



ANNUAL
REPORT | 2014

Local Technologies that Work and Create Wealth

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



Profile, Vision, Mission and Priority Areas

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

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

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

Vision
The PCIEERD envisions to be recognized for the quality of its people, leadership and performance, and contribute to the nation’s productivity and competitiveness.

Towards this end, the PCIEERD commits to pursue and make available S&T solutions and innovations to help create and sustain competitive industries, attain energy self-sufficiency, and ensure the efficient and effective use of emerging technologies for the inclusive growth and development of the country, through:

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

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

Priority Areas

<i>Industry</i>	<i>Special Concerns</i>
<ul style="list-style-type: none">• Electronics and Semiconductor Industries• Food Processing• Metals and Engineering• Mining and Minerals• 	<ul style="list-style-type: none">• Climate Change Adaptation and Mitigation• Disaster Risk Reduction and Management• Environmental Issues
<i>Energy</i>	
<ul style="list-style-type: none">• Alternative Energy• Energy Efficiency• Transportation	
<i>Emerging Technologies</i>	
<ul style="list-style-type: none">• Biotechnology/ Genomics• Information and Communication Technology• Materials Science/ Nanotechnology• Photonics• Space Technology Applications	

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MESSAGE FROM THE SECRETARY



I am confident that you will be surprised with how the Filipinos have reached in bringing the benefits of scientific research to the doorstep of the Filipino people.

We are at the frontier of a new age- with both great opportunities and challenges. Our changing climate and the looming ASEAN Economic Community (AEC) are now at our doorstep, amidst the turbulent global socio-economic environment. To endure and prevail, we Filipinos must learn how to chart our own course.

It is a fact that the country's problems cannot be solved by solutions and technologies directly derived from the western world at face value. We must learn to take these, and modify their applications as the need suits us, overcoming the challenges posed by high costs and risks- thus, the pursuit for "Technology Self Reliance".

I am pleased to present the council's accomplishments this 2014. This should serve as irrevocable proof that our modest investment in research and development (R&D) has borne exponential benefits for our countrymen. Guided by the Harmonized National R&D Agenda, and with the shepherding of the PCIEERD, major outcomes in fields of energy, society, environment, and economy, particularly industry, among a myriad of others, have been delivered.

This is just the tip of the iceberg, and I encourage everyone to read this report thoroughly. I am confident that you will be surprised with how far the Filipinos have reached in bringing the benefits of scientific research to the doorstep of the Filipino people.

Mabuhay!

A handwritten signature in black ink, appearing to read 'Mario G. Montejo'.

MARIO G. MONTEJO

MESSAGE FROM THE EXECUTIVE DIRECTOR



The year 2014 came in as a challenge to all sectors as the country faced the daunting task of rebuilding not only the communities that typhoon Yolanda destroyed, but more importantly the lives and hopes of the people. This brought the various government and private sectors to join hands and come up with viable and immediate solutions for the urgent task of rebuilding.

For DOST-PCIEERD, this was a welcome challenge as we responded with available technologies that are practical and ready for deployment. Providing food, health, hygiene and sanitation are of paramount importance in Tacloban and nearby areas. Five DOST-developed emergency food products were sent to Tacloban. Recently, the DSWD has partnered with DOST and the accredited producers of these emergency foods for deployment in post-disaster response, as well as their feeding programs. The ceramic water filters that can purify tap water, deep well water and raw water from ponds and spring are now installed in Yolanda-hit communities. The DREAM Program provided post-disaster assessment mapping to determine in detail the extent and location of damaged houses and infrastructure to

help in rebuilding Tacloban. All these are working and very much a part of the rebuilding efforts for disaster stricken areas.

In the midst of directing R&D projects, monitoring their completion and deploying useful technologies where needed, DOST-PCIEERD is steadfast in maintaining excellence and once again awarded with renewal of its ISO 9001:2008 accreditation. This is proof of the culture in PCIEERD as embodied in our core values of Commitment, Respect, Excellence, Sense of urgency and Teamwork (CREST). It also speaks of our resolve to practice good governance and provide responsive government service to every Juan.

We see the coming years to be more demanding as we usher in ASEAN 2015. To be able to respond to potentially rapid economic challenges, we know that we cannot do things on our own. In fact, we can only be more successful and responsive to the needs of the times through our partnerships in the scientific community, other government agencies, the academe, as well as the immediate translators of the results of our R&D efforts. This is a long time proven strategy for PCIEERD.

Always in mind are technologies that would make Juan's life easier and more robust that would redound to a better nation through Science and Technology.

While PCIEERD looks at activities that have immediate impact in everyday life, it also puts its stakes on big and broad programs in partnership with other government agencies that will eventually develop industries and lead to the country's ultimate goal of technology self-reliance.

Seeing the important role of the electronics sector, DOST-PCIEERD pushed for the creation of the Electronics Products Development Center (EPDC) that houses state-of-the-art equipment and services needed by the electronic industries here and abroad for rapid prototyping and product development. This year also put at the forefront the National Rubber R&D Agenda in partnership with the DTI with the aim of putting back the rubber industry as a high income-generating sector in the country. As regards urban flood monitoring, we are now working hand in hand with the MMDA and this empowers citizens to come up with sound decisions for everyday life. These are but a few examples of mutually beneficial collaborations among agencies that target a specific need for a specific industry.

DOST-PCIEERD also made 2014 a banner year for technology transfer and commercialization due to the exciting spin-offs from several R&D projects from 2013 and onwards. Always in mind are technologies that would make Juan's life easier and more robust that would redound to a better nation through S&T. This year, the smart home system was deployed in Palawan for testing. This is a device that would prompt Juan or Maria about their consumption pattern and disconnects appliances from the socket upon instruction on the information displayed by the

device. The locally nanostructured solar energy devices, on the other hand, are of comparable efficiencies to commercially available devices. We now have local capability to fabricate solar cells with nanoparticles. Right now, DOST-PCIEERD has 43 technologies that are ready for transfer.

Each year is a new beginning that we face with more zest as we are challenged to continue making PCIEERD relevant to the country's development. We continuously work with our counterpart in other government agencies, academe, and private sector, and in the international science community as we are now gearing towards a borderless ASEAN community.

Again, we cannot do things alone. We look back to those who set the foundation for us to carry on our advocacies for S&T to become part and parcel of everyday life. We continue working with our partners, the media and our colleagues in DOST. We also acknowledge the role of each person in PCIEERD in performing our mandate, and the members of our Governing Council for inspiring a culture of commitment and excellence and bringing out the best in us.

This Annual Report will tell you about the authors and story behind every project that is monitored by DOST-PCIEERD. Meet the authors and join us in re-telling our story to every Juan through the pages.


ROWENA CRISTINA L. GUEVARA, Ph.D.

FOREWORD



The Council continues to be dedicated and steadfast in the advocacy of bringing science and technology to every Juan.

2014 marks four fruitful years of the Philippine Council for Industry, Energy and Emerging Technology Research and Development's (PCIEERD) existence. The Council, recognizing the importance of science and technology (S&T) to the advancement of the nation, has continued to advocate and promote S&T by providing solutions and innovations that will eventually establish sustainable industries, energy sufficiency and the appropriate application of new and emerging technologies.

This year, PCIEERD highlights programs on disaster management and mitigation and the use of space technology. In the midst of calamities and natural disasters, the Council is determined to reduce damaging consequences for the Filipino people to be able to withstand any calamity and face these harsh conditions with hope and resilience. Furthermore, the development of space technology in the country is fairly new which the Council recognizes its capability and potential in the near future.

Notwithstanding these extensive programs, the PCIEERD equally pushes for programs and projects within its sectoral coverage. The Council sees that all-inclusive growth of science and technology in the country will pave the way for a better future for Filipinos.

Through the years, the Council continues to be dedicated and steadfast in the advocacy of bringing science and technology to every Juan.

This annual publication is a manifestation of PCIEERD's commitment towards building a science nation. As 2014 ends, the Council welcomes the challenges of years to come.

A handwritten signature in black ink, reading "Raul Sabularse". The signature is fluid and cursive.

ENGR. RAUL C. SABULARSE
Deputy Executive Director

2014 PCIEERD MILESTONES

JAN
28



Revitalization of PCIEERD Consortia

MAR
27



1st electronics design competition

MAY
08



2014 Geospatial World Excellence in Policy Implementation award

JUL
24-28



National Science and Technology Week

OCT
24



Elevator pitching kick-off activity

OCT
10



A night with the Balik Scientists

NOV
25



Asia Geospatial Excellence Award

FEB
03



Signing of commitment to the 8 DOST outcomes

APR
02



CoaTIN launch
(Image courtesy of OVCRD-UP Diliman)

JUN
27



PCIEERD 4th Anniversary and ISO 9001:2008 Certification

OCT
03



1st Mining Forum

DEC
08



Science and Technology on Intelligent Transport Program System (ITS)

EXECUTIVE SUMMARY

Advancing Science and Technology (S&T) in a nation is of paramount importance in catalyzing continuing development towards economic progress. Hence, the advocacy and promotion to support Research and Development (R&D) initiatives to facilitate growth in the field of S&T, juxtaposed with the persistent aim for excellence in service, continued to remain as the Philippine Council for Industry, Energy and Emerging Technology Research and Development’s (PCIEERD) priorities in 2014.

Focused in its aim to undertake an aggressive application of S&T in strengthening the Philippines’ S&T capabilities, the Council continually provided support to the advancement of implementing programs and strategies in the industry, energy and emerging technology sectors.

In reinforcing the field of industry, the Council continued to support R&D initiatives that will drive progress in the food processing sector, metals and engineering sector, and electronics technology. Particularly, PCIEERD allotted its biggest funding support for the year in the electronics sector amounting to PhP 83, 978, 470.94 as of October 2014.

It also remained steadfast in ensuring that developments in the field of energy will be given attention as attested by its continuous pursuit of ensuring developments in the prototype of the Automated Guide-way Transit system (AGT) and Centrally-powered Hybrid Road train (CRT). Similarly, it is keen in providing support to R&D efforts to boost growth in the field of emerging technology. This year, it was evident with PCIEERD’s provisions to the advancement of programs in Genomics, Information and Communications Technology (ICT) and Space Technology Applications.

Meanwhile, to ensure that PCIEERD’s initiatives will align with the thrusts of the Department of Science and Technology (DOST), the Council is guided by the eight (8) DOST Outcomes in facilitating its programs, activities and projects. In particular, the Council focuses on supporting three outcomes: Innovative, cost-effective and appropriate technologies that enable Micro, Small and Medium Enterprises (MSMEs) to develop and produce competitive products that meet world-class standards (Outcome 2); state of the art facilities and capabilities that enable local industries to move up the value chain and attain global competitiveness (Outcome 3); and Science-based weather information and climate change scenarios with associated impact assessments that enable concerned agencies to develop appropriate

mitigation strategies for a disaster and climate change resilient Philippines (Outcome 8).

This year also marked a highlight for PCIEERD as it bannered the first Filipino-assembled aircraft showcasing advancements in the area of industry competitiveness. Also, committed to meet its vision of serving as a reservoir of scientific and technological know-how that will empower Filipinos to attain higher productivity and a better quality of life, the Council supported a total of 35 completed projects and 118 ongoing projects in 2014. Further, there are 95 new projects noted for the year under the three specified Outcomes.

Among the aforementioned figures, there are 26 completed projects and 71 ongoing projects under Outcome 2 geared on supporting MSMEs. On the other hand, 15 are ongoing projects, four (4) are completed under Outcome 3 which promote industry competitiveness. Lastly, in the area of disaster and climate change mitigation strategies (Outcome 8), 32 projects are ongoing and five (5) are completed.

Further, in 2014, PCIEERD once again proved its commitment to achieve excellence and quality service for its clients and partners as signified by being certified anew by the TÜV Rheinland under ISO 9001:2008, reaffirming the Council’s quality services.

The extent of purpose-driven R&D initiatives that the Council supported this year justifies its commitment to the betterment of the science community and the nation. In all of its investment in R&D, PCIEERD remains resolute in ensuring that its pledge towards a nation-first path is affirmed.

THE DOST EIGHT OUTCOMES

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

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

To shed more light on the commitments and challenges that the Department has set upon itself, let us go through the eight DOST outcomes as enumerated by Secretary Mario G. Montejo.

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

To boost productivity and hasten the growth of the country’s most lucrative sector, the agriculture sector, it is of prime importance for DOST to address the major science and technology gaps in the major stages of production. The Department believes that this may be done through an extensive research and development program and through the implementation of appropriate strategies that will deliver favorable results to the country’s aggie sector.

In achieving this Outcome, DOST will put its R&D focus on the country’s prime commodities that have been identified as needing serious technological intervention. This includes rice, banana, coconut, abaca fiber, milkfish and tilapia, shrimps, crabs and seaweeds.

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

For the advancement of the country’s economic growth, the Department realizes the need for the 816, 944 micro, small and medium enterprises in the country to step up its game and produce quality and globally competitive products and services. Laying out the technologies and innovations that may help MSMEs to achieve desired target is what DOST is serious about. For years now, the department has been insistent in assisting MSMEs in the adoption of technology innovations that will improve their operations and expand their business reach through the Small Enterprise Technology Upgrading program or more commonly known as SETUP.

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

Strengthening the industry remains to be one of the top priorities of DOST as it continues to take bigger strides in propelling the country’s economic status. The 7.7 percent growth in the country’s GDP last year, mainly attributed in the steady performance of the local mining, manufacturing and construction sectors, presents a beacon of hope for other emerging industries in the country to also push forward and eventually contribute to the country’s much needed growth and development.

For its part, DOST has developed world class laboratories that are now serving the needs of industries through its wide range of products and services. These laboratories/facilities include the Advanced Device and Materials Testing Laboratory (ADMATEL), National Metrology Laboratory (NML), One-Stop-Shop Furniture Testing Service, Philippine Genome Center (PGC), and Environment Technology Verification (ETV)/Energy Audit among others.

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

Recognizing the role that the Information Technology – Business Process Management (IT-BPM) sector now plays in the creation of employment opportunities for more Filipinos in cities in Metro Manila and most specially in the countryside, DOST is a prime advocate of activities and events that would help beef up the IT-BPM industry.

Increasing the awareness of locals about the different services under the IT-PBM industry which includes but not limited to call center services; animation, game, and software development; and health care information management, enhancing the skills of IT-BPM professionals, and expanding their network are the interventions that DOST is now pushing for to achieve Outcome 4.

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

Technology will play a vital part in connecting government agencies around the country through E-governance which means using Information and Communication Technology (ICT) as a tool in making government services more efficient and effective. DOST's 5th outcome highlights the Integrated Government Philippines (iGovPhil) Project, Medium-term Information and Communication Technology Harmonization Initiative (MITHI), and Philippine Community eCenter Program.

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

Since the welfare of the country depends on healthy citizens, Outcome 6 aims to address and eliminate some health issues that are present in our communities by adopting a threefold strategy. DOST's first strategy is to provide affordable and effective technologies to help address public health problems. The second strategy will develop technologies that broaden the access and delivery of appropriate medical care to underserved communities and the last strategy deals with providing technologies to help address the basic health needs of Filipinos. Access to potable water, fighting malnutrition among children and making technology within reach are some of the goals of the third strategy.

Programs and projects in support of these strategies are already crafted by DOST with some others on the pipeline.

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

Offering scholarships to talented students in the country is DOST's approach to produce the highly-skilled and globally competitive Science and Technology (S&T) human resource.

Philippine Science High School, one of DOST's service institutes, provide scholarship for secondary course with special emphasis on science and engineering subjects to prepare students for a career in science and technology. DOST envisions PSHS to be the leading science high school in the ASEAN by 2015 and by 2016.

DOST scholarships are also offered to talented undergraduate and graduate students. From the current 11,310 scholars, it will increase to 17,852 in 2016, increasing the beneficiary municipalities of 1,330 to 1,655 as well.

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

Being part of the Pacific Ring of Fire means a frequent visit of typhoons, volcanic eruptions, earthquakes and the like. In this regard, DOST 8th outcome deals with the country's disaster preparedness separated into two strategies.

The first strategy is the timely warnings and information on weather and climate change scenarios features. DOST's Nationwide Operational Assessment of Hazards (Project NOAH) uses state of the art technologies, best practices and tools, that generates and processes weather and climate information for the public.

On the other hand, timely and accurate warnings and information on volcanic eruption, earthquake, tsunami, and other geologic hazards and disaster risks is the second strategy of outcome 8. It aims to enhance the country's capability in terms of preparedness and management.

Each outcome has goals to be reached and the road to achieving them is riddled with bumps and hurdles. The road may be rough yet DOST is ready to face it. The Department is determined to deliver the Outcomes it has promised for all Filipinos who yearn for a quality life and who deserve to live in a better country, a science nation.



Dr. Rowena Cristina L. Guevara on the signing of commitment to the 8 DOST Outcomes last February 3, 2014



S&T Policy and Program Formulation

PCIEERD 2014 PERFORMANCE

The PCIEERD is mandated to:

- program and allocate government & other external funds for industry, energy, and emerging technologies;
- support for R&D, S&T institutional development and human resource development; and
- transfer and commercialize technologies and other research output for optimal utilization.

Within the year, the Council progressively handled various projects in the industry, emerging and energy sectors that contributed to improving the life of every Juan; and took part in the evaluation of policy advisories. Below are the two (2) major final outputs (MFO) of the Council explaining the achievement in detail:

MFO 1 – S&T Policy and Planning Services

The Council was involved in various activities that contributed significantly to the policy formulation of Science & Technology (S&T). To name a few, the Council included a policy recommendation in the establishment of a framework for the different levels of evaluation in screening and approving proposed programs and projects, continuous improvement of policies and guidelines in the implementation of business process and establishing regional partnership and linkages through the PCIEERD's Regional Consortium. In addition, the 2015 Call for Proposals was rated very satisfactory by the proponents. The Call for Proposals is one of the policy advisories formed for disseminating the Council's sectoral focus and granting research for the country's development. The Council also introduced the electronic submission of proposals through the e-proposals, for a more efficient, effective and easy way of submitting research proposals.

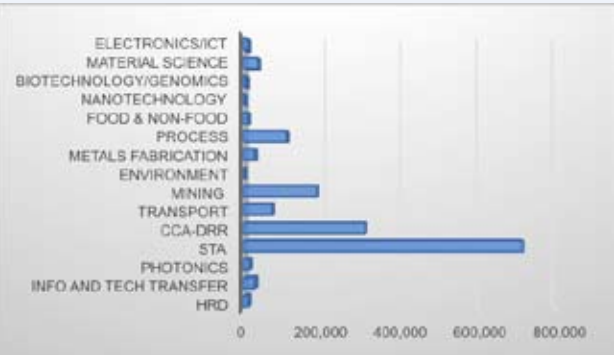
To set directions on Research and Development (R&D) and to identify S&T strategies and interventions of the sectors, the Council had to revisit and review each of the 16 sectoral roadmaps that would identify short-term and long-term goals, as follows:

1. Food Processing
2. Process
3. Mining/ Minerals
4. Metals and Engineering
5. Environment
6. Energy
7. Disaster Risk Reduction & Management

8. Transportation
9. Materials Science
10. Nanotechnology
11. Genomics
12. Biotechnology
13. Information & Communication Technology
14. Electronics
15. Photonics
16. Space Technology Applications

MFO 2 – R&D Management Services

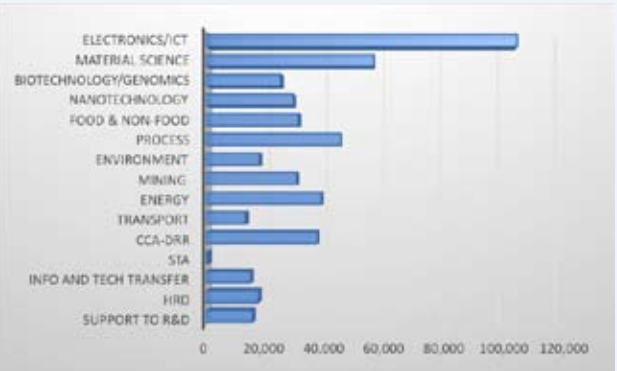
In 2014, the Council received a total of 304 project proposals from researchers in the academe and private institutions. These project proposals were distributed to the concerned divisions, namely, Energy Utilities and Services Technology Development Division (EUSTDD), Industry Technology Development Division (ITDD), Emerging Technology Development Division (ETDD), Research Information and Technology Transfer Division (RITTD), Human Resource and Institution Development Division (HRIDD) and Planning Coordination and Monitoring Division (PCMD), for thorough evaluation. Aside from the evaluation of proposals, the Divisions also developed and initiated proposals for external funding.



2014 DOST R&D Investment monitored by PCIEERD

From the 304 proposals received, 155 were subjected for PCIEERD funding while the remaining 149 proposals were either for the DOST, TECHNICOM, SET-UP, PIONEERING, OTHERS or EXTERNAL funding source.

In 2014, the PCIEERD assisted and monitored 105 new and ongoing projects amounting to P483M. On the other hand, the DOST-funded projects handled by PCIEERD amounted to approximately P1.5B.



2014 PCIEERD R&D Investment

Framework Establishment for Program/Project Evaluation

Since 2012, PCIEERD has conducted its Call for Proposals (CFP) in line with the budget requirement of the Department of Budget and Management (DBM). This policy encourages S&T collaboration and applied research among State Colleges and Universities (SUCs), government Research and Development Institutes (RDIs), non-profit S&T networks and organizations, and other proponents seeking funding for their R&D initiatives. The CFP for 2014 focused on 1) Developing Solutions to Pressing National Problems; 2) Developing Appropriate Technologies to Create Growth in the Countryside; 3) Harnessing Technology to Improve Industry Competitiveness; 4) Using S&T to Enhance Delivery of Government and Social Services; and 5) Harnessing Emerging Technologies to Boost National Competitiveness.

In support to the said policy, the Council established a framework for the evaluation of proposed program/project submitted by the proponents. This framework shows the step-by-step process of project evaluation, from proposal submission until project completion. PCIEERD identified a maximum of 81 working days excluding waiting time for revision from proponent and postponement schedule of Technical Panel (TP), PCIEERD Management Team (PMT), Governing Council (GC) and DOST Executive meetings. With this, the Council can easily monitor project proposals that are still waiting for approval and those unable to comply with the requirements.

Continuous Improvement of Policies and Guidelines of Business Process

As an ISO 9001:2008 certified agency, the Council enhanced its business processes as a guide in achieving its vision and mission. Quality management procedures for the control of documents, control of non-conformity, corrective and preventive actions, control of records, and the internal quality audit were thoroughly reviewed, enhanced and published. These procedures cover the following processes:

- Research and Development (R&D) Management
 - * Call for Proposals, Receiving, Evaluating, MOA Processing and Monitoring
- Research Information and Technology Promotion Management
 - * Technology Assessment
 - * Information Dissemination and Technology Promotion and Transfer
- Human Resource and Institution Development
 - * Scholarship application, evaluation and monitoring
- Finance and Administrative Processes
 - * Hiring and Selection of Personnel
 - * Release and Disbursement of Funds
 - * Preventive and Corrective Maintenance of Motor Vehicles, Office Equipment and Facilities
 - * Procurement, Inspection and Issuance of Goods and Services
- Information Technology Resource Management
 - * Information Technology Management

The PCIEERD Regional Consortia Program

One of the identified strategies by the Council to accelerate regional development is the building of partnerships in the regions. Towards the end, the PCIEERD Regional Consortia was established to sustain the holistic development of the regions' resources through enhanced partnerships and institutional collaborations among the member institutions from the academe, government and the private sectors. Each Regional Consortium was tasked to draft its respective S&T Agenda addressing their regional concerns through the guidance and template provided by PCIEERD. The regional development initiatives were geared towards the aggressive application of science and technology with focus on PCIEERD's sectoral concerns and priorities. Researchers, planners and policy makers from member institutions shall have the opportunity to share their expertise in the development and implementation of programs and projects aimed at harnessing the effective use of resources in the regions through the pursuit of R&D and other scientific activities.

The Council received approved 18 project proposals from the 10 consortia. These consortia were able to craft their respective S&T Agenda. Included in the said agenda are programs and project initiatives aimed to address their regional S&T needs, challenges and development issues. The regional consortia are as follows:

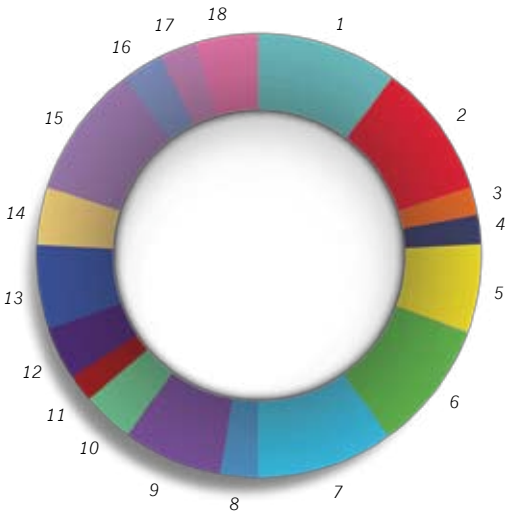
Cordillera Industry and Energy Research and Development Consortium(CIERDEC),Ilocos Consortium for Industry and Energy Research and Development (ICIERD), Cagayan Valley Industry and Energy Research and Development Consortium (CVIERDEC), Central Luzon Industry and Energy Research and Development Consortium (CLIERDEC), Southern Tagalog Consortium for Industry and Energy Research and Development (STCIERD), Southern Tagalog Islands Research and Development Consortium (STIRDC), Bicol Consortium for Industry and Energy Research and Development (BCIERD), Western Visayas Consortium for Industry and Energy Research and Development (WVCIERD), Eastern Visayas Consortium for Industry and Energy Research and Development (EVCIERD), and Eastern Mindanao Industry and Energy Research Alliance for Development (EMIERALD).

Grants-in-Aid (GIA) funding amounting to PhP 5,500.000.00 was divided among the approved projects from the 18 State Colleges & Universities (SUCs), PhP 50,000.00 was given to each DOST Regional Office for administrative expenses.



