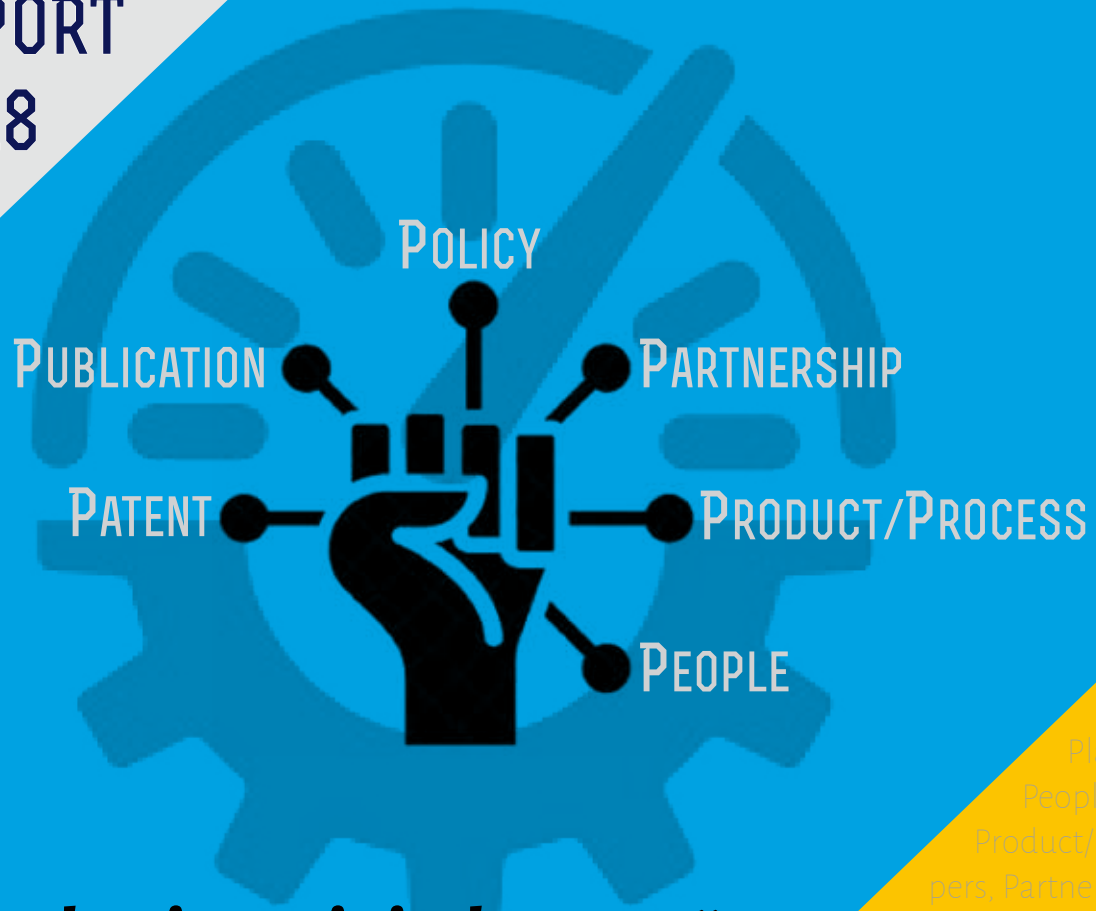
ANNUAL REPORT 2018



"Our business is industry..."

DOST-ITDI

Department of Science and Technology
INDUSTRIAL TECHNOLOGY DEVELOPMENT INSTITUTE

About ITDI

The **Industrial Technology Development Institute (ITDI)** laid the groundwork for S&T in the country.

Today, it is one of the DOST's R&D agencies and undertakes multidisciplinary industrial R&D, technical services, and knowledge translation or technology transfer/commercialization.

ITDI harnesses know-how in new technology and product innovation, and through the years, has emerged as a credible and reliable industry and government partner in accelerating growth and development in the country.

Our **Vision**

Leading industry partner for science, technology and innovation.

Our **Mission**

To contribute to making local industries globally competitive.

Mandate

- Conduct R&D to generate new knowledge and technologies
- Undertake knowledge translation or technology transfer/ commercialization
- Provide technical services, tests, and analyses
- Establish, develop, and maintain national units of measure to provide international traceability

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MESSAGE
DOST Secretary

I stand with great pride as I see ITDI being steadfast in its service to the nation for the last 118 years. You have delivered firmly on your mandate of generating new knowledge and technologies and enhancing technical services and facilities that continue to contribute to the growth of local industries and increase the country's level of competitiveness.

Being one of the lead R&D Institutes of DOST, I am pleased to witness ITDI making a difference across industry sectors. You have been delivering your services and technologies in the most efficient and effective ways possible, consistent with our vision of inclusive growth and collective prosperity towards achieving Ambisyon 2040.

Indeed, the year 2018 proved to be fruitful for the institute. ITDI's prompt response to the emergency needs of the country is commendable. The livelihood assistance extended to the survivors of the Marawi Siege, typhoon Ompong in Regions II and CAR, and those affected by the eruption of Mayon Volcano in Albay and nearby communities is concrete proof of your commitment to make lives better for Filipinos especially during trying times. The technology on I-Salt has increased the productivity of a salt manufacturer and made them ASIN Law compliant.

As ITDI continues to work on their vision as a recognized industry partner for Science, Technology, and Innovation, the development of more technologies that harness the use of our local materials like abaca composite for boat application, food and nutraceutical colorants, and nanomaterials, among others, is significant towards achieving its goal.

Likewise, I commend your efforts to improve and develop your facilities and capabilities for technical services that help make our industries increase their productivity and comply with international standards especially in the fields of food safety, metrology, and packaging. Your partnerships, technical collaboration, and venture with various institutions and organizations here and abroad have strengthened science and technology linkages, which created new opportunities for growth and development of expertise.

The Institute's active engagement with the different scientific platforms has translated into tangible outputs alongside the DOST 6Ps, namely; patent, policy, product or process, publication, places and/or partnerships, and people services.

Indeed, ITDI has done so much for the good of every Filipino. May this give you further insight into future projects and remain committed being in the front line of development and innovations, and together with your partners, help the country achieve Ambisyon 2040.

Congratulations!

FORTUNATO T. DE LA PEÑA
Secretary

MESSAGE
ITDI Director

As we reminisce on an extraordinary year, 2018 was challenging but a gratifying one. Spearheading an organization like the Industrial Technology Development Institute (ITDI) is an experience like no other. I am pleased to present the accomplishments of ITDI as we continue to accelerate our efforts on R&D, technology transfer, and technical services. Now on its 117th year, ITDI has embarked on 'going beyond business,' and being an 'engaged science'. This is short of saying that we are just very proud to tell everyone what we have accomplished so far as we perform our mandates and persevere in contributing to the achievement of inclusive growth, resilient society, and a globally competitive economy through science, technology, and innovation.

The Institute has always been the partner of local industries in developing new products or improving current processes towards increased productivity. ITDI has developed 27 new PRODUCTS/PROCESSES from its R&D projects, which will eventually be brought to the market to achieve its intended uses. The R&D areas were focused on health and wellness, alternative energy, pre-processing technologies to facilitate waste-to-energy, environment, biotechnology, food processing, nanotechnology, and packaging.

In terms of partnerships, a total of 42 partnerships were forged by DOST-ITDI with various local and international institutions. The Institute has cooperated with nine academic institutions to strengthen R&D collaborations under the Graduate Research Collaboration Program or GRCP, that would further improve the country's innovation index thru increased scientific and technical publications.

ITDI has continuously extended technical services and interventions to a total of 13 various locations in the country and abroad. Critically important and worth mentioning is the ITDI initiative for Boracay island rehabilitation in close coordination with DOST Region 6. Bioreactors and household composter were deployed in LGU-Malay to aid in their solid waste management and to upgrade their Materials Recovery Facility (MRF).

To increase the ITDI's capability in providing service to the industry, the Membrane Nano Research Laboratory was established to provide R&D and technical services in the field of membrane and nanotechnology. This facility aims to hasten the development of membrane nanotechnology in the country that find applications for water purification and water/wastewater treatment. Other initiatives include the Capability Building of Analytical and Testing Labs in the Philippines through the PCIEERD funded project entitled, OneLab Capability Assurance System for Metal Content Assessment of Agricultural Produce, Water and Environmental Samples and Capability Building on Energy Efficiency and Conservation.

ITDI has embarked on a program entitled, "Enhancement of the Competence and Capabilities of the National Metrology Laboratory (NML) of the Philippines". The program aims to strengthen the NML through enhancement of its existing capabilities in physical measurement, and the development of new capabilities in emerging fields including chemistry and biology. Over the last decade, initiatives have been taken at the international level and across measurement sectors to ensure that measurement

science issues are applied in a systematic way. The groundbreaking ceremony for the repair and improvement of extension laboratory for metrology in chemistry was led by DOST Secretary Fortunato T. De La Peña on January 17, 2018. It is envisioned that the NML will provide the country with credible measurements and traceability in the fields of physical, chemical and biological metrology. On the same day, another groundbreaking ceremony was held for the setting-up of a Modular Multi-Industry Innovation Center, to address the factors that are impeding the progress of the food manufacturing sector. The food industries may use the center in the development of new products, product equivalent, and variances as well as the reintroduction of product.

Likewise, the Institute set out and continues to provide a stream of livelihood products and technologies. Under the program of DOST Intervention for Marawi Recovery, Rehabilitation, and Reconstruction, ITDI implemented two projects namely: Livelihood Program for Rehabilitation and Reconstruction of Marawi and Deployment of Innovative Rainwater Collection System in Marawi with the objectives of building sustainable livelihoods for the Maranaos through a series of training and hands-on programs as well as the deployment of rainwater collection system to selected barangays and households to address the problem on water scarcity in the community. In the offing of these newly implemented projects in Marawi, ITDI will provide a charcoal briquette machine, essential oil extractor, and modular rainwater collection system – machines and devices that can start-up new small businesses and ease the stresses of daily living and a series of training on basic personal care products production.

As an R&D Institute, ITDI has always been actively participating in various scientific fora, conferences, symposia, and conventions both in local and abroad. This year, aside from receiving various recognitions and awards, a total of 69 scientific papers were presented and 9 were published in ISI journals. ITDI also offers various range of technical services that include analytical tests, calibration, advanced materials test, among others through its state-of-the-art laboratories. For the year, a 31% increase in revenue was achieved in the amount of 43.11M generated from the technical services that include calibration, testing, analyses, and other test services.

To boost the transfer of technologies, ITDI conducted two technology offerings focusing on Green Engineering and Advanced Technologies namely:4C oil spill absorbent, charcoal briquettes from fruit/root crop peels, compact wastewater treatment for quick service restaurants (qsrs), electric densifier,dual drum composter, abaca fiber-reinforced composite for industrial applications; biodegradable polymers production technology, nanoclay production technology, and nano-precipitated calcium carbonate (NPCC). This was made possible through the project on Pre-Commercialization Tools/ Strategies for Effective Transfer and Commercialization of Generated Technologies and Intellectual Properties funded by PCIEERD. Another activity undertaken was the conduct of Quick Look and Focus Group Discussion to market validate and assess the 27 technologies to come up with a Compendere on Technology Readiness Level (TRL). Through the year, ITDI signed up eleven agreements with eight partners for eleven technologies and issued seven Fairness Opinion Reports.

To capitalize human capabilities, ITDI moves ahead to strengthen its pool of experts by directing its staff to pursue advanced degrees. For the year, there are forty-four ITDI employees currently pursuing their Master's degree and eight for Doctorate in the areas of engineering, chemistry, microbiology, packaging, and environment among others.

Indeed, 2018 was a year of strong growth for ITDI in terms of R&D programs, technology transfer, and technical services. ITDI shall remain steadfast in its pursuit to become the leading industry partner for science, technology, and innovation.

I encourage you to read through these pages to get to know us -- a game-changer industry partner and yes, this time, going beyond business.

ANNABELLE V. BRIONES, Ph.D.
Director

Highlights of 2018 ACCOMPLISHMENTS

This year, DOST-ITDI actively engaged in delivering technological interventions that address the current needs of various communities in the country.

After the Marawi siege, the Institute provided livelihood products and technologies to Maranao communities to aid in their recovery.

The call for Boracay rehabilitation efforts was supported by DOST-ITDI through the conduct of waste analysis and characterization studies and the deployment of bioreactors to help in the local government's solid waste management activities.

Ready-to-eat foods for disaster relief were also distributed to the survivors of Typhoon *Ompong* in Regions II and CAR; and those affected by the eruption of Mayon Volcano in Albay and nearby communities.

DOST Intervention for Marawi Rehabilitation and Reconstruction

Project 2: *Deployment of Innovative Rainwater Collection System in Marawi*

Partnerships forged

MOA signing between (a) Manly Plastics and (b) RDC, ASCOM,PA

Evaluation of new design prototype

Presentation of new design prototype

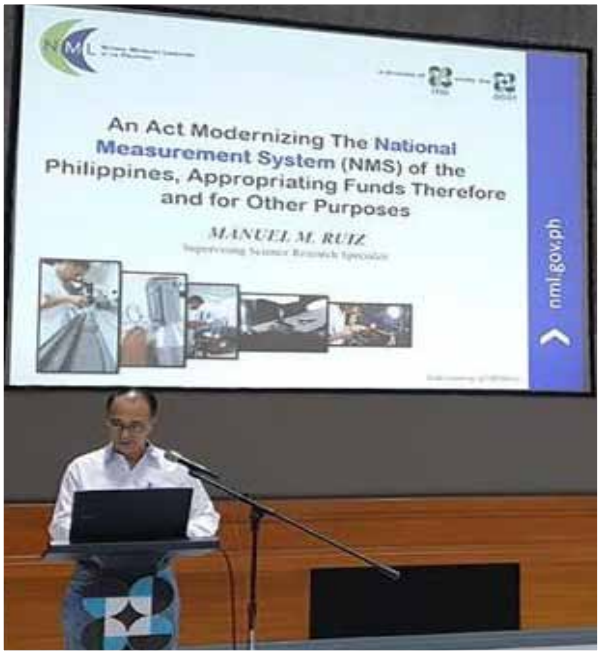
Highlights of
2018 ACCOMPLISHMENTS

The Institute has always been the partner of local industries in developing new products or improving current processes towards increased productivity. Recently, a Pangasinan-based salt manufacturer realized a 32% increase in their product output through the adoption of the ITDI-developed salt processing technology or I-Salt. This also enabled them to comply with the ASIN LAW, improving their product's marketability.

With the Graduate Research Collaboration Program or GRCP, the Institute initiated partnerships with nine academic institutions to strengthen R&D collaborations that would further improve the country's innovation index through increased scientific and technical publications. Technical expertise and assistance of DOST-ITDI were also tapped by various schools around the country for energy efficiency and conservation; and chemical safety and hazardous waste assessment.

Graduate Research Collaboration Program

Highlights of
2018 ACCOMPLISHMENTS



Various efforts on the establishment of national policies on scientific and technological innovations were also spearheaded by DOST-ITDI this year. The ever-evolving demand of having accurate and credible measurement vital to various sectors of environment, health, law enforcement, and fair trade will be met by modernizing the national measurement system through the Modernized National Measurement System Act. The institute is now lobbying for the passage of this Act in Congress. As the country gears towards Industry 4.0, activities that will guide nanotechnology research in the country are implemented thru DOST-ITDI's Environmental, Health and Safety Research in the Risk Assessment of Nanomaterials project.

ITDI ACCOMPLISHMENTS BASED ON 6P's

The year 2018 marked the active engagement of the Institute in different scientific platforms that bring technological solutions and know-how to various sectors of the economy. The results of these engagements translated to outputs in terms of patent, policy, product or process, publication, places and/or partnerships and people services, collectively known as the 6P's.

PRODUCTS & PROCESSES

The DOST-ITDI has developed 17 new products and introduced 10 innovative processes from a total of 23 completed research and development projects this year. These R&D outputs are considered to have high commercialization potential at this stage.

PRODUCTS & PROCESSES

Resistant Cassava Starch

Resistant cassava starch is an innovative type of starch that is seen as a potential food replacer for dietary application.

With its inherent ability to escape digestion in the small intestine, it acts as a dietary fiber and a functional prebiotic that helps in maintaining a favorable intestinal microflora and preventing the formation of intestinal cancers. It also provides positive health effects in the management of blood glucose, lowering cholesterol levels, and prevention of gall stone formation.

Convex Glass on Solar Panel for Improved Solar Energy Harnessing

The solar panel is a device for converting solar energy into consumable electrical energy that follows a maximum fixed tilt position depending on the latitude of a locality. With solar concentrators these tilting requirements of solar panels are eliminated, allowing the gathering of available solar energy from different angles of exposure and decrease the land requirement for solar panel set-ups.

DOST-ITDI is now studying to improve solar energy harnessing using convex glass on the solar panel. A solar streetlight prototype has already been set-up in the DOST compound. A comparative study and testing on the capability of control with solar convex glass is now ongoing. Eventually, these more efficient solar panels can be used as alternative energy sources especially in remote areas needing electrification.

Supercapacitors for High Energy Storage

Supercapacitors are energy storage devices with high energy storage to power output and better charging-discharging cycles compared to batteries. This promising energy storage alternative is the focus of researches as applied in various renewable energy methods such as solar photovoltaic systems.

DOST-ITDI has developed supercapacitor prototypes with a maximum voltage of 1.447 volts and a charging cycle of only 1 minute (i.e. 60 seconds). Added advantages of the developed supercapacitors include reduced cost of materials and better workability compared to current capacitors in the market.

Nanoencapsulation of Health Supplements for Musculoskeletal System

Despite numerous herbal medicines available in the market, several issues regarding their solubility, bioavailability, and stability continue to be major concerns for these natural medicines.

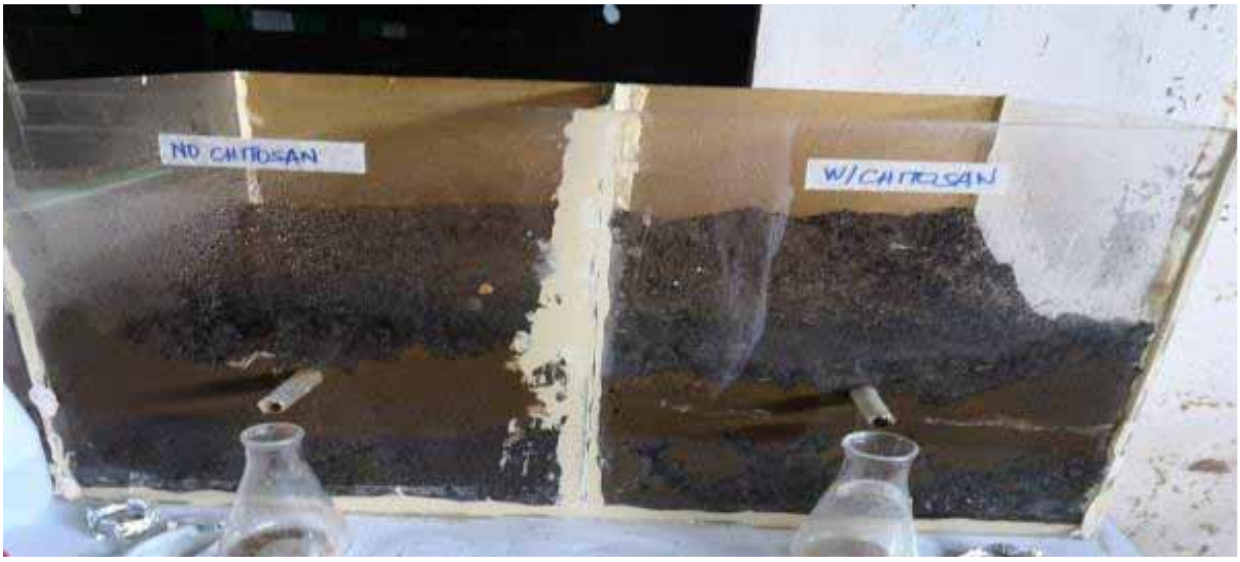
To address these, DOST-ITDI started developing a method of coating nanoparticles derived from chitosan biopolymer and make way for using nanoencapsulation, one of the novel drug delivery systems (NDDS). This innovative approach involves the coating of active ingredients within another material of nanoscale ranging from 1 to 100 nm.

