DEPARTMENT OF SCIENCE AND TECHNOLOGY

2018

DOST PERFORMANCE REPORT

science for the people

INNOVATION FOR COLLECTIVE PROSPERITY

science for the people

INNOVATION FOR COLLECTIVE PROSPERITY

Aligned with the national goals and plans, the DOST Strategic Plan for 2017-2022 bannering the call for "Science for the People" aims to use science to enhance innovation and the creative capacity of the Filipinos towards the achievement of inclusive and sustainable development.

The DOST Strategic Plan revolves on the attainment of seven outcomes as follows:

1. Innovation stimulated
2. Technology and adoption promoted and accelerated
3. Critical mass of globally competitive STI human resources developed
4. Productivity and efficiency of communities and the production sector, particularly MSMEs improved
5. Resiliency to disaster risks and climate change ensured
6. Inequality in STI capacities and opportunities reduced
7. Effective STI governance achieved

The strategies to attain these outcomes are embodied in the DOST Eleven Point Agenda as follows:

1. Pursue R&D to address pressing national problems.
2. Conduct R&D to enhance productivity and improve management of resources.
3. Engage in R&D to generate and apply new knowledge and technologies across sectors.
4. Strengthen and utilize regional R&D capabilities.
5. Maximize utilization of R&D results through technology transfer and commercialization.
6. Develop STI human resources and build a strong STI culture.
7. Upgrade STI facilities and capacities to advance R&D activities and expand S&T services.
8. Expand STI assistance to communities and the production sector, particularly MSMEs.
9. Provide STI-based solutions for disaster risks and climate change adaptation and mitigation.
10. Strengthen industry-academe-government and international STI collaboration.
11. Enhance effectiveness of STI governance.

Message from the DOST
SECRETARY

The year 2018 was a period of heightened activities and significant accomplishments. The DOST sustained its commitment to deliver to the public the benefits of scientific and technological pursuits. The attainment of the seven outcomes in the DOST Strategic Plan "Science for the People" is the driving force behind these efforts.

This Report highlights the plans, programs and projects that were implemented to strengthen the S&T infrastructure and build strategic alliances for achieving excellence in research and innovation. We continued to invest in developing S&T-based solutions and advancing capabilities of our S&T workforce and institutions. More importantly, priority was also given to ensuring that R&D results and technologies are transferred and adopted to add value to their intended users, create positive societal impact and improve our people's lives.

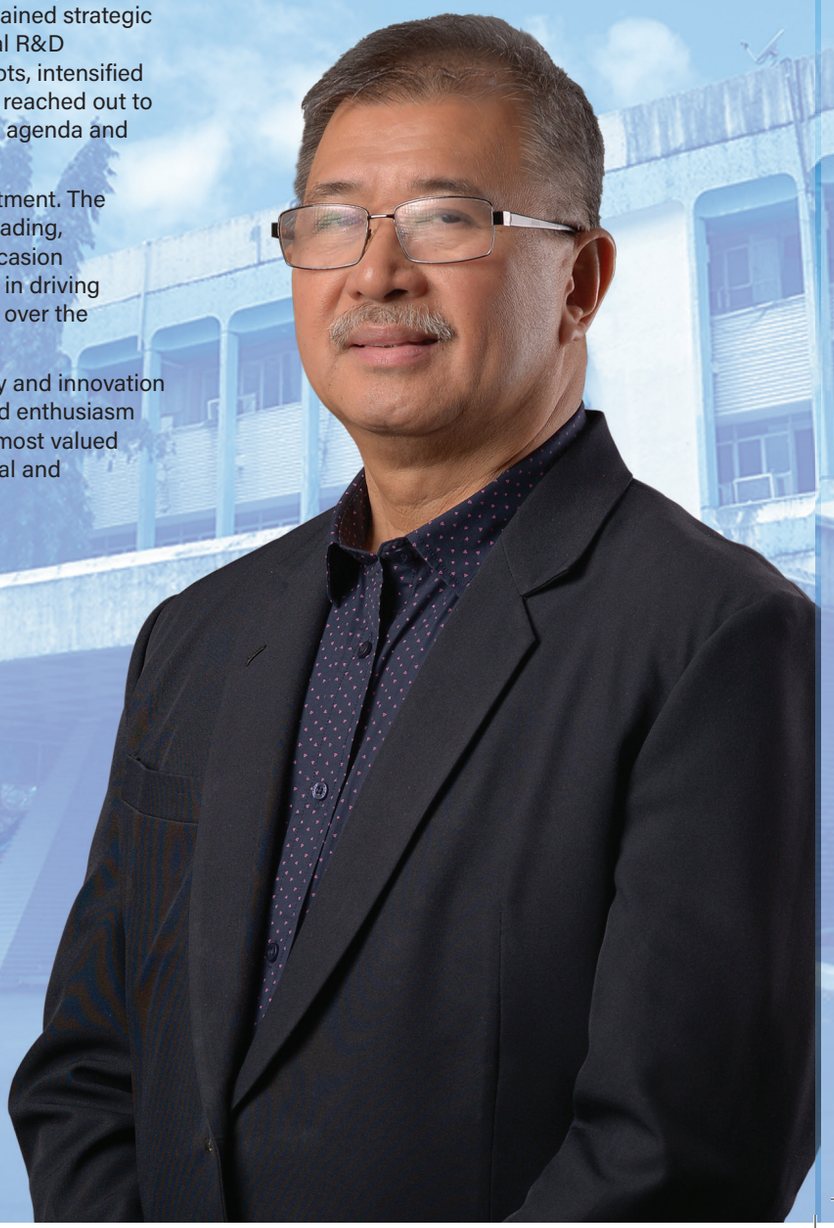
On top of our gains in 2018 is the signing of Republic Act No. 11035, also known as the "Balik Scientist Act" on June 15, 2018 as a mechanism to encourage Filipino scientists to return to the country and play an important role in spurring innovation through purposive engagements with the academ, public and private institutions, and industry. We take pride as well in our accomplishments in R&D, technology transfer, and S&T services. We sustained strategic R&D programs, supported the establishment of regional R&D centers, increased substantially our S&T scholarship slots, intensified technology transfer and delivery of laboratory services, reached out to more MSMEs and communities, pursued our legislative agenda and expanded our international partnerships.

This year also marks the 60th anniversary of the Department. The DOST has gone a long way in fulfilling its mandate of leading, coordinating and supporting various initiatives. The occasion also recognized the critical role of the DOST leadership in driving the Department and the national innovation ecosystem over the years.

With the increasing complexity that science, technology and innovation (STI) bring, I give thanks to the matching dedication and enthusiasm shown by the men and women of DOST as well as the most valued commitment and respect of our collaborators in the local and international landscape for making DOST a partner of choice.

We will remain steadfast in our role as leader, enabler and catalyst in developing our science, technology and innovation capacities amidst the macrocosm of possibilities and challenge of making our impact more profound.

FORTUNATO T. DE LA PEÑA
Secretary



EXECUTIVE **SUMMARY**

The Philippine Development Plan 2017-2022 lays down the foundation towards achieving the 25-year vision dubbed as Ambisyon 2040. Science, technology and innovation gained prominence in the current PDP with the inclusion of Chapter 14 that is dedicated to "Vigorously Advancing Science, Technology and Innovation". Anchored on the PDP, the DOST is pursuing the strategic plan with the theme "Science for the People" which covers programs that address current needs and prepare the country for future requirements and possibilities.

In pursuit of bringing science to the people on a sustainable and inclusive basis, the Department sets as its target the seven outcomes and implements the DOST 11-point agenda in partnership with other government agencies, academe, industry and other stakeholders.

Guided by the Harmonized National R&D Agenda (HNRDA) which set the priority R&D program and projects of the country, the Department implemented strategic programs and projects in the areas of health; agriculture, aquatic and natural resources; industry energy and emering technology; disaster risk reduction and climate change adaptation; and basic research.

In addressing health concerns, the Department initiated the conduct of research and development (R&D) projects on Tuklas Lunas or Drug Discovery and Development, basic research on potential new anticancer and antibiotic leds, diagnostic and therapeutic development, and genomics, among others. The DOST also supported the program of the government for Marawi by providing ready-to-eat disaster relief food as feeding intervention of the victims of the Marawi siege. To address concerns on agriculture, aquatic and natural resources, the DOST has developed new technologies on the use of plant growth promoter and nanofertilizers, agricultural machinery, pest control, and disease management. The Department also conducted studies on environmental conservation and management of resources such as the restoration of mined-out areas and the condition of Lake Lanao. For the benefit of various industries, the Department also developed technologies such as innovative food products, organic packaging material, natural fiber, abaca fiber reinforced composites, unmanned aerial vehicle, and localized steel liners and established R&D and innovation centers. Emerging technologies such as space technology development, remote sensing and data science, were also implemented in 2018 for application to various sectors.

Products and processes resulting from R&D will benefit the people once transferred or commercialized. To this end, the Department has supported technology transfer and commercialization programs, technology promotion and marketing assistance, and invention/innovation assistance program. To address pre-commercialization gaps and hurdles, the Department provided assistance in pre-commercialization activities through the Technology Innovation for Commercialization (TECHNICOM) Program. Assistance for filing of Intellectual Property (IP) comprising of patents, utility models, industrial designs, and copyright were also provided. Moreover, to intensify public awareness, promote learning, and adapting new technologies, the Department featured the latest advancements in R&D, as well as other S&T services, in S&T exhibitions and other promotional activities.

The Department continued the implementation of S&T scholarship programs through the provision of special science secondary education and scholarships for tertiary and graduate degree programs for priority S&T courses. In 2018, the PSHS system has supported a total of 8,358 scholars from 16 Regional Campuses. On the other hand, the DOST-SEI supported a total of 28,433 scholars, which is 25% higher than the previous year.

In improving the productivity and efficiency of communities and the production sector particularly MSMEs, the DOST programs, projects and activities related to the provision of STI services and setting up, upgrading and maintaining STI facilities for MSMEs, startups and spinoffs are continuously being implemented. In 2018, a more robust Small Enterprise Technology Upgrading Program, dubbed as 'SETUP 2.0' revitalized the roster of intervention mechanisms available under the program. SETUP 2.0 sets out to provide interventions needed at the level of the sector or industry, on top of its regular clientele of individual MSMEs. Alongside these are other programs for MSME development such as OneSTore, OneExpert, OneLab, and Food Innovation Center and testing services offered by various S&T facilities. Year 2018 also witnessed the development of a synchronized implementation of Community Empowerment for Science and Technology (CEST) nationwide, envisioning the transformation of the poorest of the poor communities into empowered, progressive, and resilient communities.

To ensure resilience to disaster risks and climate change, the DOST is committed to provide a science-based weather information and develop appropriate mitigation strategies for a disaster and climate change resilient Philippines. In 2018, the DOST conducted the following: weather forecasting and tropical cyclone warning services; launching of the new PAGASA website; automation of flood early warning system; volcano, earthquake and tsunami monitoring and warning services; hazards mapping, risk assessment; disaster preparedness and risk reduction; systematic assessment of flood effects and risks through Geo-Informatics; real-time radiation monitoring.

To reduce inequality in STI capacities and opportunities, the Department provides equitable access to STI capacities and opportunities across the regions to spur R&D activities and innovation.

The Niche Centers in the Regions (NICER) for R&D Program was implemented to cater to the specific needs of the regions, which included upgrading, development, and acquisition of R&D equipment, to undertake collaborative R&D activities. Alongside NICER was the launching of RDLead Program which aims to engage experts with strong leadership, management and innovative policy proficiencies to help boost and strengthen the research capabilities of the Higher Education Institutions (HEIs) or R&D institutes.

Effective STI governance is an integral foundation of the overall DOST plans and programs. Among the achievements in S&T governance is the signing of the Balik Scientist Act on June 15, 2018, strenthening the implementation of the program and institutionalizing the continuous provision of incentives and assistance to returning Filipino experts, scientists, inventors, and engineers. In addition, the Department continued to lobby for the approval of various policy initiatives in different legislative stages, forge bilateral and multilateral partners, and actively engage with other national agencies.

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OUTCOME

INNOVATION STIMULATED

Tuklas Lunas (Drug Discovery & Development)

The Tuklas Lunas Program pursues a parallel track of drug discovery and development involving the production of standardized herbal drugs that can serve as safe, accessible and alternative treatments to priority local health conditions and the identification and characterization of high-value pure drug candidates for pre-clinical or clinical development.

The Tuklas Lunas Program continues to make important leaps in advancing the discovery and development of health products from local natural resources. In 2018, a total of 46 projects implemented by 22 institutions are supported under the program, while 24 new projects were approved for implementation. The pre-clinical (animal testing) of a fixed dose combination of three plants as possible treatment for dengue has been completed and results are very promising.

New Projects Approved in 2018

- Mariano Marcos State University-TLDC project (Phase II) – Confirmation of anti-inflammatory potential of 11 plant indigenous in the Ilocos Region for the development of anti-inflammatory products
- Cagayan State University – Study of selected plants from Region II that were reported to have folkloric use as antimicrobials and/or anti-pain

Central Luzon State University - Tuklas Lunas Development Center (CLSU-TLDC)

- Prioritized four local and edible mushroom species with promising bioactivities which will be developed as functional food in Phase 2
- Expanded work activities to study wild edible and poisonous mushrooms as possible sources of anti-pain, anti- hypertensive, and anti-diabetic, and anti-cancer agents

Central Mindanao State University (CMU)-TLDC

- Identified five (5) species with promising potential as anti-inflammatory agents
- For their phase 2 program, these ferns will be pursued under three parallel initiatives: (1) coming up with fern-based functional food, (2) developmentof ointment for inflammation, and (3)isolating new compounds from ferns as possible anti-inflammatory drug candidates.

UP Diliman – Institute of Chemistry (Discovery and Development of Health Products: Disease-Specific Bioactive Hits from Terrestrial Organisms)

- Determined priority semi-pure extracts for diabetes, pain, inflammation, cholesterol-lowering and hypertension
- Pursued the priority extracts under a follow-up program to isolate, purify and determine the structure of the activate constituents

Mindanao State University–Iligan Institute of Technology TLDC (Discovery of Several Sponge Species with Promising Anti-Cancer Activity)

- Ongoing determination of compound responsible for the anti-cancer activity on its Phase II study
- Study on marine organisms as possible sources of treatment of cancer will also be expanded to seahorse and pipefishes.

UP-Marine Science Institute (Discovery and Development of Health Products - Marine Component)

- Completed the project in 2018
- Discovered, characterized and synthesized a number of neuroactive peptides
- Elucidated a number of compounds, including, novel ones, with potential activity against ESKAPE-bacteria and cancer cell lines

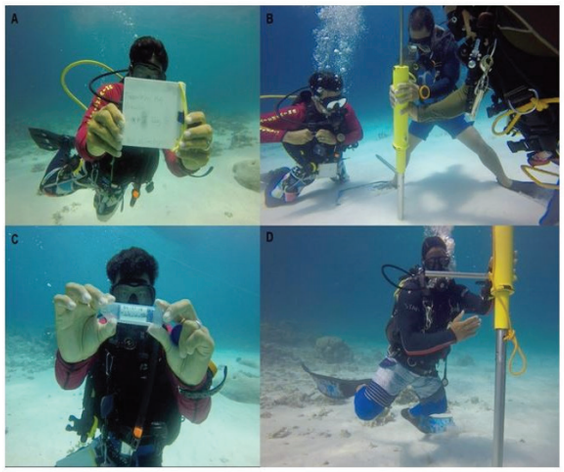
University of San Agustin (Metabolomics-driven Discovery of Antimicrobial Leads from Marine Sediment-Derived Actinomycetes of Iloilo)

- Tested the actinobacteria isolate crude extracts against ESKAPE pathogens on its first year of implementation
- Identified and subjected three (3) bioactive hits for large scale production. Isolation, purification and dereplication of these bioactive hits are ongoing

Novel Anticancer and Antibiotic Compounds from Philippine Marine Sediments

The Philippines is uniquely positioned in the tropics with significant areas of marine biodiversity that host very diverse marine organisms and microorganism. The highly biodiverse marine microorganisms in the Philippines have not been investigated well with regards to finding potential new antibiotic and anticancer leads. This pioneering research explored more than 27 islands and reefs across the Philippines for next generation or novel anticancer and antibiotic compounds from marine sediments. These islands and reefs include sites which have never been visited for scientific explorations such as the restricted areas of the Tubbataha Reefs. A total of 3,060 isolates from actinobacteria comprised the first ever marine sediment BioBank for Drug Discovery Research. Partial screening showed 114 isolates with high bioactivity against six pathogens (ESKAPE) known to develop resistance to commercially available antibiotics. Drug development from these compounds will increase availability for potent medicines and pharmaceuticals. The library of actinobacterial extracts generated out of this research will offer access to unique chemical diversity that will significantly impact the Philippine natural products research enterprise. This is a three-year on-going research program under the National Integrated Basic R&D Agenda (NIBRA) on Health Sufficiency being implemented by Dr. Doralyn S. Dalisay, a Balik-Scientist from the University of San Agustin in Iloilo.

Tubbataha Reefs Research Expedition



Marine Sediment Collection at Delsan Wreck, South Atoll, near the light house station.

Genetic Research towards Diagnostic and Therapeutic Development

Looking at the genetic makeup may eventually lead to lower costs of treatment by ensuring that the patient receives a treatment regimen to which they are responsive to and are appropriate for them. Hence, a research team composed of medical doctors: cardiologists from the UP- Philippine General Hospital, geneticist and molecular biologist from the UP-National Institutes of Health, and science research specialists from the Philippine Genome Center joined together to conduct researches on gene markers with funding assistance from DOST-PCHRD.

Genetic markers that are associated with hypertension, high cholesterol, heart attack and stroke and poor response to medications used for the treatment of these cardiovascular diseases, were identified among Filipino patients. Results showed that the markers observed among Filipinos are not necessarily the same as those found among other ethnic groups. This study also revealed the possibility that genetic test kits used abroad may not be as useful for Filipinos. These results were presented and well-received in both local and international conferences such as: a) the American College of Cardiology held in March 2018 in Orlando, Florida; and b) the Philippine Heart Association held in May 2017 and May 2018 in Pasig City, Philippines.

The end output of this research is crucial in developing medical treatments that decrease chances of developing complications arising from uncontrolled high blood pressure and high cholesterol, or from poor response to drugs used for heart attack and stroke. Likewise, it can help direct the government into identifying cardiovascular drugs for procurement.

Nutritional Genomics

Nutritional genomics continues to offer new perspectives in food and nutrition. This emerging science was once regarded as an important tool to look for the relevant genetic mutations that could potentially relate to the increasing prevalence of non-communicable diseases among Filipinos. As the science progresses, the DOST-FNRI started the endeavor to look beyond genomics: from the metagenome to the studies translating research results into practical use for the Filipino household. Related to this, the Institute created a genome database aimed primarily to serve as a repository of experimental data on nutritional genomics. The database contains a risk predictor algorithm for hypertension which is a diagnostic model that incorporates genetics in the process of preventing increased blood pressure. Another achievement was the establishment of a validated PCR-based method to study an important genetic mutation related to the macronutrient intake of Filipino adults. This relevant genetic mutation is commonly known to induce preference for sugary foods but correlated further to examine its association with body mass index (BMI) and other clinical parameters such as blood pressure.

Nutrigenomics will provide the framework for the development of novel foods that are genotype-dependent in addition to personalized dietary recommendations towards a more individualized/personalized strategy for health promotion, prevention and management of nutrition-related diseases. Hence, the Nutrigenomics Laboratory was established to be able to develop evidence-based healthful food products, lifestyle advice and dietary interventions for Filipinos

The NuGen Lab utilizes the high-resolution melt technology to detect the mutations in genes related to nutrition and diet-related diseases.

Using validated methods, the detection of genetic mutations at the NuGen Laboratory was able to minimize sending the samples for next-generation sequencing in other laboratories.

A compact fluorometer is the latest addition in the array of equipment at the NuGen laboratory. The machine can provide a highly sensitive fluorescent detection when determining the concentration of nucleic acids.

Ready-to-Eat (RTE) Boiled Sweet Potato as Disaster Relief Food

The ready-to-eat (RTE) shelf stable sweet potato in retort pouch with one year validity was developed as part of the 'pack of hope' relief foods by the DOST-ITDI. The field testing and validation study using the distribution protocols of the Department of Social Welfare and Development (DSWD) was completed in July 2018. Packs of RTE boiled sweet potato were initially distributed to calamity survivors in Itogon, Benguet.