Engr. Albert Mariño (Chief, PCMD) during the Revitalization of the PCIEERD Consortia on January 2014

#	SUC	Funding Granted
1	Benguet State University	500,000.00
2	Don Mariano Marcos Memorial State University	500,000.00
3	Isabela State University (1st Project)	100,000.00
4	Isabela State University (2nd Project)	100,000.00
5	Cagayan State University	300,000.00
6	Central Luzon Industry and Energy Research and Development Consortium	500,000.00
7	Batangas State University	500,000.00
8	Palawan State University	125,000.00
9	Western Philippines University	375,000.00
10	Bicol State College of Applied Sciences and Technology	200,000.00
11	Sorsogon State College	100,000.00
12	Central Bicol State University for Agriculture	200,000.00
13	Western Visayas College of Science and Technology	300,000.00
14	Western Visayas College of Science and Technology and UP Visayas	200,000.00
15	University of Eastern Philippines	500,000.00
16	Caraga State University (1st Project)	147,000.00
17	Caraga State University (2nd Project)	138,000.00
18	Caraga State University (3rd Project)	215,000.00
	TOTAL	5,000,000.00



Funding Distribution among 18 Projects from the Approved Regional Consortia



Support for Research and Development

OUTCOME 8

Science-based weather information and climate change scenarios with associated impact assessments that enable concerned agencies to develop appropriate mitigation strategies for a disaster and climate change resilient Philippines.

It is highly evident that being part of the Pacific Ring of Fire entails frequent visit of typhoons, volcanic eruptions, earthquakes and the like. It is PCIEERD's strong call to support projects that shall make the Philippines keen to disaster preparedness and management. This year, the Council supported projects that continues to take these initiatives to higher levels.

The NOAH (Nationwide Operation Assessment of Hazards) Program

The Philippines, situated in the humid tropics, experiences different types of climate-related calamities such as typhoons, tsunamis, earthquakes and volcanic eruptions. These natural hazards become disasters that cause loss of lives and costly damage to property and agriculture. Losses amounting to billions of pesos. In fact, according to the World Risk Report 2011, the Philippines is ranked 3rd most vulnerable country to disaster risks in the world. The report, in addition to exposure analysis, focuses on the vulnerability of the population such as susceptibility, capacity to cope and adapt to future natural hazard events. With continued development in the lowlands, and growing populations, it is predictable that damage to infrastructure and human losses would persist and even rise unless appropriate measures are immediately implemented by government.

The Department of Science and Technology launched the NOAH program to reduce the country's susceptibility to natural hazards. NOAH's mission is to undertake disaster science research and development, advance the use of cutting edge technologies and recommend innovative information services in government's disaster prevention and mitigation efforts. Though the use of science and technology and in partnership with the academe and other stakeholders, the DOST through Program NOAH is taking a multi-disciplinary approach in developing systems, tools, and other technologies that could be operationalized by government to help prevent and mitigate disasters.

Below are the NOAH component projects that shall contribute to prevention and mitigation, disaster preparedness and capacity building efforts including information, education and awareness campaigns.

NOAH Component Projects
(Images courtesy of the NOAH Project Teams)



System to identify, Quantify and Map the Storm Surge Threat to Philippine Coasts
**Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)*
Project Leader: Dr. Vicente B. Malano

The project will enhance the disaster forecasting capabilities of PAGASA by generating detailed maps of storm surge and inundation susceptibilities. These maps will be used to warn coastal communities threatened by approaching typhoons and guide plans to develop structures to protect existing housing and infrastructures in vulnerable areas. By the end of February 2015, the storm surge inundation maps of all 66 coastal provinces in the county shall be uploaded to the Project NOAH website.



Emergency Distribution of Hydrometeorological Devices in Hard-hit Areas in the Philippines (HYDROMET)
**Advanced Science and Technology Institute (ASTI - DOST)*
Project Leader: Engr. Denis F. Villoriente

Through this project, the DOST deployed and installed 1,000 hydrometrological devices (composed of 600 Water Level Monitoring Sensors [WLMS] and 400 Automated Rain Gauges [ARG]) to land areas near the river basins across the country.

These devices measure and determine the flood waters in real time, the rate of change of water level, wind speed and direction, air temperature, air humidity, air pressure, and rain amount, duration and intensity.

These devices are equipped with the ASTI Data Logger (Arq), to transmit the data gathered via GSM/ GPRS.



Enhancing Philippine Landslide Hazard Maps with LIDAR and High-resolution Imageries

**National Institute of Geological Sciences, University of the Philippines Diliman (UP-NIGS)*
Project Leader: Dr. Alfredo Mahar Francisco A. Lagmay

The use of advanced remote sensing methods, digital terrain modeling and Geographic Information System (GIS) shall identify shallow translational landslide and structurally controlled gravity failure zones. This helps in specifically mapping out certain sectors of a mountain that is landslide-prone. This project conducted landslide inventory on 36 provinces using satellite imageries, mapped 32 alluvial fans, simulated shallow landslide, debris flow and deep-seated landslide maps as part of its objective to enhance existing landslide hazard maps that can assist in emergency preparedness, planning and formulation of rational decisions regarding development in areas susceptible to slope failures.

Development and Deployment of Early Warning System for Deep-Seated Catastrophic Landslides

This program is a continuation of the Disaster Risk Management Using Sensors Networks and Computing (DRMS) Program completed in 2013 which aimed to reduce socioeconomic losses associated with relocation of communities by developing their capacity to monitor potential landslides, wherever landslide monitoring is deemed a viable alternative risk mitigation measure. It also provided an alternative to engineering intervention, and thus contributes to the reduction of landslide hazard mitigation costs.

The Development and Deployment of Early Warning System for Deep-Seated Catastrophic Landslides Program will enhance and further test the existing systems for forecasting deep-seated landslides by developing the system in 50 sites across the Philippines.



DYNASLOPE: Development of Site-Specific Threshold for Deep-Seated Landslides and Slope Failures

**Philippine Institute of Volcanology and Seismology (PHIVOLCS)*
Project Leader: Dr. Arturo S. Daag

The project is taking off from previous programs that collected data from landslide-prone areas to improve in the monitoring and data analysis software. Drafting of protocols for implementation and validation of landslide thresholds with LGUs and communities are also being done.

At the end of the project, potential deployment sites in the Philippines should be identified to promote community involvement, deploy sensors, gather and analyze data from sensors, transfer the technology and conduct IECs. With this study, it is expected that socioeconomic losses associated with relocation of communities will be reduced by developing the capacity of a community to monitor potential landslides, wherever landslide monitoring is deemed a viable alternative risk mitigation measure.



SENSLOPE: Development and Deployment of Landslide Sensors and Data Communication System

**Electrical and Electronics Engineering Institute, University of the Philippines Diliman*
Project Leader: Dr. Joel Joseph S. Marciano

The project intends to refine previous landslide sensor system design, deploy in 50 sites, establish a critical back end to store and manage all the data from sensors, monitor and maintain landslide sensor system deployed.

In 2014, the project was able to test new designs of the soil moisture and tilt sensors, including the improvement of its packaging design for the second batch of manufacturing. Likewise, the first phase of manufacturing of sensor electronics (readout unit) was finished.

For the next phase, in 2015, the project will look into systems with further refinements, piezometer readout unit integrated with the current landslide sensor system, manufactured landslide sensor system, housed servers accessible through the internet and landslide sensors deployed in sites identified as landslide hazard risk.



Weather Information Integration for System Enhancement (WISE)

**Institute of Environmental Science and Meteorology, University of the Philippines – Diliman (UP-IESM)*
Project Leader: Dr. Gay Jane P. Perez

Project WISE generally aims to improve the country's weather forecasting capability. It increases the accuracy and extends temporal range to 7 days of weather forecasts by using High-Performance Computing (HPC) and smart analytics. The results will also be integrated with FloodNet, Climate X and other components of the Nationwide Operational Assessment of Hazards (NOAH) program of the Philippine government.



Disaster Management using Web-GIS

**National Institute of Geological Sciences, University of the Philippines Diliman (UP NIGS)*
Project Leader: Dr. Alfredo Mahar Francisco A. Lagmay

This project is developing a disaster management system for the Philippines using Web-GIS technologies. It compiles all existing data from all NOAH projects for use in disaster prevention and management. Moreover, the project is designed to utilize important spatial data, non-spatial, semantic data associated metadata and the latest communication technologies which shall be used as a centralized hazards decision support system for disaster management.



Data Sharing Policy and Standards for NOAH and Related Projects

**Hybridigm Consulting Inc.*
Project Leader: Ma. Antonia Odelia G. Arroyo, MPHIL cantab

The project created a robust, cohesive, clear and consistent data sharing policy for both the DREAM and NOAH programs. The policy will serve as the guiding principle in sharing the vital and valuable data generated by both programs to requesting non-commercial parties (national government, LGUs, NGOs, government-owned utility companies, the academe) and commercial parties (private sector, foreign entities, government agencies acting as value-added resellers (VARs)).

To protect and ensure the integrity of data, the policy will only cover non-sensitive and transferable data. This includes hazard maps, precipitation probability, final reports, and consultancy care of experts under both programs.

The policy addresses the issues on data sharing such as the ownership of intellectual property rights, revenue sharing between UP and DOST/ PCIEERD, and commercial and non-commercial use of the data requested.



Iba Na Ang Panahon: Science for Safer Communities

**Science and Technology Information Institute*
Project Leader: Asec. Raymund E. Liboro

To enhance the capabilities of the LGUs and other stakeholders in managing hazards and disaster risks, this project was launched. Available information products of DOST, NOAH and other disaster-related information were collected and packaged for dissemination. These were delivered through the conduct of a series of regional IEC campaigns that were conducted in the 16 regions of the country. Seminar-workshop activities were conducted for LGUs and other local stakeholders in each region to familiarize them with disaster information products from DOST, particularly visualization products from NOAH and hazards maps from PHIVOLCS and PAGASA.

Disseminating information, educating, and assisting LGUs on how they can maximize the use of knowledge products from DOST funded Research and Development initiatives can help reduce disaster losses. This way, LGUs can be more equipped with knowledge and ensure better local decision making capabilities towards disaster risk reduction and preparedness in their communities.

Related Projects



Deployment of Early Warning Systems (DEWS) in Disaster-prone Areas

**Advanced Science and Technology Institute*
Project Leader: Engr. Gerwin P. Guba

In view of the incessant annual occurrence of floods, there is a need to deploy a dense system of hydrometeorological devices (hydromets) to protect lives, property and livelihood. A highly granular system of hydromets leads to better flood models, which will enable forward-looking mitigating actions and plans. This project complements the original hydromet project which covers the 18 major river basins. Given that there are other river systems and secondary tributaries that are likewise problematic as evidenced by recent flood events, deployment of additional sensors is

necessary to serve more communities. This project shall confirm deployment sites and determine the level of deployment priority. It shall also produce and install automated rain gauges, water level monitoring sensors, and warning stations, and ensure reliable data transmission and sustainability of the network.



Computing and Archiving Research Environment (CoARE)

**Advanced Science and Technology Institute (ASTI - DOST)*
Project Leader: Engr. Rene C. Mendoza

The project shall contribute to national disaster mitigation efforts by establishing a durable and highly available repository for environmental data, including systems for archiving and access. The data gathered from sensors and ground stations, and results generated by numerical and climate models will serve as inputs to national and local planning and decision-making on disaster management. It will also upgrade the existing computing system facility intended to test and run computationally intensive applications for numerical weather prediction, climate modeling, as well as analytics and data modeling.



Flood Sensor Development, Installation and Monitoring of Urban Flooding in Metro Manila

**Advanced Science and Technology Institute (ASTI - DOST)*
Project Leader: Engr. Alvin E. Retamar

Floods challenged the resiliency of Metro Manila in 2014 due to its recurrence every time a typhoon or storm makes landfalls in the region. This poses threat to life and property resulting to wasted time, energy and money. By monitoring real-time floods in the streets of Metro Manila, worsening traffic may be avoided through early identification of impassable roads and suggestion of alternative routes to motorists. Likewise, to protect lives and property, avoid worsening of traffic, and generate useful information for public consumption, there is a need to create a system of strategically located urban flood monitors that measure real-time flood data. The system consists of standalone stations, computing devices, display elements, and a redundant data transmission/ communication system.



MECO-TECO:Philippine-Taiwan Integrated Predictive Studies of Geo-Meteorological Hazards

**National Institute of Geological Sciences, University of the Philippines Diliman (UP NIGS)*
Project Leader: Dr. Carlos Primo David

This project with the Manila Economic and Cultural Office- Taipei Economic and Cultural Office (MECO-TECO) built and strengthened human resource, institutional capacity, tools and approaches towards a sound flood forecasting, early warning system in the Marikina River Basin. It calibrated spectral values of selected satellite imagery with ground data in order to estimate and forecast rain rates. Also, established flood threshold in different basins through generalized watershed runoff calculations and examined the accuracy of quantified rain/ flood forecast generated from the study. Lastly, it developed flood hazard protocols for different basins.



The Establishment of Meso-Scale Metrological Monitoring Infrastructure in Davao City

**Ateneo de Davao University (ADDU)*
Project Leader: Dr. Lourdes R. Simpol

The project established a robust weather monitoring system that fits the peculiar physical and institutional context of selected localities. It also defined the roles of stakeholders and partners both from public and private sectors in the maintenance and use of the system. The most visible output of this project is the pilot meso-scale meteorological monitoring infrastructure for Davao City. A website was developed to view the data gathered from the different automated weather stations located in sixteen sites in Davao City.

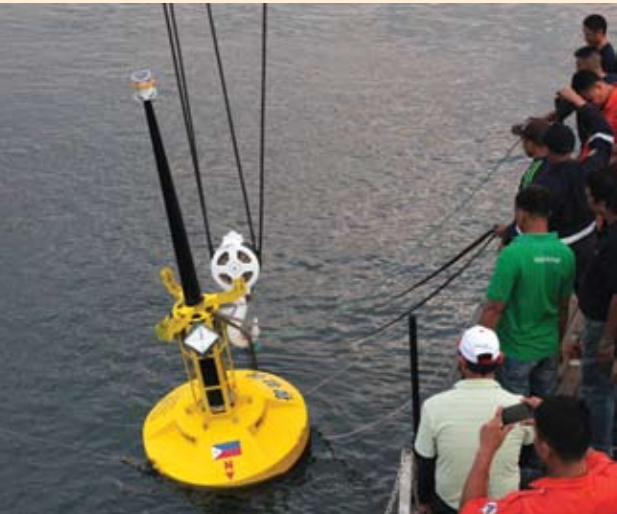
The data that will be collected from the study can be used for risk management and planning tools for watershed management.



Development of a Low-Cost and Locally Designed Meteorological Buoy (MetBuoy)

**Advanced Science and Technology Institute (DOST-ASTI)*
Project Leader: Engr. Gerwin P. Guba

To improve maritime safety in the country, and enhance the ocean observation and weather forecasting capability of the Philippines, a Meteorological Buoy system needs to be installed in critical areas especially in areas covering shipping ports, sea highways, and



MetBuoy Pilot Testing

residential areas near the shorelines/ coastal areas which are often struck by bad weather. Meteorological Buoys are instruments used in alerting for impending dangers brought about by bad weather at sea. These are equipped with sophisticated communication system and sensors which collects and measures real time ocean and weather data in a sustained manner. However, the cost of putting up a Meteorological Buoy is staggering. PAGASA has spent Php 64,936,000 for the two units of meteorological buoy deployed in Burias Island and Bantayan Island. The project will develop and deploy moored Meteorological Buoys aimed at monitoring real time weather disturbances at sea. Instead of using expensive imported system, a localized buoy system is developed to lower the cost of establishing an effective meteorological buoy system in the Philippines.

Nationwide Disaster Risk Exposure Assessment for Mitigation (DREAM)



**Training Center for Applied Geodesy and Photogrammetry and the Department of Geodetic Engineering, University of the Philippines – Dillman (UP-TCAGP)*
Program Leader: Dr. Enrico C. Paringit

Using the Light Detection and Ranging (LiDAR) technology, project NOAH's DREAM component created high-resolution 3D images — reliable, detailed, and up-to-date flood models of the country's 18 major river basins, watersheds, and all flood-prone areas in the country. In two years, DREAM completed 33 percent of the country's total land area.

Aside from creating hazard maps for disaster reduction and mitigation, the 3D maps can also be used in the areas of forest inventory, environmental monitoring, infrastructure planning, fault line mapping, archaeological surveys, agricultural assessment, and even government revenue management.

The DREAM Program under the Department of Science and Technology and UP Diliman, has earned two world recognitions this year. In May 2014, it has bagged the Geospatial World Excellence Award in Policy Implementation and in November, it was lauded as Asia Geospatial Excellence Awardee.



DREAM Mapping Process
(Image courtesy of the DREAM Program)



DREAM Project 1 – LiDAR and SAR Data Acquisition

Project Leader: Engr. Czar Jakiri S. Sarmiento

The first DREAM component focuses on the acquisition of nationwide spatial dataset in 3D at sufficient detail and resolution from which various base and thematic map features can be extracted.



DREAM Project 2 – LiDAR and SAR Data Calibration and Validation

Project Leader: Engr. Louie P. Balicanta

The second DREAM project verified and validated LiDAR and Synthetic Aperture Radar (SAR) data that acts as quality control for the output of the program. SAR is a coherent system that generates high-resolution, remotely sensed imagery successfully used for agricultural monitoring, tropical forest biomass monitoring, and land ice investigations.



DREAM Project 3 – Extracting Digital Elevation Models and Salient Features for Flood Modelling

Project Leader: Engr. Ma. Rosario Concepcion O. Ang

DREAM Project 3 obtained the Digital Surface Model (DSM) of each watershed and floodplain area in the study sites. It also extracted the Digital Terrain Model (DTM) from the derived DSM using various filters

Mapping

Phil-LiDar Program

PHIL-LIDAR 1. HAZARD MAPPING OF THE PHILIPPINES USING LIDAR

Taking off from the DREAM Program, the Phil-LiDAR project continues to map out the entire Philippines using LiDAR, a state-of-the-art geospatial data acquisition technology, to identify landslide and flood vulnerable areas.

PHIL-LIDAR-1 is a three-year program that aims to generate fine-scale flood hazard maps and river water level forecast system for 257 major rivers in the Philippines. To produce the maps, the project team will process the data gathered from the aerial images captured through the Light Detection and Ranging (LiDAR) system. LiDAR is a powerful tool for collecting information to produce detailed surface, elevation, feature-rich models more accurately and it can also lessen the time and cost compared to traditional land surveys.

The PHIL-LIDAR-1 program also features the cooperation and partnership of 15 Higher Education Institutions (HEIs) from all over the country. The HEIs will provide additional capacity to process the LIDAR data and validate the maps to be generated.

There are two sub-programs under PHIL-LIDAR 1. Program A focuses on the LIDAR data acquisition, integration, archiving, distribution and capacity building while Program B will zero in on the processing and validation of these LIDAR data.



DREAM Project 4 – Integrating High Resolution Digital Elevation Models (DEMs) into GIS-based Flood Modelling

Project Leader: Dr. Alfredo Mahar Francisco A. Lagmay

The project shall develop a dynamic GIS data model for hydrological simulation of major watersheds in the country. It shall also apply derivative products from analysis of remotely-sensed data to parameterize land cover information in the hydrological model. These products acquired from project one shall be used to characterize geometry of watershed and integrate with actual rainfall event information that would provide simulation of flood models that will be used for early warning system for flood hazards.



DREAM Project 5 – Training for LIDAR Data Acquisition and Flood Modeling

Project Leader: Dr. Enrico C. Paringit

The fifth component of DREAM developed proficiency in Airborne LiDAR acquisition and flood modeling and increase level of awareness of the public of the new technology on LiDAR products to be used for disaster risk response strategies by government agencies and local government units.

with employed necessary geometric corrections, and features significant to flood modeling and flood hazard assessment. Huge amount of filtered LiDAR data is essential in GIS-based flood modeling.



PhilLiDar Partner SUCs

The PhilLiDar Component Projects

Program A. Data Acquisition, Integration, Archiving, Distribution and Capacity Building

*Training Center for Applied Geodesy and Photogrammetry, University of the Philippines – Diliman (UP-TCAGP)



Project 1.A.1. LIDAR Data Acquisition for the Hazard Mapping of the Philippines

Project Leader: Engr. Czar Jakiri Sarmiento

The project will carry on what the DREAM program has started. The project team will continue acquiring spatial data for the remaining 2/3 of the Philippines. It will focus on critical areas such as river systems, floodplains and other urban areas using the LiDAR system.



Project 1.A. 2. LIDAR Data Validation and Bathymetry Component

Project Leader: Engr. Louie P. Balicanta

Management activities prior to spatial data collection will be covered in this project. These activities will be done to make sure that the raw and derived spatial data will pass the quality requirements of succeeding projects. Activities for this project includes the calibration, ground validation surveys, and review of data collection activities. This will also involve consistent checking to ensure the integrity, correctness and completeness of the data.



Project 1.A. 3. LIDAR Calibration, Point Cloud Classification, and Image Orthorectification (DPPC)

Project Leader: Engr. Ma. Rosario Concepcion O. Ang

This project will produce digital elevation models (DEM) for urbanized areas in the flood plain and for all

other areas. Likewise, surface feature heights and laser intensity image in digital standard format suitable for image and GIS processing as well as orthophotos of the target areas will be produced.



Project 1.A.4. Integrating High Resolution Digital Elevation Models (DEMs) into GIS-based Flood Modeling
Project Leader: Dr. Alfredo Mahar Francisco A. Lagmay

Specifically, the project aims to develop a dynamic GIS data model for hydrological simulation of the major watersheds in the country; apply derivative products from analysis of remotely-sensed data to parameterize land cover information in the hydrological model; apply derivative products from LIDAR and SAR acquisition to characterize geometry of the watershed and affected floodplain; and establish a rainfall-runoff response that can serve as input source for flood forecasting and guide for disaster contingencies during extreme rainfall events.



Project 1.A.5. Data Archiving and Distribution
Project Leader: Mr. Mark Edwin A. Tupas

PHIL-LIDAR 1. HAZARD MAPPING OF THE PHILIPPINES USING LIDAR
Program B. LIDAR Data Processing and Validation by SUCs and HEIs

There are fourteen component projects under Program B. Each project which will be handled by key State Universities and Colleges (SUCs) and Higher Education Institutions (HEIs) will process and validate LIDAR data collected in selected sites in Luzon, Visayas and Mindanao.

The research sites to be handled by key State Universities and Colleges and Higher Education Institutions in these areas are as follows:



Project 1.B.1. LIDAR Data Processing and Validation in Luzon: CAR and Selected Sites in Region 1
*University of the Philippines – Baguio
Project Leader: Dr. Chelo Pascua



Project 1.B.2. LIDAR Data Processing and Validation in Luzon: Region 2 and Abulog River in Region 1
*Isabela State University (ISU)
Project Leader: Dr. Januel P. Floresca

LIDAR data poses unique challenges in terms of storage and distribution. The capability to archive and efficiently transfer LiDAR data is of utmost importance to operationalize and sustain the use of LiDAR data among State Universities and Colleges (SUCs) and other stakeholders throughout the country.

An efficient network of LiDAR distribution sub centers is the primary goal of this component project. This will encourage a sustainable and operational use of LiDAR data in different localities in the Philippines



Project 1.A.6. Training on LIDAR Data Acquisition, Processing, Validation and Flood Modeling
Project Leader: Dr. Enrico C. Paringit

There is a need to develop local capacity skills in LiDAR equipment operation, data processing and to represent and extract feature information from them. Capability-building will be addressed in this project. Moreover, this project will develop a decision-making tool that can recommend optimized schemes for the pre-positioning and allocation of relief goods in preparation and response to the impact of a natural disaster.



Project 1.B.3. LIDAR Data Processing and Validation in Luzon: Region 3 and Pangasinan
*Central Luzon State University (CLSU)
Project Leader: Dr. Annie Melinda P. Alberto



Project 1.B.4. LIDAR Data Processing and Validation in Luzon: MIMAROPA and Laguna
*College of Human Ecology, University of the Philippines – Los Baños
Project Leader: Edwin R. Abucay



Project 1.B.5. LIDAR Data Processing and Validation in Luzon: CABARZON
*Mapua Institute of Technology
Project Leader: Dr. Francis Aldrine A. Uy



Project 1.B.6. LIDAR Data Processing and Validation in Luzon: Bicol
*Institute of Environmental Conservation and Research, Ateneo de Naga University (AdNU)
Project Leader: Dr. Emelina G. Regis



Project 1.B.7. LIDAR Data Processing and Validation in Visayas: Western Visayas (Region 6)
*University of the Philippines – Cebu
Project Leader: Dr. Jonnifer R. Sinogaya



Project 1.B.8. LIDAR Data Processing and Validation in Visayas: Central Visayas (Region 7)
*University of San Carlos (USC)
Project Leader: Dr. Roland Emerito S. Otadoy



Project 1.B.9. LIDAR Data Processing and Validation in Visayas: Eastern Visayas (Region 8)
*Visayas State University
Project Leader: Dr. Pastor P. Garcia



Project 1.B.10. LIDAR Data Processing and Validation in Mindanao: Zamboanga Peninsula (Region 9)
*Ateneo de Zamboanga University (AdZU)
Project Leader: Dr. Mario S. Rodriguez



Project 1.B.11. LIDAR Data Processing and Validation in Mindanao: Selected Sites in Northern Mindanao (Region 10) and 11
*Central Mindanao University (CMU)
Project Leader: Dr. George R. Puno



Project 1.B.12. LIDAR Data Processing and Validation in Mindanao: Regions 10,12 and ARMM
*Mindanao State University – Iligan Institute of Technology (MSU-IIT)
Project Leader: Engr. Alan E. Milano



Project 1.B.13. LIDAR Data Processing and Validation in Mindanao: Davao Region / Southern Mindanao
*University of the Philippines – Mindanao
Project Leader: Dr. Joseph E. Acosta



Project 1.B.14. LIDAR Data Processing and Validation in Mindanao: CARAGA Region (Region 13)
*Caraga State University
Project Leader: Engr. Meriam M. Santillan

PHIL-LIDAR 2. NATIONWIDE DETAILED RESOURCES ASSESSMENT USING LIDAR

The Phil-LiDAR 2 Program is aimed at providing detailed assessment, translated to maps, of the natural resources of the Philippines. These resources are the following: agriculture, forest, coastal marine, water, and renewable energy.

