

Innovations



Department of Science and Technology
Philippine Council for Industry, Energy, and Emerging Technology
Research and Development (PCIEERD)
ANNUAL REPORT 2015



ABOUT THE COVER

The best innovations are created in places where science is allowed to flourish.

The Electronics Product Development Center is a state-of-the-art facility that enables local companies and the academe to conduct research and development initiatives, and prototyping of electronic products.

CONTENTS



4 FROM OUR LEADERS	58 DISASTER RISK MANAGEMENT
7 INTERVIEW WITH THE EXECUTIVE DIRECTOR	58 Project NOAH
9 EXECUTIVE SUMMARY	64 Dream
10 ABOUT PCIEERD	66 Phil-LiDAR
10 Mission, Vision, and Priority Areas	68 TRANSPORTATION SOLUTIONS
11 The DOST Eight Outcomes	68 Hybrid Electric Road Train
12 REVIEW	70 ATPMS
16 HUBS & CENTERS	72 SMART TECHNOLOGY
16 Electronics Product Development Center	72 Smart Grid
20 Food Innovation Centers	76 Grid-Tied Inverter
23 Dual-Mode UHT/HTST Pasteurizing Facility	78 BEYOND EARTH
24 Furniture Testing Center	78 Philippine Microsatellite
26 OneLab	80 FOOD
27 Technology Business Incubators	80 FIC Food Products
30 ENVIRONMENT	82 Safety
30 MykoPlus Biofertilizer	83 Licensing and Commercialization
34 Eco-Sep and Ceramic Water Filter	86 Special Feature
37 Nano Plant Growth Regulator	90 ART AND SCIENCE
38 RENEWABLE ENERGY	90 Gitara ni Juan
38 Tidal Current Energy	94 NatDye
40 Nanostructured Electrocatalyst	98 Natural Colorants
Composites for Direct Fuel Cell	100 PEOPLE & EVENTS
42 Wind Resource Assessment	100 Balik Scientist Program
43 Microhydro Test Facility	104 PCIEERD Management Team
44 RESPONSIBLE MINING	106 PCIEERD Divisions
45 Gold and Copper Pilot Testing	114 Governing Council
48 MSU-IIT Gold Recovery	115 Seminars/Trainings/Scholarship Programs 2015
49 Responsible Mining in Mindanao Program	124 LINKAGES
52 MinERS Program	130 2015 FINANCIAL PERFORMANCE REPORT
56 Black Sand Characterization	
57 Chemical Sensors for Mine Site Monitoring Program	

Message from the DOST SECRETARY



Science and technology are at the heart of the growing need for sustainable development. 2015 was a year of tremendous change, and rightly so as its effects are felt now more than ever. We are becoming ever more involved in the fight against climate change, as representatives from 190 countries including the Philippines committed to a historic climate deal in Paris last December. The Asia-Pacific Economic Cooperation (APEC) forum held in Manila and our integration into the ASEAN Economic Community (AEC) have also provided positive momentum for socioeconomic partnerships towards our country's inclusive growth.

Our country has always stayed strong amidst storms, both literally and figuratively, owing to the Filipino's resilience and drive for progress. We have always been vigilant in making the lives of our people safer and easier, but the cause of science and technology should not stop there. As change presents us with even more opportunities

to innovate, we aim to be more responsible environmentally, socially and economically for the Filipino people, as well as more competitive in the global market.

I have always believed in the Filipino's capacity for innovation, and I am proud to say that the Philippine Council for Industry, Energy and Emerging Technology Research and Development (PCIEERD) has made significant contributions to our country's overall progress this year: a milestone as we edge towards new horizons.

I proudly present to you the Council's efforts for national progress. I encourage you to read on: get a good look at what our people can do and a glimpse of our future.

Mabuhay!


Hon. MARIO G. MONTEJO
DOST Secretary

Message from the UNDERSECRETARY FOR R & D

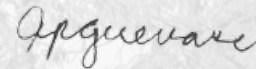


In 2015, PCIEERD continued to live up to its mandate—to support research and development (R&D) as well as to strengthen our capability for innovation in the industry, energy, and emerging sectors.

The Council sees to it that its research agenda is aligned to the government's policy directions for: 1) Rapid, inclusive and sustained economic growth; 2) Poverty reduction and empowerment of the poor and vulnerable; and 3) Integrity of the environment and climate change adaptation and mitigation. On top of these, it aims to contribute towards the achievement of the committed outcomes of the DOST particularly developing state-of-the-art facilities and capabilities and science-based weather information and climate change scenarios with associated impact assessments. PCIEERD has stepped up its efforts to transform R&D outputs into opportunities for wealth and job creation by supporting technology transfer and commercialization activities.

These accomplishments speak of the support and cooperation of PCIEERD's partner institutions from the academe, government, and private sector that complement the teamwork of the PCIEERD management and staff toward the successful implementation of programs and activities.

I congratulate PCIEERD for its resolve to make the industry, energy, and emerging technologies sectors as the catalysts for our country's economic growth and global competitiveness.



AMELIA P. GUEVARA, Ph. D.
DOST Undersecretary for Research and Development
PCIEERD Executive Director (April 1, 2011 - June 30, 2012)

Message from the UNDERSECRETARY FOR S & T SERVICES



My warmest greetings to PCIEERD for another year of productive and meaningful science and technology (S&T) development activities.

PCIEERD's strong research and development (R&D) agenda, managed by a workforce composed of multi-disciplinary scientists and engineers, is behind the success of PCIEERD as an R&D institution. Its administrative personnel is key to its efficient and timely execution of its mandate. In the last 5 years, PCIEERD has cultivated partnership with institutions from the academe, government, private industries and international organizations. This synergistic relationship has strengthened PCIEERD and its partners, and together they have served to improve the country's productivity, climate change adaptation and disaster risk reduction, and industries' global competitiveness.

PCIEERD has nurtured a new research landscape that has evolved and prevailed over recent years. It is observed that

PCIEERD has advocated for large and focused research programs in select areas such as semiconductor and electronics, biotechnology, nanotechnology and genomics, instead of going for the piecemeal project approach type of research. Impelled by the country's urgent initiatives for climate change, disaster risk management and risk reduction, the Council has continued unceasingly to pour its resources and expertise to look for scientific interventions for alleviation of poverty and prevention of loss of life and property brought about by natural calamities. These are just a few of your significant projects worth mentioning.

In the next few years we expect to see PCIEERD aggressively tackling technology transfer of completed R&D projects.

A major step in promoting science, technology development and innovation is wide and timely information dissemination of these materials and publications to all stakeholders. Hence, early and prompt publication of this 2015 annual report is highly appreciated.

Congratulations!

Dr. ROWENA CRISTINA L. GUEVARA
DOST Undersecretary for S & T Services
PCIEERD Executive Director (July 1, 2012 - March 5, 2015)

INTERVIEW with the Executive Director



It has only been since July 2015 when geologist and U.P. professor Dr. Carlos Primo "CP" C. David took over as Executive Director of PCIEERD, but the organization is stronger than ever in its drive towards innovation and greater successes.

Building on the strong programs initiated by Secretary Montejo and his predecessors since 2010, Dr. CP David cites Project NOAH and the DREAM LiDAR Program as two examples of research and development (R&D) programs which successfully responded to a pressing national issue - in this case that of disaster risk management. "We now have a refined template for a responsive science-based R&D program which we can emulate and apply to other fields", Dr. CP David adds. With its competent management team and the full support of DOST's senior officials, PCIEERD is forging ahead and making headway in other R&D fields which we are now seeing a glimpse of what is in store for the coming years.

Q: What is your vision for PCIEERD?

A: I've never thought of it as a grand plan but I aspire for PCIEERD to be the top-of-mind organization when it comes to innovating, solving problems, and creating a globally competitive nation through science and technology.

Three things come to mind in order to achieve this lofty goal. First, is to increase the country's research base by capacitating more institutions to develop their respective R&D niche. We go back to building strong foundations with a critical number of researchers and providing the necessary equipment and tools for their research activities. Second, to bring to the fore some of the mature research outputs and link these to other government agencies as well as to the business community. Science R&D

should not exist in a vacuum as it generates more relevance when a technology has been transferred and adopted by the general public. Lastly, improving our internal business operations in order to effectively manage our R&D agenda. We would like to create an environment that makes it easy for researchers to do their work and for the public to benefit faster from developed technologies. At the same time, we put in place performance indicators by which we track and measure all projects we manage to achieve a cost-effective R&D program.

Q: What shaped PCIEERD's 2015 performance?

A: In 2015, more and more projects were PCIEERD-directed and less of proposal-driven projects. This is to streamline our efforts to achieve DOST's R&D agenda. Much effort remain in the fields of disaster mitigation with the expansion of our flagship programs. Also, focus was given towards industry competitiveness to sustain the economic growth that our country is currently experiencing. Lastly, many projects were initiated to address pressing issues such as the provision of efficient mass transport, reducing vehicular traffic, renewable energy research, environment protection, and laying the groundwork for emerging technologies.

Q: PCIEERD made a lot of innovations. For you, what do you think is the most significant?

A: Perhaps the boldest step we took in 2015 was the development of the country's first microsatellite. Set to be launched in early 2016, DOST's DIWATA-1 will be exclusively providing images of our country for various uses. It is part of our efforts to develop our competency in space technologies. Aside from this, the establishment of service facilities like the Electronics Products Development Center (EPDC), technology business incubators and the Food Innovation Centers (FICs) in the regions are designed to engage even more innovators beyond University-based researchers.

"I aspire for PCIEERD to be the top-of-mind organization when it comes to innovating, solving problems and creating a globally competitive nation through science and technology."

Q: What do you think is the biggest challenge that PCIEERD encountered during the year?

A: Through PCIEERD, we have developed many good products but only a small percentage of these actually get to the market. Our researchers are good at developing products and technologies, but marketing and commercialization are on an entirely different plane. Having the products reach the market is a daunting challenge, so this year we placed extra efforts toward this endeavor. We stepped up our product promotions, reached out to businesses and brought to the DOST campus many entrepreneurs in order for them to see PCIEERD-funded products and research ranging from textile and food to mining technologies and electronic products.

Q: How does PCIEERD plan to address challenges?

A: We have found a way to face these by doing market research prior to development. This way, we will know which products or technologies are needed and in demand and we will be able to develop them accordingly. We will know which industries are ripe for development and facilitate growth there.

Q: As Executive Director, what would be your top priority for 2016?

A: Traffic management! Everything is slowed down by traffic and this decreases our competitive advantage over other countries in attracting industry locators. I want to focus on maximizing our resources: energy, water, food, and manpower.

Q: What major trends do you think will affect PCIEERD's innovations in the future?

A: I believe that the "internet of things" (IoT) which puts embedded electronics and smart technologies in just about anything is an open market we can compete in. It's a mine field for innovation that's just starting to be embraced by the general public.

We are also getting ready for ASEAN integration. I have no clear idea of its impact yet on science and technology (S&T) research, but there is a risk of being overshadowed by our neighbors that are more technologically advanced. We would like to establish right away our niche markets. At the same time, we can look at our ASEAN neighbors' requirements, tailor our R&D and look beyond the domestic market.

Q: What is the greatest innovation PCIEERD can offer to the Filipino people?

A: The plan is not to be identified with one product or innovation but to be present ubiquitously in the sectors that we cater to. To do this, we need to step up our R&D output in all fields by increasing the number of researchers and guide them towards work that directly benefits Filipinos. I guess we've done our job when the time comes that S&T innovation happens everywhere and used by everyone.



Refashioned from the old Science Heritage Building is an avenue where brilliant minds come together to develop new products of science for the future.

EXECUTIVE SUMMARY

This year, the Philippine Council for Industry, Energy and Emerging Technology Research and Development (PCIEERD) geared itself towards innovations that will further improve the Filipino's quality of life and give the much needed edge for us to be a greater participant in the global market.

To facilitate our progress, PCIEERD developed systems that connect networks—be it power or information—in key locations, ranging from an entire community to the entire country. This allows for quicker movement of knowledge and resources from one point to the other, making both daily life and our research and development (R&D) initiatives easier and faster. Last year, we focused on resiliency against natural hazards and alleviating poverty, casualties, and infrastructural and agricultural damages that they cause.

Sustainability was also at the core of our operations. We have developed new ways of harvesting renewable energy from biomass and bodies of water; improved our disaster risk reduction and management, and environmental monitoring systems; promoted environmental responsibility in the mining and manufacturing sectors; and built the foundation of new transport systems.

Among these innovations, we have also developed products from local resources, from food to textile to biofertilizers, with the revitalization and elevation of our industries in mind.

Through these innovations, PCIEERD seeks to foster a stronger sense of nationality and competitiveness and take the country closer to higher success in technological, economic, social, and environmental advancement—all for a stronger and more sustainable Philippines.

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

MISSION

To lead and partner with the public and private institutions in generating S&T policies, strategies and technologies that will contribute significantly to national economic development.

VISION

The PCIEERD envisions to be recognized for the quality of its people, leadership and performance, and contribute to the nation's productivity and competitiveness. Towards this end, the PCIEERD commits to pursue and make available S&T solutions and innovations to help create and sustain competitive industries, attain energy self-sufficiency, and ensure the efficient and effective use of emerging technologies for the inclusive growth and development of the country, through:

- A well-defined Research and Development (R&D) thrust from innovative idea to technology development and knowledge generation to technology transfer and utilization;
- Active engagement of scientists, researchers and engineers in R&D activities; and
- Strengthened partnerships and significant collaborations with industry, academe and government agencies to complement resources and expertise.

PRIORITY AREAS

Industry

- Electronics and Semiconductor Industries
- Food
- Processing
- Metals and Engineering
- Mining and Minerals

Energy

- Alternative Energy
- Energy Efficiency
- Transportation

Emerging Technologies

- Biotechnology/ Genomics
- Information and Communication Technology
- Materials Science/ Nanotechnology
- Photonics
- Space Technology Applications

Special Concerns

- Climate Change Adaptation and Mitigation
- Disaster Risk Reduction and Management

THE DOST EIGHT OUTCOMES

DOST envisions a science nation, a country whose economic growth and development is driven and pulled by science, technology and innovation.

Staying true to its mandate of providing central direction, leadership and coordination of scientific and technological efforts, DOST is committed to deliver not one but eight outcomes for the benefit of the country and its people. These eight outcomes or desired results will ensure that the Department's efforts are geared towards achieving social and economic development that can be felt by every Juan.

Outcome 1. Science-based know-how and tools that enable the agriculture sector to raise productivity to world-class standards

Outcome 2. Innovative, cost-effective and appropriate technologies that enable MSMEs to develop and produce competitive products that meet world-class standards

Outcome 3. State-of-the-art facilities and capabilities that enable local industries to move up the value chain and attain global competitiveness

Outcome 4. Philippines a global leader in Information Technology – Business Process Management Services generating direct employment of 1.3 M (520,000 in the countryside)

Outcome 5. ICT-based transformation of governance, broadening access to government services (i.e. health and education) for those in the countryside (Philippines in the top 50 global ranking of e-government by 2016)

Outcome 6. Improved quality healthcare and quality of life thru science, technology and innovation

Outcome 7. Highly skilled and globally competitive S&T human resources in support of the national S&T programs (PSHS to be the leading science high school in ASEAN by 2015 and every town to have at least one DOST scholar by 2016)

Outcome 8. Science-based information on weather, climate change and geological hazards to ensure the country's survival and future in an era of extreme and rapidly changing climate

Review

Here are some projects from 2014 that have either been completed or are continuing in 2015.



CRAVAT: CORAL REEF ASSESSMENT AND VISUALIZATION ADVANCED TOOLS

FISHDROP 360

Fishdrop 360 creates 3D maps of coral reefs by incorporating data derived from multi-beam and single-beam cameras. These 3D maps will allow for the investigation of the reefs' potential productivity and the relationship between bio-architecture and biodiversity.

Teardrop Upgrade

The Teardrop Video Transecting Tool will be upgraded to capture wider swathes and deeper corals. It will be outfitted with a propulsion mechanism, an array of cameras, underwater lighting, and echo sounders. The images from two or more cameras will be combined via stitching software. The Teardrop Upgrade will also be modified for the video transection of corals along reef walls and high gradient reef slopes.

Integration of Automated Rapid Reef Assessment System (ARRAS) and CRAVAT Tools

This project integrates 3D, rugosity, bathymetry, and assessment from software-stitched videos. Algorithms will be developed to derive 3D images from the video to provide an appropriate overlay of stitched images on seafloor maps.

Assessment algorithms will be created from stitched videos such as rugosity/complexity measurement, coral cover estimation, depth estimation, coral size estimation, and change detection.



ITS-INTELLIGENT TRANSPORT SYSTEMS

PhilMATIS

Envisioned as an automated system with minimal human influence, PhilMATIS seeks to measure local road traffic characteristics (e.g., volume, speed, composition, etc.) through digital image processing techniques that will parse information from cameras and sensors installed at strategic locations. As an Advanced Travel Information System (ATIS), it manages factors present during bad weather conditions such as traffic volume, rainfall data, routes, and other pertinent information, and provides alternative routes for travelers aside from advisories on which vehicles may still traverse flooded street sections. Key features are its abilities to monitor traffic flow along different roads, derive rainfall and flood data from existing systems, while also monitoring the incidence of flooding at critical points in the road network.

LOCALSIM

Users of this app will be able to simulate traffic environment with parameters on the behavior and tendencies of drivers and

pedestrians that can be set uniformly or can follow some known distribution. Additional traffic infrastructures and implementation of new regulations can be planned effectively and consider the possible traffic scenarios that may arise from them. It can potentially address current problems such as the optimal U-turn distance from the intersection, control of pedestrian loading and unloading, optimal combination of traffic light frequencies in intersections with optional U-turns, etc.

PUBFix

PUBFix aims to schedule Metro Manila's public transportation, particularly along EDSA, as one of specific scenarios to be modeled and tested. This study will be using the transit assignment methodology of EMME4 urban transportation planning software.



NATIONAL R&D PROGRAM FOR NATURAL RUBBER PROCESSING AND RUBBER PRODUCTS MANUFACTURING

Rubber Project 1: Upgrading and Accreditation of Laboratories to include Rubber Analyses in Strategic Areas in Mindanao Phase I. Integration of Rubber Testing Services in RSTL Region 9

To foster quality consciousness among consumers, the rubber testing laboratory shall be located at

the Regional Standards and Testing Laboratories of DOST 9. It involves activities such as:

- Validation of the feasibility and sustainability of offering rubber testing services in Region IX
- Benchmarking rubber testing services
- Procurement of laboratory test equipment and facility refurbishment
- Training of personnel including proficiency
- Methods validation and operation of the testing facility
- Documentation of quality systems for ISO 17025 accreditation
- Promotion of testing services

Rubber Project 2: Optimization and Improvement of Process in the Production of Technically Specified Rubber and Demonstration of Improved Facilities in Zamboanga Peninsula

In 2012, DOST launched the National Rubber Research and Development Agenda (NRRDA). The NRRDA found that the quality of Natural Rubber can be improved through the assimilation of best practices and appropriate technologies in rubber tapping and processing. Various activities from harvesting to processing have significant effects on the quality of the finished product, particularly on plasticity, color, and dirt content. Dirt and color are easily detected, but effects on plasticity are determined through laboratory analysis. The project team will conduct the optimization runs at a DOST-SETUP assisted rubber processing plant in Zamboanga Sibugay. Also, in coordination with TESDA, the project team has conducted a series of training for tappers from different cooperatives in Sibugay. The project will work on improving the quality of the local Technically Specified Rubber to meet international standards.

Rubber Project 3: Enhancing and Increasing Local Content in Rubber for Motorcycle Tire Application

The rise in local users of motorcycles (1 in every 350 Filipinos), paired with the impending free trade agreement between different ASEAN nations at the time of this writing, is set to increase the potential growth of the local rubber industry ten times the current rate.

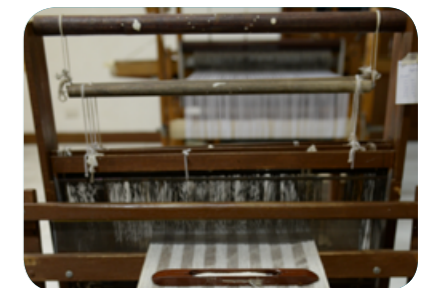
This project will focus on innovations on materials for tire manufacturing. Investigation on the use of locally available nanocomposite materials that are expected to not only lower the cost of production but also increase local content in the tire products shall also be done. In addition, it will also add potential income for clay mineral-producing companies as new players for additives processing.

Rubber Project 4: Integration of Testing Services for Rubber and Rubber Products

The Technical Committee on Rubber and Rubber Products (TC 16) of the Bureau of Philippine Standards of the Department of Trade and Industry (DTI-BPS) called on the need to implement standards in certifying the quality (PS Mark) of rubber hoses attached to gas/LPG assemblies. However, no local third party testing laboratory offers the testing requirements of ISO 4079:2009. As such, adoption of ISO 4079:2009 was deferred

In response, the project aims to establish adequate facilities for the performance testing of rubber and rubber-based products. This will involve acquisition of equipment, training of analysts, and competency development to be an ISO 17025 accredited laboratory. At the same time, become a recognized laboratory of the DTI-BPS for testing rubber and rubber-based products.

The following tests are available at the Standards and Testing Division of the Industrial Technology Development Institute (STD-ITDI): abrasion resistance, water absorption, aging test (before and after), compression set, tear resistance, density/specific gravity, hardness, effect of liquid/stain/chemical oil swelling, ozone resistance test, rubber properties in compression, tensile strength and elongation, exposure test.



REVITALIZATION OF THE PHILIPPINE TEXTILE INDUSTRY THROUGH SCIENCE AND TECHNOLOGY

Revit Project 1: Establishment of Innovation Center for Yarns and Textiles

By establishing an innovation center for yarns and textiles from indigenous fibers, it is hoped that different parts of the archipelago will be able to create beautiful, locally made fabrics with the help of standardized processing methods in the production of indigenous fiber blended yarns and state-of-the-art textile machines and equipment. The project shall implement its strategy through five activities: upgrading of PTRI's facilities, yarn and fabric innovation and development, human resource enhancement, textile performance specifications, and marketing and promotion strategies.

Revit Project 2: Establishment of Handloom Weaving Livelihood at the DOST Innovation Centers

This project aims to enhance the handloom productivity in the countryside and target textile MSMEs to develop products for both local and international markets. Project activities include technical assistance for the start-up operations in every handloom weaving center, acquisition of handloom equipment, training in their proper use and maintenance, training weavers, weave design development, and loom execution.

Revit Project 3: Upscaling and Expanding the Production and Application of Philippine Natural Dyes

This will address the need for the industry to scale up volume production on natural dyes using existing dyeing machines. This expansion will help meet the demand for natural dyes to be used in textile, cosmetics, and food.

Revit Project 4: Modernization of Geosynthetic Testing Services

The PTRI's Testing Laboratory for textiles, the nation's official laboratory in testing breaking load, mass per unit area, tearing strength, tensile strength and thickness—supports these industries in achieving global competitiveness through quality testing of their raw materials and products. For civil construction applications, geosynthetic materials such as geotextiles, geogrids, and geomembranes are used. Either woven or nonwoven geotextiles—also known as civil engineering fabrics, erosion control cloths, filter fabrics, or support membranes—are used in foundations of soils, rock, earth, or other geotechnical material as an integral part of a manufactured project, structure, or system to prevent wind and water erosion of the soil and achieve structural stability. The PTRI is the only testing laboratory that conducts tests for geosynthetics in the country.



ELECTRONICS

Smart Wire Project 1: Energy Efficient Data Acquisition and Conditioning for the SmartWire Sensor Node Project

The project's aim is the development of energy efficient data acquisition and signal conditioning circuits for the SmartWire sensor node. The circuits will be used to measure electric current and temperature information, as well as perform the necessary signal conditioning, allowing for energy efficient information transmission and storage. The main components of the data acquisition and signal conditioning subsystem are analog-to-digital converters (ADCs) and filters. These SmartWire circuits must be able to operate in a noisy, energy-limited environment.

Smart Wire Project 2: Integrated Energy Harvesting, Storage and Regulation for the SmartWire Sensor Node

The development of efficient and reliable energy harvesting circuit technologies for the SmartWire sensor node is this project's aim. The energy harvesting circuit must be able to:

- Harvest energy from the power lines and/or from ambient radio-frequency radiation;
- Supply a current of at least 50mA for the worst-case scenario communication energy requirement; and
- Operate in a low power mode while on standby, which will

make the average power consumed by the SmartWire sensor network negligible compared to grid power.

To be studied are two sources of ambient energy: electromagnetic energy emitted by the power lines; and the ambient radio-frequency energy emitted by various radio sources. The former provides the energy during normal operation, while the latter can be used to energize the nodes during power interruptions.

Smart Wire Project 3: Energy Ultra-Low Power Computation and Communication for the SmartWire Sensor Node Project

The SmartWire sensor node is in need of developed ultra-low power communication and computation circuits and architectures. The communication subsystem will provide the physical layer interface for the communication channel, and may be either the power line for power line communications or the free space for radio-frequency (RF) communications. The computation subsystem manages the operation of the entire SmartWire sensor node, including the protocol processing needed by the communication system, system- and circuit-level error correction, and digital demodulation of the received signals. Both these subsystems must be able to operate at extremely low power levels and at with a supply voltage of 0.5V.

Smart Wire Project 4: Resilient Data Transport

In order to work, the SmartWire sensor network will need energy efficient and resilient data transport mechanisms. These mechanisms will span the medium access control (MAC), network, and transport layers of the network stack. It is to leverage the cross-layer optimization design approach, which provides

better network performance compared to the traditional layered approach. Such an approach needs to be used with caution—suitable network protocols and mechanisms must be developed. Coordination of optimization processes at the different layers of the protocol stack must also be ensured.

Establishment and Operation of the Philippine Institute for Integrated Circuits

The project envisions this Institute as a key innovator for promoting the enhancement of microelectronics both in the academe and the local industry through technology incubation, research collaborations and support for EDA tools distribution, and multi-project wafer fabrication services.



MONITORING THE ENVIRONMENT

Weather Information Integration for System Enhancement (NOAH-WISE)

To improve the capabilities of the FloodNet and ClimateX components of Project NOAH, smarter analytics and high performance computing (HPC) will be needed. These can be accessed by running the Weather Research and Forecasting (WRF) model together with ground, Doppler, and satellite data assimilation in a research development platform.

The Use of Radon in the Monitoring of the Philippine Fault (PF) and the Valley Fault (VFP) System and its Implication as an Earthquake Precursor

This is to be a three-year program for utilizing radon techniques in the Philippine Fault (Central Luzon) in Luzon and the Valley Fault System's northern segment's surveillance program, which transects a major portion of Metro Manila.



GENOMES

Establishment of the Philippine Genome Center (PGC): DNA Sequencing Core Facility (DSCF)

This center provides sequencing and genotyping services for local academic research groups and scientific community. At present, DSCF addresses the sequencing needs of the health, ethnicity and forensics, agricultural and biodiversity programs of the PGC. Essential research infrastructure components include well-equipped laboratories for Next-Generation-Sequencing (NGS) and conventional Capillary Sanger sequencing technologies. The facility also provides training and produces competent human resource for the different sequencing technologies to help build a critical mass skilled researchers in genomics.

Establishment of the Philippine Genome Center (PGC): Core Facility for Bioinformatics (CFB)

This is a central facility that houses the fully configured and business-ready high performance computing system that actively contributes to furthering the improvement and development of theoretical and practical bioinformatic methodologies. It currently collaborates with PGC researchers to help find solutions to computational biological problems, entailing focus in researching key areas of bioinformatics / computational biology, including: Data mining; Development of new platform for high-performance Biocomputing; Algorithms, software and data base system. It takes requests for a range of analyses as its research thrust. It offers consultancy services for clients from the academe, government and private sectors.

Research Facilities

Testing laboratories and research facilities for the semiconductor and electronics industry as well as for the biotechnology, nanotechnology and genomics industries were established or upgraded in 2014 and 2015. These facilities aim to provide local industries access to affordable quality testing services. The pilot plant of the National Institute of Molecular Biology and Biotechnology at UP Los Baños (BIOTECH-UPLB) in Laguna was upgraded to strengthen research and technology development. This upgrade will help startup enterprises in the commercialization of products such as biofertilizers, microbial rennet, food and feed enzymes and probiotics.



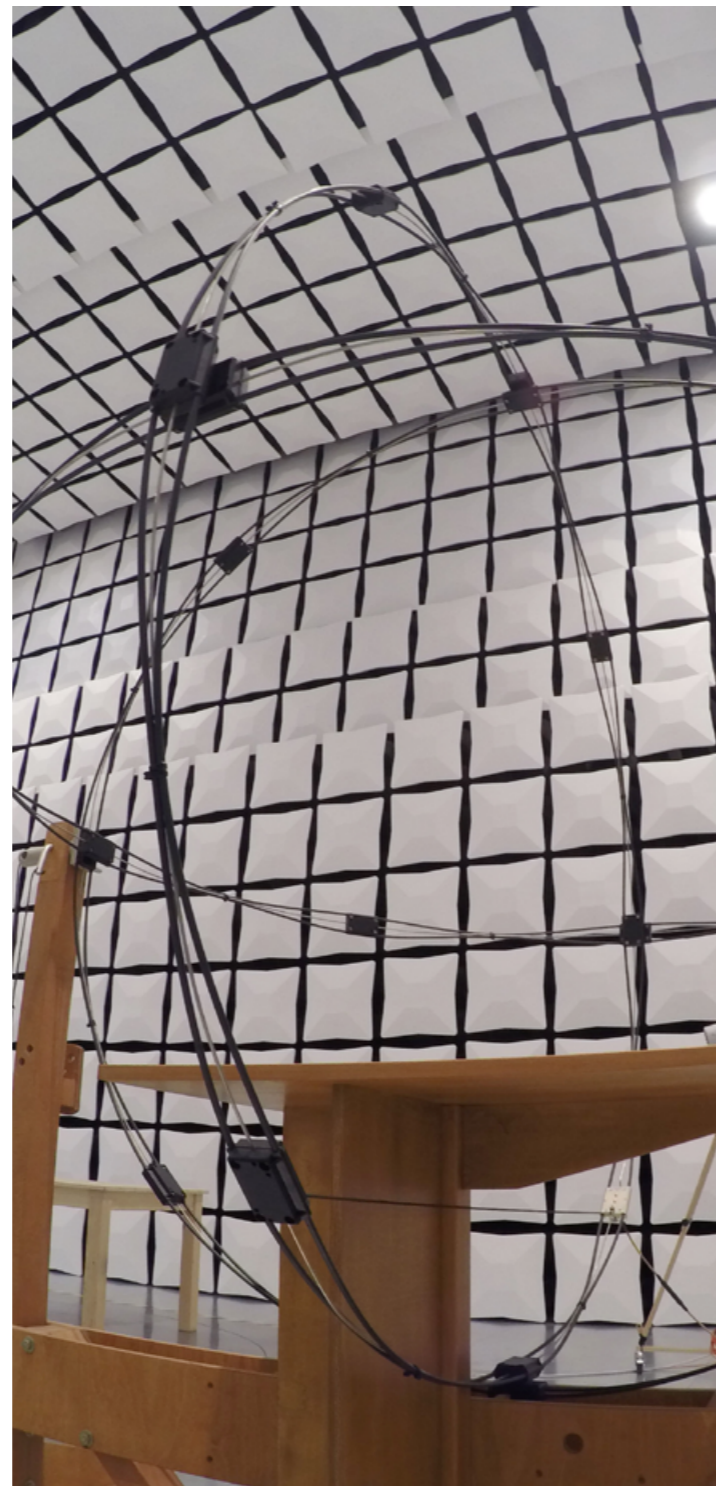
Hubs and Centers

PCIEERD supported the establishment of state-of-the-art facilities that enable industries to develop technologies and business models that will contribute to global competitiveness. Inventors, entrepreneurs, and students can think of PCIEERD as a haven for innovation.

