela School Systems, Smartfox Data Solutions, Senti, BTbox (Biotech in a Box), RestoGraph, eduSuite, EasyBus PH, Tactiles IQube, Farmwatch, and Machibox Inc.



Matchbox

NEW RITTD PROJECTS APPROVED IN 2020

PROJECT TITLE	IMPLEMENTING AGENCY	PROJECT LEADER	PROJECT MANAGER
Pilot-Testing and Deployment of a Post Community Quarantine (CQ) Health Monitoring and Contract-Tracing Online System for the IT-BPM Sector	Department of Science and Technology (DOST)	RD Rowen Gelonga	Ryan H. Torrico
IMPACT: SPRINGBOARD - Supporting Potential and Relevant IP as Next Generation Business Opportunities towards Acceleration of Research and Development	Batangas State University	Albertson Amante	Daniel H. Malapitan
IMPACT: Fostering Innovation to Galvanize HEIs Tech Transfer (FIGHTT) - Saint Louis University	Saint Louis University	Engr. Cynthia Posadas	Daniel H. Malapitan
IMPACT: The Enhancement of USTP's Intellectual Property Management and Establishment of Technology Commercialization Systems and Standards	University of Science and Technology of Southern Philippines (USTP)	Engr. Bronson G. Mabulay	Al Beato
IMPACT: Establishment of Technology Transfer and Utilization Processes and Services in Bulacan State University	Bulacan State University	Engr. Dennis R. dela Cruz	Al Beato
FASTRAC: MAPX: Manage Assets and Properties and Map for Visualization	Caraga State University	Dr. Rolyn C. Daguil	Al Beato
FASTRAC: ALAMA Project: Technology Development, Commercialization and Promotion of Gitara ni Juan	University of the Philippines-Diliman	Engr. Crisron Lucas	Norman Nicole Jimenez
HEIRIT: Establishment of DOST-ISAT U K'DRA 1905 Technology Business Incubator (KTBI)	Iloilo Science and Technology University	Dr. Karlo S. Sira	Norman Nicole Jimenez
HEIRIT: Adamson University Neo Science and Technology Incubation Center (AduNEST-INC)	Adamson University	Engr. Noe D.T. Enriquez	Norman Nicole Jimenez



**POLICY
COORDINATION
AND MONITORING
DIVISION**

The Policy Coordination and Monitoring Division (PCMD) handles the sectoral plans and monitors the implementation of all programs, projects, and innovations under DOST-PCIEERD. The division optimizes the use of resources and rationalizes the process development functions of the Council insofar as the development of national R&D competence in its delineated sectors on industry, energy and emerging technology.

While the technical divisions of ITDD, EUSTDD, and ETDD prepare policy recommendations and plans for their sectoral concerns, PCMD serves as the central coordinating and monitoring unit/division within the Council to perform the following core functions:

- » Spearhead the development, coordination and monitoring of the Council's integrated S&T policies, agenda, plans, programs and priorities;
- » Develop mechanisms and enabling policy environment for improving and strengthening the core business processes of the Council; and
- » Develop and maintain the organization's Information Technology Resources (ITR) to enable efficient and effective planning, managing and controlling of all core business processes across all levels of the Council.

The policy papers featured in this section are related to PCIEERD supported projects as part of its policy development and advocacy.

STRENGTHENING THE PHILIPPINE RUBBER INDUSTRY TOWARDS A SUSTAINABLE ECONOMY

With the abundance of natural resources in the Philippines, it is no surprise that raw materials including rubber are readily available. However, despite the long-existing rubber industry in the country, it is yet to find its solid footing both in the local market as well as internationally. The lack of focus on the industry as well as policies and facilities to give the rubber industry a boost is lacking, resulting in low production efficiency and low quality of rubber produced.

There have been bills filed such as the Congress such as House Bill (HB) No. 2664 or the "Philippine Rubber Development Act of 2018" and HB No. 526 or the "Philippine Rubber Development Act of 2019," all designed to strengthen the local rubber industry, but more work needs to be done. With the establishment of the Philippine Rubber Board, it is recommended to provide more focus to promote the inclusive growth of the rubber industry in the country.

With support and opportunities, the rubber industry can acquire the motivation and the drive it needs to improve the quality of the locally-sourced rubbers, enabling the Philippines to be one of the leading rubber exporters in the world. This will also generate employment in the countryside and contribute as well to the national economy.

There is a large market for rubber as well, both in the local and international landscapes. From domestic use to aeronautics, rubber plays a key role in human progress and it would be a win-win situation for all to work towards this currently untapped market.

To achieve these objectives, support from the government, different sectors, and stakeholders concerned with the Philippine Rubber industry are necessary. In line with this, the PCMD recommends the following:

- » Encourage collaboration among industry players and LGUs in conducting policy gap analysis, strategic planning, and resource mobilization to formulate and update related policies to ensure the sustainability of the local rubber industry.
- » Encourage agro-entrepreneurs and small-scale farmers by providing incentives to entice them to venture on the industry and through trainings, information dissemination, and advocacy campaigns among rubber producers and processors that will capacitate them to improve the quality of their products through sustainable, technologically advanced and up-to-date production and postharvest practices.

Raw materials processing for rubber production at Tire King and Rubber Products Inc., Ipil, Zamboanga Sibugay





DOST-ITDI Laboratory for Rubber and Rubber-based products

- » Urge the government to subsidize the rubber price in the event of downturn of prices to maintain a standard price of rubber and ensure the sustainability of local rubber business and complementary services.
- » Strong support to R&D in the development of grassroots and innovative technologies that will enable both the small-scale and medium rubber stakeholders to sustain the activity in the industry.
- » Provision of financial support for upgrading of laboratories should include a budget for expansion of laboratory space so it can accommodate additional equipment and samples for testing.
- » Introduce the rubber product industry to rubber producers to come up with a QA/QC system to level off and ensure that local raw rubber is of sufficient quality and quantity.
- » Encourage the development of "artisanal" rubber products (not just improving production and quality) to give opportunities to smallholder rubber keepers and local farmers. This way too, the testing facilities and services that were established would have direct uses and clients.
- » Encourage research and development on innovative rubber products. However, the focus should be on the development of value-added materials from rubber as a base material like nanomaterials

and nanofibers for smart paper, nanopackaging, coating, building construction, biomedical, and other sectors owing to their sustainability, durability, cost effectiveness, renewability, and so on.