Program A. Automation of Feature Extraction from LIDAR Data for the Nationwide Detailed Resources Assessment
*Training Center for Applied Geodesy and Photogrammetry, University of the Philippines Diliman (UP – TCAGP)



Project 2.A.1 Agricultural Resources Extraction from LIDAR Surveys
Project Leader: Dr. Ariel C. Blanco

is an urgent need to have a comprehensive data and information on agricultural resources as these data and information are critical in ensuring food security, alleviating poverty, and attaining inclusive growth.

The maps to be developed and generated in this project will provide an overall picture of the status of the Philippines’ agricultural resources. Moreover, it



Project 2.A.2 Aquatic Resources Extraction from LIDAR Surveys

Project Leader: Engr. Ayin M. Tamondong

The Philippines has approximately 36,000 kilometers of coastline. Many of its people depend on coastal resources for daily necessities such as food but due to population growth and industrialization, the coastal environment and its resources are being threatened. An evaluation and mapping of the resources is needed to sustain the use and benefits that can be taken from these coastlines. Using the LiDAR technology, mapping the coastal resources of the Philippines is not too farfetched.



Project 2.A.3 Forest Resource Extraction from LIDAR Surveys (FRExLS)

Project Leader: Dr. Enrico C. Paringit

High-resolution mapping of Philippine tropical forests and obtaining accurate carbon stock estimation can significantly enhance forest management and improve implementation of large-scale carbon retention and enhancement programs. Previous high-resolution approaches have relied on field plot and/or LiDAR samples of aboveground carbon density, which are typically up-scaled to larger geographic areas using stratification maps. Such efforts often rely on detailed vegetation maps to stratify the region for sampling, but existing tropical forest maps are often too coarse and field plots too sparse for high-resolution carbon assessments. The project aims to develop a methodology to process LiDAR point cloud data and combine it with various geospatial technologies in order to utilize the LiDAR datasets for forest resources, assessment and inventory.



Project 2.A.4 Development of the Philippine Hydrologic Dataset (PHD) for Watersheds from LIDAR Surveys

Project Leader: Engr. Anjilyn Mae C. Perez

The Philippines is composed of a wide variety of natural and man-made water resources. Having this vast amount of resources, the first step in proper water management is knowing the extent and state of all available resources. With the recently available LiDAR data and other remotely-sensed images in the country from various research efforts, the assessment and mapping of water resources in the Philippines becomes more feasible with proper implementation of new and existing methodologies. The project aims to develop a national repository of hydrologic datasets for the Philippines.



Project 2.A.5 Philippine Renewable Energy Resources Mapping from LIDAR Surveys

Project Leader: Engr. Ma. Rosario Concepcion O. Ang

The constant increase of oil price in the world market and the high economic risk of growing fuel dependence on foreign countries, coupled with the pressures of climate change, prompt the country to look for alternative ways of extracting energy. However, among the potential alternative sources of energy are from renewables such as wind, solar, hydropower and biomass which are abundant in the country. The project aims to enhance the capacity of the country in developing renewable energy by developing workflows and algorithms for resource assessment using LiDAR and other geospatial technologies, assessing the renewable energy potential of the Philippines for solar, wind, hydropower and biomass and performing site suitability assessment for the development of solar, wind, hydropower and biomass.

Program B. LIDAR Data Processing, Modeling and Validation for Nationwide Resources Assessment

An important component of the Phil-LiDAR 2 program is the mapping and validation of regional areas in the country. It is highly important that precise data are retrieved in the region in order to ensure the accuracy of the LiDAR surveys for decision-making. As such, Phil-LiDAR 2 involved 14 higher education institutions from all the regions to take part in the processing, modeling, and validation of LiDAR data obtained from their respective areas. They are as follows:



Project 2.B.1 LIDAR Data Processing, Modeling and Validation by HEIs for the Detailed Resource Assessment in Northern Luzon (Region 1)

**Mariano Marcos State University (MMSU)*

Project Leader: Dr. Nathaniel R. Alibuyog



Project 2.B.2 LIDAR Data Processing, Modeling and Validation by HEIs for the Detailed Resource Assessment in Luzon: Region 2 and Abulog River Basin in Region 1

**Isabela State University (ISU)*

Project Leader: Dr. Dante M. Aquino



Project 2.B.3 LIDAR Data Processing, Modeling and Validation by HEIs for the Detailed Resource Assessment in Luzon: Region 3 and Pangasinan

**Central Luzon State University (CLSU)*

Project Leader: Dr. Ronaldo T. Alberto



Project 2.B.4 LIDAR Data Processing, Modeling and Validation by HEIs for the Detailed Resource Assessment in Luzon: MIMAROPA and Laguna (Region 4)

**University of the Philippines Los Baños*

Project Leader: Dr. Damasa M. Macandog



Project 2.B.5 LIDAR Data Processing, Modeling and Validation by HEIs for the Detailed Resource Assessment in Luzon: CABARZON (Region 4A except Laguna)

**Mapua Institute of Technology*

Project Leader: Dr. Felicito S. Caluyo



Project 2.B.6 LIDAR Data Processing, Modeling and Validation by HEIs for the Detailed Resource Assessment in Luzon: Bicol (Region 5)

**Ateneo de Naga University*

Project Leader: Dr. Emelina G. Regis



Project 2.B.7 LIDAR Data Processing, Modeling and Validation by HEIs for the Detailed Resource Assessment in Western Visayas (Region 6)

**University of the Philippines Cebu*

Project Leader: Judith R. Silapan



Project 2.B.8 LIDAR Data Processing, Modeling and Validation by HEIs for the Detailed Resource Assessment in Central Visayas (Region 7)

**University of San Carlos Talamban*

Project Leader: Dr. Roland Emerito S. Otadoy



Project 2.B.9 LIDAR Data Processing, Modeling and Validation by HEIs for the Detailed Resource Assessment in Eastern Visayas (Region 8)

**Visayas State University (VSU)*

Project Leader: Dr. Pastor P. Garcia



Project 2.B.10 LIDAR Data Processing, Modeling and Validation by HEIs for the Detailed Resources Assessment in Zamboanga Peninsula (Region 9)

**Ateneo de Zamboanga University (AdZU)*

Project Leader: Dr. Mario S. Rodriguez



Project 2.B.11 LIDAR Data Processing, Modeling and Validation by HEIs for the Detailed Resources Assessment in Northern Mindanao (Region 10)

*Central Mindanao University (CMU)
Project Leader: For. Alex S. Olpinda



Project 2.B.13 LIDAR Data Processing, Modeling and Validation by HEIs for the Detailed Resource Assessment in Davao Region (Region 11), South Cotabato, and Sarangani

*University of the Philippines Mindanao
Project Leader: Dr. Anabelle U. Novero



Project 2.B.12 LiDAR Data Processing, Modeling and Validation by HEIs for the Detailed Resource Assessment in Selected Sites in Region 10 and ARMM

*Mindanao State University-Iligan Institute of Technology (MSU-IIT)
Project Leader: Ma. Teresa T. Ignacio



Project 2.B.14 LIDAR Data Processing, Modeling and Validation by HEIs for the Detailed Resources Assessment in Mindanao: CARAGA Region (Region 13)

*Caraga State University (CarSU)
Project Leader: Engr. Michelle V. Japitana

Other Mapping Projects



Design and Development of Aerial Mapping and Imaging Systems and Standards

*Ateneo Innovation Center
Project Leader: Dr. Nathaniel Joseph C. Libatique

Unmanned Aerial Vehicles (UAVs) are multi-role assets and platforms that when combined with a national IT platform enables research in new sciences and technologies to tackle the problems in agriculture, disaster science and environmental sustainability, and infrastructure particularly bridge and road network planning.



Super Sky Surfer 2.4 Meters (above)
Orthomosaic of Lake Palakpakin with our partner in the deployment site, Fernando Espallardo (below)
(Images courtesy of the Ateneo Innovation Center - Skyeeye, Inc.)

Coral Reef Assessment and Visualization Advanced Tools (CRAVAT)

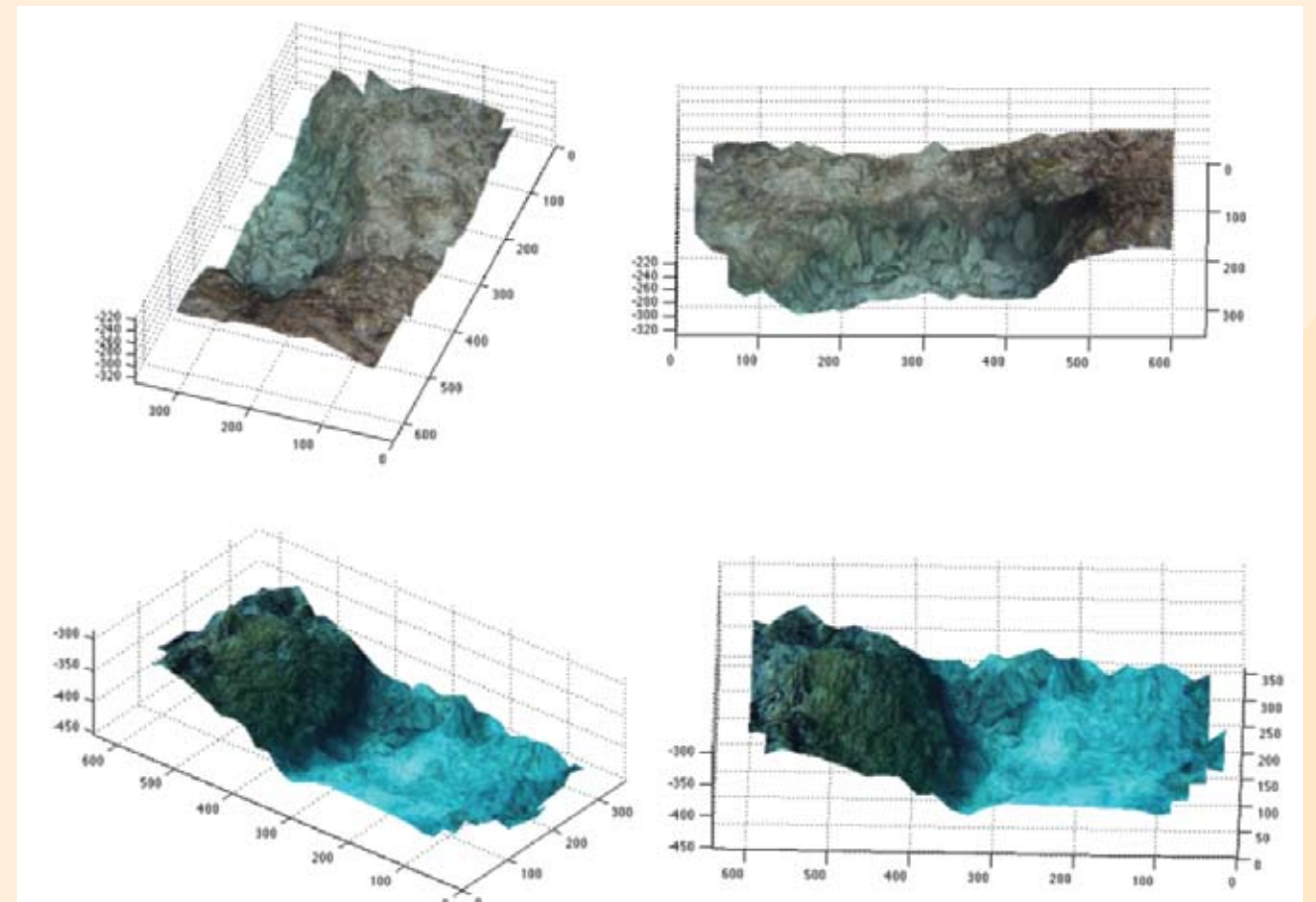
Coral Reef Assessment and Visualization Advanced Tools (CRAVAT) is an upgrade of the Automated Rapid Reef Assessment System (ARRAS) implemented last June 2010-2013 which developed tools that made way for faster and more cost-effective marine fieldwork.

As of now, ARRAS is being utilized by DENR and other non-government organizations. World Wide Fund for Nature-Philippines (WWF-Philippines) has used ARRAS to check on the recovery and improvements in the coral reefs in Tubbataha, Palawan after two foreign ships had accidentally ran aground this area over a year ago.

ARRAS reduced the laborious dive time, however, it wasn't able to measure the surface height and complexity of reefs and as a result, the CRAVAT program seeks to further enhance the ARRAS efforts by investigating the relationship of reef bio-architecture, biodiversity and potential productivity of reef fish.

The project will deliver a Coral Reef Atlas of Verde Island Passage which shall feature (a) 3D seafloor maps, (b) Overlaid stitched images, and (c) Assessment information components of tool development which shall be tied to the graduate and undergraduate thesis of students thus generating highly skilled manpower at the end of the project.

DENR, BFAR, LGUs, Tourism Industry, Coastal Dwellers and Establishments, and Researchers are the beneficiaries of this project.



3D Coral Reconstruction
(Image courtesy of the ARRAS Project)



CRAVAT Project 1 – FISHDROP 360: Development Tools for Improved Monitoring of Reef Fish Communities

**College of Science, University of the Philippines – Diliman*
Project Leader: Dr. Prospero C. Naval, Jr.

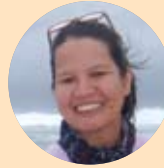
The project will develop a software for semi-automated analysis of the reef fish census video and a tool to be used for collecting underwater fish census images (video and photos) in 360 degrees. Also, a monitoring manual for detecting changes in reef fish assemblages using developed tools and protocols shall be created.



CRAVAT Project 2 – Teardrop Upgrade

**Mapua Institute of Technology*
Project Leader: Engr. Roel John Judilla

The teardrop equipment that carries an underwater video camera and creates image mosaic of reefs overlaid on Google Earth can scan for corals at depth of five to ten meters during daytime. Through this project, the teardrop equipment will be upgraded to a scanning depth capability of 20 meters to be used at any time of the day.



CRAVAT Project 3 – Integration of ARRAS and CRAVAT Tools

**Natural Institute of Physics, University of the Philippines – Diliman (UP-NIP)*
Project Leader: Dr. Maricor N. Soriano

In this component project, algorithms will be developed to derive 3D images from video for appropriate overlay of stitched images on seafloor maps. In addition, stitching algorithm will be enhanced to include multicamera stitching for Teardrop. Assessment algorithms will be created from stitched video such as rugosity/complexity.



Teardrop Equipment
(Image courtesy of CRAVAT Project 2)

Earthquake-related

The Second Phase of Taiwan-Philippines Geodynamic Integrated Project (2PIGS)

While information about the different aspects of the vast Philippine archipelago geology is available, further studies that look beyond the edges of the subduction is still needed. Extensively studying the different aspects of the Philippines' overriding plate segment will allow a more thorough picture of the archipelago's history, resource potentials and predisposition to certain natural hazards.

Thus, to have a better understanding of the Philippines' overriding plate dynamics, the Department of Science and Technology supported a program proposal in collaboration with the University of the Philippines. which seeks to have an integrated understanding of the Central Philippine tectonics and its implications for mineralization, current environmental conditions and geophysical hazards. The program focuses on the islands of Samar, Masbate, and Negros because of their strategic locations relative to the Philippines' two bounding subduction systems and the Philippine Fault zone. Specifically, the program is composed of four projects, namely:



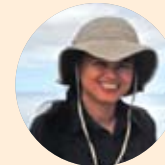
SEM capability of EPMA
(Image courtesy of Rushurgent Working Group 2014)



Project 1 – The Geology of an overriding plate: Constraints from field geology, sediment geochemistry and paleontology

**College of Science – University of the Philippines Diliman*
Project Leader: Dr. Betchaida D. Payot

Having a clear understanding of the region's geodynamic history is a necessary element in constructing comprehensive land use plans, geohazard susceptibility assessments and mineralization potential maps. Thus, this project aims to set the regional geologic background and constitute the baseline information that the other researchers will work with. Paleontologic information from foraminiferal and radiolarian tests will be used to constrain the ages of sedimentary formations. Sandstone petrochemistry will also be employed to shed light on determining histories of surrounding regions.



Project 2 – Linking active margin tectonics and overriding plate dynamics: A look at the geochemical nature of the Central Philippines

**College of Science, University of the Philippines Diliman*
Project Leader: Dr. Noelynna T. Ramos

The second project focuses on the distribution and characteristics of the basement units, different igneous provinces to decipher their source attributes, magmatic histories and deduce implications for the mineralization potential of the identified areas. Results from major, minor and trace element geochemical investigations will be able to provide a thorough picture of the magmatic processes that operated to produce the different rocks as well.



Project 3 – Retracing the Central Philippine Overriding plate motion

**National Institute of Geological Sciences – University of the Philippines Diliman (UP - NIGS)*
Project Leader: Dr. Decibel V. Eslava

The third component of the 2PIGS program combines the use of rock magnetic properties and absolute age dating techniques to interpret the motion histories of the different crustal blocks that comprise the region. Results from the study can provide information on the rotation and migration histories of the rocks and can constrain existing and prospective tectonic models which are useful supplementary information for geohazard assessment and prediction.



Project 4 – Geophysical characterization of an overriding plate: Arc-continent convergence and its implications for natural hazards and resource distribution in the Central Philippine

**College of Science, University of the Philippines Diliman*
Project Leader: Dr. Carla B. Dimalanta

The fourth project aims to characterize the effects of past plate motions of the Central Philippine overriding plate segment on the geophysical character of the different units of lithology in Central Philippines. Regional gravity and magnetic surveys shall be conducted to delineate the different geologic terranes, particularly their boundaries (i.e. faults and shear zones). These potential field techniques can image the lateral extent of large scale tectonic features associated with the arc-continent collision in the region. The electrical surveys will be utilized to investigate the small scale features (weathering profiles, occurrence of localized faults and mineralized areas) and their implications for natural resource distribution and geologic hazards in the region.

Other Earthquake-related Projects



Earthquake Hazard Assessment: Active Fault Mapping and Ground Shaking Hazard Assessment

**Philippine Institute of Volcanology and Seismology (PHIVOLCS)*
Project Leader: Dr. Arturo S. Daag

Active faults are known source of large magnitude earthquakes. In case of shallow earthquakes, the movement of fault generates ground rupture, and the rupture may extend off-shore causing underwater submarine faulting which may sometimes be producing tsunamis. The main objective of this research is to accurately map the active fault on land and offshore using sets of non-invasive geophysical tools in order to assess seismic hazards along the Valley Fault System (VFS) and offshore extensions of the Philippine Fault Zone (PFZ).

Since there is a lack of detailed mapping of active faults in the country, the data generated from the project can help geologists and seismologists to make mapping of active faults more accurate.



Specific earthquake ground motion levels that would affect medium-to-high rise structures in Metro Manila

**Philippine Institute of Volcanology and Seismology (PHIVOLCS)*
Project Leader: Dr. Rhommel N. Grutas

This project will cover 16 cities and 1 municipality of Metro Manila and some parts of Rizal province. To determine the site-specific earthquake ground motion levels in an urban region like Metro Manila, this requires knowledge of its underground structures especially for sedimentary layers overlying the basement. The project aims to enhance the capacity of PHIVOLCS personnel in conducting microtremor array surveys, analysis and interpretation; identify the shear-wave velocity of deep sedimentary layers reaching the seismic basement; map long-period site effects in Metro Manila; provide realistic ground motion levels that could affect the structures.



Enhancing the ground Deformation Monitoring Capability of PHIVOLCS in Bulusan and Taal Volcanoes through the Development of real-time Geodetic System

**Philippine Institute of Volcanology and Seismology (PHIVOLCS)*
Project Leader: Ma. Antonia Bornas

This project proposes to commission fully operational real-time geodetic network consisting of Global positioning System (GPS) and electronic tilt in Taal and Bulusan volcanoes in order to acquire high-quality volcanic ground deformation data; and generate high-resolution ground deformation data that can authoritatively support decision-making during volcanic unrest, help constrain parameters precursory to an eruption, and support research into the underlying magmatic and related source processes that produce observed patterns of volcano deformation.



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

**Philippine Nuclear Research Institute*
Project Leader: Angelito F. Ramos

The project uses radon as potential geochemical precursor of earthquake along the northern segment of the PF and VFS and to contribute in strengthening the monitoring program being undertaken along the northern segment of the PF and VFS.



Field Geochemical measurement of groundwater using handheld OAKTON Multi-parameter tester



*Field measurement of radon gas in soil using alpha GUARD PQ2000 PRO radon monitor
(Images courtesy of Radon Project Team)*

Satellite

Development of Philippine Scientific Earth Observation Microsatellite (PHL-MICROSAT)



*Ground Recieving Station Dish in Japan to be emulated in the PHL-MICROSAT Project
(Image courtesy of Engr. Retamar)*

In 2005, it was already a vision of the Department of Science and Technology (DOST) to develop the Philippines' first small satellite. This program aims to enhance the activities of world's most small satellites researches and build the basis of new paradigm for the future which is cost-effective and reliable microsatellites widely utilized for both research and business purposes.

The local development of microsatellites serves as an outstanding platform for convergence of various technical backgrounds - from embedded electronic systems and computing, signal processing, electric power, mechanical control, imaging sensors and payload design to analysis of remote sensing data. The research and development will draw upon the competencies and know-how of various Institutions to enable useful applications for the Philippines in agriculture, meteorology, climate change and disaster risk management and response.



Project 1 – Microsatellite BUS Development for Philippine Microsatellite

**Electrical and Electronics Engineering Institute (EEEI), University of the Philippines Diliman*
Project Leader: Dr. Joel Joseph S. Marciano, Jr.

The first project shall develop and launch the first Philippine Microsatellite (PHL-MICROSAT) that is robust and efficient in providing on-demand and real-time status of the country's environment particularly for applications such as land-use (i.e. forest, agriculture/crop), aquatic resource assessment and monitoring and disaster risk management.



Project 2. Ground Receiving Station for the Philippine Microsatellite

**Advanced Science and Technology Institute (ASTI - DOST)*
Project Leader: Engr. Alvin E. Retamar

A ground receiving station allows space borne images taken by an orbiting microsatellite to be transmitted to Earth for us in various scientific and civilian applications. Likewise, it is used to control and transmit commands from the ground to the microsatellite so that it can carry out its mission effectively. The ground

station is proposed to be collocated with the PEDRO project in a satellite farm in Subic Bay Freeport which will allow centralized management, monitoring and maintenance. This project aims to establish a facility for the ground receiving station to receive imagery from microsatellites. It shall also develop the capacity to control, receive and process the imageries by training personnel to manage, operate and maintain the ground receiving station. Lastly, it will also facilitate archiving and distribution of satellite imagery to end-users.



Project 3. Development of a Data Processing, Archiving, and Distribution Sub-system for the Ground Receiving Station of the Philippine Scientific Earth Observation Micro-Satellite

**Training Center for Applied Geodesy and Photogrammetry, Department of Geodetic Engineering, University of the Philippines - Diliman*
Project Leader: Mr. Mark Edwin A. Tupas

Remote Sensing (RS) applications encompasses almost all national government initiatives, these includes applications for Disaster Risk Reduction, Resource Mapping, Food Security and Defense among others. Through this project, the benefits of RS,

operationalization of remote sensing applications and products will be put forward. Operationalization can happen when an automated request and delivery systems are in place. The development of data processing, archiving and distribution system would stream line the delivery of RS products to end-users such as NGAs, LGUs and researchers.



Project 4. Calibration and Validation of Remote Sensing Instruments for Philippine Microsatellite

**Training Center for Applied Geodesy and Photogrammetry, Department of Geodetic Engineering, University of the Philippines – Diliman (UP-TCAGP)*
Project Leader: Dr. Enrico C. Paringit

This project will ensure that the instruments onboard the PHL-MICROSAT are properly calibrated and validated so that they become ready for analysis for different applications. In order to reach the target, this study will develop a calibration method to be applied for the remote sensing instrument. It shall also generate a set of calibration parameters for the remote sensing instrument to maintain image spectral fidelity and consistency, and generate an authoritative spectral signature database/ library of key ground objects of significance and/ or importance that are especially endemic to Philippine conditions.



Project 5. Remote Sensing Product Development for Philippine Microsatellite

**Institute of Environmental Science and Meteorology, University of the Philippines – Diliman (UP-IESM)*
Project Leader: Dr. Gay Jane P. Perez

An archipelago such as the Philippines would benefit from a canopy-like coverage that such satellites can afford. Whether for remote sensing or telecommunications purposes, a satellite that is fully controlled by the government for educational, research and other services will enable flexibility and faster turnaround for scientific measurements and experimentation. In light of regular typhoons and other natural calamities, providing on-demand and real-time access to remote sensing and high resolution satellite imagery to facilitate risk assessment and disaster response fills a crucial void for the country. As the last component of the PHL-MICROSAT program, this project will form a science team that will ensure the integrity and maximize the utility of data obtained from the microsatellite. It also aims to process data from previous microsatellite missions: RISING-2 and

UNIFORM. Likewise it plans to build spectral library of high-quality data to be used for groundtruthing and algorithm development, and the capacity on processing microsatellite data. Finally, it will produce georeferenced and calibrated radiances products.

Other Satellite-related Projects



Implementing a Satellite-based Monitoring and Assessment of Rehabilitation in Typhoon-affected Regions (SMARTER VISAYAS)

**Advanced Science and Technology Institute (ASTI-DOST)*
Project Leader: Engr. Denis F. Villoriente

This three-month project acquired high-resolution multispectral satellite imagery through dedicated tasking services (DTS) for rapid assessment of damages sustained by buildings that are based on building outline (totally removed), roofing condition (totally peeled) and other visual cues that indicate degree and extent of damages incurred. The acquired satellite images were used for the planning and rehabilitation of typhoon-affected regions.



Drought and Crop Assessment and Forecasting (DCAF)

**Institute of Environmental Science and Meteorology, University of the Philippines – Diliman (UP-IESM)*
Project Leader: Dr. Gay Jane P. Perez

Through satellite observations, we gain insights into the sensitivity of vegetation to various environmental and climate parameters and identify primary factors that trigger drought conditions. Among its outputs is a tool that can provide early warning system beneficial for a substantial forecast on temporal and spatial extent of drought. With this system, agricultural agencies are enabled to make informed decisions, policies and advisories necessary for drought readiness. The Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD) shall lead the monitoring of this project in 2015.