ELECTRONICS PRODUCT DEVELOPMENT CENTER

Filipino inventors, innovators, and engineers—whether young or old, student or professional, established business or start-up, electronic industry or not—need no longer worry about having a room to call their own where they can safely tinker, research, and prototype their electronic products.

Inaugurated on July 14, 2015, the Electronics Product Development Center (EPDC) at the MIRDC Compound in Bicutan, Taguig City,



is open to the public, whether for visiting or using the facility, and is designed to strengthen the local electronics and semiconductor industries. Its capabilities, are as many as the types and brands of smartphones in the market. According to Project Leader Engr. Peter Antonio B. Banzon of DOST's Advanced S&T Institute (ASTI), the EPDC offers:

- Design, rapid prototyping and testing facilities for printed circuit boards or PCB
- Electronic product prototyping
- Prototyping for 3D enclosure design, 3D scanning, and enclosure prototyping using 3D printer

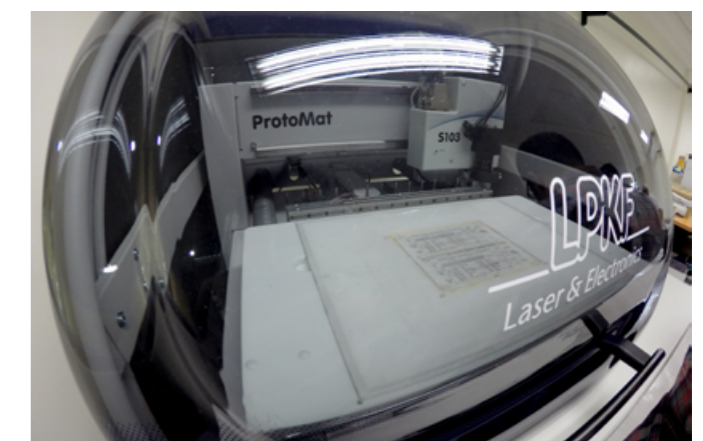
Students, in particular, can use any of the design workstations when working on their engineering projects, such as designing and duplicating circuits. The rooms are accessed electronically only for the designers co-opting the room for a certain period. All designers retain their projects' intellectual property rights.

Those working on commissions from industry clients can work in the rooms as well. Clients simply have to give the design for the PCB, which the designers can input into a machine that drills away the copper bits.

"It is both a science and an art", said Engr. Enrico Claro R. Delmoro, EPDC Manager as he showcased a circuit board. "It is a science because the lines that you see are the highways where electricity will flow. It is an art because you need to fit all these

in a space as little as possible. At the same time, the highways shouldn't overlap or there will be a short circuit."

PCIEERD Executive Director Dr. CP David further explained that the machine can produce up to four layers of circuits at a fraction of the time. "A double-sided, fully-utilized PCB can take up to eight hours to make. These are for prototyping, not mass production; the prototypes are afterward sent to local or international factories for mass production. When the designers want to test, they just go to the next room."



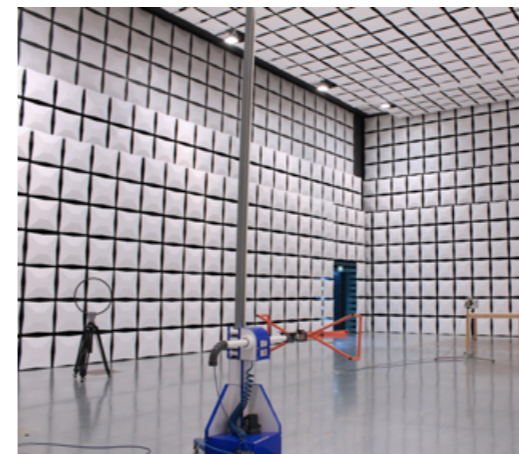


“The EPDC aims to nurture and nourish local electrical engineering talent and a culture of innovation for the furtherance and growth of the nation.”

EMC chamber

The electromagnetic compatibility testing (EMC) chamber is where designers can test their inventions. Some of the needs of the electronic and semiconductor industries are served by EMC chambers, previously only offered in nations such as Singapore, Thailand, and Malaysia. Now, the EMC is the fourth of its kind in the ASEAN region—and now offered for a very competitive price locally. EMC is important for compliance testing, harmonics, and flicker tests.

The products are tested at the 10-meter, steel-reinforced EMC chamber, the first of its kind in the Philippines. Currently, there is also a three-meter chamber in Libis owned by Emerson for their own use and a five-meter chamber in Cebu that is also open to the public.



The EMC chamber is closed from the rest of the building by a dugout to prevent the interference of different electronic signals whenever tests are being conducted. No metal is allowed inside, with the exception of the testing equipment and the all-metal floor. Inside, the walls are covered with cones that serve as noise absorbers, topped off with white caps that reduced their size.

The EMC works for all kinds of electronic devices; it is worth noting that while many products fail the test, the designers can fix these accordingly at the repair



facility. The longest test ever performed in the chamber lasted for two hours.

In total, this chamber cost Php 150 million to build, roughly two-thirds of the budget for the entire EPDC. The EPDC is working towards an ISO accreditation for the EMC chamber.

The EPDC aims to nurture and nourish local electrical engineering talent and a culture of innovation for the furtherance and growth of the nation. It was built to address the current problem of limited human resources and unavailability of equipment and facilities for the IC design industry. As the industry grows and develops, the program shall adjust its technological and economical capacities to fit industrial requirements.





FOOD INNOVATION CENTERS (FICs)

Food innovation doesn't only mean thinking of unique food concepts or combinations, and selling them commercially. It means thinking of the basic questions—how do you better preserve food, without resorting to chemicals? How do you preserve the taste if it must last for months? How do you create improved versions of existing food with local ingredients? How do you make certain healthy but traditionally undesirable food, such as vegetables, more palatable for the public?

You can stop scratching your head. DOST Food Innovation Centers to the rescue—all eighteen (18) of them, one for every region of the archipelago and one (1) central FIC at the Industrial Technology Development Institute (ITDI) of

DOST. According to Project Leader Ms. Nelia Elisa C. Florendo of ITDI, six (6) centers have already been set up. Each FIC will ideally house a set of five (5) DOST-developed food processing equipment that will address the primary needs of the food processing industry. These are vacuum packaging machine, water retort, vacuum fryer (in photo), spray dryer, and freeze dryer.

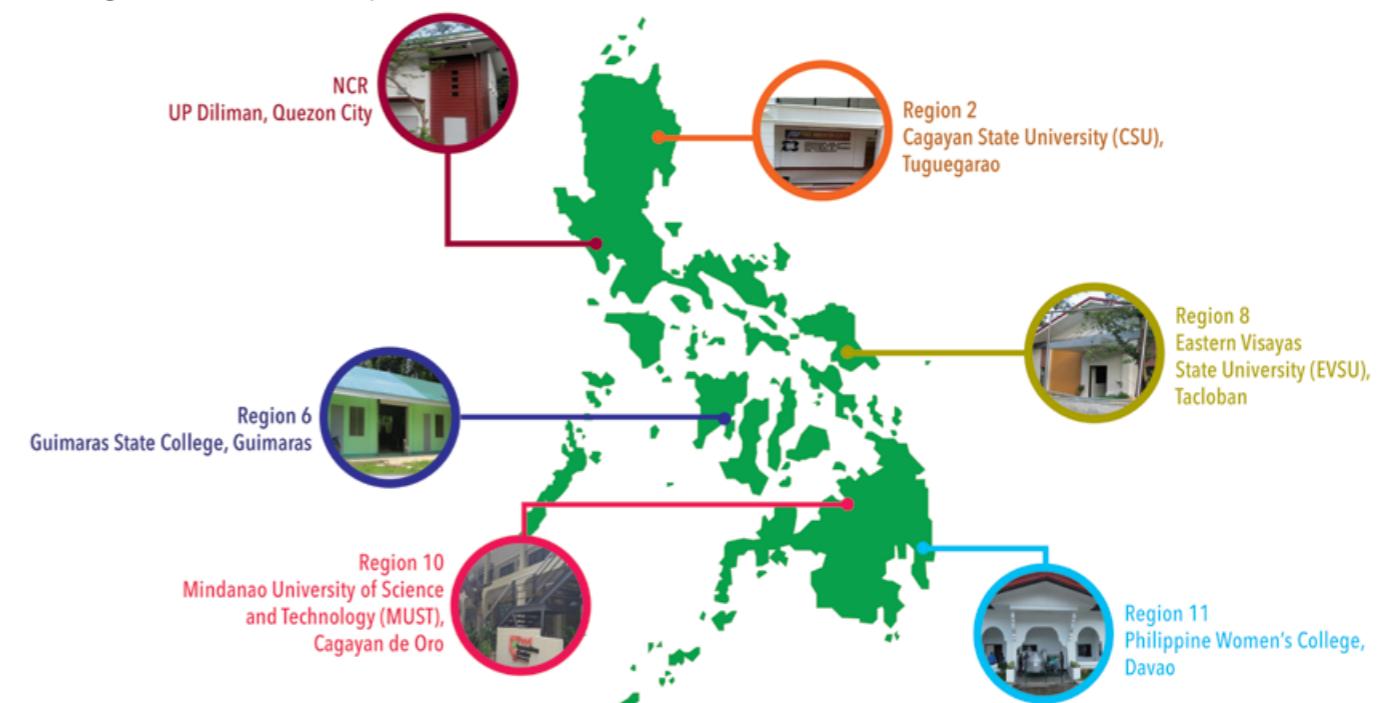
DOST's food processing equipment have been tested on the field and passed the functionality and performance standards. They are the Philippines' answer to imported equipment and are more appropriate to local considerations. They also offer local food processing firms competitive prices for their services. PCIEERD Project Manager Grace Estillore pointed out that the FICs have managed to bring down the cost of most of the equipment to about a fifth of the original cost when imported.

Innovation hubs

"These facilities can be rented by anyone who wishes to develop new food products," said Estillore. Companies with food ideas can use the equipment and do a market test at bench scale of around 50 kilos or so before proceeding to pilot and commercial scale in tons of volume.

The idea of developing FICs came from a benchmarking activity in Thailand. The first FIC in Davao was then established in December 2014.

"The FIC is meant to bridge the R&D and commercial stages, and risks to the industry lessened," Estillore said. A reason why the FICs were rolled out to the regions was to accelerate the research and development of local raw materials.





“These facilities can be rented by anyone who wishes to develop new food products.”

While the FICs aim to be innovation hubs for food, they will also play a significant part in boosting the local food processing industry. Located in certain universities, the FICs will create a network that connects everyone in the food processing industry, from farmers and

agribusiness to manufacturers and processors—including start-ups and established food processors—to retail and food service markets, food industry trade associations, food industry suppliers, and service providers, to consumers.

Food galore

Existing FIC products include vacuum fried seafood, vegetables, fruits, vegetable and fruit powdered juice and flavorants, ready-to-eat meals, and food products made with local ingredients.

With these recent developments, markets will soon see a whole new wave of food products—and surely some will be surprised with these.



The FIC Team

DUAL-MODE UHT/HTST PASTEURIZING FACILITY

Batangas State University (BSU) developed a less costly pasteurizer made for thermally stabilizing beverages at both Ultra High Temperature (UHT) Pasteurization and High Temperature Short Time (HTST).

Pasteurization is the process of heating liquids such as milk and juices for a specific time to destroy disease-causing microorganisms and increase product shelf-life. There are two (2) types of pasteurization based on the time-temperature combination used. These are Ultra High Temperature (UHT) Pasteurization and High Temperature Short Time (HTST) Pasteurization.

HTST pasteurization is the process of heating liquids up to 70 to 72°C and holding temperature for 15 to 20 seconds depending on the nature of raw materials. This kills harmful bacteria, preserves the product's nutrients, and extends shelf life to 2-3 weeks. For the project, the HTST mode of the pasteurizer was used for coconut water which was found compliant with the physico-chemical parameters in the Philippine National Standards (PNS).

UHT pasteurization, on the other hand, brings the products specifically for milk to



140°C, but only for 1-2 seconds. This greatly extends shelf life for up to 1 year. BSU's Engr. Allan B. de Villa, Project Leader, said that the UHT mode of the pasteurizer was tested using cow's milk and was found to be compliant with the physico-chemical and microbiological standards.

However, depending on the intended use, coconut water and cow's milk can be processed with either one and sold commercially. Apart from the preservation and health benefits, PCIEERD Project Manager Fatima Jhoan Ibarreta said "the pasteurizer is also available for processing a wider range of products." She added that this dual-functionality is what gives the pasteurizer its competitive edge.

The 500-liter capacity pasteurizer is available for public use, particularly commercial investors, for research and development or pilot tests before the products become commercially available.

FURNITURE TESTING CENTER



In today's world of uncertain weather conditions, there is a scramble for sturdy, toxin free furniture that will survive harsh environmental conditions. This is where the National Furniture Testing Center (NFTC) comes in. The NFTC has been the only furniture testing laboratory in the Philippines since 2008, when both the Bureau of Product Standards (BPS) and Bureau Veritas furniture testing laboratories shut down their operations. The NFTC has since taken all requests for furniture testing from various local companies.

Understandably however, with the volume of the requests and the NFTC's limited capacities (performance tests for strength, durability, and stability) and the need for export companies to send upholstered furniture to Hong Kong and China for further tests at often astronomical costs and with long waiting times between results, the NFTC was upgraded into a "One-Stop-Shop National Furniture Testing Center". With this, clients have since included many furniture producers in Pampanga and Davao, exporters from Cebu, URATEX, the Department of Education, and famed furniture designer and manufacturer Kenneth Cobonpue.

New buildings, new equipment

To accomplish the upgrade, the project acquired new machines for lead content analysis, UV analysis, corrosion testing, weather fastness tests in surface finish tests, and flammability testing.

Laboratories and offices were renovated or newly constructed and equipped anew, including:

- Wood Machining Laboratory
- Finishing and Environmental Testing Laboratory
- Furniture Flammability Testing Laboratory
- X-ray Fluorescence Spectrometry Facility for Lead Content Determination of Paint and Other Similar Coating
- NFTC Main Office

The center started offering the complete array of tests in the first quarter of this year.

A Satellite Furniture Testing Center (SFTC) was also established in Cebu to accommodate requests coming from Visayas and Mindanao. Results of a survey done by DOST Region VII indicated a demand for structural tests and lead content analysis in the region.

The NFTC and SFTC also sought and gained accreditation, certification, and/or membership from the following organizations: the Philippine Accreditation Bureau (PAB), US packaging organization International Safe Transit Association (ISTA), and European standards and research organization Furniture Industry Research Association (FIRA).

"Without the accreditations, the furniture we test will be useless. Buyers look for accreditation from this organizations," said Project Manager GraceEstillore.

Investing in human skills

Due to the importance of the human factor in operating and calibrating the equipment and evaluating the results, staff at the NFTC and the SFTC also received upgrades in the form of a series of workshops, seminars, and competency trainings.

Some of the seminars attended were the FIRA's training course on Flammability Testing of Upholstered Furniture in the UK; the International Safe Transit Association (ISTA) Certified Packaging Laboratory Professional (CPLP) Program and the Fundamentals of Weathering training course conducted by ATLAS Material Testing Technology at Chicago, Illinois; the orientation program on the operation and maintenance of transit testing machines and application of TLP data acquisition system conducted by L.A.B. in Itasca, Illinois; and the, training course on "Radiation Safety Officers of Industrial X-Ray Facilities" conducted by the Philippine Association for Radiation Protection, Inc.

Meanwhile, SFTC staff conducted International bench marking/ lectures at FIRA-CMA testing facilities in Hong Kong. The NFTC's endeavor to become a One-Stop-Shop National Furniture Testing Center will spell easy and cheap access to furniture testing services for local export companies with regard to testing and delivering the samples. Apart from accurate and punctual test



results and the assured quality and safety of furniture products, this move on the FFTC's part will assist in sustaining the growth and global competitiveness of the furniture industry and establish and improve a network with local and foreign testing laboratories.

metals, wood and nuclear testing. In other words, you can drop off your samples for analysis in any of the regional DOST Laboratories and they will take care of it whether the analysis will be done in that particular laboratory or elsewhere.

OneLab is a scientific approach to ensure compliance to food

safety regulations and public health protection. Food safety assurance through laboratory testing encompasses not only the processed food products but the raw materials as well.

By connecting the laboratories, it is expected that greater collaboration on food safety testing and best practices shall be promoted.

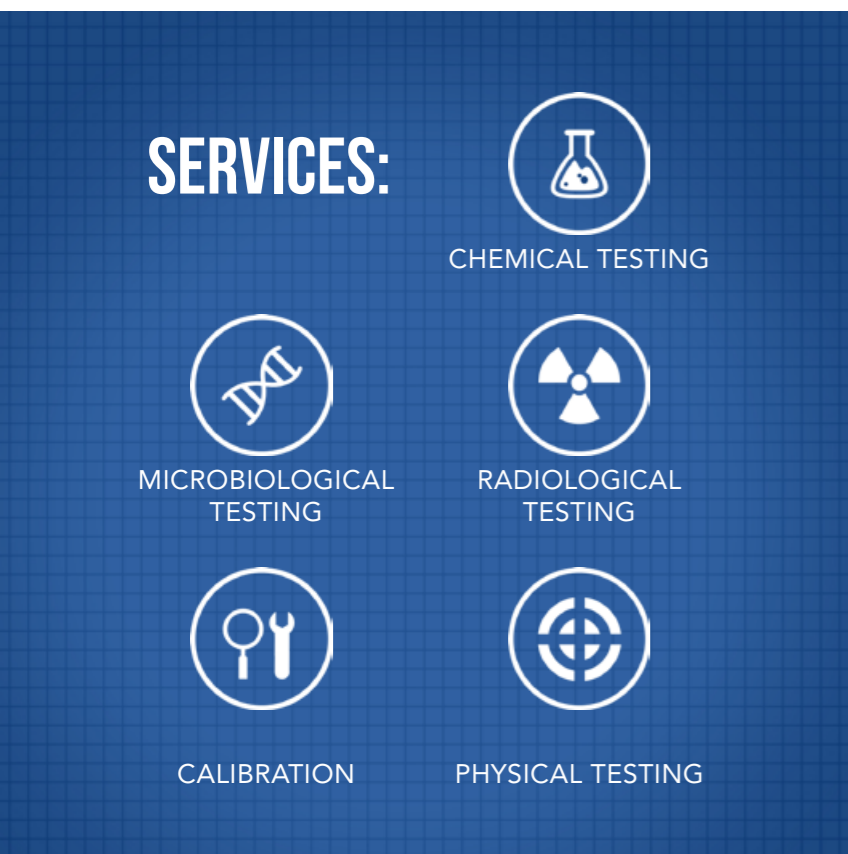
TECHNOLOGY BUSINESS INCUBATORS (TBIs)

A Technology Business Incubator (TBI) is a facility where start-ups are hosted and business development services are provided. Intended

for would-be technology entrepreneurs and start-ups, TBIs offer office space as well as technical services and facilities to get businesses established.



ONE LAB, A ONE-STOP TESTING LABORATORY



OneLab is an IT-based laboratory that broadens public access to testing services of all DOST, other government and private laboratories at a single touch point.

DOST 9 Director Brenda L. Nazareth-Manzano, also Project Leader said ONE LAB integrates all DOST laboratories and services from across the country on a single plant. This effectively allows the seamless handling of samples: from receiving, referral, transport, analysis to the prompt delivery of results.

Analyses included are those for water quality, food integrity and microbiological tests, calibration for weights and volumes, textile,

PCIEERD has established TBIs in key areas in Luzon, Visayas and Mindanao. Currently, there are four operating TBIs in DOST-PEZA Open TBI in Diliman, DOST-UP Enterprise Center for Technopreneurship in UP Diliman, DOST-UPLB TBI and Cebu Business Incubator for Information Technology or CeBuInIT in UP Cebu.

The project DOST-UP CEBU TBI at South Reclamation Project (SRP) that concluded early this year, is a satellite TBI of the UP Cebu TBI. An ongoing project, the Green Technology Business Incubator in West Visayas State University, is on its second year of implementation.

There are two newly approved TBI projects that will start establishment in 2016: the Center for Technopreneurship and Innovation in Batangas State University and in Mindanao State University – Iligan Institute of Technology.

Innovations for Change

This year, researchers and technopreneurs gathered to pitch their ideas in DOST Tech Push 2015: Innovations for Change, a PCIEERD activity in partnership with 1000 Angels as a segment of SlingshotMNL, the official start up event for APEC Philippines 2015.

Five DOST researchers delivered a 5-minute pitch of the technologies derived from their DOST-funded

research projects while four startup teams from DOST-assisted Technology Business Incubators, the UP Enterprise and CebuInIT, also pitched their technologies and current business platform.

Dr. CP David, Executive Director of PCIEERD; Dr. Federico Gonzales, Adjunct Faculty at the Asian Institute for Management, Mr. Daniel Hersson, Consultant at the Asian Development Bank; Ms. Maria Esther Santos, President of Smart PLDT Foundation; and Ms. Nicole Paterno, COO and Founder of 1000 Angels were the panellists for the pitch.

Dr. Giovanni Tapang, from the National Institute of Physics (NIP) in UP Diliman, was the first to present “VISSER”, a low-cost yet high impact hand-held device that can be used by teachers to aid them in teaching science. Dr. Maricor Soriano, also from UP Diliman NIP, on the other hand, presented “ARRAS”, a tear drop automated rapid reef assessment suite tool to more effectively monitor reefs. ARRAS is now being used by DENR and other non-government organizations.

Dr. Jocelyn Zarate from the University of the Philippines Los Banos (UPLB) introduced her technology called “Mykoplus”, a biofertilizer formula enriching the soil to indirectly improve the crops’ speed of growth through microbes. Meanwhile, Dr. Kristine Mae Magtubo from the National TeleHealth Center of the University of the Philippines Manila pitched in a telemedicine

device that can help improve healthcare in rural areas of the Philippines. She calls it the “RxBox”.



Inside the RxBox

Dr. Gil Nonato Santos from De La Salle University presented his “Nano-coat”, a cheaper liquid solution made of nano-materials that can be applied on glasses to protect people and even commercial products on display from heat and UV rays.

Start-Ups

Mr. Eight Quizon of aDEAS Inc introduced Edit.ed, a web application that automatically checks scientific, technical and medical manuscripts and recommends writing conventions and terminology preferences based on widely used publishing style. Ms. Charissa Anne de Jesus of Genni Hut, an incubatee of CebuInIT, pitched PayRuler, a complete Human Resource Information and System (HRIS) payroll system that deals with complex applications of human resource management.

Mr. Terence Elumba, President and CEO of Elumba.com presented PigeonMobi, a suite of social media marketing software armed with

advanced and easy-to-use online applications.

Mr. Juan Carlos Ayeng of Red Kamatis Virtual Studios, an incubatee of UP Enterprise, presented his start-up that creates education and tourism ecosystems, modularizes 3D content for app/ program customization, and performs other functions to change the way people learn, consume, and advertise with digital environments.



DOST Secretary Mario G. Montejo (center) listens to Dr. Kristine Magtubo (left) of the University of the Philippines National Telehealth Center as she explains the features of RxBox.



Environment

The Philippines is a treasure trove of natural resources. PCIEERD supported projects to ensure nature's yield is profitable and sustainable in all stages of the supply chain – from resourcing raw materials to production, from distribution to waste management.



was developed in the interest of replacing 30 to 50% of the chemical fertilizer requirement in plant groups such as high-value crops, fruit crops, ornamentals, and forest trees.

However, five to six months are needed to produce a single cycle of Mykovam, as the endomycorrhizal fungi must be cultivated on the roots of host plants. A large investment is also needed to produce the heavy and bulky inoculant in order to meet demand. Biofertilizers may be safe for humans and the environment, but the economic impact on the farming industry must also be considered.

Thus, the MykoPlus Biofertilizer project is a follow-up geared toward optimizing the bio-process and scaling up production.

"Initially, I was intending to have an improved version of Mykovam by adding a bacterial component," said Project Leader Dr. Joy Zarate. "But when we finished the product, it was composed of new mycorrhizal species, with the Latin word for fungi as 'myco', and we ended up adding not only one bacteria, but more microbes – hence the 'plus'. So, the product is mycorrhiza, plus more."

"Basically, we developed it as a biofertilizer to coat seeds and planting materials such as tubers, cuttings, and others," she added.

First of its kind in PHL

The enriched mycorrhizal inoculant MykoPlus is the first of its kind in the country. Many microbial products consist only of pure mycorrhizal fungi or bacterial isolates; MykoPlus contains both the mentioned microbes in a stable packaging form. This combines the bacteria's nitrogen fixation properties with the aforementioned benefits of mycorrhizae, allowing even better crop health and yield. Also, as mycorrhizal fungi are not host-specific, MykoPlus can be used for a wider range of crops as opposed to using only bacteria or mycorrhizal biofertilizers.

On the viability of MykoPlus, Zarate noted: "MykoPlus has been tried in the PCIEERD project on cassava, banana, papaya, lettuce, corn, and eggplant. In the PCAARRD (Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development) project, we used it on corn, eggplant, rice, calabasa, sorghum, sampaguita, guava, and others."

Scaling up this potent biofertilizer entailed using pilot plant facilities to improve MykoPlus' shake flasks culture production system- a suspension storage/production system for cell culture. Beginning November 2015, the product carrier will be prepared with the oven dryers, hammer mill,

MYKOPLUS BIOFERTILIZER

"Eat organic," we would often hear, understanding it as eating fruits and veggies. Experts would interpret this as eating vegetables that aren't chock full of chemical fertilizers. Other than this health issue, chemical fertilizers also pollute the soil and rivers where they spread and slowly destroy ecosystems. And thus, biofertilizers were invented. Biofertilizers make use of live microorganisms that affect the soil, unlike chemical

fertilizers that seep into both the plant and the earth. It is all natural, which means guilt-free crop boosts for all.

In the local setting, the most popular biofertilizer is Mykovam, a type of biofertilizer that makes use of infective endomycorrhizal fungi to help roots better absorb water and nutrients such as phosphorus, prevent root infection by pathogens, and increases drought and heavy-metal tolerance. It



blender, and autoclave. The 2.6- and 30-liter fermenters will be used to mass produce a microbial biomass with optimized pH, temperature, and anti-foaming properties. The centrifuge shall recover cells prior to incorporation into the prepared carrier.

Meanwhile, studies as to the development of packaging design and product labels are being undertaken. Ecological studies are also needed in determining the effect of the bacteria-and-mycorrhizae inoculum on the crops and to detect possible residual effects on succeeding crops.

The product will be registered with the Fertilizer and Pesticide Authority (FPA). Prior to this, establishment of field efficacy trials on various crops will be needed.

An array of uses

While the project aims to collaborate with private industries in testing MykoPlus for various crop production systems, MykoPlus will be of most use to foresters, nursery men, farmers, plantation crop managers, and other crop enthusiasts. Does MykoPlus have other uses? Zarate said, "We don't have complete data, but the farmer users are trying many other uses, namely as 1) an amendment to compost to make it richer, 2) one farmer used it to decompose his

agricultural wastes in the absence of Trichoderma inoculant, 3) one farmer used as a solution to induce flowering in mango. According to the agriculture technician, it was a success—hence, we are replicating the trial on mango fruiting."

Success seems to characterize the overall trials and experiments regarding MykoPlus. For example, Zarate explained, "Last year, MykoPlus was used as one of the components in the Department of Agriculture (DA)-funded project of Dr. Blesilda Calub, where she helped us disseminate it for trial in relation to organic agriculture to 21 state universities all over the country. MykoPlus was used for two trials, where until now there are some established field set ups. They continue to ask for further samples for set up."

Here follows a list of organizations, associations, municipalities, schools, and other groups that have so far ordered MykoPlus samples:

- Pangasinan LGUs of Manaoag, Mangaldan, Urdaneta, and Bani; for farmers using it on various crops
- Agricultural Training Institute of Sta. Barbara, Pangasinan; for trainees who are DA technicians from Region I
- Farmers attending the 2014 and 2015 National Conference of the Fulbright Philippine Agriculture Alumni Association
- Farmer cooperatives in Zambales (vegetable

- cooperative)
- Farmers and technicians in La Trinidad Benguet
- DA Research group from Tagum, Davao del Norte; for testing in Fusarium wilt-infested field
- The UPLB Pahinungod team; for testing in different regions
- Former farmer cooperators in Tuguegarao, Cagayan
- Students of Horticulture, Plant Path, and Soil Science
- The group of Dr. Rodel Maghirang; for seed production in the UPLB PAMANA project
- UPLB horticulture group
- UPLB edible landscaping program

- Bureau of Plant Industry in Los Baños; used on shallots
- Leyte farmers affected by typhoon Yolanda

Free in exchange for data

For all its extensive usage across many groups, MykoPlus is still not commercially available. The MykoPlus project team provides the product for free in exchange for data from farmers on the effects of the product.





ECO-SEP AND CERAMIC WATER FILTER

Natural calamities are now being touted as the new normal. As such, there is a pressing need for disaster relief management know-how, as well as for the related equipment in addressing health, shelter, food, and sanitation needs in calamity-stricken areas.

Sanitation, in particular, is key in helping the affected stakeholders because unsanitary conditions can undo any progress or recovery. This applies especially to the sewage systems serving the communities, which are expensive to maintain and are plagued by wastewater problems. This is where Eco-Sep and the ceramic water filter come in.

Eco-Sep, or the Eco-Friendly Septic System, is a self-sustaining, low-cost, and portable/movable wastewater treatment system that cleans up domestic wastewater. Meanwhile, the ceramic water filter is a portable device used in producing potable water for household use.

Ceramic water filter

Each year, nearly 6,000 premature deaths in the Philippines are caused by water-borne diseases, according to the Philippine Institute for Development Studies. This is due, in part, to 432 municipalities or 1.5 million households beyond Metro Manila having no access to safe drinking water, according to the Department of Interior and Local Government in statistics dated 2010.

In a nation with severe water pollution problems, these affected families may be able to get their potable drinking water if their houses were outfitted with ceramic water filters. These ceramic filters are examples of the micro-filtration technique, which has been proven to take out contaminants in tap and ground water.

The filters are coated with a nano-antimicrobial agent and made from red clay—an abundant resource in Ilocos Sur, Isabela, Aurora, Tarlac, Camarines Sur, Sorsogon, Aklan, Leyte, Cagayan de Oro, and South Cotabato.



The members of a household can simply lodge it in a plastic container provided with a faucet at the bottom for collecting the filtered water. They are available at the capacities of 1.5L and 6.0L.

The filter can purify tap water, deep well water, and raw water from springs. These have been distributed to National Housing Authority (NHA) households in Muntinlupa and Cagayan de Oro. These communities reported that the water can be used for cooking, saves the household's money, and tastes delicious.

There are plans for three water filter centers in the regions. Two in Luzon, specifically in Mt. Province and in Isabela, has helped inject new life into the latter's ceramics industry. These centers are already producing ceramic filter units. Their target for December 2015 is 20,000 units.

Eco-Sep

"The project arose from a consortium among Manila university belt schools on the stewardship and management of estero (estuary) projects. It was Adamson University that came up with organominerals," said PCIEERD Project Manager Dr. Ruby Raterta. "The project would not have become this big *kung wala yung mga initial initiatives*."