Pre-Processing Technologies to Facilitate Waste-to-Energy

Kitchen wastes can be converted as rich source of biogas for energy application. DOST-ITDI has developed a pre-processing technology that utilizes the common soil fungus *Trichoderma harzianum* to speed up biodegradability of kitchen wastes for the production of biogas. Using the DOST-ITDI developed portable biogas digester, biogas production per kilogram of kitchen waste averaged from 64.8 liters to 72.5 liters.

Anaerobic sludge

Pre-treated substrate

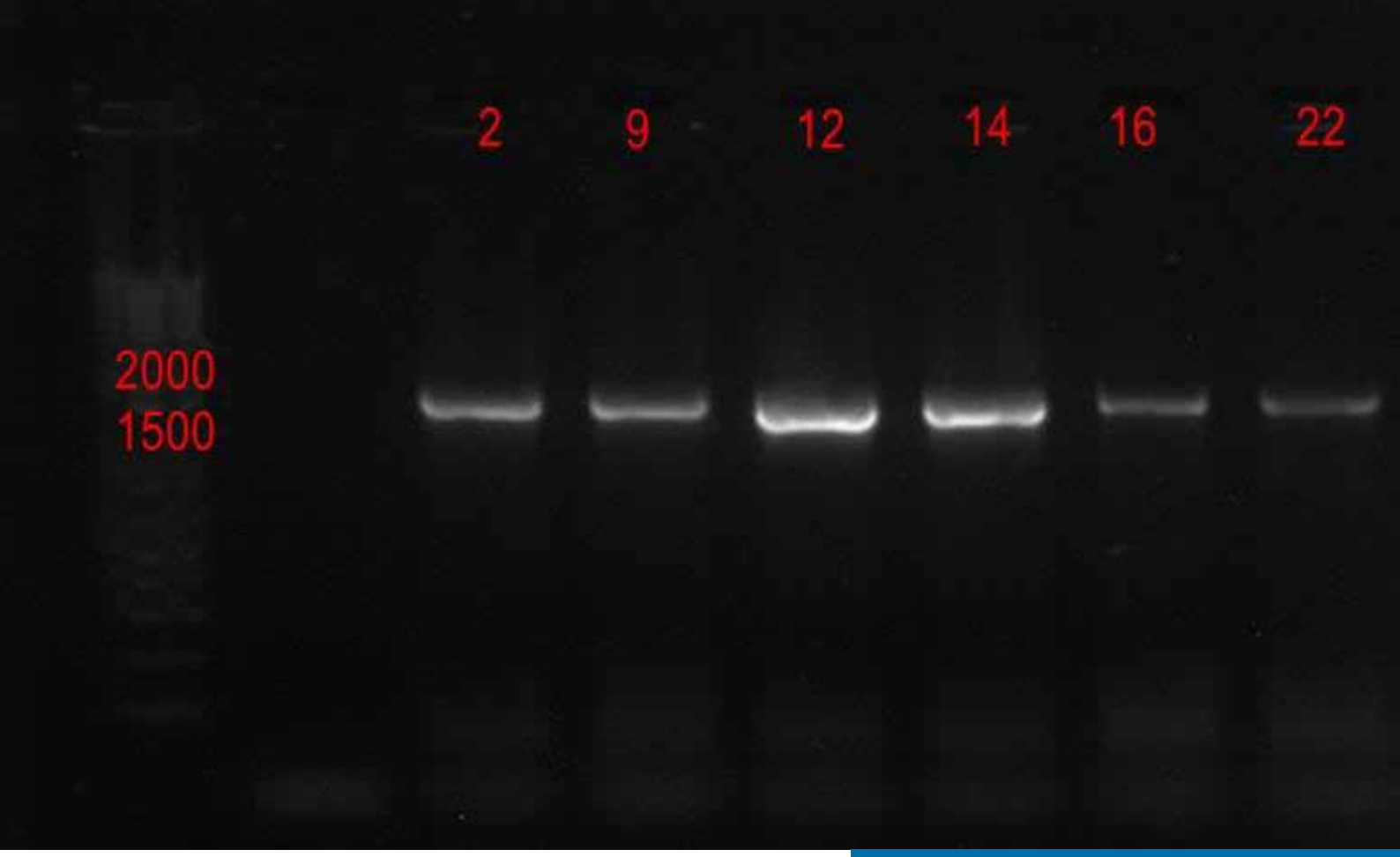


Remediation Processes for Contaminated Soil

The DOST-ITDI also developed cost-effective and eco-friendly remediation techniques that can efficiently remove pollutants from contaminated soil and help prevent adverse effects to the ecosystem.

Excess fertilizer run-off especially in agricultural lands tends to leach nutrient species into the bodies of water leading to an overabundance of algae known as algal bloom which causes red tide. In one study, a collection of shrimp skin was utilized to capture the nutrient species and eventually preventing them from reaching the bodies of water. A removal rate of 89% was achieved.

Another study focused on treating a simulated petroleum-contaminated soil by introducing chemical oxidants into soil subsurface. This has significantly reduced contaminants by up to 90% with the highest reduction obtained at higher volume of chemical oxidant. A single soil injector system was fabricated for in-situ remediation of areas with petroleum contaminated soil.



Isolation, Purification, and Identification of Microbial Succession in Philippine Traditional Fermented Foods

A wide variety of Philippine traditional fermented foods are characterized by their distinct flavor and nutritional value, and these are often processed in households and small-scale industries. However, the process of fermentation takes a long time to complete. For this reason, microbial starter cultures are often added to accelerate the fermentation process. As such, microorganisms are isolated and the results of the study will be used as the basis for the development of microbial inocula in Philippine traditional fermented foods.

DOST-ITDI focused on the isolation and identification of microbial isolates from *Achara* and fermented legumes like Baguio beans, string beans *(sitaw)* and lima beans *(patani)*. Identified microbial species isolated from fermented foods are added to the pool of microorganisms that will be made available for public and micro- small-and-medium enterprises (MSMEs).

Drum-Drying for Selected Local Food Materials

The drum-drying process remains the top choice of drying method for food manufacturers due to a number of advantages including simple process and low energy consumption during manufacturing. Moreover, the nutritional value and properties of food products are most likely retained due to minimal heat and processing applied during drying.

DOST-ITDI has already introduced in exhibitions a number of drum-dried products like banana, mangoes and *makapuno* as part of the Food Innovation Center product portfolio in 2016. This year, new drum-dried products were developed from okra and sweet potato which are well known for their beneficial properties; and dragon fruit peels which are found to be rich in dietary fiber and antioxidants. Also worth noting are the developed okra sheets that are similar to nori flakes found in sushi.

Histamine Levels and Commercial Sterility Evaluation of Bottled Sardines in Oil

Histamine level content is very critical in canned or bottled seafood products. The presence of histamine in commodity items poses a serious threat to the health of consumers since it cannot be degraded by high-temperature cooking or freezing. Their presence in canned/bottled products such as tuna, sardines, and mackerel, can be an indication of mishandling due to incorrect storage temperature and negligence of cGMP (current Good Manufacturing Practices).

To address this, DOST-ITDI evaluated existing bottled sardine products in the market for the presence of histamine. Other parameters critical to the safety of the product including pH and water activity were also determined. It was found that the average histamine concentrations at 13.44 mg/kg is within the allowable limit and would not be sufficient to cause toxic effects to consumers. Also, three of 21 brands of bottled sardines tested failed the commercial sterility test.

Table 1. Results of histamine, water activity, pH, net weight and drained weight of bottled sardines in oil

Parameter	Minimum	Maximum	Mean	Remarks
Histamine (mg/kg)	1.58	262.51	14.75	* 2.15% (1 brand) unacceptable
pH	5.44	6.31	5.80	
aw (solids + oil)	0.881	0.983	0.938	
aw (solids)	0.878	0.963	0.924	
Net weight (grams)	206.0	236.7	160.2	** 19.79% (4 brands) unacceptable
Drained weight (grams)	122.8	191.5	220.9	

n = 96 bottles (16 brands)

* >200 mg/kg histamine

** should be at least 90% of the water capacity of the container

Rice Milling By-Products for the Production of Sugar Syrup and High-Protein Powder

Usually discarded during the rice milling process, the by-products or rice bran were converted into high value-added products like sugar sweeteners and high protein powder. Through enzymatic saccharification, rice bran carbohydrates were broken down to produce sweeteners while the residue left from the process or separation can be used to produce high protein rice powder.

Mung Bean-Coconut Milk Nutritious Beverage

The popular monggo or mung bean which is a common viand among Filipinos and a usual paste filling of *hopia* was given yet another twist as a food delicacy. A nutritious beverage was developed by infusing mung bean with coconut milk making it creamier and more appetizing. The product had been thermally processed to make it shelf-stable.

Mung bean-coconut milk beverage can be served as a refreshment and deployed in disaster-stricken areas to address hunger problems of victims. This beverage is an excellent source of amino acids that are essential building blocks of protein in the body and its high fiber content contribute to the immediate curbing of hunger once consumed.

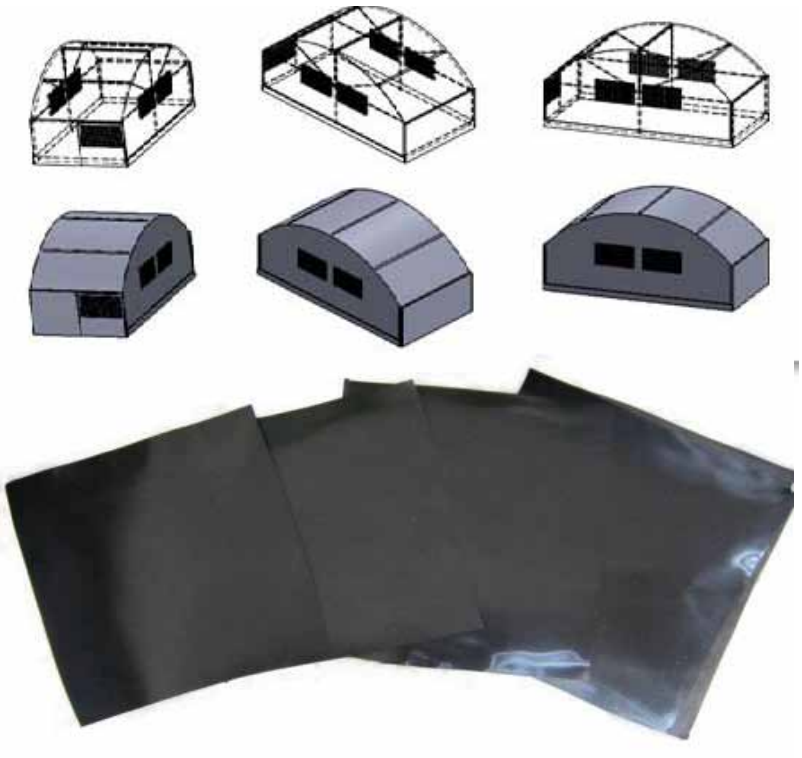
Shelf-stable *Suman*

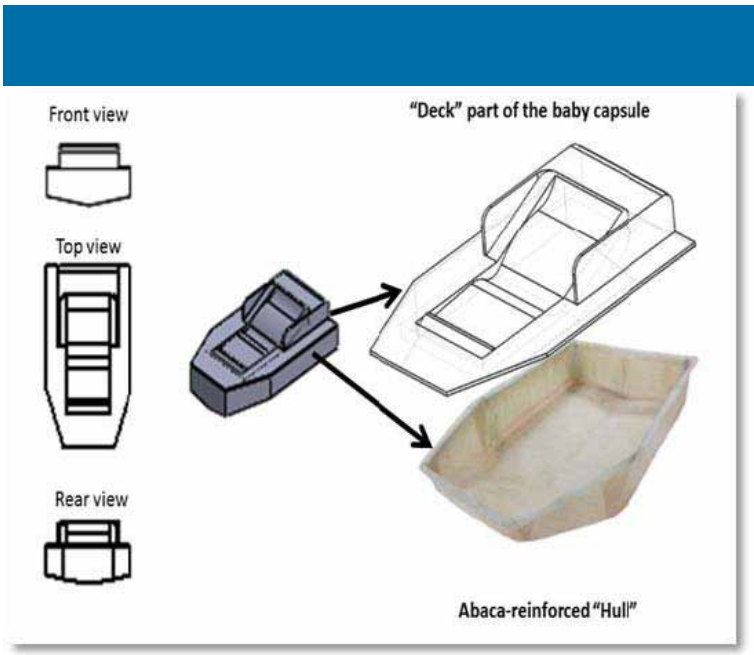
Suman is one of the Philippines' traditional foods consisting basically of glutinous rice and coconut milk, wrapped in banana leaves and cooked in boiling water. The product is a carbohydrate-based snack item normally sold in the public markets and in *pasalubong* stores in a bundle of twos or more. However, traditionally prepared *suman* is not shelf-stable and requires refrigeration, thus, it is cooked on a daily basis by vendors.

DOST-ITDI addressed this concern by developing a shelf-stable suman that is individually packed in pocket-sized pouches. It is considered a complete meal because of its *Arroz-ala-Cubana* filling consisting of ground beef cooked in tomato sauce with green peas and fried banana. This same product could also be used as food ration during emergency situations or calamities.

Abaca Composite for Bulletproof Materials

Various locally available natural fibers from abaca, pineapple, cotton, and silk were explored as possible components of a lightweight bulletproof material for military and other related applications. This can lessen the country's dependence on imported vests that are usually composed of pure *aramid* or ultra-high molecular weight polyethylene fibers (UHMWPE). Hybrid composites of natural fabrics and a few layers of *aramid* or UHMWPE have shown promising results based on initial tests. Further development and performance testing of the hybrid composites are still being undertaken.





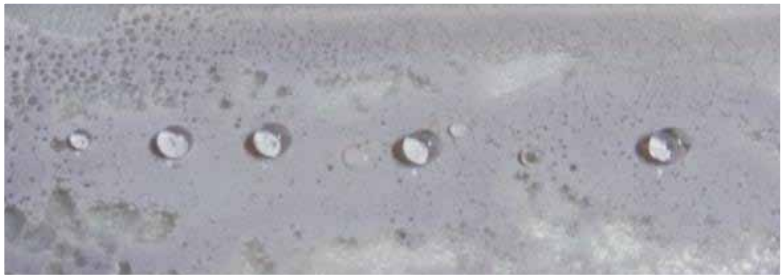
Nanocomposite Materials for Innovative Utility Tent

ITDI aims to contribute to the government's efforts to improve the country's disaster and climate resilience by developing materials that can be used for the fabrication of utility tents and baby capsules that will help protect families and children during disasters. This is an important concern for a country like the Philippines, where more than half of the total land area is at high risk from floods, earthquakes, landslides, and volcanic eruptions.

A Nano-precipitated calcium carbonate (NPCC) reinforced-thermoplastic was developed as a sturdy and durable material for the fabrication of a temporary shelter that can house displaced families during calamities. The next step involves prototype development of the tent using the developed material.

Abaca Fiber-reinforced Composite for Floating Baby Capsule

An abaca fiber-reinforced composite that can be used to fabricate portable, lightweight, and sturdy boat-like vehicle (i.e. a floating baby capsule) that can pass through narrow alleys and transport babies to a safer place were developed. The abaca composite material can also be adaptable to different designs. Further enhancement of the initial design and prototype is being carried out.



Functional Nano Coating (FuNCoat)

A method of incorporating locally produced and indigenous nanosilica to functional coatings was developed.

Functional nano coatings render various surfaces with water-resistance and self-cleaning properties that find useful applications such as in solar panels for energy sourcing and other related industrial applications. Several functional nano coating formulations were studied and applied on different substrate such as glass, polymer, aluminum, and galvanized iron.

Ultra/Nanofiltration Hollow Fiber Membrane for Drinking Water Application

Ultrafiltration and nanofiltration hollow fiber membrane was developed to address the risk associated with using contaminated freshwater sources for drinking purposes such as from groundwater, rivers and lakes as well as the rainwater collection systems. Use of this technology can increase access to safe drinking water sources during emergencies and disasters; and even on a daily basis especially in remote areas where there is no water service and sanitation is poor, that will surely benefit many.

Storage Temperature Effect on Starch-based Cup

In this study, the effect of storage temperature on the crystallinity and compressive load of the commercially sold starch-based biodegradable cup was determined. Using FTIR and DSC techniques, the composition of the starch-based biodegradable cup was identified to be composed of starch, polypropylene, and organic acid as compatibilizer. After a four-month storage in a controlled temperature environment, storage temperature did not show any significant effect on crystallinity. However, the high humidity environment of 80% relative humidity at 20°C increased the moisture content of the sample. This increase in moisture could have decreased the compressive load rather than the effect of environmental temperature during storage.

This study also highlights the importance of providing adequate information and following the proper storage condition and the retention period of packaging materials to assure their quality.

Intelligent Packaging (Time-temperature Indicator) for Chilled and Frozen Foods

This study utilized time-temperature indicators (TTIs) to determine the quality and safety of frozen tuna. TTIs are indicators that measure and monitor the temperature history at which the food product was exposed during handling, distribution, and storage, signified by a progression of color or dye within the run-out window with printed time marks identifying exposure duration.

Results of the study showed that the use of TTI exhibited a response that can be correlated to the quality deterioration of frozen tuna in terms of physico-chemical, chemical, microbiological, and sensory parameters as simultaneously exposed to abused temperature conditions. Thus, TTIs can potentially be applied as a useful instrument in monitoring the safety and quality of tuna in the supply chain.

Assessment and Strengthening of Chemical Safety and Hazardous Waste Management Program of Academic Institutions in NCR

Chemicals and hazardous wastes generated in school laboratories pose serious health and safety threats to students, school personnel and the environment without proper handling and management protocols and policies in place. Relative to this, DOST-ITDI carried out a series of chemical safety and hazardous waste assessment in eleven academic institutions within the NCR. This activity culminated with the distribution of hazardous waste management manuals crafted for each academic institution that will provide guidelines on the proper management of hazardous waste based on existing environmental laws and regulations.

Pilot-scale Testing and Technology Validation of Nanozeolite Processes

The study examined the validity of the process for producing nanozeolite from locally mined zeolite deposits aiming to make it a cost-effective alternative nanomaterial.

Nanozeolites are nano-sized crystalline, hydrated minerals that are used in industry and medicine due to their atomic structure and unique porous properties. Among their wide range of uses include those in ion exchange, filtering, odor removal, molecular sieve, gas adsorption, oil spill decontamination, and modified atmosphere packaging.

Characterization results after chemical and mechanical treatment of produced nanozeolites were also consistent, thereby validating the process and opening possibilities for production on a larger scale.

Carbon Quantum Dots

As a novel class of nanomaterial, carbon quantum dots or CQDs are rapidly gaining attention due to their excellent optoelectronic properties that find a wide array of applications including biosensing, optronics, drug delivery, and bioimaging. Another advantage of CQDs over the currently available metal-based quantum dots is their non-toxic nature, widening further, their use.

In this study, an easy synthesis approach was developed for producing fluorescent carbon quantum dots utilizing agricultural wastes such as calamansi peels *(Citrofortunella microcarpa)* and pineapple crowns *(Ananas comosus)* as carbon sources. With this, a renewable and biocompatible raw material for the development of a highly valuable product such as CQDs has been established.