Policy

Baseline Research of the 10-Year National Space Technology Applications (STA) Masterplan



**Manila Observatory, Ateneo de Manila University*
Project Leader: Dr. May Celine T.M. Vicente

In 2012, the Committee on Space Technology Applications (COSTA) foresaw the need to develop a 10-Year National STA Masterplan. The Space Science and Technology Applications (SSTA) Baseline Research Project was then conceived in order to incorporate science and development policy thrusts and priorities into the masterplanning process. The 10-Year National SSTA Masterplan is an intervening stage to the formulation of a Space Law and its Policies and the establishment of a Philippine Space Agency. The SSTA Baseline Research identifies and establishes a common science and technology framework, key institutional players/ stakeholders, organizational gaps and needs, indicators/ potential metrics, ways forward, potential contributions of SSTA to the achievement of Philippine development goals and benefits arising from regional and international collaboration.



Dr. Rowena Cristina L. Guevara at the Space Science and Technology Applications (SSTA) Scoping consultation Workshop

In the Philippines, space technology applications are envisioned to support informed decision-making and policy formulation towards more coherent and systematic governance, socio-economic development, poverty alleviation as well as environmental, natural resources and disaster management. Given its mandate to develop, integrate and coordinate research systems for S&T in the country, the DOST through PCIEERD aims to broaden and optimize the use of space technologies in delivering key national programs.

Other Policy-related projects



Crafting a National Space Development and Utilization Policy

**Regulus Space Tech Inc.*
Project Leader: Dr. Rogel Mari Sese

The project envisions the creation of a National Space Development and Utilization Policy (hereafter referred to as National Space Policy or simply Policy) that will provide a concrete and cohesive strategy for SSTA in the Philippines. Due to the over-arching nature of space science in modern times, the Policy would have a significant impact of various sectors of the Philippines. Furthermore, the application of Systems Architecture and Capability Building Frameworks

would enable the creation of a National Space Policy that is more attuned to the current situation and capabilities of the country. The Policy would propose target development areas and strategies that can be utilized for the Philippines to properly embark on a sustainable and long-term space program that is not only beneficial to scientists but would also contribute to national security and development. It would focus on six (6) SSTA development areas: national security, disaster management and climate studies, education, space research and development, aerospace industry development and international cooperation.



Regional Disaster Science and Management S&T Capacity Development - Region 2, 3, 11
**Central Luzon State University (CLSU)*
 Project Leader: Dr. Annie Melinda P. Alberto

In 2014, this project strengthened the disaster science capacity of the regions through State Universities and Colleges (SUCs). It also came up with regional and provincial hazard exposure database, and inventory database of disaster risk reduction and climate change adaptation studies and hazard maps. Further, the study conducted regional and provincial risk assessments.



REDAS Training
 (Image courtesy of the REDAS Project Team)

Evacuation, Rehabilitation and Infrastructure

Project E-Bayanihan: A Nationwide Web - Mobile Based System for Participatory Disaster Management



**Ateneo de Manila University*
 Project Leader: Dr. Ma. Regina Estuar

During the old times, “bayanihan” was used by Filipinos as a sign of helping others in a community. Now, how can such trait be revived again today given the advent of technology?

Named “Project e-Bayanihan”, this project seeks to provide ordinary citizens with a web and mobile based application to report disaster related information. It aims to develop a multi-dimensional multi-platform interface for the reporting, analysis and visualization of real time hazard, demographics and social media data. The system will be initially called “eBayanihan” which stands for collective effort of Filipino citizens in reporting disaster related information to a centralized system.

The project includes field surveys and interviews to design the application for eBayanihan. It also involves systems design to create mock-up screens for the mobile and web-based system. In particular, e-Bayanihan uses a website to display the data collected from sources. Likewise, the website also allows users to register so they can enter disaster information via the web. A mobile version of the web platform is also being designed.

The current web interface for the e-Bayanihan project contains a layout similar to the microblogging site Twitter. With this, reports from registered users nationwide can easily be seen. In addition, the site is also linked to Google Maps so the area where the emergency reported was can be located. The website being developed will also contain access to various databases including Hazard database of NOAH, and vulnerability and exposure database of Manila Observatory.



The eBayanihan Smartphone App
 (Image courtesy of Dr. Ma. Regina Estuar)

Other Projects on Evacuation, Rehabilitation and Infrastructure

RESCUED: Resilient Communications Infrastructure and Signal Processing for Use in Emergencies and Disaster



Project 1 – ROGER – Robust and Rapidly Deployable GSM Base Stations and Backhaul for Emergency Response
**Electrical and Electronics Engineering Institute (EEEI), University of the Philippines Diliman*
 Project Leader: Dr. Joel Joseph S. Marciano Jr.

ROGER is a low-cost intervention that addresses the need for an alternative communication channel when conventional communication infrastructures fail during calamities. Using the ROGER network, identified users can use their mobile phones to place calls to one another or to an emergency hotline.

The ROGER network is intended to be stored in “standby mode” in vulnerable areas in the country.



Project 2 – LADDERS – Local Capability Development for Radar Systems
**Electrical and Electronics Engineering Institute (EEEI), University of the Philippines Diliman*
 Project Leader: Leonard Bryan G. Paet

The LADDERS project plans to create a pool of experts in the field of radar technology. The project will involve both research in the field of digital signal processing and human resource development activities that will enable Filipino engineers to design our own radar systems. The weather radar system will enable the country’s monitoring system to predict both the direction of weather disturbance and rain intensity which would allow advanced warning of possible flooding.



Development of Temporary Shelter System for Disaster Stricken Areas
**University of the Philippines Diliman*
 Project Leader: Dr. Fernando J. Germar

Communities affected by flood, typhoon, or earthquake can now be assured to receive temporary shelter at a shorter period of time through this project that is

currently developing shelters that could easily be transported and installed in disaster stricken areas.



Development of Tent Systems for Emergency Applications
**Metals Industry and Research and Development Center (MIRDC)*
 Project Leader: Engr. Rodnel O. Tamayo

This project is developing cost effective and easily manufacturable tent systems good for 5-7 persons. It shall also develop a multipurpose tent to serve as temporary warehouse, field hospitals and command centers. The availability of tents will strengthen the country’s capability to respond to emergencies especially on critical needs.



Pre-positioning and Allocation of Relief Supplies for Disaster Preparedness and Response
**Ateneo de Manila University*
 Project Leader: Dr. Reinabelle C. Reyes

The Philippines is a disaster-prone country with an estimated 20 typhoons annually, of which approximately five are expected to cause major damage, along with potential for flood and landslides. In the aftermath of Typhoon Yolanda in November 2013, there have been an estimated more than 6,000 casualties, and the total economic damage has been estimated to be USD 288 million. Due to the high risk of disaster in the Philippines, there is an immediate need for a coordinated response to disasters that is both effective and efficient.

The goal of disaster response is to provide assistance to the affected population as soon as possible. Pre-positioning relief supplies in strategic locations can increase the nation’s preparedness to respond to forecasted natural disasters, especially typhoons. A decision-making tool is proposed that can be used in preparation for and in response to a disaster scenario. This tool will be based on a mathematical optimization model that can prescribe schemes for pre-positioning and allocation of relief supplies, and facilitate centralized decisions for Philippine disaster response operations.



Field Testing and Validation of Study of Retorts Food (Chicken Arroz Caldo) as Disaster Mitigation/ Relief Foods using DSWD's Distribution Protocols

**Industrial Technology Development Institute (ITDI - DOST)*

Project Leader: Daisy E. Tañafranca

The project focuses on the actual field testing of ready-to-eat (RTE) retort food (arroz caldo), which was developed by the Packaging Technology Division of ITDI as disaster mitigation/relief foods using DSWD's and LGU's distribution system. This type of relief food aims to address the immediate hunger of disaster victims, and problems reported by the victims on preparation of relief food such as difficulty of cooking rice, noodles, opening of canned goods, among others. The project is in line with the government's agenda on national disaster, mitigation, and preparedness. The DSWD has already signified interest to include the product in their relief packages to families in disaster-stricken areas such as Tacloban.



Improving the Existing Facilities of Philippine Science High School (PSHS) – Central Visayas Campus

**Philippine Science High School (PSHS) – Central Visayas Campus*

Project Leader: Dr. Warren D. Cordeta

The proposed improvement of the Philippine Science High School-Central Visayas Campus buildings will be made through Convention and Supplemental Energy Dissipation and Structural Control. Conventional Methods type of repair which includes additional new structural elements to the system (additional of shear walls and bracing). For supplemental Energy Dissipation and Structural Control Method is to reduce structural vibrations for improved safety and/or serviceability under wind and earthquake loadings.



Improvement of Flood Control Facility through the Development of Automatic Trash Rake

**Metals Industry and Research and Development Center (MIRDC – DOST)*

Project Leader: Engr. Gharry M. Bathan

The project shall improve the Automatic Trash Rake equipment in Binondo Pumping Station with a higher capacity, better trash collection rate, minimal tripping of power encounter and a capability of lifting large size of trash during pumping process. This can be achieved through Conveyor rake, trash gate and clamshell – a conveyor system for trash removal from a moving body of water such as river, tributaries or canals. With the upward movement of the rake, it will collect any trash which is in contact with the conveyor rake. On the other hand, the trash rake controls the feed of the trash / garbage on the trash rake conveyor which causes power trip. Finally, the clamshell helps in lifting large size of trash / garbage such as logs and furniture brought by flood to the waterways before going to the trash rake conveyor.



The Automatic Trash Rake System

BUILD BACK BETTER AND SAFER PHILIPPINES: The Science and Technology of Designing and Planning Sites & Buildings Safe from Disaster

**School of Urban and Regional Planning (SURP), Institute of Civil Engineering (ICE), College of Architecture, University of the Philippines – Diliman*

The program for “Build Back Better - Philippines” (BBBP) aims to be a scientific platform for defining what it truly means to build better. BBBP will focus on post-disaster rehabilitation based on good practices of environmental planning, structural design and architectural design for residential structures and evacuation centers.

The final output shall be practical guidelines and standards for the design of sites and structures, and retrofitting of existing structures damaged by the typhoon's strong winds and tailing storm surge. To further the usefulness of the said scientific output, an offshoot program can then focus on educating the people via Information and Education Campaigns, as well as, carefully-targeted trainings and workshops for capability-building.



Project 1 - Planning Guidelines for Post-Disaster Response and Rehabilitation of Communities and Localities via Supply Chain and Delivery Management, and Risk-Sensitive Environmental Planning

Project Leader: Dr. Mario R. Delos Reyes

The first project seeks to develop policy directions and guidelines to address the needs of human settlements, particularly the need to plan and implement Local Government Units' development plans, programs and projects. Specifically, the study aims to promote resilient communities through: incorporating human and supply chain management strategies; multi-hazard vulnerability assessment; local adaptive capacities identification; and disaster risk management and climate change adaptation strategy mainstreaming, into the local development plan.



Project 2 - The Architecture of Filipino Resilience: The Adaptation of Traditional Wisdom from Selected Philippine Vernacular Architecture into Modern Building Systems

Project Leader: Dr. Mary Ann A. Espina

This aims to determine the configuration and orientation characteristics of buildings that sustained minimal damage from Typhoon Yolanda's strong winds, and/or storm surge.

In particular, this project has four phases. The first phase will focus on building inventory in Tacloban and Guian to determine the basic damage inventory of the buildings in the said areas. The second phase focuses on modelling and correlational research where working drawings and models from the first phase will be subjected to structural testing and simulation—

seismic and typhoon performance. Then, the third phase focuses on design formulation and research.



Project 3 - Structural System and Construction Methodologies Resilient to Earthquake and Strong Winds

Project Leader: Dr. Alexis A. Acacio

The last project component of the BBBP will start with building model conceptualization, analysis, validation and ends at the publication of the final building model and guidelines.

Building model conceptualization covers the review of related literatures and data gathering on the common types of construction of residential and school buildings as well as evacuation centers. Afterwards, data gathered from the site and from other agencies, such as material properties and dimensions, shall be inputted to the building model. Residential buildings for single-family occupancy and evacuation centers will be modeled. These models shall be tested against earthquake and wind through analysis and validation.

The final building model will conclude the project and the guidelines can be established on the retrofit and reconstruction of school, residential buildings and evacuation centers.

OUTCOME 2

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

Technologies developed by Filipino S&T researchers have high potential in the worldwide market. To step up these innovations, the PCIEERD continued its support on projects that can produce quality and globally competitive products that shall boost the country's economic growth. These technologies are targeted to improve the operations and expansion of our local Micro, Small and Medium Enterprises (MSMEs).

Genomics & Biotechnology

Sugarcane Genomics for Increased Productivity, Profitability, Sustainability and Global Competitiveness of the Philippine Sugar Industry

**Institute of Plant Breeding (IPB), University of the Philippines Los Baños*

The Sugarcane genomics program composed of three projects is targeted to jumpstart the development of new sugarcane varieties through the fast generation of molecular markers associated with important agronomic and physiological traits and its immediate utilization in marker-assisted selection and breeding activities, leading to a more productive, profitable, sustainable and globally competitive Philippine sugar industry.

Molecular Markers are derived from differentially expressed genes associated with each of the traits mentioned, and generated from the transcriptomic sequence data.



Sugarcane Genomics Project 1: Genomics-Assisted Discovery of Genes and Molecular Markers for Important Targeted Traits in Sugarcane

**University of the Philippines – Los Baños*
Project Leader: Dr. Antonio C. Laurena

The three-year project shall generate molecular markers associated with important traits of sugarcane. Initially, sugarcane genotypes that possess either one or two of the relevant traits (high sucrose yield and disease resistance to downy mildew and smut) were identified. Markers are searched and identified via a transcriptomics-based approach using an appropriate next-generation-sequencing (NGS) platform and bioinformatics analyses. It is also the hope of this project to identify novel genes (if any) associated with each of the relevant traits important in sugarcane improvement.



Sugarcane Genomics Project 2: Application of Molecular Breeding Techniques in Sugarcane Improvement

**Sugar Regulatory Administration and
Philippine Sugar Research Institute*
Project Leader: Rimmon T. Armones

The second Sugarcane Genomics project aims to increase efficiency in the development of new sugarcane varieties through the use of molecular markers in pre-breeding, hybridization and selection. The project will also develop a molecular database which will be linked with the existing morpho-argonomic characterization databases to be used in the selection of parents in future hybridizations.



Sugarcane Genomics Project 3: Development of New Sugarcane Varieties Using Marker-Assisted Selection

**Sugar Regulatory Administration and
Philippine Sugar Research Institute*
Project Leader: Rosalyn T. Luzaran

Through the use of Marker-Assisted Selection (MAS), the project looks into identifying promising sugarcane clones with high sucrose content, sugarcane varieties resistant to at least smut and downy mildew, and shortened hybridization time to dissemination of new high-yielding sugarcane varieties.



Collection and preparation of samples for sugarcane DNA isolation
(Images courtesy of the Sugarcane Project 2 Team)

Fuel Ethanol Production from Lignocellulosic Feedstocks (FUEL LIGNO)

*National Institute of Molecular Biology and Biotechnology (BIOTECH) - University of the Philippines Los Baños

The worldwide energy crisis due to impending depletion of fossil fuel demand serious R&D efforts on renewable energy sources. Due to food vs. fuel debate and with massive demand for feedstock material for bioethanol, lignocellulosic materials or plant dry matter (biomass) are seen as better options than starchy and sugary materials. Agricultural crop residues such as sugarcane bagasse, sweet sorghum bagasse and pineapple peelings or leaf residue are good sources of lignocellulosic materials

This program aims to maximize the use of lignocellulosic feedstock in producing fuel ethanol. There are four component projects under this program. The first project, "Assessment of Selected Lignocellulosic Residues and Non-food Crops as Feedstocks for Fuel Ethanol Production", completed in 2012, surveyed lignocellulosic feedstocks with respect to relative abundance in marginally unproductive soils, evaluated the cellulose, hemicellulose and lignin contents of local lignocellulosic feedstocks, conducted ultrastructure studies on cell wall and cellulose microfibril structures of these materials by light and electronic microscopy, and established a database of these feedstocks.



Project 2 – Evaluation and Optimization of Pre-treatment Methods for Locally Available and Promising Lignocellulosic Feedstocks for Fuel Ethanol Production
Project Leader: Dr. Fidel Rey Nayve, Jr.

This project examines the evaluation of pre-treatment methods for the selected locally available lignocellulosic biomass. The target is to adapt or modify the most suitable pretreatment method for a particular biomass to result to the maximum conversion of sugars to fuel ethanol.



Project 3 – Development of Microorganism Capable of Utilizing Lignocellulosic Hydrolysates for Fuel Ethanol Production
Project Leader: Dr. Jessica F. Simbahan

BIOTECH has been undertaking research since 1980's. It has an extensive collection of yeasts spanning over 20 years of collection from all over the Philippines. Majority of the isolates has been screened for desirable fermentation characteristics and several isolates with high ethanol yield and tolerance to high temperature have been identified.

This project aims to develop microorganisms capable of utilizing lignocellulosic hydrolysates for ethanol fermentation. These promising microorganisms were bred with the BIOTECH isolates to develop strains with industrial potential to ferment lignocellulosic hydrolysates into ethanol. Genetic improvement strategies such as gene shuffling, mutagenesis and protoplast fusion were employed. The third phase of the project entails formulating inoculation strategies to utilize the wild type microorganism or the yeast hybrid or genetically improved microorganisms in fermentation of lignocellulosic biomass. Strategies such as single or multiple strain inoculation or sequential fermentation is currently explored.



Project 4 – Optimization of Saccharification, Fermentation and Purification processes for Pilot Scale Ethanol Production from Lignocellulosic Materials
Project Leader: Dr. Francisco B. Elegado

The main goal of this project is to optimize saccharification (the process of breaking a complex carbohydrate into simple sugars) and fermentation of selected pre-treated lignocellulosic feedstocks for fuel ethanol production.

The first phase of the project focuses on the saccharification of the hydrolyses resulting from the combined pre-treatment studies. Commercial or locally produced cellulases and hemicellulases will be used in the process. After which, studies to remove or minimize toxic compounds such as furfural and other products of Maillard reaction after high temperature treatment shall be done. The last step in this project would center on the fermentation of the saccharified products.



Inspecting Sample in Vials for Gas Chromatography Analysis
(Image courtesy of Dr. Fidel Rey Nayve, Jr.)

SAGO Resource Utilization for a Sunrise Bioindustry in Mindanao: Utilization/ Conversion of Sago Starch Into Value-Added Products: Ethanol and Lactic Acid

*University of the Philippines – Mindanao



SAGO PHASE 2 Project I.1 – Cloning and Expression of Raw Starch-Digesting Amylase Genes from *Saccharomycopsis fibuligera* and *Saccharomycopsis bubodii* for Direct Ethanol Fermentation
Project Leader: Dr. Annabelle U. Novero

SAGO Phase 2 I.1 project characterized the putative raw starch-digesting amylase (RSDA) genes from *Saccharomycopsis fibuligera* 2074 and *Saccharomycopsis bubodii* 2066. These strains were expressed in E.coli thus providing a proof of functionality for the generation of a recombinant *S. cerevisiae* that would directly ferment starch into ethanol.



SAGO PHASE 2 Project I.3 – Direct Lactic Acid fermentation of Sago Starch without the costly starch pretreatment using *Enterococcus faecium* DMF78: Pilot Scale Costing of the Process
Project Leader: Dr. Dulce M. Flores/
Dr. Dominica DM. Dacera

The study verified 30-L scale fermenter and later in the 200-L pilot-scale fermenter, the capability of the microorganism to retain its productivity, efficiency and optical purity which had been reported in the lab scale. A viable product in a form of technical grade 50% lactic acid that already has commercial value was produced using only initial low-cost purification processes utilizing activated carbon.



Sago Palms
(Image courtesy of SAGO Phase 2 Project I.3 Team)

SAGO Project II.1. GIS-assisted Assessment on the Potential Yield and Bioresource Availability of Sago in the Wild for Sustainable Industry Utilization



*University of the Philippines – Mindanao
Project Leader: Dr. Joseph E. Acosta

The sago palm has long been known for its starch content and as significant source of other raw materials of high economic value. In recent years, considerable progress has been made in researches on the sago palm and its relevant environmental and socio-economic conditions. In spite of such progress, much remains unexplored regarding this underutilized plant resource.

This project intends to provide more relevant information that will be helpful in exploring the sago’s full economic potential. The information generated from this project could be used to assess the current and future potential yield and availability of sago for a more sustainable sago-starch industry in Mindanao.

The project team has reported that Sago palms thriving in wet soil condition are abundant and can be derived from Bunawan, Agusan del Sur.



Sago Palm Log Sample Hauling
(Image courtesy of SAGO Project II.1 Team)

Process

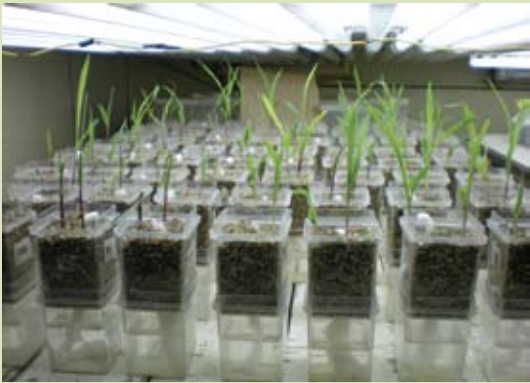
Enhancement of Biotechnology Products and Services for Food, Feed and other Agro-Industrial Applications (Enhancement Program)

*National Institute of Molecular Biology and Biotechnology, University of the Philippines – Los Baños (UPLB-BIOTECH)

This program improved and upgraded the production scale of biotechnology products developed by UPLB-BIOTECH through its extensive research efforts over the years that has the potential to become mainstream products or expand its present market reach. This is in support of the institute’s commitment to promote the use of biotechnology and use its researches to aid in attaining sustainable economic development for the country. The program is divided into three (3) sub programs focusing on the improvement of strains and formulation, product shelf life and quality, and large scale production of enzymes and probiotics for food and feed applications, and improvement of microbial based fertilizers and plant growth promoters for enhanced agriculture crop quality and yield.



Bacillus amyloliquefaciens
for Alpha-amylase enzyme
production (left)
Liquid Probiotics (right)



MykoPlus (left)
Corn Plant (right)



NitroPlus legume Inoculant (left)
Pili pulp oil and Protein Enriched
Residue (right)

Images courtesy of the Enhancement Program Teams

Sub Program 1: Large-Scale Production and Application of Enzymes for Food and Feed Applications



Project 1 – Validation of scale up Production of Microbial Rennet

Project Leader: Dr. Susan M. Mercado

A method for the production of microbial rennet was developed by UPLB BIOTECH in its previous projects from liquid and solid substrate fermentation from locally isolated *Rhizopus* sp. using coconut pairing meal as substrate. Rennet, which is composed of proteases including rennin, is used for the processing of milk into cheese by curdling/clotting the milk. It was reported that local cheese producers including the local dairy cooperatives, private cheese producers and multinational companies use about 37 metric tons of rennet to process milk into cheese.

In order to meet the large demand for rennet and to encourage small processors to use high quality microbial rennet instead of animal rennet obtained from the stomach of calves, the production capacity of the microbial rennet was upgraded in this research. Validated shelf-life for both forms of the enzymes averages at five (5) months for 100% retention of enzyme activity. The rennet protein also showed promising result by having 84% homology to the known rhizopuspepsin II gene of the *Rhizopuschinensis* CBS Strain (standard organism), making the microbe a potential source of rennet protein with different composition against the standard organism.



Project 2. Pilot-Scale Production of BIOTECH Cellulase and Alpha-Amylase for the Food, Feed and Other Industries

Project Leader: Fides Z. Tambalo

Cellulase and amylase are highly in-demand industrial enzymes. Cellulase is used for commercial applications in biomass conversion, textile desizing, detergent, food, and animal feed industries. Amylase is used for production of sugars that are in demand for food and beverages industries. The low-cost production of industrial enzymes will increase the competitiveness of the Philippine industry in general by having access to affordable but high activity enzymes that are comparable to imported enzymes produced by multinationals like Novo, etc.

This project shall validate, innovate and improve further the current enzyme technology developed by BIOTECH

UPLB for the local commercial production of cellulase and alpha-amylase. The project has conducted studies on the enzyme kinetics and shelf-life of produced cellulase and alpha-amylase. By 2015, the optimized large scale processing for 200 L and 1000 L scales will be obtained. Financial feasibility and enzyme activities per scale will be established and promoted for technology transfer.



Project 3 – Establishment of Bioprocess systems for the Production of Pili Pulp Oil and Protein Enriched Residue for the Food and Feed Industry

Project Leader: Dr. Laura J. Pham

Pili pulp oil is a potential attractive ingredient to the nutraceutical industry because of its good lipid profile attributed to the presence of minor components such as carotenoids, tocopherols and sterols. A biotechnological method for extracting pulp oil was developed at BIOTECH-UPLB which uses enzymes rather than toxic organic solvents to free the oil from the degradation of the cell wall.

In this project, the process conditions for the extraction of pili pulp oil using enzymes was optimized in the lab scale and pilot scale. The downstream processing of the pili pulp oil was also optimized. Physical and chemical compositions of the refined and virgin pili pulp oil produced were found comparable with the CODEX standard for virgin olive oil.

The resulting pili pulp residue from oil processing was enriched with protein for use as feeds for poultry and swine.

Sub Program 2: Scale-up Production of Probiotics for Food and Feed Applications



Project 1 – Development of Probiotic Starter Cultures and Adoption of Technology for Functional Food

Project Leader: Dr. Francisco B. Elegado

Growing public awareness of diet-related health issues has incurred the demand for probiotic foods. The health promoting properties of probiotic products put them under the category of “functional food” which is defined as foods that provide health benefits and basic nutrition. Probiotics are bacteria, generally lactobacilli or bifidobacteria associated with health benefits ranging from alleviation of symptoms of lactose intolerance, treatment of diarrhea, serum cholesterol reduction and cancer suppression.