These organominerals enhance the digestion of organic load

via biostimulation by providing the necessary oxygen that helps natural microorganisms multiply. These microorganisms help convert the organic pollutants into carbon dioxide and other non-harmful substances. About 70 to 90% of the sewage's suspended solids are removed via liquefaction and sedimentation. These form scum and sludge, which are then processed by anaerobic bacteria. One simply adds these organominerals into an installed septic system, the tank for which is manufactured by INCA Plastic, by flushing the mineral-water mixture into the water closet. The first dose requires about 700g of organomineral per person. This dose is then lowered to 200g per person every 21 to 30 days to maintain the water's quality. The treated water can then be drained into the soil.

The first effect the organominerals have is on odor, which dissipates





in a matter of hours. It was tested in the sewage systems of the bunkers of Yolanda survivors in Tacloban.

"In the project located in Tacloban, Leyte, the capacity of the movable/portable septic tank is 2,500L and can accommodate up to 100 persons with a total cost of Php 66,200," said Raterta. "While the Organomineral is 0.5 kg/month-person-cubic meter."

Another Eco-Sep major trial run took place during the 2015 Asia-Pacific Economic Cooperation Summit in Boracay.

According to Raterta, "Former PCIEERD Executive Director Dr. Rowena Guevara prioritized checking Boracay hotels.

As a result, there is also now an ordinance which requires hotels to use the Eco-Sep. Eco-Sep was also tested on a Materials Recovery Facility in Boracay. There are reports that the people contracted various skin diseases due to the spraying of a certain chemical to ward off the odor. The project team now receives regular orders of the organomineral.

"We are currently readying organomineral production," said Raterta. "Many hotels and villages have inquired, wishing to adopt Eco-Sep."

The next project is targeted toward beach resorts in tourist destinations like Siargao, as the hotels and restaurants there have no sewage treatment systems. There have already

been requests from LGUs of Surigao, CARAGA, Region 2 and other areas in the country.

With the growing number of tourists who visit our country to take a dip in its clear bodies of water, experience nature and its wildlife, and witness its promise of beauty and candor of its people, maintaining the environment and its sanitation becomes a challenge and a pressing issue to local and national government. Fortunately, Eco-Sep or the Eco-Friendly Septic System, a technology developed by Project Leader Dr. Merlinda A. Palencia of Adamson University, presents a solution to this environmental concern.

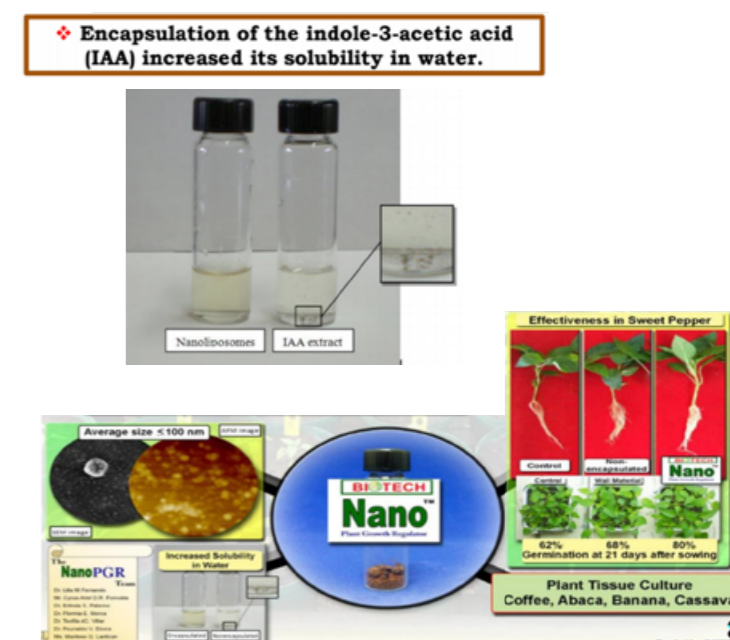
Eco-Sep's Vigormin, a mixture of organo minerals, is also proven to be effective in neutralizing strong wastewater or septic odor. The solution can also neutralize strong, decomposing or rotten odor from organic waste in landfill or material recovery facilities. The successful validation of the Eco-sep during the APEC Conference in Boracay where the organo minerals were applied to treat wastewater from septic systems in hotels, resorts and material recovery facilities called for a viable supply of these organo minerals.

Realizing a potentially strong market for such, PCIEERD is helping Dr. Palencia upscale the production of her Vigormin through a spin-off project. The project involves setting up the facility that can produce four metric tons of Vigormin per day, trial production and sample testing

and treatment validation. Market study and aggressive promotion of the product will also be done through this project.

NANO PLANT GROWTH REGULATOR

The use of microorganisms as mini factory for plant growth regulators leads to enormous contributions in attaining a low input but sustainable agriculture. Their wide use opens up new avenues of approach to botanical problems which have economic importance in horticulture and in the reduction of environmentally damaging preparation of synthetic plant hormones. Plant growth regulators derived from plant growth-promoting bacteria isolated from Philippine soil were nanoformulated for improved uptake by plants. These plant growth regulators include auxins, cytokinins and gibberellins. According to Project Leader Dr. Lilia Fernando of BIOTECH, the nanoformulated plant growth regulators have been tested in various crops including sweet pepper, cassava, coffee, banana and selected ornamentals.



Benefits:

- Enhance germination and rooting of plants
- Controlled and enhance delivery for stressed environments
- Increased solubility in water
- Higher thermal stability
- Cheaper (lower effective concentration required)
- Environment friendly



Renewable Energy

Solar, wind, and hydro energy are the first things that come to mind when we hear “renewable energy.” Though we already have these mechanisms for sustainable energy production, they are not enough. We still have to explore other options and keep refining our technologies to reduce our environmental impact and sustain our growing energy demands.

TIDAL CURRENT ENERGY INTEGRATED RESOURCE ASSESSMENT AND SPATIAL PLANNING TOOL

The Philippines’ search for alternative methods of producing energy is in the midst of climate change, increasing oil prices, high fuel dependence on foreign countries, and increasing local electricity consumption. President Benigno Aquino III affirmed the growing need for new sources of electricity in his 2015 State of the Nation

Address. The European Chamber of Commerce of the Philippines (ECCP) also believes that addressing energy security will go a long way toward improving the standard of living of millions of Filipinos and the country’s overall economic competitiveness.

Well, we need not look further. In 2006, the Department of



Energy (DOE), with the help of Mindanao State University – Iligan Institute for Technology (MSU-IIT) identified potential sites for Ocean Renewable Energy (ORE) extraction in the country, as well as a potential theoretical capacity of 170 GW. It is also worth noting that the Philippine Energy Plan for reducing carbon emissions and ensuring energy security aims to have 71 MW ocean renewable energy-based installed capacity for power generation by 2030.

Tidal energy vs. ocean current

PCIEERD Project Manager Patrick E. Montero noted that tidal current energy is a form of ocean energy. Tidal currents are closer to the shore, whereas ocean currents are found farther out in the waters. While ocean currents definitely yield more energy, ocean thermal equipment is expensive. Therefore, starting with harnessing tidal current energies is a smaller but equally sure step in bolstering the nation’s energy security.

Tidal currents are influenced by the gravitational pull of the sun and moon. This means that the movements can be predicted centuries in advance.

The tidal current project aims to produce maps such as tidal current development site suitability maps, and tidal current resource maps. The project will also develop a Tidal Current Energy Integrated Resource Assessment and Spatial Planning

Tool, a web-GIS-based marine spatial planning tool.

The produced maps will be able to tell which energy-saving devices should be used, as well as their power capacities. Locations for new developments and marine and energy resources can also be assessed.

Project Leader Prof. Ma. Rosario O. Ang of the Dept. of Geodetic Engineering - UPD said that areas that have so far been surveyed include Corregidor, Palawan, and Eastern Visayas. Montero said that Mindanao will be next in line, as per modeling sample site.

Research and design-focused

A GIS database contains data that assesses the available resources and determines areas that satisfy the requirements of an ocean power conversion scheme. To centralize local ocean renewable energy development, the database must contain:

- On-site measurements for calibrating and validating numerical models used in calculating current and power density distribution
- Fishing activities
- Port proximity
- Distance from electricity sub stations
- Special areas of conservation habitat classifications
- Shipping use

The website is currently still in development and will go online by April 2016.



NANOSTRUCTURED ELECTROCATALYST COMPOSITES FOR DIRECT FUEL CELL: PREPARATION, CHARACTERIZATION AND PERFORMANCE EVALUATION

With the sources of non-renewable energy steadily depleting, the search for renewable energy sources and the innovation of methods to cheaply and efficiently harness these sources have become even more important undertakings. The discovery of ethanol, a renewable fuel derived from fermenting biomass made from sugarcane and other plant materials, as a safe substitute for toxic methanol in fuel cells has borne numerous studies and applications such as Direct Ethanol Fuel Cells (DEFCs).

But while DEFCs are safe, is it financially practical?

No worries. The brilliant minds from the Research Center for the Natural and Applied Sciences of the University of Sto. Tomas (UST) are working together to find an answer to this question. Project Leader Dr. Bernard John V. Tongol assembled a team of 6 graduates and begun their research on DEFCs just last November 2014.

Anatomy of a Fuel Cell

Like batteries, fuel cells are composed of three main components: a cathode (+), anode (-), and an electrolyte where the electrons pass through. But unlike batteries where storage and conversion happen at the same compartment, these two processes happen in different compartments of a fuel cell.

The DEFC gets its name from the direct feeding of ethanol into the fuel cell. DEFCs then make use of anodes made from platinum-carbon (PtC) and palladium-carbon (PdC) composites to aid in the electrocatalysis—the conversion of fuel energy into electricity—of ethanol. However, these composites are traditionally expensive and consequentially unsustainable, therefore requiring alternative materials to boost efficiency and reduce costs—and make things easier for Mother Nature.

Dr. Tongol's team researched on using platinum-tin (PtSn) and palladium-nickel (PdNi) composites. These will be dispersed on graphene oxides and/or poly(3,4-ethylenedioxythiophene) (PEDOT) support matrices. These alternative combinations will be tested for their capacity to electrocatalyze ethanol to see if they could make fuel cell technology more sustainable.

So far, they have accomplished the following:

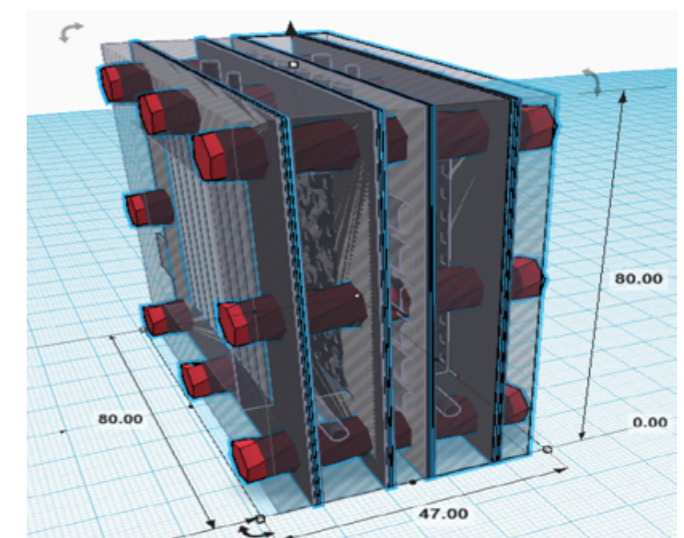
- Created PtSn and PdNi catalysts and tested them as graphene oxide/PEDOT-supported anode catalyst composites
- Compared studied catalysts to commercially available catalysts
- Optimized synthesis parameters to create catalysts
- Produced anode catalyst layers for the fuel cells, Membrane Electrode Assembly (MEA), as well as estimated MEA costs
- Designed fuel cell stacks and DEFC enclosure for an emergency LED lamp

The fuel cell design and core components are nearly complete with only a few refinement trials needed to ensure functionality and quality. A template for mass production of these parts has already been designed as well.

Fueling the Future

Fuel cell application is still very limited in the Philippines as we do not have much technology that makes use of these energy sources. Ethanol fuel application here is mostly limited to gasoline blends, where ethanol is mixed into gasoline in varying portions (usually 5 to 15%), but we have yet to develop exclusively fuel cell-powered cars.

Another concern is that research is often more focused on hydrogen fuel cells, leaving ethanol fuel cell technology lagging behind. For this specific research team, the end goal is to create an efficient, cost-effective DEFC-powered emergency LED lamp prototype. The success of this line of research will see this innovation not just on the road and in gas stops, but also on the shelves of our favorite hardware stores. Continued research may unveil more areas for DEFC application and pave the way for more sustainable energy sources.





WIND RESOURCE ASSESSMENT

Another initiative to support the Philippine government efforts to promote the utilization of renewable energy resources in the country is the wind resource assessment conducted by the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA).

The Philippines has vast potential for wind energy development. Preliminary assessments based on the wind energy atlas indicate a possible commercial potential of 70,000 MW-installed capacity, with the Northern Luzon having the most attractive wind regime.

PAGASA measured the wind regime in four (4) sites, namely, Lanuza, Surigao del Sur; Sta. Monica Siargao, Surigao del Norte; General Santos City; and San Vicente, Palawan. Project Leader Anthony Joseph R. Lucero of PAGASA said each of these sites is equipped with wind sensors and data loggers mounted on towers and measured wind speed and direction for a year. The data that will be obtained will determine the wind energy potential of the project sites and provide input in determining the best specification of wind

energy conversion systems to be installed. With many potential benefits of wind resource, its long-term development and utilization is foreseen to make a significant contribution to the country's energy requirement.

PCIEERD played a key role in paving the way for the commercialization of wind energy in the country by supporting projects in the 1990s such as the Philippine Wind Mapping Atlas and the demonstration of a 10 kW Wind Turbine Generator in Pagudpud, Ilocos Norte.



MICROHYDRO TEST FACILITY

Micro-Hydropower (MHP) technology is a proven technology, relying on non-polluting, renewable and indigenous source and is one of the best choices in renewable energy options for small scale decentralized applications.

However, the lack of performance data on local as well as imported turbines results to low confidence in the technology. Sometimes problems arise on the suitability of the design to local conditions and this is due mainly to the absence of a turbine testing facility in the country.

This drawback is addressed in the current project led by Mr. German L. Peñaranda of the University of Rizal System to establish a common service facility for the development, testing and optimization of locally developed turbine components of a micro hydro system. The facility will serve as a testing center for imported MHP turbines to determine its output against manufacturer's specifications, and help in retrofitting and repair of existing installed MHP units. The facility will also be used in the development of high-efficiency turbines as well as improve the capability of local fabricators in the design, fabrication and installation of MHP systems.

“The facility will also be used in the development of high-efficiency turbines as well as improve the capability of local fabricators in the design.”





Responsible Mining

Under Executive Order 79, PCIEERD sought to reduce the negative effects of mining on our environment. Small-scale mining, in particular, needs intervention. Its negative environmental impact is significant yet its output is meager. Our country is rich in mineral resources—and PCIEERD intends to safeguard and maximize that potential.



GOLD AND COPPER PILOT TESTING

When small-scale miners process ores, you can be sure that the percentages of the yields will vary as it is difficult to oversee a large number of simultaneous small-scale operations. And the environmental impact of these haphazard operations is not exactly small-scale because the methods used to extract these ores involve chemicals like mercury and cyanide, which are highly toxic to organisms and could seep into the soil if not handled carefully. Add that to the fact that these operations are often done near rivers which results to water pollution.

In order to address these socio-economic and environmental concerns, the Gold and Copper Pilot Plant was established in Benguet—the first of its kind in the Philippines according to Project Leader Dr. Herman D. Mendoza of UPD's Dept. of Mining, Metallurgical and Materials Engineering (DMMME). Its groundbreaking and blessing took place on 27 February 2015.

"We applied engineering principles. The technology isn't really new," said Project Manager Ruby Raterta. "All of the players were present during the inauguration—LGUs, PCIEERD,

small-scale miners, the project team, representatives from the communities and private companies. In small scale mining, there are problems miners think do not have solutions to. With the establishment of the plant, miners will know that DOST does something to address these problems."

She added, "*Sa small-scale mining, ang daming problema, walang solusyon. With the inauguration of the plant, makikita ng mga small-scale miners at ng community na meron palang ginagawa ang DOST for this.*"

Other beneficiaries include associations or federation of small-scale mining and other government institutions like the DENR, MGB, and others.

High-yielding, homegrown

At the inauguration last October 2015, DOST Secretary Mario G. Montejo said that the event of the Gold and Copper Pilot Plant's establishment means three important things:

- The numbers are good. Using traditional chemical methods, gold recovery is only at 40 to 45%; however, the new gold-



copper mineral processing plant can recover a yield of 90 to 95%.

- The technology is homegrown. This means that the plant will use locally fabricated equipment. The University of the Philippines Diliman developed the environment-friendly technology that does not in any way use mercury or cyanide.
- The plant is the result of successful collaboration between different sectors. The plant is proof and monument to the collaboration between the government, the academe, and the private sector.

Dr. Raterta also said that the plant's purposes are twofold. "First is to show that gold can be processed without using harmful chemicals such as mercury and cyanide. Second is to show that we can help the small-scale miners with their problems on water pollution."

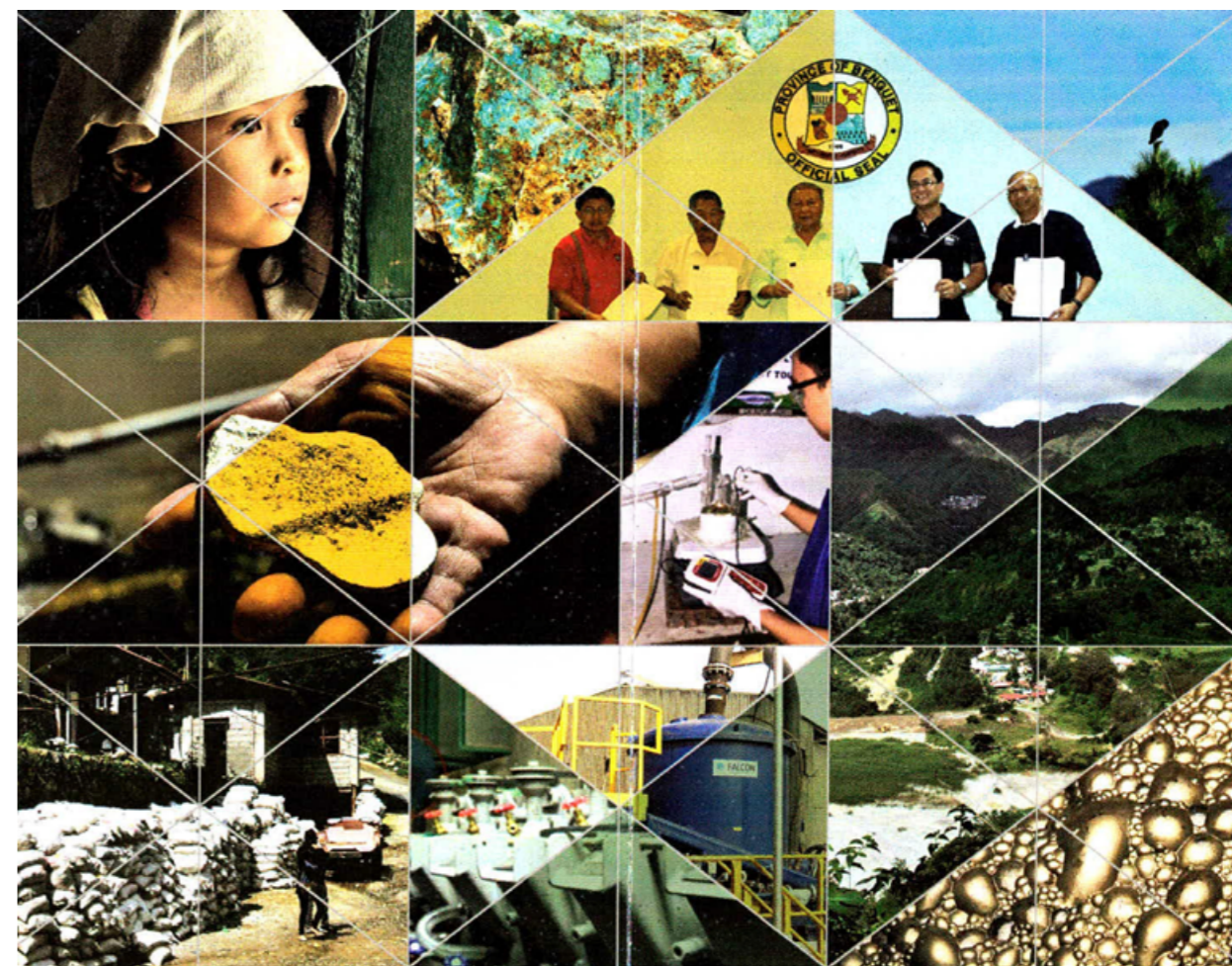
The project which promotes the use of eco-friendly chemicals, was one of the seven projects under the BETTERMINE Program of the UP Diliman Department of Mining, Metallurgical, and Materials Engineering in 2009 to 2010. DOST Secretary Montejo saw the potential and expanded it. It is part of the DOST's Water Road Map.

The plant's proponents hope to promote an environment-friendly and high-yielding alternative process of extracting gold and copper from ore using flotation/gravity concentration technologies. It will also address the technological limitations of small scale-mining via the appropriate technological applications. These applications will allow even small-scale operations to conduct recovery activities while minimizing health risks and environmental problems.

Dr. Raterta added, "The project has benefits to many aspects—one of them is socio-economic. The project will be able to give the Bangko Sentral data on the gold sold by these small-scale miners in the black market, which usually cannot be monitored. With this, we will be able to tell the type of gold and the real prices."

"Anti-poverty din yung project na ito kasi kung nakikita mo yung mga small-scale miners, kinikita nila ay para sa pagkain nila," she added, referring to how the plant will help refine mining processes and allow small-scale miners to extract more substantial amounts of minerals.

She also stated that the plant will treat mine tailings by using coco peat, which has been evaluated to have high potential in removing heavy metals from wastewater streams.



Perseverance despite delays, high anticipation

The plant was inaugurated despite delays in the construction, getting the commitment of the people around the area, and legal aspects. While Typhoon Lando wrecked the area where the plant is located, the project still continues, which highlights the commitment and efficiency of the project team.

The Benguet plant is expected to start processing in February 2016. There are other on-going projects

that conducted groundbreaking and inauguration as well as initial preparation made in Caraga, Bicol, and Compostella Valley.

Dr. Raterta said, "All of them [the provinces] are looking forward to the completion of this much-awaited project because there is a need to have a technology that will solve some of the problems of the provinces on water pollution and small-scale mining-related problems mostly related to the environment."



MSU-IIT GOLD RECOVERY EQUIPMENT

Executive Order 79, signed on July 6, 2012, was written to strictly prohibit mercury in small-scale mining. But is there really a mercury-free alternative that will be just as efficient? And will it not have other side effects that can be just as harmful?

The Mindanao State University – Iligan Institute of Technology (MSU-IIT) also responded and developed a process that uses a concentrating table and smelting to recover gold.

Transforming ore into gold

According to Project Leader Prof. Ephraim E. Ibarra, in the MSU-IIT method, the concentrating table separates the gold from its ore using gravity. The gold sinks being heavier than the other materials, which water then washes away. This method speeds up the process, increases the gold recovery and poses no threat to either humans or the environment.

Once this machine is fully tested and mass produced, small-scale mining of gold will be both environmentally and economically valuable



RESPONSIBLE MINING IN MINDANAO PROGRAM

When asked which regions in the Philippines are hotbeds for mining activities, Program Managers Katrina Landicho and Jonas Karl Liwanag replied, “Ay, marami! Depende kung ano ang hinahanap ninyo.”

Mineral-rich Mindanao’s yield—particularly the Caraga Region, Sultan Kudarat, South Cotabato, and Cagayan de Oro—includes gold, copper, iron, nickel, chrome, and limestone. However, unregulated mining utilizing mercury and cyanide, especially among small-scale miners, will lead to the eventual exhaustion of these resources and the deterioration of the health of both the miners and the dwellers of surrounding communities.

To address this problem and its many aspects, the Responsible Mining in Mindanao Program was launched.

“When we say mining, people have a negative impression. We want to show that responsible mining is possible in order to change people’s mindset,” said Liwanag.

Science and responsibility

As an offshoot of the Innovation Clusters initiated by the Committee on Science, Technology and Engineering (COMSTE), the three-year (2012-2015) Responsible Mining in Mindanao Program in answer to the Philippine Senate’s identifying Responsible Mining as an area of concentration.

Program Leader Dr. Rowena P. Varela of Caraga State University said that as an S&T-based program, its aims and goals are to discover and verify scientific information, fabricate technologies, and formulate appropriate policies geared toward influencing local decision-makers to support ecologically sound, environmentally friendly, and socially acceptable mining in Mindanao.





“When you say mining, people have a negative impression. We want to show that responsible mining is possible in order to change people’s mindsets.”

The program consists of eight projects:

- Project 1: Assessment of Terrestrial Biodiversity in the Selected Key Mining Areas of Mindanao
- Project 2: Assessment of Aquatic Biodiversity in Selected Mining Environs in Mindanao
- Project 3: Monitoring, Assessment and Profiling of Artisanal Small Scale Gold Mining (MAP- ASGM) Towards Sustainable Livelihood Through Science Based Intervention in Key Areas in Mindanao
- Project 4: Contamination Pathway and Pollution

Management of Artisanal and Small-scale Gold Mining (ASGM) in selected areas in Mindanao

- Project 5: Rehabilitation of Nickel Mining Areas in Surigao Provinces Towards Ecorestoration
- Project 6: Alternative Technology for Processing of Chromite and Laterite Ores: Crude Fe-Ni Cr Alloy Production
- Project 7: Development of an Alternative Technologies for Small-Scale Gold Mining in CARAGA and South Cotabato Region
- Project 8: ICT for Responsible Mining: Use of GIS, DSS, Datamining in Selected Areas in Mindanao

The goal of the first four (4) projects is policy recommendation. The fifth intends to come up with a manual for large scale nickel mining companies in the rehabilitation of their mined out area. The sixth will develop and introduce ecologically-friendly technology for small scale gold mining, the seventh aims to produce alloy for stainless steel and the eight will be focused on overall data compilation.

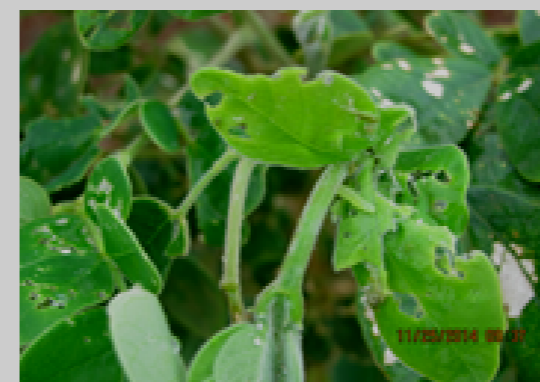
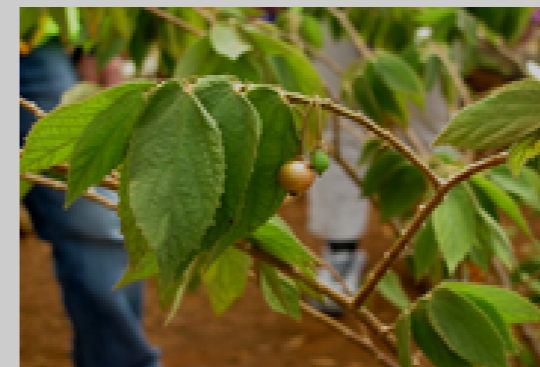
Public response

The output of the program was presented at the Mining Stakeholders Forum held in October 2014 in Manila and in Butuan City in July 2015.

“So far, the response of the stakeholders has been okay,” said Landicho. “even the rehabilitation technology and gold and alloy.” “Mining companies were hesitant to be a part of the study because they were afraid of tarnishing their image,” said Liwanag. “When they saw that the program was promoting good image to mining companies last July, they became more willing. We are hoping

that even funding runs out, the company itself will continue to fund the rehab technology”.

As for the program’s next step, Landicho explained that, “For projects with policy recommendation as output, these will be elevated to the LGUs first. For example, if a certain species of bird is scarce in this area, we will inform the concerned LGU and recommend implementation of the policies. However, for the gold extraction technology, a common service facility (CSF) is planned to be built in Iligan City for the small-scale miners.”



Plants now growing in the established Ecobelt at Taganito Mining Corporation (TMC) with herbivores (below) and with flowers and fruits (above) indicating the potential for ecological succession



MinERS PROGRAM

Begun in October 2013 and set to end in September 2016, the Mineral Extraction with Responsibility for Sustainability or MinERS Program work for the sustainable growth and development of the small-scale mining industry. A direct result of Executive Order 79, which ordered the improvement of the small-scale mining industry and prohibited mercury utilization in mining, the program's proponents seek to promote better mine practices and technologies among industry players.

"This program teaches miners to be more responsible, because small-scale miners go mostly unregulated," said Project Manager Katrina Landicho.

She elaborated, "Small-scale miners use mercury in gold extraction. Kung mercury ang ginagamit, negative ang impact sa health ng workers and environment. It gets into the soil for vegetables and rice, and can also flow into the water. Agri-fishery is also affected, as gold panning causes river siltation. Para mapigil ang mga ito, Miner Program ang naimungkahi para ma-conserve ang environment."

As an industry-developing program, MinERS' goal is to develop a production line that can process ore to gold, with an integrated wastewater treatment using cocopeat and nano-fiber. According to Program Leader Dr. Leslie Joy L. Diaz of UPD-DMMME, the MinERS Program is currently conducting further processing of gold concentrate to produce gold bullions and engaging in waste water treatment. Once successfully completed, the production line will be integrated with the gold



and copper pilot plant facility which is currently being deployed in four (4) regions.

The five projects under the MinERS Program are:

MinERS Project A: Non-Hazardous Methods of Gold Extraction for Philippine Small-Scale Mining Applications

- » **Why?** To determine the feasibility of applying mercury and cyanide-less methods of extracting gold for small-scale mining.
- » **How?** Leaching the gold concentrate using hypochlorite and precipitation
- » **What happened?** Currently, parameters for the leaching and stage precipitation for ores from Benguet, Bicol, CARAGA and Compostela Valley are being optimized.



MinERS Project B: Modeling of Fate and Transport of Heavy Metals in Surface Waters from Source at Mining Site to Downstream Receiving Waters

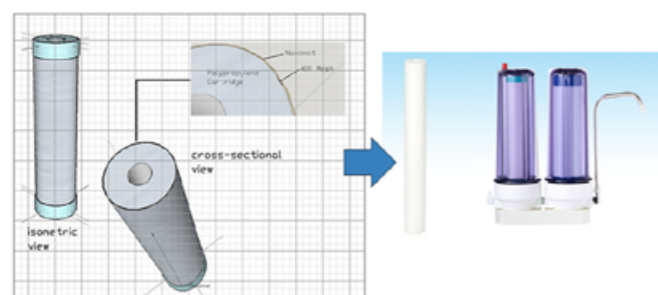
- » **Why?** To assess the human health hazards posed by tailings and wastewater discharges from mining activities.
- » **How?** By developing a transport model that can determine the expected concentration of heavy metals along any location reached by the surface water. Mercury, lead, and arsenic were considered for the study.
- » **What happened?** The Bued and Agno Rivers have been characterized with the help of the Water Quality Simulation Program (WASP). The contaminant transport model was developed through the Hydrologic Modeling System (HEC-HMS).