2018 R&D COMPLETED PROJECTS

GAA-funded

(Project Title / Project Leader)

Collagen Extraction and Calcium Carbonate Production from Eggshell Wastes
E. Panerio

Deployment and Impact Assessment of Developed Disaster Relief Projects (GAD project)
M. Villaseñor

Development of Artificial Muscles from Natural Rubber for Intelligent Robots Application: A Preliminary Study
M. Paglicawan

Development of Innovative Bulletproof Vest and Bulletproof Panels for Armored Vehicles
M. Paglicawan

Development of Materials for Innovative Utility Tent & Floating Baby Capsule as Temporary Shelter for Disaster & Natural Calamity Victims
Study 1: Innovative Utility Tent
P. de Yro
Study 2: Floating Baby Capsule
C. Emolaga

Development of Pre-processing Technologies to Facilitate Waste-to-Energy
D. Herrera

Development of Supercapacitor with Organic Electrolytes using Graphene
J. Herrera

Development of Ultrafiltration/Nanofiltration HF Membrane for Drinking Water Application
M. Margarito

Effect of Drum Drying Parameters on the Quality Characteristics of Selected Local Food Materials (Fruit, Vegetables, Rootcrops) as Intermediate Ingredient and Healthy Snack
M. Falco

Effect of Storage Temperature on the Compressive Strength and Microstructural Properties of Commercially Sold Starch-based Biodegradable Cup
R. Garalde

Evaluation of Histamine Level and Commercial Sterility of Bottled Sardines in Oil
L. Montevirgen

Functional Nano Coating (FuN Coat) for Applications in Energy and Related Industries
J. Celorico

Integration of Convex Glass on Solar Panel for the Improvement of Harnessing Solar Energy
F. del Pozo

Isolation, Purification and Identification (Phenotyping and Genotyping) of Microbial Succession in Philippine Traditional Fermented Foods
Study 1: Phenotypic and Biochemical Characterization of Microbial Isolates from Fermented Products
U. Bigol
Study 2: Molecular Characterization of Microbial Isolates from Fermented Products
E. Panerio
Study 3: Data-mining of Previous Biotechnology R&D Outputs related to Food Processing
F. Coronado

GAA-funded
(Project Title / Project Leader)

Nanoencapsulation of Herbal Drugs in Hydrogels and Matured Coconut Water as Health Supplement for Musculoskeletal System: Development and Scale-up Production
Z. Walde

Quality and Safety Monitoring of Chilled and Frozen Foods Using Intelligent Packaging with Time Temperature Indicators: A Preliminary Study
D. Tañafranca / D. Ortiz

Remediation of Petroleum Contaminated Soil by Oxidation
M. Latosa

Scale-up to Pilot Production of Resistant Cassava Starch
C. Bulan

Sequestration of Nutrient Species on Agricultural Runoff using *Chitosan*
B. Gutierrez

Southeast Asian Atmospheric Corrosion Exposure Studies for Electronic Components
A. Monsada

Utilization of Rice Milling By-products for the Production of Oil, Syrup (as Food and Industrial Sweetener), and High-Protein Powder
N. Ambagan

GIA / Externally-funded
Project Title / Project Leader

Assessment and Strengthening of the Chemical Safety and Hazardous Waste Management Program of Ten Selected Academic Institutions in the National Capital Region (NCR)
E. Ongo

Development, Characterization, and Performance Evaluation of Polymeric Separation Membrane for Industrial Applications using Local Materials (Phase 1)
B. Basilia

Green Synthesis and Functionalization of Carbon Quantum Dots from Biowaste for Biomedical and Industrial Applications
P. de Yro

Pilot-scale Testing and Technology Validation of Nanozeolite Processes
J. Celorico

PARTNERSHIPS

A total of 42 partnerships were forged by DOST-ITDI with various local and international institutions.

PARTNERSHIPS

A total of 42 partnerships were forged by DOST-ITDI with various local and international institutions. The nature of these linkages included memberships in professional or technical associations, scientific cooperation, laboratory networks, and industry contract researches. A recent initiative is called the Graduate Research Collaboration Program or GRCP.

Aimed at strengthening the Institute's R&D collaborations with the academe, GRCP will provide graduate students from selected universities and colleges in the regions the opportunity to work alongside DOST-ITDI experts especially in the conduct of their theses and dissertations. Their research topics should be aligned with the Institute's ongoing R&D initiatives in accordance with the Harmonized National R&D Agenda (HNRDA). With its launching last 3 July 2018, the GRCP has already enlisted nine academic institutions as partners in bringing up the country's innovation index with more scientific and technical papers published through this collaboration.

Memberships

ista
INTERNATIONAL SAFE TRANSIT ASSOCIATION

PACKAGING INSTITUTE OF THE PHILIPPINES

APLMF ASIA-PACIFIC LEGAL METROLOGY FORUM

ASIA PACIFIC METROLOGY PROGRAMME APMP

OIML Organisation Internationale de Métrologie Légale
International Organization of Legal Metrology

Contract Researches & Technical Cooperation

WARM

Waste and Resource Management, Inc.
design, construction and operation of biogas digester using food/kitchen waste

Metro Manila Industry and Energy Research and Development Consortium (MMIERDC)
joint R&D collaboration

Partnerships

Contract Researches & Technical Cooperation

Bio -Vision Sustainable Solutions
development of mixed plastics recycling process

Manly Plastics, Inc.
design and fabrication of rainwater collection systems

Stoneworks Specialist International Corp.
fabrication of abaca fiber-reinforced boat

Partnerships

Philippine Army
deployment of rainwater collection system in Marawi City

Shimadzu Philippines Manufacturing Inc.
training on calibration techniques & procedures

Korea-Philippines Cooperation through Technology Advice and Solutions from Korea (TASK Program)
technology advice & solutions for food processing sector

DSWD, DILG & DOST – Region 5, 7, 10 and CAR
distribution of RTE relief foods before and after the calamity

Partnerships

Universidad Zaragoza
1542

Department of Organic Chemistry, University of Zaragoza
training on migration testing & specific packaging -related contaminants

Thai Packaging Center
training on testing packaging for dangerous goods

N. Canarias Poultry and Piggery Farm
installation of pilot-scale wastewater treatment system

PARTNERSHIPS

LGU-Lubao, Pampanga
deployment of community and household-based water treatment systems

San Miguel Yamamura Asia Corporation
application of nanotechnology on glass

Mines & Geosciences Bureau - DENR
training on Internal Quality Control
and measurement uncertainty

UNILAB Synnovate
consultative meeting and plant tour

OneLab
New Member Laboratories

ASTS Analytical Solutions & Technical Services

CEDRES

F.A.S.T (CALAMBA)

intertek Total Quality. Assured. THAILAND

intertek Total Quality. Assured. VIETNAM

MACH UNION WATER LABORATORY, INC.

OSTREA MINERAL LABORATORIES

SGS THAILAND

SCIENTIFIC STANDARDS SERVICES CALIBRATION LABORATORY

PARTNERSHIPS

Graduate Research Collaboration Program

ADAMSON UNIVERSITY MANILA, PHILIPPINES

BATANGAS STATE UNIVERSITY PHILIPPINES

BULACAN STATE UNIVERSITY PHILIPPINES

CAGAYAN STATE UNIVERSITY

CARAGA STATE UNIVERSITY

CENTRAL LUZON STATE UNIVERSITY 1907

MSU-IIT INSTITUTE OF TECHNOLOGY

RW 1919

Xavier University ATENEO DE CAGAYAN

PLACES

This year, the agency continued extending further its reach through technical interventions to a total of 13 various locations in the country and abroad.

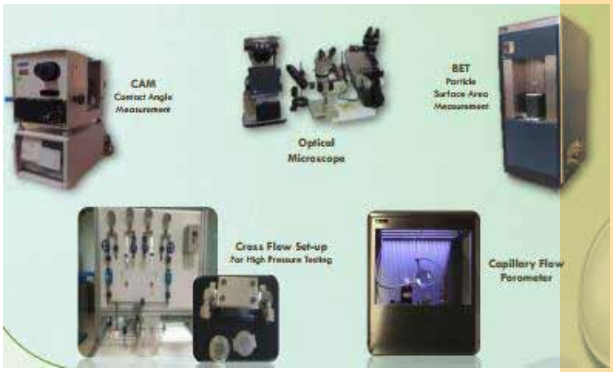
PLACES

This year, the agency continued extending further its reach thru technical interventions to a total of **13** various locations in the country and abroad. Worth noting is the initiative for **Boracay island** rehabilitation by Pres. Rodrigo Duterte in which DOST-ITDI heeded by closely working with DOST Region 6. This led to the deployment of household composter and bioreactor in **LGU-Malay** to aid in their solid waste management and to upgrade their Materials Recovery Facility (MRF). A series of training and Waste Analysis and Characterization Study (WACS) Plan Preparation was also conducted in various LGUs, establishments, and institutions.

The **JM Salt Refinery in Infanta, Pangasina**n, was the first recipient of the ITDI-developed salt processing technology I-Salt, which included the following equipment: evaporating set-up, salt washer, spin dryer and salt iodizing machine. This intervention has significantly increased the company's salt production capacity to 32% in a shorter production run of less than 12 hours compared to the traditional process. I-Salt technology ensures that local salt products entering the market are compliant with RA 8172 or the Asin Law. Future plans include the transfer of the developed I-Salt technology to other salt-producing regions in the country.

PLACES

To increase DOST-ITDI's capability in providing service to the industry, the **Membrane Nano Research Laboratory** was established to provide R&D and technical services in the field of membrane and nanotechnology. This facility aims to hasten the development of membrane nanotechnology in the country that find applications in water purification and water/wastewater treatment.



Other interventions include the deployment of pilot-scale wastewater treatment systems in two swine facilities in **Batangas** and a water treatment module in **Pampanga.** Visits to packaging institutions were also done for advancement in packaging techniques. Two international benchmarking activities were done at the **Halal Products Research Institute, Universiti Putra Malaysia** and **Standards and Industrial Research Institute of Malaysia.** Locally, benchmarking activities were undertaken at two local companies in **Davao** namely RDL Pharmaceutical Company (certified Halal company) and Bioskin Cosmetics. An internship program on Air and Water Measurement Technology for Environmentally Sustainable Development in **Kyoto Japan,** and an International Summer School on Analytical Science, Metrology and Accreditation in **Tallinn, Estonia** were also attended by technical staffs this year.

PATENT

This year, DOST-ITDI was granted five (5) utility models on durian and nano zeolite; and one (1) copyright on BPA detection in canned sardines adding up to the Institute's intellectual properties. A total of eight (8) more IP applications were made this year consisting of five (5) patents, one (1) industrial design, and two (2) trademarks.

PATENT

IP Granted

Type of IP	Title	Registration No.
Utility Model	Nano Precipitated Calcium Carbonate and Method for Preparing the Same	2-2018-050-240
Utility Model	Silver Modified Nano Zeolite and Method for Preparing the Same	2-2018-050-236
Utility Model	Silver Modified Nano Zeolite and Method for Preparing the Same	2-2018-050-237
Utility Model	Process of Packaging Durian Flesh to Keep its Strong Flavor and Aroma	2-2017-050090
Utility Model	Process of Preserving Durian *(Durio zibethinus L.)* Fresh	2-2017-050091
Copyright	BPA Detection in Canned Sardines	02017-713

IP Filed/Drafted

Type of IP	Title	Date Filed
Patent	Iron Modified Nano Zeolite and Method for Preparing the Same	29 June 2018
Patent	Iron Modified Nano Zeolite and Method for Preparing the Same	29 June 2018
Patent	Packaging System to Extend the Freshness and Shelf Life of Pork *Lechon*	01 Aug 2017
Patent	Okra Flakes	12 Jul 2018
Patent	A Processing Method and Composition for a Shelf-stable Non-dairy Ready-to-Drink Beverage from Mung Bean and Coconut Cream	06 Sept 2018
Industrial Design	Transparent Water Container with Nano Coated Ceramic Filter	28 March 2018
Trademark	Pack of Hope	7 Feb 2018 (Reg No. 4/2018/00002264)
Trademark	Mighty *Kamote*	Feb 2018 (Reg No. 4/2018/00002263)

Publications

Papers Published

Nanobubbles from Ethanol-Water Mixtures: Generation and Solute Effects via Solvent Replacement Method

J.C. Millare and B.A. Basilia. Chemistry Select, Vol. 3, Issue 32, 27 August 2018. https://doi.org/10.1002/slct.201801504

Abstract

Replacement of ethanol-water solutions (70–100% v/v) with deionized water was performed in a flow cell of a particle size analyzer. The resulting alcohol solutions were found to contain bulk nanoscale bubbles due to air supersaturation as can be induced by the difference in gas solubility of the solvents. The effect of charged and polar solutes (salt and sugar) that may influence the formation and surface chemistry of nanobubbles was also determined. Dispersion characteristics such as hydrodynamic diameter, particle concentration, along with the particle's electrokinetic property were measured all at once using light scattering techniques after solution replacement with and without the solute species. Light scattering results showed that the resulting solutions upon exchange have higher particle quantities than the starting ethanol-water solvents with smaller diameters ranging from 80 to 160 nm due to nanobubble formation. The claim for air supersaturation forming nanobubbles that may have resulted to the increase in particle density can also be deduced from the obtained optical images in a microscope. The electrokinetic potential or zeta potential was also higher for the solvent exchange protocols entailing for a selective orientation of ethanol molecules in a bubble surface. More importantly, in terms of solute effects, it appears that while salt anions promote gaseous diffusion, sugar molecules inhibit it.

Controlling the Absorption of Gold Nanoparticles via Green Synthesis Using *Sargassum crassifolium* Extract

A.F. Maceda, J.J.S. Ouano, M.C.O. Que, B.A. Basilia, M.J. Potestas and A.C. Alguno. Key Engineering Materials, Vol. 765, March 2018. https://doi.org/10.4028/www.scientific.net/KEM.765.44

Abstract

This work controls the absorption of gold nanoparticles (GNPs) via green synthesis utilizing Sargassum crassifolium extract. The amount of seaweed extract acts as both reducing (from Au+ to Au0) and capping agent. The S. crassifolium extract is mainly composed of biomolecules such as protein and phenolic compounds which are responsible for the synthesis of GNPs. The synthesized GNPs were characterized using UV-Visible spectroscopy, Fourier Transform Infrared (FTIR) spectroscopy and Transmission Electron Microscopy (TEM). UV-Vis spectra revealed peaks around 505 nm to 544 nm which corresponds to the Surface Plasmon Resonance (SPR) of GNPs. FTIR spectroscopy analysis showed peak at 825 cm-1 and 1144 cm-1 which corresponds to the signature peaks of GNPs. Polydisperse GNPs with varied sizes (between 5 nm to 300 nm) were further confirmed by TEM analysis.

Papers Published

Polymer Coated Piezoelectric Quartz Crystal Sensors for the Authentication of Virgin Coconut Oil

E.A. Ongo, et al. Sensors & Transducers Journal, Vol. 28, Special Issue, April-May 2018. ISSN: 2306-8515, e-ISSN 1726-5479

Abstract

The authentication of virgin coconut oil is important in view of its increasing popularity and great potential in the international market. In this study, a novel approach that could elucidate the distinct quality characteristics of virgin coconut oil was developed. An electronic nose based on polymer coated piezoelectric quartz crystal was assembled to discriminate different quality of coconut oils such as virgin coconut oil (VCO), flavored VCO, rancid VCO and refined, bleached, and deodorized (RDB) coconut oil. It consisted of four polymeric sensors, an oscillator and a digital frequency counter. The sensors gave a stable response (response time = 5 to 8 minutes) and good reproducibility (r.s.d. = 6.48, 3.83, 6.45, 7.52; n=7) and repeatability (n=3). A unique quality profile of authentic VCO was observed against flavored and rancid VCO and RBD coconut oil using radar plot. The image formed is a chemical signature of an odor for a well-defined quality of VCO. The inherent structure of data was also analyzed using Principal Component Analysis (PCA). This technique decides which among all possible projections is the best for representing the clusters of data. The results have converged in suggesting that even two sensors are appropriate in distinguishing patterns or relationships in variables.

Controlling the Absorption Spectra of Gold Nanoparticle Synthesized via Green Synthesis Using Brown Seaweed *(Sargassum crassifolium)* Extract

J.J.S. Ouano, M.C.O. Que, B.A. Basilia and A.C. Alguno. Key Engineering Materials, Vol. 772, July 2018. https://doi.org/10.4028/www.scientific.net/KEM.772.78

Abstract

Gold nanoparticles were synthesized using brown seaweed (Sargassum crassifolium) extract and chloroauric acid solution. This is an easy, cheap and environment friendly synthesis method for the formation of gold nanoparticles. The gold nanoparticles with varying amount of seaweed extract was characterized using ultraviolet-visible spectroscopy. Moreover, transmission electron microscopy characterization was used to observe the shape and size of gold nanoparticles. Experimental results revealed that varying the amount of brown seaweed extract can control the optical absorption spectra of the produced gold nanoparticles. Greater amount of brown seaweed extract will exhibit peak in the lower wavelength while smaller amount of seaweed extract will exhibit peak in the higher wavelength. It is believed that the wavelength of free surface electrons resonance is related to the shift of absorption peak. TEM images revealed a more spherical and smaller particles as the amount of brown seaweed extract was increased. This simple green synthesis method of gold nanoparticles will give a cost-effective route in the mass production of gold nanoparticles for biomedical applications.

Provision of Proficiency Testing for Histamine Mass Fraction in Canned Tuna to Improve the Capability of Chemical Laboratories in the Philippines

B.S. Ebarvia, A. Dacuya, S. Cabanilla and N. Mamplata. Accreditation and Quality Assurance, Vol. 24, October 2018. https://doi.org/10.1007/s00769-018-1347-3

Abstract

In this work, two reference materials (RMs) for mass fraction of histamine in canned tuna were developed to address the need of local testing laboratories for matrix RMs and a PT scheme for histamine. A validated method using HPLC with fluorescence detector (340 nm for excitation and 445 nm for emission) was applied with post-column derivatization for the RM's homogeneity and stability studies. Acceptable results were obtained after statistical evaluation of homogeneity and stability according to IUPAC Harmonized Protocol and ISO Guide 35, respectively. Two PT exercises for histamine determination based on ISO/IEC 17043 were organized in 2014 and 2015 with the assigned values of 148 and 65 mg/kg, respectively. These reference values were obtained using exact matching liquid chromatography–isotope dilution mass spectrometry (LC–IDMS) with gravimetric sample preparation. The corresponding uncertainty of the reference value was obtained by ISO GUM approach where the characterization of the sample gave the highest contribution (41 %). The satisfactory z-score performance evaluated from the 12 laboratories was 50 % and 58.3 % in the first and second PT round, respectively. Most of the laboratories used AOAC Official Method 977.13 but not all conducted method validation. The 50 % decrease in unsatisfactory results in the second PT round is a significant improvement in the local laboratory performance for histamine analysis. However, the provision of more PT schemes and the increased use of CRMs in the future are still needed by these laboratories for external quality assurance and method validation to enhance the present capability.