The project developed probiotic-based functional foods and starter cultures. Initially, surveys on the needs for starter cultures and functional food products in small and medium scale industries in selected provinces were conducted including six (6) dairy cooperatives situated in Leyte, Baguio, Bacolod, Nueva Ecija, Camarines Sur and Laguna. Based from the analyses conducted by the team, the SMEs are interested in using starter cultures and rennet for production of local cheese and other fermented milk products. Appropriate carrier materials for stable starters were selected and formulated. Microbial viability, metabolites produced and sensory properties of the developed product were determined. Quality monitoring of the starter cultures produced were monitored. Immobilization, spray drying and freeze drying techniques were done for stabilizing the starters. Freeze-dried cultures were found to be shelf-life stable.



Project 2 – Application of Probiotic for Fish and Prawn

Project Leader: Dr. Laura J. Pham

Probiotics represent one of the most promising alternatives to antimicrobials (chemicals and drugs) developed in recent years to protect animal health and increase the efficiency of nutrient utilization. The market for animal probiotics developed in the Philippines is large. In 2010, aquaculture production in the Philippines was 2.7M metric tons. This huge demand has led to an increased use and misuse of drugs and chemicals in aquaculture resulting in food safety concerns.

This project has developed and tested probiotics specifically for fish and prawn. Part of the selected probiotics are those with inhibitory properties against common aquaculture pathogens. The lab scale feeding trials were conducted to validate the benefits derived from probiotics such as improvement in nutrient digestion and intestinal microflora, and to observe occurrences of antagonistic reactions of the microbes. Farm scale feeding trials were conducted to confirm initial results gathered.

Sub Program 3: Improvement and Commercialization of Microbial-based Fertilizers and Plant Growth Promoters



Project 1 – Improvement and Commercialization of Microbial-based Fertilizers and Plant Growth Promoters

Project Leader: Dr. Erlinda S. Paterno

The project enabled development of new BioGroe™ formulations to withstand stress level conditions such as climate change effects. BioGroe™, a microbial-based plant growth promoter containing selected plant growth promoter bacteria (PGPB), has been developed, packaged and tested in the propagation and production of crops and ornamentals by BIOTECH.

The project has produced new variants of BioGroe™ using microbial inoculants that are tolerant to soil stresses in order to improve soil productivity such as saline environment, acidic conditions, with biocontrol activity for selected diseases and for tissue culture purposes. Also a formulation containing multi-strain inoculant has been developed. These formulations have undergone shelf life studies and were found to be stable.

The variants have been subjected to efficacy trials and will be issued new product licenses under the Fertilizer and Pesticides Authority.



Project 2 – Large-scale Production, Improvement and Commercialization of NitroPlus™ Legume Inoculant

Project Leader: Fe G. Torres/
Dr. Marilou Sison

The initial rhizobial legume inoculants called NitroPlus™ developed and produced at BIOTECH, UPLB way back 1987, has been effective in increasing the legume crop yields. Through the project, enhanced NitroPlus™ formulations in solid and liquid forms were developed by using beneficial organisms as co inoculants with capacity to increase nodule occupancy and affect symbiotic nitrogen fixation. The co-existence of selected strains of active associated bacteria other than rhizobia on the surface of nodules of legumes were used as sources of phosphorus and other growth hormones.

The enhanced formulations have been subjected to efficacy trials and will be issued new product registrations under the Fertilizer and Pesticides Authority.



Project 3 – Optimization and Scale up of Production of MykoPlus for the Biofertilizer and Bio-Organic Fertilizer Industries

Project Leader: Dr. Jocelyn T. Zarate

One of the microbial inoculants developed by BIOTECH is the mycorrhizal inoculant Mykovam. Mykovam is a soil-based biofertilizer, composed of spores and colonized roots and other infective propagules of endomycorrhizal fungi. This fungus-root association is an efficient biofertilizer input for high value crops, ornamentals, fruit crops and forest trees.

A new product was formulated with trade name of MykoPlus that seek to solve the limitations of the previous product, Mykovam, especially in the production system. The enriched mycorrhizal inoculant (MykoPlus) is the first of its kind in the Philippines, as it consists of both mycorrhizal fungi and bacterial components. Since mycorrhizal fungi are not host specific, MykoPlus can be used for wider crop range including agricultural crops, fruit and forest trees.

Color change in the production medium of *Monascus purpureus* on a per-day basis after inoculation
(Image courtesy of the *Monascus* Project Team)



Related Project on Biotechnology



Production, Characterization and Application of Red Pigment Produced by *Monascus Purpureus* M1018

*National Institute of Molecular Biology and Biotechnology, University of the Philippines Los Baños (UPLB-BIOTECH)
Project Leader: Fides Z. Tambalo

Monascus purpureus (*M.purpureus*) is one the many species of molds used for pigment production, giving off a mixture of pigments with different colors like red, yellow and violet. It is widely used in Asian countries like China and Japan as coloring for fermented foods like rice wine, “Koji”, soybean, cheese and red meat. The red pigment of *M. purpureus* is believed to have therapeutic effects, specifically in lowering blood cholesterol anti-cancer and anti-diabetes.

This project shall pursue the large scale production of the *M. purpureus* red pigment. It will focus on the production of the red pigment since it is one of three colors that has high market demand and can be a replacement for the synthetic red dye such as Sudan C. The project has established the extraction protocol. Initial stability, solubility and application tests were done while the selection of best binder to use for the pigment is on-going.

Development of National Standards for Chemical Measurements

*Industrial Technology Development Institute (ITDI-DOST)

Having a national infrastructure to ensure that a nation’s chemical measurement results are fit for their purpose has been recognized as a necessity in the global economy and trading environment. Over the last decade initiatives have been taken at the international level and across measurement sectors to ensure that measurement sciences are applied in a systematic way. The growing demand of the public for reliability in chemical measurements has been recognized especially on issues regarding food safety and quality.

This program will formalize the institutionalization of metrology in chemistry in the country. Metrology in Chemistry (MiC) is the science of chemical measurements, concerned with studying and providing the basis for comparability and traceability in chemical measurements.

Initially, the Philippines will establish its competence in MiC through capability building on holding Proficiency Tests (PT) and developing analytical procedures at par with other National Metrology Institutes (NMIs). These includes method validation and conduct of higher order methods, as well as preparation of reference materials with traceability or acceptable reference value assignment. The target analytes of the program will be applied eventually for Calibration and Measurement Capability, the highest recognition given to NMIs which shows their capability to give true value per analyte that will be accepted anywhere in the world. The recognition for this capability will be applied to the International Bureau of Weights and Measures (Bureau International des Poids et Mesures, BIPM).

PT-14-04 Histamine in Canned Tuna (Cap sealing)
(Image courtesy of MIC Project Team)



Sample Proficiency Tests (PT) and Preparation of PT material for Metrology in Chemistry (MiC)
(Image courtesy of MIC Project Team)





MiC Project 1 – Inter-laboratory Comparisons of Additives and Contaminants in Foods

Project Leader: Dr. Benilda S. Ebarvia

This project focuses on the conduct of interlaboratory comparisons for Benzoic Acid in Fruit Juice and Histamine in Fish. Both belong to the top 20 products exported by the Philippines. Histamine in fish is among the analytes identified in the consultative forums held by the Standards Testing Division (ITDI-STD) composed of participants from industry and government agencies. A method for histamine has been developed at ITDI and will be compared to a primary method or a higher order method, then subsequently validated and applied for ISO 17025 accreditation. Benzoic acid was also identified during the consultative forum. This analyte is a preservative typically added to fruit juices and beverages.



MiC Project 2 – Production of Secondary Certified Reference Materials and Provision of Proficiency Tests for Metals in Water (Elemental Water Solutions)

Project Leader: Hermelina H. Bion

Metals analyses is important for monitoring detrimental amounts in food and environment. The target analytes

of the project are classified into 2 groups: group 1 composed of Lead (Pb), Cadmium (Cd), Manganese (Mn) and Copper (Cu) for food safety and environmental monitoring purposes and group 2 that includes Iron (Fe), Magnesium, (Mg), Zinc (Zn) and Calcium (Ca) for quantifying amounts of essential nutrients in food.

The team have been successful in conducting two (2) rounds of Proficiency Tests (PTs) for Benzoic Acid in Fruit Juice, one (1) round for Histamine in Fish and three (3) rounds for metals in water.

In terms of establishing international recognition of STD for MiC, STD was recognized this year as the Designated Institute for MiC by BIPM. The laboratory has also applied for accreditation to ISO 17025 and ISO 17043 for the target analytes. The ITDI has also been actively participating in the Asia Pacific Metrology Programme (APMP) and Consultative Committee on Quantitative Measurements (CCQM) meetings and workshops to gain a foothold on the technical and operational aspects of advanced NMIs in the regions and to promote the activities of MiC in the Philippines.



*Sample Preparation Room
(Image courtesy of MIC Project Team)*

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

**Industrial Technology Development Institute (ITDI-DOST)*

The Philippines is a potential producer of cocoa according to the Department of Agriculture. Presently, there is a growing interest from farmers to plant more trees due to increasing local and international demand for cocoa products. According to the Cocoa Foundation of the Philippines (Cocoa Phil), Filipino farmers are being encouraged by chocolate manufacturers like Mars Inc. to expand the local production of cacao given its favorable price in the international market. In 2005, the country's production was nearly 5,000 metric tons (MT) and local consumption reached almost 50,000 MT. This means that the country requires at least 30,000 MT of dried cacao beans yearly.



Dried Cacao Beans



Cacao Project 1 – Improving the Quality of Solid Cocoa Liquor Including Molded Cocoa Nibs and Developing the Capability of Small Scale Processors in the Manufacture of Intermediate Cocoa Products

Project Leader: Ma. Dolor L. Villaseñor

Philippine tablea can be said to contain almost all its natural flavanols since its process involves only roasting, grinding and molding. However, one of the unfavorable glaring sensory properties of tablea is its "sandy" mouth feel. Refining step is needed to improve its mouth feel similar to chocolate blocks sold to artisan chocolate makers. This project reviews and documents traditional and existing practices in the processing of molded cocoa nib [tablea]/ solid cocoa block, cocoa butter and cocoa powder. It aims to establish the processing parameters for solid cocoa liquor/ molded nib and improve safety and sensory properties. Processing parameters for alkalization of cocoa beans and intermediate cocoa products using the designed and fabricated equipment developed under the program shall also be established. It shall also determine the appropriate storage conditions for the products to be developed.



Cacao Project 2 – Microbial Community and Biochemical Profiling for Microbial Augmentation and Development of Quality Indicators for Cacao Fermentation and Processing

**National Institute of Molecular Biology and Biotechnology, University of the Philippines – Los Baños (UPLB-BIOTECH)*

Project Leader: Dr. Jessica Simbahan

The fermentation of cacao is crucial in the development of the body and richness of the chocolate flavor from cacao beans. It is important for the removal of tannins, which can impart an astringent flavor, as well as other compounds that can detract from the final flavor of the chocolate. Fermentation is a spontaneous process that occurs in 3-6 days and can be carried out in baskets, boxes, trays or heaps. The project aims to improve cacao fermentation through development of a starter culture from indigenous microorganisms as well as strategies to avoid mycotoxin production. It will be conducting five studies namely: Microbial Community Profiling of Cacao Fermentation using Molecular Methods; Chemical Profiling of Cacao Fermentation; Characterization of Microorganisms Important in Flavor Production of Cacao; Development of Inocula Using Promising Microorganisms; and Identification of Best Practice for Cacao 500kg Box Fermentation.



Cacao Project 3 – Development and Evaluation of Improved Drying Technologies for fermented Cacao/ Cocoa Beans in the Philippines

**Department of Agriculture & Philippine Center for Postharvest Development and Mechanization (PhilMech)*
Project Leader: Dr. Romualdo C. Martinez

In response to the need for further improvement of the drying methods for fermented cocoa beans, the project “Development of Appropriate Drying Systems for Philippine Fermented Cocoa Beans” was funded by PhilMech and implemented in 2010-2011 in order to address the problem of poor bean quality due to inadequate drying methods. In this project, two drying technologies namely Multi-Commodity Solar Tunnel Dryer (MCSTD) and Fixed-Bed Dryer with Biomass Furnace were investigated. Moreover, the researchers improved the design and lowered the cost of the said drying equipment.

The improved dryer prototypes were field tested for fermented cocoa beans. Also, SHEGA III Moisture Meter, developed by PhilMech, was field tested and used for the measurement of the moisture content of dried cacao beans.



Cacao Project 4 – Design and Fabrication of Equipment for the Production of Local Cocoa Products

Project Leader: Engr. Reynaldo L. Esguerra

Small processors of ‘tablea’ all-over the country use different improvised equipment and methods. These equipment need to be assessed and documented to improve the current quality of Philippine Tablea.

Upgrading the secondary processing equipment for cocoa products to address the need of local processors in terms of consistent product quality and processing capability will be the goal of this project. Making available the equipment for industrial processing of cocoa will support the future needs of the cacao industry and will open up avenues for the processing of cacao and promote its agricultural production.



Refining of Cacao Liquor
(Image courtesy of ITDI-DOST)

Smart Textile Biopolymers Research and Development Program

**Philippine Textile Research Institute (PTRI – DOST)*

The program is a pioneering work infusing multi-functionality in textiles by exploring the application of nanotechnology and polymer grafting directly in lignocellulosic pineapple and other staple fibers. It delves on the development of textiles with novel and unique properties due to the relatively underexplored field of nanofinishing on local textiles containing biopolymers.

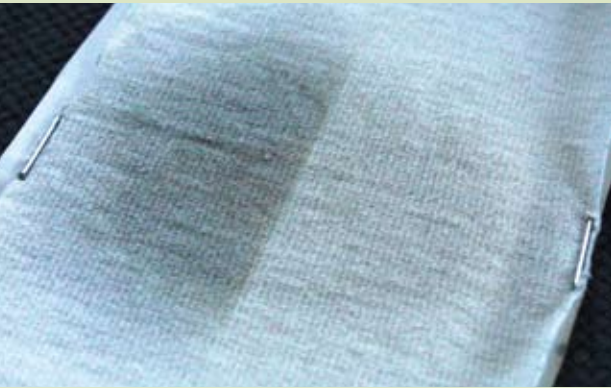


Smart Textile Project 1. Photocatalytic Multi-Functional Natural Fiber-blended Technical Textiles and Materials

Project Leader: Nora B. Mangalindan

The increasing number of skin cancer occurrences observed worldwide has led to conscious efforts to minimize, if not totally prevent cumulative UV exposure. The most frequently recommended form of UV protection has been the use of sunscreens and clothes that provide skin coverage. With these, the development of textiles with UV absorbers has been becoming a trend worldwide, with some using organic UV blocker compounds that can be highly susceptible to a number of degradation mechanisms.

The project developed simplified techniques for nanocomposite dispersions on textile, cheaper, organic, natural and readily available polymer matrix was used to reduce the amount of nanoparticles in the textile without compromising its UV protection capability and prevent the aggregation of nanocomposites. The nanofinishing approach involves TiO₂ and ZnO in their most suitable stabilizing matrix applied on natural-fiber blended textiles thereby infusing the desired self-cleaning, UV protecting and antimicrobial properties. These nanocomposites shall be characterized and applied via pad-dry-cure method to fabrics with selected staple fibers.



Photocatalytic Cotton Fabric with Self-Cleaning Property
(Decrease in stain after exposure to light)
(Image courtesy of PTRI Smart Textiles Program Team)



Smart Textile Project 2. Durable and Regenerable Biocidal Hydantoin-Grafted Polyester and Lignocellulosic Fiber Containing Textiles

Project Leader: Jeannie Lyn J. Cabansag

There is a growing market trend for development of textiles with antimicrobial and biocidal properties such as socks and sportswear. Several antimicrobial agents have been studied to be incorporated into fabrics or fibers either chemically or physically. The Dimethylol Dimethyl Hydantoin (DMDMH) as a biocidal finish have been of particular interest to the project due to its low-cost, stability, rechargeable properties, and efficacy in preventing microbial activity. In this study, optimum DMDMH concentration will be grafted on to staple fibers using the conventional “pad-dry-cure” finishing method. Untreated, treated and chlorinated fabrics will be prepared, analyzed and subjected to biocidal efficacy, durability, regenerable property and light stability of Chlorine (Cl) bound assessments.



Water Particles are Unable to Seep Through the Textile.
This is called the “lotus-effect”
(Image courtesy of Julius Leaño, Jr. of PTRI-DOST)

Revitalization of the Textile and Garment Industries through Science and Technology (Revit)

**Philippine Textile Research Institute (PTRI-DOST)*

The program on Revitalization of the Philippine Textile and Garment Industries through Science and Technology as the first of the three major S&T approaches shall contribute to the revival and sustainability of the textile industry. At its highest peak in the early '80's, there were over 200 non-integrated and 36 integrated firms with employment of 320,000 labor force, the highest in the manufacturing sector, with additional 700,000 workers as sub-contractors.



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

Project Leader: Engr. Daniel J. Lavin

The project shall catalyze innovative yarns and textiles from materials indigenous to the country in order to produce innovative Filipino textile products adding value and authenticity to the existing local textile products. It will involve upgrading of the existing PTRI spinning, weaving and knitting facilities to produce specialized yarns and expertly woven and knitted fabrics using different blends of indigenous materials and to establish standard specifications in the processing of these blended yarns and fabrics. The research shall also serve as venue to bring to the market PTRI's innovations where product improvement, green technologies, smart and functional textiles and new textile raw materials are concerned. The renovations of the Technical Services Division (TSD) Processing Laboratories and Research and Development Division (RDD) Boiler Room were finished in 2014 as well as the upgrading of the parts and accessories of ringframe, open-end and knitting machines.



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

Project Leader: Nora B. Mangalindan

Handloom weaving is one of the leading handicraft industries in the Philippines. It has great potential as an industry because it is labor intensive and utilizes indigenous materials such as abaca, raffia, pineapple, buri, etc. This legacy is supported by the second project that shall ensure a sustained weaving industry. Considering that the country's weaves are located



Circular Knitting Machine (Image courtesy of PTRI)

mostly in the countryside, the program definitely addresses President Ninoy Aquino's poverty reduction and countryside development agenda. Particular attention to poorest provinces for livelihood generation through handloom weaving innovation centers will be established



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

Project Leader: Jeannie Lyn J. Cabansag

The third project will address the need for the scale up volume production of natural dyes utilizing the existing dyeing machineries. Sustainable supply of natural dyestuff would be ensured by establishing dye production satellite facilities. The project will also see to the expansion of application of Philippine natural dyes from textiles to food and cosmetics sector. The development of natural food colorants and cosmetic formulations would further show potential for a wider array of applications of natural dyes.



Revit Project 4 – Modernization of Geosynthetic Testing Services

Project Leader: Engr. May S. Rico

Started in March 2014, the research will address the evolving needs of the construction industry involved in civil engineering works. The modern facilities will respond to frequently requested tests for geosynthetics as a requirement of the industry to ensure the suitability and durability of materials for government infrastructure projects thereby addressing the many infrastructure-related problems of the country.

National R&D Program for Natural Rubber (NR) Processing and Rubber Products Manufacturing

The increasing demand for rubber and specialty rubber from the automotive, industrial, construction and medical supplies industries has sparked interest on developing the local rubber industry that has long struggled to survive amidst neglect, rising cost of doing business and peace and order situations in Mindanao. With the government recognizing the potential of the rubber industry to improve its world market position, the DTI led the formation of the interdepartmental Technical Working Group for Rubber, composed of different agencies of the government, academe and private sectors. As part of the DOST's support and contribution to the Rubber Industry, PCIEERD has developed the National Rubber R&D Agenda which targets to address concerns identified by the industry through the farm to market approach where PCAARRD shall address agricultural productivity issues and PCIEERD, on the other hand, shall address market competitiveness through quality improvement and development of innovative rubber products. The agenda is included in the S&T interventions for processing under the Rubber Industry Strategic Plan.

At the current state of the industry, an estimated total area of 138,710 ha in 2010 were planted with rubber, generating a total of 277,420 jobs to support roughly 70,000 families affected and dependent on rubber. By pouring in investments to increase land area and productivity, and product value through quality improvement, these families will benefit through increased opportunities and income. Hence, the program was crafted and being implemented to increase competitiveness of the rubber industry by targeting the major problems identified by the industry through processing technologies, manpower upgrading and provision of technical support. This three-pronged approach provides S&T interventions needed to attain sustainable economic development particularly in Mindanao where natural rubber is primarily sourced.



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

**DOST Regional Standards Testing Laboratory Region IX*

Project Leader: Dir. Brenda Nazareth-Manzano

The Philippine Rubber Industry Association (PRIA) identified the establishment of rubber testing facilities near the source in order to foster quality consciousness among producers and in turn, provide means for buyers such as rubber manufacturers to verify quality of the product. To facilitate and enhance the competitiveness of the Philippine Rubber Industry, the establishment of laboratories that are aligned with international standards for raw rubber testing should be set-up.



Rubber Tree in Mindanao

As an initiative of the DOST, this project is aiming for the establishment of an operational testing facility for natural rubber that is internationally recognized and strategically located in Zamboanga City to cater to the highest producer of natural rubber in the Philippines, the Zamboanga Peninsula and the 3rd highest producer, the Basilan Island. DOST-IX will expand its ISO 17025 accreditation to include the analytes for testing Technically Specified Rubber (TSR). The team has also conducted benchmarking activity at Malaysia Rubber Board and Standard Malaysia Rubber Testing Laboratory to compare equipment specifications and laboratory layout and learn laboratory management techniques and training plans. The laboratory is set to accept samples in 2015.



Rubber Project 2 – Optimization and Improvement of Process in the Production of Technically Specified Rubber (TSR) and Demonstration of improvement felicities in Zamboanga Peninsula

**Forest Products Research and Development Institute (FPRDI – DOST)*
Project Leader: Engr. Belen B. Bisana

The local natural rubber industry has been plagued with problems that resulted to low share of supply in the world market. Hence, the project will determine, validate and optimize the processes that have significant effects on technically specified rubber quality and demonstrate these practices and technologies to increase quality consciousness of farmers, tappers and processors. The interventions shall be realized by improving an existing natural rubber processing plant which shall serve as a full-scale demonstration facility.

The project's main deliverables cover documentation, implementation and promotion of best practices and appropriate technologies in rubber tapping, latex harvesting and handling, and processing into crepe or crumb rubber. These are to be verified through laboratory analysis of crepe and crumb rubber as a result of the interventions that are found appropriate for rubber processing. The interventions shall be realized thru improvement of an existing NR processing plant, which shall serve as a full-scale demonstration facility.



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

**College of Engineering, *University of the Philippines – Diliman (UP-COE)*
Project Leader: Dr. Leslie Joy L. Diaz

Local tire manufacturing companies, of which some are considered major suppliers of tires to original equipment manufacturers (OEM), are aware of the need to continually pursue innovation especially with the impending free trade agreement between ASEAN countries. With the deficient R&D capability of the partner tire manufacturing companies of the project, an R&D tie-up with the implementing institute, UP Diliman-Department of Mining, Metallurgical, and Materials Engineering (UPD-DMME), in order to focus on innovations on development of materials for tire manufacturing involving locally available nanocomposite materials.

The team accomplished collection of local and foreign sourced-carbon black and studied its possible sources. Also, UPD has started establishing the Rubber Materials R&D and Consulting Facility, with final lay-out and furnishing requirements completed and are awaiting execution upon availability of counterpart funds from UPD.



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

**Industrial Technology Development Institute (ITDI-DOST)*
Project Leader: Ms. Adelaida Seneca

Tests and analyses of rubber hoses and hose assemblies, which are products required by the oil, gas and liquid petroleum industries including consumer LPG and gas products, were recently recognized by the authorities. The DTI called on the need to implement standards that would enable them to certify the quality (PS Mark) of rubber hoses attached to gas/LPG assemblies due to reported accidents that occurred. However, due to the absence of local facility, no third party testing laboratory could offer the testing requirements of ISO 4079:2009.

To prevent the possible entry of locally-produced and imported sub-standard rubber hoses and hose assemblies in the market, the project will cover the establishment of adequate facilities for the performance testing of rubber and rubber-based products. This will involve acquisition of equipment, training of analysts and competency development to extend the scope of ISO 17025 accreditation of ITDI. Additional tests to be included as validated by the rubber manufacturing industry includes Ozone Resistance Weathering Tests, Low Temperature Tests - Brittleness test, Rebound Resilience test, Flammability Resistance, Electrical Property Test (Volume Resistivity) & ROHS, all of which are not available locally.



Coagulated Latex (Image courtesy of Rubber Project Team)

Physical Vapor Deposition of Advanced MAX Phase Materials



**Plasma Physics laboratory, National Institute of Physics, College of Science, University of the Philippines Diliman*

Project Leader: Dr. Henry J. Ramos

This project is a pioneering effort in the research and development of MAX phase materials by Physical Vapor Deposition (PVD) using a magnetized sheet plasma facility developed at the National Institute of Physics in UP Diliman. Applications like decorative and functional coatings on polymers, glass and metals/ metal alloys were investigated using multilayer combinations of proven MAX phase PVD layers on these substrates. Results of the study generated the database of operational conditions or the menu/ recipe on the PVD machine like arc evaporation current, bias voltage, gas flow, temperature cycle, ion energy and treatment time which caters to specific household, industrial or commercial applications.

Thin film coatings of MAX Phase combinations: Nb-Al-C; Ti-Cd-C; Ti-Si-C; and Ti-Al-C on various substrates without substrate heating and bias were produced. Said thin films may be utilized for decorative or functional applications. Possible potential applications may be pursued for example on TiSiC-coated polycarbonate. The polycarbonate substates which exhibit the highest surface energy thereby the most hydrophilic coated substrate in every variation could find applications in self-cleaning and anti-fog operations on windows, doors, or roofs. The Ti-Si-C can be coated to imbue cooking pans with non-stick properties. Other functional utilizations of the other MAX films can be explored.



Sheet Plasma Negative Ion Source used for MAX Phase Thin Film Deposition (Image courtesy of the Advanced MAX Phase Project Team)

Sensors for Agricultural and Fishery Ecosystems and Harvests Safety (SAFEHarvestS) Program



Project 1 – Development of portable surface plasmon resonance Molecularly Imprinted Polymer (MIP)-based sensor for detection of histamine in shrimp/ fish harvests
**Institute of Chemistry, University of the Philippines Diliman*
 Project Leader: Dr. Florian R. del Mundo

Recently, Thailand, Vietnam, Malaysia, China and Indonesia experienced decline in shrimp production because of early mortality syndrome (EMS) in their shrimp farms which affects the quality and quantity of their shrimp produce. To take advantage of the current opening in the demand for shrimp in the world market, the Philippine government has been implementing “crash programming” on shrimp farming.