- » Perform routine resource (re) assessment on behalf of the industry for analyzing current production areas and site suitability analysis expanding rubber area production. This can be an added service and alternative activity of the personnel testing centers in slack periods (when testing is not done).
- » Currently, the Philippines does not have any regulation on the mandatory testing of raw natural rubber. The country should establish a mandatory testing of natural rubber during every stage of its production. The necessary testing for natural rubber enumerated above must be in place to ensure the quality of rubber being produced in the country.

DOST-RSTL IX Laboratory for semi-processed rubber



READ IT HERE:



PREVIOUS POLICY BRIEFS

READ IT HERE:



TERRESTRIAL BIODIVERSITY ASSESSMENT IN SELECTED KEY AREAS IN MINDANAO AS POLICY MAINSTREAM FOR RESPONSIBLE MINING

This policy brief is based on the result of the project funded by PCIEERD titled "Assessment of Terrestrial Biodiversity In Selected Key Mining Areas of Mindanao". The study found out that based on the Red List of Threatened Species under the International Union for Conservation of Nature (IUCN), there are 111 flora and fauna species recorded in selected mine areas in Mindanao of which 11 are critically endangered flora, 13 endangered flora and fauna, 58 vulnerable flora and fauna and 29 near-threatened.

READ IT HERE:



DEVELOPMENT OF MUNICIPAL E-GOVERNANCE SYSTEMS IN NABUA AND BULA, CAMARINES SUR: A POLICY DEVELOPMENT INITIATIVE

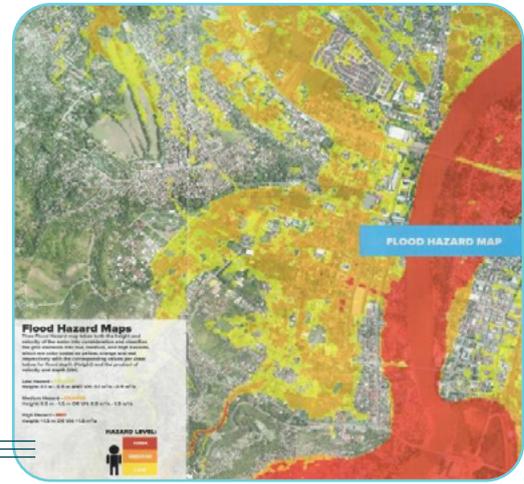
In support to the eLGU program, the PCIEERD spearheaded the project entitled "Development of Municipal e-Governance Systems through ICT" implemented by the Camarines Sur Polytechnic Colleges (CSPC), Nabua, Camarines Sur. It is a proactive program of the Council to transform local government services into a one-stop web portal solution by automating level operations across departments and sub-offices primarily for local government units in consonance with the Smart City program of the DOST.



As a result of PCIEERD's policy recommendations, the municipalities of Bula and Nabua Camarines Sur filed an ordinance for the establishment of the egov system to their respective localities.



Caption



READ IT HERE:



LiDAR AT THE FOREFRONT OF THE DISASTER RISK REDUCTION AND MANAGEMENT IN THE PHILIPPINES: LESSONS AND CHALLENGES

LiDAR 1 Program or the Hazard Mapping of the Philippines using LiDAR in 2014 and the adoption of tools developed in the program. The program served as an urgent response to the pressing need of the country for effective and efficient disaster risk reduction and management strategies particularly for flooding. Some recommendations mentioned in the paper are capacity building for LGUs, information dissemination, and collaboration among stakeholders.



READ IT HERE:



GREEN MINING TECHNOLOGY FOR THE SMALL-SCALE MINING INDUSTRY

The Philippines is the fifth most mineral-rich country in the world and from this, the mining industry contributes billions in the country's economy. However, the traditional mining employed by small-scale miners use mercury and cyanide substances that are damaging to the environment. To aid the small-scale miners, DOST-PCIEERD supported the establishment of an eco-friendly mining facility in Itogon, Benguet. This Policy Brief examines the issues and challenges surrounding the facility, Integrated Gold-Copper Processing Plant.

PCIEERD SUSTAINABILITY AND POLICY DIRECTION RECOMMENDATIONS

READ IT HERE:



In 2020, PCIEERD published the white paper entitled PCIEERD'S R&D Management: Sustainability and Policy Direction: Addressing Low Adoption of the Environment Sector's Project Outputs by Mandated National Agencies. The paper touches on several national policies including the Harmonized National R&D Agenda

(2017- 2022), in alignment with the Sustainable Development Goal (SDG), No. 6: Clean Water and Sanitation. It also mentioned the Philippine Development Plan 2017-2022 (PDP) that provides policy direction through stricter implementation of existing legal frameworks pursued to promote a clean and healthy environment and the 2020 Environmental Performance Index Ranking, as reported by Yale University, wherein the Philippines ranks 111th among the 180 countries, drastically dropping from 66th rank in 2016 to 111th in 2020.

Despite the efforts of the government to curb environmental degradation, the pressing issue persists, with the paper citing diversified interests of the involved parties as one of the main hurdles. Another issue is the low adoption rate of innovations in relation to protection of the environment. For instance, there are 90 completed projects under the environment sector covering 2011-2019. Of these 90 completed projects, only 11 were commercialized, 15 are undergoing pre-commercialization, 30 are for further R&D, and the rest are for publication and for information and dissemination.

In the IP Management Program for Academic Institutions Commercializing Technologies (IMPACT) Program funded by PCIEERD with selected universities, only 13% were adopted or used by government agencies. Looking at the total projects completed in the environment sector, only 41% of these are commercialized and/or adopted, with 11% by private entities and 13% by mandated agencies and LGUs.

To add, PCIEERD Executive Director Dr. Enrico C. Paringit designed a Policy Development

Framework, covering the overarching process of enabling policies, from setting of the R&D priorities by the government to the output of the researchers. From these, recommendations can be provided and developed into S&T-based national legislation, eventually translating to commercialization and adoption on a national level.