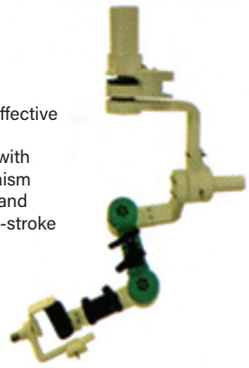
The RTE boiled sweet potato has high nutrients that include dietary fiber and Vitamin A, among others. Its distribution can be done easily in calamity areas whether by land, sea or aerial drop.

Ready-to-eat shelf stable sweet patato

Hospital Equipment and Biomedical Devices

The hospital equipment and biomedical devices program has undertaken the development of affordable, safe and reliable hospital equipment and biomedical devices; development of skills and expertise in biomedical engineering and related areas; and development of support systems towards a Philippine Biomedical devices/life sciences industry. The program was implemented in collaboration with 17 partner institutions from academic and technology R&D organizations, health and manufacturing industries, and regulatory government agencies.

Reliefvent is a compact, affordable, safe, and effective Intensive Care Unit (ICU) ventilator that can be used for both children and adults.



Agapay exoskeleton prototype is a cost-effective 3D-printed wearable robotic exoskeleton with biofeedback mechanism for physical therapy and rehabilitation of post-stroke and injured patients.

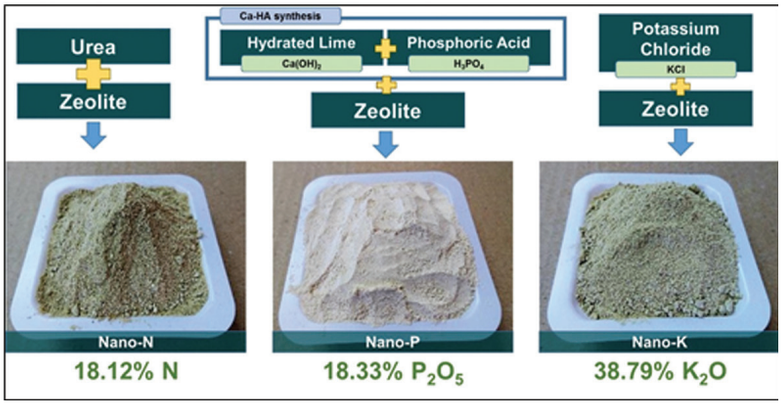
Among the devices developed under the program were Reliefvent and prototypes of robotic exoskeleton. ReliefVent is a compact, affordable, safe, and effective Intensive Care Unit (ICU) ventilator that can be used for both children and adults. Powered by AC/DC back-up battery, ReliefVent can also be used as transport and home ventilator. On the other hand, a robotic device that can be used for physical therapy and rehabilitation of post-stroke and injured patients was developed under the Agapay Project. The two robotic exoskeleton prototypes were developed with biofeedback mechanism and assists motor movements in the shoulder, arm, and hand.

Carrageenan as a Plant Growth Promoter

The award winning Carrageenan as a Plant Growth Promoter developed by the DOST-PNRI gained positive feedback from the different users who realized increases in yield for rice, mungbean and peanut, as follows: a) 20-30% increase in rice yield in Region 2 and 60% highest yield increase in Pulilan, Bulacan; b) 45% increase in mungbean yield in Bukidnon; and c) 18–30% increase in peanut yield in Laguna and Pampanga. Likewise, the PGP for enhanced growth and induced pest and disease resistance in rice and corn was evaluated under different field conditions in Regions I, II, III, IV-A, VI, IX and XI on the efficacy and demonstration of the usefulness of radiation-growth and yield of rice and corn. A total of 22,500 liters of PGP were distributed to Regions I,III, IV-A and IX which already obtained license to start its operation.

FertiGroe N, P, and K Nanofertilizers for crop growth and development

The protocol for the production of FertiGroe N, P and K nanofertilizers is being optimized. Significant reduction in costs of production of the nanofertilizers, particularly the P and K nanofertilizers, has been achieved by using zeolite instead of chitosan as carrier and by synthesizing calcium hydroxyapatite as P source. This makes FertiGroe competitive against conventional fertilizers. Further optimization studies are being done to further reduce production cost without compromising the nutrient content per unit mass of the nanofertilizers. The application protocols of the FertiGroe nanofertilizer are currently being optimized in rice, corn, vegetables, sugarcane, coffee, cacao and banana through on-station and field experiments. The use of Fertigroe offers a yield advantage over the use of conventional fertilizers. Initial results in corn showed an incremental yield ranging from 10 to 25% depending on rate of application or an average of 15% or about 555kg per hectare using FertiGroe.



FertiGroe nanofertilizer formulation

FertiGroe products

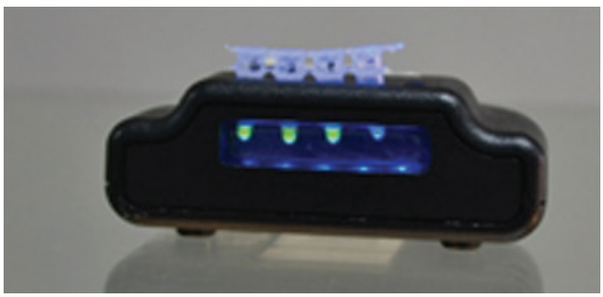
Rice Transplanter Attachment (RTA) and Rice Harvester Attachment (RHA) for Tractors

The DOST-MIRDC undertakes R&D on machine-building and materials and minerals processing. The Center's machine building program focuses on agricultural, food processing, disaster mitigation and industrial or special purpose equipment in support of the revival of the country's manufacturing industry and increased mechanization in the agriculture sector. In 2018, the Center completed the development of RTA and RHA for hand tractors. Said technologies, which meet the requirements of the Philippine Agricultural Engineering Standards, can provide farmers with higher productivity and reduce labor and machine rental costs.

Performance Evaluation of Organic Based Preservatives

The DOST-FPRDI developed formulations from locally available plants for cashew (*Anacardium ocidentale*); lemon scented gum (*Corymbia citriodora*); *Tubang-bakod* (*Jatropha curcas*); and river red gum (*Eucalyptus camaldulensis*) as organic preservatives against bamboo-destroying fungi and insects. The technology is a milestone in the field of wood protection and preservation. It is envisioned to reduce the hazards due to the use of synthetic chemicals, and reduce the country's dependence on imported preservatives.

New LAMP test kits for swine disease



The RT-LAMP assays and quick test kits for the detection of classical swine fever (CSF) virus and porcine reproductive and respiratory (PRRS) virus in commercial pigs were successfully optimized by the Central Luzon State University. The CSF and PRRS are among the economically important diseases in pigs which are affecting the productivity and efficiency of the swine industry. The new LAMP test kits are in dry format, which makes the reagents more stable, less affected by contaminants and with longer shelf-life compared to the wet format of LAMP. The dry format LAMP is faster than wet format LAMP because it reduces the number of steps and user error in performing the test. The transfer and commercialization of this new technology is expected to help the government and swine industry achieve a CSF-free status which is important in exporting our local pork to other countries.

Protein-Enriched Copra Meal (PECM)

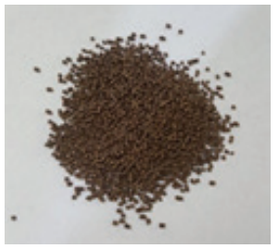
Protein Enriched Copra Meal (PECM) is a product of the solid state fermentation (SSF) of copra meal, a by-product of the oil extraction process in coconut. The SSF technology developed by UP Los Baños- Biotechnology Department enhances the protein content of copra meal to about 35 to 38% which is comparable to that of soybean meal. The PECM is popularly used as protein source for swine and poultry. It is relatively cheap compared to soybean and fish meal.

Likewise, it was successfully incorporated in finfish and shrimp diet at 200 kg/ton and 100 kg/ton, respectively and was used in the commercial scale culture of shrimp, tilapia and milkfish. It can help reduce the cost of feeds while maintaining growth performance, feed conversion ratio, survival rate and yield of these aquaculture species. In the case of milkfish, a significant difference in growth and production of milkfish was observed in feed incorporated with PECM.

Shrimps fed with PECM

Finfish feeds with PECM

Milkfish fed with PECM



Shrimp feeds with PECM

Tilapia fed with PECM

Modified Modular Rainwater Collection System

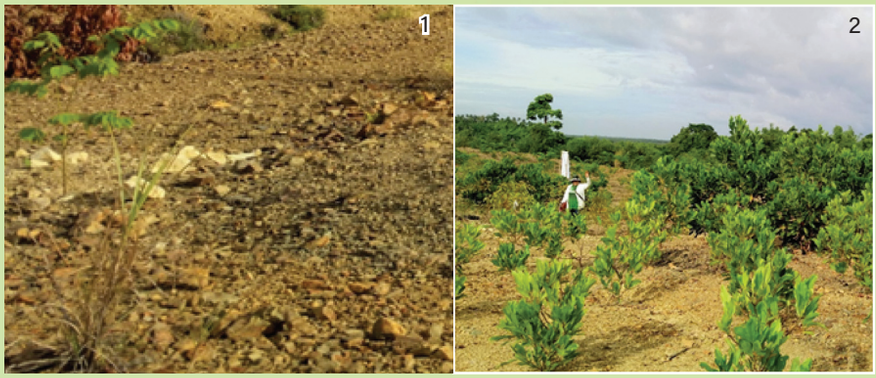
The DOST-ITDI developed a low-cost and lightweight 'modular tank' that can store rainwater up to one cubic meter for non-potable domestic use. This is an alternative solution to address water shortage and promote water conservation in the country. The developed rain water collection system has a nanocomposite liner made from locally available raw materials. The high-density polyethylene (HDPE) was compounded with a nano precipitated calcium carbonate (NPCC) to achieve better mechanical properties. It also has improved water barrier properties and very good blend of physical properties like tensile-impact strength coupled with good weatherability and chemical resistance properties. The unit can easily be installed, stored (foldable) and can fit into individual homes.

A total of 124 units of rain water collection system were already deployed and installed in different areas in Bicutan, Quezon City, Manila, Rizal, Laguna, Nueva Ecija, Pampanga, Mt. Province and Mindanao in 2018. Several units were also installed in Infantry Divisions and Brigades in Marawi City, Sulu and Surigao del Sur. In 2018, in cooperation with the Research Development Center, Army Support Command of the Philippine Army, barangays and households in Marawi were selected as recipients of a total of 50 rainwater collection system units to aid them in the rehabilitation and reconstruction efforts for their communities.

Microbial-based Protocol for the Rehabilitation of Mined-out Area in Mogpog, Marinduque

Part of the 32-hectare mined dumpsite in Mogpog, Marinduque which has been barren for almost 30 years due to more than two decades of mining activity was successfully rehabilitated using a microbial-based bioremediation protocol. The protocol was developed from indigenous microorganisms discovered from the heavy metal contaminated soils of the mined-out area. In tandem with soil amendments, these promising indigenous microbes investigated for bioremediation activity effectively promoted the growth and development of various tree species such as Narra and Acacia despite the toxic and nutrient - depleted condition of the soil. Reforestation of the mined-out area will contribute to the reduction of heavy metal exposure to the surrounding communities.

Adopting this protocol in mined-out areas in the Philippines will reduce heavy metal pollution and contamination to humans and animals and will contribute to the country's efforts toward climate change mitigation by increasing the carbon sink with reforested areas.

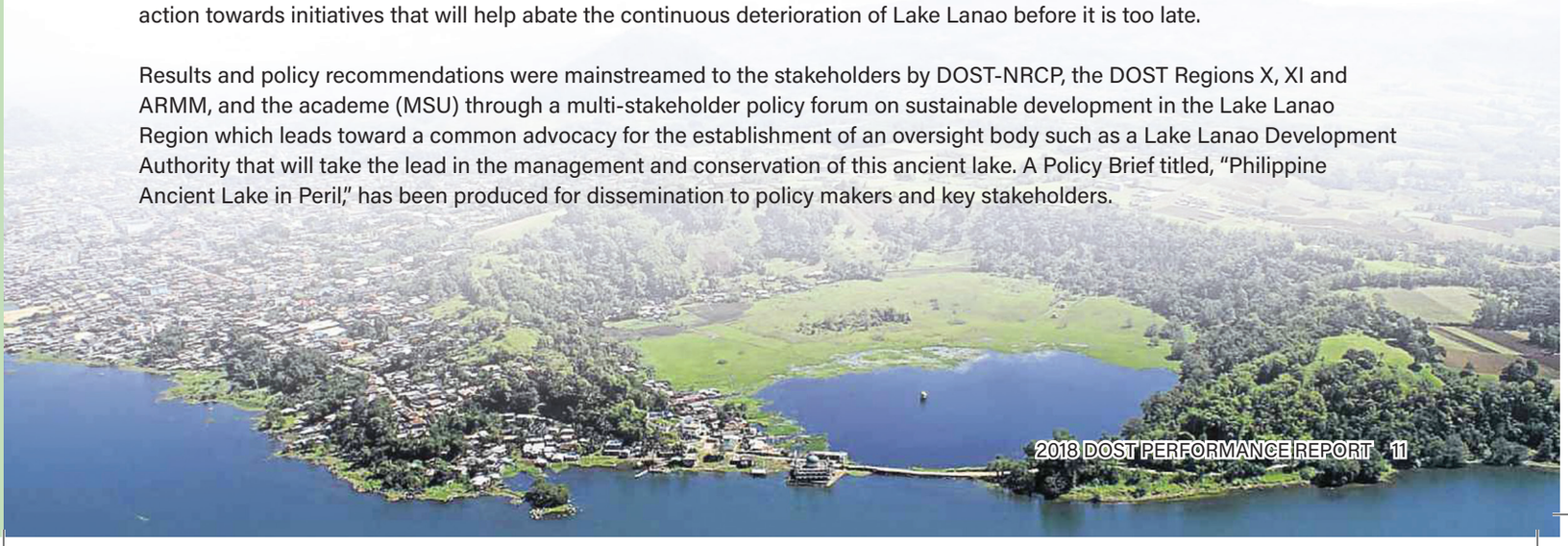


(1) Mined-out area and (2) Reforested mined-out area in Mogpog, Marinduque

Mindanao Policy Forum on Sustainable Development in the Lake Lanao Region

The DOST-NRCP launched the first major research program of the country in Lake Lanao, titled, "Comprehensive Studies on Lake Lanao for Sustainable Development." Through this research program led by NRCP experts from the Mindanao State University Iligan and Marawi Campuses, it was revealed that on using ciliates, a pollution bio indicator microorganism, Lake Lanao water quality has been classified as oligotrophic, i.e., still pristine in condition or not yet polluted. However, it is contaminated with coliform bacteria and exceeds the Philippine National Standard for Drinking Water (PNSDW) and DENR Water Quality Guidelines and General Effluent Standards of 2016 level for safe drinking and recreation. These results call for action towards initiatives that will help abate the continuous deterioration of Lake Lanao before it is too late.

Results and policy recommendations were mainstreamed to the stakeholders by DOST-NRCP, the DOST Regions X, XI and ARMM, and the academe (MSU) through a multi-stakeholder policy forum on sustainable development in the Lake Lanao Region which leads toward a common advocacy for the establishment of an oversight body such as a Lake Lanao Development Authority that will take the lead in the management and conservation of this ancient lake. A Policy Brief titled, "Philippine Ancient Lake in Peril," has been produced for dissemination to policy makers and key stakeholders.



INDUSTRY

Multi-Nutrient Extruded Rice Kernel (MNERK)

The DOST-FNRI developed the Multi-Nutrient Extruded Rice Kernel (MNERK) with iron and zinc, and vitamins A, B9 and B12. This achievement recognized FNRI as a technology provider and supplier of multi-nutrient extruded rice kernel in the international market. Currently, MNERK is being used as feeding intervention of the victims of the Marawi siege. The Nutri-Dense Food Manufacturing Corporation in Sta. Barbara, Pangasinan has expressed intentions to adopt the technology. Private-public partnership in the transfer of technology is expected to help reduce the prevalence of micronutrient deficiency.

Feeding intervention at Sagonsongan, Area 1, Marawi City.

Modular Multi-Industry Innovation Center

The Modular Multi-Industry Innovation Center dubbed as "Innohub" of the DOST-ITDI will be equipped with generic modular equipment with multi-function/application that can be retrofitted or modified as needed. It is designed for advanced researches on food and nutraceutical products using by-products of manufacturing operations as starting materials. While the completion of physical infrastructure is ongoing, personnel were trained on how to operate various equipment. Sample products are as follows: (1) dietary fiber from fruit pulp/peels, (2) dietary fiber cookies, (3) herbal supplement, (4) citrus seed oil and pili pulp oil, and (5) toothpaste and mouthwash with citrus seed oil.

Production of Bio-based Polyols and Polyurethanes for Industrial Applications

The Philippines may soon take the lead in the production of environment-friendly anti-corrosion material and foams as researchers from Mindanao create a process that will optimize their production through non-petroleum based replacements from organic by-products. Funded by DOST-PCIEERD, scientists from the Mindanao State University – Iligan Institute of Technology, and in partnership with Chemrez Technologies, Inc., unraveled a system that utilizes coconut oil to produce an industry-grade substitute for the petroleum-based chemicals used in anti-corrosive coating for the protection of metals and semi-rigid polyurethane (PU) foams as packing materials.

The researchers also produced foams from by-products of biodiesel production and farm wastes like rice straw. The organic refuse is converted into liquid form by dissolving it in crude glycerin to produce high hydroxyl content polyol which is then used for the production of rigid polyurethane foam products for the insulation of buildings. Farmers are envisioned to benefit from this breakthrough as their usual farm waste may become their future treasure trove.

A researcher from MSU-IIT prepares a polyurethane mixture made from rice straws and pineapple leaves.

One of the foams produced from the pineapple leaves and rice straws by the project

Newly Developed Philippine Bamboo Fabric

The environment-friendly pre-treatment technologies of bamboo fiber for textile production are DOST-PTRI's response to the growing interest and demand for ecologically-friendly textile processes and materials in support of the global goal of transforming Philippine bamboo for textile application. The technology employs an environmentally-sound approach that combines mechanical and chemical processes which yielded significantly higher fiber recovery compared to other natural textile fibers (NTFs) currently in use today. The pre-treatment application produced a bamboo blend fabric that is comparable to abaca and pineapple blended fabrics already developed at the PTRI.

Bambusa blumeana, Kawayan

Up-scaled Two-Way Extraction and Natural Dyeing Machine (2WEND)

A number of community-based enterprises has successfully adopted the DOST-PTRI's natural dyes technologies. To encourage and satisfy the demand of the textile dyeing industry, the Two-Way Extraction-Dyeing Machine (2WEND) was developed. 2WEND is designed to automatically extract the colorants from the raw materials, and to dye the NTFs such as abaca, pineapple, pineapple-silk and silk, in the same tank.

Two-Way Extraction-Dyeing Machine (2WEND)

Innovation Center for Yarns and Textiles (ICYT) Processing Services

The Innovation Center for Yarns and Textiles (ICYT) of the DOST-PTRI continued to cater to the needs of micro/small enterprises such as: 1) Narda's Handwoven Arts and Crafts, with the ICYT 80/20 cotton/abaca and cotton/pineapple yarns produced a new range: Narda's Naturals, developing 30 new styles, and with natural dyeing technology, 40 new color shades increasing sales 15-20% and adding 10 more weavers and six sewers; 2) Ilocos Norte's Pinili weavers developed new home accessory products using Philippine cotton yarns and grew sales by 20-30%; 3) Creative Definitions, with weavers of Kabankalan, Negros Occidental and Bugasong, Antique increased sales by 15% using 1,700 kg of Philippine cotton yarns; and 4) Roxas Foundation, with the initial 360kgs of 80/20 cotton/sugar cane bagasse yarns, launched placemats, table runners, and like home furnishings for the export market very successfully that another 500 kgs are in immediate demand. Going for the big league of national government agencies (NGAs) in support of Philippine Tropical Fabrics (PTF), the ICYT produced yarns of 80/20 cotton/abaca and 70/30 cotton/pineapple of various counts, converting these into 960 meters of PTF for uniform designs and prototypes by premier designers, design advocates and uniform makers for male and female employees of the DOST, DTI, DFA, DOT, CSC, and NEDA.