In view of this drive to export shrimps, the need to develop quality assurance sensor has become quite significant. In addition, this sensor can also be used to make sure that shrimps reaching the local markets are safe enough for consumption. The goal of this project is to develop a portable surface plasmon resonance (SPR) MIP-based sensor for the detection of histamine in shrimps.



Project 2 - Development of sensitive prototype sensor for monitoring insecticide residues in fruits and vegetables to address current Maximum Residue Limits (MRLs)
**National Crop Protection Center, University of the Philippines Los Baños*
 Project Leader: Dr. Susan May F. Calumpang

This project intends to develop a diffraction sensor for profenofos and malathion (insecticides) residues in fruit and vegetable as a monitoring tool in the field for quicker assessment of safety and compliance to good agricultural practice.



Project 3 – Development of Potentiometric MIP for the Detection of Clenbuterol in Meat
**Institute of Chemistry, University of the Philippines Diliman*
 Project Leader: Dr. Susan D. Arco

This project shall develop a testing kit for the detection of clenbuterol in hog. The sensor itself will be developed

and is based on polymeric membrane ion selective electrode (ISE) with potentiostat transduction mode. The potential response generated at the surface of the membrane electrode will be the basis of detection of clenbuterol.

The developed MIP-potentiometer will be useful for the quality control monitoring laboratories of government agencies such as the Department of Agriculture-National Meat Inspection Service.



Project 4 – Development of Electrochemical Sensor Platform for Fish Freshness Monitoring
**National Institute of Physics, University of the Philippines Diliman*
 Project Leader: Dr. Armando S. Somintac

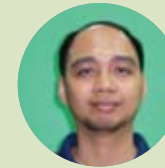
The development of electromechanical sensing will be useful in monitoring the environment as well as in securing food and water safety. This project aims to fabricate cost-effective platforms integrated with metal oxide based sensor capable of determining fish freshness.

At the end of the project, the information collected about the sensor and sensor platform will pave the way for the construction of a handy and compact sensor device.



Project 5 - The Development of Portable Detection Systems for Banned Drugs such as Nitroimidazoles and Chloramphenicol in Hog Urine and Piggery Run-off Water
**Institute of Chemistry, University of the Philippines Diliman*
 Project Leader: Dr. Imee Su Martinez

The project will come up with analytical testing kits for trace detection of nitroimidazole/chloramphenicol in swine urine and piggery run-off water, as well as generate information for legislation purposes. The generated sensing devices will be important in ensuring meat safety for the general public, as well as profit loss mitigation for livestock growers. Lastly, a Sum Frequency Generation (SFG) will provide the latest surface-specific analytical tools for integrated circuits in the country.



Project 6 – Molecularly Imprinted Polymer modified-Carbon Paste Electrodes (MIP-CPEs) as multi-analyte sensor for the detection of Organophosphorus pesticides Chlorpyrifos and Fenitrothion and Triazine herbicide Atrazine
**Institute of Chemistry, University of the Philippines Diliman*
 Project Leader: Dr. Allan Christopher C. Yago

In this study, pesticides will be detected via electrochemical method using a molecularly imprinted polymer (MIP)-modified carbon paste electrode (CPE) composite system.

Application of MIP-CPE acting as electrode provides a simple technique in monitoring these hazardous pesticide residues (chlorpyrifos, fenitrothion, and atrazine), as well as enhanced selectivity and possible low detection limits required in pesticide analyses. Once the individual MIP-CPEs are prepared, they can then be employed for the detection of pesticide residues in aqueous system

Chemical Sensors for Mine Site Monitoring

The growth of the Philippine mining industry entails an increase in potentially toxic and irreversible environmental effects. A major contributor to these effects is the management and disposal of mine tailings. Mine tailings are leftover materials after the valuable minerals are separated from the non-valuable materials. However, managing mine tailings discarded to dams are costly and dams exposed to mine tailings can be a source of highly acidic water, leading to the need for a permanent monitoring and water treatment.

One important component of the management as well as the mitigation of the effects of the mining industry on the environment is the ability to monitor different contaminants, using different modes of sensing, and at different sensing scenarios. The objectives of this program are to develop electronic and chemical environmental sensors as well as integrate all sensor data for various mining related situations. These sensors will be critical in the management, regulation and safety of the Philippine mining industry as well as the communities that host the industry's operations.

Flow Cells (above),
 Polymer Inclusion Membrane
 (PIM) (below - left),
 Mining Site Visit (right)
 (Image courtesy of Chemical
 Sensors Program Team)





Chemical Sensors Project 1: Mapping of Heavy Metal Contamination in the Philippine Mining Soils Using Laser-induced Breakdown Spectroscopy (LIBS) Field Sensors

**Institute of Chemistry, University of the Philippines Diliman*
Project Leader: Dr. Rheo Lamorena-Lim

This study provides a systematic approach for monitoring the soil quality affected by small-scale mining activities in nearby communities in the Philippines. It will utilize the Laser-Induced Breakdown Spectroscopy (LIBS), a sensing instrument used for quantitative and qualitative analyses of heavy elements (such as Mercury (Hg), Cadmium (Cd), Arsenic (As), Lead (Pb), Nickel (Ni), Zinc (Zn) and others. The LIBS monitoring device will handle direct measurements (without complex sample preparations) of contamination in soil samples. The LIBS method, a nondestructive surface analytical technique, involves very little sample preparation and the analysis can be completed within a matter of seconds or longer.



Chemical Sensors Project 2: Optical Sensors for the Determination of Copper (Cu) and Zinc (Zn) in Ambient Water

**Institute of Chemistry, University of the Philippines Diliman*
Project Leader: Dr. Lilibeth Co

In this project an inexpensive, portable, robust and sensitive optical chemical sensors (optode) utilizing a flow injection system or a microfluidic paper-based system is being constructed to analyze heavy metals Copper (Cu) and Zinc (Zn). The sensors will be a “pack, go and analyze” system.



Chemical Sensors Project 3: Gaseous Elemental Mercury Sensors for Atmospheric Monitoring

**Research Center for Natural and Applied Sciences (RCNAS), University of Sto. Tomas*
Project Leader: Dr. Fortunato Sevilla III

Gaseous Mercury is measured using commercially available analyzers. These analyzers require sample collection and the introduction of the sample to the instrument. This project is developing a cost-effective sensor system that can be employed for real-time measurements for the monitoring of gaseous mercury levels at the Artisanal Small-Scale Gold Mining (ASGM) sites.



Chemical Sensors Project 4: Integrated Sensing System Using Mobile and Cloud Technologies for Mining and Nearby Communities

**School of Science and Engineering, Ateneo de Manila University*
Project Leader: Dr. Emilyn Q. Espiritu

This study provides a systematic approach in monitoring heavy metals in air, water and soil (environmental compartments) including human contaminations resulting from exposures due to indiscriminate mining practices. Specifically, the project will design low-cost, mobile and nano-based devices for monitoring water quality parameters (such as dissolved oxygen, PH temperature, salinity), and arsenic and mercury levels in rivers and human volunteers in selected large- and small-scale mining sites and communities.



Chemical Sensors Project 5: Data Integration and Visualization of Sensor Output for Mine Site Monitoring

**Ateneo de Manila University*
Project Leader: Dr. Andrei D. Coronel

As an addition to the Chemical Sensors program, this project will develop and implement an IT framework that allows storage, integration, and processing of the data outputs coming from remote sensors that are part of the entire program. Data received from the remote sensors and mobile devices will be processed, and the derived information will be consequently provided to the mining site community through a mobile application, a website and a public display board showing relevant information regarding mining site toxicity (river water quality, air/water contaminants).



Ateneo Sensor Control box with plug-ins for pH, conductivity, DO communicates wirelessly with Android phone. (Image courtesy of Chemical Sensors Project 5)

e-Asia Joint Research Program (JRP): Development of Functional Nanocarbon-Based Catalysts for Biomass Conversion Processes



**Department of Chemical Engineering, De La Salle University*
Project Leader: Dr. Joseph Auresenia

Towards realization of green and sustainable carbon and biomass-based society in East Asia, this multilateral joint research aims to develop carbon-based catalysts as applied to conversion of biomass to value-added chemicals and biofuels focusing on microalgae, marine and nonedible biomass resources as feedstocks. Emerging carbon-based catalysts such as graphene, carbon nanotube and hydrothermal carbon chemically modified with functional groups such as sulfonic or amine groups to adjust its acidity or basicity will be developed. The functional carbon-based catalysts will be applied to reaction systems using environmentally friendly microwave and supercritical fluid technologies. In addition, the proposed joint research program intends to strengthen cooperation among Filipino, Thai and Japanese researchers for more active future research collaboration, and to promote development of young researchers to address the imminent biomass-centered economy in the region.

The Philippine research team will synthesize and functionalize the carbon nanotubes (CNT) and exploit its use as functional carbon-based catalysts for various applications including conversion of waste oils to biodiesel and marine biomass conversion to biochemical. They will be sharing their expertise and experience on carbon nanotube production, microalgae production and biodiesel production from various seeds, and Life Cycle Analysis.

Related Projects



Fabrication of a Solid-State Rechargeable Li-ion Battery using Li7La3Zr2O12 as Solid Electrolyte for Energy Storage Applications

**Department of Mining, Metallurgical and Materials Engineering, University of the Philippines Diliman*
Project Leader: Dr. Rinlee Butch M. Cervera

For the next generation energy storage systems, the development of lithium ion batteries is a significant endeavor not only due to its widespread applications, much faster charging, higher energy density, and longer battery usage time but also as support for obtaining

a sustainable and clean alternative energy source. In the proposed research, the project intends to fabricate a solid-state rechargeable Li-ion Battery in order to obtain a high energy density energy storage device that is safer and have longer life cycle as compared to Lead acid batteries and those Li-ion batteries using liquid electrolytes. The project aims to synthesize Lithium Lanthanum Zirconium Oxide (Li7La3Zr2O12), via low temperature wet chemistry approach. The synthesized sample will then be electrochemically analyzed for its conductivity and performance as a solid electrolyte for lithium-ion battery. This solid-electrolyte will then be used to fabricate a solid-state rechargeable Lithium-ion battery.



Development of a Low-Energy Ion Source System for the Synthesis of Diamond-like Carbon Films

*Department of Mining, Metallurgical and Materials Engineering, University of the Philippines Diliman
Project Leader: Dr. Magdaleno R. Vasquez Jr.

When technological applications of components involving contact are subjected to abrasive conditions, they can be limited by the tribological characteristics of the interacting surfaces. This limitation will diminish the intended function of the component, which eventually leads to failure and shortened tool lifetime. The estimated direct and consequential annual loss to industries due to wear is around 1-2% of a country's GDP. To improve the performance and minimize wear, components may be coated with films that have superior surface properties. Systems such as diamond-like carbon (DLC) coatings have tremendous potential because of its hardness and low coefficient of friction.

Synthesis of DLC films is usually a physical process using energetic ions. The quality of the film is strongly dependent on the incident ion energy. For a good DLC film, ion energy should be around 100 eV. By properly tuning the synthesis parameters, properties of the DLC coatings can be controlled. The goal of this project is to develop a low-energy ion beam system for DLC film deposition.

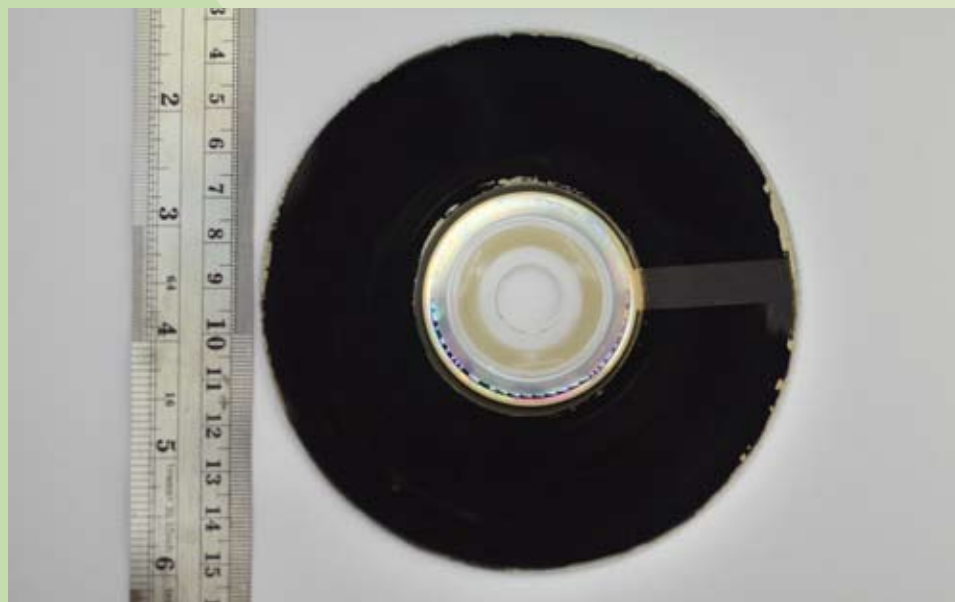


A Graphene-Based Electrochemical Supercapacitor for Solar Cells

*College of Science, University of the Philippines Baguio
Project Leader: Dr. Ian Jasper Agulo

Electrochemical Supercapacitors (EC) are well-known for their long operational life, very good cyclability, high specific power and broad operating temperature range when compared to conventional capacitors and batteries. The basic idea in this research is to fabricate an energy storage device based on Laser-Scribed Graphene (LSG) nanostructures. LSG can be used as electrodes for electrochemical capacitors and provides high energy storage, fast charging and discharging times.

The new energy storage device, the LSG-electrochemical capacitor (LSG-EC), will then be optimized and designed for solar cells. The project also intends to integrate the LSG-EC with solar cells in one solar module.



Laser-irradiated Graphene on an Acetate Substrate attached to a Laser-Scribe DVD (Image courtesy of Electrochemical Supercapacitor Project Team)

Energy

Wind Resource Assessment for Wind Power Systems



*Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)
Project Leader: Anthony Joseph R. Lucero

Wind speed and direction were collected in the project sites and these will be analyzed to determine the techno-economic viabilities of putting up wind power systems.

The five (5) sites considered in the study are a) Siargao, Surigao del Norte, b) General Santos, c) Lanuza, Surigao del Sur, d) Canavid, e) Eastern Samar, and San Vicente, Palawan. These areas are either ecotowns identified by the Climate Change Commission or areas serviced by the Strategic Power Utilities Group of the National Power Corporation. In addition, most are located in Mindanao in order to attract renewable energy investments in the area.



Project Leader, Mr. Anthony Lucero, retrieving data from the logger of the wind monitoring station in General Santos

Smart Grid Technology for Filipino Household

*Electrical and Electronics Engineering Institute (EEEI), University of the Philippines Diliman

High energy cost occupies a huge portion on the fixed expenses of an average Filipino family, making it one of the known challenges faced by the country. Moreover, the Philippines has one of the highest electricity rates in Asia. The Smart Grid program aims to address this issue by identifying the most consumer-friendly way of implementing techno-economic solutions that would enable end-users to manage, and eventually, reduce energy consumption.

The program is composed of three (3) projects:



Project 1 – Design and Development of a Smart Home Platform

Project Leader: Dr. Jhoanna Rhodette I. Pedrasa

This platform utilizes an in-house display that informs the consumers of their total and individual appliance consumption. The project has finalized the hardware of the smart plug, smart meter, In-House Display (IHD), and Branch Circuit Meter moving towards their mass production for deployment in 20 homes in Palawan. Currently, the project is designing the purpose-built enclosures for all the abovementioned hardware modules.



Smart Plug Component (Image courtesy of the Smart Grid Project Team)



Project 2 – Design and Development of an Advanced Metering Infrastructure (AMI) Emulator Platform

Project Leader: Dr. Michael Angelo A. Pedrasa

An Advanced Metering Infrastructure (AMI) provides real-time data about power consumption which helps end users to make smart choices about their energy usage based on the price at the time of use. In this project, the features of AMI were implemented in an emulator (hardware and software) that will be deployed in several households to simulate a small-scale smart metering infrastructure. The emulator shall also be used to conduct consumer studies relative to the research. Towards the end of the project, targeted 20 smart meters, 20 in-house displays, 20 branch circuit meters and 60 smart plugs found in the emulator shall be improved.



Project 3 – Prepaid Metering and Smart Home System: Technology Acceptance and Technology Features Studies

Project Leader: Dr. Jordan Rel C. Orillaza

Prepaid metering and smart home system are two technologies that are expected to enable households to manage their electricity consumption with minimal effect in their quality of life. This promise of significant reduction in both the total energy consumed and the peak demand of the customer is anchored on a positive user experience. The project conducted a series of surveys in Leyte Electric Cooperative (LEYCO) II and Palawan Electric Cooperative (PALECO) electric distribution franchise areas to investigate users' opinion during the development of prepaid metering and smart home system technologies. Surveys on Prepaid Metering, Prepaid Metering Preferences, Intelligent Home System and Intelligent Home System Preferences were completed with more than 1000 participants throughout Palawan province for each survey. In Brgy. Biabas, Ubay, Bohol, 110 participants out of the 167 households were offered Prepaid Metering.

Other Projects on Energy



Design and Implementation of a Power Distribution System for Data Centers

**Electrical and Electronics Engineering Institute (EEEI), University of the Philippines Diliman*

Project Leader: Dr. Michael Angelo A. Pedrasa

The Power Distribution Unit (PDU) is a locally developed and low-cost energy monitoring system for Data Centers. The PDUs are capable of measuring the energy consumption of several computing devices at ambient temperature, and periodically send these measurements to the central monitoring software. The central monitoring software is an application that receives, archives, and organizes the data sent by the PDU, and presents these data in an organized way to the data center operator as well as the end-users (the owner of the computing equipment).



Tidal Current Energy Integrated Resource Assessment and Spatial Planning Tool

**Department of Geodetic Engineering, University of the Philippines Diliman*

Project Leader: Engr. Ma. Rosario Conception O. Ang

As energy need continues to increase in the country, the project aims to create the foundations on advancing Ocean Renewable Energy (ORE) development in the Philippines by developing a web-based Geographic Information System (GIS), a planning tool for marine space to analyze potential sites for ORE development. It shall also create models for energy conversion and estimation of energy yield.



Thermophysical and Transport Properties Characterization of Industrially Important Solvent Systems

**School of Chemical Engineering and Chemistry (ChE-Chm), Mapua Institute of Technology (Mapua)*

Project Leader: Dr. Allan N. Soriano

The project characterized the thermophysical and transport properties of different solvents that could be used as absorbent for carbon capture from flue gases. The study on property measurements and correlation development could add to the continuously increasing number of important data needed for process and equipment design on carbon capture. The results will

Nanotechnology

Nanostructured Solar Energy Devices Program

**University of the Philippines Diliman/ Ateneo de Manila University*

Solar energy is an important form of renewable energy and is one of the more environmental friendly alternatives to fuel energy. Development of solar energy will help alleviate the nation's dependence on oil for power generation. Solar power devices are now commercially available. However, there remains a room for improvement in terms of its efficiency.

This program is aimed at improving the efficiency of solar cells in absorbing and converting light into current through the synthesis of nanostructures which addressed the issues on system loss due to light reflection, shadow blocks and collection inefficiency.

Specifically the project zeroed in on the use of silicon nanostructures and textured surfaces to reduce reflection losses, the use of transparent thin films as electrodes to minimize the shadowing losses and the use of nanoparticles to enhance collection efficiency of the solar cells.



*High quality metal contacts as well as a transparent conducting oxide contacts for solar cell applications
(Image courtesy of Nanostructured Solar Energy Devices Program)*



Project 1 – Nanostructures for Solar Cell Applications

**National Institute of Physics, University of the Philippines – Diliman (UP-NIP)*

Project Leader: Dr. Arnel A. Salvador

The project aimed to develop and incorporate nanorods, nanowires and other one dimensional nanomaterials into the fabrication of solar cell devices. The project paved the way for the improvement of local facilities for solar cell prototyping and characterization.



Project 2 – Transparent Electrodes for Solar Cell Applications

**National Institute of Physics, University of the Philippines – Diliman (UP-NIP)*

Project Leader: Dr. Roland Sarmago

The researchers investigated the use of graphene in producing transparent electrodes and integrate these electrodes into the fabrication of dye-sensitized, GaAs-based and nanostructured solar cell devices. Solar cell devices with transparent electrodes as contact is

deemed to be more efficient than a metal contact since the visible light would just pass through it, allowing more light to be absorbed and converted to energy.



Project 3 – GaAs-based Solar Cell Devices

**National Institute of Physics, University of the Philippines – Diliman (UP-NIP)*
Project Leader: Dr. Armando S. Somintac

The project fabricated a Gallium Arsenide (GaAs) based solar cell device which has the advantage of a direct band gap, that it can be used to absorb and emit light efficiently. To further improve its efficiency, researchers integrated nanostructured materials into the fabricated GaAs based solar cell devices.



Project 4 – Modification of Graphene for Nanostructured Photovoltaic Cells

**Ateneo de Manila University*
Project Leader: Dr. Erwin P. Enriquez

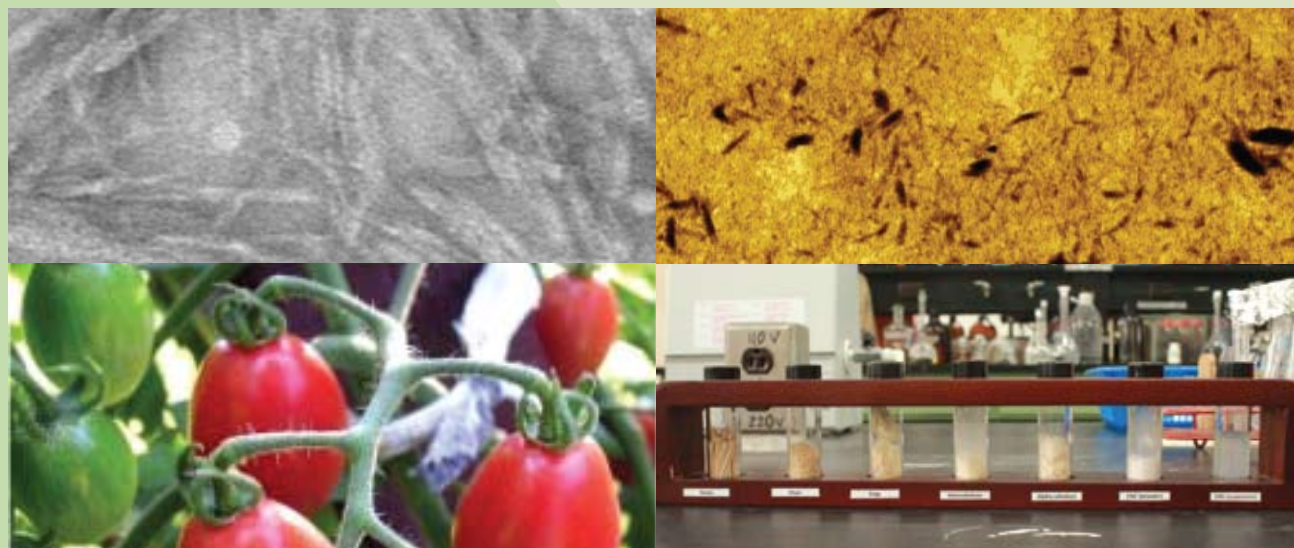
This project investigated how graphene can be chemically modified to render functions in key components of the dye-sensitized solar cell (DSSC), either to make cheaper components or improve cell efficiency and stability.

Graphene offers an advantage since it is produced from graphite, which is readily available, and it has no known environmental toxicity as well as offers stability.

Development of Nanosensors and Nanostructured Materials from Agricultural By-product for Enhancement of Food and Agricultural Productivity and for Environmental Sensing and Remediation Program

**University of the Philippines Los Baños*

The University of the Philippines Los Baños came up with 11 projects that harnessed the power of nanotechnology for the benefit of local agriculture and food sectors. The projects developed nanostructured materials including those from low value agricultural by-products and indigenous materials in order to enhance agricultural productivity, improve food safety, promote food security and address issues relating to environmental concerns in agriculture. Use of low - value agricultural by-products to provide nanotechnological solutions to common agricultural problems raises the productivity of the Filipino farmer and minimizes problems of waste disposal in the farm.



Nano Cellulose (top, left) AFM Analysis of CNC (top, right) Tomato for Sampling (bottom, left) Stages of Sample Production (bottom, right) Bamboo Sticks, Bamboo Flour, Bamboo Pulp, Holocellulose, Alpha Cellulose, Cellulosic Nanocrystals (CNC) powder, CNC Suspension
(Images courtesy of UPLB Projects)



Project 1 – Removal of Arsenic from Contaminated Water using Modified Biopolymer-Silica Nanocomposite Materials

Project Leader: Dr. Milagros Peralta

The research utilized nanomaterials from rice hull ash, a processed by-product, for arsenic remediation of groundwater. It optimized and scaled-up the production of nanosilica, nanocomposite formulation derived from it and the production of chitosan hydrogels for the efficient removal of arsenic from groundwater. It also optimized the formulation and condition for the remediation process; explore the feasibility of utilizing the proteinaceous by-products of the poultry industry; and characterize the prepared nanozeolites, chitosanderived hydrogels using XRD, SEM, AFM and spectroscopic analyses.



Project 2 – Detection and Analysis of Arsenic in Contaminated Water

Project Leader: Dr. Mary Ann Torio

The detection of arsenic in contaminated water was focused in this project. It consisted of three studies: development of a colorimetric analysis for arsenic detection which involves chromophore attached to a biopolymer nanomaterial suitable for coating test strips for arsenic detection or as components of a test reagent kit; preparation of nano-gold-modified electrodes for detection of arsenic by differential pulse anodic stripping voltammetry; and fluorescent biosensor for arsenic detection



Project 3 – Development of Nano-Biosensors for Detection, Monitoring and Diagnosis of Diseases of Banana and Abaca

Project Leader: Dr. Lorele Trinidad

Banana and abaca are two of the top export commodities of the Philippines. To have a continuous supply of these, the basic step is to use healthy planting materials and proper disease control in the field. This is done by indexing initial planting materials for specific viruses and other diseases. This project developed field-operable nano-biosensors specific and sensitive for the detection of banana and abaca viruses, such as BBTv (Banana Bunchy Top Virus), BBMV (Banana Bract Mosaic Virus), ABTV (Abaca Bunchy Top Virus) and AMV (Abaca Mosaic Virus) - a technology that is locally available, less expensive and easy to use by farmers, researchers and private individuals.