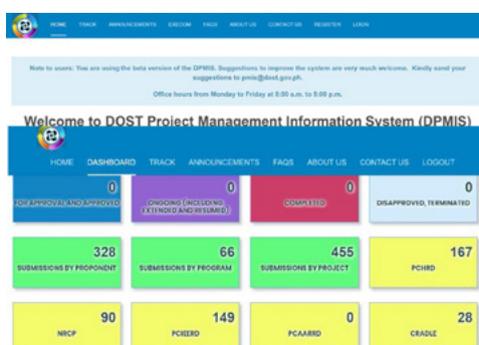
Building on this, the white paper recommends the following policy actions:

- » A Cradle-to-Grave approach in project implementation where stakeholders work together to push the innovation forward, from project proposal evaluation all the way to project outputs' adoption. This process will ensure that the project complies with the requisites of the mandated agency that will eventually adopt the project output.
- » Revisit sector's Roadmap to validate whether its planned programs and strategies are still relevant to the current needs of the industry as well as to the government agencies' functions. The roadmap serves as synchronized plans of the budget, time, and resources needed in the implementation of each of the sectors' S&T plan. It also provides a picture of the sectors' S&T directions for the succeeding years.
- » Engage government bodies that can regulate/impose policy reforms such as the National Economic Development Authority (NEDA), Local Government Units, and both chambers of congress. These agencies are responsible for crafting enabling policies necessary to carry out the objectives of the programs.
- » Reinvigorate Innovation Ecosystem, which includes universities, government, corporations, startup accelerators, venture capitalists, private investors, foundations, entrepreneurs, mentors, and the media. This collaboration among the players is critical in transforming new ideas into reality through access and financial investment.

NEW INFORMATION SYSTEMS

Innovations in PCIEERD go both ways - externally through the support toward researchers and experts, and also internally, through the continuous journey of always working toward improvement.

With this, new information systems are in place to ensure enhanced efficiency in the PCIEERD operations. Several automation scripts were also introduced to further make the process simpler yet more accurate.



DOST PROJECT MANAGEMENT INFORMATION SYSTEM (DPMIS)

The DOST Project Management Information System (DPMIS) is a web-based information system that contains information on DOST program/project proposals, funded programs/projects, and researchers that can be accessed online. It facilitates data collection, storage, analysis, and reporting to track and monitor the performance of all programs and projects funded and implemented by the DOST.

The DPMIS can also be used to submit proposals from applicants interested to apply for research grants under DOST and its network. Users can create individual accounts in the DPMIS and proceed with the necessary submissions.

In the DPMIS dashboard, relevant information on programs and projects such as For Approval and Approved, Ongoing, Completed, Disapproved/Terminated, Submissions by Proponent, Submissions by Program, and Submissions by Project. Specific program divisions are divided as well into categories such as PCHRD, NRCP, PCIEERD, PCARRD, and CRADLE.



PMIS 4.0 - PROJECT FINANCIAL MANAGEMENT INFORMATION SYSTEM (PFMIS)

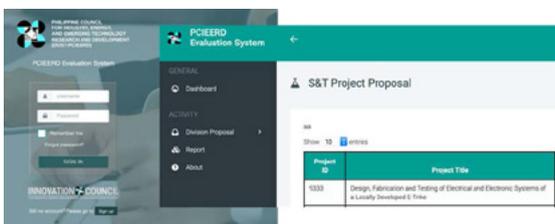
The Project Financial Management System (for PLs) is an external-facing information system designed for Project Leaders. It allows project leaders access to input financial information and accomplishment data. This can be used to monitor the project finances anytime, anywhere.

RESEARCH DATABASE

Research Database showcases projects funded and monitored by the council. It also provides technology profiles generated from the projects. Categories of the projects featured in the database include Environment, Transportation, Construction, Energy, Disaster Mitigation, Information Networking, R&D Networking, Scholarship, Photonics, Information and Communication Technology, Biotechnology, Technology Transfer and Commercialization, Electronics Technology, Genomics, Human Resource Development, Nanotechnology, Infrastructure Development Program, Information Dissemination and Promotion, Space Technology Applications, Material Science, Human Security, Creative Industries, Data Science, Artificial Intelligence, Mining and Minerals, Metals and Engineering, Food, and Process.

Additional information on DOST Grants-In-Aid Guidelines, Call for Proposals, and Technology Adoption are available in the database as well.

EXISTING INFORMATION SYSTEMS HELPFUL IN THE WORK-FROM-HOME SETUP



PCIEERD Proposal Evaluation System

The PCIEERD Evaluation System S&T Proposal dashboard is an efficient channel to find proposals along with all the necessary related information, improving the evaluation process, thereby enhancing the overall system as well.

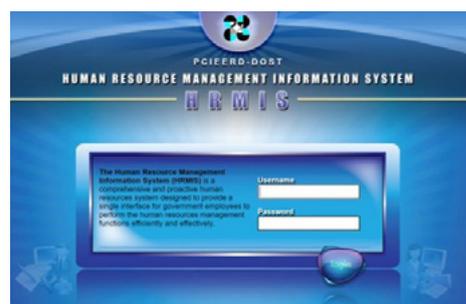


Tracking, Retrieval and Archiving of Communications for Efficiency (TRACE)

Designed to improve the overall efficiency of communication within the Council, the Tracking, Retrieval and Archiving of Communications for Efficiency (TRACE) information system features an interactive, real-time dashboard that displays incoming documents, pending documents, outgoing documents, and events. There are also sections for Calendar/ Schedules, Statistics, Company, and Employees.

Human Resource Management Information System (HRMIS)

The Human Resource Management Information System (HRMIS) is a web-based comprehensive and proactive system designed to provide a single interface for government employees and all their human resources needs and management requirements.



Customer Relations Management Information System (CRMIS)

The Customer Relations Management Information System (CRMIS) is designed to capture the entire customer's concern lifecycle from acquiring feedback, processing and addressing the issues, and improving the systems and processes of PCIEERD. Through the CRMIS, PCIEERD ensures systematic and timely response to the needs of its customers.



NEW PCMD PROJECTS APPROVED IN 2020

PROJECT TITLE	IMPLEMENTING AGENCY	PROJECT LEADER	PROJECT MANAGER
Noah: Save Wildlife (Test Project)	University of the Philippines - Diliman, Natural Science Research Institute Department of Energy (DOE)	Rodelyn Lobo	Elowie Cruz
Customer Focused DARIUS II	DOST-Regional Offices DOST Central Office DOST IV-A Department of Science and Technology Regional Offices	Francisco III Barquilla	George Monroyo

INFORMATION DISSEMINATION INITIATIVES

Along with the innovations and the progress made, information dissemination plays a crucial role, not just in S&T sectors but in the overall technological and national advancements.

The Information Group handles all the communications, promotions, and branding requirements of the Council, along with communicating updates on projects, breakthroughs, events, and supporting information dissemination and promotion activities of DOST Research and Development Institutes (RDIs) and non-government organizations (NGOs).