Portable Solar Lumber Dryer

The portable solar lumber dryer developed by the DOST-FPRDI collects energy from the sun through solar panels. This energy is stored in a series of solar batteries and converted into electrical energy to power the electric motors of the blowers to ensure uniform air circulation in the chamber during drying. The dryer has an auxiliary biomass heater and a glazed material roofing that also absorbs solar heat. Generating electricity from the sun through solar panels is practically free, nearly limitless and produces almost zero pollution. The portable solar drying chamber with biomass heater makes the drying of raw materials simpler by using solar heat and solar energy. Although the initial investment is high, free electricity would be beneficial for years due to almost zero maintenance cost.

Abaca Fiber for Pulp and Paper Industry


Abaca fiber produced

The DOST-FPRDI developed a decorticating machine for abaca (*Musa textilis* Nee) that is capable of completely extracting fibers from the leaf sheaths in a single feed, significantly increasing the fiber extraction/production rate compared with the existing methods of hand stripping (15-25 kg per day), spindle stripping (80-120 kg per day), and use of conventional decorticating machine (120-140 kg per day).
The developed non-hold on type single-pass decorticating machine improves the fiber extraction process and increases user safety in comparison with the traditional extraction methods for abaca fibers.

The introduction of the conveyor type of feeding leaf sheaths and integration of the clamping system to the machine will modify abaca fiber extraction and improve user safety.

Machine Features:

- 2 HP single phase motor
- Speed controller andi meter
- Automatic feeding
- Variable speed controller
- Variable clearance feeding
- Variable activated clamping system


Non-Hold on type single pass decorticating machine for abaca

Intelligent Transportation Solutions

The Intelligent Transport System (ITS) is one of the programs of the DOST-PCIEERD that currently develops innovative traffic and transportation systems that would employ advanced information and telecommunications technologies to modernize traffic management, and transport planning and operations. The developed technologies provide near real time traffic information for quick response related to road accidents and improvement of people and goods mobility.

The Local Traffic Simulator (LOCALSIM ver. 2) is a software that evaluates and provides simulation scenarios on proposed traffic counter measures, saving time and cost from eliminating actual trial implementation. The technology can be used by the Local Government Units (LGU) as an alternative to expensive commercially available traffic simulation software.

On the Other hand, the Contactless Apprehension of Traffic Violators on 24-Hour Basis and All-Vehicle Detection System (CATCH-ALL) uses a Machine Vision System that captures vehicle images on the street intersection in real time. The video analysis system consists of a vehicle detection and tracking, license plate localization and recognition, and traffic violations detection algorithms. Vehicle detection and tracking have 89.19% accuracy with 88.24% precision. Number coding has 94.67% with 86.67% precision. Swerving detection has 96.67% accuracy.

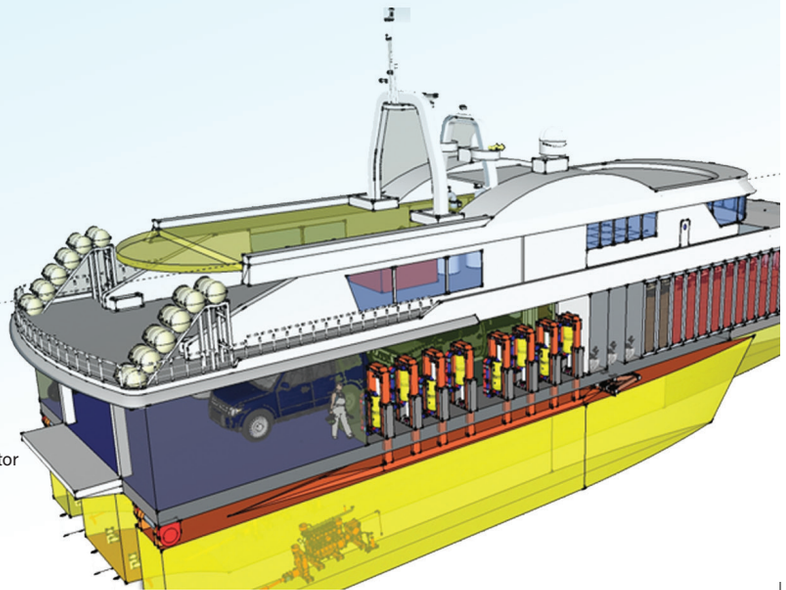
Sea Worthier Interisland Transport and Safety Systems Program

In the area of maritime transport, the DOST-PCIEERD supported research and development projects on the development of transportation vehicles on water and land to improve the maritime industry. One of these projects include the development of a hybrid trimaran fast craft passenger cargo vessel using multi-engine and alternative energy source from ocean waves. This environment-friendly and safe hybrid craft is being developed by Aklan State University (ASU), in partnership with the Maritime Industry Authority (MARINA) and Metallica Shipyard. It can carry 100 passengers, four vans, and 15 motorcycles.

On the other hand, the Severe Weather Amphibious Navigator is being developed by as means of transportation for relief and rescue operations when typhoon and flooding occurs. This water and land vehicle is capable of carrying up to 20 persons and 200 packs of relief goods. The project is a collaborative undertaking among Wesleyan University of the Philippine, Holy Angel University, Don Honorio Ventura State University and DOST-ITDI.

In addition, a Local Automatic Identification System was developed by De La Salle University (DLSU) and the Mapua University for ship tracking and monitoring purposes through the guidance of the Maritime Industry Authority

Hybrid Trimaran Fast Craft Passenger Cargo Vessel



Severe Weather Amphibious Navigator

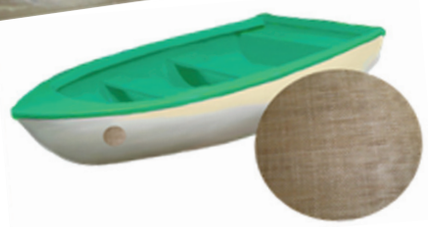
Abaca Fiber Reinforced Composites for Transport Application

Unmanned Aerial Vehicle

The DOST- ITDI developed composites from natural fiber of abaca as good substitutes to metals such as stainless steel, galvanized iron, wood and other materials commonly used to fabricate automotive parts and components. Earlier, the composites were used to fabricate the roof and side cars of tricycles in Bicutan. This time, the study used the abaca fiber composites to fabricate parts/components of a dinghy boat and an unmanned aerial vehicle (UAV). Prototype model for the dinghy boat has already been fabricated and will be tested for mobility thru paddling and/or motor use.

The technology intends to utilize the abundant supply of abaca in our country, develop an innovative technology using our local materials and create income for local abaca fiber producers. The fabricated boat and UAV can also be used during calamities, the latter in monitoring the extent of damage and the former as a rescue vehicle during calamities.

Dinghy Boat



Unmanned Aerial Vehicle (UAV)

Ravaged by an average of 20 storms a year, the Philippines may soon find formidable compliments from a fleet of unmanned aerial vehicles (UAV) in mitigating disaster risk and monitoring environmental concerns in the country.

The DOST-PCIEERD, FEATI University (FEATIU), De La Salle University (DLSU), and Ateneo de Manila University (ADMU) teamed up to develop a medium-range, fixed-wing, short take-off and landing (STOL) unmanned aerial vehicle (UAV) for the rapid assessment of disaster-stricken areas. This locally fabricated UAV with a modular flight controller, user-customizable communications system, and a multi-sensor payload system is capable of gathering various data from the ground. It provides greater elbowroom for disaster risk managers who can tailor-fit the aircraft according to their need to help scour hard-to-reach disaster hit areas. Further, the UAV R&D Program stimulates the development a local aerospace industry in the country.

A prototype of a drone starter kit developed by the De La Salle University

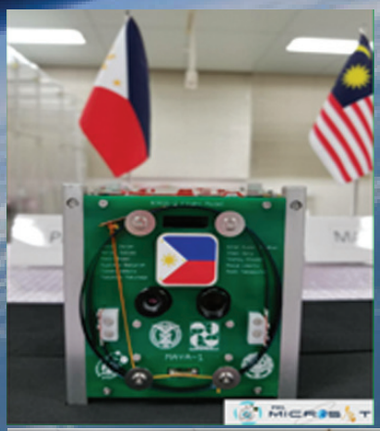
A model of a flight simulator developed by FEATI University which serves as a practice module for pilot training of UAV operators

Localized Steel Liners

The DOST-MIRDC developed localized steel liners catering to the requirements of the mining, quarrying and aggregates industries. The R&D project on the design and optimization of austenitic manganese steel liners, completed in March 2018, improved the value of cast plates used in jaw crushers. In comparison, the developed cast plates attained more than a 25% improvement over the best locally available brand. The locally-developed cast plates can provide mining and quarrying companies with a lower operating cost per cubic meter of aggregates produced.

Moreover, the DOST-MIRDC completed a study on utilizing the country's available indigenous iron mineral resources, particularly black sand and coal from Cagayan and Leyte and coal from Semirara Island, potentially building the country's capacity to locally produce iron.

Assembly and Launch of MAYA-1



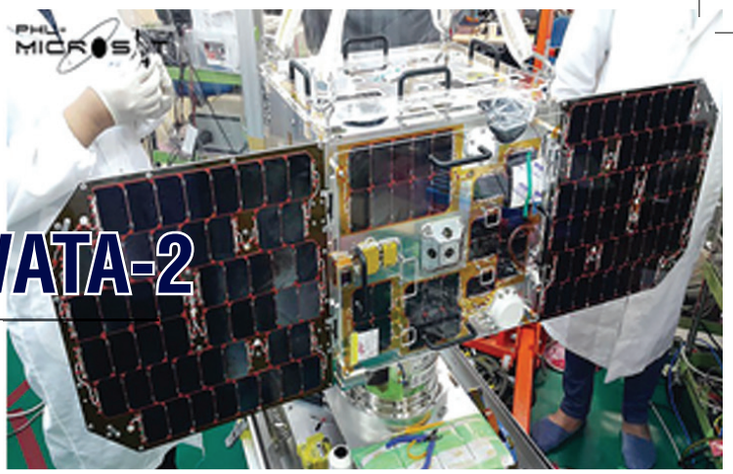
DOST-ASTI acting Director Joel Joseph S. Marciano Jr., Ph.D. together with MAYA-1 Engineers Mr. Joven Javier of DOST-ASTI and Mr. Adrian Salces of U.P. Diliman

The BIRDS-2 Project is a collaboration between the Philippines, Bhutan, and Malaysia. The project seeks to build nanosatellites with store and forward capabilities. It was hosted by the Kyushu Institute of Technology (KYUTECH) in Japan as part of the Philippine Microsatellite Program. The project successfully capacitated Filipino engineers in building the Philippines' first nanosatellite, MAYA-1. The nanosatellite was launched into orbit from the International Space Station (ISS) on August 10, 2018. Mr. Joven C. Javier, an engineer from the DOST-ASTI was one of two Filipino engineers trained during the project.

The satellites are designed to form a Low-Earth Orbit (LEO) constellation which will provide the countries with more opportunities to make measurements and run experiments.

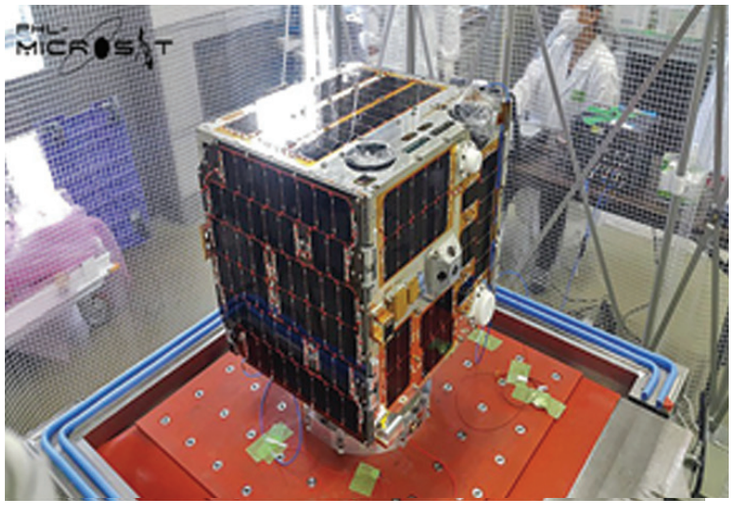
Maya-1 was released into space on August 10, 2018.

Assembly and Launch of DIWATA-2



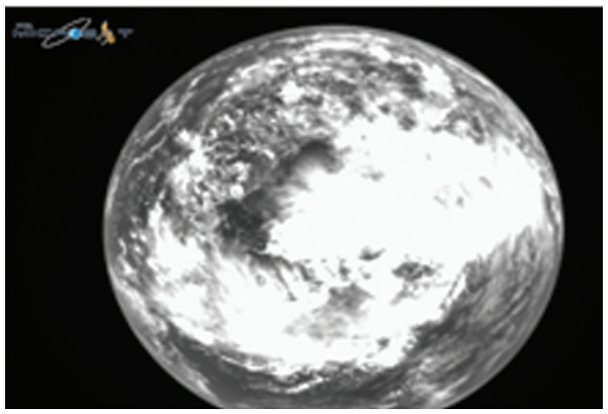
As part of the Philippine Microsatellite Program, the DIWATA-2 was built to continue the operations and purpose of DIWATA-1. DIWATA-2 is a 50kg class microsatellite built by Filipino engineers in Japan, in collaboration with Japanese professors from Tohoku University and Hokkaido University. The satellite was launched from the Tanegashima Space Center in Japan on October 29, 2018. The PEDRO center ground station in DOST-ASTI will serve as the main ground station for the command and control of the satellite. On the same day, the GRS made first contact with the satellite at approximately 13:00 PHT. The first image received from the satellite was made at 13:36, an image of the Earth's cloud formations covering the South China Sea.

The DIWATA-2 is expected to stay in orbit for five years, much longer than its predecessor, DIWATA-1, which is expected to deorbit soon after its deployment in 2016. Space-borne imagery creates opportunities for the country to be both responsive and proactive to environmental changes through real-time surveillance and continuous monitoring. With regard to this, images and data application services are provided for free.

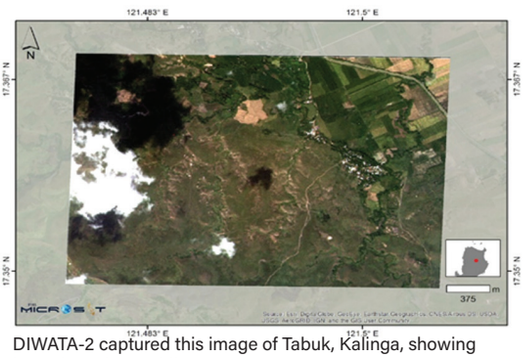


Solar array panel development test of Diwata-2 flight model. (Photo from PHL-Microsat)

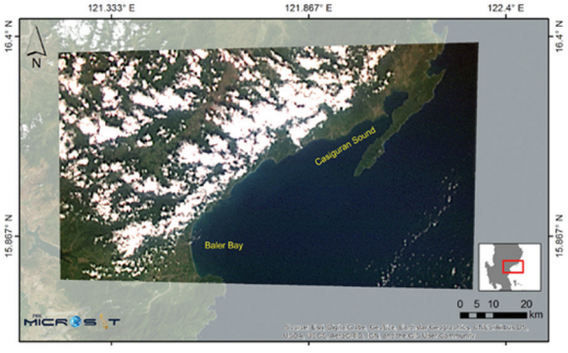
The H-HA F4 rocket at the Tanegashima Space Center in Kyushu, Japan which carried Diwata-2 into space (Photo from JAXA)



2018 at 13:36:02 PHT using the Wide Field Camera, DIWATA-2



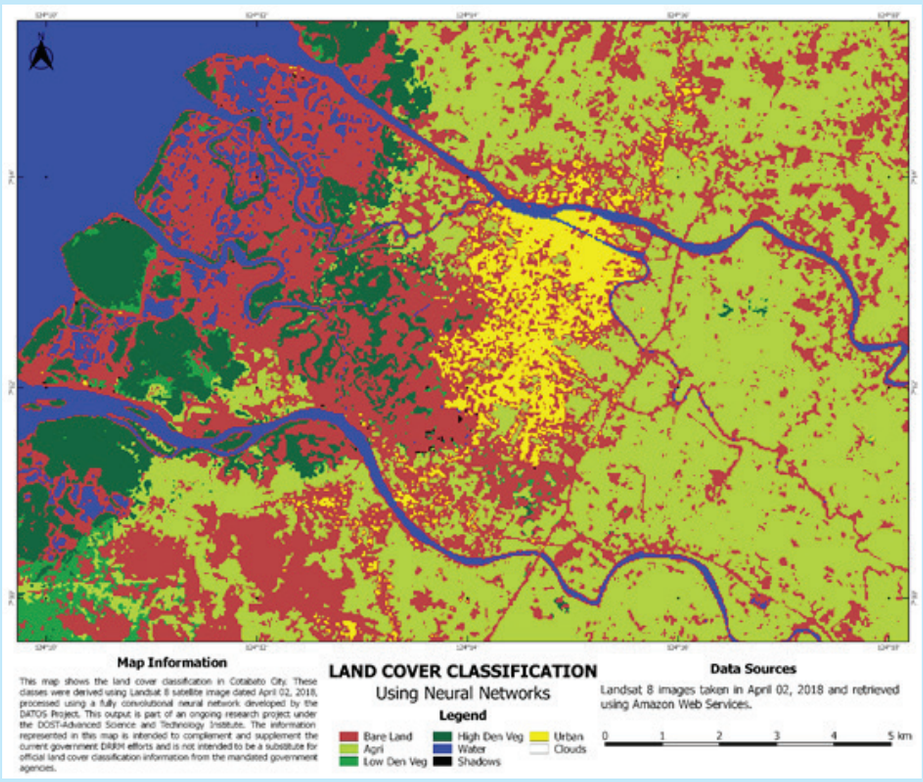
DIWATA-2 captured this image of Tabuk, Kalinga, showing its various rice paddies.



The image of Aurora, Philippines captured on November 15, 2018 13:18:32 PHT using the Spaceborne Multispectral Imager. (Basemap from ESRI)

DATOS Help Desk Project

The Remote Sensing and Data Science: DATOS Help Desk aims to produce outputs to support critical activities on disaster mitigation, analysis, and advice. DATOS utilizes data from both ongoing and completed DOST-funded programs/ projects, and other private/ non-government organizations (open-source). The DATOS Project of the DOST-ASTI uses Artificial Intelligence (AI) in processing satellite images. The DATOS team acquires these images through DOST-ASTI's Philippine Earth Data Resource and Observation (PEDRO) Center, the agency's ground receiving station for satellite data. These images are then processed and stored using the High-Performance Computing (HPC) facility of DOST-ASTI's Computing and Archiving Research Environment (COARE). Images can be ingested, processed, and released anywhere between 14 days to even just six hours depending on the availability of satellite images and the computing power needed for each output. The DATOS project uses Convolutional Neural Networks in processing satellite images to automate the detection and classification of objects—such as potentially flooded areas during hazard events, land cover classes, and road networks—from satellite images.



Land cover classification map of Cotabato City. These classes were derived using Landsat satellite image dated 2 April 2018 processed using a fully convolutional neural network developed by the DATOS Project. This classification can be applied nationwide and can change based on the latest satellite image available.

Transceiver antenna situated at the Davao Ground Receiving Station at the CAAP Radar Facility, Davao, Philippines

The DATOS Project of the DOST-ASTI uses AI in processing satellite images.

2

OUTCOME

TECHNOLOGY ADOPTION PROMOTED AND ACCELERATED

Technology Innovation for Commercialization (TECHNICOM)

The TECHNICOM program was created as an intervention to address or overcome pre-commercialization gaps/ hurdles through financial grant and technical assistance. The TECHNICOM which has been implemented by the DOST-TAPI since 2013 aims to stimulate technological innovation, and strengthen capacities in pursuing pre-commercialization activities, increase private sector adoption and commercialization of government-initiated R&D outputs and maximize benefits from government investments in R&D activities. The funding assistance from TECHNICOM prepares technologies for commercialization or use.