Molecularly Imprinted Polymer Sensing Layer for Tetracycline Chemical Sensor Based on Piezoelectric Quartz Crystal Transducer

B.S. Ebarvia and I.E. Ubando. Sensors & Transducers Journal, Vol. 28, April-May 2018. ISSN: 2306-8515, e-ISSN 1726-5479

Abstract

Molecularly imprinted polymer (MIP) for tetracycline was prepared via precipitation polymerization at 60°C for 24 h using methacrylic acid as the monomer, trimethylolpropane methacrylate (TRIM) as the crosslinker, 2,2-azobis–isobutyronitrile as initiator, dichloromethane as porogen and tertracycline HCl as template. After template-removal by methanol-acetic acid solvent extraction, the MIP suspension was coated as sensing layer of a piezoelectric quartz crystal transducer. The molecular recognition of tetracycline in the MIP coating was indicated by a corresponding frequency shift of the sensor response. The sensor response was optimized by varying the amount of coating and pH of solution measured. Different parameters like linearity (r=0.9921), sensitivity (41 Hz/ln [conc]), response time (2.4 min), and dynamic range of solutions (1x10-6 to 1x10-3 µg/mL tetracycline) were obtained. A decrease in sensitivity and selectivity ratio was observed for oxy- tetracycline and chlortetracycline in the selectivity study done. Acceptable % recovery was observed for milk and honey matrices. The developed tetracycline sensor is a possible cheaper methodology for screening and quantitation of low levels of tetracycline in foods.

Papers Published

Evaluation of Antioxidant and Nutritional Properties of *Sago (Metroxylon sagu Rottb.)* and its Utilization for Direct Lactic Acid Production Using Immobilized *Enterococcus faecium* DMF78

S.M.M. Duque, I.J.L. Castro and D.M. Flores. International Food Research Journal, Vol. 25, February 2018. http://www.ifrj.upm.edu.my/25%20(01)%202018/(11).pdf

Abstract

Sago flour obtained using the Argao process (indigenous Philippine flour extraction process) was prepared into different mesh sizes (60, 100 and 200 mesh). The sieved flour was divided into fine (F) and course (C) fractions and were tested for percent process recovery, proximate analysis, total starch, total phenolic content, and antioxidant activity. Percent process recovery ranged from 77–89%. Crude fat content was less than 1% (w/w) for all samples while crude fiber content were significantly higher in the coarse fractions. Starch content (db) of the fine fractions were 88.31±1.78% (F60), 92.87±1.49% (F100), and 96.62±1.03% (F200) while coarse fractions had a total starch content (db) of 74.65±1.20% (C60), 68.66±0.96% (C100),and 64.67±1.14% (C200). Total polyphenol content of fine flour fractions (2.83–6.17mg GAE/g sample) was significantly lower than the course fractions (31.50–42.76mg GAE/g sample). Moreover, sago was used as substrate for lactic acid production. Agar, alginate, and carrageenan were tested as immobilization matrices for E. faecium DMF78. Alginate (3% w/v) extruded drop wise on 0.2M CaCl2, and cured for 1hr was found to be the most efficient immobilizing matrix. The use of immobilized and free cells led to the production of 3.011g/L and 4.80g/L lactic acid after 24hrs, representing lactic acid productivity of 0.125 g.L-1h-1 and 0.200 g.L-1h-1 and lactic acid yield (conversion) of 25.42% and 39.76%, respectively.

Antibacterial and Antibiofilm Activities of *Sesbania grandiflora* Against Foodborne Pathogen *Vibrio cholerae*

J.P.M. Guzman, A.D.V. Cortes, K.D. Neri, C.E.T. Cortez and T.P.L. De Las Alas. Journal of Applied Pharmaceutical Science, Vol. 8, March 2018. https://doi.org/10.7324/JAPS.2018.8310

Abstract

The progressing threat of antimicrobial resistance to global public health remains a problem yet to be solved. Hence, new natural products and novel strategies in combating bacteria are continuously being discovered. In this study, Sesbania grandiflora was tested for its antibacterial and antibiofilm activities against the pathogenic Vibrio cholerae. S. grandiflora was able to yield growth inhibition at 7.81 mg/mL and was bactericidal at 15.63 mg/mL. However, it was only able to start to actively inhibit growth at 125 mg/mL. S. grandiflora ethanolic extract was also able to significantly inhibit biofilm formation at concentration as low as 0.98 mg/mL. Hence, the results showed the concentration-dependent antibiofilm activity of S. grandiflora that it was able to inhibit biofilm formation without completely eradicating the microorganism at lower concentrations. These activities were due to their phytochemical composition which exhibit antibacterial and antibiofilm activities. Isolation and characterization of their bioactive compounds may enhance the efficacy of their activities.

Adsorptive Removal of Lead (Pb2+) Ion from Water Using Cellulose Acetate/Polycaprolactone Reinforced Nanostructured Membrane

B.A. Basilia, R.R. Aquino, M.S. Tolentino, R.M.P.D. Elacion, R. Ladrillono, T.R.C. Laurenciana. IOP Conference Series: Earth and Environmental Science, Vol. 191, 2018. DOI 10.1088/1755-1315/191/1/012139

Abstract

Nanostructured membranes of cellulose acetate (CA) with various polycaprolactone (PCL) loadings (0%, 10%, 20% and 30%) were produced via electrospinning process for the removal of Pb^{2+} ion from wastewater. Optimized electrospinning parameters were utilized: voltage supply (30 kV), temperature (25 ^{0}C), tip to collector distance (18 cm) and needle size (25 G). Certain characterization techniques were used to investigate the effect of PCL addition on CA nanostructured membranes. The surface morphology was examined through Scanning Electron Microscopy (SEM), and chemical composition and molecular structure were determined using Scanning Electron Microscope – Energy Dispersive X-ray Spectroscopy (SEM-EDX) and Fourier Transform Infrared Spectroscopy (FTIR), respectively. Results showed that the incorporation of PCL in CA produced finer fiber diameter which gave the membrane a larger surface area; thus, increasing the adsorption sites. Based on the results, adsorption capacity was improved from 43.96 mg Pb^{2+}/g of pure CA membrane to 70.50 mg Pb^{2+}/g of CA/PCL doped membrane. Moreover, the results of this experiment best fitted the pseudo second-order kinetics, and the Freundlich isotherm which appropriately describe the adsorption process. CA membranes are widely used in several separation processes, and the results showed, its capability can be further enhanced by the incorporation of PCL to produced nanostructured membranes.

Fabrication and Characterization of Electrospun Polysulfone (PSf) / Halloysite (HAL) Nanocomposite Membrane

B.A. Basilia, R.R. Aquino, M.S. Tolentino, J.C. Millare, C.D. Balboa, C.J.B. Castro. Materials Science Forum, Vol. 934, 2018. 10.4028/www.scientific.net/MSF.934.55

Abstract

Polysulfone (PSf) is one of the commonly used polymeric membrane materials due to its excellent properties. One of the major concern however is that PSf membranes are mostly hydrophobic in nature. The presence of fillers like halloysite nanotubes (HNTs) into the polymer matrix can decrease this hydrophobicity and may also alter some of its important properties. This study focused on the fabrication of nanofibrous membranes by electrospinning method and characterization using SEM, UTM and contact angle goniometer to determine the effect of HNT concentration to the membrane's surface morphology, mechanical properties and wettability. Results showed that samples subjected at the highest voltage produced finer fibers. The intial addition of HNTs also creates fiber strands with smaller diameters until beading in the fibers due to perturbation of the polymer jet caused by the increased viscosity of the solution and particle agglomeration was observed at higher concentrations. In terms of response to mechanical load, the tensile strength was higher upon HNT integration showing an effective transfer of stress to the dispersed phase despite the morphological imperfections. The contact angle results showed a decrease in hydrophobicity at the highest HNT concentration reflecting the water-loving character of the filler. The overall data gathered showed that the addition of nanoclay improved the properties of PSf matrix making them a suitable material for different filtration applications particularly in water treatment systems.

Papers Published

Preparation of Cellulose Acetate Blended with Chitosan Nanostructured Membrane Via Electrospinning for Cd2+ Adsorption in Artificial Wastewater

B.A. Basilia, R.R. Aquino, M.S. Tolentino, S.C.S. Amen, M.A.V. Arceo, M.E.S. Dolojan. IOP Conference Series: Earth and Environmental Science, Vol. 191, 2018. 10.1088/1755-1315/191/1/012137

Abstract

This study focused on using chitosan (CS) as the functional polymer in the cellulose acetate (CA) matrix to provide reactive ion exchange sites for heavy metal ions. Pure CA and CA/CS blends (wt % 95:5, 90:10 and 85:15) were electrospun to determine the most qualified blend for the adsorption experiment. The morphologies of the electrospun nanostructured membranes were investigated using Scanning Electron Microscopy. The average fiber diameter was found to decrease with increasing CS concentration. CA and CS interaction was confirmed using Fourier Transform Infrared Spectroscopy. Upon characterization, the blend with 15% CS had the best properties for the adsorption process. The adsorption capacities of pure CA and CA/CS blend at different membrane loading and initial concentration showed a significant increase from 67.25 mg Cd^{2+}/g pure CA membrane to 110.48 mg/g CS doped membrane. The experiment revealed that the adsorption kinetics of pure CA and CA/CS blend for Cd^{2+} were described by the pseudo-second order reaction model. The adsorption isotherm data for Cd^{2+} on the surface of pure CA and CA/CS blend best fit the Freundlich isotherm and can be used to described adsorption of Cd^{2+}. This study produced an innovative nanostructured membrane for the removal of Cd^{2+} in wastewater.

Dispersion and Electrokinetics of Scattered Objects in Ethanol-water Mixtures

B.A. Basilia, J.C. Millare. Fluid Phase Equilibria, Vol. 481, 2018. 10.1016/j.fluid.2018.10.013

Abstract

Scattered objects ranging from 100—300 nm were detected in ethanol-water mixtures at increasing concentrations—10 to 90% v/v ethanol using a particle size analyzer. To evaluate the structural transitions, two mechanisms of nanostructure formation from previous studies were considered: (1) molecular clustering and (2) nanobubble formation. Measurement of particle counts, polydispersities and sub-micron particle diameters were made available with the Dynamic Light Scattering (DLS) system and high resolution of detectors on the equipment (as small as 1 nm under dilute conditions). The electrokinetic property of colloidal dispersion through its zeta potential was simultaneously determined using the Phase Analysis Light Scattering (PALS) function of the instrument. Results suggest that the structural changes can be rooted, starting from an accumulation and amphiphilic encapsulation of gaseous phases forming nanobubble-like clusters at initial additions of ethanol, followed by bigger, and mostl;y aggregated ethanol-water and ethanol-ethanol clusters at higher concentrations. An inflection in the measured particle counts and zeta potentials at about 20% v/v ethanol as may be caused by the substantial amount of nanobubble clusters was observed similar to the reported anomalous trend in the measured thermophysical properties of ethanol-water mixtures.

Synthesis and Characterization of Polysulfone (PSU) / Philippine Halloysite (PH-HAL) Nanostructured Membrane via Electrospinning

B.A. Basilia, R.R. Aquino, M.S. Tolentino, N.K.G. Arcamo, J.P.N. Gara. MATEC Web of Conferences, Vol. 213, 2018. 10.1051/matecconf/201821303001

Abstract

Membrane technology is widely used in many separation processes because of its multi-disciplinary characteristics. One of the techniques that is used in the fabrication of membranes is the electrospinning process which can create nanofibers from a very wide range of polymeric materials. In this study, electrospun nanostructured fibrous composite membranes of polysulfone (PSU), commercial halloysite (COM-HAL), and Philippine halloysite (PH-HAL) were synthesized. The concentrations of COM-HAL and PH-HAL were both varied from 0.5%, 1%, and 2%. The FTIR results showed that there were changes in the intensity of the PSU-IR spectra which confirmed the presence of COM-HAL and PH-HAL in the synthesized membranes. The SEM revealed that nanofibers can be successfully produced by the addition of LiCl salt in PSU with varying HAL concentrations. Also, it was observed that the addition of HAL with varying concentrations have no significant effects on wettability due to the strong hydrophobic character of the PSU membrane. Moreover, it was found from the analysis of mechanical properties that the tensile strength of the membranes weakened by the addition of HAL due to its weak interaction with PSU.

Papers Presented (Oral/Poster)

Division	Title of the Paper Presented	Presenter/ Author	Conference/Event	Date
CED (Chemicals and Energy Division)	Salt Iodization Technology	M. Carandang	Regional Science and Technology Forum, R1, Alaminos, Pangasinan	Sep 20
	Modular Multi-Industry Innovation Center	O. Evangelista	57th Philippine Association of Food Technologists Convention / Blueleaf Cosmopolitan, Ortigas, Quezon City	Sep 21
	Methyl Ester from Spent Coffee Grounds	M. Carandang C. Mendoza	1st Southeast Asian Coffee Education Congress DAP Tagaytay	Oct 1-4
EBD (Environment and Biotechnology Division)	Interactions of *Sinigrin* and Allyl Isothiocyanate with Common Metal Ions	B. Gutierrez	33rd Philippine Chemistry Congress (PCC) / PICC, Pasay City	May 31
	Biodecolorization of Textile Dye and Wastewaters by Crude Laccase from *Pleurotus florida* ITDI 6003	E. Montiague N. Unciano J. Guzman E. Panerio, P. Jose, U. Bigol I. Castro,	Mycological Society of the Philippines Convention UPLB	Aug 14
	Prospects of Waste-to-Energy Facilities in the Sugar Industry	R. Esguerra	Philippines Sugar Technologists, Inc. Convention / Cebu City	Aug 16-17
	Fueling National Development through Compliance to Republic Act 9003 by Local Government Units: The Importance of Waste Analysis and Characterization Study	R. Esguerra	PIChE Visayas Regional Conference / Iloilo City,	Sep 13-14
	Nurturing the Youth through Science and Technology	U. Bigol	2018 PhilAAST Annual Convention / PHILVOLCS, UP Diliman, QC	Sep 20-21

Division	Title of the Paper Presented	Presenter/ Author	Conference/Event	Date
EBD (Environment and Biotechnology Division)	Developing a Waste Analysis and Characterization Study Sampling Plan for an LGU / Environmental Policy Development / Process Design in Industrial Wastewater Treatment / Technologies for Managing Municipal Solid Wastes	R. Esguerra	PIChE Baguio-Benguet Industrial Environmental Management Seminar / Baguio City	Sep 23
	Technological Intervention in the Cacao Industry	U. Bigol	Kakaokonek 2018 / Mindanao Region	Oct 19
	Developing a WACS Sampling Plan for LGUs	R. Esguerra M. Tansengco M. Artuz	3rd Solid and Hazardous Waste Management Conference / Metro Centre Hotel and Convention Center, Tagbilaran City, Bohol	Dec 6
FPD (Food Processing Division)	Development of RTE Dried Cavendish Banana /	C. Palla	Association of Higher Education Multidisciplinary Researchers Inc. (AHedMRI) Integrative Research Summit / Bayview Hotel	Aug 18
	Establishment of a Food Safety System for *Taho* and *Tokwa* Manufacturers in Metro Manila /	U. Dollete		
	Establishment of Processing Methods for the Production of Natural Sweetener from Nipa Sap /	C. Villaluz		
	Low Input Drying Technology of Vegetables: City of Manila Experience 2002-2007	L. Montevirgen		

Papers Presented (Oral/Poster)

Division	Title of the Paper Presented	Presenter/ Author	Conference/Event	Date
FPD (Food Processing Division)	Characterization of Different Fractions of *Makapuno* from "*Kabuwig*" and Embryo Culture *Makapuno* (ECM) / Establishment of a Food Safety System for Peanut Butter Manufactured in Metro Manila	M.E. Falco G. Diopol	Association of Higher Education Multidisciplinary Researchers Inc. (AHedMRI) Integrative Research Summit / Bayview Hotel	Aug 19
	DOST Food Innovation Center	B. Macaraeg	57th PAFT Convention / Quezon City	Sep 13
	High Value Products from Cacao Processing	M.D. Villaseñor	2018 RSTW/ Quezon Convention Center / Lucena City	Nov 13
MSD (Materials Science Division)	Comparison of Surface Functionalization Mechanisms Relative to the Activity of Cellulose Acetate Membrane Against Gram-positive and Gram-negative Bacteria /	E. Casa R. Cruz B. Basilia	2018 PIChE Convention / Bellevue Hotel, Alabang	Feb 21-23
	Surface Characterization and Crystallographic Structures of Polysulfone with Locally Synthesized Nanoclay Membranes /	B. Basilia S. Cayabyab E. Casa, L. Milo A. Collera V. Lagura M. Margarito M. Que, P. de Yro, B. Visaya		
	The Effect of Organo-Montmorillonite to the Thermal Property, Flux Rate, Morphology and Surface Profile of PVDF Hollow Fiber Membrane	V. Lagura, F. Fu M. Margarito B. Basilia B. Visaya		

Division	Title of the Paper Presented	Presenter/ Author	Conference/Event	Date
MSD (Materials Science Division)	Process Validation on Producing Nanozeolite from Natural Resources	J. Celorico A. Collera L. Samson M. Que, L. Milo R. Antinopo B. Basilia	2018 PIChE Convention / Bellevue Hotel, Alabang	Feb 21-23
	ITDI Research Initiatives on Non-Metallic Minerals	B. Basilia	Inorganic Minerals Consultative Meeting by PCIEERD	Mar 9
	Abaca Fiber-reinforced Composites: Effect of Additives and Fiber Length to Mechanical Properties and Water Absorption	M. Paglicawan	NRCP Annual Scientific Conference and 85th General Membership Assembly- 85 Leading Frontier Research and Poster Exhibit and Competition / PICC	Mar 14
	Preparation and Characterization of Natural NanoZeolite Modified with Iron Oxide	J. Celorico, et. al	33rd Philippine Chemistry Congress, PICC, Pasay City, Manila.	May 30 Jun 01
	Development of Nanocomposite Polysulfone-Nanoclay Membrane with Enhanced Hydrophilicity	B. Basilia, et. al	ICSET 2018 / Mapua University, Manila	Aug 19-21
PTD (Packaging Technology Division)	Effect of Ozone on Prolonging the Shelf Life of Mango and Broccoli During Cold Storage and Distribution	M. Paico	IAPRI World Packaging Conference / Jinan Univ., China	Jun 26

Papers Presented (Oral/Poster)

Division	Title of the Paper Presented	Presenter/ Author	Conference/Event	Date
NMD (National Metrology Division)	Molecularly Imprinted Polymer Sensing Layer for Tetracycline Chemical Sensor Based on Piezoelectric Quartz Crystal Transducer	B. Ebarvia	AsiaSense 2018 Conference (8th International Conference on Sensors)/ University of Santo Tomas	Feb 21-23
	Purity Assessment of Benzoic Acid Calibration Standard Using Mass Balance Approach	B. Ebarvia R. Galo A. Bion	NRCP Annual Scientific Conference and 85th GMA / PICC, Pasay City	Mar 14
	Comparative Study of Sample Digestion Techniques for the Determination of Ca, Mn & Zn in Food Supplement /	C. Laurio C. Ramil B. Ebarvia	33rd Philippine Chemistry Congress (PCC) / PICC, Pasay City	May 31
	Development and Characterization of Matrix Reference Materials in Philippine Products /	B. Ebarvia		
	Estimation of Measurement Uncertainty: Evaluation of the Fitness for Purpose of Analytical Method for Reference Material Characterization /	A. Dacuya S. Cabanilla N. Mamplata B. Ebarvia		
	International Comparison for Calibration Standard Purity Assessment of Folic Acid /	A. Tongson R. Galo A. Bion B. Ebarvia		
	Method Validation of Copper in Drinking Water by Atomic Absorption Spectrometer for Proficiency Testing Studies	C. Daniel J. Guerrero E. Encarnacion B. Ebarvia		