The group also ensures all communication materials released are within the PCIEERD branding and values.

Information Group Supported Communication Projects

TECHNOLOGY MARKETING PACKAGE FOR JUAN AND JUANA

Dr. Milflor S. Gonzales
Project Leader

Department of Science and
Technology (DOST) - Food and
Nutrition Research Institute (FNRI)
Implementing Agency

The FNRI Juan and Juana project is aimed at promoting food technologies, products, and services developed and being offered by the Department of Science and Technology (DOST) - Food and Nutrition Research Institute (FNRI) as a way to address the problem of malnutrition in the Philippines.

The project developed and implemented its strategic communication plan with the use of tri-media and social media in promoting FNRI technologies, products, and services. Through information collaterals, there was an increase of awareness among policy-makers, businessmen, and community leaders about the existing nutritional struggles in the Philippines, leading to 95% increase of technology inquiries, 45% increase in technology negotiations and 13% increase in technology adoption.

Included in these collaterals are brochures, whitepapers, videos and other information campaign activities.

DOST-FNRI conducted "BREAK 4K" or Bringing-In Resources for Agenda in Kalusugan, Kabuhayan at Kaalaman sa Kabikulan, a food training and forum highlighting the Institute's food and nutrition services in the Municipality of Cabusao, Camarines Sur on October 9-10, 2019. Rice-Mongo curls, Rice-Mongo crunchies, and other food products adopted by Nutridense Food Manufacturing Corporation were introduced to the Bicolanos.



Nutrition Information	
RICE-MONGO CRUNCHIES	
Serving Size: 1 pack (25g)	
Total Fat	10g
Total Carbohydrate	22g
Total Protein	3g
Total Energy	120 kcal
Percent Daily Values are based on a diet of other people's secrets.	

RICE-MONGO CRUNCHIES

Rice-Mongo Crunchies is a healthy and nutritious snack made from a blend of rice flour and mongo flour. The product is crispy and has an appealing crunch. It is further enhanced with cheese or other flavorful toppings.

- 22g Carbohydrates
- 3g Protein
- 120 kcal Energy

Rice-Mongo Crunchies contain 550kcal and 8g protein per 100g. Two packs (20g per pack) of Rice-Mongo Crunchies will provide 11% of RDA for energy and 14.3% for protein of 3-year-old children.

Recommended Daily Allowance for 1-3 years old

7-2 packs

The product can easily penetrate the market due to its similarity to existing commercial products, which are widely purchased by both children and teenagers.

The product can improve the nutritional intake of young children by making a portable but nutrient-rich snack available to them.

Be a technology adopter of Rice-Mongo Crunchies!

Or rice technology, write to: DOST-FNRI, Department of Science and Technology, Office of the Director General, Office of the Director General, Office of the Director General.

DOST-FNRI, Department of Science and Technology, Office of the Director General, Office of the Director General, Office of the Director General.

Department of Science and Technology
FOOD AND NUTRITION RESEARCH INSTITUTE

Information Group Supported Communication Projects

STRATEGIC COMMUNICATION PORTFOLIO FOR ENHANCED TECHNOLOGY PROMOTION AND TRANSFER

Ms. Violeta B. Conoza
Project Leader

Industrial Technology Development Division (ITDI)
Implementing Agency

The DOST-Industrial Technology Development Division (ITDI) has been actively developing and implementing various communication projects, however, there remains a need for knowledge translation or technology transfer. Hurdles to these goals are the low technology adoption, medium visibility of ITDI as a technology/ expert source, limited skills of staff in developing and implementing specific communication projects, and insufficient budget for communication and promotion activities.

To address this and to further promote the Institute, the Institute through this project aimed to implement a strategic communication

approach by targeting the right audiences and highlighting the various technologies and innovations produced, the services offered, and the expertise and credibility of ITDI.

Currently, the project has developed 13 episodes of their business-type talkshow called "TekNegoShow" or TNS that features ITDI products, services and technologies ready for adoption. Along with their TNS, promotion through tri-media and social media is being done as well. The project is expected to be completed at the end of August 2021 for its Year 2 implementation.



TekNegoShow featuring DOST-supported products and technologies



Information Group Supported Communication Projects

REVITALIZATION AND IMPROVEMENT OF EXISTING BICOL SCIENCE AND TECHNOLOGY CENTRUM (BSTC)

Mr. Rommel R. Serrano
Project Leader

DOST - Region V
Implementing Agency

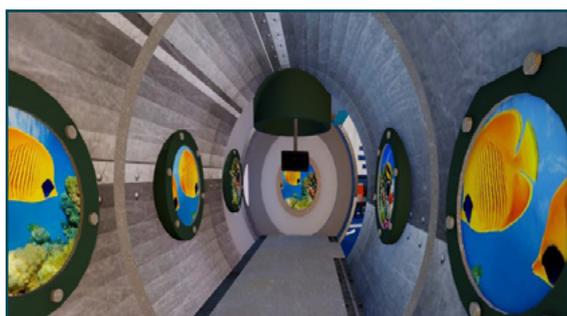
A fully-equipped facility with access to the latest technology is a promise of future innovations and solutions. First of its kind as a Regional Science Centrum initiated and operated by the local government, the Bicol Science and Technology Centrum (BSTC) was built in 1995 under the partnership of the local government of Naga and the DOST Region V office. It was a pilot project of DOST to create a science center outside of Metro Manila.

In its launch, the center featured a Main Science Gallery housing gifts from the DOST-SEI and the Philippine Science Foundation, Inc., including momentum machines, chaotic pendulum, optical illusions, and Archimedes' screw. At present time, the attractions have now

expanded to a Sci-Art Cubbyhole for toddlers and preschoolers, IBM Kidsmart / Young Explorer computers with Early Childhood Education modules, Naga River Gallery, Space and Astronomy Gallery, Gallery on Lights, Colors and Shapes, Optical Illusion Gallery, Audio-Visual Room, and Science-on-wheels.

The BSTC has been non-operational since December 2016 due to repairs and renovations. With its revitalization and improvement, the upgraded centrum will feature 50 interactive exhibits to be displayed in 5 new galleries, further engaging Filipinos in S&T programs and projects.

The renovated centrum is expected to be launched in the first quarter of 2022.



TIKTOK PARTNERSHIP

PCIEERD takes on an exciting partnership with social media giant TikTok with the goals of strengthening Pinoy innovation, giving the Filipino technology a boost in promotion, and making information more accessible to the youth of today.