TECHNICOM supported 12 projects in 2018 implemented by the following institutions:

State Universities and Colleges (SUCs)

1. Design and Development of an Improved Manually Operated Carrot Seeder
2. Design Review, Design Finalization, and Product Assessment of a Locally Fabricated Optical Aerosol Monitor
3. Up-Scale Production and Market Validation of Oyster Powder from Philippine Oyster *(Crassostrea irredalel)*
4. Commercial Production and Evaluation of Fungal Entomopathogen *Isaria fumosorosea* as Bioinsecticide

Research and Development Institutes (RDIs)

5. Piloting of the DOST-FPRDI Wine Barrel Technology
6. Prototype Development of Natural Fiber-Thermoplastic Composites from Agricultural and Industrial Wastes for Industrial Applications
7. Product Improvement, Validation of Hypoglycemic Effect, Pilot Testing and Assessment of Business Potentials of the Developed Guava-based Probiotic Drink

Private Higher Education Institutions (HEIs)

8. Field and Market Testing of ILAWA: Renewable Power Generation from Traversible Waters using Recycled Anodic Material for Small Fishing/ Touring Vessels
9. Design of A Dielectric Spectroscope Utilizing Microwave Frequency for Cacao Pod's Maturity Testing

Start-Up Companies

10. Commercial Prototype Development and Scale-Up of Production Process of Po-lite Products
11. Pilot Testing of a Deepwater Operation 3D Visual Mapping and Inspection System (PD-DOMAINS)
12. Development of an Alternative Credit Scoring Model applying Machine Learning for Financing Farmers

Internationally awarded technologies

Two technologies assisted/funded through the TECHNICOM program were awarded gold medals during the 46th International Exhibition of Inventions of Geneva on April 11-15, 2018 at the Geneva Palexpo Arena in Geneva, Switzerland. These technologies included the Regional Roll-out of BIOTEK-M Aqua Kit from the Institute of Molecular Biology and Biotechnology of the National Institutes of Health, UP Manila and the Development; Pilot Testing and Market Validation of an Industrial Grade Prototype of Smart Surface from the Electrical and Electronics Engineering Intitute, UP Diliman.

Capacitated Program Stakeholders

The TECHNICOM conducted a three-day series of technical training/workshop for its stakeholders on November 21-23, 2018 at Astoria Plaza, Ortigas Center, Pasig City. The activity equipped and capacitated 50 program beneficiaries, stakeholders and implementers in terms of market penetration and technology transfer, and building technology-based businesses, facilitated by experts from the said fields.

Intellectual Property Rights (IPR) Assistance

In 2018, DOST-TAPI thru the Intellectual Property Rights Assistance Program (IPRAP) received and evaluated a total of 519 proposals/requests from private individual inventors, various institutions, and researchers with privately funded R&D. Out of the 519 proposals received, TAPI was also able to gather 30 technologies for possible IP protection.

In January 2018, the DOST-TAPI and the Association of Patent Agent Qualifying Examination (PAQE) Professionals, Inc. signed a Memorandum of Agreement for the conduct of IP audits in line with the implementation of the DOST-funded TAPI project titled "Support to the Commercialization of 500 DOST-Generated Technologies: Strengthening the Intellectual Property and Technology Portfolios of the DOST".

Awarding of UM certificate to Prof. Franklin Samonte (Professor of Isabela State University)

The DOST-TAPI provided assistance in the filing of 425 IP applications comprising of patents, utility models, industrial designs, and copyright. Other than contracted IP law firms, TAPI in-house patent agents were also tapped in drafting and filing IP applications. Out of the total number of IP applications, 26 of the Industrial Design registrations were filed by in-house patent agents and the copyright registrations were facilitated by the program.

With the technologies evaluated and with the on-going engagement with patent agents, 141 of the prior art search reports were conducted in-house and by contracted patent agents. Moreover, the program also rendered 245 consultations to various applicants for inquiries relative to Intellectual Property and the assistance covered by the program.
As to the technologies contracted out with on going prosecution, a total of five of these prosecution activities were reported.

The technologies which were meritorious for IPR assistance from applicants who signified their interest thru signed Conforme letters were contracted out to various IP service providers while six applications for IPR assistance are in process.

Technologies Transferred/Commercialized

The Research and Development Institutes (RDIs) of the Department focus its transfer, commercialization and utilization of completed R&D outputs on enterprises, particularly to micro, small and medium enterprises (MSMEs) improve productivity and competitiveness in the regions. Likewise, the Sectoral Councils provide funding to agencies for transfer, commercialization and utilization of their R&D outputs. Below is the list of Technologies Transferred/ Commercialized by DOST RDIs or by implementing agencies supported by DOST Councils through Technology Transfer Agreement in 2018.

List of Technoloies Transferred/Commercialized by DOST RDIs Through Technology Transfer Agreement in 2018

ASTI

1. Advanced Remote Data-acquisition Unit (arQ)

FNRI

1. Pancit Canton Noodles with Saluyot
2. Complementary Foods (Rice-Mongo curls)
3. Complementary Foods (Rice-Mongo Instant Blend)
4. Iodine-Rich Drinking Water and Iodine Premix
5. Bakery Products with Squash
6. Stabilized Brown Rice
7. Pancit Canton with Squash
8. Complementary Foods (Rice-Mongo-Sesame Blend)

FPRDI

1. Charcoal Crusher
2. Drum Kiln (2 units)
3. Electrically Heated Handicraft Dryer (2 units)
4. Furnace Type Handicraft Dryer
5. Furnace Type Lumber Dryer (1,000 and 10,000 bd. ft. capacity)
7. Manual Charcoal Briquettor
8. Mixer

ITDI

1. Biogas Digester System
2. Vacuum Fried Okra
3. Electric Plastic Densifier
4. Dual Drum Composter
5. ITDI Carbonizer
6. Salt Washer Machine
7. ITDI Cacao Roaster
8. ITDI Cacao Desheller/Winnower
9. ITDI Cacao Grinder

MIRDC

1. Spray Dryer
2. Vacuum Fryer
3. Water Retort
4. Freeze Dryer
5. Rice Transplanter Attachment for Hand Tractors
6. Rice Harvester Attachment for Hand Tractors

PNRI

1. Plant Growth Promoter

PTRI

1. Modified Handloom Weaving Machine (40" and 60")
2. Thera Loom v2.0
3. Geo Loom
4. Sectional Warping Machine
5. Twining/Twisting Machine
6. Basic Handloom Weaving
7. Advanced Handloom Weaving
8. Extraction and Application of Natural Dyes
9. Dyeing of Indigenous Fibers

List of Technologies Transferred/Commercialized Through Technology Transfer Agreement Facilitated by DOST Councils in 2018

PCAARRD

1. Sinta Papaya
2. Trichoderma
3. Composition and Method of Producing a Multi-Functional Biofertilizer for Use as Seed/ Planting Material Inoculant for Use in All Crops (Mykoplus)
4. Biocontrol Agents Against Panama Wilt Causing-*Fusarium oxysporum* Tr4 Cavedish Banana (ACTIcon)
5. Microbial-based Foliar Fertilizer for Improved Production off Eggplant (*Solanum melongena*) and Sugarcane (*Saccharum officinarum L.*) (Nutrio)
6. Carrageenan Technology
7. Rice Harvester Attachment to Hand Tractor
8. Rice Transplanter Attachment to Hand Tractor

PCIEERD

1. Community Lead Integrated Non-Cyanide Non-Mercury Gold Extraction Method (CLINN-GEM)
2. LEAP: Learning English Application for Pinoys
3. Eco-Sep
4. Nano-PGR (Nanoencapsulated Plant Growth Regulator)
5. VISSER (Versatile Instrumentation System for Science Education and Research)
6. ARRAS (Automated Rapid Reef Assessment Systems)
7. NitroPlus
8. Pancit Canton Noodles with Squash Technology
9. Bakery Products with Squash Technology
10. Rice Mongo Sesame Blend Technology
11. Tubig Talino

PCHRD

1. Lagundi Syrup
2. Lagundi Tablet
3. Sambong Tablet

Technology Marketing and Promotion

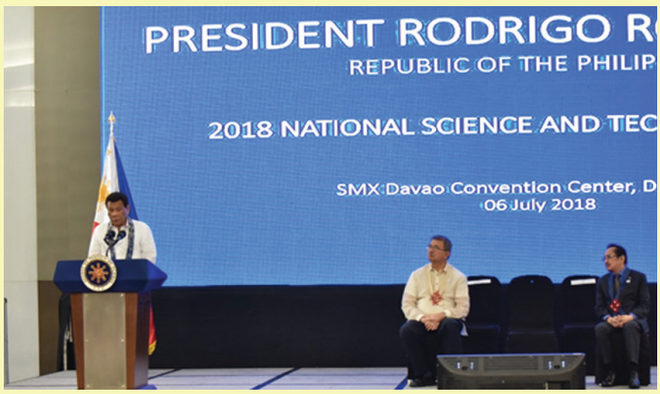
The DOST sustained its promotion and marketing of technologies developed from R&D supported and/or implemented projects undertaken by DOST agencies, academe, government R&D institutions and the private sector. These activities include fairs, exhibits and invention contests which serve as platforms for dissemination and exchange of information and ideas as well as strengthening linkages with various partners.

National Science and Technology Week (NSTW)

July 6 became a landmark day as the National Science and Technology Week (NSTW) was launched outside Metro Manila for the first time at the SMX Convention Center in SM Lanang, Davao City. President Rodrigo R. Duterte was on hand to view various scientific, technological, and innovative products and services featured at the exhibit.

Holding the NSTW celebration in Mindanao showcased the results of DOST's nationwide interventions during the past year. These include the rehabilitation of war-torn Marawi City, the SETUP 2.0 program for small and medium enterprises, the Human Resource Development program that reached scholars from 97 percent of municipalities nationwide, and the Balik Scientist Act that was signed on June 15, 2018.

The 2018 National Science and Technology Week (NSTW) Celebration was conducted on July 17-21, 2018 at the World Trade Center, Pasay City with the theme "Science for the People: Innovation for Collective Prosperity". The Department featured breakthrough programs, services and technologies in three clusters: STI at Home, STI at Workplace, and STI at School. A total of 26,932 registered visitors viewed the technology exhibits and participated in various games, raffles, cooking demonstrations and other fun activities.



President Rodrigo R. Duterte (at the podium) with Sec. Fortunato T. de la Peña (center) and Mindanao Development Authority Chair Abul Khayr D. Alonto (far right) during the NSTW celebration in Mindanao

Secretary Fortunato T. de la Peña delivering his welcome remarks during the Opening Ceremony of the 2018 NSTW at World Trade Center Pasig City.

National Invention Contest and Exhibits (NICE)

DOST-TAPI conducted the CY 2018 National Invention Contest and Exhibits (NICE). The NICE activity was in recognition of the value of the Filipino inventors to Philippines society and to national economic development. The regional winners of the CY 2017 Regional Invention Contests and Exhibits (RICE) competed for the major awards under the following categories: (1) Outstanding Invention (Tuklas Award), (2) Outstanding Utility Model, (3) Outstanding Industrial Design, (4) Outstanding Creative Research (Likha Award), and (5) Outstanding Student Creative Research (Sibol Award for High School and College Levels). They also vied for special awards sponsored by the World Intellectual Property Organization (WIPO) and International Federation of Inventors' Associations (IFIA).

Director Garcia and Secretary de la Peña pose for photos with the Outstanding Invention (TUKLAS) awardees, Aurora Amante El-estwani and Dr. Mary Beth Maningas (GMA News online photo)

Inclusive Innovation for Industrial Strategy (i³S)

The Philippines moves forward with innovation and entrepreneurship as the central pillar of the government's Inclusive Innovation Industrial Strategy (i³S) with the launch of the Inclusive Filipinnovation and Entrepreneurship Roadmap during the Inclusive Innovation Conference (IIC) held on October 2 to 3, 2018.

The DOST signed a memorandum of understanding with the Department of Trade and Industry (DTI), Department of Information and Communications Technology (DICT), Department of Education (DepEd), Commission on Higher Education (CHED), National Economic and Development Authority (NEDA) and Department of Agriculture (DA) to implement the i³S. These collaborations served as a venue to discuss industrialization and address innovation challenges in the country.

Also highlighting the event is the signing of an MOU among DOST, DTI and DICT for the establishment of the Startup Systems program 2019-2023, a five-year roadmap for the sustainable growth of the Philippine startup ecosystem. Through this, the three government agencies will promote and support startups through their programs, events, and projects.

MOU Signing during the Inclusive Innovation Conference 2018

3

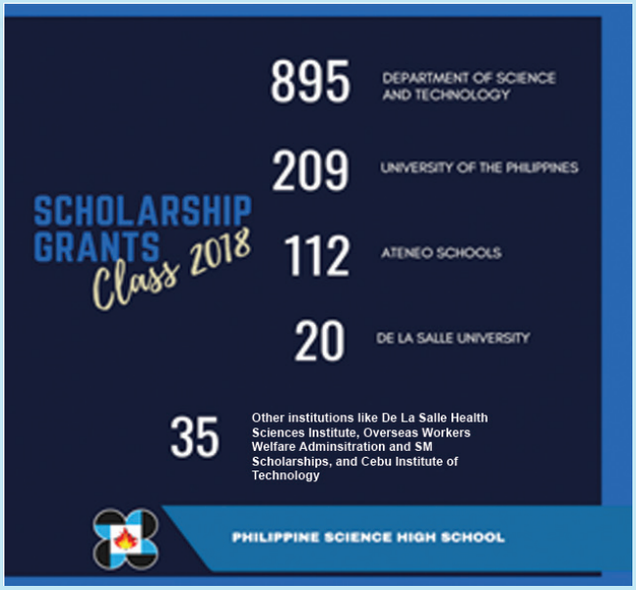
OUTCOME

CRITICAL MASS OF GLOBALLY COMPETITIVE STI HUMAN RESOURCES DEVELOPED

Provision of Specialized Secondary Education

Now carrying the brand of Global Excellence and Service to Nation – the DOST-PSHS System continues to reach greater heights in realizing its vision of becoming the leading science high school in the Asia Pacific region, that prepares scholars to become globally-competitive Filipino scientists.

The PSHS System has pushed the frontiers of education and refined its curriculum to focus on STEM (Science, Technology, Engineering, and Mathematics) education, keeping abreast of 21st century's global and cutting-edge technologies. To achieve this, the DOST-PSHS partnered with esteemed institutions in the country and benchmarked with premiere schools across the globe. They shared the knowledge they gained, from this engagement, with the rest of the PSHS teachers and the Department of Education. In 2018, the PSHS system has supported a total of 8,358 scholars from the 16 Regional Campuses. As the PSHS Campuses expand with new campuses and the implementation of the Specialization Years Program, development of infrastructure projects is one of the priorities.



The greatest testimonials to the hard work and dedication of the PSHS System are the achievements of PSHS scholars and graduates. In 2018, the PSHS scholars brought home top awards from prestigious international competitions such as the International Physics Olympiad, International Chemistry Olympiad, International Earth Science Olympiad, ASEAN+3 Junior Science Odyssey, and many more. PSHS Batch 2018, the first batch of graduates from the 6-year PSHS Curriculum, aced the University of the Philippines College Admission Test (UPCAT). The PSHS Batch 2018 manifested its passion for excellence as the PSHS Main Campus consistently ranked first in the category of high schools with 100 or more applicants. Meanwhile, the 10 regional PSHS campuses' graduates, occupied the top 10 spots in the category of high schools with less than 100 but not less than 70 applicants.

Among those who applied for various scholarships, 895 graduates obtained scholarships from DOST, 209 (still counting) from the UP System, 20 from DLSU, 112 from Ateneo and 35 from other institutions like De La Salle Health Sciences Institute, Overseas Workers Welfare Administration, SM Scholarships, and the Cebu Institute of Technology. In addition, 75 graduates qualified for scholarships in international universities from PSHS-Main Campus (52), PSHS-Southern Mindanao Campus (17) PSHS-Cagayan Valley Campus (2), PSHS-Western Visayas Campus (2), PSHS-Central Luzon Campus (1) and PSHS-Bicol Region Campus (1).

PSHS administrators attended a STEM Education Program by Temasek Foundation International and Nanyang Polytechnic

For instilling the value of public service among the youth, the PSHS was acknowledged by the Development Academy of the Philippines under the Central Luzon Campus – Kalasag Lahi Club's project entitled "KinaBOOKasan ng Kanaynayan" in the Government Best Practice Recognition 2018. The members of this club set up a Learning Resource Center in the Kanaynayan Community School where they made books and art works available in the center for students in the community.

Undergraduate and Graduate Scholarship Programs

The DOST-SEI enhanced its provision for scholarship, teacher development and science promotion programs in 2018. The DOST-SEI furthered its scholarship programs this year by increasing the number of slots and higher scholarship privileges for all its undergraduate scholars such as: monthly stipend (P7,000/month), tuition fee (P40,000/year), book allowance (P10,000/year), uniform allowance (P1,000), graduation allowance (P1,000), one economy-class round trip fare per year for those studying outside of their home province, and group insurance. For the graduate level scholars, there was an increase in book allowance from P10,000 to 20,000 per year.

The number of undergraduate and graduate scholars supported by DOST-SEI in 2018 increased by 25% totaling 28,433. The undergraduate scholarship programs supported a total of 23,531 scholars. Likewise, the graduate level is also higher than 2017 attainment by 24% with 4,902 scholars (MS – 3,632, PhD – 1,270) under the Capacity Building Program in Science and Mathematics Education, Accelerated Science and Technology Human Resource Development (ASTHRD) Program, and Engineering Research and Development for Technology (ERDT).

The Institute's efforts to promote its various scholarship programs have resulted in a steady upsurge in the number of municipalities being served. Over the past years, the percentage of municipalities served has climbed from 72 percent in 2011 to 97 percent in 2018. Out of 1,655 total number of municipalities and congressional districts, a total of 1,609 now host their own scholars.

Career Incentive Program

Another component of the DOST-SEI graduate scholarship program is the Career Incentive Program (CIP) which aims to strengthen the country's S&T capability and boost employment opportunities for DOST scholar-graduates. The program is available to MS and PhD scholar-graduates of the ASTHRD and ERDT who assume the positions of Senior Science Research Specialist and Supervising Science Research Specialist, respectively. To date, there are 97 scholar-graduates who benefited from the program since 2014. These scholar-graduates are deployed in DOST attached agencies, DOST regional offices and research institutions.

Science Teacher Academy for the Regions (STAR)

To improve the teaching and learning of science and mathematics at the primary and secondary levels with emphasis on content and pedagogy, the DOST-SEI's Science Teacher Academy for the Regions (STAR) project conducted various STEM teacher trainings all over the country with a total of 1,127 science and mathematics teachers as beneficiaries in 2018.

The program has engaged the participation of DOST-SEI's institutional linkages nationwide, namely:

- St. Louis University
- Mariano Marcos State University
- Saint Mary's University
- Central Luzon State University
- Philippine Normal University
- Batangas State University
- Palawan State University
- Bicol University
- West Visayas State University
- Cebu Normal University
- Leyte Normal University
- Western Mindanao State University
- Mindanao State University - Iligan Institute of Technology
- University of Southeastern Philippines
- University of Southern Mindanao
- Caraga State University

Furthermore, DOST-SEI also organized the Search for Brightest STAR, a competition for science and mathematics teachers who were trained under the Project STAR and adopted learning to make their classrooms, school, and teaching community places of innovation and positive change.

Training of Trainors on Engineering Design Process conducted at the City Garden Suites, Manila on November 10-11, 2018.

MOA Signing on April 26, 2018
at MSU-Main Campus, Marawi City

Rebuilding Marawi through Science Education

The DOST-SEI Bangon Marawi Program in Science and Technology Human Resource Development (STHRD) is DOST's immediate response to the call of helping rebuild and rehabilitate Marawi's human and social infrastructures, particularly in the S&T human sector. Scholarship slots were awarded to 217 BS, 20 MS, and 10 PhD students. The beneficiaries of the program are students who were immediate members of the families affected by the armed conflict or were displaced from their communities in Marawi City because of the siege in 2017.

The signing of the Memorandum of Agreement (MOA) between DOST-SEI, Mindanao State University (MSU)-Main Campus, and MSU-Iligan Institute of Technology for the implementation of the DOST-SEI Bangon Marawi in STHRD happened on January 26, 2018. DOST Secretary Fortunato T. de la Peña graced the event.