Division	Title of the Paper Presented	Presenter/ Author	Conference/Event	Date
NMD (National Metrology Division)	Presentation and Characterization of Copper in Water In-house Reference Material	J. Guerrero C. Laurio E. Encarnacion B. Ebarvia	33rd Philippine Chemistry Congress (PCC) / PICC, Pasay City	May 31
	Mass Balance Approach for Purity Assessment of Organic Materials: Histamine Dihydrochloride Case Study /	A. Tongson M. Galo A. Bion B. Ebarvia	NAST Annual Scientific Meeting / Manila	Jul 11-12
	Pilot Study on the Development of a Local Candidate Reference Material for Aerobic Plate Count in Flour /	M. Aguinaldo A. de Asis		
	Presentation and Characterization of Lead in Water In-house Reference Material /	J. Guerrero C. Laurio E. Encarnacion		
	Production of Reference Material for Benzoic Acid Analysis in Banana Ketchup	B. Ebarvia A. Dacuya A. Veranga J. Valdueza		
	Gravimetric Quantification of Benzoic Acid in Matrix Reference Material by HPLC and Isotope Dilution-LCMSMS /	B. Ebarvia	47th Annual Convention of the Kapisanang Kimika ng Pilipinas-Southern Tagalog (KKP-ST) / Batangas State University	Sept 6-7
	Method Validation of Karl Fischer Coulometer for Water Content Determination in Certified Reference Materials	A. Bion R. Galo A. Tongson B. Ebarvia		

Papers Presented (Oral/Poster)

Division	Title of the Paper Presented	Presenter/ Author	Conference/Event	Date
NMD (National Metrology Division)	Method Validation of Copper in Drinking Water by Inductively Coupled Plasma – Optical Emission Spectrometry for Proficiency Testing Studies	C. Gatchalian C. Laurio E. Encarnacion B. Ebarvia	47th Annual Convention of the Kapisanang Kimika ng Pilipinas-Southern Tagalog (KKP-ST) / Batangas State University	Sept 6-7
	Assessment of Capability of Local Chemical Testing Laboratories for Histamine Analysis in Canned Tuna Through Proficiency Test Schemes	B. Ebarvia A. Dacuya S. Cabanilla N. Mamplata	2018 PhilAAST Annual Convention / PHILVOLCS, UP Diliman, QC	Sept 20-21
	Purity Assessment of Histamine Dihydrochloride Using Mass Balance Approach /	A. Tongson M. Galo A. Bion B. Ebarvia	2018 International Symposium on Biological and Environmental Reference Materials (BERM-15) / Berlin, Germany	Sept 23-26
	Reference Material Development for Benzoic Acid Analysis in Banana-based Philippine Condiment	B. Ebarvia A. Dacuya A. Veranga J. Valdueza		
	Development of Proficiency Test Material for Microorganisms for Food : Aerobic Plate Count in Flour	M. Aguinaldo A. de Asis	Food Safety Analysis 2018 Conference / Singapore	Nov 27-28
	Proficiency Testing Scheme Based on Reference Value for Trace Metals Measurements in Drinking Water	B. Ebarvia	ONELAB FORUM 2018: Fostering Competency and Proficiency Among Analytical Testing Laboratories of Onelab / Acacia Hotel	Dec 5

Division	Title of the Paper Presented	Presenter/ Author	Conference/Event	Date
STD (Standards &Testing Division)	Market Opportunities for Philippine Rubber Industry	A. Senica, J. Amante	DTI International Building	Feb 27
	Terminal Report for Rubber Project 4: Integration of Testing Services for Rubber and Rubber-based Products	A. Senica N. Rodriguez M. Magandia E. Daranciang	PCIEERD	Apr 03
	Extraction, Characterization and Bio-assay for Larvicidal Activity of Some Philippine Medicinal Plants	R. Torres A. Garbo	NAST Outstanding R & D Award Oral Presentation, Hotel Jen, Manila	Apr 18
	Optimization of Extraction Process, Characterization and Determination of the Total Betalain Content of *Beta vulgaris* (Beet Root) /	R. Torres	33rd Philippine Chemistry Congress / PICC Manila	May 30 - Jun 01
	Reference Value-based Proficiency Testing Scheme on Trace Metals in Drinking Water /	C. Ramil		
	Simultaneous Determination of Glucose, Fructose and Sucrose by HPLC-RID /	M. Parcon R. Fuertes C. Ramil		
	Validation of Colorimetric Method for the Determination of Low-level Nitrite in Water Using UV-Vis Spectrophotometer Accessorized with Torlon Fiber-optic Probe	R. Salazar A. Dablio E. Tayag		

Papers Presented (Oral/Poster)

Division	Title of the Paper Presented	Presenter/ Author	Conference/Event	Date
STD (Standards &Testing Division)	Determination of Turbidity in Water Using UV-Vis Spectrophotometer (In-house Method) /	R. Damian I. Ubando E. Tayag	NAST 40th Annual Scientific Meeting / The Manila Hotel	Jul 11-12
	Effect of pH, Light and Temperature to the Anthocyanin Extract from *Clitoria ternatea* Flowers	R. Torres		
	NSTW Technical Session: Integration of Testing Services for Rubber and Rubber-based Products	J. Amante	2018 NSTW / World Trade Center, Pasay City	Jul 19
	Sharing Best Practices-ISO/ IEC 17025	R. Torres	Philippine Alliance of Laboratory Equipment Users (PALEU) Seminar on "Quality Assurance and Compliance" / St. Paul's University, Quezon City	Sep 06-07
	Phytochem and Polyphenols in Coconut Embryo /	R. Fuertes A. Cruz	PhilAAST 67th Annual Convention / PHILVOLCS UP Diliman, QC	Sep 20-21
	Microencapsulated *Beta vulgaris* (Beetroot) Extract as Source of Natural Colorant, Betanin	R. Torres R. Walde R. Yumang M. Casais		
	Larvicidal, Ovicidal and Adulticidal Studies of Philippine Medicinal Pants Against Dengue Vector, *Aedes aegypti*	R. Torres A. Garbo	National Academy of Science and Technology "Meet Your Scientist", Philippine Science Heritage Center, Taguig City	Oct 04-21

Division	Title of the Paper Presented	Presenter/ Author	Conference/Event	Date
STD (Standards &Testing Division)	Benefits, Updates and Way Forward of the Philippine National Standard ISO/IEC 17025 /	A. Dablio	18th Regional Chemistry Congress / Cagayan de Oro City	Oct 24-26
	Characterization of an In-house Reference Material for pH in Water	A. Dablio H. Armario E. Tayag		
	Chemical Composition of Manila Elemi Oil	R. Torres	First Pili National Scientific Conference and Trade Fair, Naga City, Camarines Norte	Nov 05-06
	Parenting Role in Molding a Future Philippine Inventor	R. Torres	Taguig Science High School, Taguig City	Nov 08
	How to Close Non-Conformities	A. Dablio	Philippine Alliance of Laboratory Equipment Users (PALEU) Seminar on "Quality Assurance and Compliance" / St. Paul's University, Quezon City	Dec 5
	Assessment of a Lead and Cadmium Mixture as In-house Reference Material for Testing Laboratories	E. Encarnacion	3rd Philippine Solid and Hazardous Waste Management Conference / Bohol Province	Dec 05-07
	Production of an In-house Reference Material for Water-Testing Laboratories as Means of Reducing Waste /	H. Armario		
	The Solid Waste Management of Japan: An Internship Program Learning Experience	A. Dablio		

POLICIES

DOST-ITDI has been an active member of the Technical Working Group (TWG) of various national committees. In 2018, the Institute worked alongside other government agencies such as the Department of Trade and Industry-Bureau of Philippine Standards (DTI-BPS), National Solid Waste Management Commission, Department of Agriculture, Department of Environment and Natural Resources, and Anti-Terrorism Council-Philippine National Authority on the Chemical Weapons Convention to formulate policies pertaining to solid waste management, use of natural food colorants, standards for packaging materials, and regulation of chemicals which may be used as chemical weapons. Within the DOST System, ITDI contributed to preparing the IRR of the Techno-transfer Act (RA 10055) and in drafting the Policy and Guidelines for Identifying R&D Outputs for Public Goods, to name a few.

3 POLICIES IMPLEMENTED

1. Suitability of packaging materials for food contact

2. Protocol for the Implementation of Technology Offerings as a Strategy to Hasten the Transfer and Commercialization of ITDI Generated Technologies/ Intellectual Property (IP) Assets
3. Guidelines for the Computation of Training Fees within the DOST System

13 POLICIES DRAFTED

1. Guidelines on Composting and Market Development for Compost (NSWMC Publication, DA Lead Author, DOST-ITDI Co-author)
2. Guidelines on the Conduct of Waste Analysis and Characterization Study (WACS)

3. Promotion of the use of natural food colorants from local materials

4. PNS 2097:2014 – Packaging & packaging materials-Plastic Shopping Bags Specifications
5. PNS ISO 7458:2015 – Glass containers – Internal pressure resistance-Test method
6. PNS ISO 7459:2015 – Glass containers-Thermal shock resistance and thermal shock endurance-Test method
7. PNS ISO 8113:2015 – Glass containers-Resistance to vertical load-Test method
8. PNS ISO 9008:2015 – Glass bottles-Verticality-Test method
9. PNS ISO 9009:2015 – Glass containers-Height & parallelism of finish with reference to container base-Test method
10. PNS ISO9885:2015 – Wide-mouth glass containers – Deviation from flatness of top sealing surface-Test method

11. Formulation of Policy and Guidelines for Identifying R&D Outputs for Public Goods (N. Florendo as TWG member – July 2018 still on-going)
12. Revision of IRR for RA 10055 (N. Florendo/T. Chan- See as TWG member/alternate – 1st draft submitted to USec. Guevara)

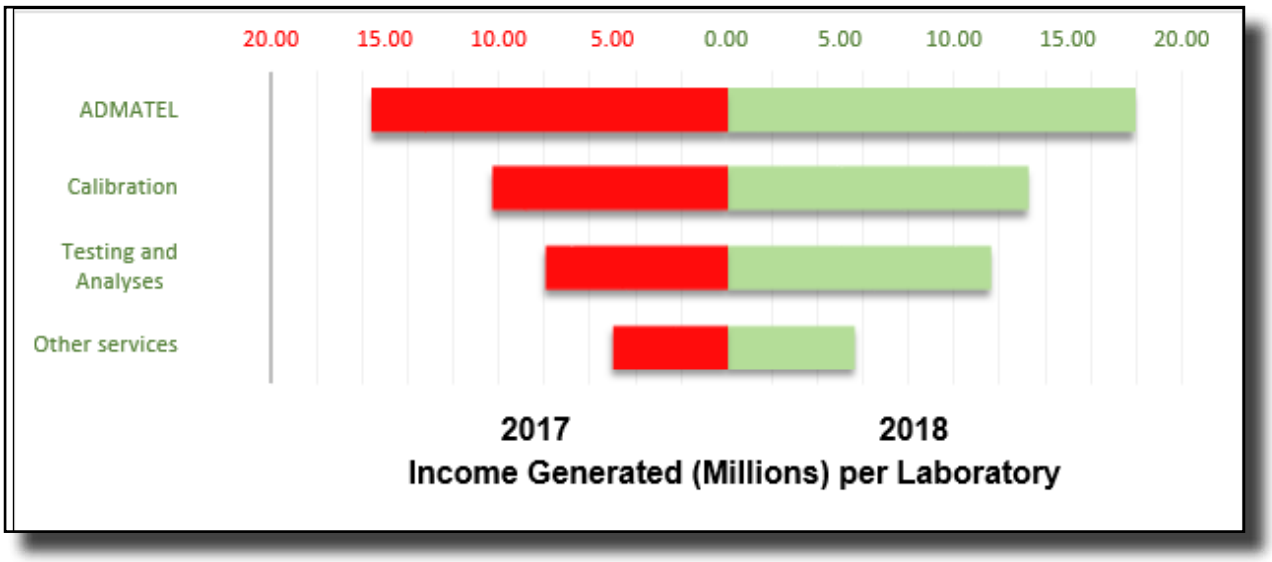
13. Law on the Compliance of the Philippines to Chemical Weapons Convention

TECHNICAL SERVICES

Being the industries' partner for science, technology and innovation, ITDI also offers diverse array of technical services. Stakeholders from the industry and academe composed the majority of the customers served by the Institute through its state-of-the-art laboratories.

Total Income Generated (Millions)

For the year 2018, the total revenue generated from technical services aggregated to PHP 43.11 M. The 31% growth from the previous year's income despite the decrease in number of clients served is an indicator that the Institute has maintained its image as one of the nation's leading laboratory service providers, hence, continuing good rapport with its stakeholders.

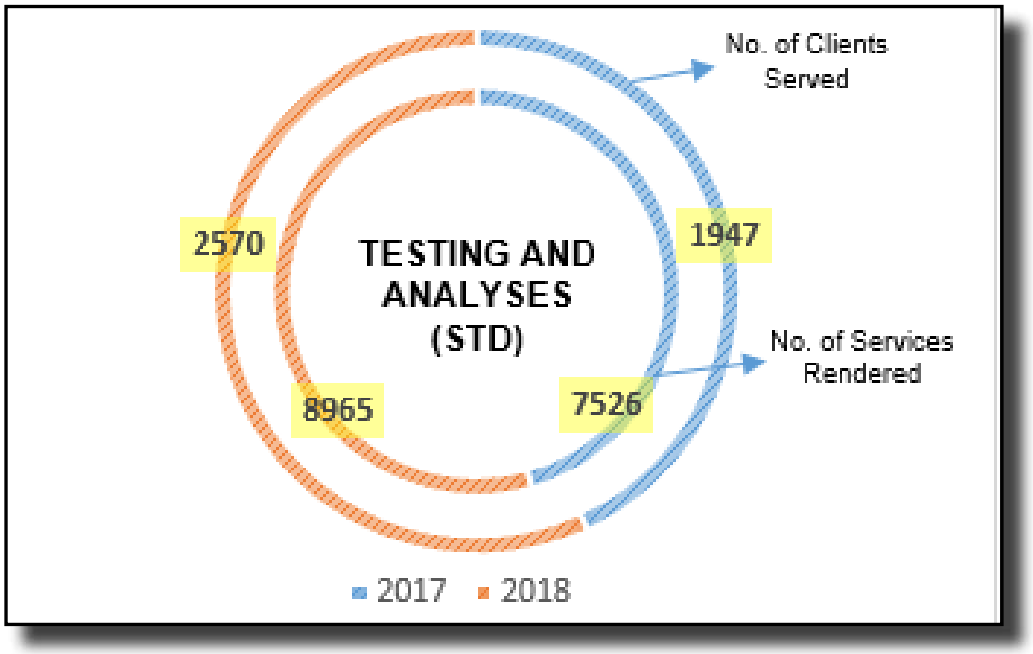


Since the institutionalization of OneLab's referral system in 2016, the Standards and Testing Division (STD) has been continually increasing its income, finally reaching PHP 11.6M in 2018. This posted 47% higher income than last year. Five percent of the total number of tests were from the referral system of the OneLab Network. This signifies that a wider range of stakeholders all throughout the country can be reached. The Formula of Conversion technical services contributed a total income of PHP 0.9M this year.

Also, the launching of new services of STD in 2018 paved the way to a broader spectrum of sectors. Included in the list were: sugar profile in food, dissolved oxygen, 5-day biochemical oxygen demand, salinity, nitrite in water; International Rubber Hardness Degree Method M, International Rubber Hardness Degree Method N and flexibility of rubber hoses at low temperature.

A Certificate of License to Operate (LTO) as a chemical testing laboratory was given to STD last June 2018 during the 33rd Philippine Chemistry Congress in compliance with the Chemistry Profession Act (RA 10657). All existing STD laboratory accreditations under the PNS ISO/IEC 17025:2005 were also maintained this year.

TECHNICAL SERVICES



Various auditing activities were also carried out in STD laboratories, namely:

- Pharmacology and Toxicology Section by the Bureau of Animal Industry (BAI) on January 22, 2018 and found the laboratory operations **compliant with the RA 8485 (Animal Welfare Act)**

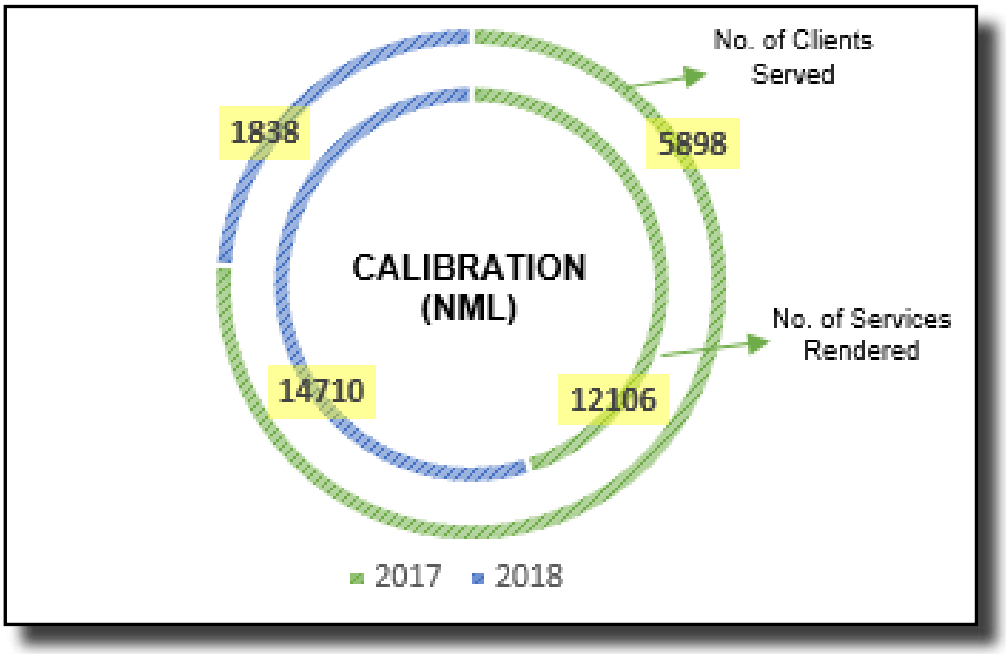
- Inorganic Chemistry Section, Chemistry Laboratory by the Health Facilities and Services Bureau (HFSRB) of the Department of Health (DOH) on April 26, 2018 for the **Drinking Water Testing Laboratory Accreditation**

- Inorganic and Organic Chemistry Sections of the Chemistry Laboratory and the Microbiology Section of the Biological Laboratory by the Food and Drug Administration (FDA) on July 4-6, 2018 for the **Food and Bottled Water Testing Accreditation**

The success of the assessments done by DOH-HFSRB and FDA paved the way for the STD to earn its laboratory accreditation for Drinking Water testing granted on 01 October 2018 and laboratory accreditation for Food and Bottled Water testing granted on 06 December 2018.

Various local and international proficiency testing (PT) programs have been participated by STD laboratories. These PT programs include microorganisms in water and food (marinade and infant formula), nutrients and contaminants in food (fish meal, corn-based snack food, rice and soy flour), and physical properties of rubber and plastics. Satisfactory to excellent results showed the competence of the technical staff and comparability of STD laboratories to testing laboratories worldwide.