Through its TikTok account @pinoyscience, DOST-PCIEERD aims to promote technologies with science communication and to garner support for innovations developed by Filipino researchers.

The six-month collaboration includes TikTok providing training for researchers on how to make the most of the platform in engaging its online community, how to effectively promote Filipino science and technology innovations as well as how to hold contests for the Pinoy TikTok community.

One of these contests is the #PinoyInnovator challenge where participants must demonstrate their creativity and resourcefulness, by converting regular household items into useful innovations. The winners will be awarded the title “Pinoy Science Innovator 2021.” Another contest is the #PinoyScience challenge where TikTok users try to explain the science behind some DOST-PCIEERD projects.

An educational campaign via #LearnOnTikTok was also launched, where content creators together with the Council will create educational content for the Pinoy TikTok community.



Signing of memorandum of agreement between DOST-PCIEERD and TikTok Philippines with (bottom left to right) TikTok Philippines Public Policy Head Kristoffer Rada and DOST-PCIEERD Executive Director Dr. Enrico C. Parigit.

SOCIAL MEDIA ANALYTICS AND MEDIA PLACEMENTS

SOCIAL MEDIA ANALYTICS

Facebook (@dostpcieerd)	Posts: 999 Likes: 46,881 Total Impressions: 8,386,687 Average Reach: 7,327 Average Engaged Users: 520
Facebook (@pinoyscience)	Posts: 111 Likes: 36,506 Average Reach: 3,414 Average Engaged Users: 172
Instagram (@dostpcieerd)	Posts: 354 Followers: 1,013
Twitter (@dostpcieerd)	Tweets: 1,600 Followers: 1,484 Average Tweet Impressions: 31,855

MEDIA PLACEMENTS

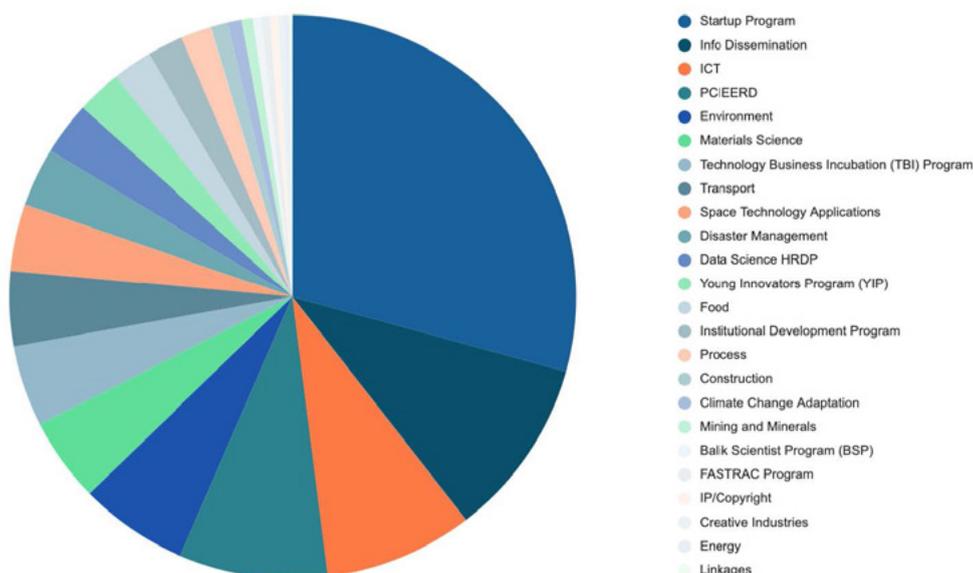
(JANUARY 1 TO DECEMBER 31, 2020)

Total of 625 media placements
 Total Ad value: PHP62,805,560.60
 47 press releases seeded

TOP 3 STORIES

- » Supported projects against COVID-19
- » Project SPARTA 2019
- » NASA Space Apps Challenge

SECTORAL COVERAGE



10TH ANNIVERSARY WEBINARS

For its 10th Anniversary, PCIEERD held webinars in 10-parts, highlighting its high-impact innovations in the past decade, current exciting new projects, and the PCIEERD plans and programs for the future.

Launched on PCIEERD Facebook Page, the webinar series reached a total of 172,254 people mostly from Metro Manila. For each of the webinars, the average audience is 10,766 people.

Topics covered in the PCIEERD webinars include Pinoy Science: Reporting on Innovation in the Philippines, DOST's TBI Virtual Summit, A Decade of Innovation: PCIEERD's 10-Year Journey, Innovation In The Covid-19 Economy, LAB IN THE TIME OF COVID: How Laboratory Standards and Practices are changing, Science Communication in the Time of COVID-19, and S&T-Empowered Transport Solutions for the New Normal to name a few.

PCIEERD Outstanding Employees

In recognition of their invaluable support and contribution to science and technology through the years, particularly to the PCIEERD projects and programs, the Council celebrates its Outstanding Personnel for 2020.

PERMANENT PERSONNEL



EDWARD PAUL H. APIGO
Outstanding Senior Project Manager



KRISTINA PAULA Y. ANACLETO
Outstanding Junior Project Manager



CARLOTA P. SANCHO
Outstanding Senior Support Personnel



ALLEN Z. MANIBOG
Outstanding Junior Support Personnel

CONTRACTUAL PERSONNEL



BIANCA IGNACIO
Outstanding Technical Contractual Personnel



RODELYN LOBO
Outstanding Administrative Contractual Personnel

Kabalikat Awards

PCIEERD recognizes the contribution of its partners in showing interest and expressing invaluable support to science and technology, especially in PCIEERD R&D projects and programs.

The PCIEERD Kabalikat Awards is a celebration of these outstanding individuals and organizations. For 2020, there is a total of 16 Kaba-likat Awardees under the following categories:

KABALIKAT AWARDS: PUBLIC SECTOR

For Financial Contribution: National Water Regulatory Board (NWRB) PCIEERD recognizes the NWRB for providing the most significant amount of research and development funding counterpart contri-bution in the last five years. To date, the NWRB has contributed PHP 25.7 million for various research and development projects.

[Click to watch the acknowledgment video.](#)



Dr. Seville D. David Jr.
Executive Director, NWRB

For S&T Adoption in Good Governance: Department of Budget and Management (DBM) PCIEERD celebrates DBM in its commitment to innovation on monitoring high-value government projects through Project DIME or Digital Imaging for Monitoring and Evaluation, ensuring that the public funds are spent appropriately.