The Bangon Marawi scholars attended an orientation on scholarship policies and signing of the Scholarship Agreement on April 26, 2018. Furthermore, the 71 (49 BS, 14 MS, 8 PhD) scholars were presented to President Rodrigo Roa Duterte during the celebration of the 2018 MindaDOST Cluster-Regional Science and Technology Week (RSTW) in Region XI. The activity restores the scholars' confidence and importance as Filipino citizens of the country.

A total of 218 DOST-SEI scholars from undergraduate and graduate scholarship programs such as Bangon Marawi Program, RA 7687, RA 10612 and RA 2067 participated in the 2-Day Scholars' Formation Program on September 22-23, 2018 in Cagayan de Oro City to foster patriotism and bridge the gap between different cultures and belief systems for inclusive sustainable peace in Marawi City.

Out of the 217 BS scholars, 65 have already graduated from their respective fields (39 at the end of the Second Semester AY 2017-2018, with two Magna cum laude; and 26 in the First Semester of AY 2018-2019, with one Cum laude).

Promoting S&T Digital Literacy

As part of the advocacy for digital literacy, installation of Science and Technology Academic and Resource-Based Openly Operated Kiosks (STARBOOKS) continued in various regions. Currently, STARBOOKS is present in 3,312 sites nationwide.

The DOST-STII collaborated with the National Library for the implementation of the Integrated Philippine e-Library Project (iPeL), an interagency collaborative partnership that aims to provide greater access to online resources and subscription-based electronic databases as well as digitized Filipiniana materials including theses, dissertations, special collections, and research papers. Other members are the UP, DA, and CHED.

Philippine eLib Project Steering Committee Monitoring Visit
at Benguet State University with the NLP, DA, and CHED.

4

OUTCOME

PRODUCTIVITY AND EFFICIENCY OF COMMUNITIES AND THE PRODUCTIVE SECTOR, PARTICULARLY MSMEs, IMPROVED

Small Enterprise Technology Upgrading Program (SETUP)

SETUP aims to upgrade the technological capabilities and improve the productivity and efficiency of micro, small and medium enterprises (MSMEs). SETUP provided technological interventions such as innovation fund, technology transfer and commercialization assistance, consultancy, packaging assistance, technology trainings and laboratory and testing services to empower MSMEs to innovate, move up the technology scale and become more competitive. In 2018, a total of 773 MSMEs received innovation-enabling fund support to upgrade their technological capability contributing around 40% average productivity improvement in their operations and generating 42,458 jobs/employment. In the same year, a more robust SETUP, dubbed as 'SETUP 2.0' revitalized the roster of intervention mechanisms available under the program. SETUP 2.0 sets out to provide interventions needed at the level of the sector or industry, on top of its regular clientele of individual MSMEs.

RU Foundry and Machine Shop Corporation (RUFMSC), one of the SETUP beneficiaries, caters to the casting, machining, and fabricating requirements of the sugar industry, cement/mining factories, and agro-industrial companies.

With the technical assistance provided, the company's productivity improved: the number of units produced increased from 322 units to 354 units or by at least 10% on the first year of SETUP implementation. The manufacturing process also improved: processing time for machining of shredder parts was reduced from 26 hours to 13 hours or by at least 50%. Aside from the company, the community also benefited: regular employment increased from 64 to 86 personnel and new technical skills were acquired by the workers. It also facilitated technology transfer to partner communities for them to sustain and become self-reliant.

OneStore

To help MSMEs expand their customer reach, increase brand awareness, save up on operational costs for opening new physical stores, and overcome geographical limitations, DOST established the oneSTore.ph program, which promotes both "e" (electronic) and "m" (mobile)-commerce.

In 2018, DOST and Department of Trade and Industry (DTI) sealed an innovation partnership through a Memorandum of Agreement to complement programs and services for the MSMEs. MSMEs assisted by DTI through the Negosyo Centers and One Town, One Product (OTOP) Philippines Hub may now market their products online through the OneStore.

OneSTore.ph was also able to reach out to 165 women micro entrepreneurs who enrolled their products in oneSTore.ph through collaboration with a social enterprise under the auspices of a women economic empowerment project.

As of 2018, the onestore.ph online and mobile shopping platform has uploaded a total of 12,000 products. Local products sold online amounted to 2.2 million pesos. In 2018, OneStore.ph was able to close a high value transaction of an agricultural machinery, reaching an island market as far as Batanes.

In addition, a total of 23 OneSTore Hubs located nationwide sold local products worth 143.5 million pesos.

Launching of the DOST S&T Nook during the DOST-DTI Synergy Meeting on April 5, 2018. The DOST S&T Nook features OneSTore flatform which will be established inselected DTI Negosyo Center. OneSTore assist in the online marketing SETUP products

OneExpert

To improve the overall performance of MSMEs, government-subsidized consultancy services are provided to MSMEs to help them improve their operations and intelligently exploit their resources to make them even more competitive.

To improve access to experts and technologies particularly of people living outside of major urban centers, an interactive web-based nationwide pool of S&T experts was created. The program, dubbed as One Expert, brings the services of accredited expert located anywhere in the Philippines to clients that need S&T assistance.

As of 2018, the portal had a total of 668 registered experts from 152 institutions all over the Philippines. Through this database, project implementers, both from DOST and other organizations, can outsource experts and consultants from anywhere in the country. These accredited experts and consultants provided support to 88,172 individual customers and 13,736 firms mostly through on-site assistance under the SETUP.

A total of 264 consultancy and training applications are managed and monitored through the OneExpert portal although the project aims to include all S&T services of the DOST Regional Offices. The portal has 1,363 registered online clients and has received a total of 360 inquiries from clients through the OneExpert Opportunities and other official channels.

Aside from the portal, OneExpert has also developed its own messaging platform called OneChat to digitally connect experts, clients and technical personnel. The project plans to promote OneChat to MSMEs, other government agencies and the general public as a mode of communication among Filipinos.

OneExpert is indeed an innovation in nation-building - by bridging the gap between S&T experts and the Filipino community.

Interactive Scientific Knowledge Management System (SKMS) Portal

The Scientific Knowledge Management System (SKMS) is linked with OneExpert portal which allows and gives members of the DOST-NRCP the opportunity to join in consultancy programs that provide technical advice and consultancy services to Filipinos anywhere in the country.

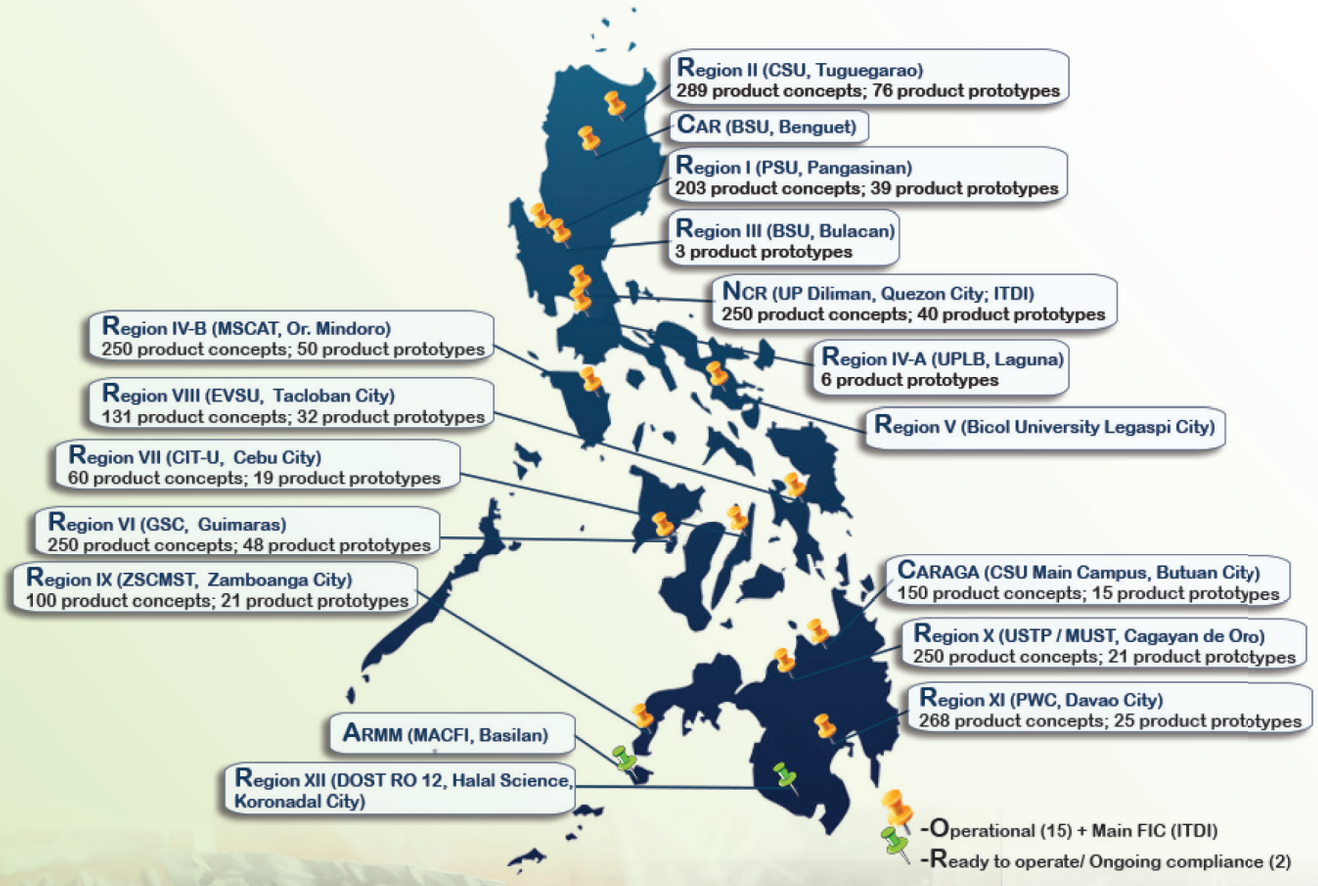
The SKMS is a repository of Filipino researchers, scholars, scientists, engineers and authors of scientific publications and basic researches in the Philippines as well as research-based policies. It virtually provides a wide array of valuable scientific information to stakeholders and clients. SKMS also provides online services to the DOST-NRCP clients such as submission and evaluation of membership applications, online updating of members' profile, submission and evaluation of research project proposals, project management and monitoring, and peer review process of journal publications.

The project is now on its final year of development. Its components are expected to be fully integrated and operational by the end of 2019.

Food Innovation Center

The Food Innovation Centers (FICs) serve as a hub for innovations, research and development, and technical support services for value-adding of fresh produce and development of processed foods in the regions. Each FIC provides the opportunity among local food manufacturers to improve and develop products using the four locally designed and fabricated food processing equipment: (1) vacuum fryer, (2) spray dryer, (3) freeze dryer, and (4) water retort. As of 2018, 15 out of the 17 regional FICs were operational with the FICs in Regions CALABARZON and SOCCSKSARGEN still under renovation and construction, respectively.

Overall, the regional FICs had generated 2,946 product concepts; of which, 406 were translated into product prototypes. The regional FICs were able to generate 70 IP applications and provided various technical assistance to 1,618 customers nationwide who have rated the service at 86% and higher.



Technology Business Incubators

Technology Business Incubation (TBI) Program is designed to nurture and accelerate the establishment and growth of technology-based startups through the provision of business and mentoring support, offered both in the incubator and through the network of key players in the industry. The DOST- PCIEERD and DOST-PCAARRD has supported the establishment of 26 TBIs and two innovation hubs.

In 2018, DOST-PCIEERD initiated a program that aims to further stimulate the growth of technology business incubation around the country. The program dubbed as "Higher Education Institution Readiness for Innovation & Technopreneurship (HeIRIT) Development Program for Starting TBIs" prepares 20 universities in the creation of their own TBIs by equipping them to plan, implement and establish their own TBIs in the hope of building and supporting a startup community in their own university. Ten of these 20 universities have received funding from DOST-PCIEERD for their TBI operation.

Towards the end of 2018, the 2nd National TBI Summit was held to gather the incubators and startups assisted by DOST-PCIEERD. The event not only served as a venue to learn about the governments' programs and support for the sector, but also to promote partnerships. More than 300 startups participated in the event. The activity was highlighted by the signing of memorandum of understanding (MOU) among the DOST, DTI and Department and Information and Communications Technology (DICT) to harness their programs and projects in putting up a conducive business ecosystem for startups.

On the other hand, the DOST-PCAARRD has supported the establishment of 14 TBIs since 2017 across the country to encourage, support, and nurture the development of mature agriculture, aquatic and natural resources (AANR) technologies into viable commercial agribusiness ventures for the creation of wealth, employment, and economic development. A total of 95 incubatees are currently being assisted by the TBIs since the commencement of the program.

The program demonstrated significant potential to play a positive role in entrepreneurship growth in the AANR sectors as the incubatees from the initial set of TBIs already generated 185 jobs and an aggregate gross income of Php 9.8 million.

PCAARRD TBI Accomplishments

14	TBIs established/supported	44	promotional activities conducted/participated in
95	incubatees supported	60	TBI personnel trained
3	incubatees for potential graduation	552	incubatees (including other clients such as potential incubatees or pre-incubatees) trained
36	technologies commercialized	33	trainings conducted for or attended by TBI personnel
15	TBI operation manuals developed	63	trainings conducted for incubatees
27	TBI curricula developed	39	partnerships/linkages established
18	business plans for TBI developed	29	IP applications filed
32	business plans or business model canvases for incubatees developed	185	jobs generated by incubatees
34	IEC and other printed promotional materials developed	PhP 9.8 M	gross income generated by incubatees

OneLab

Networking of the science and technology laboratories into a Onelab Network enable clients to submit their samples to any location. The One-stop Laboratory Services for Global Competitiveness (Onelab) project integrates DOST and non-DOST laboratories through an IT-based Referral System which allows for the seamless handling of samples from receiving, referral, transport, analysis to the prompt delivery of calibration and testing reports, no matter where the customers are in the Philippines and other parts of the world.

In 2018, OneLab network expanded its reach to other ASEAN neighbors. Three international laboratories in the ASEAN formally joined OneLab, namely: (1) Intertek-Thailand (2) Intertek-Vietnam and (3) SGS-Thailand. In the local arena, six new members were added to the network as follows: Fast Lab-Calamba, Center for Excellence in Drug Research, Evaluation and Studies, Inc. (CEDRES), Scientific Standards Services, Analytical Solutions and Technical Services Laboratory, Mach Union Laboratory, and Ostrea Mineral Laboratory. As of 2018, a total of 44 laboratories comprise the OneLab network.

In 2018, the network facilitated 346 referral transactions involving 648 samples and 1,747 test and calibration services. The number of transactions increased by 68.75% compared to 2017 data. From these figures, Php 1.9 million laboratory fees were collected.

Under the project, two Halal Verification Laboratories in Regions CALABARZON and XI were set-up and inaugurated. Of the 11 new services targeted to support the food safety program of the Department, eight are now fully offered, *Vibrio parahaemolyticus*, *Vibrio cholera*, *Campylobacter*, nitrites in meat products, *Salmonella*, shelf-life testing, commercial sterility and benzoate.

The project capped 2018 on a high note with the successful conduct of the OneLab ASEAN Forum on December 5, 2018 where the new members were introduced to the OneLab network. Another highlight was the recognition of OneLab's Referral Module System as one of the Top 10 Best Practices among the 36 entries to the 6th International Best Practice Competition held in Abu Dhabi, United Arab Emirates on December 10-12, 2018.

Natural Rubber Testing Laboratory

DOST-IX's Raw and Natural Rubber Testing Laboratory has been conferred the ISO/IEC 17025:2005 accreditation by the Philippine Accreditation Bureau (PAB). The conferment of the said accreditation on January 08, 2018 makes DOST-IX's laboratory, the first and only accredited testing facility for raw and natural rubber in the country.

The Rubber Lab Team hurdled the thorough assessment of its Quality Management System, testing procedures and laboratory staff competencies conducted by the accreditation bureau on August 10-11, 2017. PAB has recognized the facility for complying with the requirement mandated by international standards and has issued the Certificate of Accreditation for a defined scope in Chemical and Mechanical Testing fields. Registered Chemical Technician, Ruben M. Lim, Jr. and Registered Chemist, Shadam E. Suganob, were also approved as signatories for the following testing parameters: dirt, ash, nitrogen, Mooney viscosity, volatile matter, initial plasticity, plasticity retention index and color.

ISO/IEC 17025:2005 is one of the highest standards that a testing laboratory can obtain. It is also the standard that laboratories must be accredited with in order to be deemed technically competent to carry out tests and/or calibrations including sampling, using standard methods, non-standard methods, and laboratory-developed methods in the specified and listed test scope. Laboratories use ISO/IEC 17025 to implement a quality system aimed at improving their ability to consistently produce valid results.

The Natural Rubber Testing Laboratory was set-up through the DOST's National Rubber R&D Agenda to address the need for a rubber testing facility in the country. DOST, through its Grants-In-Aid program, provided funds to set-up and operate a Natural Rubber Testing laboratory under the project, "Upgrading and Accreditation of Laboratories to Include Rubber Analyses in Strategic Areas in Mindanao".

Radiation Protection Service

Radiation protection service is one of the scientific and technological services offered by the DOST-PNRI to ensure the safety of personnel working with radioactive materials and other sources of ionizing radiation such as x-ray equipment. Considering that exposure to radiation could be a health hazard to humans, it is necessary that radiation levels in these facilities are measured, monitored and controlled within safe limits.

In 2018, the two-storey Radiation Protection Services Facility and a Neutron Dosimetry and Research Laboratory have been completed. Alongside is the development of systems for the National Dose Registry, a tool that tracks the dose history of workers and provides a means to assess and report levels of exposures and their associated risks.

The new Radiation Protection Facility

Neutron Dosimetry Laboratory

Community Empowerment through Science and Technology

Through CEST, S&T interventions were extended to economically disadvantaged communities in rural and urban areas through five entry points: (1) economic development (livelihood), (2) health and nutrition, (3) human resource development, (4) environmental protection and conservation, and (5) disaster risk reduction and climate change adaptation.

Beneficiaries of S&T interventions either belong to geographically isolated and disadvantaged areas (GIDA), indigenous people, women's organizations, communities with conflicts, fisher folks, farmers, and other marginalized sectors. In 2018, CEST has assisted a total of 222 communities nationwide, which brings to a total of 889 communities assisted since its inception.

DEPARTMENT OF SCIENCE AND TECHNOLOGY
CEST
Community Empowerment Thru Science and Technology

Interventions

6,963	Household beneficiaries receiving Ceramic Water Filter Units
92	Training / review classes conducted
298	STARBOOKS units deployed
397	DOST- SEI Scholarships granted
502	Technology trainings conducted
269	Technology-based projects implemented
127	Packaging materials and labeling design provided
9,438	Normal / Malnourished Children (0-5 yrs. old) served under the regular feeding program
53	WLMS devices installed
116	ARG devices installed
11	Tandem (WLMS+ARG) devices installed

Empowering the Coffee Farming Community in Tuburan, Cebu

The CEST program further empowers the coffee farming community in Barangay Kabangkalan, Tuburan, Cebu by upgrading its coffee production capabilities for more income opportunities. Post-harvest and processing technologies are provided to the community such as bean dryer, pulper machine, huller machine, coffee roaster, coffee grinder, moisture analyzer, and packaging machines.

This project also provides assistance in the improvement of the current packaging and labeling of Tuburan coffee. The current packaging utilizes generic packaging with sticker label. Although ground coffee beans are adequately protected and preserved by their current packaging - black opaque, matte-finish, stand-up, zip-locked, aluminum composite plastic, direct printing of label information would be a significant improvement for marketability. The packaging and labeling assistance provided includes label design improvement, packaging with direct printed label design, nutritional analysis for nutrition facts, shelf life analysis for identification of expiry date and acquisition of barcode.

Tuburan is a 2nd municipal income class municipality in the province of Cebu. It has a high poverty incidence and high frequency of flood in lowland areas.