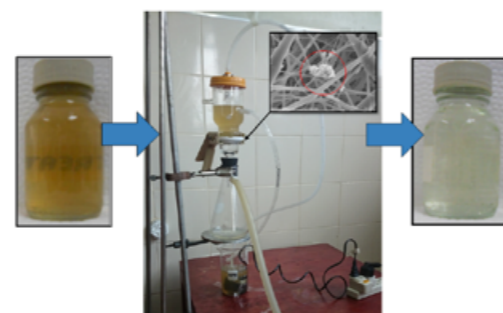
MinERS Project C: Optimizing the Effectivity of Coco Peat Filter Bed in Field Applications

- » **Why?** To evaluate and optimize the effectiveness of coco peat filter bed for wastewater treatment.
- » **How?** By monitoring parameters such as physicochemical and heavy metal concentration.
- » **What happened?** A coco peat filter bed system has been installed inside the new Environmental Engineering Complex in UP Diliman. The reactor is currently treating the mine wastewater gathered from Paracale, Camarines Norte. Parameters are being monitored to index its performance.



MinERS Project E: Nanofiber Membrane Adsorption for Third Level Waste Water Treatment Method for Small Scale Mining Operations

- » **Why?** To enable miners to abide by the environmental protection laws and guidelines as found in Section 2 of Executive Order 79.
- » **How?** By designing an integrated wastewater treatment system using nanofiber membrane as a third level treatment facility.
- » **What happened?** The system is being tested on actual waste water from Kias, Benguet, and Paracale, Camarines Norte. The coco peat filter bed will be integrated to the nanofiber membrane. Hence, coordination meetings with the team behind Project C resulted in the optimization and planned installation of the Integrated Wastewater Treatment System at a small-scale facility in Kias, Benguet.



MinERS Project G: The Gold and Copper Chase: Life Cycle Analysis of Sustainable Small Scale Production System

- » **Why?** To develop practical systems for the sustainable mining and extraction of gold and copper.
- » **How?** By investigating methods which will refine the recovery of copper and gold while minimizing wasted minerals.
- » **What happened?** Briefing surveys and coordination meetings have occurred in selected sites in Abra, Compostela Valley and Davao Oriental. Gold extraction and recovery processes at two mining sites in Abra have also been documented. Residents living within the Abra mine site have been surveyed. Samples from Maragusan were taken to analyze the presence of gold and copper.



“ This program teaches miners to be more responsible, because small-scale miners go mostly unregulated. ”



BLACK SAND CHARACTERIZATION

Black sand mining has proliferated in Leyte; Albay, Bicol; Surigao; Pangasinan; Zambales; and the Cagayan River—and yet no one is aware of the kinds of materials this sand contains and how valuable these are that they are being taken from the country.

“Our black sand is usually taken by foreign entities. Their target is iron magnetite”, said Project Manager Katrina Landicho. “We are studying it to know its value and perhaps utilize it in the country.”

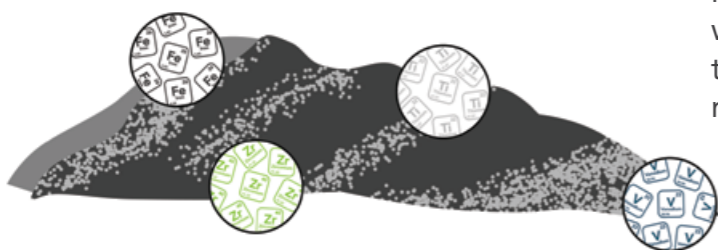
The DOST and the Department of Trade and Industry - Board of Investments (DTI-BOI) are targeting value-adding of metallic minerals. We only export the ores but we do not process it. By characterizing black sand, its iron magnetite content will be determined. This could possibly be used as raw material to produce iron steel.

Program Manager, Jonas Karl Liwanag explained, “We sell black sand as raw material. Unlike gold, it is processed and sold as bullion. As of now, we do not know what valuable metals are present and is sold at its least value.”

Complete mineralogical and elemental characterization of black sand occurring in six sites across the Philippines—beginning with Zambales in October 2015—entails the following:

- Quantifying amounts of iron in black sand deposits
- Quantifying amounts of vanadium, titanium, and zirconium and other valuable trace elements
- Determining mineralogical residence of titanium, vanadium, and other trace elements
- Ascertaining prospective economic values of major and trace elements

Program Leader Dr. Carlos A. Arcilla of UP-NIGS said this might be another breakthrough in mineral research. The project will end in July 2016 and the team expects to publish scientific reports on their findings.



CHEMICAL SENSORS FOR MINE SITE MONITORING PROGRAM

The Philippines is considered a mega-biodiversity center in the world. In terms of mineral resources, the country ranks 5th in the world for its gold and copper reserves with approximately 9 million hectares of land with mineral potential. As of 2005, approximately Php 366 billion worth of investments from 24 priority mining sites had been approved by the Mines and Geosciences Bureau. Furthermore, the Chamber of Mines of the Philippines promotes responsible mining which boosts the economy by attracting and bringing in investments, generating employment (up to 2 million mining-related jobs), and increasing government revenues which are projected to reach up to USD 8 billion by 2016 or USD 12 billion every year starting 2018 and for the next 20 years.

This sector is required by law to develop a Social Development Management Program and to continuously engage in environment projects including solid waste management, tailings dam maintenance and stability, erosion control, forest protection and reforestation.

Chemical Sensors for Mine Site Monitoring Program is a

two-year endeavor led by Dr. Rheo B. Lamorena-Lim of UP-Chemistry Department. It aims to complement the efforts towards responsible mining in the country, specifically, by developing local sensor tools that will allow near real-time monitoring of the environment in mine sites.

The overall development end-goals of the program include locally designed and fabricated prototype units linked to a single network for real-time data transmission and able to deliver:

- Deployable and robust chemical sensing for water quality;
- Smart sensing to regularly monitor, archive, process, and communicate the soil, air, and water quality in terms of levels of heavy metal concentration.



Disaster Risk Management

Some people might argue that there is no such thing as a natural disaster, only a natural hazard. Whether we agree with this or not, there is no denying that avoiding calamities is everyone's business. PCIEERD hopes that through science and systematic efforts, the number of disasters will be reduced.

The Philippines, with its too-close-for-comfort proximity to the largest ocean where tropical cyclones form is the 3rd most vulnerable to natural hazards, according to a recent report by the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP).

PCIEERD was tasked to take up the mantle and build the ark that will save lives: the NOAH Program (Nationwide Operational Assessment of Hazards). Operating since July 2012 under Program Leader Dr. Alfredo Mahar Francisco A. Lagmay of UP-NIGS, NOAH aims to improve disaster communications by utilizing advanced technology to obtain relevant data and provide an advanced (six-hour lead-time) forewarning to flood-prone communities and their government units. The initiatives to propagate disaster prevention and mitigation, preparedness, and capacity building have borne numerous subprograms that have

made significant milestones in both disaster management and scientific excellence.

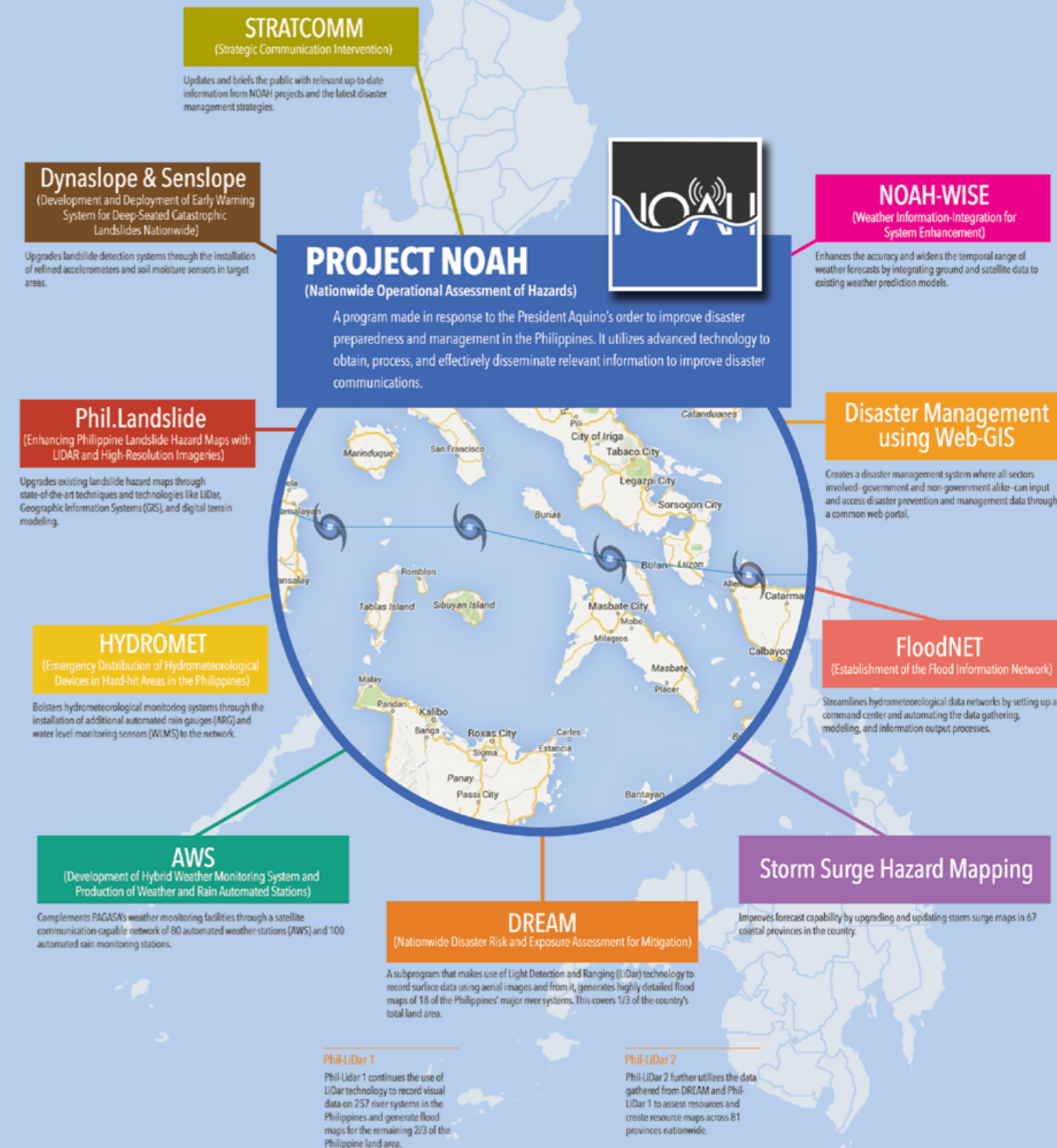
The NOAH Initiatives:

- DREAM Program (Nationwide Disaster Risk, Exposure, Assessment and Mitigation Program): Utilizes Light Detection and Ranging (LiDAR) technology to generate topographic datasets that will aid in disaster forecast and preparations.
- Automated Weather Stations (Development of Hybrid Weather Monitoring System and Production of Weather and Rain Automated Stations): Complements PAGASA's weather monitoring facilities through a satellite

PROJECT NOAH



<http://noah.dost.gov.ph>





communication-capable network of 80 AWS and 100 automated rain monitoring stations.

- HYDROMET (Emergency Distribution of Hydrometeorological Devices in Hard-hit Areas in the Philippines): Bolsters hydrometeorological monitoring systems through the installation of additional automated rain gauges (ARG) and water level monitoring sensors (WLMS) to the network.
- Storm Surge Hazard Mapping: Improves forecast capability by upgrading and updating storm surge maps in 67 coastal provinces in the country.
- FloodNET (Establishment of the Flood Information Network): Streamlines hydrometeorological data networks by setting up a command center and automating the data gathering, modeling, and information output processes.
- Phil.Landslide (Enhancing Philippine Landslide Hazard Maps with LiDAR and High-Resolution Imageries): Upgrades existing landslide hazard maps through state-of-the-art techniques and technologies like LiDAR, Geographic Information Systems (GIS), and digital terrain modeling.
- Disaster Management using Web-GIS: Creates a disaster

management system where all sectors involved—government and non-government alike—can input and access disaster prevention and management data through a common web portal.

- NOAH-WISE (Weather Information-Integration for System Enhancement): Enhances the accuracy and widens the temporal range of weather forecasts by integrating ground and satellite data to existing weather prediction models.
- Dynaslope and Senslope (Development and Deployment of Early Warning System for Deep-Seated Catastrophic Landslides Nationwide): Upgrades landslide detection systems through the installation of refined accelerometers and soil moisture sensors in target areas.



- STRATCOMM (Strategic Communication Intervention): Updates and briefs the public with relevant up-to-date information from NOAH projects and the latest disaster management strategies.

How are we doing?

So far, so good. The most notable achievement of the NOAH programs is the greater number of lives saved in meteorological events that previously proved catastrophic. 2012 saw a significant decrease in disaster death toll. 2013 was an even bigger success when Marikina, widely known for being submerged in flood during storms, survived through Typhoon Maring with zero casualties.

"Dahil mas eksakto na ang pagtukoy natin kung kailan at saan tatama ang epekto ng bagyo, ngayon po, napapaaga ang paghahanda at pagbibigay-babala ng ating mga LGUs," President Aquino said in his 2014 State of the Nation Address, adding *"Kung ang maayos na forecasting, tatambalan pa natin ng mahusay na LGU, talaga naman pong maraming buhay ang maililigtas."*

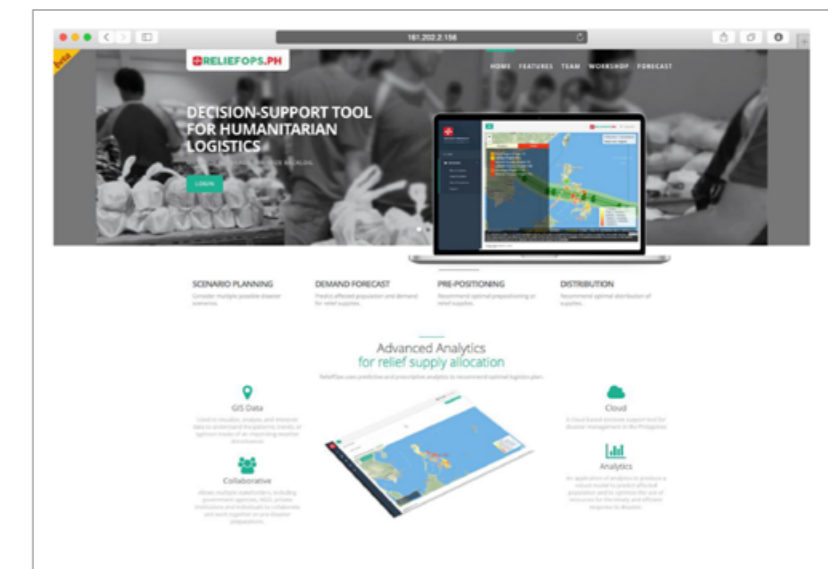
The positive changes brought about by the NOAH program continue to improve the disaster preparedness and mitigation capacities of our country. They are also reflected on the economic and scientific fields with the decrease of disaster risk reduction costs and acquisition of international merits

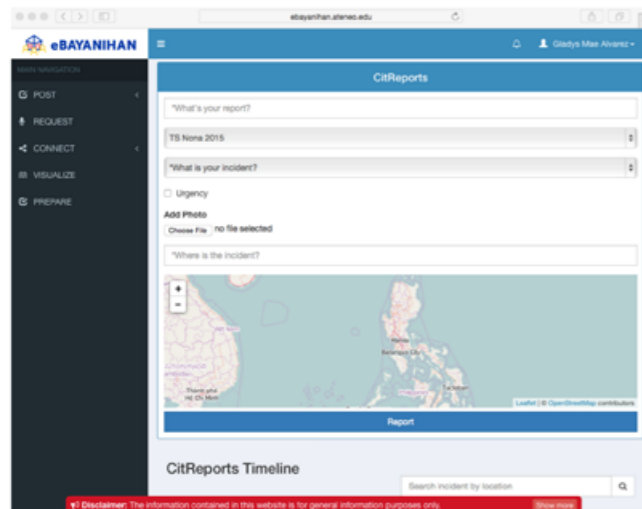
on Geospatial World Excellence—like hitting a flock of birds with one stone.

As of 2015, with the completion of 7 of 10 components, the NOAH program has set itself as the hub of disaster management information, steadily fortifying the country's defenses through awareness, technology, and tons of hard work.

(ReliefOps.Ph) Pre-positioning & Allocation of Relief Supplies GIS-Based Support System for Disaster Preparedness & Response

This project allows decision makers to recommend optimized schemes for prepositioning and allocation of relief goods in preparation and response to the impact of natural disasters.





The mathematical and quantitative models of the project take in complexities of the Philippine's relief operations. It can come with an actionable plan to meet relief operation objectives on coverage, time and cost.

eBayanihan

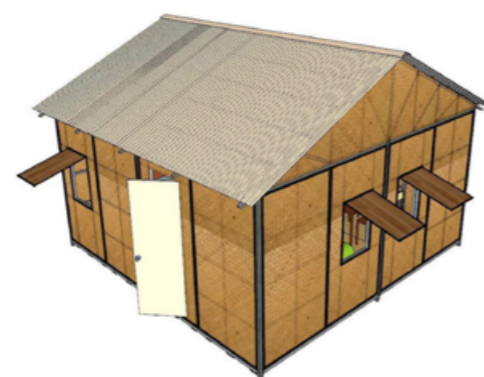
Project eBayanihan of the Ateneo de Manila University (ADMU) is a mobile and web application for feature phones, smart phones and web-enabled devices that manages reports coming from ordinary citizens, social network, social media and hazard reported by sensors. The features of the system are data reporting application, data modeling (summarization and management), and data visualization. Users of eBayanihan who volunteer information valuable (resources, skills) to disaster are profiled and notified in cases of disaster.

The system also serves as a visual analytics dashboard for first

responders Office of Civil Defense (OCD) and DILG (Department of Interior and Local Government) both at national, regional, provincial and municipal level for critical information before, during and post disaster. It also interfaces with other existing systems to produce layers of information for validation of crowdsourced information. Currently, it has an existing partnership with Japan and United States on Shelter Response System (SHEREPO) and Leveraging Social Media for Humanitarian Assistance/Disaster Relief (HA/DR), respectively.

Development of Temporary Shelter System for Disaster-stricken Areas

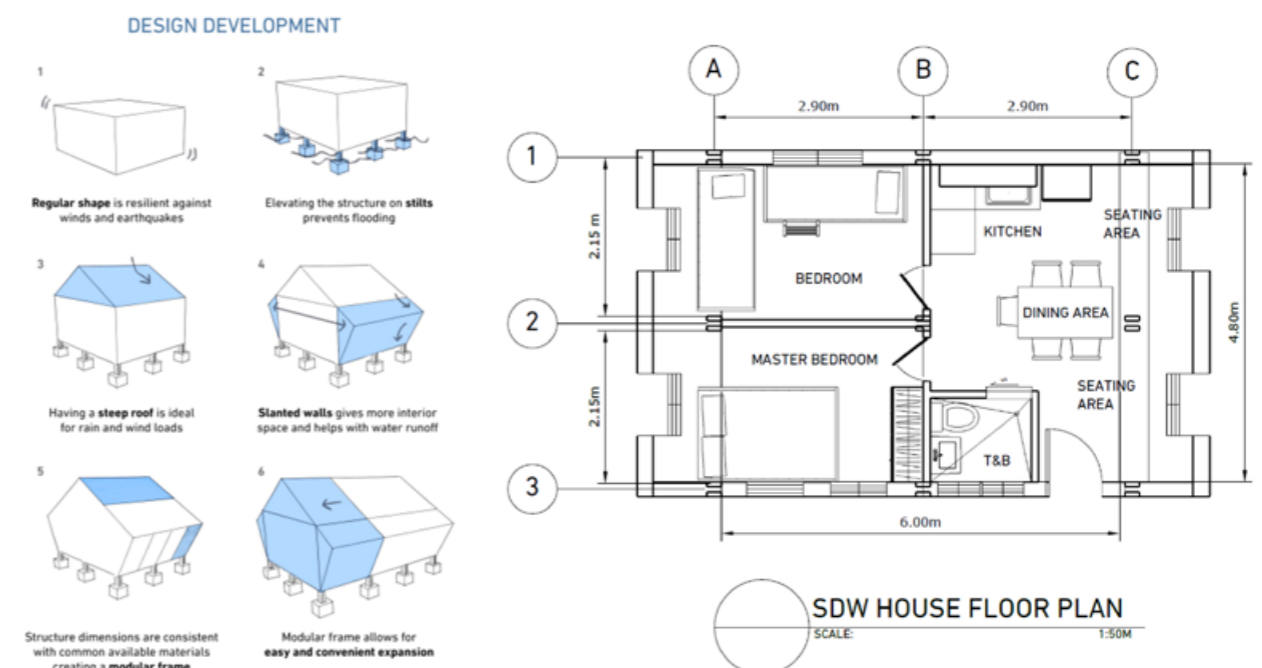
The UP Building Research Service aims to develop a temporary shelter system that can be deployed in areas hit by natural hazards. The design of this shelter considers not only the architectural and social aspects based on humanitarian needs, but also the strength and integrity of the structure that can be verified using engineering analysis.

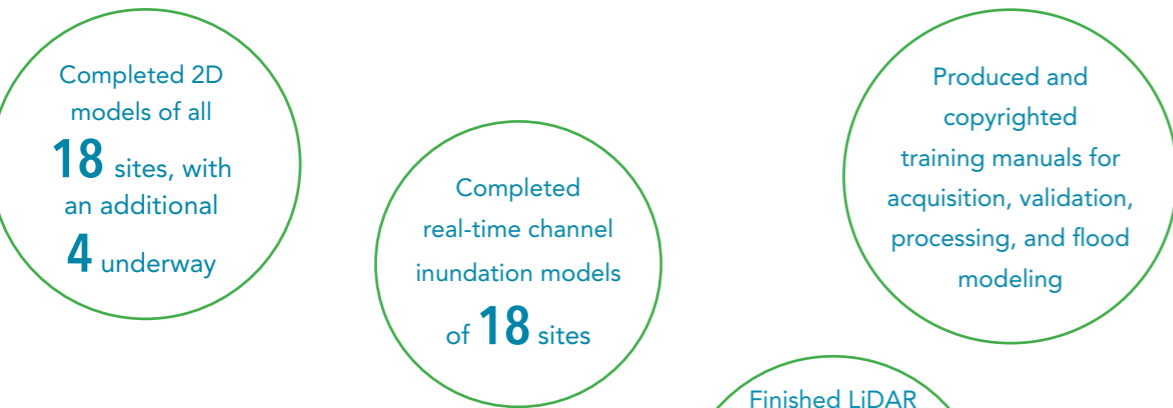


BUILD BACK BETTER PROGRAM. The Science and Technology of Designing and Planning Disaster-Resilience Communities, Sites and Buildings

The research program of UPD-College of Architecture expects to provide guidelines and concrete solutions towards creating disaster-resilient buildings, sites and communities. It is comprised of

planning and design guidelines for disaster risk reduction which should not just address present conditions but also consider future hazards. The general guidelines will show what factors must be considered before construction takes place and what should be done once a site is selected. It also focuses on the general guidelines for new (disaster-resilient) construction specifically on residential building, school building and evacuation centers.

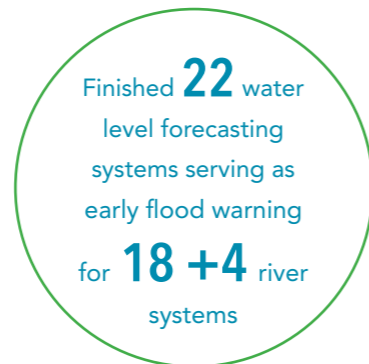
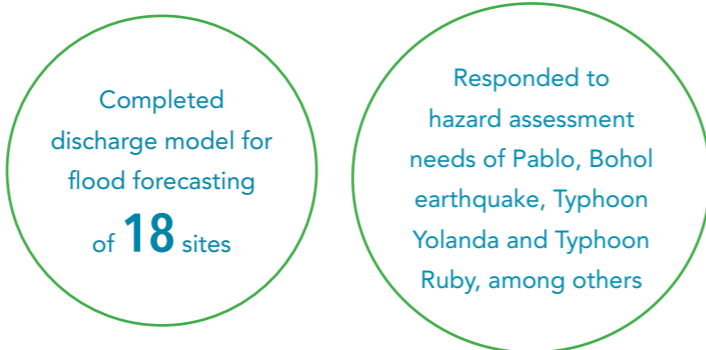




DREAM

In the tropics where locales are constantly being collectively assailed by storms, meteorological and geological events, complete security and a 100% survival rate is but a dream. But aspiration is the fabric of success as the UP Training Center for Applied Geodesy and Photogrammetry (UP-TGACP), backed by the DOST, has taken one of our wildest dreams a step closer to realization.

According to Program Leader Dr. Enrico C. Paringit of UP-TGACP, the Nationwide Disaster Risk and Exposure Assessment for Mitigation (DREAM) program is their answer to our national aspiration of being prepared for disasters and having access to every useful tool in the arsenal against natural hazards. This program makes use of Light Detection and Ranging (LiDAR) technology to capture aerial images and create high-resolution, finely detailed, and beneficial flood maps of 18 of the Philippines' major river systems and their affected areas. The area covered by the project estimates at least 1/3 of the



country's total land area. With these conditions met, the DREAM program has almost come full circle. Flood maps for target sites are now operational on the NOAH and DREAM websites and the data needed to refine the maps is almost complete. The program has also been tested on the field and has proven helpful.

Other than these accomplishments that moved the country closer to full disaster preparedness, the DREAM program bagged the esteemed Geospatial World Excellence in Policy Implementation Award for 2014 during the Geospatial World Forum held in Geneva, Switzerland last May 8, 2014, and the Geospatial Asia Excellence Award for Policy Implementation in November 2014 at Jakarta, Indonesia, yet again fulfilling another dream—that of scientific progress, responsibility, and excellence.

PHIL-LIDAR

The two operations described under this program, Phil-LiDAR 1 and Phil-LiDAR 2, each have two phases. The first phase of the first Phil-LiDAR program, Hazard Mapping of the Philippines Using LiDAR, covers data acquisition, integration, archiving, distribution, and capacity building, while the second focuses on data processing and validation by SUCs and HEIs.

Similarly, Phil-LiDAR 2, Nationwide Detailed Resources Assessment Using LiDAR, has two phases with the first emphasizing the extracting feature information from existing LiDAR data to for resource mapping, and the second on data processing, modeling, and validation. *(Project Leader: Dr. Ariel C. Blanco, Department of Geodetic Engineering-UP Diliman)*

As of September 2015, the **769** researchers and experts enlisted under Phil-LiDAR have accomplished the following:

Phil-LiDAR 1

- 167 river systems/floodplains (82,383 km²) with LiDAR and SAR data
- 117 rivers with calibrated and validated Digital Elevation Model (DEM), cross-section, profile, hydrometry and bathymetry data
- 77,172 km² of floodplain with pre-processed LiDAR data
- 54 rivers with High Resolution Flood Hazard Maps
- Beta release of the LiDAR Portal on Data Archiving and Distribution (LiPAD) which is the central data distribution channel for PHIL-LiDAR 1 and 2

Forest Resource Extraction from LiDAR Surveys (FRExLS)

- Produced Canopy Height Model, Canopy Cover Map and LiDAR-Based DBH Map from the six (6) pilot sites covering 402 sq. km. of forestland.
- FRExLS team won two awards namely Innovation Award and Best Poster Presentation Award during the 36th ACRS.

Development of the Philippine Hydrologic Dataset (PHD) for Watersheds from LiDAR Surveys

- 41 hydrological dataset maps produced from the 13 riverbasins
- Geodatabase of PHD is already being deployed through GeoNode portal.

Agricultural Resources Extraction from LiDAR Surveys (PARMap)

- 121 municipal agricultural maps from 21 provinces were produced and distributed to LGUs.
- Produced classified Landsat Images showing all coconut areas in the Philippines.

Mentored **14** implementing HEIs.



Begun data distribution and map distribution

Established **15** fully equipped and operational LiDAR facilities, two for each HEIs.

Participated in various local and international events on Remote Sensing and LiDAR

CarSU Team has developed a preliminary version of an application for flood extent visualization/inundation monitoring called the Web-based Near-real Time Flood Extent Visualization and Damage Estimations (Flood EViDEns), which bagged the Web Con Award during the Asian Conference on Remote Sensing (ACRS) held last 19-23 October 2015 in Manila.

Procured the 4th LiDAR system and aircraft, expected for delivery in **February 2016**

LiDAR Data Acquisition and Trainings done in partnership with the DREAM Program

Developed mobile application to be use in gathering field data and mapping of land features. Noteworthy of the mobile application that were developed are reGIS app and Land Use Mapper app of Ateneo de Naga University and Caraga State University, respectively.

Philippine Renewable Energy Resources Mapping from LiDAR Surveys (REMap)

- Biomass: Modelling of theoretical and available potential biomass has already been done for the four (4) municipalities of Camarines Sur (Milaor, Canaman Camaligan and Gainza).
- Hydro: 9 provincial hydropower resource map has been produced while 3 of it were distributed to LGUs: SWAT modeling has been already been done for the 16 provinces.
- Solar: Clear sky GHI has been computed for the 47 provinces.
- Wind: Offshore wind WRF processing was already done for the whole Philippines.

Aquatic Resources Extraction from LiDAR Surveys (CoastMap)

- 34 coastal maps covering mangroves and aquaculture from the 67 coastal municipalities were produced and distributed to LGUs and NGAs.
- Produced Philippine Mangrove Map from Landsat imagery.

The DREAM program succeeded in creating in-depth, up-to-date flood maps for 18 of the Philippines' largest river basins, including watersheds and nearby flood-prone areas, rippling progress on disaster management over 33% of the country's total land area in a span of two years. How about the remaining 66%?

Here comes the Phil-LiDAR Program to continue its predecessor's legacy. Effective since last March 2014 and envisioned to be completed in three years, the Phil-LiDAR takes off from the DREAM program, continuing to use LiDAR (Light Detection and Ranging) technology to collect visual information on 257 river systems and their surrounding terrain, gathering enough data to construct richly-detailed flood maps while eliminating the need for tedious and lengthy land surveys. Producing flood maps for virtually every community will ensure that our countrymen are given a means to prepare for imminent deluges.

PCIEERD also decided to further utilize LiDAR technology and maximize opportunities with its state-of-the-art terrain-scanning capabilities. Generation of flood maps, the images will also be used to assess and map the country's resources scattered across 81 provinces nationwide. PCIEERD enlisted the assistance of Higher Education Institutes (HEIs) and State Universities and Colleges (SUCs) in processing data and testing the maps, showing that we



are a united front for nationwide safety and environmental security.

Phil-LiDAR earned multiple awards just as its predecessor did. Other than the Web Con Award, the Phil-LiDAR 2 program bagged yet another Geospatial Excellence Award for DOST at the annual GeoSmart Asia held in Kuala Lumpur, Malaysia last September 29, 2015. Various institutions in the geospatial industry gathered along with some of our country's most brilliant minds. Dr. Ariel C. Blanco, who received the award, talked in detail about the value of geospatial technologies emphasizing on the Phil-LiDAR and earning merit for the program.

While both Phil-LiDAR operations are still ways to go from the endgame, what this devoted team has shown so far shows much promise for the future of Philippine disaster preparedness and mitigation, and natural resource assessment. As early as July 2015, completed flood and resource maps were provided to its target beneficiaries.



Transportation Solutions

Getting around in the Philippines is interesting at best and hazardous at worst. PCIEERD understands that urban transport is a key element in building a sustainable city. It has come up with solutions that improve our daily commute.



Hybrid Electric ROAD TRAIN

Metro Manila's traffic problem not only clogs the metropolis's narrow roads—it also jeopardizes commuter health in the long run and contributes greatly to air and noise pollution.

Engr. Jonathan Q. Puerto of DOST's Metals Industry Research Institute (MIRDC), Program Leader said there are three (3) environment-friendly transportation solutions already underway.