[Click to watch the acknowledgment video.](#)



Wendel E. Avisado
Secretary, Department of Budget and Management

For Infrastructure Technology Adoption: Department of Public Works and Highways (DPWH) PCIEERD recognizes DPWH in its commitment to innovation on infrastructure technology, through its four projects with the Council amounting to a total of PHP69 million.

[Click to watch the acknowledgement video.](#)



Engr. Reynaldo G. Tagudando
Secretary, DPWH

KABALIKAT AWARDS: PRIVATE SECTOR

PCIEERD acknowledges the role of the private sector in contributing to the R&D initiatives in science and technology.



Jonathan F. Co
Manager, Manly Plastics Inc

Manly Plastics Inc. for the rainwater collection systems through modular, pillow, and underground types/designs.



Henry Siy
General Manager, Chemrez Technologies Inc

Chemrez Technologies, Inc. for the Polyols derived from coconut oil for anti-corrosive coating applications.

KABALIKAT AWARDS: RESEARCHER

PCIEERD recognizes researchers and their valuable support and contribution to science and technology through PCIEERD and S&T.



Dr. Blessie Basilia
Division Chief, Materials Science Division
Industrial Technology Development Institute (DOST-ITDI)

For her significant contributions as a best performing PCIEERD-GIA project leader for the past five years.

[Click to watch the acknowledgment video.](#)



Dr. Francis Aldrine Uy
Dean, School of Civil, Environmental, and Geological Engineering, Mapua University
President and CEO, USHER Technologies

For having exceptionally performed and contributed to the advancement of S&T with a significant number of projects and technologies deployed, commercialized, and adopted for PCIEERD-assisted projects in the last five years.

[Click to watch the acknowledgment video.](#)

Kabalikat Awards: University Technology Business Incubator

PCIEERD recognizes the contribution of university-based incubators that serve as centers of innovations while also contributing to their local communities and driving forward the growth of S&T at local and national levels.

CDO b.i.t.e.s. (Business Incubation Technology Entrepreneurship and Startups) of the University of Science and Technology of Southern Philippines (USTP) for advancing their accomplishments in enabling innovations in its respective sectors.

Since its launch in 2016, CDO b.i.t.e.s. has supported 33 startups, raised PHP3.7 million in investment for startups and firestarter programs, and generated PHP37.7 million accumulated revenue. It has also successfully established partnerships with 17 local and four international organizations including Microsoft. To add, CDO b.i.t.e.s. has the highest satisfaction ratings among the DOST TBI Network.

Kabalikat Awards: Startup Ecosystem Builder

PCIEERD celebrates innovation in all forms and functions, with the startup ecosystem being one of the most successful. With this, PCIEERD recognizes QBO Innovation Hub for being one of the pillars of the Philippine startup ecosystem. In 2020, the Philippines reached the 50th rank in the Global Innovation Index, putting the country within the top 50 innovative ecosystems in the world for the first time.

KABALIKAT AWARDS: ACADEME

PCIEERD celebrates educational institutions with the most meritorious accomplishments, projects, outputs, and assistance to various industries, in line with the priority sectors of the Council.



University of the Philippines Diliman (UPD) for outstanding and sustained contributions to research and development in the country, leading to 4 spin-offs/startups; 7 licensing agreements, and 16 IP filings.

[Click to watch the acknowledgment video.](#)

Camarines Sur Polytechnic Colleges (CSPC) for serving as the base agency for the Bicol Consortium for Industry, Energy, and Emerging Technology Research and Development (BCIEERD) and for implementing two completed projects that significantly provided its citizens enhanced public service with e-government technology.

[Click to watch the acknowledgement video.](#)



Dr. Charlito P. Cadag
President III, Camarines Sur Polytechnic Colleges

Kabalikat Awards: Regional Office

PCIEERD recognizes DOST Region IV-A - for its outstanding commitment to enabling research and development in the priority areas of PCIEERD in the region, contributing to local and national advancements.

[Click to watch the acknowledgement video.](#)



Dr. Alexander R. Madrigal
Regional Director, DOST Regional Office IV-A

PCIEERD celebrates the Eastern Visayas State University - Eastern Visayas Council for Industry, Energy and Emerging Technology Research and Development (EVSU-EVCIEERD) for their outstanding commitment to championing research and development in the priority areas of PCIEERD in the region.

[Click to watch the acknowledgement video.](#)



Dr. Dominador O. Aguirre Jr.
University President, Eastern Visayas State University

Kabalikat Awards: Media Partners

PCIEERD recognizes media members taking an active role in contributing to disseminating S&T information to the public.

Top Media Organization - Manila Bulletin for being a platform of information advocacy to the projects of DOST-PCIEERD and for continuously supporting and expressing commitment to promote S&T programs.

Top S&T Correspondent - Mr. Dhel Nazario, Manila Bulletin for actively engaging in S&T advocacy specifically on the DOST-PCIEERD priority sectors, whether in print, broadcast, or online.

Best S&T Feature - Mr. Mikael Angelo Francisco, FlipScience for providing the most comprehensive and effective feature stories on DOST-PCIEERD's sectors, programs, and projects.

GEOGRAPHY OF STAKEHOLDERS

PCIEERD works together with various educational institutions, government agencies, non-government organizations, representatives from the private sectors, as well as local and foreign stakeholders in ensuring a collaborative ecosystem of networks and partnerships anchored on science and technology, towards the common goal of progress and contribution to society.

1000+	75
RESEARCHERS AND TRAINEES CAPACITATED UNDER THE EXPANDED NOAH PROGRAM (2011-2018)	HIGHER EDUCATION INSTITUTIONS REACHED (2018-2020)
366	22
MEDIA PLACEMENTS	GROUPS OF YOUNG INNOVATORS
13	854
INTERNATIONAL COOPERATIONS	AVERAGE SOCIAL MEDIA ENGAGEMENT
13	209
COLLABORATIONS WITH NATIONAL GOVERNMENT AGENCIES (NGAS)	NEW RESEARCHERS IN 2018
	194
	NEW RESEARCHERS IN 2019
	259
	NEW RESEARCHERS IN 2020
	*3:2 RATIO MALE TO FEMALE PROJECT LEADERS

- 56 State Universities and Colleges
- 35 Private Colleges and Universities
- 1 Local University
- 7 Research and Development Institutes
- 17 National Government Agencies
- 18 Regional Offices
- 20 Non-Government Organizations
- 32 Private Industries