About 1,000 coffee farmers in Tuburan, Cebu, are now enjoying the fruits of the government-assisted coffee plantation and post-harvest facility. The coffee farmers were able to produce 128.18 kilograms of coffee beans from January to April 2018. It generated sales of P102,490. From a mere 500 hectares in nine barangays in Tuburan, Cebu, the farm has now spread to 2,850 hectares in 16 barangays. Tuburan is also a recipient of other government programs such as the National Greening Program of the Department of Environment and Natural Resources (DENR) and Accelerated and Sustainable Anti-Poverty Program of the National Economic and Development Authority (NEDA).

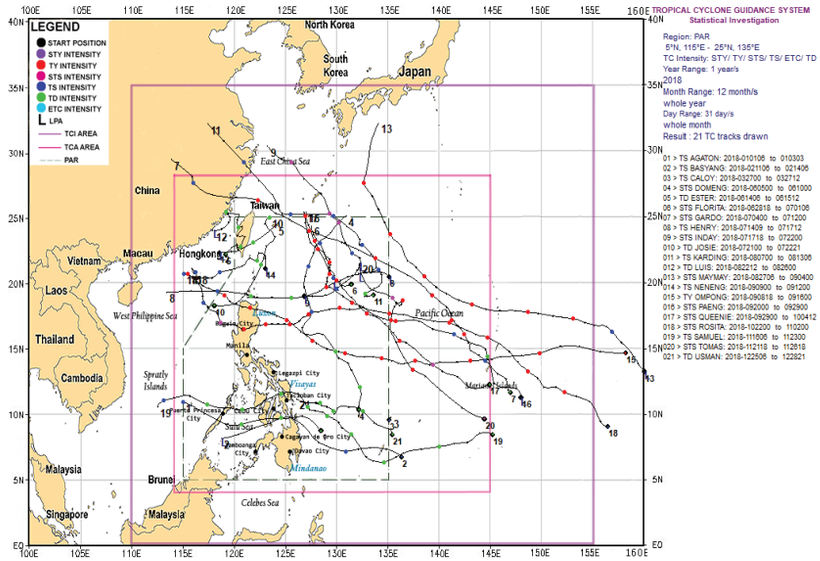
5

OUTCOME

RESILIENCY TO DISASTER RISK AND CLIMATE CHANGE ENSURED

Weather Forecasting and Tropical Cyclone Warning Services

As the mandated agency for the provision of adequate, up-to-date and timely information on atmospheric, astronomical and other weather-related phenomena, the DOST-PAGASA continuously monitors the daily atmospheric activity in the country. In 2018, 21 tropical cyclones entered the Philippine Area of Responsibility (PAR). DOST-PAGASA recorded a 24-hour forecast track error of 69.6 kilometers for the 4th quarter of 2018. This satisfies the agency's target of 100kms error for a 24-hour forecast.



Tropical Cyclone Track (January to December 2018)

Launching of the new DOST-PAGASA website

DOST-PAGASA launched its new website under a new address (bagong.pagasa.dost.gov.ph) on June 11, 2018 to enhance DOST-PAGASA's services in weather and tropical cyclone warning services, hazards monitoring and risk assessment.

Flood Early Warning System Automation for Disaster Mitigation in Greater Metro Manila Project

The Korea International Cooperation Agency (KOICA) and the DOST-PAGASA officially launched the Automation of Flood Early Warning System for Disaster Mitigation in Greater Metro Manila Project on December 7, 2018, at DOST-PAGASA, Quezon City.

The Korean Government through KOICA granted US $5.2 Million for the establishment of a Command Center with state-of-the-art equipment; provision and installation of automatic water level gauges, automatic rain gauges, warning posts, CCTVs; development of 10 units of software; and setting up relay stations and wireless network for the CCTVs.

The project intends to improve responsiveness to natural disasters and mitigate damages to residents in the Tullahan and Pasig-Marikina river basins. Through this project, casualties and property damages would be minimized by securing forecast way before flooding incidents occur.

Ambassador Han Dong-Man, Korean envoy to the Philippines, led the ceremony together with DOST Secretary Fortunato T. de la Peña, KOICA Country Director Myung Seop Shin, and DOST-PAGASA Administrator Vicente Malano during the launching of the Automation of Flood Early Warning System for Disaster Mitigation in Greater Metro Manila Project on December 7, 2018 at DOST-PAGASA, Quezon City.

Volcano, Earthquake and Tsunami Monitoring and Warning

The DOST-PHIVOLCS continued to upgrade monitoring capability by improving the monitoring systems for volcano, earthquake, and tsunami.

Earthquake and Tsunami Monitoring

The country's capability to detect earthquakes and determine tsunamigenic events was enhanced. With the commissioning of four new seismic stations in Marawi City, Lanao del Sur; Loreto, Dinagat Island; Laak, Compostela Valley; and Tandag, Surigao del Sur, DOST-PHIVOLCS now operates a 100-station Philippine Seismic Network capable of monitoring earthquakes and providing accurate and timely information. Similarly, DOST-PHIVOLCS continued to operate 10 tsunami detection stations and 43 tsunami alerting stations. The sea level stations increased to 19 with the commissioning of one tsunami monitoring station in Dumaguete City and further enhancing DOST-PHIVOLCS capability in detecting local and distant tsunamis.

Ribbon Cutting Ceremony during the Inauguration of the 100th Seismic Station in Tandag City, Surigao del Sur on October 4, 2018. (Front Row L-R) Joseph Poruatirio, Mayor Alexander Pimentel, Roxanne Pimentel, Usec. Renato U. Solidum Jr., Abel De Guzman, and Karter Ronquillo.

Volcano Monitoring

The status of the country's active volcanoes can now be assessed anytime, anywhere which is crucial to the timely issuance of information and warning with the operation of manned volcano observatories and monitoring networks. DOST-PHIVOLCS closely monitored the activities of the eight most active volcanoes in the country, namely: Pinatubo, Taal, Mayon, Bulusan, Kanlaon, Hibok-hibok, Parker and Matutum. DOST-PHIVOLCS enhanced the integrated multi-parameter and real-time volcano monitoring through the installation of broadband seismic arrays, remote cameras for online live streaming and real-time visual monitoring and real-time data acquisition. These enhancements would improve the capability of DOST-PHIVOLCS volcanologists in the local observatory and in the main office in Quezon City to monitor closely and in real-time any volcanic activities. This assessment was proven during the Mayon Volcano eruption in January 2018 when DOST-PHIVOLCS raised Mayon Volcano's alert level from II to III, signifying that Mayon had increased tendency towards hazardous eruption. As a result of the heightened alert level, precautionary evacuations were conducted in 25 barangays in three municipalities and two cities to ensure the safety of the residents.

Volcanic, Earthquake and Tsunami Hazards Mapping, Risk Assessment and Research and Development

Hazard maps used for local development and contingency planning and in the design of buildings and infrastructure can now be easily accessed through the launching of DOST-PHIVOLCS' website on April 20, 2018 for a convenient, quick, and hassle-free online access to volcanic, earthquake and tsunami hazard maps for stakeholders. Local Government Units (LGUs), government agencies, and other stakeholders can now access hazard maps using their computers and even through their smartphones free of charge by accessing the website (https://gisweb.phivolcs.dost.gov.ph/hazardmap). Aside from volcanic and lahar hazard maps, the website also contains information on active faults, ground shaking, liquefaction, earthquake-induced landslide and tsunami. The hazard maps are useful for disaster awareness, prevention, mitigation, preparedness and response plans of the local government, land-use planning, teaching aid, urban planning, and risk assessment.

Also launched in 2018 was the Philippine Earthquake Model (PEM) Atlas during a press conference on January 17, 2018 at the DOST-PHIVOLCS Auditorium. The PEM Atlas is a handbook of probabilistic seismic hazard maps that aid engineers in designing earthquake resilient buildings and structures. It is useful for land use and urban planning, and disaster risk management plans of LGUs, government agencies, and other stakeholders. The PEM Atlas was distributed to various stakeholders in January 2018. On the other hand, the Metro Cebu Earthquake Model (MCEM) Atlas was launched on July 4, 2018 at the DepEd Ecotech Center, Ecotech Road, Sudlon, Lahug, Cebu City. The Atlas is a seismic ground motion hazard assessment specific for Metro Cebu, considering various earthquake sources including the Central Cebu Fault System. This Atlas is used as reference in the seismic design of buildings and structures and as a tool for earthquake impact assessment and earthquake risk reduction efforts of national government agencies, LGUs in Metro Cebu, academe and the private sector.

DPWH Asec. Gilberto Reyes, DPWH Usec. Ma. Catalina Cabral, DOST Sec. Fortunato T. de la Peña, and DOST Usec. Renato U. Solidum Jr. unveil the Philippine Earthquake Model Atlas on January 17, 2018 at PHIVOLCS Auditorium.

Volcano, Earthquake and Tsunami Disaster Preparedness

Risks brought about by volcano, earthquake and tsunami hazards were communicated to the public through various IEC campaigns, drills, tours, lectures, seminars and exhibit. Earthquake awareness and preparedness was also taught through capability building activities for LGU of Bohol on October 10-11, 2018 and teachers' training in Ormoc City on April 24-26, 2018 and July 4-5, 2018.

With the aim of ensuring the mainstreaming of disaster risk reduction into the local development process of LGUs, agencies and organizations, nine batches of training were conducted on the use of the DOST-PHIVOLCS-developed Rapid Earthquake Damage Assessment System (REDAS). The participants of REDAS trainings were representatives from provincial offices, towns and cities, various NGAs, and planners and engineers from private companies. Over a 5-day period, the participants underwent lectures and hands-on exercises on seismic hazard assessment risk exposure database.

Teachers' Training on Communicating Volcano, Earthquake and Tsunami Hazards" for high school teachers of Ormoc City

Seminar-Workshop for the Local Government Units: Earthquake Awareness and Preparedness for the Province of Bohol

Geo-Informatics for the Systematic Assessment of Flood Effects and Risks for a Resilient Mindanao (Geo-SAFER Mindanao)

The Geo-informatics for the Systematic Assessment of Flood Effects and Risks for a Resilient Mindanao, also called "Geo-SAFER Mindanao Program" is a Mindanao-wide Disaster Mitigation Program funded by the DOST-PCIEERD. It is implemented by five (5) Higher Education Institutions (HEIs) in Mindanao namely: the Ateneo de Zamboanga; Caraga State University; Central Mindanao University; Mindanao State University – Iligan Institute of Technology; and the University of the Philippines – Mindanao.

President Rodrigo Duterte listens attentively as Geo-SAFER Mindanao Project Leader Dr. Meriam D. Santillan of Caraga State University explains the project.

The program aimed to produce highly detailed flood hazard maps using Light Detection and Ranging (LiDAR) and Interferometric Synthetic Aperture Radar (IfSAR) technologies of 97 river basins in 23 provinces in Mindanao. Conduct of trainings and seminars for Disaster Risk Reduction and Management Officers (DRRMOs) and Planning Officers of the LGUs were arranged for the proper interpretation and application of the project outputs, not only for flood disaster management purposes but for comprehensive land-use planning as well.

With the aim of delivering science for the people, the project hopes that through the generation of detailed flood hazard maps, MINDANAO will become more resilient to the adverse effects of climate change.

Real-Time Radiation Monitoring System

The program aims to establish a real-time environmental radiation monitoring system for immediate detection and continuous monitoring of radiation emergencies throughout the Philippines. In 2018, the DOST-PNRI accomplished the following under the program: (1) commenced pre-installation requirements for three radiation monitoring stations in Baler, Guiuan and Hinatuan; (2) installed radiation monitoring station in Guiuan; and (3) drafted protocol for use and access of radiation monitoring data for emergency preparedness and response.

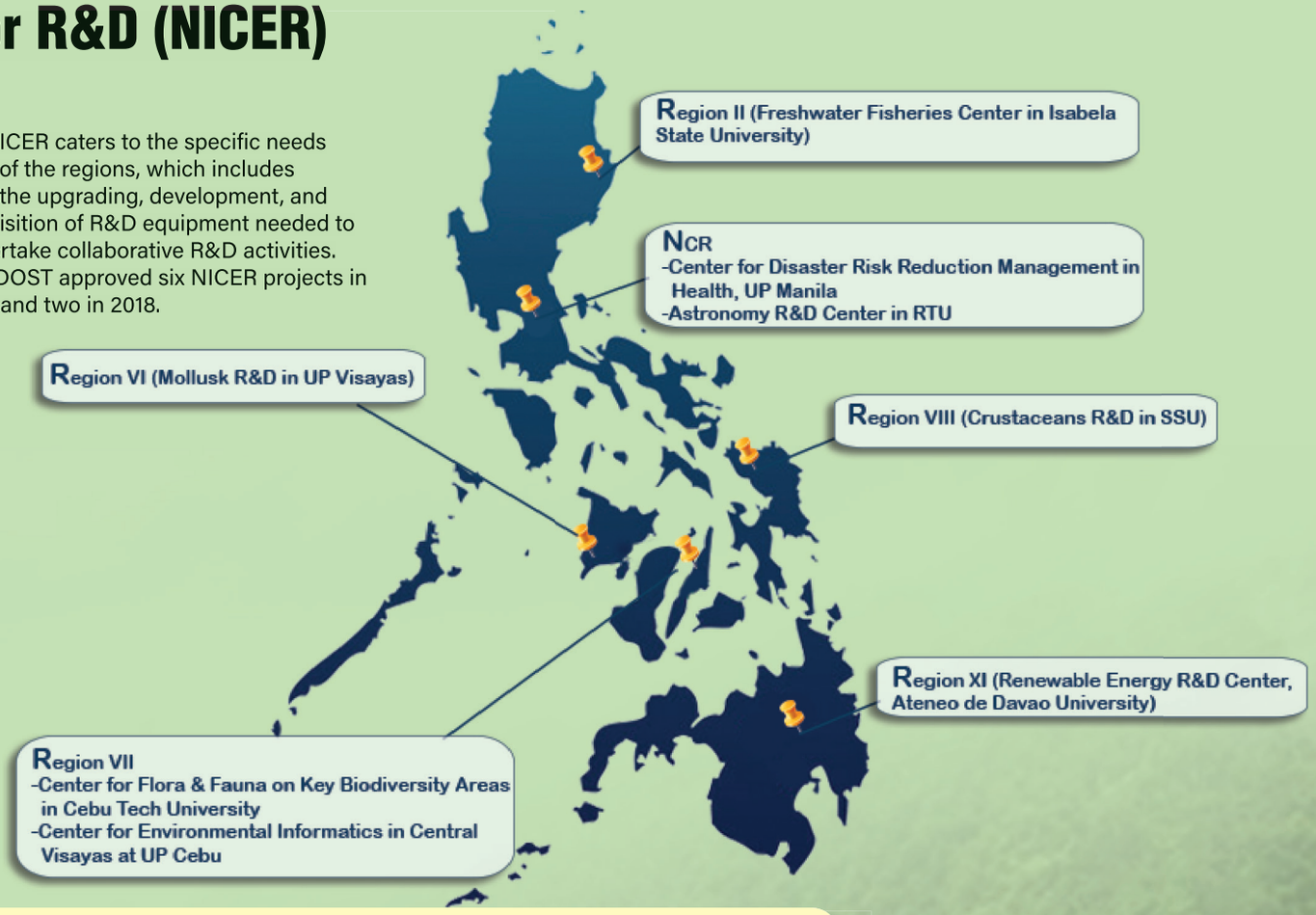
6

OUTCOME

INEQUALITY IN STI CAPACITIES AND OPPORTUNITIES REDUCED

Niche Centers in the Regions for R&D (NICER)

NICER caters to the specific needs of the regions, which includes the upgrading, development, and acquisition of R&D equipment needed to undertake collaborative R&D activities. The DOST approved six NICER projects in 2017 and two in 2018.



UP Manila received a research grant for the establishment of the Center for Disaster Risk Reduction Management in Health, one of the undertakings under the NICER Program

Towards the establishment of a Renewable Energy Center in Davao Region, the R&D project "Microgrid Solar-PV System" is being implemented at Manurigao, New Bataan, Compostela Valley (in photo). It will setup a community smart management system wherein utilization of electricity per household can be remotely monitored and controlled. A prepaid electricity usage can be implemented wherein each household can set the cost of electricity the owner wants to use - just like a mobile phone prepaid load scheme.

R&D Leadership (RDLead)

To complement the establishment of NICER in the Higher Education Institutions (HEIs) and other existing Research and Development Institutes (RDIs), the RDLead program was launched to engage experts with strong leadership, management and innovative policy proficiencies to help boost and strengthen the research capabilities of the HEIs or RDIs. The program which started in mid-2018 has formally engaged six RDLeaders for the writeshops covering the following areas: Turmeric (Region VIII); Seaweed (ARMM); Sea Cucumber (Region X); Halal Goat (Region XII); Product Design (Region IV-A); and Micro-Hydro (Region IV-A).

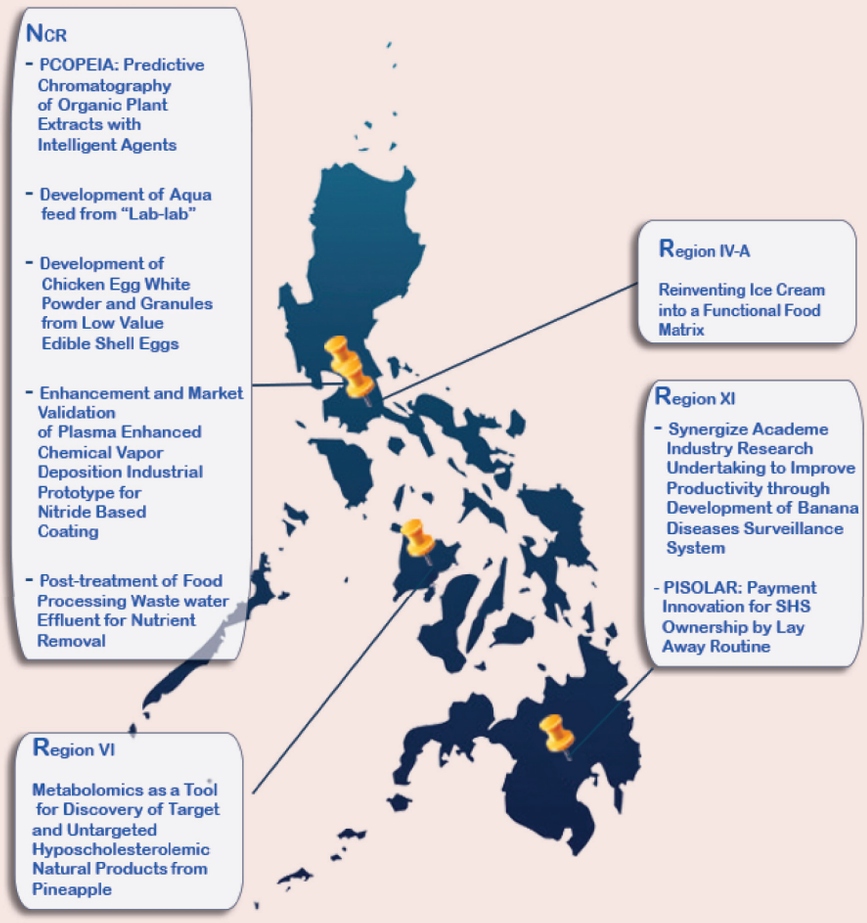
RDLeaders were engaged in a writeshop for researchers in Region VIII

Collaborative Research and Development to Leverage Philippine Economy (CRADLE)

The DOST launched the CRADLE program to demonstrate risk taking in R&D and new technologies in partnership with the private sector.

Under the CRADLE Program, an industry is expected to identify a problem while its partner HEI or RDI would undertake the necessary R&D to find solutions. A CRADLE project can have a maximum funding of Php5M, to be completed for a period of one to three years. As of 2018, there are nine approved CRADLE projects.

To further encourage proposal submissions from the regions and bridge the academe and the industry, the Regional Academe-Industry Forum on Proposal Writeshop and Packaging were held which gathered private companies, consortiums/organizations and academes. The forum discussed the status of R&D activities and needs of the private sectors. A writeshop was conducted to guide academe and private companies in writing capsule and research proposals for CRADLE and BIST funding. In 2018, four fora were held in Regions I, III, V, and XIII.



Collaboration between the Technological Institute of the Philippines and Pascual Pharma Corp., one of undertakings under the CRADLE Program.