Amenities

What makes the train's system a hybrid is the combination of a 300kVA Generator Set and 250 pieces of Lead Acid Batteries. The first coach will be the pilot coach, the second to fourth are the passenger coaches, and the fifth is the power coach, which contains the diesel generator, Lead Acid Batteries and other electrical components. Every coach has one unit of Induction Motor and

Variable Frequency Drive.

There are two types of trains. The CRT, the larger of the two and equipped with a 100 hp motor, can hold up to 260 passengers and travel at a maximum of 50 kph. The LCRT, meanwhile, is equipped with a 75 hp motor, can hold up to 160 passengers, and travel at a maximum of 45 kph. The LCRT is the light version of CRT.

Regardless of type, each has a five-coach, fully air-conditioned, and classified as a diesel hybrid electric vehicle. Both will have an automated ticketing system and regenerative braking. But while the CRT will be deployed to Cebu as a part of the province's projected Bais Rapid Transit (BRT) System, the LCRT will be heading to Pampanga.

Positive responses

If the BRT is successful, that's when the CRT will be brought to Manila. It is worth noting that the CRT has been tested while the LCRT's testing is ongoing until December 2015. Demonstration rides have been offered at the Mall of Asia during National Science and Technology Week.

Trainset

The Prototype Trainset is one of the three major transport projects under DOST's High Impact Technology Solution. It is envisioned to improve the current operations of the Philippine National Railway (PNR) by raising

its efficiency while lessening the production and operational cost. This project will utilize and maximize the capabilities of local industries in the fields of metals and engineering enabling the country to generate its own mass transport technology to address its needs in the area of transportation.

Automated Guide-way Transit (AGT)

The Automated Guideway Transit (AGT) is a two coach train that can accommodate 120 passengers per coach and uses 60hp electric motor as its prime mover to run on its elevated concrete track using rubber tires similar with our conventional buses. It was developed to innovate local mass transport system using Filipino ingenuity and design capability in transportation engineering. Aims to produce a low cost, environmental and locally manufactured alternative sustainable mass transit.





ATPMS

trapik.org

Is there a solution to Metro Manila's traffic problem? The minds behind the Advanced Traffic and Pollution Monitoring System (ATPMS) believe so.

PCIEERD partnered with Ateneo de Manila University to develop ATPMS, which is a smart telematics system under PCIEERD's Intelligent Transport Systems (ITS) banner.

Its goals are to determine road capacity demand via origin-destination route data collection and to distribute traffic load by suggesting the best routes and forecasting the best times to travel in real-time. It will also be able to provide engine status data and air quality data on the taxis that are part of the project.

On speaking of ATPMS's limitations, Project Manager Rachel Habana said that the goal is to outfit 200 selected vehicles with ATPMS's GPS trackers.

"The project has already installed 70 GPS trackers to at least six taxi companies," said Habana. "The taxi companies only allow around 10 to 20 of their taxis to be outfitted, and not all their taxi fleets."

Unfortunately for those who use apps to flag down cabs and cars, the project is not yet underway for GrabCar/Taxi and Uber.

Apps and sites

There is more to ATPMS than just installing GPS trackers and pollution sensors in taxis. The

installation works together with a cloud server for data storage and processing, a web interface for monitoring traffic and pollution, and mobile apps where users can contribute traffic data and access related information.

The website, Trapik.org, is already available for accessing by the public. The mobile app version can also be downloaded for free on Google Play and the Apple Store, alongside taxi fare tracker FairFare. These are often upgraded with user input.

The FairFare is an accompanying app developed by the Project Leader, Dr. Proceso Fernandez, Jr. of ADMU. Through the FairFare app, taxi meter versus the app's computation.

The challenge of 'hassle-free'

Any project, especially one that seeks to make commuting easy and hassle-free, is not without its own challenges.

Habana cited the difficulty of getting the commitment of taxi operators, developing the website, and procuring the equipment as one such challenge. But the team is pushing through. The project will be completed on April 30, 2016.



Smart Technology

In this day and age where nearly everything is accessible through the screen of a phone or computer, people are becoming accustomed to a convenient and fast-paced lifestyle. Therefore, we must upgrade our technologies to fit into this trend and deliver even basic needs, such as electricity, in the quickest and most efficient way possible.

SMART GRID TECHNOLOGY FOR THE FILIPINO HOUSEHOLD

As the country ranks among the most expensive power prices in Asia, the average Filipino household allots a significant amount of expenses to cover the cost of power. For several reasons—of course, increasing demand for energy is one of them, putting stress to aging infrastructure and the environment while the power grid strains to keep up. All this falls to the everyday Filipino as high power prices on our monthly bill—and it's not like increased costs would be considered very consumer-friendly.

The UPD-Electrical and Electronics Engineering Institute (EEEI) came up with a Smart Grid Technology for the Filipino household under

Project Leader Dr. Michael A. Pedrasa. This includes a three-fold system of projects that will help us manage and, eventually, reduce our energy consumption—because we're not just price-takers of our electricity bill. With help from S&T, we can become active participants in how we operate the power system.

Project #1: Smart Home Platform

The Smart Home Platform starts with the human being behind it: the everyday Filipino who makes use of energy. Think about it: when we come home from work, we turn on our lights, switch on the electric fan or air-conditioner, check Facebook

on our computers, charge our phone, maybe heat up dinner, possibly iron a few clothes for the next day. But we hardly realize or think about what we're doing in terms of the energy we use.

The Smart Home is designed to inform and influence consumers of their energy consumption patterns. One of the easiest ways to do this is to display our energy consumption in real-time through a smart meter—measuring real power, voltage, and the reactive power of the entire household, as well as that of our appliances and even the power existing between appliance and socket. The platform is also capable of measuring energy consumption against peak times for demand energy (say, the summer break when it's too hot without air-conditioning, or when December rolls around with all our parols and Christmas lights). It also performs direct load control, thus reducing our energy usage as well as CO₂ emissions.

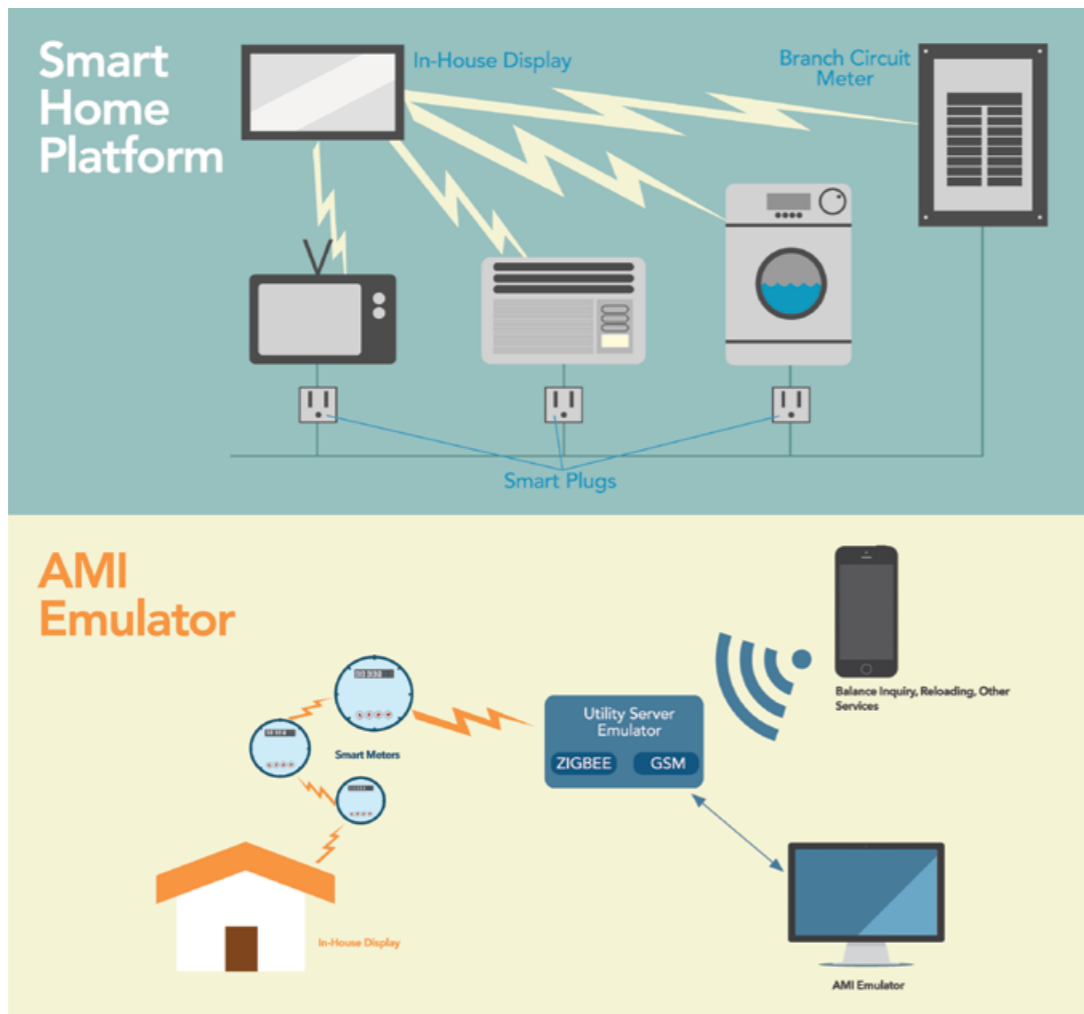
An In-Home Display (IHD) then acts as a control center. So imagine if you could store your measurement data and then immediately display it as your total cost. Or schedule your appliances to turn on and off at exact times during the day, these automated rules programmed into a system. Zigbee—a module specifically designed for small personal area networks—also enables communication between the meter, smart plugs, and display. A desktop computer then archives and displays information, where we can upload our scheduling functions.

Through the application of intelligent hardware (such as a smart meter, displays, sensors, and networked outlets) and software (such as wireless communications systems, human machine interface, and control and scheduling algorithms), the Smart Home serves as a foundation for the smart technology for the Filipino home. Currently, the platform is being deployed in 20 households for testing, and surveys are being taken to help maximize the effectiveness of the design.

Project #2: AMI Emulator

Advanced metering infrastructure (AMI) is a system that measures, collects and analyzes consumer energy usage through two-way communication: a household's metering devices sends data to the electric utilities, and the utility





sends back pricing signals to the household. It's considered an important part of any smart grid initiative, but setting up an AMI network entails significant cost. Even in countries with existing infrastructure, the potential benefits and impacts of AMI has yet been fully realized or understood.

Smart grid project #2 between PCIEERD and UP Diliman's EEEI is an AMI emulator, which aims to make practical and efficient use of electrical infrastructure. It benefits not just the consumers but also electric utilities—due to deferred network upgrades and generation capacity—as well as policymakers and regulators, who can develop new approaches based on the project's results. It also serves as

an alternative to the Smart Home Platform, especially for those who cannot afford its appliances.

The proposed AMI emulator will require the use of a smart meter—it will track prepaid energy usage, limit loads, monitor power quality, remotely control on and off operations, and measure the net energy costs by time. Consumers can then use their mobile phones to communicate with the utility—receiving alerts, making balance inquiries, and reloading through a gadget that most of us already have. In-depth information can also be stored in a desktop computer in the system, where we can manage our account and review past energy consumption data. Communication-ready with other home devices, it

can even notify us of power loss, theft, and tampering. A Zigbee module is also installed to connect meters from different homes in the local area. An IHD constantly provides metering information to the consumer.

Plenty of capital is required in setting up an AMI network, but the emulator serves to perform a number of functions in a full-scale AMI. Currently, the project team's goals are to design an emulator that implements AMI features and deploy this to several households—to ultimately simulate small-scale smart metering infrastructure. A study will be conducted to complement prepaid metering and implement any design suggestions from surveys into the project.

Project #3: Prepaid Metering and Smart Home

In conjunction with the Smart Home Platform, prepaid metering can bring positive impacts to our energy usage, and both methods promise significantly reduced peak demand and consumed energy. As with any new technology, the project aims to firstly understand people's perceptions of it, both consumer and utility, in the early stages of development. The results of these acceptability studies are expected to increase its chances of success, so that Structural Equation Models (SEM) will be made for the consumers' decision to use prepaid metering; for the utilities' decision to offer (or not offer) prepaid metering to customers; and for the consumers' decision

on incorporating smart home technologies.

The prepaid metering system is expected to improve cash revenue management—directly addressing poor collection, and minimizing theft and overhead costs—as well as customer service—simplifying the billing process and eliminating disconnection procedures. In fact, a handful of electric cooperatives have started to offer prepaid billing, which utilizes prepaid meters from third-party providers.

All these smart grid projects are expected to lower energy consumption and total energy costs. They are innovations that can help us achieve energy efficiency in our homes—knowing that the smart grid makes for a smart choice.





GRID-TIED INVERTER FOR A SOLAR ENERGY SYSTEM

We spend electricity in real-time, but through science and technology, we have discovered—and continue to discover—ways that we can store it. A finalist of PCIEERD's Electronics Design Competition, the Electronics Industries Association of the Philippines, Inc. (EIAPI) has found a way to expand its horizons—going beyond the electronics industry and venturing into this important area of energy—by developing a competitive grid-tied inverter for an efficient solar energy system.

A grid-tied inverter is a power inverter that converts direct current (DC) electricity into alternating current (AC) with the ability to synchronize and interface with a utility line. In other words, when you “tie” or connect a power inverter to the grid, you can directly convert DC sources, such as solar panels, into AC sources—the form of electricity that reaches us in businesses and our homes. And the result makes electricity generation and distribution from solar energy more efficient and cost-effective for all.

The inverter here is meant to be used with solar panels—that by maximizing the power drawn from the panels, it optimizes that conversion of sunlight into energy (this is called a photovoltaic or PV system). So when an intermittent resource like sunlight dips in and out, always fluctuating, the inverter keeps the grid reliable to deliver electricity—and, when configured with solar panels, pollution-free.

The power grid becomes a virtual storage facility: because the technology is literally “tied” or connected to the grid, a grid-

tied inverter saves on installation costs and lessens the necessary equipment—no need for batteries or off-grid systems that are not only expensive and bulky, but can also be maintenance-intensive. Grid-tied inverters are also designed to quickly disconnect from the grid in the event of a blackout, and when power is insufficient, the inverter directly sources the energy needed from the utility. The technology will also have a user-friendly man-machine interface or control mechanism for properly controlling and managing the running inverter, including wireless and internet connectivity for remote access, load management, and power management.

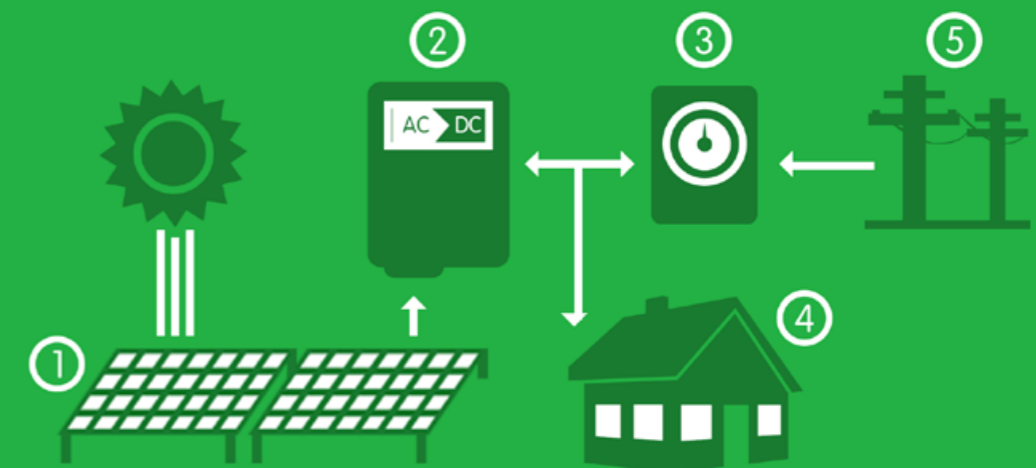
This project combines several electronics technologies—PV energy harvesting, DC to DC and DC to AC conversion, grid synchronization, power factor correction, and high voltage power systems—to bring the system

to life. From the design phase to testing, it involves skills and capabilities that are vital in the electronics sector, using computer hardware and software to manage voltage conversion among several modules, and providing the real-time monitoring of a solar energy system. This project will also bring energy back to the grid safely and efficiently according to industry standards.

The EIAPI team targeted the project for fellow Philippine electronics companies and further industry growth, but the possibilities of a grid-tied inverter can also benefit residential homes and commercial areas—widening the reach of solar for clean, renewable energy.

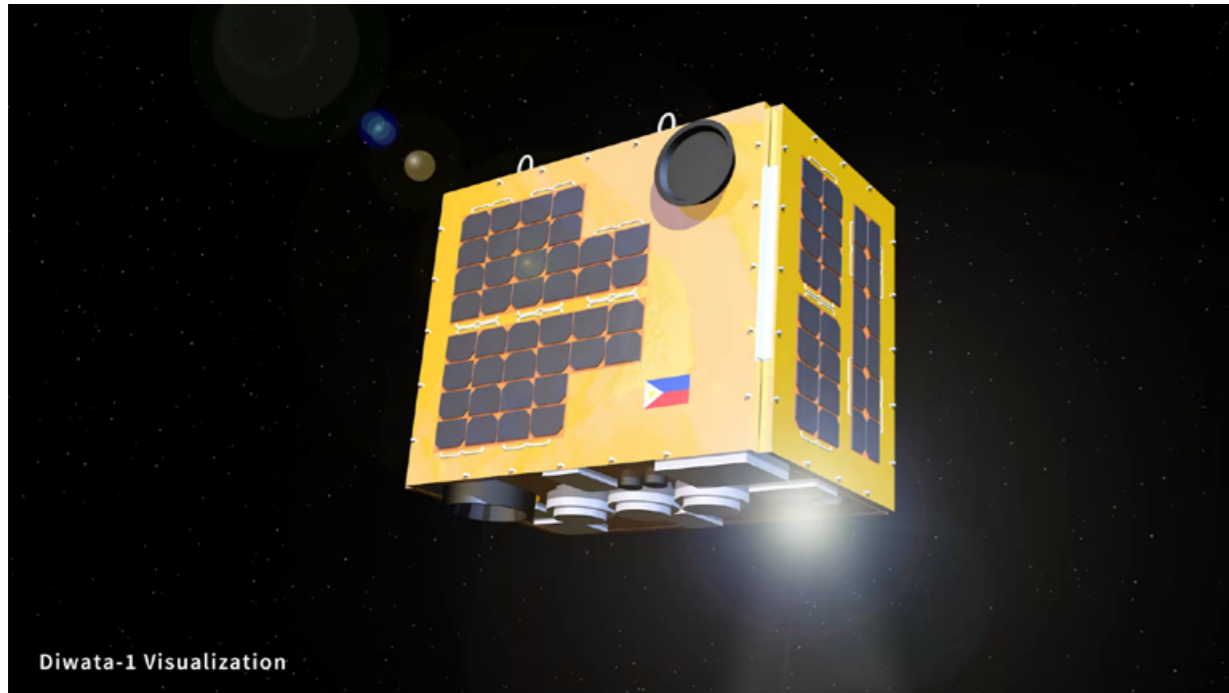


- ① SOLAR PANELS
- ② INVERTER
- ③ METER
- ④ HOUSE
- ⑤ UTILITY GRID



Beyond Earth

Space is a frontier not new to humans, yet to us in the Philippine scientific community, it is fairly unexplored. We enjoy the benefits of space technology, but only through our foreign partners. If we are to stand on our own and maximize every bit of space information we can use to help our country, we have to establish and expand our space systems.



Diwata-1 Visualization

PHILIPPINE MICROSATELLITE

Outer space is a horizon the Philippines has not yet ventured in — and whether or not to travel to that expanse has been debated on for decades. One side supported the launch of a satellite, counting on the significant augmentations it can provide to our meteorological and geographical monitoring systems. Another side ardently defended the ground, arguing that there are more pressing concerns on land as it is.

The coming year will see the Philippines' first foray into space

advancement as the launch of our first microsatellite, named DIWATA-1, in the first quarter of 2016, punctuates the last sentence of this long standing debate and shows that the heavens and the earth do not need to be worlds apart.

A Wish Granted

Named after the Filipino word for 'fairy', because we believe fairies watch over us, the satellite is expected to complement our

weather prediction systems, mapping, disaster management processes, and resource monitoring

A brainchild of the University of the Philippines- Diliman, the Advanced Science and Technology Institute (ASTI), Hokkaido University and Tohoku University in Japan, DIWATA-1 is envisioned to become part of the Asian consortium of microsatellites. Joining the constellation is hoped to provide the Philippines with more data which are relevant to the country's diverse needs/applications for satellite imagery, according to Project Manager Dr. Joel Joseph S. Marciano, Jr.

The Sky is the Limit

The nine (9) engineering and science researchers sent to Tohoku and Hokkaido universities in Japan to work on the microsatellite while pursuing advanced degrees and the other PHL-Microsat team members sent to different training/ conferences relevant to the PHL-MICROSAT program are just antecedents to the country's bid for capacity building on space technology.

The first step has been made. DIWATA-1 has given the green light to the drafting of the Philippine space program. It does present its challenges, but it's only a matter of time before our country's scientific and economic horizons expand skyward, entailing many great returns for scientists and the common Filipino people alike.



Microsatellite's Maginificent 9

Food

Innovations in science have made life safer and easier. When it comes to food, science applies itself to fulfilling one of our most basic needs – sustenance. Those canned sardines and tightly-packed jerkies are all products of science. With food processing, the shelf life of certain types of food have been greatly extended and the applications of many food products have also been expanded.

PCIEERD seeks to improve upon local food processing technologies in order to bolster the local food industry as well as discover new ways to pack food for emergency purposes, such as the event of a typhoon. To accomplish this, PCIEERD set up Food Innovation Centers (FICs). There are currently six of these facilities, with each one housing five food processing machines: vacuum packaging machine, water retort, vacuum fryer, spray dryer, and freeze dryer. This new set of technology has created exciting products.

Interested investors may contact PCIEERD!

TAMARIND & POMELO JUICE POWDER

There's no such thing as too much sourness. For those looking to add a little kilig (not really a little), the tamarind and pomelo juice powder is sure to get you squirming with delight with every sip.



VEGETABLE-FRUIT POWDERED JUICE

Eating a vegetable and a fruit at the same time is no easy undertaking, even for a vegetarian. But now, you can enjoy the best of both worlds with just a spoon, a glass of water, and a packet of vegetable-fruit powdered juice.

PCIEERD Annual Report 2015

VACUUM-FRIED BARINDAY

Clams, locally known as barinday, are little shellfish with even smaller, but tasty flesh. Vacuum-frying just made it possible for you to enjoy snacking on barinday nonstop without opening a single shell.



VACUUM-FRIED VEGGIES AND FRUITS

The problem with fruits and vegetables is that they don't last as long as we want them to. Whether you need them for emergency supplies or just to satisfy a craving, vacuum-fried vegetables will save the day.

READY-TO-EAT CHICKEN ARROZ CALDO

Arroz Caldo is one of the Filipino staples. If you ever need a helping of arroz caldo on a literal or figurative rainy day, just open a pack of ready-to-eat chicken arroz caldo and slurp away.



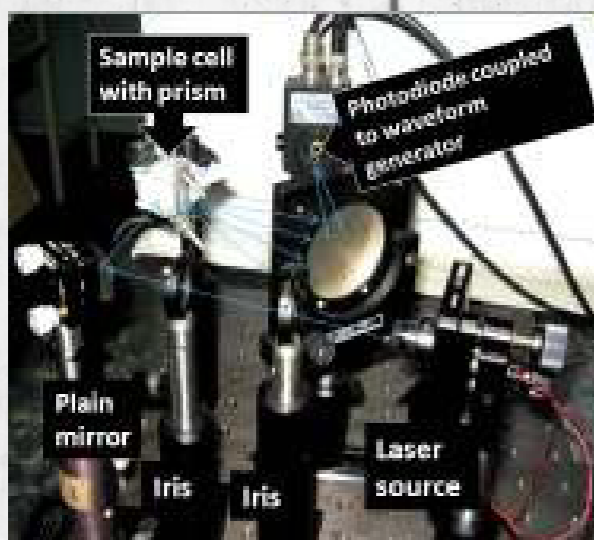
GOURMET TUYO

Tuyo is famous for its smoky, sun-dried taste. But the best tuyo is usually found near seaside towns—and not everyone lives near those. Premium-grade tuyo is now available to everyone. All you need to do is go to the nearest supermarket and voila!



SAFEHarvestS

"Provide food safety from farm to table" is the ultimate goal of the Sensors for Agricultural and Fishery Ecosystems and Harvests Safety (SAFEHarvestS) Program. The program proponents intend to move toward this objective through the development of low-cost and portable in situ sensing devices and kits to facilitate rapid testing and monitoring of contaminants in harvests and farm ecosystems. Comparative studies against standard methods will be performed to ensure the effectiveness of the sensors.



In particular, the component projects focus on each of the following:

Project 1 Development of portable surface plasmon resonance MIP-based sensor for detection of histamine in fish and shrimps, Florian del Mundo, Ph. D, Institute of Chemistry, UP Diliman (on-going)

This project is developing a portable histamine detection system based on a molecular-imprinted polymer (MIP) sensor, which can be used to determine "freshness" in shrimp harvests. The detection system will consist of a home-built portable surface plasmon resonance (SPR) spectrometer incorporating the molecular-imprinted histamine sensors.

Project 2 Development of sensitive prototype sensor for monitoring insecticide residues in fruits and vegetables to address current MRLs, Susan May F. Calumpang, Ph. D, National Crop Protection Center, UP Los Baños (on-going)

This project is currently preparing and optimizing the fluid sample cell and laser set-up of the diffraction sensor kit, which will detect organophosphate insecticide residues (profenofos and malathion) in mango, banana, okra, tomato, as well as soil and water samples.

Project 3 Development of Potentiometric Based Test Kit for the Detection of Clenbuterol in Meat, Susan D. Arco, Ph. D, Institute of Chemistry, UP Diliman (on-going)

On-going work in the project has seen synthesis of the clenbuterol-imprinted polymer. The synthesized imprinted polymer is being used as the sensing material for clenbuterol in meat. Detection of clenbuterol is based on the change in the potential reading of the sensor upon contact with the sample.

Project 4 Development of Electrochemical Sensor Platform for Meat and Fish Freshness Monitoring, Armando Somintac, Ph. D, National Institute of Physics, UP Diliman (completed)

This newly accomplished project produced a gas sensor prototype that is able to determine the freshness of fish. Using the prototype, fish freshness monitoring is performed by exposing the fluorine-doped tin oxide sensing material to the gases being emitted by a freshly butchered fish. Electrochemical changes provide the needed information to determine the level of fish freshness; the result is then displayed in the prototype readout – informing the consumer whether the fish is fresh or not.

Project 5 Development of Portable Detection Systems for Nitroimidazoles in Hog Urine and Piggery Run-off Water, Imee Su Martinez, Ph. D Institute of Chemistry, UP Diliman (on-going)

Aimed at helping monitoring agencies and local farmers to monitor residues of Nitroimidazole/Chloramphenicol in livestock prior to slaughter, the project is currently developing the MIP-based sensing material of the spectroscopic sensor prototype.

Project 6 Molecularly Imprinted Polymer Modified-Carbon Paste Electrodes (MIP-CPEs) as multi-analyte sensor for

the detection of Organophosphorus pesticides Chlorpyrifos and Fenitrothion and Triazine herbicide Atrazine, Allan Christopher C. Yago, Ph. D, Institute of Chemistry, UP Diliman (on-going)

This project will produce electrochemical sensors to detect internationally banned pesticides (Chlorpyrifos and Fenitrothion and Triazine herbicide Atrazine) in banana, rice bran, citrus fruits. Currently, the MIP-modified CPE composite system, which will serve as the detector for chlorpyrifos/fenitrothion and atrazine molecules – is being prepared and optimized.

LICENSING AND COMMERCIALIZATION

Bringing technologies from the laboratories to the market was a major goal of PCIEERD this year. It is of prime importance for PCIEERD that technologies and products developed by its researchers reach consumers and have their intended outcome felt by every Filipino. With this in mind, PCIEERD is proactive in assisting technology developers to commercialize the products of their research.

IFR Rice

The lack of iron in kids' daily meal is said to be one of the many causes of micronutrient deficiencies prevalent among Filipino children. According to the Food and Nutrition Research Institute (FNRI), Iron-deficiency anemia affects two out of 10 children six months to five years old, as well as the six- to 12-year-olds. One out of ten 13- to 19-year-old teens are likewise affected by IDA. The good news is that we can fight iron deficiency anemia through the very rice that we consume everyday. We are not talking about Iron-fortified rice.



To support this cause, FNRI has developed a technology to efficiently fortify rice with iron. FNRI believes that IFR is a "strategic nutrition intervention in

helping address IDA because rice is the staple food of most Filipinos.” Through a project assisted by PCIEERD which led to a licensing agreement between FNRI and two adaptors of iron premix production technology and two millers in Davao who agreed to blend the iron premix and the regular rice to produce IFR, a great part of Davao now has a steady supply of IFR. The project also became an advocacy that strengthened the implementation of the IFR Law which served as an impetus for the greater public consumption of IFR.

FNRI is still pushing for more consumers, not only in Davao region, to choose IFR rice over regular rice. Aside from its health benefits, it is also a relatively cheaper way to get iron since you only have to pay an additional one or two pesos when you buy a kilo of rice. So the next time you eat rice, make sure that it is iron-fortified.

Nipa Sugar

People nowadays opt to follow strict diets just to attain the physique they want or to embrace a fitter, healthier version of themselves. As the health-consciousness trend in the country becomes rampant, many people try to avoid eating energy-giving foods just to prevent themselves from gaining too much weight. The good news is that we can still enjoy that occasional piece of cake or that invigorating taste of sweets without having to worry about our figure and our health. We introduce to you the Nipa Sugar.

As the name suggests, nipa sugar is made from the sap of nipa palm. You may have come across such plant in one of your trips to the beach as the nipa palm grows in abundance in estuarine-brackish waters and may often be seen along coastlines. Nipa sugar has



lower glycemic index than that of a regular sugar, making it a healthier alternative. Carbohydrates with a low GI value are more slowly digested, absorbed and metabolized and cause a lower and slower rise in blood glucose and, therefore insulin levels. Nipa sugar is generally cheaper than coco sugar which has the same features with the nipa counterpart but already has established a niche market locally and even for export.

PCIEERD is supporting the South Luzon State University (SLSU) in Infanta Quezon in building its own facility that will produce a total of 1,800 kg of nipa sugar by the end of 2016. The facility in SLSU will be producing nipa sugar using the technology developed and licensed by the Industrial Technology Development Institute. The facility is already on its early stage of pre-commercial production. Soon enough, you may find nipa sugar in one of your favorite stores.

Nanocoat for Papaya

The Nanocoat project team is working on an edible and biodegradable film for produce that will delay ripening, preserve quality, and convert waste to high-value products. The goal is to reduce post-harvest loss, thereby raking in more income for the farmers, food processors, food manufacturers, and others in the network. On a broader scale, this will allow a wave of better quality fruits and vegetables in the domestic and foreign markets.

Nanocomposites are materials modified to incorporate elements in nanometer size. Hemicellulose is a polysaccharide found in a plant cell wall. When transformed into a colorless, tasteless spray, the compounds act like a second skin of fruit that perform the double functions of protecting the fruit from the elements and slowing the onset of ripeness.

This two-year project is the follow-up to a currently ongoing project to determine the conditions for the bench-scale production—a trial production of 1 to 20 kg samples—of a hemicellulose-chitosan nanocomposite coating and to evaluate the performance of the nanocomposite coating in extending the shelf life of papaya fruits.