Project 4 – Development of Zinc Oxide Thin Film for Gas Sensing

Project Leader: Emmanuel A. Florido

The first year of the research involved proof of concept for the detection of three gases: ammonia, methane, and carbon monoxide. The second year focused on the development of functionalized Zinc Oxide (ZnO) thin film for sensing the chosen gases. The ZnO thin films were synthesized using electrophoretic deposition (EPD), sedimentation and sol-gel method on different substrates. These films were characterized by AFM, SEM, XRD, and gas sensing. This sensor will be used for the detection of ammonia in poultry farms.



Project 5 – Development of Controlled Release Nano-Encapsulated Plant Growth Regulators from Locally Isolated Plant Growth Promoting Bacteria (PGPB)

Project Leader: Dr. Lilia Fernando

The nanoencapsulation of plant growth regulators produced by locally isolated plant growth promoting bacteria (PGPB) were explored. The specificity and controlled-release parameters of the nanoencapsulated plant growth regulators to target plants were determined in terms of their effectiveness in promoting plant growth and potential bio-control property.



Project 6 – Optimization and Bench-Scale Preparation of a Hemicellulose-Chitosan/ Tripolyphosphate (Polyphosphate) Nanocomposite Coating and Its Use in Post-Harvest Life Extension of Papaya (Carica Papaya) Fruits

Project Leader: Dr. Hidelisa Hernandez

The food processing and agricultural industries generate large quantities of processing waste that are regarded of low economic value.

The project optimized conditions for the preparation and bench-scale production of a hemicellulose chitosan/ tripolyphosphate (polyphosphate) nanocomposite coating and evaluate its performance in extending the shelf life of some high-value Philippine fruits, such as papaya.



Application of coating using a spray gun
(Image courtesy of UPLB Project 6 Team)



Project 7 – Development of Pectin-Collagen Nanocellulose Biocomposite Coatings from Mango Peel and Nata de Coco for Post-Harvest Life Extension of Mango (*Mangifera Carabao*)

Project Leader: Dr. Hidelisa Hernandez

This project prepared and characterized coating materials containing bio-materials derived from waste of agricultural and food processing sectors. The coating material was used for extending the shelf life of Carabao mangoes.



Project 8 – Nanotechnology for the Philippines' Forest Products Industry: Cellulosic Nanocrystals from Selected Philippine Bamboo Species

Project Leader: Dr. Ramon Razal

The project involved the selection of Philippine bamboo species based on abundance, distribution, growth, and cellulose content. A methodology for extraction and purification of cellulose from bamboo and wood waste were developed to obtain cellulosic preparations with consistent properties for industrial applications.



Project 9 – Characterization and performance analysis of nanosilica powder incorporated in biodegradable film based on cassava starch for food packaging applications

Project Leader: Dr. Engelbert Peralta

In this study, the mechanical and barrier properties afforded by rice hull ash nanosilica in cassava starch films were explored. This presents our country the advantage of using rice hull, a waste by-product of agricultural processing industries, for economically

viable and environmentally sound ventures such as biodegradable film packaging for mangoes.



Project 10 – Performance evaluation of nanosilica-in-fluid dispersion (nanofluid) used as coolant in heat exchanger

Project Leader: Ma. Christine Concepcion Ignacio

The study analyzed the performance of nanosilica-in-fluid dispersion (nanofluid) derived from rice hull ash in a mini heat exchanger. This method may help find an alternative way of enhancing thermal properties of heat transfer fluids. Fluids with nano-scaled particles form a stable suspension and provide improvements in the thermal properties of base fluids and performance of heat exchangers.



Project 11 – Evaluation of nanosilica powder from rice hull ash used as silicon fertilizer for tomato (*lycopersicon esculentum*) plants

Project Leader: Ma. Morissa Lu

Tomato is extensively cultivated in the world and is one of the most important vegetables grown in the country. Silicon is an important element for a large number of plants because it contributes to the compression resistance and rigidity of cell walls, which in turn improve light interception, drought resistance and photosynthetic efficiency and also increases the resistance to pathogens, blast and insects. This research evaluated the potential use of nanosilica powder from rice hull ash as silicon fertilizer for tomato. It also determined the effects of silicon fertilizer on the morphological and developmental characteristics of tomato plant. The application of nanotechnology in fertilizers is expected to enhance absorption for optimized fertilizer uptake and further contribute to the development of the plant.



Tomato Coated with Nanosilica Powder
(Image courtesy of UPLB Project 11 Team)

Other Projects on Nanotechnology



Development of DNA-Based Nano-Biosensor for Food and Environmental Applications

**National Institute of Molecular Biology and Biotechnology (BIOTECH), University of the Philippines Los Baños*

Project Leader: Dr. Francisco Elegado

Food and water must be free from unpleasant tastes or odor, suspended matters, harmful chemicals, but most importantly from pathogenic organisms responsible for waterborne and foodborne diseases. The two-year study did sample preparation and target DNA extraction from various sources such as water, fresh produce, milk and milk products. It also synthesized, characterized and functionalized gold and magnetic nanoparticles, and constructed a thiolated DNA probe for *E.coli*, *E.coli* O157:H7 and *Listeria Monocytogenes* detection and identification. Development and inhouse validation of DNA assay, and confirmation and electrochemical detection were also done on the bacteria strains. Moreover, the long term goal of this collaborative project is to develop field-operable DNA based biosensor technologies for rapid detection and identification of disease-causing microbial pathogens transmitted through water, food and the environment.



Nanostructured Electrocatalysts Based on Graphene-Support Nanoparticles towards Direct Ethanol Fuel Cell Application

**Research Center for the Natural and Applied Sciences, University of Santo Tomas*

Project Leader: Dr. Bernard John V. Tongol

Electrochemical energy conversion's main developments arose from novel anodic electrocatalysts. A direct methanol fuel cell (DMFC) is considered one of the important electrochemical energy conversion systems suitable for a variety of applications due to its simplicity, low pollution, low operating temperatures, and high efficiency of energy conversion. The project uses ethanol as a fuel source which is advantageous over the more toxic methanol.

This project shall also develop electrocatalysts which are ideal for the large surface areas, small catalyst loading and ability to prevent aggregation between particles. Thus, this research project developed anode materials by combining noble metal nanocatalysts (e.g. Palladium) and non-noble promoter metal (e.g. Nickel) on carbon-based materials (e.g. graphene). The

use of carbon-based materials could offer a cheaper alternative as substrates for the nanoparticles. This research would have a long-term benefit not only in the academe, but also in the industry and institutes engaged in materials science, electronics, and electrochemical energy research.



Synthesis and Application of Novel Nano-Scale Photocatalysts with Different Dopants for the Treatment of A) Dimethyl Sulfoxide, B) Chlorophenols In Aqueous Solutions and C) Gaseous Formaldehyde

**Department of Chemical Engineering, University of the Philippines Diliman*

Project Leader: Dr. Mark Daniel De Luna

A Philippine-Taiwan collaboration, the project started in 2012 and aimed to synthesize novel doped-titanium dioxide catalysts, and evaluate their photocatalytic performance. Photocatalysis involves the use of light to activate the catalyst to speed up a chemical reaction. The study focused on the synthesis and characterization of photocatalysts and its application for the treatment of pollutants in water and in air.



Synthesis of Carbon Nanotubes (CNT)-Silicon Heterojunctions for the Fabrication and Assembly of a Solar Panel

**University of the Philippines – Baguio*

Project Leader: Dr. Ian Jasper Agulo

The development of a solar panel that is cost-effective is extremely important, especially at these times when oil prices are high and renewable energy sources are called for. Our country can extremely benefit from technologies that harness energy from the natural environment. The project designed and built a deposition system for the synthesis of carbon nanotubes (CNT) in large scale, and a system that integrates the solar cell with the electrical storage device for a fully characterized and functional solar cell system.



Exfoliated Carbon Nanotubes
(Image courtesy of CNT Project Team)



Polymer Electrolyte Systems Based on Carrageenan for Solid State Dye Sensitized Solar Cell

*Chemistry Department, De La Salle University

Project Leader: Dr. Drexel Camacho

This research investigated, developed and fabricated a solid type electrolyte system by investigating the use of carrageenan composites as polymer electrolyte. It looked into the optimization of self-assembly conditions, the impact of carrageenan molecular weight and electrolyte concentrations to achieve better ion transport. Moreover, the optimized film was incorporated in Dye-Sensitized Solar Cell (DSSC) and its energy conversion efficiency and its long term stability has been characterized.



Bench Scale Production of Food Grade Nano Precipitated Calcium Carbonate from Local Limestone

*Industrial Technology Development Division (ITDI - DOST)

Project Leader: Dr. Blessie Basilia

Various industrial applications use commercially available calcium carbonate for products such as fillers for plastics, rubber, paper, glass manufacture and other related industries. This project intends to produce food grade nano precipitated calcium carbonate or NPCC from local limestone using green technology.

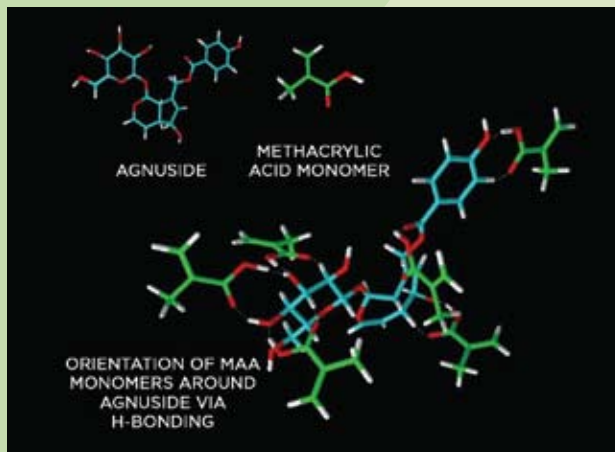


Molecularly Imprinted Polymers (MIPs) and for the Targeted Purification of Natural Compounds

Department of Chemistry, Ateneo de Manila University

Project Leader: Dr. Fabian Dayrit

Despite the rich tradition and widespread use of herbal medicine in the Philippines, only a handful of medicinal plants have been developed into successful commercial herbal medicine products which can meet strict quality specifications and good manufacturing practice (GMP). This proposal shall bring Philippine natural products to a higher level by developing efficient technology for the purification of biologically active compounds or marker compounds from medicinal plants using molecular imprinted polymerization (MIP). In MIP, polymer particles, which can be micro to nano-sized, will be prepared to selectively bind to target natural product compounds and as pure active components in a drug formulation or as reference standards for quality assurance or biological research.



Molecular Model for MAA-Agnuside Interaction

(Image courtesy of Dr. Fabian Dayrit) with permission from Dr. Fabian Dayrit



Flexible Nanohybrid Supercapacitor Based on Conducting Polymers and Metal Oxides

*Institute of Chemistry, University of the Philippines Diliman

Project Leader: Dr. Florentino Sumera

In recent years, electrochemical supercapacitors have gained interest in energy devices because of increasing pollution and explosive growth of digital communication, portable electronic devices and electric vehicles. Activated carbon, conducting polymers and transition metal oxides are the commonly used electrode material for such device. This project will focus on the assembly of flexible nanostructured hybrid supercapacitor based on conducting polymers



Electrochemical Synthesis of Nanocomposite Electrodes

(Images courtesy of Dr. Florentino Sumera)

and metal oxides as an energy storage device. Capacitor with nanostructured electrodes provide higher surface and more participation in the redox reaction due to rapid ion diffusion thus, could deliver a higher capacitance leading to a better device. The simplicity of the process offers a viable production of flexible, bendable and portable energy storage devices.



Electrochemical Synthesis of Nanocomposite Electrodes

(Image courtesy of Dr. Florentino Sumera)



Synthesis, Morphology and Chemical Modification of Fullerene-Based Nanomaterials for Nano-engineered Structural Materials and Optoelectronic Applications

*University of the Philippines Diliman and Baguio/ Mariano Marcos State University

Project Leader: Dr. Cherry R. Pascua

Fullerene is a class of carbon with a roughly spherical shape. Fullerene's electrical properties is a good material for transistors, the basic building block of all our electronic devices. Its response to electromagnetic radiation gives us an alternative material for the fabrication of solar cells, makes it a good candidate for terahertz detectors, and a viable material for biomedical applications. This study can open up a wide field of research in electronics, optoelectronics, nanodevice fabrication, biological and medical applications, and even renewable energy sources.



Synthesis of Metal Nanowires and their Application in Foldable Transparent Conducting Electrode

*Dept of Mining, Metallurgical and Materials Engineering, University of the Philippines Diliman

Project Leader: Dr. Donnabelle Balela

There is currently a strong demand for cheap electronic devices that are smaller in size with superior performance, and robustness, and many researchers are working on the fabrication of inexpensive,

transparent, flexible conductor that would open the door for the development of low-cost flexible and flat-panel displays, light-emitting diodes, and thin film solar cells. Doped metal oxides, such as indium-tin oxide (ITO), is the material of choice for transparent conducting films due to their high electrical conductivity and optical transparency. However, ITO is expensive and brittle. But metal nanowires, such as Silver (Ag) and Copper (Cu), are the leading alternative materials due to their excellent electrical conductivity comparable to metallic oxides, and the advantage of low-temperature processing.

This project aims to develop a low-cost process for Ag, Cu and (Copper-Nickel) Cu-Ni nanowires, establish an inexpensive yet effective printing process for Ag, Cu, and Cu-Ni nanowires on plastic substrates, and fabricate Ag, Cu, and Cu-Ni nanowires transparent conducting electrodes.



Development of Ink Using Carbon from Straight Pyrolysis of Glycerol as Electrodes in Printed Electronics

*Department of Chemistry, Ateneo de Manila University

Project Leader: Dr. Erwin P. Enriquez

The project is developing an ink formulation using carbon from pyrolyzed glycerol as main component. The ink will be studied for its physico-chemical properties: rheology and flow behavior, and interaction with plastics, paper, and glass. Its suitability in various printing technologies will be evaluated using digital or inkjet printing, spray, or film-transfer method (gravure) via print-testing, investigating the ink flow properties and the corresponding electrical-optical properties: electrical conductivity, and optical transparency. The printed ink will also be evaluated for suitability in target printed electronic devices such as paper supercapacitor or paper batteries, conductive electrodes in photovoltaics or bioelectronics sensing devices.

Process Improvement and Waste Minimization in Chichacorn Manufacturing



**Northwestern University (NWU)*
Project Leader: Dr. Rolando P. Javellonar

Chichacorn is a popular corn snack from the Ilocos region prepared through a series of processes that include soaking, boiling, de-skinning, drying, and deep-frying. Through the One Town One Product (OTOP) program of the Department of Trade and Industry (DTI), several processors were able to tap markets abroad such as Cyprus, Australia and Saudi Arabia. The increase in demand for the product led to the growth of the industry and the emergence of several small scale chichacorn manufacturers in the region. However, most chichacorn products are not able to meet the minimum requirements specified in the Philippine National Standard (PNS) for chichacorn. In order to address this problem, the project partnered with an association of chichacorn processors to establish a standard process of chichacorn production. The result of the study is a process ready for dissemination to interested chichacorn producers.



Finished Product Mixed with Ingredients
(Image courtesy of Chichacorn Project Team)



Development of Frozen Makapuno as Intermediate Raw Materials for Food Processing- Project 2
**Batangas State University (BSU)*
Project Leader: Dr. Shirley Cabrera

The demand for Makapuno is constantly high because of the high demand from both the local primary and secondary food processors. However, Makapuno spoils easily even with shell. This project offers alternative solution to prolonging the shelf life of Makapuno for use as an intermediate raw material for the ice cream and bakery industry. The best time and temperature combination in processing frozen Makapuno were established and applied in the production of ice cream and pie. This development redounds to a stable supply of Makapuno for food processors in the country and at the same time, it can now be exported due to its improved shelf life.



Pilot Scale Standardization of Product and Processes using Drum Drying Technology on Selected Raw Materials (Mango, Banana and Makapuno)
**Food Processing Division, Industrial Technology Development Institute*
Project Leader: Maria Elsa M. Falco

One method of food preservation is the drum drying technology which can provide products with stable shelf-life at ambient conditions, retained sensory qualities, and reduced handling, transportation and storage costs. Dried products can be used as toppings or food ingredient in confectionary or bakery products. More than these, they can also be consumed as snack foods.

This project is currently establishing the drum drying parameters of mango, banana, and Makapuno in cooperation with a private sector company who are also into the same line of products. Several processors and a big chain of supermarket have already expressed interest in the commercialization of the products. It is targeted that by second semester of 2015, these will already be available in the market.



Stabilization of Finer-Grade Rice Bran Using Microwave-Vacuum Technology
**College of Home Economics, University of the Philippines Diliman*
Project Leader: Dr. Maria Patricia V. Azanza

Rice bran is a by-product of the rice milling process (the conversion of brown rice to white rice), and said to contain various antioxidants that impart beneficial effects on human health.

The Philippines, being a rice-producing country produces tons of rice. In 2012 alone, approximately 0.90 to 1.80 million metric tons of rice bran was produced as a by-product of the 18 million metric tons rough rice output at a range of 5-10% rice bran recovery. Locally produced rice bran is still commonly used as animal feeds and has not been utilized as food which is of higher value. The application of stabilized rice bran and its derivatives (e.g. oil) include a wide array of products not only in food industry but also in the nutraceutical and cosmeceutical industries.

Initial findings on stabilization of rice bran through volumetric microwave batch drying in an earlier project indicated that the technology has a potential to stabilize rice bran although some issues must be considered to further improve the technology. This project is currently addressing these issues such as longer processing time and relatively faster occurrence of rancidity through the use of microwave technology in combination with vacuum to improve microwave drying performance for ingredient drying and stabilization.



Design and Development of a Local Microwave Vacuum Dryer -Year 1 & 2
**Metals Industry Research and Development Center (MIRDC-DOST)*
Project Leader: Engr. Jayson Rogelio

This project was implemented in cooperation with the National Institute of Physics (NIP) and College of Home Economics (CHE) of UP-Diliman to support the project, “Stabilization of Finer-Grade Rice Bran Using Microwave-Vacuum Technology”. It aims to locally design and fabricate a 30-Li capacity microwave vacuum dryer which will be used in the stabilization of rice bran as well as other intermediate food products and ingredients such as spices. To date, the equipment is now ready for functional testing.

Other beneficiaries of this equipment includes agricultural sectors which act as suppliers of raw materials, fabricator shops and micro and small

enterprises that use the equipment to dry various products ranging from pharmaceutical to food materials.



Development of Oyster Powder for Use as an Ingredient and Condiment
**University of the Philippines Visayas*
Project Leader: Ernestina M. Peralta

Being an archipelago, oyster culture is considered as an important food-producing sector in many coastal municipalities in the country. It is a viable economic activity that requires less input and capitalization compared to other aquaculture activities such as fish cages and pens.

This project intends to create new products from oysters that would enhance its competitiveness and market value as well as making these food products available in the domestic market as a natural source of good nutrition. This supports the oyster program under the PCAARRD-DOST that intends to increase oyster production through refinement of existing technologies. With the imminent increase in oyster production volume, available postharvest technologies should be in place for immediate use of the industry.



Cooking the Oyster Samples
(Image courtesy of Oyster Powder Project Team)



Technology Generation for the Production of Multi-Nutrient Extruded Rice Kernel (MNERK) to Address Malnutrition (1 Year and 9 mos.)
**Food and Nutrition Research Institute (FNRI - DOST)*
Project Leader: Marcela Saises

TThe 2008 FNRI National Nutrition Survey showed that only a small percentage of Filipino households meet the Recommended Energy and Nutrient Intake

(RENI) for most essential nutrients such as iron (13%), calcium (11.5%), vitamin A (21.5%), vitamin B1 (34.5%), vitamin B2 (19.7%), and vitamin C (30.2%). These nutrient deficiencies lead to prevalence of diseases and health risks such as low birth weights among infants, and mental and growth retardation.

One strategy in addressing malnutrition is through food fortification. Since rice is the most commonly consumed food item by Filipinos, it is a good vehicle for fortification of nutrients. In the project, rice will be fortified by producing multi-nutrient extruded rice kernel through hot extrusion technology.



Roll-Out of Complementary Food Production in the Regions
**DOST - CAR*
Project Leader: Director Julius Caesar V. Sicat

The alleviation of malnutrition by decreasing prevalence of underweight children under five (5) remains to be a national priority program. In the aggressive effort of the government to address the issue on malnutrition, the FNRI- DOST responded through the “S&T-Based Intervention Program to Address Malnutrition” which aims to reduce the prevalence of under nutrition among 6 to 35- month old children through production and technology transfer of complementary food blends, snack foods, and DOST PINOY (Package for the Improvement of Nutrition of Young Children).

This project further complements the said program through the roll-out of complementary food technologies such as rice-mongo curls, rice-mongo baby food blend, and rice-mongo-sesame blend. It also provides a complete line of complementary food production equipment to selected beneficiaries in all regions of the country. These beneficiaries will in turn provide a Good Manufacturing Processing (GMP)-compliant facility where the equipment will be housed. The complementary food products will be sold in the local market. These will also be used by the DSWD in their feeding programs.



Rice Kernel Samples (Image courtesy of MNERK Project Team)

Sustainability of FNRI Proficiency Testing Laboratory’s ISO/IEC 17043:2010 Accreditation as PT Provider on Nutrition Labeling Parameters and Expansion of its Scope



**Food and Nutrition Research Institute (FNRI - DOST)*
Project Leader: Leah C. Dajay

Proficiency test is a means of calibrating the competence of laboratories in the conduct of testing/analyses and the use of Reference Materials which establish the traceability of measurements. These are requirements for maintaining ISO/IEC 17025 accreditation. Proficiency tests therefore are important to keep the country competitive in delivering accurate measurements for local and export products.



Preparation of Proficiency Test (PT) Materials
(Image courtesy of FNRI-DOST)

The Proficiency Testing Laboratory (PTL) of the FNRI-DOST is the only accredited proficiency testing laboratory for ISO/IEC 17043. The provision of affordable, accessible, and reliable PT programs will help local testing laboratories especially the DOST food testing laboratories in obtaining/maintaining their ISO/IEC 17025 accreditation.

This project aims to sustain and expand the FNRI PTL competence in the provision of PT to other priority food matrices such as breakfast cereals, fruit drink and canned fish with focus on the following analytes: cholesterol, Vitamin C, and sugar; and in the production of PT material in liquid or oil forms.

Toxic Migrants in Packaged Foods and Beverages: Addressing the Safety Issues on Packaging Related Contaminants in Food: Phase 2



**Industrial Technology Development Institute (ITDI - DOST)*
Project Leader: Josefina L. Diaz

Packaging plays a significant role in the shelf life and ease of storage and cooking for many foods. However, there are still health concerns regarding chemicals migrating from the packaging into food.

This project addresses safety issues on packaging-related contaminants in food by providing scientific data on toxic migrants in packaged foods and beverages. This study assessed contaminants such as benzophenone in printed paper and paperboard (used as food packaging) and phthalates in Polyethylene Terephthalate (PET) and High-density Polyethylene (HDPE) containers since these are now used in fast food chains as alternative to plastic containers.

Previously (Phase 1), the project has established capabilities for detection (laboratory testing) and assessment of toxic migrants such as Bisphenol A (BPA) and acetaldehyde in canned products and acetaldehyde in bottled water.

The results of the project could be used by appropriate government agencies in the formulation of policy related to the safety requirements on the use of packaging materials, provide measures on issues concerning packaging related contaminants to avoid future market access problems related to these substances, provide information to the general public and avoid misconception regarding certain issues on packaging related contaminants.



Actual method of extraction of packaging contaminants from packaging materials (Image Courtesy of ITDI-DOST)

Development of a Dipstick Assay Format for Detection of Salmonella in Food and Feeds



**National Institute of Molecular Biology and Biotechnology (BIOTECH) - University of the Philippines Los Baños*
Project Leader: Susan A. Sedano

This project is an off-shoot of the Salmonella Detection and Amplification System (DAS) developed by BIOTECH. This project aims to further improve the detection of Salmonella in terms of speed and portability, and will be using shorter DNA probes in solid support (e.g. plastic films). Currently, conventional method of detection takes about 3-10 days analysis, while BIOTECH DAS kit takes about 4 days. For this project, it will further shorten time of detection to 18 hours.

The procedures that will be developed may be used by regulatory agencies, quality control laboratories in both private and public institutions and academe that need accurate, rapid testing for contamination by salmonellae.

Roll-out of DOST-Developed Food Processing Equipment to the Regions



**Industrial Technology Development Institute (ITDI - DOST)*
Project Leader: Nelia Elisa C. Florendo

The Food Processing Firms (FPFs) are recognized to be the prime movers of the country’s economic growth. They provide a reliable and equitable basis for economic development as experienced by most successful and newly industrialized countries in the world. However, technology-based food processors in the country are confronted with barriers with regard to access to information, capital and high cost of equipment. Acquisition of state-of-the-art equipment deprive local manufacturers the opportunity to expand their product lines in order to meet diverse range of customer requirements.

The project aims to promote and demonstrate the functionality of the DOST–developed food processing equipment in partnership with state colleges and universities (SUCs) and LGUs in the region. These partner agencies will provide the plant while DOST will provide the equipment such as water retort, vacuum fryer, spray dryer, freeze dryer, and vacuum packaging machine to complete a Food Innovation Center (FIC) and operated as a business enterprise by the partner institutions. Currently, two (2) FICs located at the Philippine Womens College in Davao City and at the Cagayan State University (CSU) in Tuguegarao City are now accepting products for innovation and initial production runs at their newly established FICs.



Bottled Samples (top, left) Packaged Vacuum Fried Samples (top, right) Spray Dryer Equipment (bottom, left) Training on Equipment Operation (bottom, right) (Image courtesy of ITDI-DOST)



Testing with Training of Process Equipment for Food Processing Firms
**Metals Industry Research and Development Center (MIRDC-DOST)*
Project Leader: Engr. Jose B. Ferrer

This project intends to test three (3) food processing equipment previously developed by the DOST: Continuous Type Immersion Freezer, Continuous Type Vacuum Fryer, and Continuous Type Vacuum Packaging Machine as well as mechanization of the production line of complementary baby food production (CFP). Also, this project will train the operators to operate and maintain the equipment and the CFP production line.