TECHNICAL SERVICES

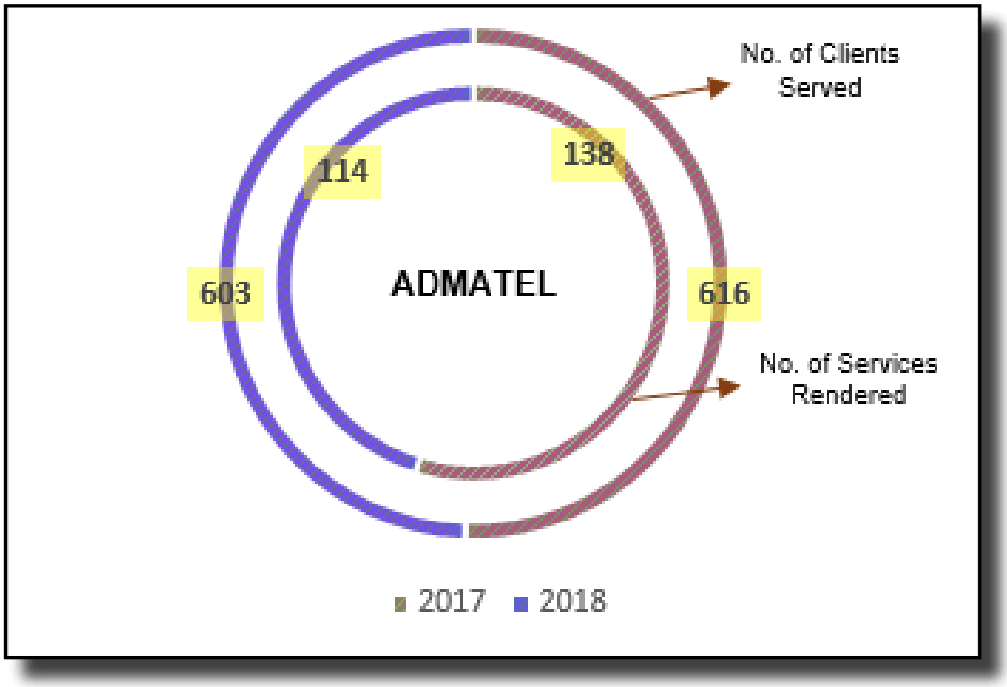


Nineteen new calibration services boosted the performance of the National Metrology Laboratory (NML) for the year 2018. The continuous effort to promote new and existing services resulted to the 21% increase in the number of services rendered by the laboratory regardless of the drop in the number of clients served. **From 2017, the total income generated from calibration services spiked by PHP 2.9M.**

A new addition to the wide range of services offered by NML include:

- Calibration of OIML E2 weights 1kg to 10kg
- Calibration of OIML Class E2 weights 20kg to 50kg
- Calibration of OIML Class F1/F2 weights 100kg to 200kg
- Calibration of OIML Class M1/M2/M3 weights 100kg to 200kg
- Calibration of OIML Class M1/M2/M3 weights 500kg
- Calibration of Free Nominal Mass Standards Using OIML Class E2 100kg to 200kg
- Calibration of Free Nominal Mass Standards Using OIML Class F1 100kg to 200kg
- Calibration of Free Nominal Mass Standards Using OIML Class F1 500kg
- Calibration of NAWI (Electronic) up to 2kg
- Calibration of Volumetric Instruments (Glassware) from 0.1 mL to 5 L
- Calibration of Piston-operated pipettes with variable volume from 1 µL to 10 mL
- Calibration of Piston-operated pipettes with fixed volume from 1 µL to 10 mL
- Calibration of dispensers from 1 µL to 100 mL
- Automated testing of Road Tankers from 2 000 L to 50 000 L
- Rectangular Gauge Block Grade 0 (Steel) 0.5-100mm
- Rectangular Gauge Block Grade 1 (Steel) 0.5-100mm
- Rectangular Gauge Block Grade 2 (Steel) 0.5-100mm
- Vernier Caliper (Mechanical/Digimatic) 0.0mm – 250mm
- Outside Micrometer (Mechanical/Digimatic) 0.0mm-250mm

TECHNICAL SERVICES



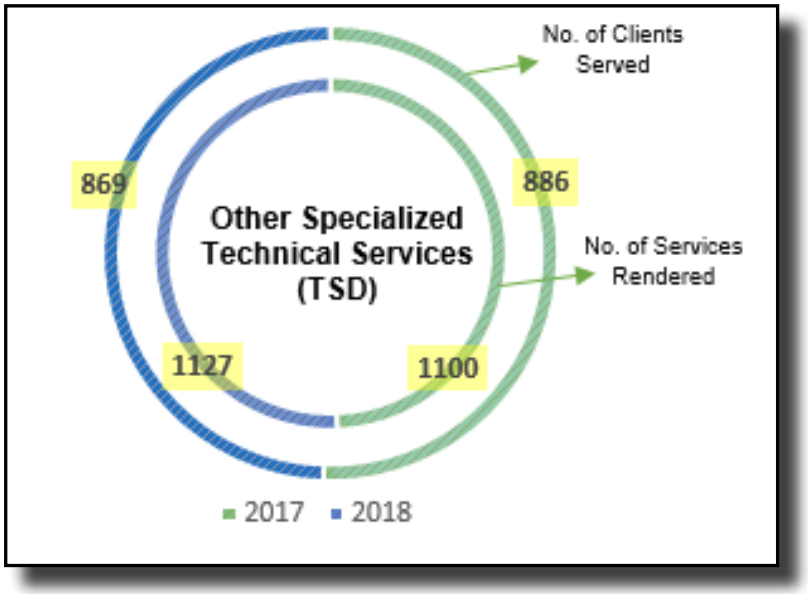
A remarkable 23% increase in the total income of the Advanced Device and Materials Testing Laboratory (ADMATEL) from 2017 to 2018 was recorded. The laboratory gained 63 new clients and maintained 51 repeating clients.

The stakeholders were from different sectors such as government, academe, semiconductor and electronics (S&E) and other industries. Come next year, the newly installed 3D-Xray CT machine and laser decapsulation will surely improve the earnings of the laboratory.

Last November 2017, ADMATEL has acquired the PNS ISO/IEC 17025:2005 Accreditation covering two scopes, Chemical and Mechanical and will be accredited until February 2020. Currently, ADMATEL is working on continuing this certification that covers its Surface Analysis, Thermal Analysis and Chemical and Metallurgical Laboratories.

TECHNICAL SERVICES

From 2017 to 2018, 12% increase in the total income generated from other specialized technical services was recorded. Majority of the requests from stakeholders involved the extraction of crude plant extracts and essential oils, use of facilities such as spray dryer, furnace, two-roll mill and compression molding machine and label design.



The Philippine Environmental Technology Verification (ETV) Program, which aims to provide credible, reliable and independent verification of the performance of environmental technologies, is being implemented by ITDI since 2006. The Department of Environment and Natural Resources (DENR) – Department of Science and Technology (DOST) Joint Administrative Order (AO) No. 01, Series of 2006 serves as the basis for the establishment of the said program. Section 5 of the Joint AO states that "The DENR shall no longer process and approve applications for Technology Approval. All applications for technology approval and review shall be subject to the Technology Protocol on Environmental Technology Verification of the DOST thru its Industrial Technology Development Institute." Likewise, the Department of Energy (DOE) recognizes the DOST's ETV Program and concurs that new and modified technologies related to energy savings and anti-air pollution be subjected to ETV upon request by technology proponents. The DOE supports the ETV Program by providing experts that will review and verify this type of technologies.

To date a total of 118 technologies have been verified. In 2018, the ETV Program received 30 applications and has developed 16 ETV plans and prepared 10 ETV report/statement for the technologies verified. Applications received include technologies on solid waste management and treatment (use of biodegradable plastic/ packaging, healthcare/medical waste treatment and municipal solid waste treatment), water and wastewater treatment, conversion of waste to energy, energy saving devices; and climate change mitigation technologies.

TECHNOLOGY TRANSFER

The institute continued to explore ways on how to step up the delivery of its technology transfer program. Implementation of its project on Pre-Commercialization Tools / Strategies for Effective Transfer and Commercialization of Generated Technologies and Intellectual Properties funded by PCIEERD was pursued with the conduct of two more Technology Offerings during the first quarter of the year. The offerings aimed to boost the transfer or uptake of technologies resulting from R&D (research and development) to the production sector. These focused on Green Engineering and Advanced Technologies. A total of 77 representatives from relevant industries attended the events while seven expressed interest on some of the featured technologies.






Table 1.
Events Highlights (2017-2018 ITDI Technology Offering)

Event/Date/Venue	No. of Participants (Industry)	Potential Technology Takers	Potential Partners/ Collaboration for R&D
1. Fourth Cluster – **Green Engineering** January 16, 2018 FNRI Auditorium	155 (total) **40 (industry)**	**7** **1** 4 C Oil Spill Absorbent **1** Charcoal Briquettes from fruit/root crop peels **1** Compact waste water treatment for Quick Service Restaurants (QSRs) **1** Electric Densifier **3** Package: Dual Drum Composter, Charcoal Briquette, & Electric Densifier	**1** (baking equipment)
2. Fifth Cluster – **Advanced Technologies** February 15, 2018 FNRI Auditorium	115 (total) **37 (industry)**		

TECHNOLOGY TRANSFER

Beefing up the technology offerings were the conduct of **Quicklook** and **Focus Group Discussions (FGD).** The Quicklook aimed to market-validate the 27 technologies in focus through 121 interviews where the perceptions and insights from the validators were gathered. Meanwhile, the FGDs with stakeholders on cacao from Davao and Eastern Visayas region gathered first-hand information and different points of view on the current situation of the cacao industry in the country, and, hopefully, bring the ITDI cacao technologies to its customers in a faster and more efficient way to make the technology accessible and improve the success rate of technology transfer.

To complement these internal initiatives, the institute sought to provide the needed external perspective on its technologies and went a notch higher by embarking on a new technology check strategy to rank market readiness of 27 ITDI-developed technologies called the **Technology Readiness Assessment (TRA)** review. A systematic, metric-based process and report, TRA assesses the readiness level and maturity of technologies. It covers technology, manufacturing and quality, and programmatic aspects such as customer focus and documentation.

This was pursued in partnership with the Export Marketing Bureau (DTI-EMB), which enlisted the help of 15 industry influencers to form five TRA teams. The technologies were clustered into five, namely: FIC (Food Innovation Center) technologies, other food processing technologies, health and wellness, green engineering, and advanced technologies.

The teams determined which technologies make business sense and have business value; how best to develop and expand export trade prospects of the 27 technologies; and selecting which from the 27 technologies/ products to trade and further develop following current market trends. Together, the teams assessed the readiness of the 27 technologies and their Project Readiness to Transition level.

Results of the project will be compiled into a Compendere supported by 27 TRA full reports which are expected to impact various industry sectors. This Compendere will be launched early next year with the DTI and industry partners.

A coaching workshop that brought together researchers, technology transfer officers, and other stakeholders was also conducted. The workshop aimed for all stakeholders to understand and appreciate each other's role and contribution in the creation, capture, and delivery of value of ITDI technologies.

TECHNOLOGY TRANSFER

During the year, ITDI inked 11 agreements with eight partners covering 11 technologies (Table 2); while seven Fairness Opinion Reports were issued (Table 3).

Table 2. 2018 Technology Transfer Agreements / Memoranda of Agreement (TLA or MOA)

Client/ Adopter	Technology Agreement	Type
Suki Trading	Package: Electric Plastic Densifier, Modified Carbonizer and Dual Drum Composter	MOA
Suki Trading	Waste Water Treatment for Quick Service Restaurants (QSRs)	MOA
Mariñas Technologies	Package: Electric Plastic Densifier, Modified Carbonizer and Dual Drum Composter	MOA
L. Angeles Machineries Corp. (LAMACO)	Package: Electric Plastic Densifier, Modified Carbonizer and Dual Drum Composter	MOA
NAV's Inc.	Modified Carbonizer	MOA
RS Unitech	Cacao Desheller/Winnower	TLA
RS Unitech	Cacao Roaster	TLA
RS Unitech	Cacao Grinder	TLA
NSB Engineering	Salt Washer Machine	TLA
NSB Engineering	Salt Iodization Machine	TLA
Kai Anya	RTE Chicken *Arroz Caldo* in Retort (Renewal)	TLA
Sally's Authentic Bicol Express	Vacuum-fried Carrots (TLA Amendment for ITDI Use of Facilities)	TLA

Table 3. 2018 Fairness Opinion Report (FOR)

Technology	Client / Adopter	Reference
Drum Drying	Gata Daku Multi-Purpose Cooperative	FOB-2018-248
Vacuum Frying Technology for Carrots and Okra	Sally's Authentic Bicol Express	FOB-2018-247
Cacao Desheller/Winnower	RS Unitech MFG. and Trading Corp.	FOB-2018-252
Cacao Roaster	RS Unitech MFG. and Trading Corp.	FOB-2018-251
Cacao Grinder	RS Unitech MFG. and Trading Corp.	FOB-2018-253
Technology Offering: DOST FIC Main Technologies	ITDI Technology Offering (October 2017)	FOB-2018-285
Technology Offering: Other Food Processing Technologies	ITDI Technology Offering (November 2017)	FOB-2018-286






Provision of training and technical assistance to various stakeholders is another scheme of ITDI to bolster its technology transfer delivery. In 2018, a total of 85 trainings were facilitated and implemented focusing on calibration and livelihood courses (food and non-food processing) with 2,099 participants coming from MSMEs, LGUs, cooperatives, associations, academe, government offices, and private individuals from the different regions of the country, that generated a total income of PHP 998,778.95.

A Weaning Program for ITDI technologies was also implemented through a Trainer's Training Program, intended to capacitate the DOST Regional Offices and State Universities and be their own trainers especially on livelihood technologies often requested in their areas. Those trained are then assessed and monitored as to their readiness to conduct such trainings.

A total of 65 participants were trained by ITDI on the following technologies:

1. Fish Processing (smoked fish and bottled sardines in oil and sauce)
2. Vinegar and Wine Production using ITDI Kits
3. Fruit Processing
4. Dried Powdered Rootcrops and Vegetables Processing
5. Formulation of Personal Care Products (shampoo, facial cream, hand and body lotion)
6. Household care products making

Consultative meetings with fabricators of bioreactor and plastic densifier were also conducted while a seminar-workshop for DOST Food Innovation Centers was implemented at the Pangasinan State University, Bayambang Campus.

TECHNOLOGY TRANSFER

A Memorandum of Agreement for technical assistance and training program on food processing was also forged with Gawad Kalinga (GK) Farms' School for Experiential and Entrepreneurial Development (SEED) Philippines, GK's first Farm Village University (FVU) that serves as model for rural development through education and hands-on learning. It is also their platform to raise social entrepreneurs, help local farmers, and create wealth in the rural areas.

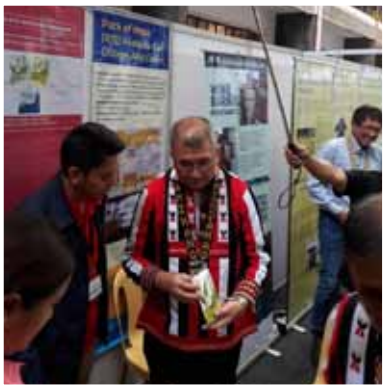
Moreover, 10 more clients received technical assistance on various technologies (Table 4).

Table 4. Technical Assistance Rendered by Region

Region	Technical Assistance	Client
III	| Fish sauce making	| Angel Farms Gourmet Food Corp, Pampanga
IV-A	| Site inspection/assessment for production facility of salt	| Atimonan, Quezon
	| Post assessment of the operation of ITDI Vinegar Acetator	| San Pedro, Laguna
	| Site assessment and consultative meeting for adoption of biogas digester and bioreactor	| LGU Carmona, Cavite
	| Site inspection/evaluation of the existing 3- installed bioreactor, stationed at the MRF	| Sta. Rosa Laguna. Roadpacker Philippines, Inc.
	| Upgrading of the production and processing of *taho* and *tokwa*	| Imus, Cavite
	| Proper water disposal and product improvement from the waste generated in fish production	| Fish2Go, Damariñas, Cavite
IV-B	| Technical assistance in the MRF Immersion in Muntinlupa and Valenzuela City	| Rio Tuba Nickel Mining Corporation, Palawan
NCR	| Assessment/evaluation in the operation of newly acquired water retort and jacketted kettle cooker	| ALL BIALLETI Corporation, Mandaluyong City
	| Testing of 500kg bioreactor and shredder	| (DOST-NCR SET-UP beneficiary)LGU-Paranaque

TECHNOLOGY TRANSFER

All these undertakings were further complemented with other knowledge translation initiatives. Through a proposal-driven project funded by DOST-GIA, the institute was able to participate in IFEX (International Food Exposition) 2018, a DTI-CITEM engagement; where the DOST-ITDI Seafood Innovation Hub was among the main features of the event. The hub showcased the latest ITDI seafood innovations and technical services related to food safety. It was designed as the space where various stakeholders in the food industry can mingle and encourage food innovation using locally available resources. Added to this were 25 more exhibitions participated by ITDI including the annual NSTW celebration, regional S&T week, Biotech, and other invitations from academe and the private sector.



TECHNOLOGY TRANSFER

The institute likewise continued to strengthen its quad media presence with a total of 72 press releases (print and online) and 25 guestings in radio/TV/teleradyo interviews; while the promise of social media as added platform for promotion was further harnessed with 187 posts and three online streaming of events garnering 2001 engagements.

In addition, 26 study tours/visits of various sectors were accommodated while other communication collaterals were produced and disseminated as follows: 76 (titles) technology posters, 92 (titles) technology flyers, 24 newsletters, one annual report, and three videos on technology and services.

Meanwhile, in support of the DOST technology transfer program, the institute has completed formulating two policies namely: 1. Protocol for the Implementation of Technology Offerings as a Strategy to Hasten the Transfer and Commercialization of ITDI Generated Technologies/ Intellectual Property (IP) Assets, and 2. Guidelines for the Computation of Training Fees within the DOST System – (in compliance to DBM-DOST Joint Circular No. 1 and RA 6493; while another two are still being formulated with other concerned parties. These are: 1. Formulation of Policy and Guidelines for Identifying R&D Outputs for Public Good, and 2. Revision of IRR for RA 10055. All these efforts aim to rev up the DOST technology transfer drive.

DOST-ITDI Initiatives

- DOST-ITDI Interventions for Marawi Rehabilitation and Reconstruction
- Providing Directions Toward Sustainable Development of Nanotechnologies in the Philippines
- Capability Building on Energy Efficiency and Conservation
- Capability Building of Analytical and Testing Labs in the Philippines
- Enhancement of the Competence and Capabilities of the National Metrology Laboratory of the Philippines

DOST-ITDI Initiatives

DOST-ITDI Interventions for Marawi Rehabilitation & Reconstruction

Various government agencies through Task Force *Bangon Marawi* were tasked by Pres. Rodrigo Duterte to aid the conflict-stricken city towards recovery, reconstruction, and rehabilitation. The DOST-ITDI is actively implementing initiatives in support of this national call to help Marawi rise again after the war.

Through the project ITDI Livelihood Program for Rehabilitation and Reconstruction of Marawi, DOST-ITDI aims to establish sustainable livelihoods for the Maranaos via a series of training that includes the technology on personal care products, charcoal briquette, herbal processing, and essential oil extraction. To date, two (2) trainers had been trained by experts from the Chemicals and Energy Division to conduct training for seven (7) different livelihood technologies. Various livelihood products and manufacturing equipment were also distributed to the Marawi community.

Another intervention for Marawi is the deployment of innovative rainwater collection systems to help address the problem on water scarcity in the community. Rainwater collection appears to be one of the most promising alternatives for supplying freshwater in the area. With the use of the rainwater collection system, water conservation is promoted and practiced by collecting rainwater and stored in the system which can then be readily used in households.

Design of the prototype has since been done with Manly Plastics Inc., while deployment and evaluation of prototypes is being done with the Research and Development Center, Army Support Command of the Philippine Army.

DOST-ITDI Initiatives

Providing Directions Toward Sustainable Development of Nanotechnologies in the Philippines

Through the DOST-ITDI project of the Materials Science Division on Environmental, Health and Safety Research in the Risk Assessment of Nanomaterials, various activities geared towards the establishment of policies, standards, guidelines, and protocols on Nanosafety in the Philippines were conducted.