Extended shelf life, network support

To determine how safe the coatings are for ordinary use, the toxicity of the nanoparticles and its composite was tested by identifying potential toxicity or hazards in the preparation and use of the coatings. These were then tested by evaluating the blood and kidney chemistry tests of animals fed with the nanomaterial after two weeks and

conducting oral and inhalation toxicity tests on rats with a total exposure period of 90 days.

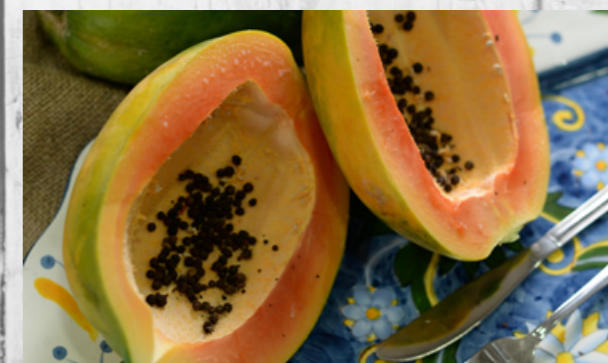
After optimizing the hemicellulose and the chitosan nanoparticles and testing the toxicity, these were then spray-dried onto papayas. During the coating trials, the following had to be observed:

- Physical attributes: Color, firmness, shriveling, weight loss, disease incidence, and disease severity
- Chemical changes: pH, titratable acidity, total soluble solids, total sugars, total reducing sugars, chlorophyll, and carotenoid content of the peel.

Without cold storage, the coated papaya lasted one week.

The successful application of nanocoat technology to papaya entails positive effects on its local and foreign market value as well as the future of this technology.

Apart from clear agricultural applications, the full range of the nanocoat's potential has yet to be explored. Perhaps nanocoat can also act as an environmentally safe alternative layering or coating for other products. More research needs to be done on this end to mine the opportunities this new technology has opened.





Cacao



Anyone who has ever purchased molded cocoa liquor, otherwise known as tablea, from two different sellers can immediately tell the marked differences between the taste and texture of the final solid cocoa liquor product after melting both on the stove.

"It is because different processors have different techniques for processing the fermented cacao beans," said Project Manager Joni Mae Gonzaga.

Cacao is considered a priority commodity by the DTI. In light of this, PCIEERD sought a way to standardize the way the tablea is processed. This is one of the four projects geared toward upgrading the entire local cacao industry.

Technological Support for the Upgrading of the Local Cacao and Cocoa Industry

The first project led by DOST-ITDI conducted on-site observations of the cacao processors as well as collection and analysis of samples to compare them with the existing Philippine National Standards for Cacao. The project then worked on the standardization and improvement of process for the tablea for its hygiene properties and other sensory properties. Addressing the "sandy" mouth feel of the tsokolate was also covered by the project. They also studied the storage conditions of the tablea to minimize the fat bloom. As the industry recognize the importance of fermentation in developing the flavor of the tablea, Project 2 co-implemented by UPLB-BIOTECH and DOST-ITDI worked on studies for the microbial and chemical profiling for cacao fermentation and processing. The project has also done initial studies on the development of starter cultures for fermentation of beans. The third project, implemented by Philippine Center for Post-harvest Development and Mechanization (PhilMech), addressed the need of the industry for better dryers for the cacao beans. Completed in 2014, the engineers and

researchers have managed to improve the design of a Multi-Commodity Solar Tunnel Dryer (MCSTD) and a Fixed-Bed Dryer. The team was able to conduct field testing of the prototypes in Davao.

The improvements in the dryer made them more efficient even during cold/rainy seasons. Calibration of the Moisture Meter developed by PhilMech, the SHEGA III Moisture Meter, is also part of the project. Initially used for corn and paddy, the SHEGA III Moisture Meter was calibrated for cacao and was field tested for the measurement of dried cocoa beans moisture content. The last project implemented by DOST-ITDI with DOST-MIRDC responds to the need of the industry to develop locally fabricated equipment for the cacao processing. Eleven equipment were designed and fabricated by the project namely: roaster, desheller, grinder, melanguer, conching machine, hydraulic press, sorter, breaker/pulverizer, filter, tempering machine, molder. An operations manual for all of these equipment fabricated will also be prepared by the project.

The Cacao Program Team led by Ms. Ma. Dolor Villaseñor, MS will soon release a manual on Best Practices for Tablea Processing covering the Fermentation, Drying, up to the Processing of Tablea and intermediates such as Cocoa Butter and Cocoa Powder. This manual will be made available for farmers, processors, and all others interested in the processing of the Philippine Tablea.



Oyster POWDER

Oysters taste good, whether they are served cooked in vinegar to make a kilaw, grilled and smothered in cheese and bacon bits, or lightly marinated with soy sauce and lemon and butter. While not for everyone, it cannot be denied that four (4) to five (5) medium-sized oysters can provide the recommended energy and nutrient intake of iron, copper, iodine, magnesium, calcium, zinc, manganese, and phosphorus. Now imagine mounds of oysters spanning the coastline, all uneaten and rotting under the sun. You might think, “What a waste”—and indeed it is an actual problem experienced by the people of Iloilo, who have more oysters than they know what to do with it.

Ms. Ernestina M. Peralta, Project Leader said a method of solving the problem is to process oysters at the Food Innovation Center (FIC) in Guimaras. There, the oysters can be processed in powder. Oyster powder, a shelf-stable product, can be an excellent source of taurine, zinc and glycogen and can be used in a variety of food preparations such as an ingredient that can be incorporated in snack food or a shelf-stable ready-to-use condiment.

When this innovation hits the shelves, the many other benefits of oysters will become readily accessible and convenient to the public. Those looking mainly for its flavor and nutritional benefits won’t have to worry about running to the wet market to get the freshest catch, not even the hassle of oyster shucking.



Cassava FLOUR

What if we tell you that there’s more to cassava than being a great dessert? Cassava is the third largest carbohydrate source in the Philippines and its products range from puto and suman balanghoy to cookies to espasol. It seems that the industry is ripe for growth and many initiatives are seeking to hasten this growth.

The Visayas State University (VSU) under Project Leader Dr. Daniel Leslie S. Tan sought to make flour out of cassava. Cassava flour can be an alternative to wheat flour. And good news to those with celiac disease and those allergic to gluten and wheat—the flour

is completely gluten-free. The VSU established the process of producing flour from cassava and designed and fabricated a complete line of processing equipment to mechanize the production process from washing of the cassava roots to flour production. To promote the utilization of the flour, the VSU also developed products using cassava flour such as cakes, cookies, bread sticks, and kakanin, in cooperation with a big bakeshop in Bohol which is into processing bakery products from cassava. Further, VSU also established the different applications of cassava flour and determined its nutritional composition. A complete cassava processing line will be built in Bohol and is soon expected to produce large quantities of cassava flour. The development of these facilities will improve the value of cassava, satisfy market demands, and generate additional employment opportunities in target communities.



Art and Science

Art and science are pursuits that might appear unrelated. However, both are essential to the health of a society, and each enhances the other.



Gitara ni JUAN

The guitar is believed to be introduced to the Philippine shores during the transpacific galleon trade back in the 16th century. Mexican luthiers migrated to the Philippines to expand their craft, imparting the art of guitar-making and guitar-playing to the Filipinos. This is why guitar luthiers and shops can be found all over our islands, especially in Cebu.

It is safe to say that, after more than 300 years of guitar-making, Filipino luthiers are masters of the craft of making and repairing guitars. However, there is yet no standard for design, consistency, intonation, sound quality, strength, stability and playability that all guitar-makers can adhere to, hence the uneven sound emitted by many locally made guitars. Additionally, the wood used is usually either cheaper with low quality ones or expensive, imported ones. These cause problems for the quality, accessibility, and affordability of our local entry-level guitars which prompt Filipinos to buy imported entry-level classical guitars instead—and this hampers our local guitar-making industry.

Enter Gitara ni Juan, which seeks to develop a prototype design and standardize the guitar-making process for quality entry-level classical guitars using select Philippine woods.

Gitara ni Juan is an 18-month (December 2014 to May 2016) joint project between the musicians of the UP College of Music, the UP Electronics and Engineering Institute, and wood experts from

the DOST. It focuses on refining the elements of guitar luthiering, from the wood used to the tools used.

The project's goal, according to Project Leader Asst. Professor Nathan Neil Manimtim of the UPD-College of Music, is to make an affordable guitar using local wood that exhibits sharper tones and smoother playability, with the endgame of boosting the livelihood of Filipino luthiers. It is also seen to make our local guitar-making industry more competitive. Further, it will also help our agriculture industry through the development of tree plantation farms, supplying the wood needed to make these guitars as well as providing jobs to farmers and local wood distributors. Ultimately, this will make learning the art of classical guitar-playing accessible to everyone in the country through quality and affordable entry-level classical guitars—something to start with.

Project Manager Ermie Bacarra articulates the “need to help the local guitar industry with regard to entry-level classical guitars”,





motioning to make our local guitars more competitive and affordable to match our foreign competitors. Hopefully, locals will choose the Philippine-made and propagate a sense of ownership and nationality in both luthiers and guitar players.

“The project aims to ultimately produce 12 prototype guitars made of different Philippine wood,” said Bacarra.” The team has so far made a practice guitar crafted from select local woods and a control guitar of conventional guitar materials, namely German spruce for the top, rosewood for the back and sides, mahogany for the neck, and ebony for the fingerboard. We will try to see if Philippine wood will do.”

Bacarra explained that the team first traveled the Philippines to gather data on how guitars are made in different parts of the country. Their conclusion is that different makers indeed have different processes.

The next step was to craft the classical guitar prototypes composed of local wood. These will be evaluated along with the control guitar in a series of qualitative tests such as listening and playing tests performed by professors and students of the UP College of Music. The viability of the wood, meanwhile, will be tested by conducting quantitative tests such as vibration tests, finite element analysis, modal analysis, and Chladni patterns on all the guitars,

including their raw materials.

The team also hired 26-year-old Dumaguete luthier William Alama to build the guitar prototypes and improvise certain tools for guitar making based on instructions the project team put together from their research, such as a prescribed process for all the parts and even the method of gluing. Improvisation of the tools was one effective and cheaper way for our local luthiers to make high quality guitars without having to purchase the expensive equipment required to make them. A sample tool Alama improvised is the mold for making the guitar body.

The final step is to compose a luthiering guide or compendium from the research and design output. The team plans to launch the locally made guitar prototypes in a recital at the UP College of Music’s concert hall in May 2016.

To showcase the project and its significance, the team participated in the National Science and Technology Week on July 24-28, 2015 at the SMX Convention Center. Booth visitors were given the chance to see the guitar-making process through constructible miniature guitars. Not only were they exposed to the science behind guitars, but they were also given a glimpse of the future of the local guitar industry through performances by guitar majors from the University of the Philippines College of Music.



Nat DYE

How would you like to wear the colors of the rainbow? Natural dyeing is an ancient skill passed down from generation to generation. Our ancestors extracted natural dyes from certain plants and minerals and used it to adorn crafts, clothes, fabrics, hair, and even the body.

Many of the indigenous tribes in the Philippines still practice this art, and it is apparent in the vibrant colors of the different traditional garb of each tribe. But according to Project Manager Joni Mae Gonzaga, even with this enduring knowledge, our local textile and garment industries have been hampered by a huge influx of imported textile and garments which actually are affordable to the masses.

The ancient art of natural dyeing is believed to be one of the keys to revitalizing our local textile industry. Refining the quality of locally made clothes and dyes and expanding the application of natural dyes to other industries can surely help with our economy and establish our local brand.

But first, how does one even produce natural dye for the mainstream in today's world of plastic and synthetics?

The NatDyes Center, also known as the Philippine Dyes and Color Innovation Center, under the DOST's Philippine Textile Research Institute (PTRI), seeks to scale up and expand the production and application of Philippine natural dyes on textiles.

Doing this requires:

1. Ensuring the sustainable supply, production, and trade of natural dyestuff and naturally dyed textiles for continued future use through establishment of NatDyes Hub in Occidental Mindoro and Abra and a Satellite Hub at Ilocos.
2. Scaling-up application of Philippine natural dyes on textiles using the existing design and machineries of local finishing/dyeing mills.
3. Developing nanodyes and pigments for textiles and other potential manufacturing applications.

Natural dyes are derived mostly from roots, berries, bark, leaves, and wood, and organic sources such as fungi and lichens. The PTRI has developed several dyes of potential, among them: red (coconuts and sampaloc), orange (mahogany and achuete), yellow (yellow ginger), green (mayana plant), blue (indigo plant), and black (talisay and gumamela).

PTRI's Ms. Nora Mangalindan, Project Leader, said the colorants make up the beginnings of a color library for natural dyes, as part of the NatDyes Center's projected Philippine Textiles and Dyes e-Portal that would serve as a location reference of dyeing hubs and handloom weaving communities. This will also provide brief info on the textile-related products of the communities in various regions of our country.



Contact information of the partner communities will also be part of this e-portal. This e-Portal will be completed in December 2015.

PTRI's existing spray drying equipment for the conversion of natural dye crude extract into powder form received an upgrade in the form of increased speed—from 3L/h to 10 L/h—and was tested to evaluate its efficiency in producing powdered dye.

Recently acquired additional equipment enables the NatDyes Center to conduct more comprehensive natural dyes properties and performance evaluations that include:

- Tannin content analysis of dye sources
- Colorimetric
- Colorfastness evaluations
- Extraction and purification of natural dyes

- Standardization
- Color ways development

The evaluation and quality assessment of dye sources and dyestuffs on actual textile application is also being conducted in the Center. PTRI has developed its own logo for the Natural Dyes which they applied for trademark.

In addition, for the ensured expansion of the project, a satellite NatDyes Center in Paoay, Ilocos Norte and NatDyes production hubs in Peñarubia, Abra and Sablayan, Occidental Mindoro, are being established. Locals have also done a mapping of their area where they could find possible sources of natural dyes to assure the sustainability of the NatDyes production. These hubs will cultivate the plants which are sources of NatDyes.

Weaving a stronger network

Knowing how to make natural dyes is one thing. Using them to revive our local garment and textile is an entirely different matter and requires more than just pigments and powders.

Gonzaga and fellow Project Manager Kristina Paula Anacleto stated that there are actually four projects under the PTRI. The first is for the improvement of innovative center for the textiles.

"The natural fiber blended yarns processed from the old machined has naps/excess fibers which in turn causes the roughness of the fabric," said Anacleto. "The new lines can produce even finer threads as a finished product—even with a natural fiber blend."

The second project seeks to establish handloom weaving centers in the regions. The project team from PTRI has evaluated a number of handloom weaving communities across the count to determine the Handloom Weaving Innovation Centers (HWICs), aside from the upright handlooms and ancillaries that will be given to.

The third is the NatDyes upscaling for textile application while Geosynthetics are those fabrics used in the construction industry used to ensure the stability of the terrains where the structures are built. The fourth project is on the expansion of the geo-textile testing services of PTRI to include the following tests: (1) CBR Puncture - measure of the force required to puncture a

geotextile; (2) Apparent Opening Size - reflect the apparent largest opening dimension available for soil to pass through.; (3) Water Permittivity – determine the quantity of water that can pass through a geotextile in an isolated condition; and (4) Tensile Strength for geogrids made of polypropylene which has a strength higher than 50 kN. With the increasing demand for geosynthetics in the country, private companies as well as those certified by the DPWH and PPA require the testing of analysis of geotextiles to ensure that those that will be used for construction projects meet the quality standards.

The market for Philippine natural dyes is expected to expand from textile to the food and cosmetics industries as more products such as food colorants and cosmetic formulations are developed. These four projects are meant to establish and become the pillars for a textile network stretching all across the country and connecting everyone from the raw material harvesters, dye processors, hand weavers, machine operators, consumers, and so on.





Natural COLORANTS

Color is a big part of the global market because of its wide range of applications. Color is a powerful form of communication because it can sway thinking, change actions, and cause reactions particularly in choosing the food we eat. In the food industry, colorant possessing organic quality is very attractive to consumers since inorganic ones sourced from petroleum tars are perceived to be harmful to humans. Consumers prefer natural colorants because they associate these with health and good quality.

Many of the currently authorized natural food colorants of either plant or animal origin have a number of disadvantages such as instability against light, heat, adverse pH, low water solubility and non-availability. Furthermore, their production is dependent on the availability and external supply of raw materials resulting in a great variation in the extracted colorant profile. In addition, issues like cost efficiency, labor, extensive land requirement and use of expensive solvent for extraction of colorants from higher plants are also under scrutiny.

Project Leader Ms. Fidez Tambalo, MS of BIOTECH said these problems can be addressed with the use of biotechnological tools involving microorganisms for the production of organic colorants. Microorganisms provide a readily available alternative source of such naturally derived food colorants that could easily be produced in high yields.

The advantages of pigment production from microorganisms include easy and fast growth in the cheap culture medium, independence from weather conditions and colors of different shades. Hence, microbial pigment production is now one of the emerging fields of research to demonstrate its potential for various industrial applications.

Among the approved food colors, the most widely used and consumed artificial dye is Red #40 named Allura Red and Red #3 or commonly known as Erythrosine Red. There have been reported health-related concerns on the use of these dyes such as chromosomal damage, lymphomas and hyperactivity, neurochemical and behavioral effects, thyroid tumors.

There is a need to search for alternative natural red color that is sustainable and safe for consumption. The adaptation of the production technology being developed by BIOTECH-UPLB to produce red color from *Monascus sp.* is a good start for the local production of industrially important microbial-based safe colorants. BIOTECH-UPLB is taking the

lead towards these goals through the development of technology of production of pigment from microorganisms that are safe to use.

It is envisioned that local production of microbial-based organic colorants is cheaper if not comparable to the imported and or synthetic ones. With an existing local manufacturer of specific industrially important microbial-based organic colorants, there will be savings on importation cost and an assured supply of the said products all time of the year. Moreover, a positive chain effect from manufacturers to end users will contribute to an overall positive growth of the economy. Employment will be generated not only from the local production of microbial-based organic compounds but also from its commercial applications.

Food coloring is now a USD 1.2 billion global market (2015), with natural colors capturing 31% of the food market, and growing at a rate of 5%. The world market for natural colors has increased by more than 29% in value in terms since 2006 (LIF William Reed Business Media SA, 2013). New food uses of natural colors include application in processed meats, marine products like fish paste, beverages, personal care products and others are being developed.

People and Events

We at PCIEERD consider our people to be our best assets. We encourage our top scientists to contribute to the economic growth of the country, and we nurture the talents of the PCIEERD team by providing training and other opportunities for growth.

BALIK SCIENTIST PROGRAM



The Balik Scientist Program (BSP), established in 1975, is a brain gain initiative of the Philippine government which seeks to encourage highly-trained overseas Filipino scientists & technologists, experts, and professionals to return to the Philippines and share their expertise for the acceleration of the scientific, agro-industrial and economic development of the country.

The BSP is now being implemented by the three (3) DOST Sectoral Councils: the Philippine Council for Health Research and Development (PCHRD), the Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development (PCAARRD), and the Philippine Council for Industry, Energy and Emerging

Technology Research and Development (PCIEERD) under the supervision of the Undersecretary for Research and Development (R&D).

In 2015, there were fourteen (14) short-term BSP awardees granted by the BSP-PCIEERD, seven (7) of whom had already completed their BSP engagement while the remaining seven (7) will complete their engagement in 2016. In addition, five (5) 2014 BSP short-term awardees and one (1) 2013 BSP long-term awardee completed their engagement in 2015. Dr. Marlon T. Conato, who is among the 2015 BSP Awardees is now fully repatriated in the country. He was hosted by the UP Diliman - Institute of Chemistry.

The BSP Awardees' contribution ranges from delivering lectures/seminars, formulating project proposals, providing consultancy services to DOST-funded projects; mentoring graduate students and researchers; publishing scientific papers; delivering classroom lectures/handling curricular offerings, donating laboratory equipment and a lot more.

The year 2015 also marked a milestone in BSP for hosting the 1st BSP Convention with the theme "From Global to Local: Sharing Expertise to Accelerate Development through Science, Technology and Innovation" held last 27 November 2015 at the InterContinental Manila Hotel. The convention gathered the BSP awardees, host institutions, researchers and academicians. Scientific presentations by BSP awardees highlighted current scientific developments in the agriculture, health, industry and energy sectors as well as in the emerging technologies, which the Balik Scientists have done in collaboration with their host institutions. The convention also showcased the big heart of our Balik Scientists through their testimonials and that of their host institutions about how the BSP has helped the institutions and how the program has impacted the lives of the Balik Scientists themselves.



BALIK PUSO. BALIK PILIPINAS. BALIK SCIENTIST.



DR. LEOREY O. MARQUEZ
UP DGE



Expertise:

- Nanotechnology
- GIS
- Statistics
- Systems Modeling

Contributions:

- 1 subject taught (GmE 222 Advanced GIS)
- 15 seminars and lectures conducted
- 5 journal-quality paper submitted for publication and accepted for International symposium



DR. SERGIO C. CAPAREDA
MMSU and UPLB



Expertise:

- Renewable energy
- Environment

Contributions:

- 8 seminars & lectures conducted
- 2 curriculum assisted
- 2 projects assisted and implemented
- 2 proposals developed
- 4 graduate students advised (Local)
- 7 graduate students hosted



DR. ANABELLE P. VILLALOBOS
CMU



Expertise:

- Health
- Biotechnology

Contributions:

- 25 seminars & lectures conducted
- 3 projects assisted
- 1 proposal developed
- 2 graduate students mentored
- 1 publication
- 53 instruments donated

BSP Awardees completed engagement in 2015



DR. ZENAÍDA V. MAGBANUA
UP NIMBB



Expertise:

- Biotechnology
- Genomics
- Gene Sequencing

Contributions:

- 10 seminars & lectures conducted
- 2 subjects taught (MBB 225 & 201)
- 1 projects assisted
- 3 protocols generated



DR. MANUEL V. HERNANDEZ, JR.
DOST - MIRDC



Expertise:

- Electronics
- Semi conductor
- Transportation

Contributions:

- 8 researchers mentored
- 2 PCIEERD projects assisted
- 4 seminars & lectures conducted



DR. GONZALO C. SERAFICA
UP Diliman, MSU-IIT,
DOST PNRI and ITDI



Expertise:

- Biocellulose Technology
- Technology Transfer Health
- Biotechnology

Contributions:

- Numerous seminars & lectures conducted
- Proposals writing in IP review
- Commercialization efforts
- IP awareness and technology transfer
- Reviewed technology portfolio
- Identified possible private partners
- Linking industry & university collaboration



DR. APOLLO C. ARQUIZA
DOST - FNRI



Expertise:
→ Biotechnology
→ Genomics Biological
→ Chemical and Environmental Engineering

Contributions:
→ 2 project proposals developed for possible funding
→ 2 FNRI projects assisted
→ 1 design of pilot-scale processing equipment for testing
→ 1 prototype of food for disaster product



DR. MARLON T. CONATO
UP IChem



Expertise:
→ Solid State Organic Chemistry
→ Metallo-organic Chemistry
→ Material Science

Contributions:
→ 5 seminars and lectures conducted
→ 3 PCIEERD funded projects consulted
→ 1 curriculum developed (Chem 319); 6 courses taught
→ 7 graduate students co-advised
→ 2 project proposals developed for possible funding



DR. ALDWIN M. ANTEROLA
UPLB BIOTECH



Expertise:
→ Biotechnology
→ Biosynthesis of natural products
→ Plant metabolic engineering

Contributions:
→ 5 seminars and lectures conducted
→ 2 DOST-funded projects consulted
→ 1 curriculum assisted (Plant BioChem)
→ 2 researchers hosted
→ 3 project proposals developed for possible funding



DR. MARY ANN B. GO
DOST - PSHS EVC



Expertise:
→ Neurophotonics

Contributions:
→ 2 seminars and lectures conducted
→ 32 teachers trained in optics and research workshop
→ 15 research papers supervised



DR. ALEJANDRO F. TONGCO
SLSU and UP Mindanao



Expertise:
→ Geographical Information System (GIS)

Contributions:
→ 2 workshops conducted
→ 1 curriculum developed (BS GIST)
→ 2 graduate students advised
→ 10 GIS-Engaged proposals for SLSU Funding



DR. VINCENT RICARDO M. DARIA
UP NIP and USC



Expertise:
→ Neurophotonics
→ Applied Physics

Contributions:
→ 8 seminars and lectures conducted
→ 1 possible project collaboration with USC and MSU-IIT



DR. MANUEL V. HERNANDEZ, JR.
DOST - MIRDC



Expertise:
→ Electronics
→ Semi conductor
→ Transportation

Contributions:
→ 8 researchers mentored
→ 2 v projects assisted
→ 4 seminars & lectures conducted



ENGR. LEO M. ALMAZAN
UP EEEL



Expertise:
→ Electronics
→ Military Intelligence
→ Systems Design
→ ICT

Contributions:
→ On-going



DR. ARMANDO S. QUITAIN
DLSU



Expertise:
→ Chemical Engineering
→ Supercritical Fluid
→ Microwave

Contributions:
→ On-going



DR. MAYROSE R. SALVADOR
UPOU and ADDU



Expertise:
→ Physical Science
→ Experimental learning kits for communities

Contributions:
→ On-going



DR. DANILO B. ROMERO
UP Baguio



Expertise:
→ Condensed-matter Physics
→ Optics
→ Materials science
→ Atomic Layer Deposition

Contributions:
→ On-going



DR. CONCEPCION A. REMOROZA
WMSU and UP - IChem



Expertise:
→ Chemistry
→ Carbohydrate
→ Chemistry Enzymology

Contributions:
→ On-going



DR. RICHARD D. ALORRO
UST



Expertise:
→ Metallurgy
→ Geo-environmental Engineering

Contributions:
→ On-going



MS. SHEILA E. DENNIS
DNA Analysis Laboratory -
UP Diliman



Expertise:
→ Forensic Science
→ Disaster Victim Identification (DVI)

Contributions:
→ On-going

“ Being a BSP Scientist provided the opportunity for me to return to the Philippines and put into reality my own personal sentiments about forensic science, the Philippines and the BSP program's tag line 'Balik Puso, Balik Pilipinas!' ”

- MS. SHEILA E. DENNIS
CY 2015 BSP, Forensic Biologist



PCIEERD MANAGEMENT TEAM

- 01
Engr. Nonilo A. Peña
Chief, Energy and Utilities Systems
Technology Development Division
(EUSTDD)
- 02
Engr. Albert G. Mariño
Chief, Policy Coordination and
Monitoring Division (PCMD)
- 03
Engr. Ermie Bacarra
Chief, Human Resource and Institution
Development Division (HRIDD)

- 04
Dr. Carlos Primo C. David
Executive Director, PCIEERD
- 05
Engr. Raul C. Sabularse
Deputy Executive Director
- 06
Ms. Sonia P. Cabangon
Chief Administrative Officer,
Finance and Administrative
Division (FAD)

- 07
Engr. Nelson P. Beniabon
Chief, Emerging Technology
Development Division (ETDD)

- 08
Engr. Niñaliza H. Escorial
Chief, Industrial Technology
Development Division (ITDD)

- 09
Ms. Carlota P. Sancho
Senior SRS
Policy Coordination and
Monitoring Division (PCMD)

- 10
Ms. Russell M. Pili
Chief, Research Information and
Technology Transfer Division
(RITTD)

// Our PMT meetings are normally long and could be sometimes intellectually draining but on the other hand intellectually stimulating. The atmosphere is always friendly and collegial. //

ERMIE M. BACARRA
Chief SRS, HRIDD

PCIEERD DIVISIONS



01 Mark Deniel D. Forbes; 02 Jesusita C. Venturina; 03 Carlos Primo C. David; 04 Rolly H. Pactores; 05 Carmella P. Dumali; 06 Rolando A. Yanquiling; 07 Raul C. Sabularse; 08 Maria Elena A. Talingdan; 09 Mary Ann P. Magnaye; 10 Jachin Jane O. Aberilla (Not in photo: Magdalena F. Frando)

Office of the Executive Director & Deputy Director (OED & ODED)

The Office of the Executive Director and the Deputy Executive Director oversees the operation of the Council. They are in-charge with the formulation and implementation of approved policies, plans, programs, rules and regulations and promotion of close coordination between government and private sectors. Under the Office of the Executive Director, is the Information Group which handles information dissemination, promotions and branding of the Council.

PCIEERD gives me training opportunities to enhance my skills. I aspire to grow in PCIEERD and I look forward to working with the best.

MARK DENIEL D. FORBES
Administrative Assistant I
OED & ODED

Policy Coordination and Monitoring Division (PCMD)

The 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.



01 Albert G. Mariño; 02 Cydsyl Ann Z. Prestado; 03 Edelyn Joy L. Gamalando; 04 George DC. Monroyo; 05 Joseph R. Escorial; 06 Tony Rose C. Tumaneng; 07 Lionel F. Tataro; 08 Ruel A. Pili; 09 Carlota P. Sancho; 10 John Ernie S. Evalle; 11 Arlene Romasanta; 12 John Keishner C. Romero; 13 Mark Anthony A. Zosa; 14 Mark Anthony Bathen

The best thing about working for PCIEERD is that I feel like I am among family. No matter how occupied we are with work, we get together to ask each other how we are.

TONY ROSE C. TUMANENG
Science Research Specialist II
PCMD – PCIEERD



01 Marietta Valdez; 02 May-Rose B. Pariñas; 03 Mary Joy C. Buitre; 04 Nelson P. Beniabon; 05 Clarina G. Reyes; 06 Desiree D. Vera; 07 Meraida D. Reyes; 08 Jezzel R. Jao; 09 Ruth Gonzales; 10 Roven D. Tumaneng I; 11 Erika Lorraine C. Gaw; 12 Dianne Remae C. San Pedro; 13 Danilo C. Pateño Jr.; 14 Arianne Jaraplasan; 15 Jenny Leigh A. Daquioag; 16 Janina Catrina H. Fuentes
(Not in photo: Diana Marie Jimenez-Leomo, Edna D. Nacianceno, Darwin V. Santos, Joanna G. Cruz)

Emerging Technology Development Division (ETDD)

The 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 biotechnology, genomics, materials science, electronics, information and communications technology, photonics technology, space technology applications and nanotechnology sectors

“In 2015, we practiced “Doing More with Less”. Programs and projects were managed at reduced cost with the help of the R&D team and experts of the S&T community.”

ETDD TEAM

Industrial Technology Development Division (ITDD)

The Industrial Technology Development Division (ITDD) formulates S&T sectoral plans, as well as coordinates, evaluates, and monitors R&D programs and projects relating to industrial processes, chemicals, food, textile and wood-based sectors, metals and engineering, mining and minerals, and environment sectors.

“My work experiences in PCIEERD strengthened my capabilities in terms of IT, project management, communication skills and leadership. Working at PCIEERD brings out the best in me!”

LAARNI T. PILOTON
Science Research Specialist II
ITDD – PCIEERD



01 Myrna M. Blah; 02 Stephanie Ann M. Blanco; 03 Ruby Raterta; 04 Fatima Jhoan Ibarreta; 05 Ma. Chelsea Clarisse Ugay; 06 Niñaliza H. Escorial; 07 Aleah P. Orendain; 08 Kristina Paula Y. Anacleto; 09 Glenn Ryan P. Asilum; 10 Grace F. Estillore; 11 Laarni T. Piloton; 12 Mark John N. Ratio; 13 Liz Ahren C. Peñaflor; 14 Mary Grace C. Buenavides; 15 Ronaldo Q. Dominguez; 16 Katrina B. Landicho; 17 Jonas Karl Liwanag; 18 Joni Mae D. Gonzaga; (Not in photo: Bianca C. Ignacio)



01 Carminda R. Tandelcarmen; 02 Julius C. Mayorga; 03 Engr. Emelita A.S. Dimapilis; 04 Ryan Christopher P. Viado; 05 Nonilo A. Peña; 06 Luthar James S. Co; 07 Sheila Marie M. Medina; 08 Carluz R. Bautista; 09 Marlon C. Aguilar (Not in photo: Loreto C. Carasi; Gladys Mae C. Alvarez; Kasfhi Nicole Patricio; Raymundo H. Habal; Rachel R. Habana; Patrick E. Montero)

Energy and Utilities Systems Technology Development Division (EUSTDD)

The Energy and Utilities Systems Technology Division (EUSTDD) formulates S&T sectoral plans, as well as coordinates, evaluates, and monitors R&D programs and projects relating to energy, disaster management, construction and transportation sectors.