INTERNATIONAL COOPERATION



- UK Environment Agency
- PH UK Newton Agham Joint Cooperation Program on Understanding the Impacts of Hydrometeorological Hazards in South East Asia
- DOST-UKRI-NERC (UK-Philippines Minerals & Mining - Natural Environment Research Council/DOST-PCIEERD joint programme)
- SEA-EU (Southeast Asia-Europe Joint Funding Scheme)
- e-Asia Joint Research Program
- Taiwan-Philippines Cooperative Advancement on Research in Science for Society (TW-PH CARES) MECO-TECO
- DOST-JST-UKRI
- MOST China
- USAID
- ASEAN Foundation
- ASEAN SC SER
- JSPS
- Japan Space Agency

PCIEERD IN THE NEXT DECADE: PLANS AND PROGRAMS

The start of 2021 is also the beginning of exciting new projects for PCIEERD, as well as for the S&T sectors in the Philippines. Through the experiences, challenges, and learnings of the past decade, PCIEERD moves with confidence toward a more agile and resilient future.

As we work together to transform the new normal into a better normal, PCIEERD aims to:

- **Improve Total Quality Management**
- **Enhance the Human Capital Management and Development Process through a Competency Framework)**
- **Establish Virtual Monitoring with the assistance of DOST Regional Offices/Consortium for validation**
- **Enhance the Voice of Customer, from Customer Satisfaction to Customer-Centricity and finally to Customer Intimacy**
- **Develop a Financial Management Module**
- **For 2021, new initiatives on Policy including 2 draft policies for Food Innovation Centers and Gold Processing Facilities, 2 policies fora, and conduct Impact Assessment on 7 projects**
- **Convergence from the Top (encourage GC member Institution-PCIEERD Program Design and Planning)**
- **Continue with on-going PCIEERD-DTI-BOI discussions on Priority R&D Requirements of Industry, together with DOE, DTI, NEDA, CHED, etc.**
- **Enhance IT Systems Management and Development**

PCIEERD R&D PRIORITIES

For the next decade, PCIEERD is excited to launch its next set of priority projects for innovations for the people.

1. A.I. Robotics Enabling Solutions for Emerging Needs, with preference for Cognitive A.I.

Objective: For smart/intelligent robots, humanoid and non-humanoid robots, decision intelligence - prescriptive analysis, recommender systems, financial time forecasting, generative adversarial networks (risk model development and pricing models), reinforced/supervised/unsupervised learning, natural image processing, and natural language processing, to name a few.

Application period: May 3, 2021 - June 3, 2021

2. SMART CITY CHALLENGE PH: Sustainability through Innovation in Cities in the Philippines

Objective: Turn vision to reality through a smart city framework featuring smart digital collaborative practices for managing governance, services, data, and systems. The Smart City Challenge also aims to integrate Smart City Indicators in the Urban Development Plans/ Designs of the country.

Application period: May 3, 2021 - June 3, 2021

3. MSME Low-Carbon and Energy-Efficient Transition Program

Priority Areas: Detection, analysis, and control of energy utilization of MSMEs; energy efficient and energy conserving technologies; and low carbon technology for MSMEs

Application period: May 3, 2021 - June 3, 2021

4. DOST Smart Food Value Chain Program For The New Normal

Objective: An integrated program among PCAARRD, PCIEERD, ITDI, FNRI, SUCs, and Regional Offices, with the objectives of food security, waste management and recovery, human resource development, and smart / innovative technologies supply chain management systems

Application period: May 3, 2021 - June 3, 2021

5. Collaboration with DOST Smart Food Value Chain Program and DTI Value Food Innovation Program (SFVC x VFIP)

Objective: The SFVC x VFIP aims to assist in the development and promotion of food products of Philippine SMEs, from research to testing, labeling, packaging, market testing, and promotion. PCIEERD will be the S&T partner of DTI-CITEM for concerns on funding for research on 10 priority products

6. Sustainable Mineral Resources in the Philippines

Objective: A UK-PH scientific collaboration, all proposals must include both a UK and a Philippine Investigator to address the following priority areas, namely: novel technologies for sustainable extraction and understanding of mineral deposition; legacy mines and mine tailings; and understanding the fate, transport, and impact of associated contaminants through the environment.

Application period: Open until January 21, 2021

7. The i-NEST Program: Innovation to Incubation for New and Emerging Space Technologies

Objective: Roll-out commercial applications based on digital geo-climatic data generated by the DOST by means of engaging startups on the processing of data targeted to specific commercial applications.

Application period: March 12, 2021 - May 28 2021

8. Women-Helping-Women: Innovating Social Enterprises (WHWise) Program

Objective: Support more women social entrepreneurs to create impact and benefit more communities, as well as onboard and assist 10 women-led enterprises.

Application period: March 12 2021 - May 28 2021

9. Project Personnel Research Opportunity for Progressive Education and Learning (PROPEL)

Objective: A graduate scholarship of project personnel under PCIEERD-funded and monitored projects for the completion of their graduate degrees while gaining research experience. The program includes coverage of tuition and other school fees, monthly stipend, book and transportation allowance, group insurance, thesis/dissertation allowance, and research and publication grants for Filipino MS or Ph.D. students in any science or engineering degree within PCIEERD priority areas

Application Period for A.Y. 2021-2022 will be announced at a later date.

10. Pinoy Science Science Communication Fellowship Program

Objective: Train 40 researchers and science communicators in popularizing research results

Application period: May 3, 2021 - June 3, 2021

To accelerate the pace of growth and marketability of these innovations, the Council also aims to further develop and nurture the partnership between PCIEERD and the Board of Investors (BOI) Compendium of Technologies.

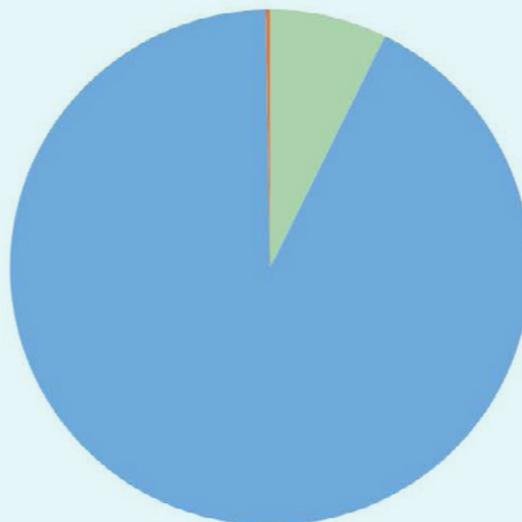
The DOST PCIEERD x BOI Compendium of Technologies is a collection of technologies developed by researchers with the support and funding of the Council. The compendium aims to provide investors with a roster of updates on the latest innovations and technologies that they can opt to license or adopt.