A Stakeholders' Forum on Nanotechnology that was attended by 47 participants coming from industry, government agencies, regulatory agencies, academe, professional organizations, and NGOs, provided an avenue to discuss the status of nanotechnology in the Philippines. One of the highlights of the event was the Industry sharing wherein representatives from Boysen/Philippine Association on Paint Manufacturers (PAPM), Inc., Chemrez Technologies, Inc., Beta Nanocoating Philippines, Inc., and Nanofixit Inc showed how nanotechnology boosts the manufacturing industry through the use of nano titanium dioxide in paints for cleaner air, development of self-healing/repairing coatings, coatings that increase tool life, and antibacterial nano cleaning products. One of the speakers also noted that the Philippines offers a great opportunity for entrepreneurs in nanotechnology.

Moreover, three regulatory bodies of the government namely, the Bureau of Product Standards-Department of Trade and Industry (BPS-DTI), Food and Drug Administration (FDA), and Occupational Safety and Health Center – Department of Labor and Employment (OSHC-DOLE) discussed the International Standards, Guidelines and Protocols for Nanotechnologies (ISO/TC 229), Nanosafety in Cosmetics, and Occupational Safety and Health Regulations in the Philippines, respectively.

Stakeholders' Forum on Nanotechnology

DOST-ITDI Initiatives

Benchmarking Activity of Philippine Nanotechnology Delegation in Malaysia

The Philippine nanotechnology delegation from the Department of Science and Technology (DOST), University of the Philippines Los Baños (UPLB), Mindanao State University – Iligan Institute of Technology (MSU-IIT), and Occupational Safety Health Center (OSHC) conducted benchmarking activities through a series of meetings and laboratory visits to the National Nanotechnology Centre-MESTECC, MIMOS Berhad, NanoCAT, University Malaya, SIRIM-IBRC, Biocompatibility Lab, Universiti Kebangsaan Malaysia and NanoMalaysia Berhad on Nov. 21-23, 2018. Malaysia's National Nanotechnology Center - Ministry of Energy, Science, Technology, Environment and Climate Change (NNC-MESTECC) through Mr. Mohd Helme Mohd Helan facilitated the visit of the Philippine delegation to the above mentioned nanotechnology facilities. The said activity enabled the team to learn the best practices for the establishment of policy, standards, guidelines, and protocols on nanosafety; nano-market development and facilities for nanosafety implementation.

Meeting on the formation of the Technical Committee on Nanotechnologies (TC-85)

The Department of Trade and Industry's Bureau of Philippine Standards (DTI-BPS) created the BPS Technical Committee (TC) 85 on Nanotechnologies to develop the Philippine National Standards on Nanomaterials.

The first technical meeting for the establishment of the Technical Committee on Nanotechnologies (TC-85) was held last October 26, 2018 at the Advanced Device and Materials Testing Laboratory (ADMATEL), DOST Complex, Taguig City, Metro Manila, Philippines. It was hosted by DTI-BPS.. The meeting was attended by various stakeholders from the academe, government, consumers, testing institutions, and industries. A brief presentation regarding the organizational structure of BPS and the composition of TC-85 was given by Ms. Ana Victoria Lim of BPS.

DOST-ITDI Initiatives

Capability Building on Energy Efficiency and Conservation

In support of the energy conservation program of the government and help reduce energy consumption of government facilities, ITDI's Chemicals and Energy Division implemented a PCIEERD-funded project titled, Capability Building on Energy Efficiency and Conservation (EE&C) for State Universities and Colleges (SUCs) in six (6) Regions as Demonstration Sites.

The project aims to promote the judicious and efficient utilization of energy resources through capability building on Energy Efficiency and Conservation (EE&C) starting with State Universities and Colleges (SUCs) in various regions. To date, DOST-ITDI already implemented the project in three cooperating regions which include Region II at the Cagayan State University, Region VIII at Eastern Visayas State University, and Region X at Xavier University.

Capability Building of Analytical and Testing Laboratories in the Philippines

The DOST-ITDI Standards and Testing Division, through the PCIEERD-funded project titled, OneLab Capability Assurance System for Metal Content Assessment of Agricultural Produce, Water and Environmental Samples, conducted various capability building activities for analytical and testing laboratories in the country.

Considering the significant role of these laboratories in providing scientific data that dictate product/commodity quality and safety, it is important to ensure that their results are accurate and reliable. A total of 35 laboratories, consisting of private companies, government agencies and academic institutions, participated in the Proficiency Testing (PT) of 10 trace metals organized by STD. Preliminary reports were released on June 2018 and final reports are scheduled to be released next year.

In-house trainings on the analysis of arsenic and trace metals in water for DOST Regional Laboratories were also initiated. This aimed to increase competency on test method performance and to add as testing service offering in the region. This year, DOST-IVA and DOST-CAR were trained last 11-12 January 2018 and 29-31 August 2018, respectively.

DOST-ITDI Initiatives

Enhancement of the Competence and Capabilities of the National Metrology Laboratory of the Philippines

The National Metrology Laboratory (NML) started implementing its Five-Year Enhancement Program last 2017 which aimed to upgrade, repair, and renovate the facilities, develop certified reference materials (CRMs), further equip the personnel through training, and be able to provide services that are internationally recognized.

This program consisted of four projects:
Project 1: Chemical Metrology for Organic Contaminants in Food and Water
Project 2: Chemical Metrology for Inorganic Toxic Elements in Food and Water
Project 3: Biological Metrology for Microorganisms in Food
Project 4: Strengthening the Physical Metrology Capabilities of the National Metrology Laboratory

Establishment of New NML Facilities

In line with the program's objectives, construction of two new facilities, the Metrology in Chemistry (MiC) and Metrology in Biology (MiB) laboratories on both sides of the existing NML (National Metrology Laboratory) building was started. The groundbreaking ceremony for the construction was held last January 17, 2018 led by DOST Secretary Fortunato T. De La Peña.

These new three-floor NML extension laboratories cover an area of 1,900 m2 and 1,600 m2 for MiC and MiB, respectively. It is in these laboratories where technical functions such as the production of reference materials, analyses, and storage thereof; and other related activities will be conducted.

(Left to Right) Men in blue shirts, contractors, NML Chief Ms. Aurora V. Kimura, Asec. Leah Buendia, Usec. Carol Yorobe, ITDI Director Ma. Patricia V. Azanza, DOST Sec. Fortunato De La Peña, Usec. Rowena Cristina Guevara, ITDI Dep. Director Annabelle V. Briones, Contractor, PCIEERD Dep. Director Raul Sabularse, Program Leader Benilda S. Ebarvia, and MiB Project Leader Marlon Aguinaldo.

Artists' perspective of the new NML building

DOST-ITDI Initiatives

An Offering of Metrology Courses in Celebration of the 2018 World Metrology Day

The first Metrology Course in the Philippines was offered by NML last May 21-25, 2018 as part of the celebration of 2018 World Metrology Day. Fourteen delegates from the DOST-Regional Metrology Laboratories participated in the said activity.

A first for NML-ITDI and deemed successful, NML experts served as lecturers during the event where they shared their knowledge and experiences; earning for them and the institute, positive feedback from the participants.

DOST-RML participants pose at the Metrology building lobby.

(L-R) Mr. Michael Solis and Ms. Maryness Salazar delivering lectures during the event.

Bill Modernizing the National Measurement System (NMS)

DOST-ITDI management lobbied for the urgency of the proposed Senate Bill - "Modernized National Measurement System Act", that is designed to replace the existing Republic Act 9236 or the National Metrology Act of 2003.

Two separate teams from the Institute sought audience from the sponsors and authors of the Bill. One led by Dr. Diana L. Ignacio, Deputy Director for Administrative and Technical Services; at the office of Sen. Bam Aquino on September 18; and the second, by OIC-Office of the Director and the Deputy Director for Research and Development, Dr. Annabellle V. Briones, and NML Chief, Ms. Aurora V. Kimura, at Sen. Tito Sotto's on October 24.

The legal team of the two senators gave positive feedback on the concerned bill.

Meeting at Sen. Bam Aquino's office. (Left to right: Anne Labayoga, Manuel Ruiz, Ahdrian Gernale, Paola Deles, Paulo Leones, Dr. Diana Ignacio, Michael Solis, Helen Dacuycuy and Maryness Salazar)

Meeting at Sen. Tito Sotto's office. (Left to right: Mr. Jojo Villapando, Atty. Carisa Barcarse, Ms. Aurora Kimura, Dr. Annabelle Briones, Atty. Sheela Millera, Maryness Salazar and Paulo Leones)

DOST-ITDI Initiatives

The Metrology Bill was presented on the 3rd DOST S&T Legislative Fora organized by the DOST Department of Legislative Liason Office (DLLO) last October 17-18, 2018. NML experts presented the bill to the Committee Secretaries and Legislative Officers of the members of the Senate and other invited guests held at PhiVolcs, Quezon City.

3rd S&T Legislative Forum. (L-R: Engr. Nazarene Baculanta, Dr. Diane Ignacio, Asec. Orville Ballitoc, Ms. Lita Suerte, Mr. Paulo Leones, Ms. Maryness Salazar and Engr. Manuel Ruiz.

Last November 28-29, 2018, NML experts also presented case studies on the importance of the accuracy and reliability of measurements as to health, consumer protection, fair trade, and fair legal decisions at the 4th S&T Legislative Forum which was held in Legazpi City.

AWARDS Received

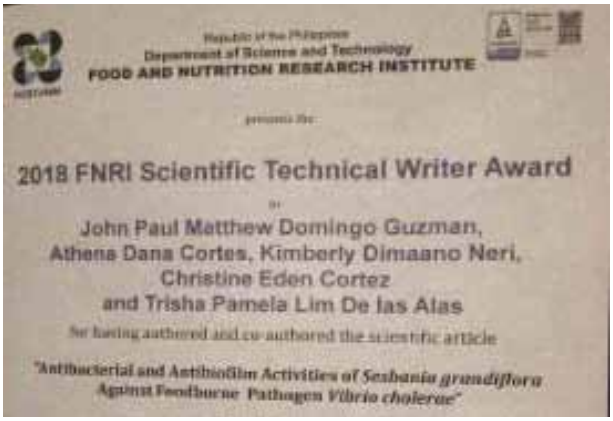
AWARDS Received

Name of Awardees	Title of Award / Award Giving Body
Rosalinda Torres	
	**Outstanding Research and Development Award for Basic Research**, Eduardo A. Quisumbing Medal / National Academy of Science and Technology – Manila
	**Gregorio Y. Zara Award for Basic Research** / PhilAAST – Manila
	**Outstanding Jubilarian** / UST Faculty of Pharmacy Alumni Association and Scholarship Foundation, Inc. - Manila

AWARDS Received

Name of Awardees	Title of Award / Award Giving Body
Cynthia Ochona	
	**2018 Outstanding Practitioner in Laboratory Animal Practice** / Veterinary Practitioners Association of the Philippines (VPAP) – Manila
Marissa Paglicawan	**Gregorio Y. Zara Award for Applied Research** / PhilAAST – Manila
Marissa Paglicawan **Carlo Emolaga** **Ma. Teresa Navarro** **Delmar Marasigan** **Rosito Cerbito** **Blessie Basilia**	**2nd Place, Outstanding Utility Model:** Renewable Resource-based Biodegradable Plastic / National Invention Contest and Exhibit 2018 - Manila
Ian Castro et al.	
	**DOST International Publication Award 2018:** Evaluation of Antioxidant and Nutritional Properties of *Sago (Metroxylon sagu Rottb.)* and its Utilization for Direct Lactic Acid Production Using Immobilized *Enterococcus faecium DMF78* / National Academy of Science and Technology – Manila

AWARDS Received

Name of Awardees	Title of Award / Award Giving Body
John Guzman **Athena Cortes et al.**	
	**2018 FNRI Scientific Technical Writer Award:** Antibacterial and Antibiofilm Activities of *Sesbania grandiflora* Against Foodborne Pathogen *Vibrio cholerae* **DOST International Publication Award 2018:** Antibacterial and Antibiofilm Activities of *Sesbania grandiflora* Against Foodborne Pathogen *Vibrio cholerae* / National Academy of Science and Technology – Manila
Fe Coronado **Noel Unciano et al.**	
	**DOST International Publication Award 2018:** Removal of Heavy Metal Compounds from Industrial Wastes Using a Novel Locally-Isolated *Vanrija sp.* HMAT2 / National Academy of Science and Technology – Manila
Mar Christian Que **Blessie Basilia**	
	**DOST International Publication Award 2018:** Controlling the Absorption of Gold Nanoparticles via Green Synthesis Using *Sargassum crassifolium* Extract / National Academy of Science and Technology – Manila

AWARDS Received

Name of Awardees	Title of Award / Award Giving Body
John Guzman	
	**2nd Runner-up for Poster Presentation:** Crude biosurfactants from locally-isolated *Bacillus spp.* inhibit biofilm formation in *Pseudomonas aeruginosa* / 23rd Biological Sciences Graduate Congress 2018 - Thailand
Benilda Ebarvia **Aaron Dacuya et al.**	**1st Best Poster:** Reference Material Development for Benzoic Acid Analysis in Banana-based Philippine Condiment / 2018 International Symposium on Biological and Environmental Reference Materials (BERM 15) – Berlin, Germany
Araceli Monsada	**Best Technical Paper:** ADMATEL: Supporting Industry Competitiveness and Market Globalization / PIChE National Convention 2018 – Bellevue Hotel, Manila
Reynaldo Esguerra	**3rd Best Paper:** Prospects of Waste-to-Energy Facilities in Sugar Industry / Philippine Sugar Technology Inc. Convention – Cebu
Lourdes Montevirgen	**Best Oral Presentation Award:** City of Manila's *Sustansya Atienza* Program (2002-2007): Nutrition and Livelihood for the City's Poor / Association of Higher Education Multidisciplinary Researchers, Inc (AHEdMRI) Integrative Research Summit 2018 – Bayview Hotel, Manila

AWARDS Received

Name of Awardees	Title of Award / Award Giving Body
Maria Elsa Falco	**Best Oral Presentation Award:** Characterization of Different Fractions of *Makapuno* Endosperms from Embryo Cultured and Mutant *"Kabuwig"* / Association of Higher Education Multidisciplinary Researchers, Inc (AHEdMRI) Integrative Research Summit 2018 – Bayview Hotel, Manila
Charles Feb Palla	**Best Oral Presentation Award:** Development of Banana Leather / Association of Higher Education Multidisciplinary Researchers, Inc (AHEdMRI) Integrative Research Summit 2018 – Bayview Hotel, Manila
Elyson Encarnacion	**Best Presentor:** Assessment of a Lead and Cadmium Mixture as In-house Reference Material for Testing Laboratories / 3rd Philippine Solid and Hazardous Waste Management Conference – Bohol
Annabelle Briones **Nuna Almanzor** **Josie Pondevida** **Maricar Carandang** **Armando Mallilin** **Lucila Alconera** **Lorencito Pacatang**	**2nd Best Poster, Professional Category:** Capacity Building of Internal Quality Assurance of the Salt Industry in the Philippines, ITDI-DOST-GAIN Project No. 104601 / 2nd International Symposium & 9TH Annual Scientific Conference of the Metro Manila Health Research and Development Consortium (MMHRDC) – Pan Pacific Hotel, Manila

HUMAN RESOURCE Development

In support of the operations of the Institute, ITDI capitalized on its human resources with a total count of 329 as of December 2018 representing 89.2% of total plantilla positions. Female employees account for 55% of the current workforce while male employees are at 45%. In addition to the total manpower, 131 contractual and job order staff were employed to support the attainment of the Institute's mandates.

HUMAN RESOURCE Development

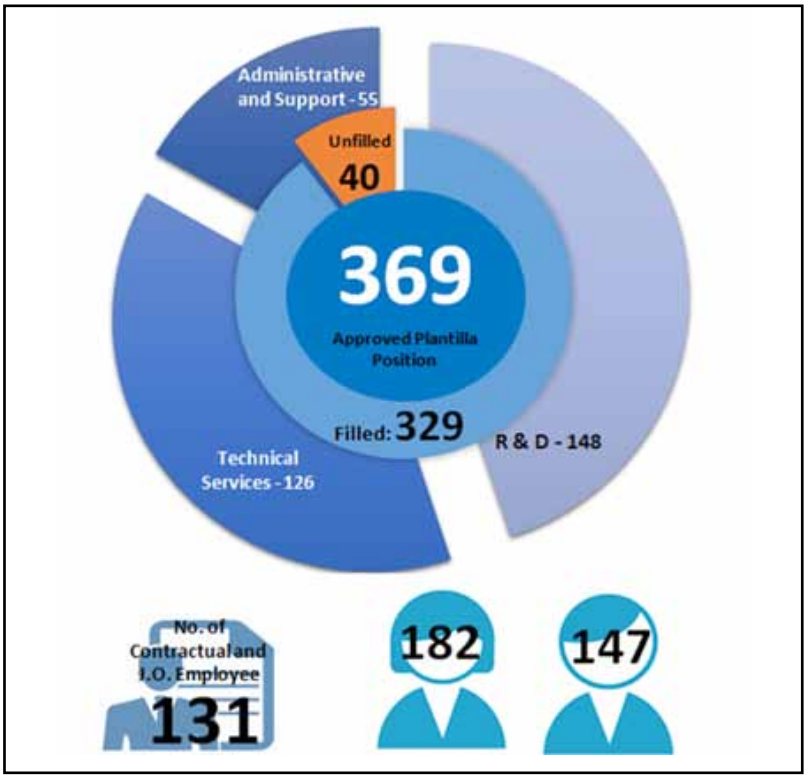
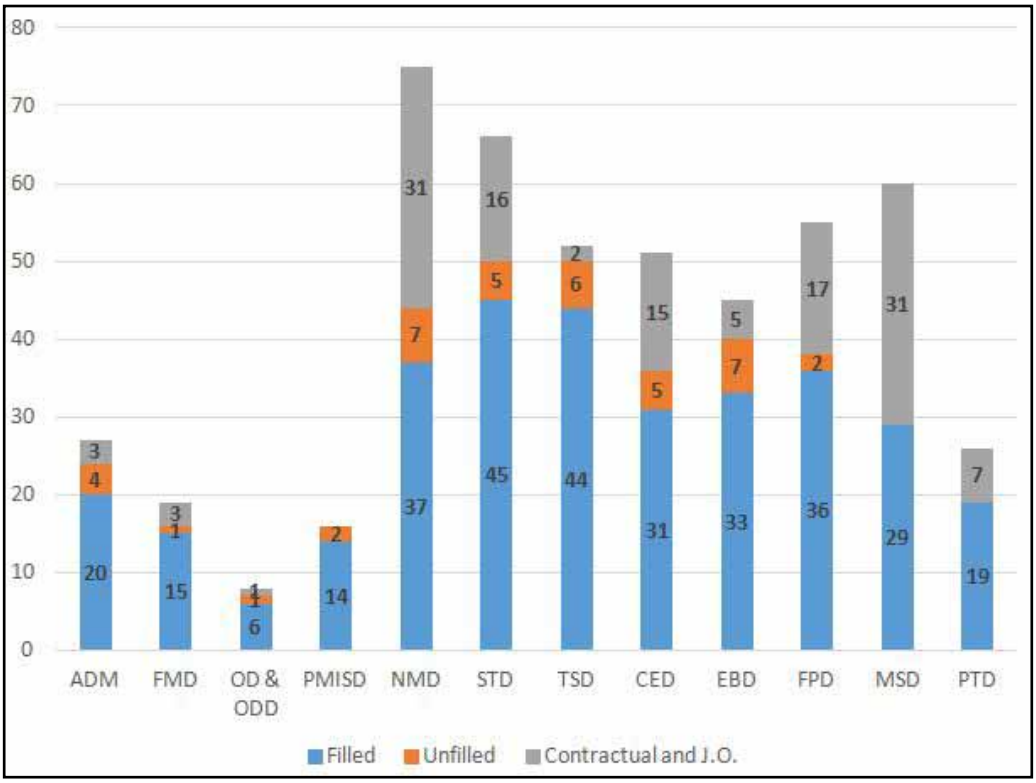


Figure 1. ITDI Employees by the Numbers

Figure 2. Human Capital Distribution by Division



HUMAN RESOURCE Development

In addition to the 2018 manpower profile, the staff is categorized based on their educational attainment of which 213 are Bachelor's degree holders, 62 with Master's degree and 14 with Doctorate degree.