Regional Academe-Industry Forum: Proposal Writeshop and Packaging was held on September 6-7, 2018 in Butuan City, Agusan del Norte (Region XIII).

Business Innovation through S&T (BIST) for Industry

Forum on BIST Program was held on 26 November 2018 in Makati City.

The DOST launched the BIST program to level-up the innovation capacity of Filipino-owned companies while promoting industry-based R&D. Through the BIST program, Filipino-owned companies have the opportunity to acquire strategic and relevant technologies. In 2018, BIST program was presented in various conferences and fora to increase the level of awareness of private companies about the program and to encourage the Filipino-owned companies or their consortium to undertake R&D activities.

Infrastructure Development Program

The DOST-PCIEERD's Infrastructure Development Program (IDP), helps set up or upgrade laboratories in universities and research institutions around the country by providing funding, which the institutions can use to purchase important technology like advanced technical equipment and specialized software. The program also offers small research grants to allow institutions to demonstrate their capability to use the newly purchased equipment. Since 2015, the project has helped set up and upgrade 18 laboratories all over the country.

For 2018, four institutions were supported as follows: 1) Bataan Peninsula State University (BPSU), 2) Central Philippine University (CPU), 3) Central Luzon State University (CLSU), and 4) University of San Carlos (USC). These, and other labs supported by DOST-PCIEERD, give researchers a solid foundation for their work, and allow them to conduct their research more efficiently. These facilities can also open new research possibilities, by helping scientists overcome technological restrictions, and allowing them to learn new methods and techniques.

R&D and Innovation Centers in the Regions

R&D and Innovation Centers have been established to cater to the specific needs of an industry sector in an area. This supports the thrust of the government to speed up progress of the regions through science, technology and innovation and ensure that no area is left behind in the quest for development. These initiatives, implemented through multi-sector collaboration, also elevate the capability of state colleges and universities and consortia to undertake R&D and become partners for development. Some of these centers are:

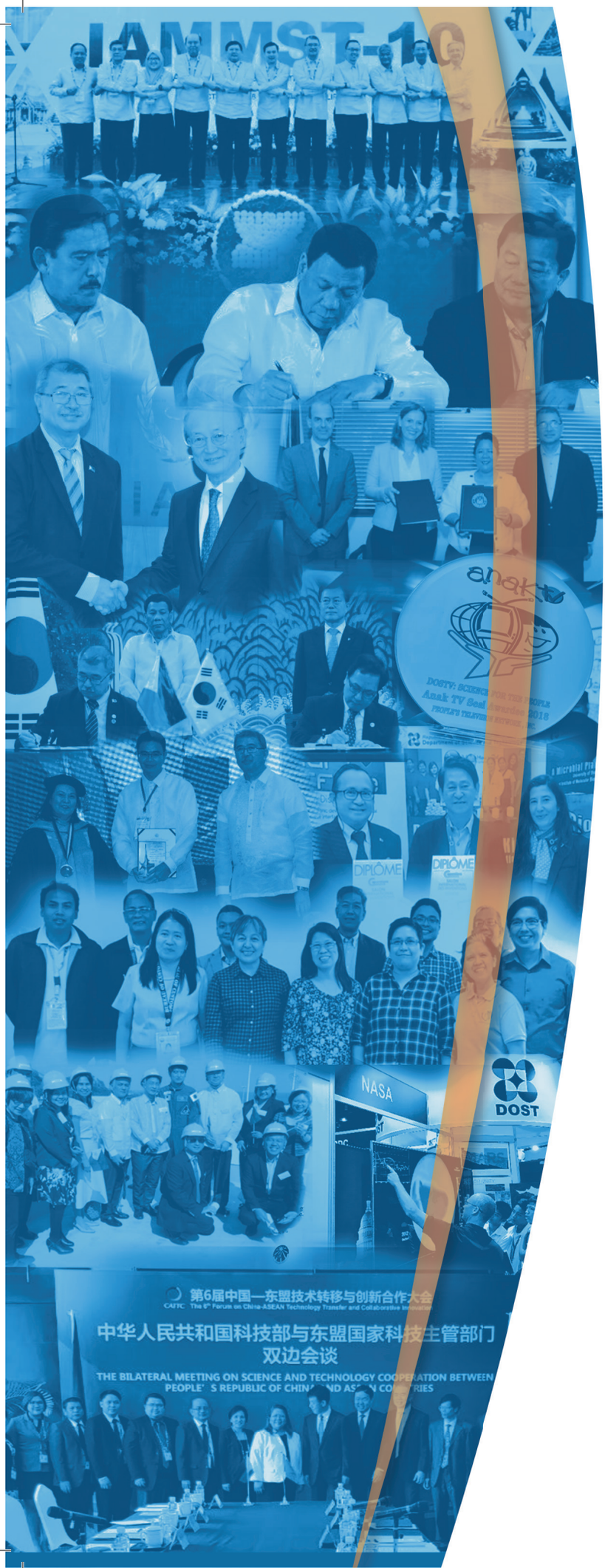
- Small Ruminant R&D Center in Cagayan Valley
- Citrus Research and Development Center in Cagayan Valley
- R&D on *Ludong* and *Igat* in Cagayan River
- Metals Innovation and Engineering Research and Development Center in Tuguegarao City
- Manufacturing and Fabrication Laboratory in Bicol
- Mt. Kitanglad Agri Eco-Tourism Farm in Bukidnon, Northern Mindanao

1

2

1. The establishment of Metals Innovation Center in Cagayan State University-Carig Campus aims to improve the quality of metal-based products in the region as the demand grows, as well as to support industrial students, through the provision of state-of-the-art metal fabrication facilities and equipment.

2. DOST Sec. Fortunato de la Peña graced the inauguration of the Manufacturing and Fabrication Laboratory in Bicol State College of Applied Sciences and Technology (BISCAST). The facility aims to improve the competitive edge of MSMEs in Bicol region by designing and developing customized solutions suited to their needs.



7

OUTCOME

EFFECTIVE STI GOVERNANCE ACHIEVED

DOST-Balik Scientist Program institutionalized through RA No. 11035 or the Balik Scientist Act

On June 15, 2018, President Rodrigo Duterte signed into law Republic Act No. 11035, "An Act Institutionalizing the Balik Scientist Program, Appropriating Funds Therefore, and For Other Purposes". This law institutionalizes the Balik Scientist Program which started in 1975 through Presidential Decree No. 819, series of 1975 and renewed through Executive Order No. 130, series of 1993.

The program aims to strengthen the scientific and technological human resources of the academe, public and private institutions, including locally registered enterprises in order to promote knowledge sharing and accelerate the flow of new technologies into the country. From 2007-2018, the program has brought home 219 Balik Scientists and engaged them through 318 engagements (288 short-term; 30 long-term) in 109 local host institutions nationwide.

With the assistance of the Inter-Agency Technical Working Committee (IATWC) and stakeholders, including but not limited to balik scientists, academe, industry representatives and host institutions, six public consultations were conducted in different regions in the country. The Implementing Rules and Regulations of the Balik Scientist Act, and DOST Memorandum Circular No. 006, Series of 2018, "Rules and Regulations on the Grant of Benefits, Incentives and Privileges to Balik Scientists", were formulated and signed on October 4, 2018 and November 22, 2018, respectively.

Malacañang file photo shows President Rodrigo Duterte with Senate President Vicente Sotto III and House Speaker Pantaleon Alvarez

Inter-Agency Technical Working Committee (IATWC)

Balik Scientist Program Timeline

On October 26, 2018, the DOST honored the two major pillars of the Balik Scientist Program, the Balik Scientists and the host institutions, during the 4th Annual Balik Scientist Program Convention with the theme "Balik Scientists: Catalysts for Global Innovation and Competitiveness". The convention also served as a venue for expanding the network of experts and local institutions to improve collaborations. The event was successfully concluded with a resolve to further improve the return rate of Balik Scientists from 41 Balik Scientists who came home and served 36 local institutions in 2018, and to effect greater impact of the Balik Scientists' accomplishments/contributions in addressing development requirements of the country.

Sec. Fortunato T. de la Peña welcomed Balik Scientists, host institution representatives and guests at the 4th Annual Balik Scientist Program Convention.

Legislative Agenda

With the help of S&T Committee in both houses of congress, supported policies shape the S&T landscape in the country. Aside from the most recently signed legislation, the "Balik Scientist Act", there are other policy initiatives in different legislative stages that are being shepherded by the Department. These policy initiatives are as follows:

(1) Creation of Philippine Space Agency

The objectives of this measure include safeguarding Philippine sovereignty; development of space science and technology for the benefit of citizens; and ensure representation in the international space community. It will also include the development of "Philippine Space Development and Utilization Policy" which will be the country's roadmap to address national issues, promote efficient utilization of space assets and resources, capacitate human resources, strengthen national defense, and enhance international cooperation. The bill was already approved on second reading in the House of Representatives on November 27, 2018.

(2) Comprehensive Nuclear Regulation

The proposed law modernizes and raises to international standards the current laws governing the control of nuclear and radioactive materials and ionizing radiation generated from electrical devices. It also ensures adherence to exercise authority over all aspects of safety, security and safeguards involving nuclear materials and other radioactive materials and facilities. It guarantees an independent and effective regulatory body and an equally independent and strong scientific agency for the promotion of nuclear S&T. A Technical Working Group meeting was held on October 23, 2018 in the Senate to discuss the proposed bill. Currently, it is still pending with the Committee on Science and Technology in the Senate, whereas a substitute bill was approved on August 28, 2018 by the Committee on Appropriations in the House of Representatives.

(3) Upgrading the Position of Provincial S&T Officers

This policy pushes the Provincial S&T Directors (PSTDs) to be at par with other national government agencies (NGAs), provincial directors in terms of compensation (SG 26). This also highlights the duties and responsibilities, qualifications of the PSTDs. In this bill, the PSTD shall be assisted by at least seven plantilla personnel (six technical staff and one non-technical officer). In cases when there is a need for additional staff, such shall be determined by the Provincial Director based on the population of the province. The bill was approved on third reading on November 26, 2018 in the Senate.

(4) National Metrology

The bill aims to (1) promote confidence in measurements for the "State Regulated Sector" (health, safety, fair trade, environmental protection, law, enforcement) as well as in the "Voluntary Sector" (industrial, manufacturing, research and development); (2) provide traceability to the International System of Units (SI) for measuring instruments used in the regulated areas; and (3) establish linkages between the country's measurement system to the global measurement system. The bill was approved on December 5, 2017 by the Committee on Science and Technology in the Senate. On the other hand, briefings for this bill are still being coordinated in the House of Representatives.

(5) Science for Change

The bill aims to achieve a higher standard of science and technology to contribute to the development of economy and society, and to the improvement of the welfare of the nation through prescribing the basic policy requirements. DOST shall formulate the five-year Science for Change program in coordination with other relevant government agencies including state universities and colleges and representatives from the private sector undertaking R&D.

(6) Amendments in the Magna Carta for S&T Workers (RA 8439)

The propose measure aims to allow government scientists, engineers and other S&T personnel to receive additional salary or honoraria as provided by the law. This also includes a provision for hiring retired scientists. The bill was already approved on third reading on March 12, 2018 and transmitted to Congress for concurrence on March 14, 2018.

International S&T Collaborations

The Department also continually explores and strengthens linkages with international counterparts to promote development of STI and encourage exchange of knowledge. It has established and maintained international S&T linkages and partnership through fulfillment of international commitments, forging of agreements, and participation in international meetings.

DOST maintains its priority bilateral cooperation with Australia, China, Chinese Taipei, France, Germany, United Kingdom, India, Iran, Israel, Japan, Korea, Russia, Switzerland, Thailand, and United States to promote extensive Science, Technology and Innovation and enhance the flow and benefit of a wide range of existing knowledge and technologies from other countries.

The Department also actively engaged with other international bodies through multilateral linkages with Asia-Pacific Economic Cooperation (APEC), Association of Southeast Asian Nations (ASEAN) and United Nation (UN) organizations to fulfill the international commitments of the country.

The following are the 2018 highlights for S&T Collaborations:

Two Filipino inventions grab global recognition
Geneva, Switzerland | Apr. 11-15, 2018

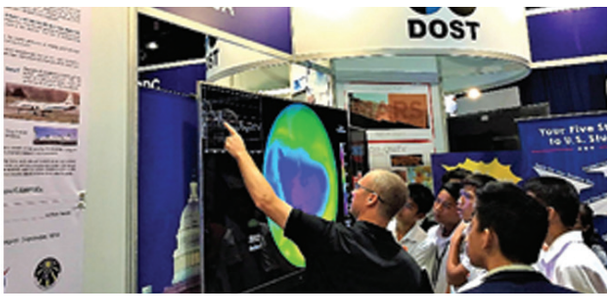
DOST-TAPI's Dir. Garcia received the gold award for Filipino inventions recognized at the 46th International Exhibition of Inventions Geneva. The inventions from UP Diliman and UP Manila were brought to the Geneva Exhibit through a funding support from DOST-GIA.

"Future of society" centers on ASEAN-Japan forum
Mactan, Philippines | Apr. 25-26, 2018

125 senior delegation from nine countries participated in a stimulating discussion on the role of technology transfer and artificial intelligence towards building "Society 5.0"– a super-smart society where humans and technology solutions are seamlessly interconnected.

PHL, KOR agree on S&T cooperation
Seoul, South Korea | Jun. 3-5, 2018

During the official visit of President Duterte in South Korea, Sec. de la Peña signed an MOU with Korea's Ministry of Science and ICT. Following this, R&D projects in mutual areas of interest, human resource development and capacity building activities will be pursued.



U.S. NASA makes historic landing at NSTW
Manila, Philippines | Jul. 17-21, 2018

NASA scientists engaged the Filipino public in their first-ever exhibit during the National Science and Technology Week. Talking about its past space missions and the CAMP2EX project with DOST and Manila Observatory, the NASA team was met with overwhelming enthusiasm from Filipinos interested in space tech.

DOST forges partnership with CERN, EU's premiere nuclear research center
Manila, Philippines | Sept. 4, 2018

The International Cooperation Agreement signed by DOST and CERN provides for human resources support, support for research projects in theoretical and experimental physics, and the linking of Philippine universities/institutes to CERN and its state-of-the-art facilities.

Exploring the frontiers of science in China
Guangxi, China | Sept. 10-14, 2018

The Philippine delegation headed by DOST Usec. Guevara met with Chinese counterparts, to propel collaborative R&Ds on renewable energy, traditional medicine, rice research, bamboo post-harvest and processing, and green oil from cashew. The mission also brought back home insights on China's innovation ecosystem that makes it a scientific superpower.

10th Informal ASEAN ministerial mweeting handshakes to regional cooperation on S&T
Mactan, Philippines | Oct. 15-19, 2018

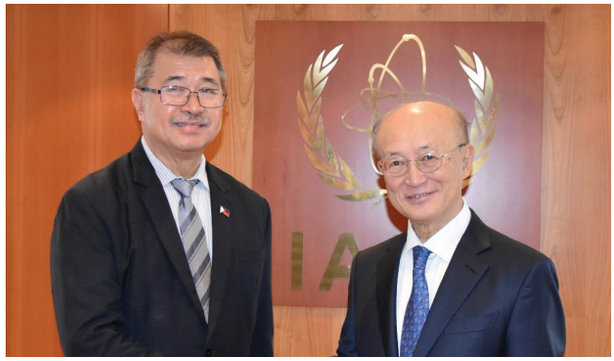
ASEAN S&T Ministers gathered for a series of meetings that pushed forward enhanced cooperation and harmonized strategies in the development of Science, Technology and Innovation and its deployment for sustainable growth in the region.

Breaking boundaries: Launch of DIWATA-2
Kagoshima, Japan | Oct. 29, 2018

Sec. de la Peña led the Philippine delegation in the launch of Diwata-2, the second microsatellite developed by Filipino scientists. The new satellite is expected to gather imaging data useful in various applications like disaster mapping, resource inventory and assessment, infrastructure planning and monitoring, and even governance.

Philippines commemorates 60th year of partnership with IAEA through participation in ministerial conference
Vienna, Austria | Nov. 28-30, 2018

To commemorate DOST's long-standing partnership with the International Atomic Energy Agency (IAEA), Sec. Fortunato T. de la Peña together with DOST-PNRI Director Dr. Carlo Arcilla participated in the IAEA Ministerial Conference on Nuclear Security. Sec. de la Peña delivered the Philippine Statement at the IAEA Ministerial Conference reinstating the country's support to the IAEA and highlighting IAEA's Technical Cooperation Programme which assists several developing member states.



DOST joins innovation and entrepreneurship mission to Israel
Israel | Nov. 11-16, 2018

Philippine Delegation (DOST, DTI, CHED, and the private sector) visited Israel, the start-up nation, to learn best practices from them, and discuss how these can be adopted and adapted in the Philippines, in support of the Innovation and Entrepreneurship Roadmap initiative. DOST and MOST also met for the implementation of the MOU on Scientific Cooperation, forged during the Presidential Visit.

New Partnerships with NGAs

Project DIME (Digital Imaging for Monitoring and Evaluation)

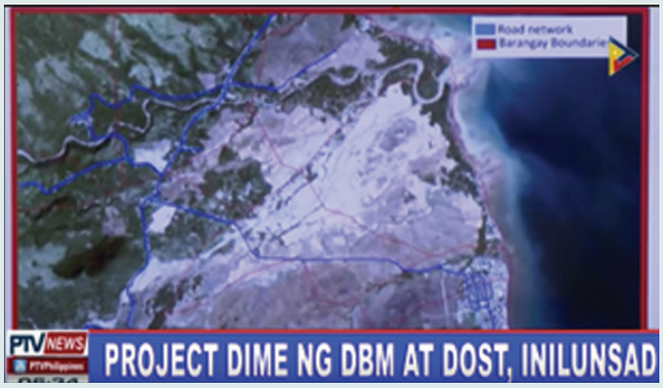
A Memorandum of Agreement (MOA) between the DOST and the Department of Budget and Management (DBM) through the DOST-PCIEERD was signed for the "Effective Monitoring of Government using Digital Data and Imaging Technologies".

The program's main objective is to develop geospatial-based monitoring for reforestation and irrigation programs including other infrastructure projects (dataset dependent) funded by DBM.

Project DIME, spearheaded by UP Diliman – College of Engineering, is composed of two components namely, (1) the Monitoring and Assessment of Planting Activities and other Applications (MAPA); and (2) the Remote Assessment for Irrigation Networks (RAIN) which commenced in August and September 2018, respectively. On March 7, 2018, Project DIME was launched at DBM during the "Breakfast with BEN" forum.

Series of trainings and capacity building activities for DBM personnel were conducted in order to assist them in setting up and adapting to the geospatial monitoring system.

BREAKFAST WITH BEN: Photo from L-R: DOST Secretary Fortunato de la Peña, DBM Secretary Benjamin Diokno, and DBM Undersecretary Lilia Guillermo on March 7, 2018



Project DIME was featured in PTV News.

Project BUHAWI (Building a Universal-Mount for Heavy Barrel Automated Weapon Integration)

The DOST and the Department of National Defense (DND) sealed their partnership through the signing a memorandum of agreement on January 5, 2018 to achieve a self-reliant defense posture. Granting the opportune phase of implementation, DOST-MIRDC proposed to develop an automated gun mount for browning 0.50 caliber machine gun, M2, (Heavy Barrel) to increase the firepower capability of the Philippine Navy's small patrol crafts defending the country's littoral water territories and capability to counter terrorism. This will also ensure the safety of personnel operating the machine and will eventually lead to the local manufacturing of automated gun mount in accordance with the DND Self-Reliant Defense Posturew (SRDP) and the revival of the local industry.

This is in collaboration with the Mechatronics and Robotics Society of the Philippines (MRSP) and the private sectors. The outcome of this project is to increase the firepower of the Philippine Navy and safety of its personnel, modernize the local defense industry and enhance the capability of Philippine Navy on different metals and engineering technology.

Images of the actual automated gun mount prototype

DOSTv bags AnakTV Seal award

DOSTv: Science For The People is one of the Anak TV Seal Awardees for 2018.

DOSTv–the science and weather program of the DOST received the 2018 AnakTV Seal Award for family-friendly and child-safe television. This means that the program can be watched by kids even with little or no adult supervision.

Aside from AnakTV Seal Award, DOSTv received nomination for Best Educational Program in the 3rd Polytechnic University of the Philippines (PUP) Mabini Media Awards alongside big and famous broadcast programs in the industry.