FINANCIAL REPORT

The Republic Act 11465, the General Appropriations Act for Fiscal Year 2020, entitled “ AN ACT APPROPRIATING FUNDS FOR THE OPERATION OF THE GOVERNMENT OF THE REPUBLIC OF THE PHILIPPINES FROM JANUARY ONE TO DECEMBER THIRTY-ONE TWO THOUSAND AND TWENTY , AND FOR OTHER PURPOSES. “ was approved by President Rodrigo Roa Duterte on January 6, 2020. This included the PCIEERD budget amounting to **SEVEN HUNDRED TWENTY-THREE MILLION NINE HUNDRED EIGHTY ONE THOUSAND PESOS (723,981,000.00)**. The budget is divided as follows: Personnel Services amounting to PHP52,090,000.00, Maintenance and Other Operating Expenses with PHP660,668,000.00 and Capital Outlay with PHP1,820,000.00. Out of the Allocated budget for PCIEERD, the Council was able to utilize 91.48% of the total budget.

PCIEERD also manages Externally funded projects, as for 2020, the Council was entrusted with **ONE HUNDRED NINETY-TWO MILLION SIX HUNDRED TWELVE THOUSAND NINE HUNDRED NINETEEN PESOS (PHP192,612,919.00)** total external funds, most of which were from the Department of Science and Technology – Central Office (DOST-CO). Around 74% or **ONE HUNDRED FORTY-TWO MILLION NINE HUNDRED THIRTEEN THOUSAND SIX HUNDRED SIXTY-FOUR & 10/100 PESOS (PHP142,913,664.10)** was utilized. Part of the external fund, SIX MILLION PESOS came from the Department of Energy (DOE) for the funding of a project between DOST and DOE.

2020 PCIEERD BUDGET ALLOCATION



● Personnel Services: PHP 52,090,000.00 ● Maintenance and Other Operating Expenses: PHP 660,668,000.00 ● Capital Outlay: PHP 1,820,000.00

ORGANIZATIONAL STRUCTURE

GOVERNING COUNCIL

The policy-making body of PCIEERD, the Governing Council (GC) is responsible for making the important decisions. The GC also provides the direction for policy and broad management decisions in setting the goals, plans, and priorities for research in the priority areas of PCIEERD. The GC is headed by the DOST Secretary, working in collaboration with other Cabinet Secretaries, as well as designated representatives from pertinent departments, the Executive Director of PCIEERD, and representatives from the private sector including industry, energy, and emerging technology sectors.

OFFICE OF THE EXECUTIVE DIRECTOR

Sets the direction of the organization and leads the overall operations of the Council.

OFFICE OF THE DEPUTY EXECUTIVE DIRECTOR

Oversees the operation of the Council.

FINANCE AND ADMINISTRATIVE DIVISION (FAD)

Handles administrative functions such as personnel administration, supply, cash, and property management, communications and records management, and financial including budgeting and accounting.

INDUSTRIAL TECHNOLOGY DEVELOPMENT DIVISION (ITDD)

Formulates an S&T sectoral plan, as well as coordinates, evaluates, and monitors R&D programs and projects relating to industrial processes, chemical foods and feeds textile and wood-based sectors, metals and engineering, mining, and minerals and environment sectors.

ENERGY AND UTILITIES SYSTEM TECHNOLOGY DIVISION (EUSTDD)

Formulates an S&T sectoral plan, as well as coordinates, evaluates, and monitors R&D programs and projects relating to energy conservation, conventional, and non-conventional sources of energy, construction, and infrastructure, and transportation sectors.

POLICY COORDINATION AND MONITORING DIVISION (PCMD)

Assesses and coordinates the sectoral plans and monitors the implementation for consistency with the overall policy of the Council.

HUMAN RESOURCE AND INSTITUTION DEVELOPMENT DIVISION (HRIDD)

Plans, develops, evaluates, and monitors R&D programs and projects that would develop human resources and institutions in emerging S&T fields, industry, and energy.

EMERGING TECHNOLOGY DEVELOPMENT DIVISION (ETDD)

Formulates an S&T sectoral plan, as well as coordinates, evaluates, and monitors R&D programs and projects on emerging technologies, including Advanced Materials, Nanotechnology, Photonics, Information and Communications Technology, Electronics, Artificial Intelligence, Data Science, Creative Industries, Space Technology Applications

RESEARCH INFORMATION AND TECHNOLOGY TRANSFER DIVISION (RITTD)

Optimizes the agency's use of resources and strengthens programs relating to the diffusion of technologies generated by the Council as well as on the conduct of information dissemination, advocacy, and promotion of the same.

INFORMATION GROUP (IG)

Handles information dissemination, promotions, and branding of the council.



DR. ENRICO C. PARINGIT
EXECUTIVE DIRECTOR, PCIEERD



ENGR. RAUL C. SABULARSE
DEPUTY EXECUTIVE DIRECTOR



ENGR. NIÑALIZA H. ESCORIAL
CHIEF, INDUSTRIAL
TECHNOLOGY DEVELOPMENT
DIVISION (ITDD)



ENGR. NONILO A. PEÑA
CHIEF, ENERGY AND UTILITIES
SYSTEMS TECHNOLOGY
DEVELOPMENT DIVISION (EUSTDD)



MS. EDNA C. NACIENCENO
CHIEF, EMERGING TECHNOLOGY
DEVELOPMENT DIVISION (ETDD)



MS. GRACE F. ESTILLORE
CHIEF, POLICY COORDINATION AND
MONITORING DIVISION (PCMD)



DR. RUBY RATERTA
CHIEF, HUMAN RESOURCES AND
INSTITUTION DEVELOPMENT
DIVISION (HRIDD)



MS. RUSSEL M. PILI
CHIEF, RESEARCH INFORMATION
AND TECHNOLOGY TRANSFER
DIVISION (RITTD)



MS. SONIA P. CABANGON
CHIEF ADMINISTRATIVE OFFICER,
FINANCE AND ADMINISTRATIVE
DIVISION (FAD)



Science Heritage Bldg., DOST Complex, Gen. Santos Ave.,
Bicutan 1631, Sibol St, Taguig, Metro Manila

pcieerd.dost.gov.ph