The institute continues to provide a conducive environment for its human resource to pursue higher studies and keep on acquiring new knowledge and set of skills to improve competency and enable them to keep abreast with an ever evolving knowledge and innovation-fueled economy.

This year, 44 ITDI employees are currently pursuing their Master's degree and eight for Doctorate in the following fields of specialization:

- Analytical Chemistry
- Applied Statistics
- Biochemistry
- Biological Science
- Business Administration
- Chemical Engineering
- Chemistry
- Development Communication
- Electrical Engineering
- Environmental Science
- Food Science
- Industrial Engineering
- Molecular Biology and Biotechnology
- Packaging and Manufacturing Technology/Engineering
- Public Administration

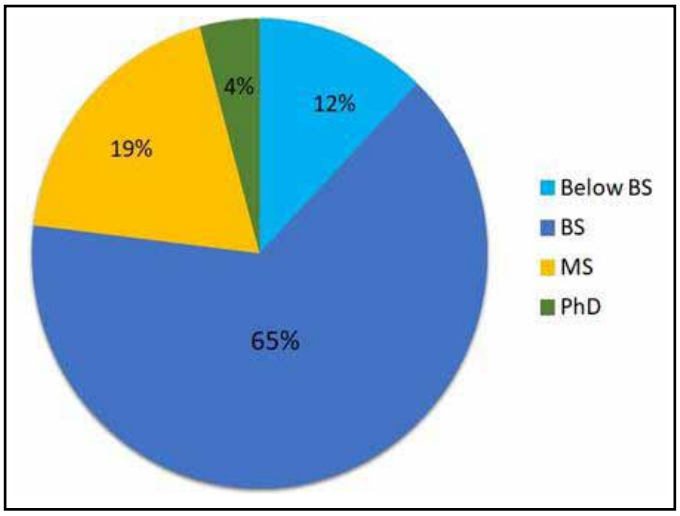


Figure 3. Manpower by Educational Attainment

The following ITDI staff completed their graduate and undergraduate studies this year:

Doctorate Degree

Norberto G. Ambagan (FPD)	-Agricultural Engineering
Ursela G. Bigol (EBD)	-Biochemistry

Master's Degree

Maria Clarissa M. Manabat (FPD)	-Microbiology Minor in Food Science
Carlo S. Emolaga (MSD)	-Chemistry
Mary Joy P. Paico (PTD)	-Packaging Technology
Ma. Rachel V. Parcon (STD)	-Chemistry

Bachelor's Degree

Virginia V. Marino (PMISD)	-Business Management

FINANCIAL Management

This year marked a major reform in ITDI's budget structure by the grouping of its activities and projects under major programs or key strategies. The Institute transitioned from Organizational Performance Indicator Framework (OPIF), an approach by which agency performance was assessed based on the identified Major Final Outputs (MFOs) and performance indicators (PIs), to Program Expenditure Classification (PREXC). In PREXC, performance information and costs are assigned at the program level, rather than at the agency and MFO levels.

FINANCIAL Management

For 2018, ITDI received a total allotment from various funding sources accounting to a total of PHP 842.77 Million with funds from the GAA yielding the highest percentage followed by the fund assistance of DOST through its Grants-In-Aid (GIA) program. Philippine Council for Industry, Energy and Emerging Technology Research and Development (PCIEERD) and other DOST-attached agencies granted PHP 64.16 Million this year to support the implementation of high-impact ITDI projects. This year, a PHP 3.02 Million grant was provided by the Department of Energy (DOE) as assistance for the project "Characterization/ Performance Testing of Biodiesel/ Diesel Blends from Combined Feedstock of Various Vegetables & Used Cooking Oils".

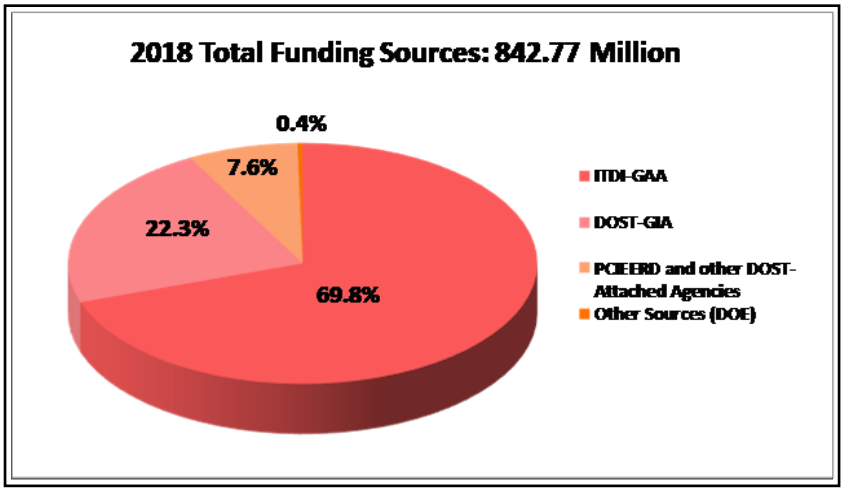


Figure 4. 2018 Total funding sources of the DOST-ITDI

In particular, the 2018 total GAA budget allotment of PHP 587.964 Million decreased by 24.4% compared to the appropriated PHP 777.457 Million budget last year. The largest share of the 2018 GAA or regular budget of the Institute was attributed to its major programs under the PREXC structure, namely the Industrial Technology R&D Program, Industrial Technology Transfer Program, and Industrial Technology Technical Services Program. The highest allocation was attributed to the Technical Services Program amounting to PHP 226.35 Million (48%) with the Metrology Program contributing to a large portion of the allocated fund. The Institute also received a grant from the National Disaster Risk Reduction and Management to implement its intervention projects under the Marawi Recovery, Rehabilitation, and Reconstruction Program.

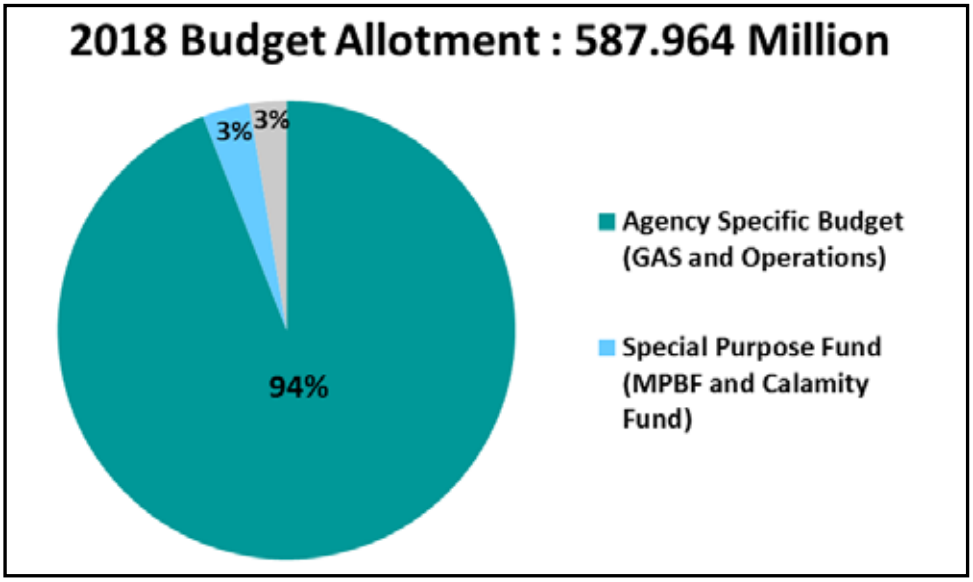
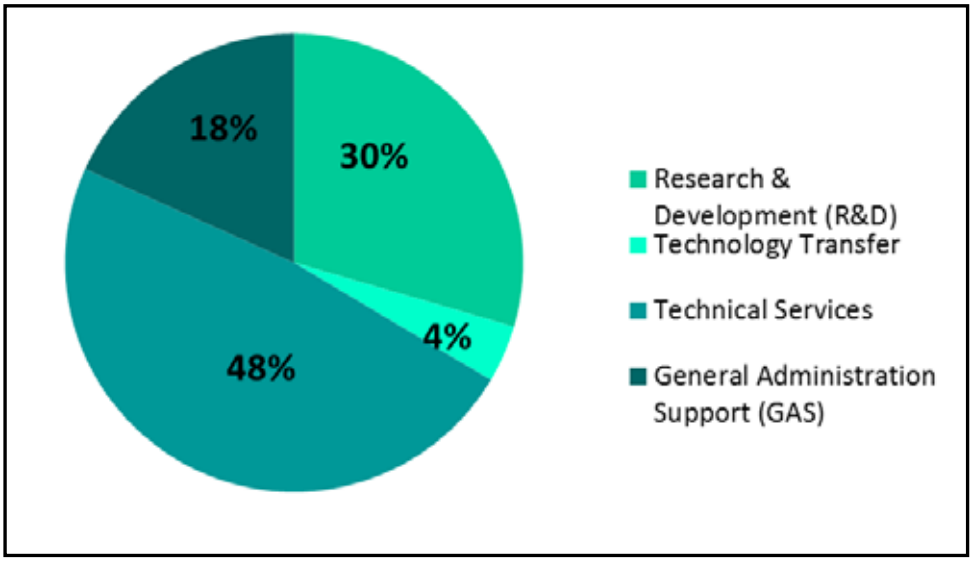


Figure 5. DOST-ITDI budget allotment, 2018

Figure 6. DOST-ITDI specific budget by program, 2018



By Allotment class, the expenditures are classified under Personal Services (PS), Maintenance and Other Operating Expenses (MOOE) and Capital Outlay (CO). In comparison with the 2017 budget, there is a 42% decrease in budget allocation for MOOE and 39% for CO. However, a 13% allotment increase in PS was recorded when compared to last year's allocation.

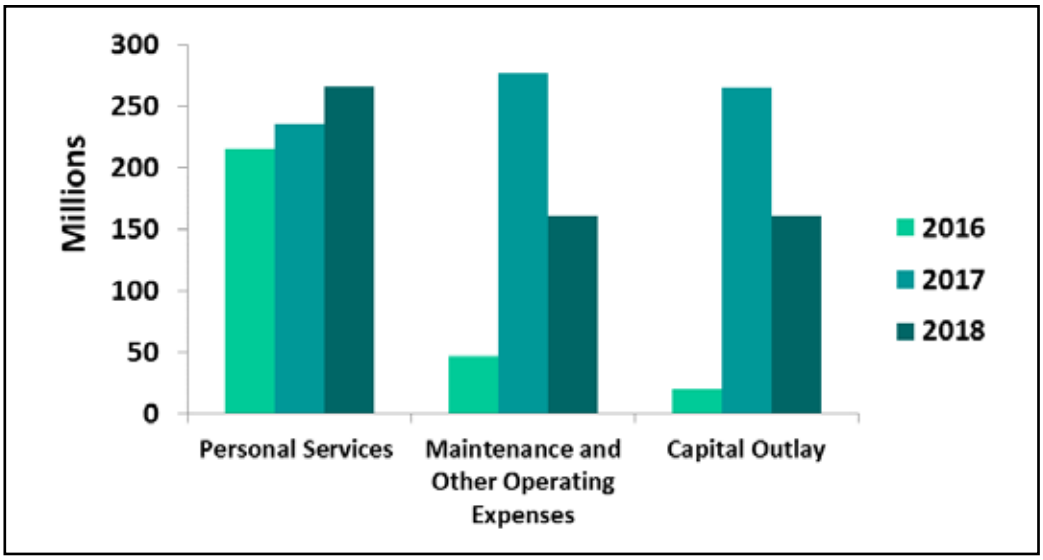
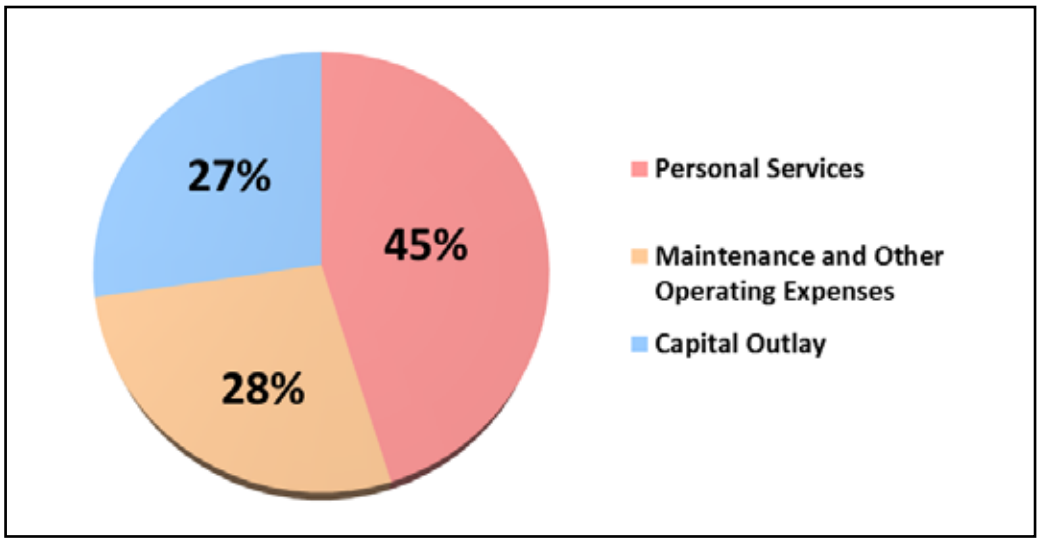


Figure 7. DOST-ITDI budget by allotment class, 2016-2018

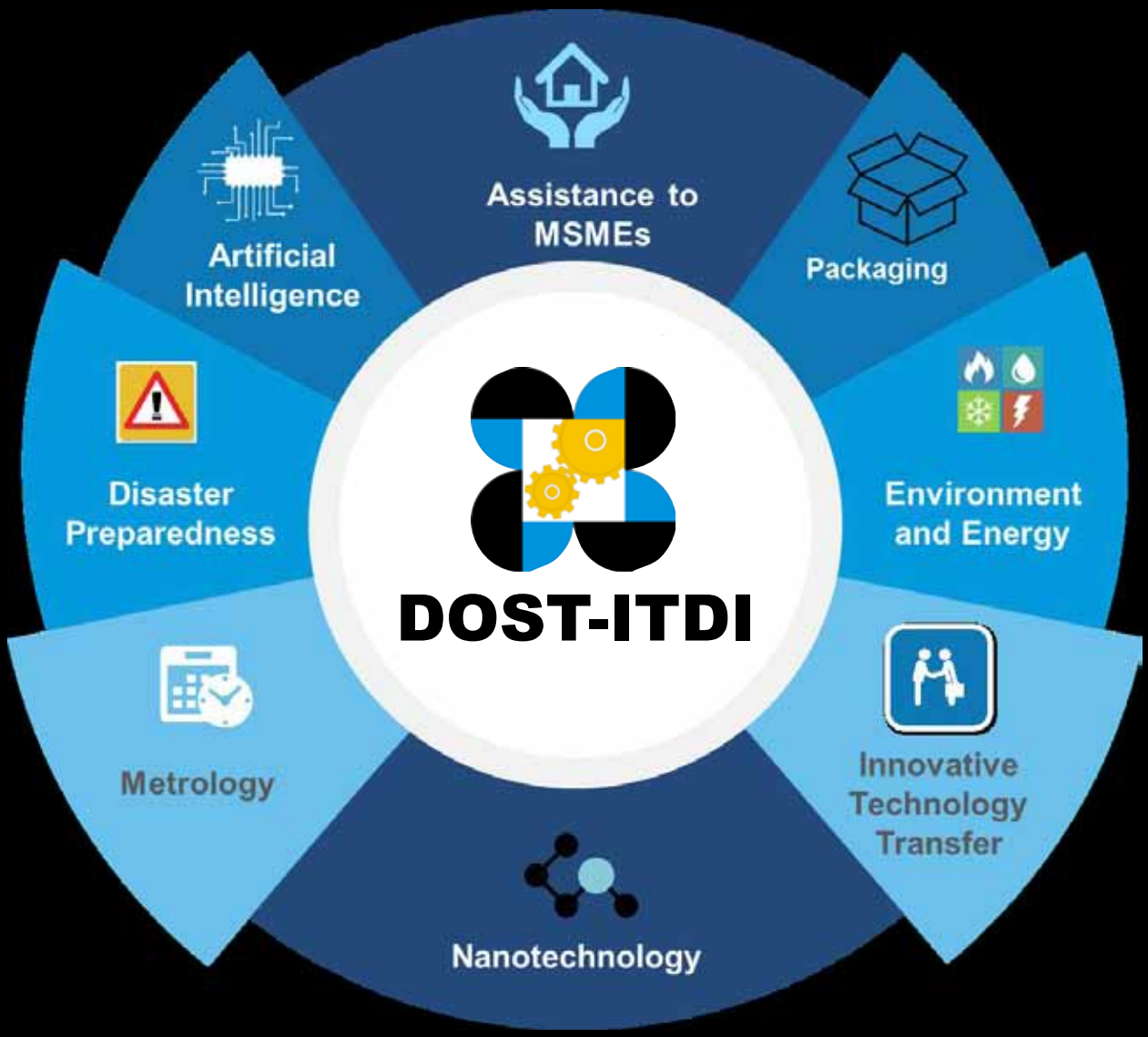
Figure 8. DOST-ITDI budget allotment by class (%)



Based on the total allotments received and obligations incurred in 2018, the Institute attained a high utilization rate of 92% which is 1% decrement to last year's rate.

LOOKING FORWARD

For the year 2019, DOST-ITDI will be implementing eight programs that address the needs of our local industries while at the same time catalyzing their development as the Philippines gears towards Industry 4.0. These programs include Assistance to MSMEs, Packaging, Environment & Energy, Innovative Technology Transfer, Artificial Intelligence, Disaster Preparedness, Metrology and Nanotechnology.



DOST-ITDI

ITDI Organizational Chart

Dr. Annabelle V. Briones
DIRECTOR

Dr. Annabelle V. Briones
OIC, DEPUTY DIRECTOR, R&D

Dr. Diana L. Ignacio
DEPUTY DIRECTOR, ATS

RESEARCH & DEVELOPMENT

Dr. Emelda A. Ongo
OIC, CHEMICALS & ENERGY DIVISION (CED)

Engr. Reynaldo L. Esguerra
ENVIRONMENT & BIOTECHNOLOGY DIVISION (EBD)

Dr. Norberto G. Ambagan
FOOD PROCESSING DIVISION (FPD)

Dr. Blessie A. Basilia
MATERIALS SCIENCE DIVISION (MSD)

Daisy E. Tañafranca
PACKAGING TECHNOLOGY DIVISION (PTD)

ADMINISTRATIVE

Dr. Janet F. Quizon
ADMINISTRATIVE DIVISION (AD)

Dr. Janet F. Quizon
FINANCIAL MANAGEMENT DIVISION (FMD)

Dr. Zorayda V. Ang
PLANNING & MANAGEMENT INFORMATION SYSTEMS DIVISION (PMISD)

TECHNICAL SERVICES

Aurora V. Kimura
NATIONAL METROLOGY DIVISION (NMD)

Dr. Rosalinda C. Torres
STANDARDS & TESTING DIVISION (STD)

Nelia Elisa C. Florendo
TECHNOLOGICAL SERVICES DIVISION (TSD)

Papers, Partnerships & Places, Patents, People, Policies, Product/Process, Papers, Partnerships & Places, Patents,
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