Prior to 2018, DOSTv was a recipient of the Gawad Filipino Awards in two categories namely: Most Trusted Science TV Program and Most Outstanding Science TV Host (Gel Miranda).

"The AnakTV Seal Award is a validation of the relevance of DOSTv's content across a broad spectrum of audience, especially among the young," said DOST-STII Director Richard P. Burgos. "Starting them early is the best way to instill awareness and appreciation of science, technology, and innovation among Filipinos."

Along the web and social media front, the DOSTv mobile app became a top downloaded application during the 2018 NSTW. Its Facebook page now has more than 20,000 likes from the previous year's 11,208 likes while its followers increased to 23,929 from 11,378 last year. Its page activity increased from 67% to 92% and response rate of 100% from 44% the previous year. In 2017, the DOSTv page reach of 7,294 almost tripled at 20,477 in 2018.

Outstanding Scientists and Scientific Outputs

Dr. Gay Jane Perez from the Philippines Wins ASEAN-US Science Prize for Women

Dr. Perez is the first Filipino winner of the 2018 ASEAN-U.S. Science Prize for Women. The award is intended to reward promising early-career women scientists in the ASEAN region and to encourage collaboration between ASEAN Member States and the United States around opportunities for agricultural improvement across Southeast Asia. The prize was awarded by the United States Government in partnership with the ASEAN and Underwriters Laboratories (UL).

Dr. Perez is a member of DOST-NRCP Division of Physics and currently the UP Diliman's Deputy Director for Research and Extension. She received a cash prize of $20,000 for her exceptional research on how precision agriculture can improve yields by using satellite observations, in conjunction with models and ground data, to better derive and develop prediction tools for agriculture in the Philippines.

Dr. Perez (center) at the press interview upon her winning.

Eight Filipinos Recognized in 2018 Asian Scientist 100

In its third year of publication, the Asian Scientist Magazine's 2018 Edition of Asian Scientist 100 has included eight Filipinos who showed exemplary performance in the field of research, academics, innovation and business in Asia. Seven of them had also been recognized and had been given awards by the DOST-NAST. All scientists had received research grants from DOST and two of them were DOST undergraduate scholars. The eight scientists included in the Asian Scientist 100 are as follows:

1. DR. ROGEL MARI D. SESE (Space Technology)- National Space Development Program, Regulus Space Tech Inc., Philippine Space Science Education Program, DOST-SEI
2. DR. MARIO ANTONIO L. JIZ II (Infection Disease)- Research Institute for Topical Medicine (RITM)
3. DR. LUCILLE V. ABAD (Nuclear Science)- DOST-PNRI
4. DR. LANNDON A. OCAMPO (Industrial Engineering)- Cebu Technological University (Department of Industrial Engineering)
5. MR. JEFFREY S. PEREZ (Seismology)- DOST-PHIVOLCS
6. DR. ALETTA CONCEPTION T. YÑIGUEZ (Marine Science)- UP Diliman (Marine Science Institute)
7. DR. PHILIP A. ALVIOLA (Natural History)- UP Los Baños (Museum of Natural History)
8. DR. NATHANIEL HERMOSA II (Photonics)- UP Diliman (Photonics Research Laboratory)

National Science and Technology Week (NSTW) Awards

The DOST gave major awards during the opening ceremonies of NSTW Week celebration on July 17, 2018. The awards aim to provide national recognition to exemplary contributions to S&T.

The following are the annual major awards and awardees:

- Outstanding Science Administrator Award (Dioscoro L. Umali Medal)
  - DR. EDGARDO E. TULIN (Visayas State University)
- Outstanding R&D Award (Basic Research or the Eduardo A. Quisumbing Medal)
  - DR. CARLA B. DIMALANTA (UP Diliman)

Awarding of plaques to the winners of NSTW awards during the opening ceremony on July 17, 2018 at the World Trade Center in Pasay City.

Awards and Recognitions during NAST 40th Annual Scientific Meeting

DOST-NAST was established in 1976 through Presidential Decree 1003-A to provide meaningful incentives to those engaged in scientific and technological research, as well as give due recognition to outstanding achievements in science and technology.

Five new DOST-NAST members and one Corresponding Member were elected and formally included in the elite roster of Academicians during the awarding ceremony on July 12, 2018. The investiture was led by Science Secretary Fortunato T. de la Peña and Acd. Rhodora V. Azanza, DOST-NAST President.

The new DOST-NAST members comprised the following:

1. GLENN B. GREGORIO, Ph.D. (Genetics),
2. MUDJEKEEWIS D. SANTOS, Ph.D. (Applied Marine Biosciences),
3. VICTOR B. AMOROSO, Ph.D. (Botany),
4. ARNEL A. SALVADOR, Ph.D. (Physics) and
5. MAHAR K. MANGAHAS, Ph.D. (Economics)

Corresponding Member:

- RIGOBERTO C. ADVINCULA, Ph.D. (Chemistry)

Oath Taking of New Academicians

DOST-NAST also presented the following awards: Outstanding Young Scientists (OYS), NAST Environmental Science Award, NAST Talent Search for Young Scientists, Outstanding Books, Outstanding Scientific Papers, and Best Scientific Posters.

The recipients of OYS awards this year were:

1. ANGEL B. ENCARNACION, Ph.D. (Marine Science) of Bureau of Fisheries and Aquatic Resources Region II;
2. DIXON T. GEVAÑA, Ph.D. (Forest Environmental Science) of UP Los Baños;
3. NONILLON M. ASPE, Ph.D. (Natural History Sciences) of Western Philippines University- Puerto Princesa Campus;
4. RINLEE BUTCH M. CERVERA, Ph.D. (Mechanical Electrical and Materials Engineering) of UP Diliman;
5. JEY-R S. VENTURA, Ph.D. (Environmental Engineering and Biotechnology) of UP Los Baños; and
6. MARIO A. TAN, Ph.D. (Pharmaceutical Sciences) of University of Sto. Tomas.

The recipient of the 2018 DOST-NAST Environmental Science Award is WILFREDO ROEHL Y. LICUANAN, Ph.D. (Biology) of De La Salle University (DLSU).

The awardees of DOST-NAST Talent Search for Young Scientists are as follows:

First Prize - CHITHO P. FELICIANO, D.Eng. (Materials Science) of DOST-PNRI
Second Prize - RALPH JOHN L. DE LA CRUZ, Ph.D. (Mathematics) of UP Diliman
Third Prize - JOHN FREDERICK D. TAPIA, Ph.D. (Chemical Engineering) of DLSU and LORI SHAYN A. BUSA, Ph.D. (Chemical Sciences and Engineering) of Nueva Vizcaya State University

L-R: Acd. Reynaldo B. Vea, Acd. Rhodora V. Azanza, Dr. Jey-R S. Ventura, Dr. Rinlee Butch M. Cervera, Dr. Nonillon M. Aspe, Dr. Dixon T. Gevaña, Dr. Angel B. Encarnation, Dr. Mario A. Tan, and Sec. Fortunato T. de la Peña

Philippine Quality Award (PQA)

The DOST IX received the Philippine Quality Award (PQA) Recognition for Proficiency in Quality Management (Level 2). The award was conferred by President Rodrigo Duterte during the PQA conferment ceremony held at the Malacañan Palace on October 24, 2018. PQA recognizes achievements of public and private sector organizations as they strive for and attain performance excellence. DOST IX is the lone national line agency in the country to be awarded with PQA Level 2. Aside from DOST IX, DOST CALABARZON and DOST-PCIEERD were also conferred with PQA Level 1.

DOST IX received the PQA Award Level II (recognition for Proficiency in Quality Management) in Malacañang on October 24, 2018.

Creating An Enabling Environment for a Gender-Responsive DOST

DOST supports gender mainstreaming which has been espoused and promoted by the UN, the World Bank and bilateral aid agencies and embraced by the Philippine government through the passage of RA 9710, the Magna Carta of Women. The DOST Gender and Development (GAD) Project: Creating an Enabling Environment for A Gender-Responsive DOST has been working towards gender equality and advance women's rights by infusing gender analysis, women's perspectives and gender equality goals into mainstream policies, programs and activities within the department.

Women's Month

DOST celebrated the Women's Month on March 23, 2018 where 360 women and 174 men employees of DOST gathered at the DOST-PSHS Gym. The main focus of the celebration was the forum on women inspiring women in line with the theme, "We Make CHANGE Work for Women". The highlights of the celebration were the launching of the DOST GAD Kit and DOST GAD Help Desk.

Sec. de la Peña launched the DOST GAD Kit together with other DOST Officials

Capacity Building

In creating an enabling environment and enhancing the knowledge and skills of the agencies, the GAD Office facilitated purposive capacity building like the training-workshop on the Harmonized Gender and Development Guidelines (HGDG) for all program implementers and GAD Focal Point Systems (GFPS) of DOST agencies. The GAD Office has already conducted the training in seven areas attended by 234 women and 94 men employees of DOST.

Workshop on the HGDG for the Luzon Cluster (a) CAR, (b) Region I, (c) Region II, and (d) PSHS

DOST Speaker's Bureau

Another highlight in gender mainstreaming activities was the creation of the DOST Speaker's Bureau, a pool of GAD experts composed of DOST employees who have been serving as members of the GFPS of their agencies. The GAD and Regional Support Service invited prospective GFPS members and they went through a rigorous selection process facilitated by the Philippine Commission on Women (PCW). Of the 14 who attended the selection process, only six passed the standard set by the PCW and these qualified GAD trainers have participated as presenters and reactors during the DOST GAD Focal Point Assembly 2018 held at the province of Bohol attended by eight male and 51 female members of the GFPS of DOST agencies.

S&T Journey: 60 years and beyond

DOST 60th Anniversary Celebration

The DOST celebrated its 60th anniversary with the theme "S&T Journey 60 Years and Beyond", at the Philippine International Convention Center (PICC) in Pasay City on June 13, 2018.

One of the highlights of the event was the opening of an exhibit that showcased the Department's accomplishments through the decades as the country's premier agency that provides central direction, leadership and coordination of all scientific and technological activities and initiatives for national development. The exhibit also featured key research priorities of DOST for the past decades in the fields of science and technology scholarship, agriculture, healthcare services, disaster preparedness and management, and enterprise development. These are all designed and implemented to bring inclusive development in the country.

Secretary de la Peña also recognized the former heads of DOST with a plaque of appreciation for their contributions to the success of the Department. He also presented the ongoing S&T initiatives and future directions of DOST.

(From top, L-R): Dr. Paulino J. Garcia [NSDB Chair, 1958-1963]; Dr. Juan S. Salcedo, Jr. [NSDB Chair, 1963-1970]; Gen. Florencio A. Medina [NSDB Chair, 1970-1976]; Dr. Melecio S. Magno [NSDB Chair, 1976-1981]; Dr. Emil Q. Javier [NSTA Director-General, 1981-1986]; Dr. Antonio V. Arizabal [DOST Secretary, 1986-1989]; Dr. Ceferino L. Follosco [DOST Secretary, 1989-1992]; Dr. Ricardo T. Gloria [DOST Secretary, 1992-1994]; Dr. William G. Padolina [DOST Secretary, 1994-1999]; Dr. Filemon A. Uriarte [DOST Secretary, 1999-2001]; Dr. Estrella F. Alabastro [DOST Secretary, 2001-2010]; Engr. Mario G. Montejo [DOST Secretary, 2010-2016]; and Prof. Fortunato T. de la Peña [DOST Secretary, 2016-Present].

The DOST celebrated its 60th founding anniversary with the theme "S&T Journey: 60 years and beyond" at the PICC, Pasay City on June 13, 2018.

DECADE 50's

Laying the groundwork

Dr. Paulino J. Garcia was the first Chairman when the National Science Development Board came into being in 1958. And as early as 1956, the Undergraduate Scholarship Program was created.
Filipino Scientists began their work on the development of medicines from plants.
By 1959, a Nuclear Reactor Facility was constructed in Quezon City.

Chairman Paulino Garcia (1958)

DECADE 60's

Preparing the Filipino as the greatest Resource

There has been a continuous development of scholars in this decade.
The Philippine Science High school was created and produced its first batch of scholars.
The pioneering work of Arturo Alcaraz in geothermal energy paved the way for this country to be among the top producers of this type of energy.

DECADE 90's

Providing Health, Nutrition and information for the people

The Department developed fortified food for better nutrition of the school-age population; assisted the small entrepeneurs in developing their products through better packaging and longer shelf life; came up with more cures, such as the "shunt" being used to treat children with congenital hydrocephalus;
and provided people with better access to information through IT developments;
e-Health, PH-net, various websites and networking.

DECADE 2000's

Pushing the local products and regional private enterprise to greater heights

By this time, more Filipinos in all regions benefited from technology transfer.
The Small Enterprise Technology Upgading Program (SET-UP) was launched, together with the Technology Incubation and Cleaner Production.

DECADE 70's

Taking the lead in the regional development of Agriculture and Forestry

NSDB strongly supported the development of the Agriculture Sector, giving way to various rice strains. FPRDI became the leading forestry institution in the Asian region, acting as host to our Asian neighbors in forestry conferences.

DECADE 80's

Preparing for Change

As with the nation, the pre and post-EDSA era, the Department was also in transition during this decade. The "Ten Outstanding Young Scientists Award" was launched; the different science communities (*Bicutan, Los Baños and Manila*) were established; the Filipino consumers were given protection initiatives by way of Standard Code for labeling fabric and ready-made garments; and food supplement program developed by FNRI was greatly utilized to feed the malnourished "Batang Negros".

DECADE 2010's

Opening frontiers with cutting edge technologies

The period marks a leap in bringing forth change through high impact technology solutions covering the areas of mass transport systems (AGT, Road Train, Hybrid Electric Train) disaster risk reduction and climate change adaptation (Project NOAH, ClimateX, DreamLiDAR, Diwata), state-of-the-art facilities like ADMATEL and Makibayan, Genome Center, Food Innovation Centers, among others. Concurrent with these interventions is DOST's aspirations for inclusive growth by reaching out more to the masses in the areas of science education, health services, community empowerment, and small and medium enterprise development which truly give credence to the slogan:
"Science For The People."

S & T Journey:
60 years and Beyond

The Department of Science and Technology (DOST) spearheaded a journey spanning six decades of scientific activity to bring about national development and economic progress. Let us retrace this amazing journey of pursuing new knowledge, seeking solutions to problems, fighting poverty and creating opportunities to improve the lives of Filipinos through science, technology and innovation. This journey will prove that despite the little "bumps and potholes" along the road, DOST is determined to move forward to make a difference for many people.

Text and photos from DOST-STII

DOST RESOURCES

Financial Profile

Total Allotment Received in 2018: **Php 21.3 Billion**

17% Personnel Services

62% Maintenance and Other Operating Expenses

21% Capital Outlay

S&T Personnel Profile

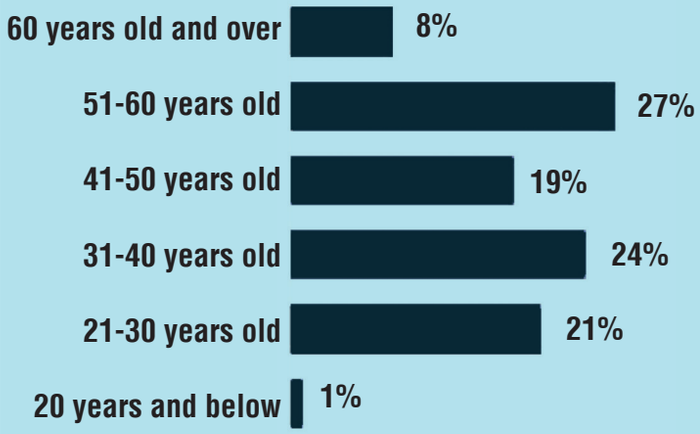
Total Number of DOST Personnel holding plantilla positions:

4,473

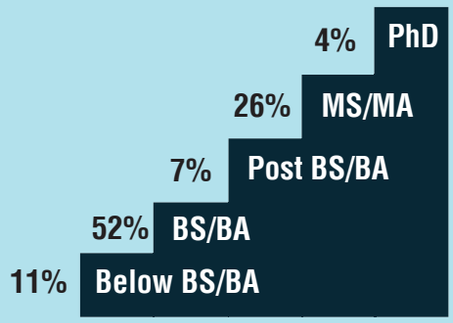
48% Male

52% Female

Distribution by Sex

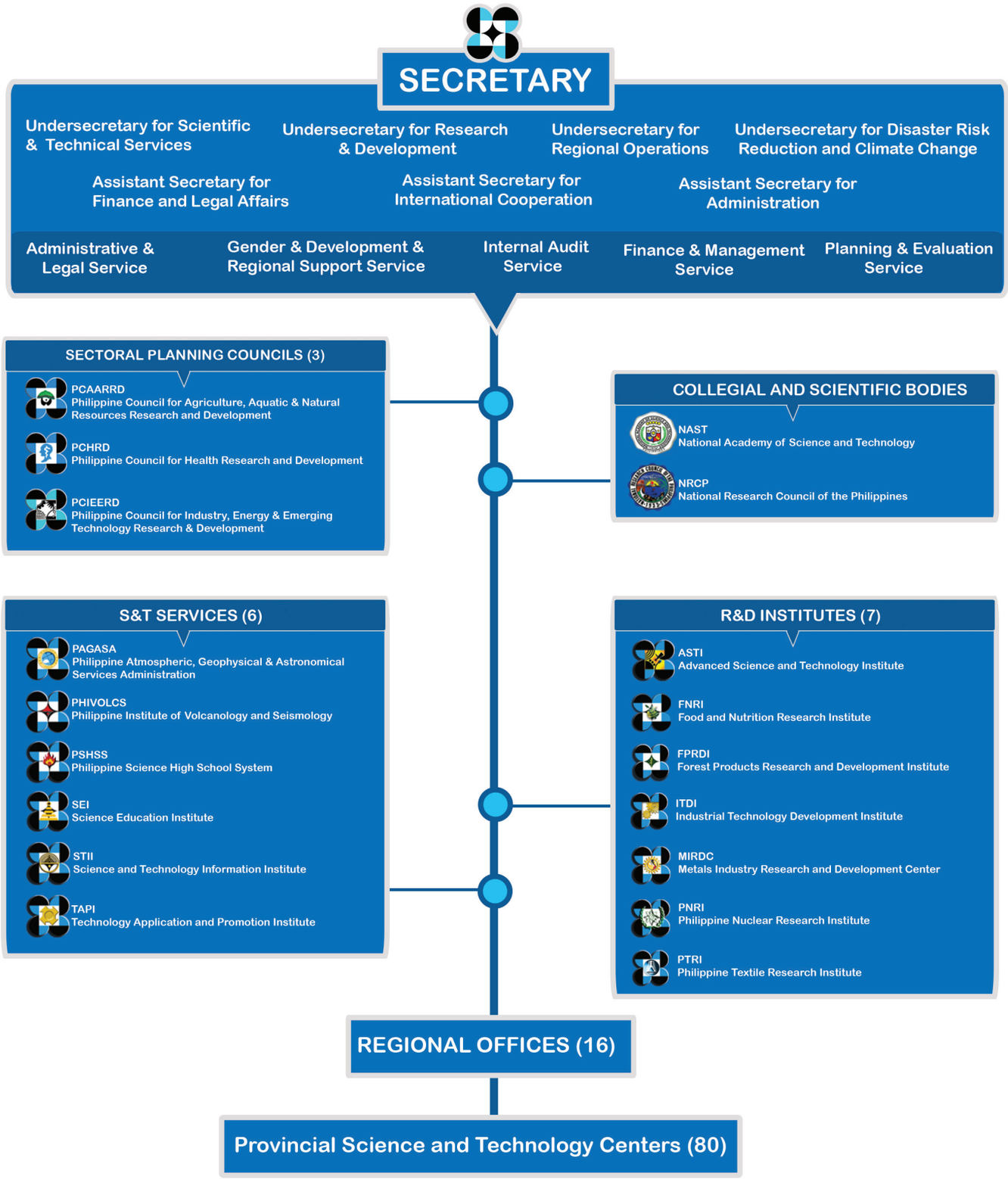


Distribution by Age Group



Distribution by Educational Attainment

DOST Organizational Chart



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