Working at PCIEERD gives me a sense of purpose. I enjoy being able to contribute to national development through science and technology.

EMELITA A.S. DIMAPILIS
Senior Science Research Specialist
EUSTDD

Research Information and Technology Transfer Division (RITTD)

The Research Information and Technology Transfer Division (RITDD) 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.

Working for PCIEERD enables me to learn new things. We receive equal opportunities regardless of rank and position. I am glad to be part of this council.

EDWARD PAUL H. APIGO
Science Research Specialist II
RITTD-PCIEERD



01 Arlyn Joy P. Amata; 02 Jennifer D. Antonio; 03 Ms. Russell M. Pili; 04 Liezl D. Sueno; 05 Tarhata M. Mariano; 06 Norly B. Villar; 07 Efren V. Reyes; 08 Edward Paul H. Apigo; 09 Lanquin Seyer R. Gacusan



Human Resource and Institution Development Division (HRIDD)

The Human Resource and Institution Development Division (HRIDD) plans, develops, evaluates, and monitors R&D programs and projects that develop human resources and institutions in emerging S&T fields, industry, and energy.

01 Roxanne E. Delos Reyes; 02 Mary Joy A. Zabala;
03 Jerica A. Fernes; 04 Mary Joy G. Borromeo;
05 Ermie M. Bacarra; 06 Arnold Rey B. Gines;
07 Eidel Quinn T. Eda; 08 Annaliza R. Monterey;
09 Leonila P. Valdez; 10 Glenda Dorcas T. Sacbibit;
11 Arnel M. Bisnar (Not in photo: Jonathan G. Muñoz; Marie Christie B. Santos)

// As an ISO Certified institution, PCIEERD has clear cut mission, vision, policies, and workflows that guide its people in working for the attainment of the council's goals."

GLEND A DORCAS T. SACBIBIT
Senior SRS
HRIDD

Finance and Administrative Division (FAD)

The Finance and Administrative Division (FAD) handles personnel administration, supply, cash and property management, communications and records management, budgeting, and accounting.

// I feel proud working for PCIEERD because as we work together in the spirit of good service, PCIEERD brings out the best in us providing with all these amazing things for our enjoyment"

VILMA ROSA BORJA
Admin. Officer V – Cashier
FAD



01 Sonia S. De Leon; 02 Dayanara B. Herras; 03 Vilma Rose C. Borja; 04 Ena R. Conde;
05 Isidro V. Querubin Jr.; 06 Antonio L. Reduta; 07 Chingky N. Silvederio; 08 Julieta H. Lacsa;
09 Roland S. Rendon; 10 John Paul S. Canillas; 11 Alvin Sabanal; 12 Jayson Ryan G. Salunson;
13 Anthony D. Dela Cruz; 14 Emmanuell Marcelino; 15 Mildred F. Cabradilla; 16 Dondon Santiano;
17 Alex R. Gesmundo; 18 Allen Z. Manibog; 19 Elaine Annette C. Salma; 20 Divina B. Almazar;
21 Grace Sablan; 22 Marissa G. Dalay; 23 Nomer T. Evangelista; 24 Joselito B. Velasquez;
25 Leslie John A. Nuyda; 26 Queenie Anne Gacayan; 27 Charlemagne P. Valdez; 28 Emmerick C. Quema;
29 Aileen L. Ventura; 30 Anna Margarita B. Isidro; 31 Mary Ann F. Bangunan (Not in Photo: Sonia P. Cabangon)

GOVERNING COUNCIL

The Governing Council (GC) serves as the policy-making body of PCIEERD. The GC is responsible for policy and broad management decisions in setting the national development goals, plans and priorities for research in the priority areas of PCIEERD.

Item 19 of the Approved Rationalization Plan specifies the composition of the PCIEERD GC. It is headed by the DOST Secretary as ex-officio Chairman and the Secretary or the designated representatives of the Departments of Trade and Industry, Energy, Transportation and Communications, Public Works and Highways and Budget and Management, the Commission on Higher Education and the PCIEERD Executive Director; and five (5) representatives from the private sector who represent the industry, energy and emerging technology sectors, as members. Representatives from the private sector are appointed by the President upon the recommendation of the DOST Secretary. They serve for a term of two years.



Dr. Minella C. Alarcon



Ms. Remedios V. Baclig



Dr. Arthur N. Cacdac



Dr. Antonio B. Villaflor



Dr. Judy F. Sese



Engr. Ramon N. Santos



Dr. Ameurfina D. Santos



Dir. Jesus T. Tamang

NOT PHOTOGRAPHED:
Dir. Felicisimo Pangilinan, Jr.
Dir. Ma. Corazon H. Dichosa

“PCIEERD is unarguably one of the government’s premier institutions that provides the fundamental link between innovative ideas and emerging technologies and beneficial industrial applications that stimulate national progress. Through the provision of fiscal support and technical guidance involving in-house and industry experts, PCIEERD provides the conducive environment wherein novel proposals and creative solutions are incubated and nurtured for development and applications contributing to technological advancement and national progress.”

Engr. Ramon N. Santos

SEMINARS / TRAININGS / SCHOLARSHIP PROGRAMS 2015

OED/OED

Name	Status	Training/Seminar Attended	Date	Venue
DAVID, Carlos Primo C.	P	PHL-MICROSAT: Development of the Philippine Scientific Earth Observation Microsatellite, Project 1-Microsatellite Bus Development	October 27 - November 3, 2015	Japan
SABULARSE, Raul C.	P	"ASEAN Policy Framework on Private Sector Partnerships for Technology Development and Innovation	October 20 - 22, 2015	Jakarta, Indonesia
		19th Intergovernmental Consultative Committee on the Regional Space Applications Programme for Sustainable Development and 4th Session of the Committee on Disaster Risk Reduction	October 26 - 29, 2015	Bangkok, Thailand
		7th meeting of the ASEAN - Russia Working Group on Science and Technology (ARWGST-7)	September 23 - 24, 2015	Moscow, Russia
VENTURINA, Jesusita C.	P	Technical Report Writing	July 6 - 7, 2015	DOST ADMATEL
YANQUILING, Rolando A.		Technical Report Writing	July 6-7, 2015	DOST ADMATEL
		Risk Management based on 31000: 9001	August 25, 2015	MIRDC
TALINGDAN, Maria Elena A.	P	2nd APEC Young Scientists Workshop on Effective Science Communication in the 21st Century	September 30 - October 1, 2015	Putrajaya, Malaysia
FRANDO, Magdalena F	P	Basic Indexing and Abstracting and SILMS Retraining	October 29, 2015	Shogun Hotel, Pasay City
FORBES, Mark Deniel	C	Basic Indexing and Abstracting and SILMS Retraining	October 29, 2015	Shogun Hotel, Pasay City
MAGNAYE, Mary Ann P.	C	Technical Report Writing	July 6-7, 2015	DOST ADMATEL
ATUN, Raquel O.	C	Technical Report Writing	July 6-7, 2015	DOST ADMATEL
ABERILLA, Jachin Jane O.	C	"LIKHA PILIPINAS: The 1st Philippine Multi-Disciplinary Summit on Creativity and Innovation"	October 13 - 14, 2015	CCP & DLSU, Manila
		Feature Writing 101	October 17, 2015	Fully Booked, Bonifacio Global City
DUMALI, Carmella P.	C	"LIKHA PILIPINAS: The 1st Philippine Multi-Disciplinary Summit on Creativity and Innovation"	October 13 - 14, 2015	CCP & DLSU, Manila

PCMD

Name	Status	Training/Seminar Attended	Date	Venue
MARIÑO, Albert G.	P	63rd National Conference of Philippine Society for Mechanical Engineers	October 21-24, 2015	SM Convention Center, Pasay City
ESCORIAL, Joseph R.	P	Strategic and Critical Thinking	April 22 - 23, 2015	Berhaya Hotel, Makati City
		Technology and Policy Program (TAP) for Asian Countries	March 23 - April 15, 2015	Korea
		Technical Report Writing	July 6 - 7, 2015	DOST ADMATEL
		Course on Basic Policy Process	November 11-13	Pasig City
ROMASANTA, Arlene A.	P	Business Analytics Training	May 5 - 8, 2015	De La Salle Dasma, Cavite
		Technical Report Writing	July 6 - 7, 2015	DOST ADMATEL
		Risk Management based on 31000: 9001	August 25, 2015	MIRDC

Name	Status	Training/Seminar Attended	Date	Venue
SANCHO, Carlota P.	P	Technical Report Writing	July 6 - 7, 2015	DOSTADMATEL
		LIKHAPILIPINAS: The 1st Philippine Multi-Disciplinary Summit on Creativity and Innovation	October 13 - 14, 2015	CCP & DLSU, Manila
TUMANENG, Tony Rose C.	C	Technical Report Writing	July 6 - 7, 2015	DOSTADMATEL
PILI, Ruel A.	C	Core Functions of Records Mnagement Standards and Best Practices	May 19 - 21, 2015	Hotel Supreme Convention Plaza Baguio City
		Technical Report Writing	July 6 - 7, 2015	DOSTADMATEL

HRIDD

Name	Status	Training/Seminar Attended	Date	Venue
BACARRA, Ermie M.	P	Practical Applications of the Earth Remote Snesting Technologies to Solve Social and Economic Challenges	March 25 - 26, 2015	Research Center for Earth Operative Monitoring, Moscow, Russia
		1st NFEC S&T Infrastructure Innovation Program for High Level Policy Makers	November 23 - 27, 2015	Daejeon, Korea
EDA, Eidel Quinn T.	P	Technical Report Writing	July 6 - 7, 2015	DOSTADMATEL
		ACRS 3025: The 36th Asian Conference on Remote Sensing	October 19 - 23, 2015	Crowne Plaza, Quezon City
		22nd Session of the Asia-Pacific Regional Space Agency Forum	November 28-December 4, 2015	Bali, Indonesia
SACBIBIT, Glenda D. T.	P	ACRS 3025: The 36th Asian Conference on Remote Sensing	October 19 - 23, 2015	Crowne Plaza, Quezon City
		22nd Session of the Asia-Pacific Regional Space Agency Forum	November 28-December 4, 2015	Bali, Indonesia
SANTOS, Marie Christie B.	P	Technical Report Writing	July 6-7, 2015	DOSTADMATEL
		ACRS 3025: The 36th Asian Conference on Remote Sensing	October 19-23, 2015	Crowne Plaza, Quezon City
BISNAR, Arnel	P	Technical Report Writing	July 6 - 7, 2015	DOSTADMATEL
		ACRS 3025: The 36th Asian Conference on Remote Sensing"	October 19 - 23, 2015	Crowne Plaza, Quezon City
BORROMEO, Mary Joy	C	Feature Writing 101	October 17, 2015	Fully Booked, Bonifacio Global City
DELOS REYES, Roxanne	C	Technical Report Writing	July 6-7, 2015	DOSTADMATEL
MONTEREY, Annaliza R.	C	Financial Statement and Analysis	October 21, 2015	PTTC, Pasay City

EUSTDD

Name	Status	Training/Seminar Attended	Date	Venue
CARASI, Loreto C.	P	Study Tour: South Korea's Bus System	April 8 - 10, 2015	South Korea
DIMAPILIS, Emelita A.S.	P	Asia Pacific regional Workshop on Biomass Energy Resource Assessment and Biomass Open Research Forum	July 6 - 10, 2015	Bangkok, Thailand
		ASEAN - Russia Energy Dialogue on Renewable Energy	November 18 - 20, 2015	Nay Pyi Taw, Myanmar
HABAL, Raymundo H.	P	International Seminar on Natural Disaster Mitigation with Geosynthesis and other Advanced Methods	August 27 - 28, 2015	UP Diliman, Quezon City

Name	Status	Training/Seminar Attended	Date	Venue
MONTERO, Patrick E.	P	Global Warming Mitigation and Adaptation by Balancing Sustainable Energy Management	June 3 - 19, 2015	Thailand
		US-Singapore Third Country Training Program - Financing Energy Efficient Buildings	September 28 - 30, 2015	Singapore
		Interregional Group Fellowship Training on Comprehensive Introduction to Nuclear Power	November 28-December 18, 2015	Texas, USA
PEÑA, Nonilo A.	P	APEC Innovation Platform	March 9 - 13, 2015	Song-do, Incheon, Korea
TANDELCARMEN, Carminda R.	P	Climate Change and Energy Sustainability	October 5 - 16, 2015	Singapore
VIADO, Ryan Christopher P.	P	FORUM 2015: Global Forum on Research and Innovation for Health	August 24 - 27, 2015	PICC Complex, Pasay City
HABANA, Rachel R.	P	Study Tour: South Korea's Bus System	April 8 - 10, 2015	South Korea
		Heat Resistance Test	March 2 - 4, 2015	Malaysia
		11th International Conference of Eastern Asia Society for Transportation Studies (EASTS 2015)	September 11 - 14, 2015	Radisson Blu Hotel, Cebu City
		APEC Cooperative Forum on Internet Vehicles (IoV) and its Worldwide Application Implementation	October 19 - 21, 2015	Shenzhen, China
CO, Luthar James S.	C	4th Philippine EV Summit 2015: Sustaning the Gains in the Philippine Electric Vehicle Development	February 26 - 27, 2015	Meralco Compd., Ortigas, pasig City
		Technical Report Writing	July 6 - 7, 2015	DOSTADMATEL
		11th International Conference of Eastern Asia Society for Transportation Studies (EASTS 2015)	September 11 - 14, 2015	Radisson Blu Hotel, Cebu City
		63rd National Conference of Philippine Society for Mechanical Engineers	October 21 - 24, 2015	SM Convention Center, Pasay City
PATRICIO, Kasfhi Nicole	C	ACRS 3025: The 36th Asian Conference on Remote Sensing	October 19-23, 2015	Crowne Plaza, Quezon City
FLORIDO, Lucky John	C	4th Philippine EV Summit 2015: Sustaning the Gains in the Philippine Electric Vehicle Development	February 26-27, 2015	Meralco Compd., Ortigas, pasig City
		Technical Report Writing	July 6-7, 2015	DOSTADMATEL
AGUILAR, Marlon C.	C	Technical Report Writing	July 6-7, 2015	DOSTADMATEL
		11th International Conference of Eastern Asia Society for Transportation Studies (EASTS 2015)	September 11-14, 2015	Radisson Blu Hotel, Cebu City
		63rd National Conference of Philippine Society for Mechanical Engineers	October 21-24, 2015	SM Convention Center, Pasay City
CHAVEZ, Gladys Mae H.	P	2015 Disaster Tools and Exchange Workshop	August 1-10, 2015	Pittsburgh, PA, USA
		ACRS 3025: The 36th Asian Conference on Remote Sensing	October 19-23, 2015	Crowne Plaza, Quezon City
BAUTISTA, Carluz	C	Technical Report Writing	July 6 - 7, 2015	DOSTADMATEL
		International Seminar on Natural Disaster Mitigation with Geosynthesis and other Advanced Methods	August 27 - 28, 2015	UP Diliman, Quezon City
MAYORGA, Julius	C.	Technical Report Writing	July 6 - 7, 2015	DOSTADMATEL
		63rd National Conference of Philippine Society for Mechanical Engineers	October 21 - 24, 2015	SM Convention Center, Pasay City

Name	Status	Training/Seminar Attended	Date	Venue
BENIABON, Nelson P.	P	63rd National Conference of Philippine Society for Mechanical Engineers	October 21 - 24, 2015	SM Convention Center, Pasay City
NACIANCENO, Edna C.	P	30th Philippine Chemistry Congress: ASEAN Chemistry in Resonance	April 15 - 17, 2015	Ateneo De Davao University, Davao City
		Technical Report Writing	July 6 - 7, 2015	DOST ADMATEL
		The Philippine 3D Printing and Digifab Expo and Conference 2015	August 7 - 8, 2015	SMX Convention Center, SM Aura, Taguig City
PARINAS, May-Rose B.	P	Technical Report Writing	July 6 - 7, 2015	DOST ADMATEL
		ACRS 3025: The 36th Asian Conference on Remote Sensing	October 19 - 23, 2015	Crowne Plaza, Quezon City
		Geo-informatics Technology for Environmental and Disaster Monitoring Training Course	October 28 - 30, 2015	Chon Buri Province, Thailand
REYES, Clarinda G.	P	"ACRS 3025: The 36th Asian Conference on Remote Sensing"	October 19 - 23, 2015	Crowne Plaza, Quezon City
		22nd Session of the Asia-Pacific regional Space Agency Forum	November 28- December 4, 2015	Bali, Indonesia
REYES, Meraida D.	P	Technical Report Writing	July 6 - 7, 2015	DOST ADMATEL
		FORUM 2015: Global Forum on Research and Innovation for Health	August 24 - 27, 2015	PICC Complex, Pasay City
		42nd PSBMB	December 3 - 4, 2015	CEU, Manila
SANTOS, Darwin V.	P	The Philippine 3D Printing and Digifab Expo and Conference 2015	August 7 - 8, 2015	SMX Convention Center, SM Aura, Taguig City
VERA, Desiree D.	P	30th Philippine Chemistry Congress: ASEAN Chemistry in Resonance	April 15- 17, 2015	Ateneo De Davao University, Davao City
		ASEAN Food Conference 2015	June 24 -26, 2015	SMX Convention Pasay City
		Technical Report Writing	July 6 - 7, 2015	DOST ADMATEL
		FORUM 2015: Global Forum on Research and Innovation for Health	August 24 - 27, 2015	PICC Complex, Pasay City
		LIKHAIPILIPINAS: The 1st Philippine Multi-Disciplinary Summit on Creativity and Innovation	October 13 - 14, 2015	CCP & DLSU, Manila
BUITRE, Mary Joy C.	C	ACRS 3025: The 36th Asian Conference on Remote Sensing	October 19 - 23, 2015	Crowne Plaza, Quezon City
		Geosmart Asia 2015	September 29 - October 1, 2015	Kuala Lumpur, Malaysia
LEOMO, Diana Marie J.	C	7th Asian Computational Materials Design Workshop	March 19 - 21, 2015	De La Salle University- Science and Technology Complex, Biñan, Laguna
		Technical Report Writing	July 6 - 7, 2015	DOST ADMATEL
		LIKHAIPILIPINAS: The 1st Philippine Multi-Disciplinary Summit on Creativity and Innovation	October 13 - 14, 2015	CCP & DLSU, Manila
FUENTES, Janina Catrina H.	C	Digital Strategies for Development Summit 2015 Accelerating Inclusive Development through ICT Innovation"	September 22 - 24, 2015	Waterfront Hotel, Cebu City

Name	Status	Training/Seminar Attended	Date	Venue
GONZALES, Ruth A.	C	Core Functions of Records Mnagement Standards and Best Practices	May 19 - 21, 2015	Hotel Supreme Convention Plaza Baguio City
JAO, Jezza R.	C	Technical Report Writing	July 6 - 7, 2015	DOST ADMATEL
		LIKHAIPILIPINAS: The 1st Philippine Multi-Disciplinary Summit on Creativity and Innovation	October 13 - 14, 2015	CCP & DLSU, Manila
		42nd PSBMB	December 3 - 4, 2015	CEU, Manila
GAW, Erika Lorraine E.	C	7th Asian Computational Materials Design Workshop	March 19 - 21, 2015	De La Salle University- Science and Technology Complex, Biñan, Laguna
		30th Philippine Chemistry Congress: ASEAN Chemistry in Resonance	April 15-17, 2015	Ateneo De Davao University, Davao City
		Bioinformatics Lecture Series Introduction to Next Generation Sequencing Data Analysis	September 11, 2015	National Science Complex, UP Diliman
		42nd PSBMB	December 3 - 4, 2015	CEU, Manila
VALDEZ, Marietta	C	LIKHAIPILIPINAS: The 1st Philippine Multi-Disciplinary Summit on Creativity and Innovation	October 13 - 14, 2015	CCP & DLSU, Manila
DAQUIOAG, Jenny Leigh A.	C	LIKHAIPILIPINAS: The 1st Philippine Multi-Disciplinary Summit on Creativity and Innovation	October 13 - 14, 2015	CCP & DLSU, Manila

Name	Status	Training/Seminar Attended	Date	Venue
PILI, Russell	P	"Training Course on Technology Commercialization"	March 23-April 1, 2015	United Kingdom
		"Policy Framework on Private Partnership for Technology Development and innovation	May 20-22, 2015	Bangkok, Thailand
		"ASEAN Policy Framework on Private Sector Partnerships for Technology Development and Innovation	October 20-22, 2015	Jakarta, Indonesia
TALINGDAN, Maria Elena A.	P	APEC Young Scientist Workshop on Effective Science Communication in the 21st Century	March 16 - 17, 2015	Malaysia
VILLAR, Norly B.	P	GO NEGOSEM NEGOSYO BASICS SEMINAR	April 17, 2015	Mandaluyong City
		ASEAN-German Project "How to bring ideas to the market: push or pull?"	March 10 - 12, 2015	Jakarta, Indonesia
		WIPO professional Development program - Colloquim on Transfer of Technology and Licensing (CEITI-TT-Strasbourg 2015)	June 16 - 26, 2015	Strasbourg, France
MARIANO, Tarhata	P	76th PICHe National Convention	February 18 - 21, 2015	Puerto Princesa, Palawan

Name	Status	Training/Seminar Attended	Date	Venue
AMATA, Arlyn Joy P.	P	Basic Photography Workshop	February 16 - 20, 2015	FPPF Art Chamber inside Fort Santiago, Intramuros, Manila
		Dealing with Media Effectively for Efficient PR Work	February 26 - 27, 2015	Marco Polo Hotel, Ortigas Center, Pasig City
		32nd Strategic marketing Course	June 20 - July 26, 2015 (6 Saturdays)	UP Diliman, Quezon City
APIGO, Edward Paul H.	P	GO NEGOSEM NEGOSYO BASICS SEMINAR	April 17, 2015	Mandaluyong City
		2nd Financial Management for Entrepreneurship and Investment (FINEST)	June 20 - July 26, 2015 (6 Saturdays)	UP Diliman, Quezon City
GACUSAN, Lanquin Seyer R.	C	Basic Photography Workshop	February 16 - 20, 2015	FPPF Art Chamber inside Fort Santiago, Intramuros, Manila
ALCASID, Edgilyn	C	Dealing with Media Effectively for Efficient PR Work	February 26 - 27, 2015	Marco Polo Hotel, Ortigas Center, Pasig City
SUENO, Leizl D..	C	ASEAN-German Project "How to bring ideas to the market: push or pull?"	March 10 - 12, 2015	Jakarta, Indonesia
		ASEAN Policy Framework on Private Sector Partnerships for Technology Development and Innovation	October 20 - 22, 2015	Jakarta, Indonesia

Name	Status	Training/Seminar Attended	Date	Venue
BANGUNAN, Mary Ann F.	P	Financial Statement and Analysis	October 21, 2015	PTTC, Pasay City
BORJA, Vilma Rose C.	P	3rd PAGBA Quarterly Seminar and Meeting	November 4-7, 2015	PTTC, Pasay City
CABANGON, Sonia P.	P	Training on Internal Control Structure	June 9-11, 2015	COA, Quezon City
		37th Annual National Convention:GACPA Leads, Excels and Adheres to Professional Standards	April 15-18, 2015	Lanang, Davao City
CABRADILLA, Mildred F.	P	Public Sector HR Symposium and PSTD National Convention	May 27 - 29, 2015	Waterfront Hotel, Lahug, Cebu City
		Technical Report Writing	July 6 - 7, 2015	DOST ADMATEL
		Training on Management of R&D Talents in the DOST	October 13 - 15, 2015	MIRDC Auditorium, MIRDC Compd.
		5th Convention of Human Resource Management Practitioner	December 1-3, 2015	Camp John Hay, Baguio City
CONDE, Ena R.	P	Technical Report Writing	July 6-7, 2015	DOST ADMATEL
		Formulating and Writing a Recordkeeping Policies and Procedures Handbook	December 1-3, 2015	Naga City, Camarines Sur
DALAY, Marissa G.	P	"COA Capacity Training"	February 9-13, 2015	PDC, COA, Quezon City.
		Technical Report Writing	July 6-7, 2015	DOST ADMATEL
		Bolstering Good Governance though Public Expenditure Reforms	October 21-24, 2015	Aziza Hotel, Puerto Princesa
DE LEON, Sonia S.	P	3rd PAGBA Quarterly Seminar and Meeting	November 4-7, 2015	PTTC, Pasay City

Name	Status	Training/Seminar Attended	Date	Venue
GESMUNDO, Alex R.	P	Technical Report Writing	July 6-7, 2015	DOST ADMATEL
LACSA, Julieta H.	P	COA Capacity Training	February 9-13, 2015	PDC, COA, Quezon City.
VENTURA, Aileen L.	P	COA Capacity Training	February 9-13, 2015	PDC, COA, Quezon City.
ALMAZAR, Divina B.	C	Withholding Tax Compliance and Gov't Compensation & Public Personnel Administration	May 25-28, 2015	Bohol Tropics, Tagbilaran City
		Technical Report Writing	July 6-7, 2015	DOST ADMATEL
		Formulating and Writing a Recordkeeping Policies and Procedures Handbook	December 1-3, 2015	Naga City, Camarines Sur
GACAYAN, Queenie Ann A.	C	Technical Report Writing	July 6-7, 2015	DOST ADMATEL
		5th Convention of Human Resource Management Practitioner	December 1-3, 2015	Camp John Hay, Baguio City
QUEMA, Emmeric C.	C	3rd PAGBA Quarterly Seminar and Meeting	November 4 - 7, 2015	PTTC, Pasay City
QUERUBIN, Isidro V.	P	COA Capacity Training	February 9-13, 2015	PDC, COA, Quezon City.
		The Philippine Budgeting System	November 4-6, 2015	Hotel Kimberly, Manila
SALMA, Elaine Annette C.	C	Withholding Tax Compliance and Gov't Compensation & Public Personnel Administration	May 25-28, 2015	Bohol Tropics, Tagbilaran City
		COA Capacity Training	February 9-13, 2015	PDC, COA, Quezon City.
		Technical Report Writing	July 6-7, 2015	DOST ADMATEL
SALUNSON, Jayson Ryan G.	C	Financial Statement and Analysis	October 21, 2015	PTTC, Pasay City
SILVEDERIO, Chingky N.	C	37th Annual National Convention:GACPA Leads, Excels and Adheres to Professional Standards	April 15-18, 2015	Lanang, Davao City
VALDEZ, Charlemagne P.	C	Technical Report Writing	July 6-7, 2015	DOST ADMATEL
NUYDA, Leslie John A.	C	Internal Control System for Property and Supply Management	May 20-22, 2015	Hotel Kimberly, Manila
CANILLAS, John Paul	C	Internal Control System for Property and Supply Management	May 20-22, 2015	Hotel Kimberly, Manila
SABLAN, Grace I	C	Basic Internal Control Concepts and Internal Auditing Principles and Practices	April 21-23, 2015	Hotel Kimberly, Manila
		"The Future of Philippine Taxation and ASEAN Integration 2015: Reforms and Implementation"	February 27, 2015	ACCM, Makati City
		"The Philippine Budgeting System"	November 4-6, 2015	Hotel Kimberly, Manila
ISIDRO, Anna Margarita	C	Accounting and Auditing Standards	April 28-30, 2015	Hotel Kimberly, Manila
		Bolstering Good Governance though Public Expenditure Reforms	October 21-24, 2015	Aziza Hotel, Puerto Princesa
MARCELINO, Emmanuelle M.	C	Technical Report Writing	July 6-7, 2015	DOST ADMATEL

Name	Status	Training/Seminar Attended	Date	Venue
ESCORIAL, Niñaliza H.	P	Regional Development and Mining	March 2-13, 2015	Manila
		FORUM 2015: Global Forum on Research and Innovation for Health	August 24-27, 2015	PICC Complex, Pasay City
		Mining Philippines 2015 International Conference and Exhibition	September 15-17, 2015	Solaire Resort and Casino, Manila Philippines
		Training on Management of R&D Talents in the DOST	October 13-15, 2015	MIRDC Auditorium, MIRDC Compd.
ESTILLORE, Grace F.	P	FORUM 2015: Global Forum on Research and Innovation for Health	August 24-27, 2015	PICC Complex, Pasay City
LANDICHO, Katrina B.	P	Technical Report Writing	July 6-7, 2015	DOST ADMATEL
		Regional Development and Mining	March 2-13, 2015	Manila
		Mining Philippines 2015 International Conference and Exhibition	September 15-17, 2015	Solaire Resort and Casino, Manila Philippines
PILOTON, Laarni T.	P	76th PIChE National Convention	February 18-21, 2015	Puerto Princesa, Palawan
		Technical Report Writing	July 6-7, 2015	DOST ADMATEL
IBARRETA, Fatima Jhoan	P	ASEAN Food Conference 2015	June 24 -26, 2015	SMX Convention Pasay City
ANACLETO, Kristina Paula Y.	P	Technical Report Writing	July 6-7, 2015	DOST ADMATEL
		PRRI/BAR/IRRDB International Conference on Rubber Agronomy and Transfer of Technology	August 25-27, 2015	Limketkailuxe Hotel, Cagayan De Oro City
		ISO/IEC 17025:2005 The Standard for Laboratory Competence	October 21, 2015	PTTC, Pasay City
BLANCO, Stephanie Ann M.	C	Technical Report Writing	July 6-7, 2015	DOST ADMATEL
		"LIKHAPILIPINAS: The 1st Philippine Multi-Disciplinary Summit on Creativity and Innovation"	October 13-14, 2015	CCP & DLSU, Manila
ORENDAIN, Aleah M.	C	76th PIChE National Convention	February 18-21, 2015	Puerto Princesa, Palawan
		ASEAN Food Conference 2015	June 24 -26, 2015	SMX Convention Pasay City
		Technical Report Writing	July 6-7, 2015	DOST ADMATEL
		Formulating and Writing a Recordkeeping Policies and Procedures Handbook	December 1-3, 2015	Naga City, Camarines Sur
IGNACIO, Bianca C	C	Technical Report Writing	July 6-7, 2015	DOST ADMATEL
		PRRI/BAR/IRRDB International Conference on Rubber Agronomy and Transfer of Technology	August 25-27, 2015	Limketkailuxe Hotel, Cagayan De Oro City
		"ISO/IEC 17025:2005 The Standard for Laboratory Competence	October 21, 2015	PTTC, Pasay City
LIWANAG, Jonas Karl C.	C	LIKHAPILIPINAS: The 1st Philippine Multi-Disciplinary Summit on Creativity and Innovation	October 13-14, 2015	CCP & DLSU, Manila
		SMEP Metallurgical Conference 2015	October 22-24, 2015	Elfisher Hotel, Bacolod City
ASILUM, Glenn Ryan	C	SMEP Metallurgical Conference 2015	October 22-24, 2015	Elfisher Hotel, Bacolod City

Training/Seminar	Date	Venue
Technical Report Writing	July 6-7, 2015	ADMATEL Bldg. DOST Compound
Professional Excellence Assistant Workshop	October 29, 2015	SEI Training Room, DOST Compound
Financial Literacy and Investment Seminar	December 16, 2015	Acacia Hotel Manila

SUMMARY OF APPROVED DEGREE PROGRAMS AND THESIS GRANTS

Name	Degree Program	School
Rolando A. Yanquiling	Master in Information System	Asia Pacific College
Marie Christie B. Santos	Master in Information System	Asia Pacific College
Darwin V. Santos	Master in Information System	Asia Pacific College
Laarni T. Piloton	Thesis Grant: Factors Affecting Project Management Efficiency of PCIEERD-Assisted S&T Projects (MS in Management Engineering)	Adamson University

Linkages

PCIEERD has a strong local and international network.

United Nations Industrial Development Organization (UNIDO)

Technical cooperation on its three (3) main thematic areas, namely, poverty reduction through productive activities, trade capacity-building, and energy & environment.

ASEAN Sub-Committee on Materials Science and Technology (SCMST)

The sub-committee aims to undertake R&D collaboration, develop a technology information network as well as mechanisms for technical consultations for industrial concerns, technology transfer and exchange of human resources for R&D work.

ASEAN Sub-Committee on Space Technology and Applications (SCOSA)

Participates in enhancing the ASEAN space technology applications and in expanding the activity of the sub-committee beyond remote sensing.

ASEAN Sub-Committee on Sustainable Energy Research (SCSER)

Undertakes research, development, and demonstration projects in energy technologies and management in natural gas utilization technology, biomass/biogas technology, clean coal technology, solar/wind/micro-hydro energy technology and energy efficiency technology.

United Nations Economic and Social Commission for Asia and the Pacific (UN-ESCAP)

Participates in and benefits from other member states in promoting inclusive and sustainable

economic and social development through partnerships and agreements.

Asian Association on Remote Sensing

Exchange of information, mutual cooperation and international understanding and goodwill.

Municipal Solid Waste Sub-Committee

Cooperates in formulating sector action plans in relation to the focus of the sub-committee on the four sources of methane emissions, such as, coal mines, landfills, oil and gas systems, and animal waste management

Agriculture Sub-Committee

Cooperates in formulating sector action plans and help in building capacity, develop strategies and markets, and remove barriers to methane mitigation project development.

J-rapid Framework

Collaborative research/investigation activities with Japanese researchers regarding natural or anthropogenic disasters and similar unanticipated events.

E-Asia

Strengthens research and development capabilities towards resolution of shared challenges across the region, including those associated with environmental protection, natural disaster mitigation and infectious diseases prevention.

Manila Economic and Cultural Office - Taipei Economic and Cultural Office (MECO-TECO)

Joint research/study, exchange of scientists/technical experts, capacity building, scientific and technical access to facilities, provision of professional services, organization of scientific conferences, symposia, training courses, workshops & exhibitions, and the Sandwich Scholarship Program (SSP).

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Cooperates in formulating the ASEAN policy framework

British Council - PCIEERD (Newton Fund)

Supports science and innovation collaboration with UK in the following programmes: Institutional Links, Researcher Links, and Professional Development and Engagement

Presidential Mineral Industry Environmental Award (PMIEA)

Participate as a member of the selection committee for the best mining companies in various categories such as mine safety, mineral processing and etc.

Mining Industry Coordinating Council (MICC)

Participates in the assessment and review of all mining-related laws, rules and regulations, issuances, and agreements with the view to formulating recommendations.

Philippine Rubber Industries Association, Inc. (PRIA)

The Process Sector currently has very active linkages for the rubber, cacao, and chemicals industry. One of which is the Philippine Rubber Industries (PRIA). PRIA is composed of companies from diverse fields in the manufacturing, trading, planting & processing of rubber. Through their member companies, the association has been continuously providing technical assistance as well as networks to the "National R&D Program for Natural Rubber Processing and Rubber Products Manufacturing," the inter-agency program currently being handled by the PCIEERD. Other institutions linked with the council in support of the Rubber Industry are as follows:

- ASEAN Consultative Committee on Standards and Quality (ACCSQ) - Rubber-Based Product Working Group (RBPWG)
- International Rubber Research and Development Board
- PhIRUBBER Technical Working Group (PRTWG)
- Mindanao Development Authority (MinDA)

For the both the Cacao and Chemicals industries, PCIEERD has been in continuous connection with the following Institutions and Organizations for the discussion of the most recent advancements as well the future plans and roadmaps for the enhancement of each of these industries:

- Department of Trade and Industry Board of Investments (DTI-BOI)
- Chemicals Technical Working Group
- Asia Pacific Metrology Programme (APMP)

Global Environment Facility Writeshop/Workshop on Proposal re: International Waters, Biodiversity, POPs and Climate Change

The protection of the global environment and to promote environmental sustainable development. The GEF provides new and additional grants and concessional funding to cover the "incremental" or additional costs associated with transforming a project with

national benefits. The GEF’s fund flow into six focal areas: climate change, biodiversity, international waters, land degradation, ozone layer, persistent organic pollutants.

The GEF is the largest funder of projects to improve the global environment. GEF funds are grants, but co-financing requirements are usually loaned or financed by the recipient country. PCIEERD is part of the Inter-Agency Technical Working Group that provides comments, discuss, and reviews project proposals for funding of GEF in collaboration with DENR.

European Free Trade Agreement (FTA) Inter-Agency Committee Meeting on Trade Services

This Annex on Energy Related Services shall apply to measures affecting trade in energy related services, irrespective of the energy source dealt with, technology used, whether the energy source is renewable or non-renewable, and whether the service is supplied onshore or offshore. This agreement will be negotiated with 3 countries (Iceland, Norway, Swtzerland and Liechtenstein). PCIEERD is part of the Inter-Agency Committee that review the Annex on Energy Related Services that also includes environment for policy input in the negotiations to be done by NEDA, DFA and other concerned agencies.

Japan-Philippines Dialogue on Waste Management (DFA, DENR)

The dialogue is focused on related issues of interest regarding waste management particularly waste to energy initiatives and status of guidelines, waste management policies in Japan, waste technologies and areas of cooperation with Japan. PCIEERD is part of the Inter-Agency Committee or Group in collaboration with DENR and DFA that prepares, discuss the preparations and activity re: Japan-Philippines Dialogue on Waste Management.

Biodiversity Conservation Society of the Philippines

The activity is the 24th Annual Philippine Biodiversity Symposium organized by the Biodiversity Conservation Society of the Philippines (BCSP) at the University of Eastern Philippines (UEP), Catarman, Northern Samar

14-17 April 2015. Environment Sector (Ruby Raterta) as Resource Speaker in one of the Sessions attended the Biodiversity Conference.

Joint Crediting Mechanism with Japan Development Mechanisms (CDM)

This workshop was conducted to discuss the joint crediting mechanism proposed by Japan to the Philippines.

Engineering Research & Development for Technology (ERDT)

The ERDT is created to deliver high impact researches aligned with the country’s National Science and Technology Plan (NSTP) and the Medium-Term Development Plan (MTDP), to attain a critical mass of MS and PhD graduates, to upgrade the qualifications of practicing engineers, and to develop a culture of Research and Development (R&D).

Accelerated Science and Technology Human Resource Development Program- National Consortium in Graduate Science and Mathematics Education (ASTHRDP-NCGSME)

The Department of Science and Technology - Science Education Institute has created a National Consortium in Graduate Science and Mathematics Education (NCGSME) among ten (10) universities which aims to establish

a common quality graduate program and to accelerate the development of a critical mass of experts in SME. The member universities of the consortium are:

- Ateneo De Manila University (ADMU)
- Bicol University (BU)
- Central Luzon State University (CLSU)
- De La Salle University (DLSU)
- Mariano Marcos State University (MMSU)
- Mindanao State University (MSU)-Marawi
- Philippine Normal University (PNU)
- University of San Carlos (USC)
- Western Mindanao State University (WMSU)
- West Visayas State University (WVSU)

PH-US Joint Science & Technology Cooperation

Two (2) projects have been identified under the cooperation which includes Leveraging Social Media for Humanitarian Assistance/ Disaster Relief through the Ateneo’s Project eBayanihan and PAGASA and SCRIPPS’ Marine Weather Forecasting using High Frequency Doppler Radar (HFDR). Several collaborative project proposals are in the pipeline which includes Cloud Aerosol Monsoon Philippines Experiment(CAMPEX), between the Manila Observatory, PAGASA and NASA.

JICA-JST SATREPS (PHIVOLCS & PAGASA Projects)

Japan International Cooperation Agency- Japan Science and Technology Agency – Science and Technology Research Partnership for Sustainable Development.

National Biofuel Board

Committee on Harmonization of Vehicle Standards & Regulation

Auto-LPG for Transport Program Committee Special Vehicle Pollution Control Fund Climate Change Commission – Joint Project Cooperation

Association of Southeast Asian Nations Sub-Committee on Sustanainable Energy Research (ASEAN-SCSER)

Asia – Pacific- Economic Cooperation Policy Partnership on Science, Technology and Innovation. (APEC PPSTI)

Global Methane Initiative

Accreditation of Innovative Technologies for Housing. (AITECH)

LIST OF 2015 COMPLETED PROJECTS

Title	Implementing Agency
A Graphene-Based Electrochemical Supercapacitor for Solar Cells	UP Baguio
Abaca Functional Genomics: High Throughput Discovery of Genes and Molecular Markers	Institute of Plant Breeding, UP Los Baños
Action Research on Strengthening Community Structures and Mechanisms for Disaster Risk Reduction and Management	Department of Community Development, College of Social Work and Communit Development, UP Diliman
Applications of Sago Starch Films Filled with PVK Nanoparticles-(EVCIERD)	University of Eastern Philippines (UEP)
Assessment on Ground Water Resources affected by Small-Scale Mining in Barangay Maibu, Butuan City -(EMIEERALD) Project 4	Caraga State University
Bench Scale Production of Food Grade Nano Precipitated Calcium Carbonate from Local Limestone	ITDI
Biodiversity Assessment of Terrestrial and Aquatic Ecosystems in Selected Mining Environs in Mindanao-Sub- PProgram 2: Assessment of Terrestrial Ecosystems Biodiversity in Selected Mining Environs in Mindanao- Project 1	Caraga State University, University in Southern MIndanao

Title	Implementing
Cacao Project 1. Improving the Quality of Solid Cocoa Liquor Including Molded Cocoa Nibs and Developing the Capability of Small Scale Processors in the Manufacture of Intermediate Cocoa Products	ITDI
Cacao Project 2. Microbial Community and Biochemical Profiling for Microbial Augmentation and Development of Quality Indicators for Cacao Fermentation and Processing	UPLB-BIOTECH
Cacao Project 4. Design and Fabrication of Equipment for the Production of Local Cocoa Products	ITDI
Capability Development and R&D on Electroplating of Various Non-Conductive Materials - Project 7	Metals Industry Research and Development Center
Chemical Sensors Project 1: Mapping of Heavy Metal Contamination in the Philippine Mining Soils Using Laser-induced Breakdown Spectroscopy (LIBS) Field Sensors	IC - UPD
Chemical Sensors Project 2: Optical Sensors for the Determination of Zn and Cu in Ambient Water	IC - UPD
Chemical Sensors Project 3: Gaseous Elemental Mercury Sensors for Atmospheric Monitoring	RCNAS - UST
Chemical Sensors Project 4: Integrated Sensing System Using Mobile and Cloud Technologies for Mining and Nearby Communities	ESD - ADMU
Chemical Sensors Project 5: Data Integration and Visualization of Sensor Output for Mine Site Monitoring	Ateneo de Manila University
Conservation of Native Metallophytes, Phytochemistry of Nickel Hyperaccumulators and Phytostabilization and Restoration of Mined-out Areas in Palawan, Surigao and Zambales	College of Forestry and Natural Resources, UP Los Baños
Copper and Arsenic Recovery as a Post Mining Activity Using Indigenous Plant Hyperaccumulators	Ateneo De Manila University
Deployment and Field Testing of Eco-friendly Septic System (Eco-Sep) in Boracay Island Phase II	Adamson University
Design and Development of a Local Microwave Vacuum Dryer	Metals Industry Research and Development Center
Design and Development of Electronic Feeds Formulator - (BCIERD)	Bicol State College of Applied Sciences and Technology
Design and Development of Rootscrops Washer/Cleaner - (BCIERD)	Central Bicol State University of Agriculture (CBSAUA)
Design and Fabrication of Foam Shredder for the Furniture Industry - (CLIEERDEC)	Holy Angel University - CLIEERDC
Design, Construction and Performance Evaluation of Solar Dryer with Oven Type Biomass Burner as Back-up Heater (EMIEERALD) Project 2	Caraga State University (CSU)
Development of Heavy Duty DC Inverter SMAW-GTAW Welding Machine (Shielded Metal Arc Welding-Gas Tungsten Arc Welding)- Project 14	Metals Industry Research Development Center
Development of Oyster Powder for Use as Ingredient and Condiment	UP Visayas
Development of Tent Systems for Emergency Applications	Metals Industry Research and Development Center
Development of Transport Packaging Technology for Cut Flowers (Rose, Chrysanthemum, Anthrium, and Malaysian mums)	Industrial Technology Development Institute
Disaster Management using Web-GIS	UP Diliman
DYNASLOPE: Development of Site-Specific Threshold for Deep-Seated Landslides and Slope Failures	Philippine Institute of Volcanology and Seismology (PHIVOLCS)
Enhancement Program. Sub Program 1. Project 2. Pilot-Scale Production of BIOTECH Cellulase and Alpha-Amylase for the Food, Feed and Other Industries	BIOTECH-UPLB
Enhancing Philippine Landslide hazard maps with LIDAR and High-resolution Imageries	UP National Institute of Geological Sciences
Establishment of the Philippine Genome Center (PGC): Core Facility for Bioinformatics (CFB)	UP Diliman (PGC)
Establishment of the Philippine Genome Center (PGC): DNA Sequencing Core Facility (DSCF)	Philippine Genome Center
Field Deployment and Effectiveness Testing of LEAP Software	UP Diliman
Field Testing and Validation of Study of Retort Foods (chicken arroz caldo) as Disaster Mitigation/Relief Foods Using DSWD's and LGU's Distribution Protocols	Industrial Technology Development Institute
Flood Sensor Development, Installation and Monitoring of Urban Flooding in Metro Manila	Advanced Science and Technology Institute
FUEL LIGNO Project 2 : Evaluation and Optimization of Pre-treatment Methods for Locally Available and Promising Lignocellulosic Feedstocks for Fuel Ethanol Production	National Institute of Molecular Biology and Biotechnology (BIOTECH)
FUEL LIGNO Project 3 : Development of Microorganism Capable of Utilizing Lignocellulosic Hydrolysates for Fuel Ethanol Production	National Institute of Molecular Biology and Biotechnology
FUEL LIGNO Project 4 : Optimization of Saccharification, Fermentation and Purification processes for Pilot Scale Ethanol Production from Lignocellulosic Materials	National Institute of Molecular Biology and Biotechnology (BIOTECH)
Geophysical characterization of an overriding plate: Arc-continent convergence and its implications for natural hazards and resource distribution in the Central Philippine	College of Science, University of the Philippines

Title	Implementing
Human Resource Intervention for Sustainable Growth, Productivity and Competitiveness of the Metals and Engineering Sector: Development and Implementation of Appropriate Training Curriculum Design For CNC Machine Tool Programming and Operations (formerly: " Development of Appropriate Training Curriculum Design for CNC Machine Tool Programming and Operation for Sustainable Growth, Productivity and Competitiveness of the Metals and Engineering Sector".	
Iba na ang Panahon: Science for Safer Communities	Science and Technology Information Institute
Improving The Existing facilities of PSHS-Central Visayas Campus	PSHS-Central Visayas Campus
ITS 0. Development of the Philippine Metropolitan Advanced Traveler Information System (PhilMATIS)	NCTS,, UP Diliman,, QC
Linking active margin tectonics and overriding plate dynamics: A look at the geochemical nature of the Central Philippines	College of Science,, University of the Philippines
Newton Royal Academy of Engineering (RAE) Leaders in Innovation Fellowship (LIF) Programme [Project Code: PRP#2407]	The Asian Institute of Management (AIM)
Pilot Scale Standardization of Product and Processes using Drum Drying Technology on Selected Raw Materials (Mango, Banana and Makapuno)	ITDI
Product Development of Abalone in Palawan-(STIRDC)	Western Philippines University (WPU)
Proficiency Testing: ISO/IEC 17043:2010 and the New ISO 13528	Food and Nutrition Research Institute
Project1. Coils in Gels: Developing capability to investigate gel composite viscoelasticity Project2.Flow to Gel: Developing capability to implement optical tweezers with microfluidics for homogenized gelling Project3.Cells as Gels: Developing capability for high throughput cell elasticity sorting.	University of San Carlos
Project 1. Simulation and Evaluation of an AGT System Passenger Stations - Phase 2	Metals Industry Research and Development Center
Project 1: Technology Transfer to Private Mills	FNRI
Project 3. Establishment of a Die and Mold Solution Center in support of the Components and Parts Manufacturing Industry- Project 3	Metals Industry Research and Development Center
Project 3. Upgrading of Heat Treatment Facility	Metals Industry Research and Development Center
Project 4. Test and Evaluation of 120-Passenger per Coach Capacity Automated Guide-way Transit System - Phase 2	Metals Industry Research and Development Center
Project 5. Performance Testing of Five-Coach Centrally Powered Hybrid Electric Road Trains for Local Applications – Phase 2	Metals Industry Research and Development Center
Promoting World Class Philippine Nuclear Science and Technology Applications at the International Atomic Energy (IAEA) General Conference Exhibition	Philippine Nuclear Research Institute (PNRI)
Rainfall Spatial Analysis in Butuan City Using GIS - (EMIEERALD) Project 1	Caraga State University
Retracing the Central Philippine Overriding plate motion	College of Science,, University of the Philippines
ROGER- Robust and Rapidly Deployable GSM Base Stations and Backhaul for Emergency Response - Project 1	Electrical and Electronics Engineering Institute,,UP Diliman,, Quezon City
SENSLOPE: Development and Deployment of Landslide Sensors and Data Communication System	Electrical and Electronics Engineering Institute,, UP Diliman
Setting-up of Sewage Treatment Plant (STP) in the DOST Bicutan Compound - Project 1	ITDI
Specific earthquake ground motion levels that would affect medium-to-high rise structures in Metro Manila.	Philippine Institute of Volcanology and Seismology
Stabilization of Finer-Grade Rice Bran Using Microwave-Vacuum Technology	UP Diliman
Support for the Establishment of the DOST-UP Cebu Technology Business Incubator at the UP Cebu - SRP Campus	University of the Philippines Cebu Campus
Synthesis and Application of Novel Nano-Scale Photocatalysts with Different Dopants for the Treatment of A) Dimethyl Sulfoxide, B) Chlorophenols in Aqueous Solutions and C) Gaseous Formaldehyde	ChE, UP Diliman
Synthesis of Carbon Nanotubes (CNT)-Silicon Heterojunctions for the Fabrication and Assembly of a Solar Panel	UP-Baguio
Synthesis of Metal Nanowires and their Application in Foldable Transparent Conducting Electrode	Department of Metallurgical and Material Engineering,, UP Diliman
Synthesis, Morphology and Chemical Modification of Fullerene-Based Nanomaterials for Nano-engineered Structural Materials and Optoelectronic Applications	IESM, UP DILIMAN
The Geology of an overriding plate: Constraints from field geology, sediment geochemistry and paleontology	College of Science, UP Diliman
The Use of Radon in the Monitoring of the Philippine Fault (PF) and the Valley Fault (VFP) System and its Implication as an Earthquake Precursor	PNRI
Toxic Migrants in Packaged Foods and Beverages: Addressing the Safety Issues on Packaging Related Contaminants in Food: Phase 2	Industrial Technology Development Institute
Voices of Yolanda: Narratives of Risk and Coping Among Survivors of Typhoon Yolanda in Tacloban City, Guiuan Eastern Samar and San Francisco, Cebu	Department of Anthropology, UP Diliman
Weather Information Integration for System Enhancement	Institute of Environmental Science & Meteorology, UP Diliman

2015 FINANCIAL PERFORMANCE REPORT

For CY 2015, the PCIEERD approved budget as stipulated in the 2015 General Appropriations Act (R.A. 10651) amounted to P 619.677 million distributed as follows: Personnel Services with Php 43.100 million and Php 573,577 million for Maintenance and Other Operating Expenses (MOOE). The largest portion of the PCIEERD budget was allocated for Grant-In-Aid (GIA) to support the Council's thrusts and major programs for Competitive Industries, Sustainable Energy, Sustainable Mass Transport, Environment, Climate Change Adaptation and Disaster Risk Reduction. About 76% of the total GIA was allocated to support the Competitive Industries. Aside from the Council's budget, it also obtained additional resources from Special Purpose Fund (SPF) in the amount of Php 4.2 million for Miscellaneous Personnel Benefits Fund, Retirement Gratuity and Monetization of Leave Credits of PCIEERD personnel. The Council utilized 96% of the total budget allocated for the year.

Aside from the Council's regular budget, the total cash receipts from other sources amounted to Php 226.533 million. This is for the implementation of various programs and projects funded by the DOST, DOTC and allocation for the monitoring and evaluation of DOST-funded projects.

The breakdown of Allotment and Obligations are as follows:

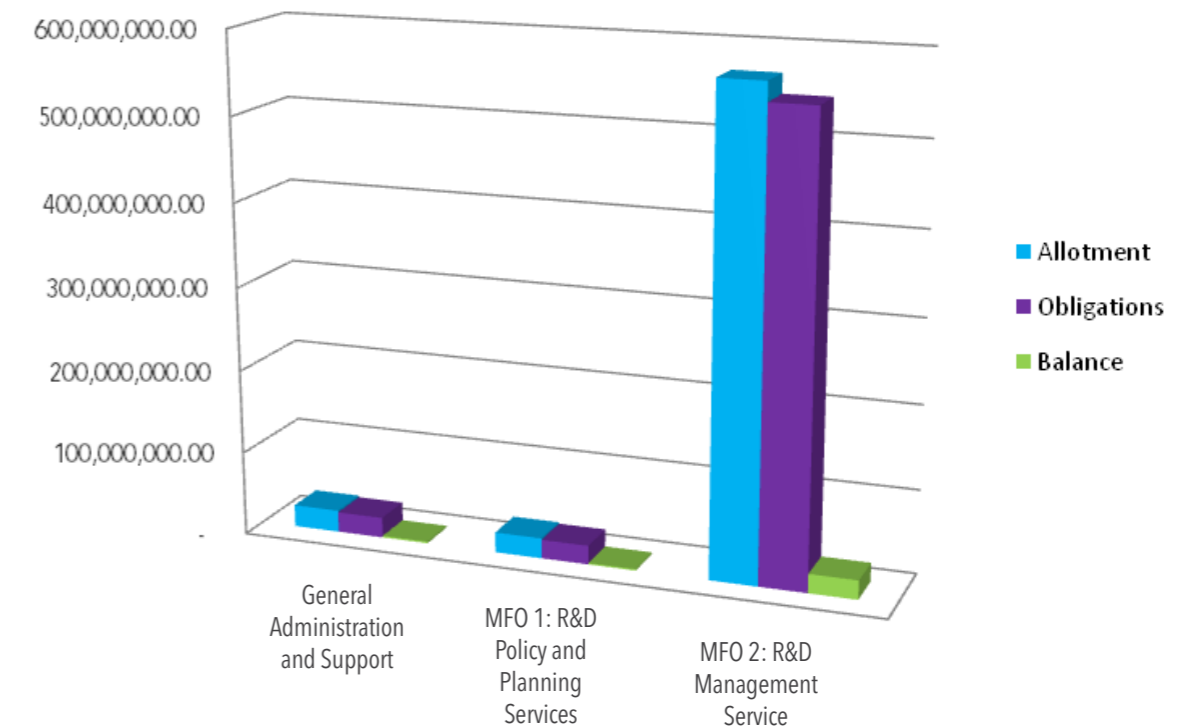
A. By Programs/Activity

Program	Allotment	Obligations	Balance
General Administration and Support	26,224,000.00	24,285,072.09	1,938,927.91
MFO 1: R&D Policy and Planning Services	24,284,000.00	22,622,474.04	1,661,525.96
MFO 2: R&D Management Service	569,169,000.00	546,310,584.34	22,858,415.66
TOTAL	619,677,000.00	593,218,130.47	26,458,869.53

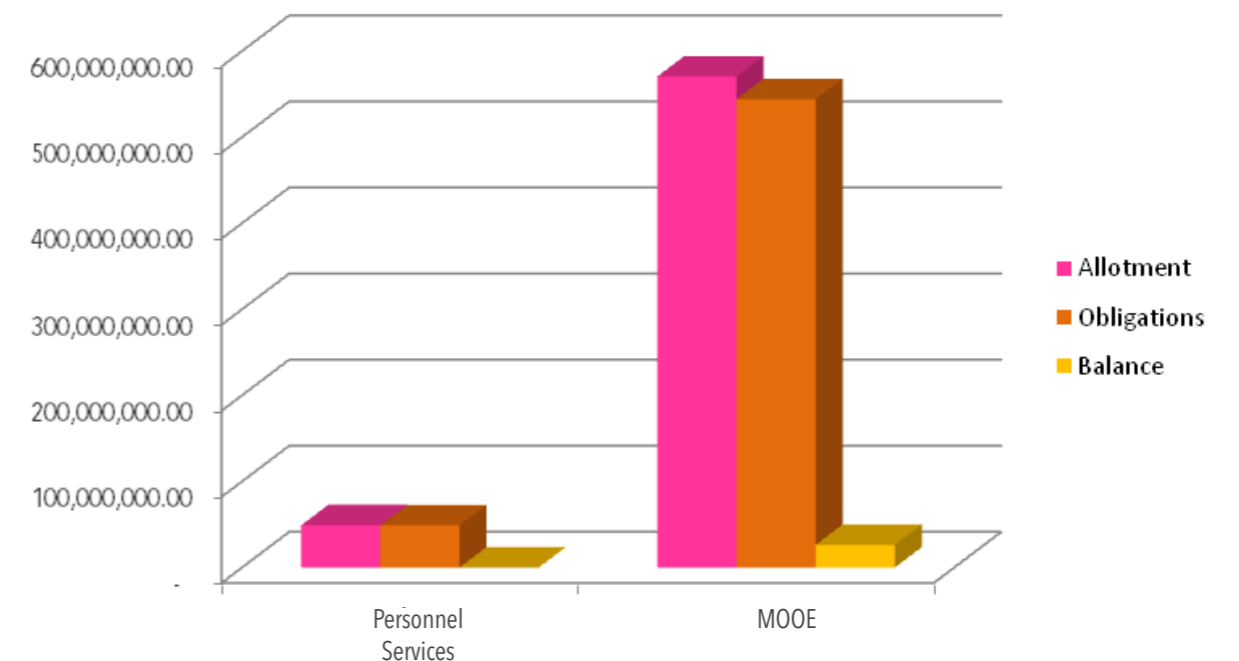
B. By Expense Class

Expense Class	Allotment	Obligations	Balance
Personnel Services	49,165,777.00	49,063,718.44	102,058.56
MOOE	570,511,223.00	544,154,412.03	26,356,810.97
TOTAL	619,677,000.00	593,218,130.47	26,458,869.53

A. By Programs/Activity

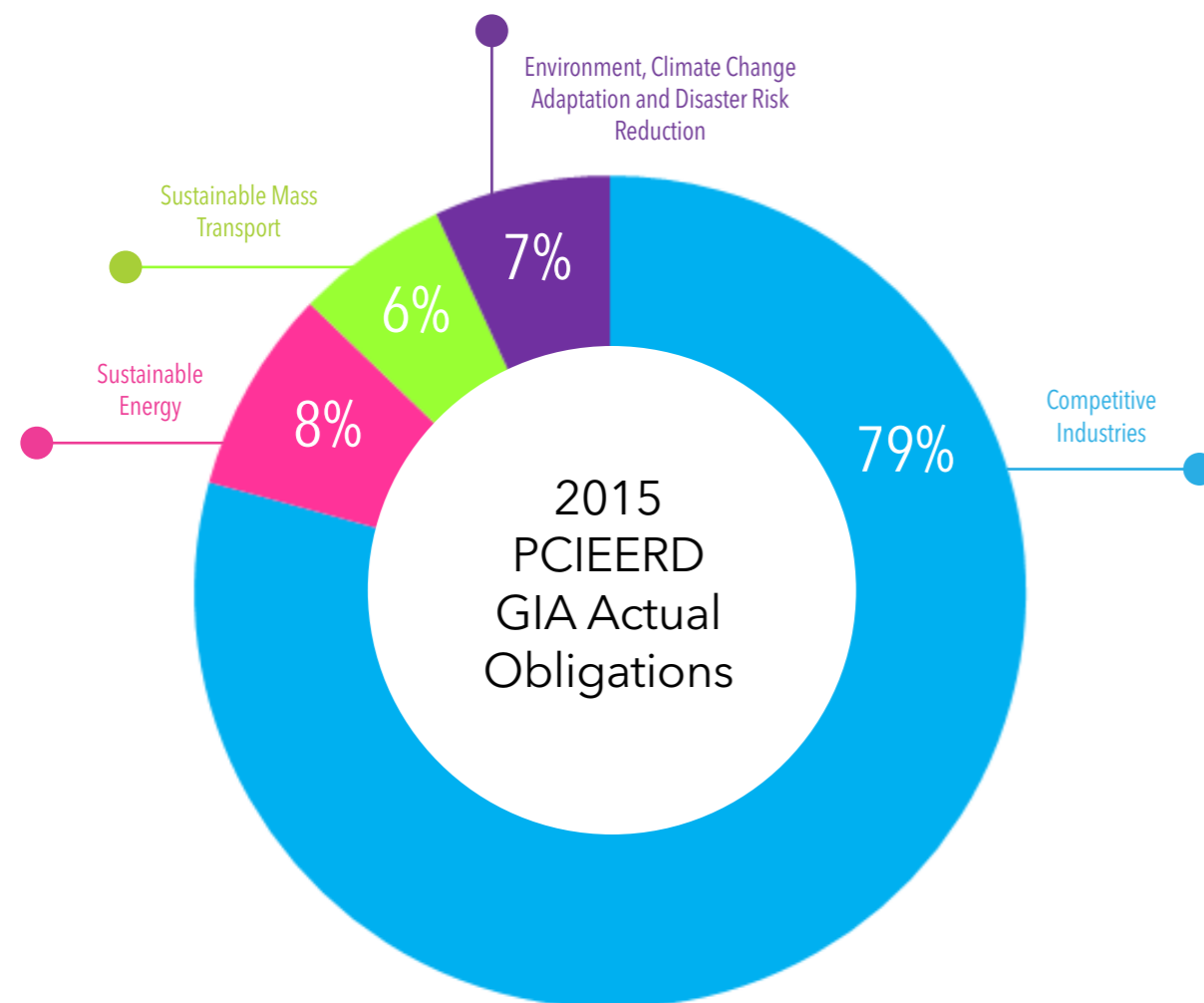


B. By Expense Class



2015 PCIEERD GIA Actual Obligations

PCIEERD Major Programs	2015 Actual GIA Obligations
Competitive Industries	422,311,782.00
Sustainable Energy	42,259,577.00
Sustainable Mass Transport	31,792,721.00
Environment, Climate Change Adaptation and Disaster Risk Reduction	36,598,501.00
TOTAL	26,458,869.53





**Philippine Council for Industry, Energy, and Emerging Technology
Research and Development (PCIEERD)**

4th and 5th Level Science Heritage Bldg., Science Community Complex,
Gen. Santos Avenue, Bicutan, Taguig City 1631 Philippines
Tel. No.: (+632) 837-2071 to 82 loc. 2100, 2120 & 2121