Improvement of Process Equipment for Food Processing Firms
**Metals Industry Research and Development Center (MIRDC-DOST)*
Project Leader: Engr. Jose B. Ferrer

This project was conceived to promote locally developed technologies addressing the needs and problems of the food processing industry and nutrition in the country. The project supports the DOST High Impact Technology Solutions (HITS) under the leadership of the Department of Science and Technology (DOST) focused towards recognizing equipment requirements that will enhance the performance and productivity of Food Processing Firms (FPFs) in the country .

In this project, the previously DOST-developed food processing equipment namely, vacuum fryer, vacuum packaging machine, and immersion freezer will be improved by making it continuous or fully-mechanized to make it more appropriate and affordable for use by food processing firms.



Continuous Type Vacuum Fryer (Image courtesy of MIRDC-DOST)

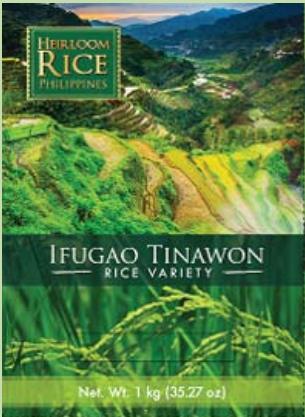
Enhancing the Competitive Identity of Unique Philippine Products through the Development of Packaging Design and Appropriate Packaging Technology



**Industrial Technology Development Institute (ITDI - DOST)*
Project Leader: Grace D. Noceja

A good packaging speaks of the product it carries. This is one of the factors considered by ITDI in developing a packaging design, technology and country branding to enhance the competitiveness of unique Philippine products. The designs will incorporate the cultural heritage of indigenous peoples along with their unique products like ‘tinalak’ of the tribe of ‘Tiboli’ in Sebu. Thus, aside from creating added value to the products, the packaging design also contributes to preserving the cultural heritage of the specific places.

These kind of packaging were applied to eight (8) Philippine products namely: sweet potato, queen pineapple, upland/ Ifugao rice, Philippine citrus, tinalak, raffia, handcrafted bags, and coffee. These are expected to contribute to increasing the competitiveness of the products, and overall helps in promoting Philippines as a country.



Sample Packaging Designs by ITDI
(Images courtesy of ITDI-DOST)



Development of Transport Packaging Technology for Cut Flowers
**Industrial Technology Development Institute (ITDI - DOST)*
Project Leader: Daisy E. Tañafranca



Packaging Design by ITDI
(Image courtesy of ITDI-DOST)

Nowadays, the packaging of goods matters, especially for flowers. But generally, the common practice is wrapping the cut flowers with newspaper and then packed in an ordinary used box or in styrofoam box. Cut flowers and their packaging are subjected to a number of stresses through the distribution chain from harvest to end user. It is therefore important that actual handling practices at the farm level, loading to and unloading from the delivery truck, and final market destination are documented so that appropriate transport packaging is designed to protect the cut flowers from environmental hazards such as shock/vibration, chemical hazards (toxic fumes, gases), light, temperature, humidity, and pests and rodents.

Appropriate transport packaging technology that will reduce handling and distribution damage, graphic design and brand name that will give a reputation for quality of cut flowers grown in the Philippines were undertaken in the project. Now on its second year, the project continues the simulation study for Modified Atmosphere Packaging (MAP) or the reduction of oxygen on packaged foods/ non-food items to prolong shelf-life using the redesigned transport packaging.

Environment

Production of Dome Type Ceramic Water Filter



**Industrial Technology Development Institute (ITDI - DOST)*
Project Leader: Dr. Blessie A. Basilia

A water filtration system using nanotechnology was developed by the Industrial Technology Development Institute (ITDI), one of the Research and Development Institutes of the Department of Science and Technology (DOST). A total of 10,000 units were produced through the project which were deployed in areas without access to potable drinking water. The results of performance testing showed that the developed water filtration system using a ceramic water filter (CWF) was capable of eliminating microorganisms, and met limits for physic-chemical parameters in tap and deep well water, conforming to the Philippine National Standards (PNS) for Drinking Water.



The Ceramic Water Filter System



Pilot Production and Field Testing of Ceramics-Based Water Filtration System

**Center for Innovative Materials in Emerging Applications, Mariano Marcos State University*

Project Leader: Dr. Chelo S. Pascua

Disasters and calamities like typhoons, landslides and earthquake have always shown to have difficult complications on the sources of natural potable water supplies. Lack of access to areas needing potable water supplies in an emergency is further compounded by lack of electricity and fuel. These cases call for a deployable and potable water supply crucial in disaster preparedness and response. Hence, this project

fabricated porous/ permeable ceramic-based water filtration system deployed and installed in disaster affected areas in Leyte and Samar due to Typhoon Yolanda.

Mariano Marcos State University (MMSU) led by Dr. Chelo S. Pascua successfully demonstrated the fabrication of mullite-based ceramics that features controllable pore size throat and sufficient permeability that can be used for water filtration purposes. In time for the need of potable drinking water in the severely hit areas of Typhoon Yolanda in Leyte and Samar, the project was able to fabricate and deploy ten (10) stand-alone ceramics-based water filter prototypes to provide potable drinking water.

Deployment and Field-testing of Eco-Friendly Septic System (Eco-Sep) for Temporary Shelters: Towards Efficient Sanitation Management in Disaster-Affected Areas



**Chemical Engineering Department, Adamson University*

Project Leader: Dr. Merlinda Palencia, ASEAN Engineer

Following the many big disasters that happened in the country, the DOST resolved to look at rehabilitation measures and programs on a macro scale, taking into consideration all scenarios and looking at possible S&T interventions for rehabilitation. Another immediate problem is wastewater and sanitation in communities where households are displaced from their private homes. For this, the DOST saw the need for an efficient sanitation management to address the vulnerability and risks caused by sanitation problems particularly in temporary shelters.

The Adamson University (AdU) has developed an Eco-Friendly Septic System (Eco-Sep) that is a self-sustaining and portable/movable wastewater treatment system that uses an innovative combination of bio-stimulation and filtration. It is a low-cost and deployable method for immediate installation of domestic wastewater clean-up in disaster-affected areas anywhere in the country. Being enhanced with organominerals, the Eco-Sep is an appropriate technology for immediate deployment in disaster stricken areas.



Eco Sep with Organominerals inside for Remediation

Related Project

Green Technology and Active Community Engagement (Green ACE) towards Estero de Paco Revival Project 3. In-Situ Remediation of Estero de Paco by Local Biominerals



**Adamson University*

Project Leader: Dr. Merlinda Palencia, ASEAN Engineer



*Tea Bags for Biominerals for In-situ Remediation
(Image courtesy of Dr. Merlinda Palencia)*

The third Green Technology and Active Community Engagement (Green ACE) Model towards Estero de Paco Revival program provided an alternative technology on water remediation through the application of local, abundant, economical, environment-beneficial and natural material. This project laid down the real time and in-situ application of biominerals as a viable technique for the bioremediation of Estero de Paco, which leads to the development of an economic, sustainable and replicable bioremediation technique for estuaries, lakes and rivers.

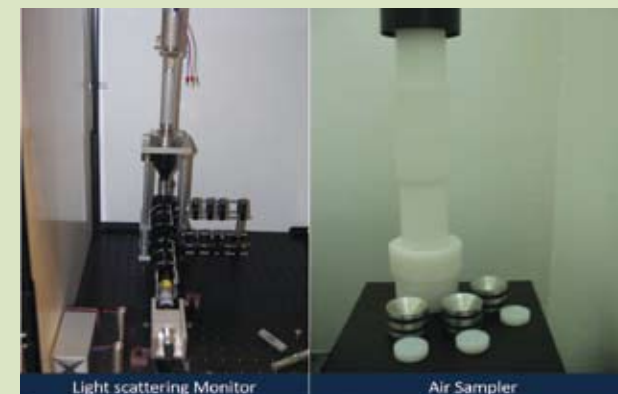
Design, Fabrication, and Evaluation of Monitoring and Sampling Devices for Particulate Matter



**Institute of Chemistry, University of the Philippines Diliman*

Project Leader: Dr. Len Herald Lim

The DENR, atmospheric and environmental scientists, the academe and industry need a daily dose of high quality data on particulate matter for their activities. But they rely heavily on data generated by imported and expensive instrumentation for air quality monitoring.



(Image courtesy of Particulate Matter Project)

Realizing this, the DOST embarked on a project that localize the development of monitoring devices and air sampler for particulate matter (PM) measurements. Localizing this capability will redound to lower costs with the generation of the same high quality data needed. Further, it is seen to strengthen local expertise in aerosol research with the availability of a locally fabricated, low-cost, robust and deployable air monitoring and sampling device that is comparable and competitive with existing devices in the market.

In 2014, the light-scattering based device for continuous monitoring of particulate matter was designed. Together with its ongoing development, a

portable air sampler for 2.5m size fraction will likewise be finished in 2015.

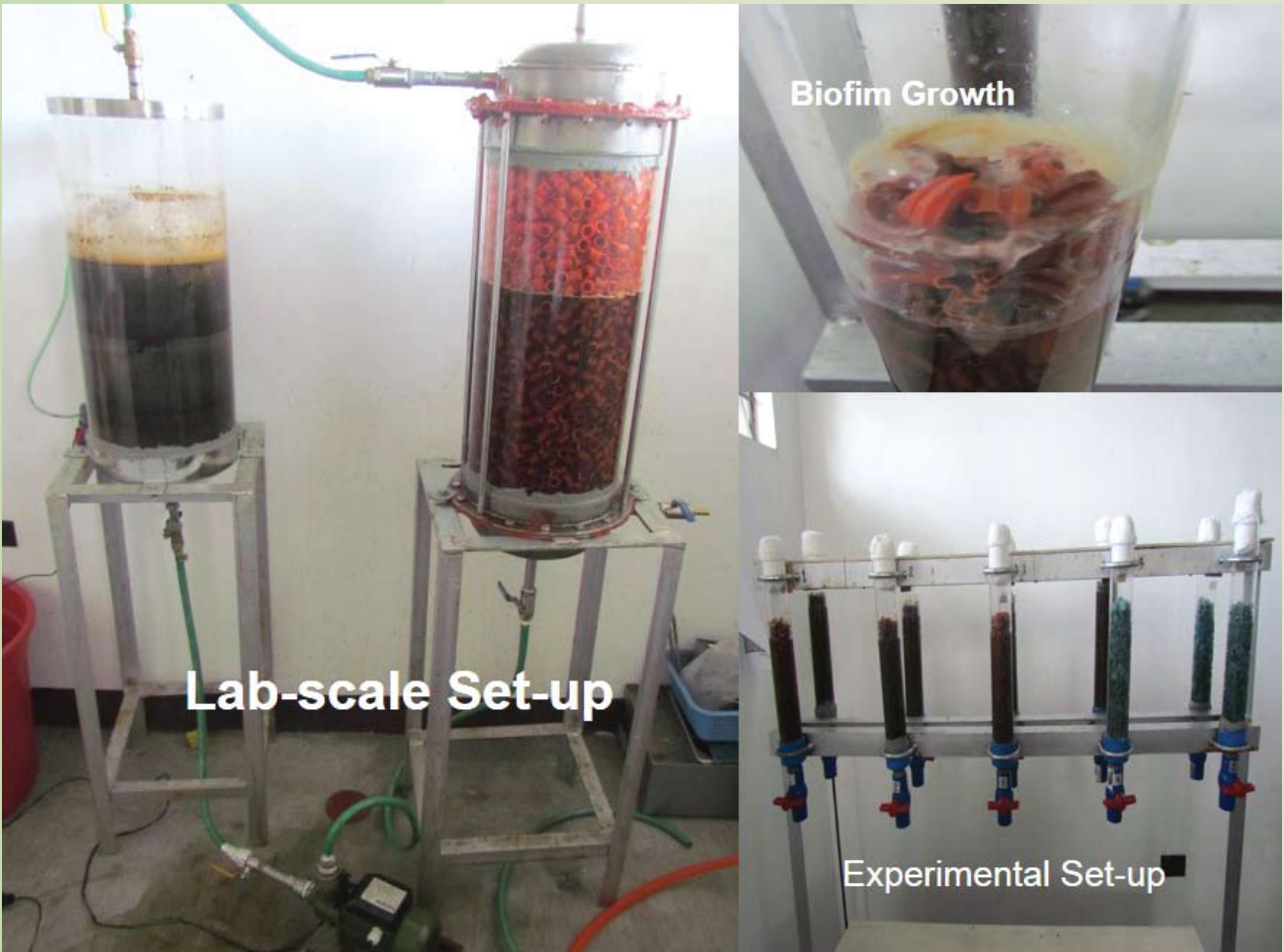
With such instruments, high-quality data produced will generate predictive models of PM dispersion as well as local air quality standards from which practical procedures may be drafted for evaluating compliance in the industrial sector.

Use of Microbial Biofilms for the Rehabilitation of Heavy Metal Contaminated Wastewater



**Institute of Biological Sciences, University of the Philippines Los Baños*
Project Leader: Dr. Rina Oplencia

Pollution caused by heavy metals is a major environmental concern due to their highly toxic concentrations. Particularly, heavy metals such as copper, nickel and zinc affect plant vegetation. These hazardous wastes are majorly discharged by the semiconductor industry. Thus attention to this must be taken seriously. In order to address this matter, this project used microorganisms as biofilms immobilized in a fabricated bioreactor to clean up wastewater discharge from semiconductor manufacturing company. The technology targeted to remove copper, reducing the concentration from 1 to 0.1 ppm.



(Image courtesy of Microbial Biofilms Project)

Program for Rehabilitation and Restoration of Mined-Out Areas through Phytotechnologies



Establishment of restoration plot within the tenement of TMC at Surigao Del Norte (Image courtesy of Phytotechnologies Project 1)



Project 1 – Conservation of Native Metallophytes, Phytochemistry of Nickel Hyperaccumulators and Phytostabilization to Restore Mined-out Areas in Palawan, Surigao and Zambales

**Forest Biological Sciences-College of Forestry and Natural Resources (FBS-CFNR), University of the Philippines Los Baños*
Project Leader: Dr. Marilyn O. Quimado

Conducting conservation biology of the native hyperaccumulators, identifying the various plant metabolites involved in the uptake and sequestration of nickel as well as new biologically active compounds are the primary aims of this project. It will also conduct pilot testing of phytostabilization technology and ecological restoration using native metallophytes. In addition, the project will develop a policy paper on the restoration of mined-out areas using native metallophytes.



Project 2 – Metal Bio-Indicator Plant Species of the Philippines
**Biology Department, College of Science, De La Salle University*
Project Leader: Dr. Esperanza Maribel Agoo

Given the importance of early detection in the reduction of the impact of anthropogenic heavy metal soil contamination, it is crucial to identify plant species that can be potentially used as bio-indicators of heavy metals in the soil.

There is still hope for the vast mined-out areas that are left with heavy metal contaminated soils like Palawan, Surigao and Zambales through the application of phytotechnology. This is the strategic use of plants to solve environmental problems by remediating the qualities and quantities of soil, water, and air resources and by restoring ecosystem services in managed landscapes.

An example of such plant is a hyperaccumulator which is capable of growing in soils with very high concentrations of metals, absorbing these metals through their roots, and concentrating extremely high levels of metals in their tissues. Another is a metallophyte which can tolerate high levels of heavy metals such as lead.

The goal of the project is to find a cheap and easy-to-use, accessible technology, using plants, to detect the presence of heavy metals in soils, a technology that makes detection, monitoring, and clean-up of mining areas cheaper and easier for mining sector stakeholders and ordinary citizens to adopt.



Project 3 – Copper and Arsenic Recovery as a Post Mining Activity Using Indigenous Plant Hyperaccumulators

**Department of Environmental Science, Ateneo de Manila University*
Project Leader: Dr. Teresita R. Perez

The project will propagate species of copper and arsenic hyperaccumulators in large mines and in small scale mining areas for potential metal recoveries. It will focus on identifying indigenous plants that are capable of hyperaccumulation of Copper (Cu) and Arsenic (As) collected from areas of the small scale miners and mining companies in Benguet and Surigao. The physiology of hyperaccumulators is studied to understand their ability to accumulate significant amounts of the metal including their requirements for propagation in the nurseries and in the field. In the third phase of the project, the community and the LGU as well as support from the mining sector will be tasked to do mass propagation of the hyperaccumulators in the mining areas.

Minerals Extraction with Responsibility for Sustainability (MinERS)

**University of the Philippines Diliman*

The MinERS project aptly describes and brings to the fore the various S&T interventions being implemented to address mining issues and problems and setbacks to apply responsible mining. It is an all-inclusive approach that gives possible solutions to environmental issues and risk analysis as well as use of appropriate technology.

MinERS will benefit Small-scale mining and milling operators, concerned local government agencies and units, mine-site developers and operators, local communities adjacent to mining areas, and also university undergraduate and graduate researchers. The five (5) component projects of this program are as follows:



Project A – Non-Hazardous Methods of Gold Extraction for Philippine Small-Scale Mining Applications
Project Leader: Dr. Herman Mendoza

The project intends to determine the feasibility of applying alternative gold extraction methods in support of the proposed cyanide- and mercury-less process. The comparison between the conventional and the novel methods shall be established based on technological and socio economic considerations.



Project B – Modeling of Fate and Transport of Heavy Metals in Surface Waters from Source at Mining Site to Downstreams Receiving Waters
Project Leader: Dr. Augustus Resurreccion

Processed wastewater from gold mining may contain heavy metals that when disposed to bodies of water will pose health and environmental risks. It is important to monitor heavy metal concentration along the entire length of the nearby surface water. Risk of possible receptors can be calculated by conducting transport modeling and risk analysis of the different pathways of heavy metals from source to surface water to end receptors.

In order to know the expected concentration of heavy metal at any location along any reach of the surface water and when there is a possible significant discharge along the source, the project will apply a developed



Gold bead recovered using the CHLORIDE-HYPOCHLORITE LEACHING STAGED PRECIPITATION PROCESS
(Image courtesy of MinERS Project A)

and possibly modify an existing transport model to calculate the risks.



Project C – Optimizing the Effectivity of Coco-peat Filter Bed in Field Applications
Project Leader: Dr. Maria Antonia Tanchuling

Coco-peat is a by-product material from the fiber extraction or decortication of coco husk and is produced as a powdery, dusty material. It is currently an underutilized agricultural waste material and is mainly used as a soil conditioner.

Studies were conducted using different heavy metals in batch and column set-ups, and showed the effectivity of the materials in removing environmentally-regulated heavy metals in both ideal and field conditions. A coco peat filter bed reactor was also designed for in-situ wastewater treatment applications. This year, wastewater samples were already gathered from Gumaus, Paracale, Camarines Norte. Wastewater was characterized for its physico-chemical characteristics.



Project E – Nanofiber Membrane Adsorption for Third Level Waste Water Treatment Method for Small Scale Mining Operations
Project Leader: Dr. Leslie Joy Diaz

This research evaluates the treatment capacity of the Polycaprolactone (PCL)-clay nanofiber mat in remediating heavy ions while increasing the production

capacity of the electrospinning set-up. Moreover, the degradability and reusability of the nanofiber mat is also determined.



Project G – The Gold and Copper Chase: Life Cycle Analysis of Sustainable Small Scale Production System
Project Leader: Dr. Virginia Soriano

This research study is geared towards helping small industries through the development of feasible and simplified tool, system or technology that can address economic, environmental and social concerns while

maintaining competitiveness and promoting growth. The project aims to promote the sustainable growth and development of the small-scale mining industry through better mine practices and technologies. It shall document gold-copper mining/ processing/ refining activities, identify the best practices in the mining operations, and produce a detailed life cycle inventory of existing and new gold-copper mining/ processing/refining processes. Using the triple-bottom line criteria: Economic (efficiency). Quality and Environmental (effectiveness), and Social aspects, a situational analysis will be created. Priority areas of intervention for the small scale of gold and copper industries will also be identified.

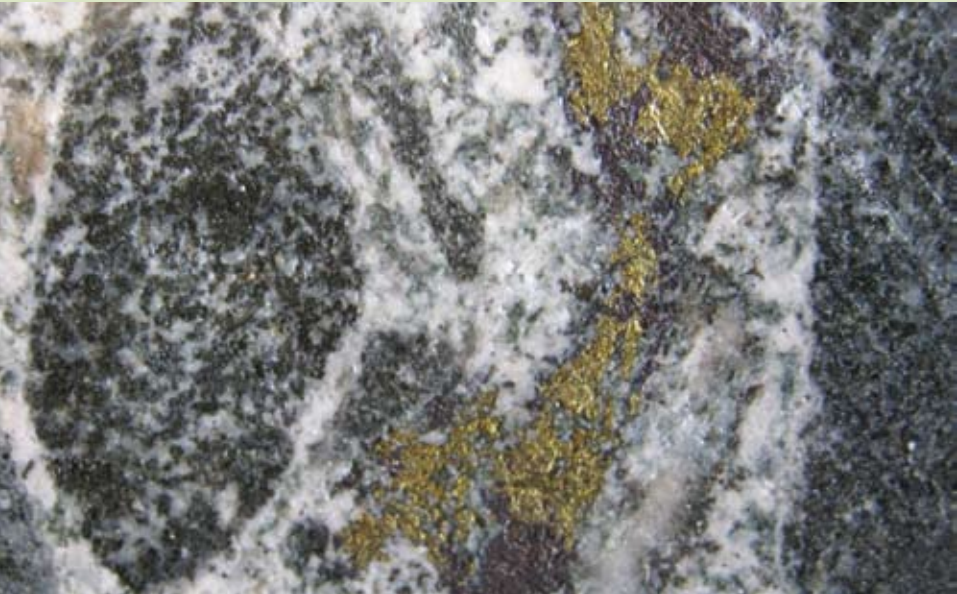
Trace and Rare Earth Element Geochemistry of Selected Porphyry-Epithermal Cu-Au Deposits in the Philippines



**Department of Environmental Science, Ateneo de Manila University*
Project Leader: Dr. Rene Juna R. Claveria

Ore characterization is an approach in geological research that aims to provide geologists, mining, environmentalists and metallurgical engineers and other stakeholders in the mineral industry, scientific information on a mineral deposit. It encompasses a very broad spectrum of studies ranging from the purely theoretical to the more application-related perspectives in understanding a deposit.

The study will focus on defining and understanding the occurrences of the mineral assemblages that characterize the deposit. Outcomes and applications of this study could be divided into 2 components: 1) Geological which considers the identification of ore minerals and assemblages, interpretations on the mode and conditions of ore formation and determination of provenance of mineralization; and 2) Mineral Processing which requires information on the types of ore minerals and their compositional and textural inter-relationships in search for effective ore beneficiation processes.



Mineralization in Alkaline Rocks:
Photograph of Bornite and Chalcopyrite in a brecciated drill core sample. The hostrock is dark monzonite porphyry. The breccia infills are predominantly quartz (DDDH-16/558.3)
(Image courtesy of the Trace and Rare Earth Project Team)

S&T Program for Responsible Mining in Mindanao

Mining is one of the major sources of income in Mindanao. However, the extraction of minerals from the earth affects the integrity of the soil, site clearing that impacts on the resident biodiversity, and the operation-associated generation of dusts, trailing and other pollutants that can run to secondary impact areas such as settlement areas, agri-production and fishery areas and water bodies.

The program focuses on addressing the central issue of economic, socio-cultural and policy scenarios of mining and the mining impacts resulting to environmental degradation & biodiversity loss in Mindanao. To describe the social, political, cultural and economic dimensions of mining in Mindanao, characterization of the socio-economic and culture of both the indigenous people and non-indigenous people will be done. A policy review in relation to mining will also be conducted to assess the policies at the national and regional levels. Moreover, the governance associated with the policy implementation in the mining site and associated communities will also be looked into.



Micron mill wave table used to concentrate low-grade ore samples (Image courtesy of S&T Responsible Mining in Mindanao Project 8)



Project 1 – Assessment of Terrestrial Biodiversity in Selected Key Mining Environs in Mindanao

**Caraga State University*

Project Leader: Sherryl Lipio - Paz

This project assesses the biodiversity of terrestrial ecosystems in key mining areas in Mindanao using the ridge-to-reef approach that will enable comprehensive profiling and analysis of land vegetation and animals near the area. The assessment and profiling covers species composition, conservation status, diversity, and

distribution that includes birds, amphibians, reptiles, and mammals using Geographical Information Science (GIS) which will be put into a web-based database, catalogued herbarium and voucher specimens, policy recommendations on flora and fauna conservation towards responsible mining, bio-acoustic libraries of bird, bat, and amphibian calls, nematode species, and species distribution models on how mining and vegetation changes affect the distribution and diversity of vertebrate animals.



Project 2 – Assessment of Aquatic Ecosystems in Selected Mining Environs in Mindanao

**Caraga State University*

Project Leader: Dr. Joycelyn Jumawan

Using the same ridge-to-reef approach, the second project on responsible mining in Mindanao is focused on providing baseline record and insights on both freshwater and marine flora and fauna, and possible impacts of mining to their diversity. The three-year undertaking is important for the formulation and implementation of policies, laws and ordinances to mitigate the adverse impacts of mining activities on aquatic flora and faunal diversity. Furthermore the research outputs will also provide a basis for the development of effective strategies to mitigate the impact of mining on biodiversity in other areas of the Philippines.



Project 3 – Monitoring, Assessment and Profiling of Arenal and Small-scale Mining (MAP-ASM) in Key Areas in Mindanao

**Caraga State University*

Project Leader: Engr. Sonia Buscano

In resolving issues and concerns in Artisanal and Small-scale Gold Mining (ASGM), mine practitioners and local government units (LGUs) require vital source of information from which to choose from and to keep abreast with the varying needs of time. The general concept of this research progressed to the technological advancement and legitimized operation of the ASGM sub-sector. As the title suggests, it serves as information repository via monitoring, assessment and analysis of mine operational practices done both by the operators and the local miners in the identified key areas in Mindanao. A mini-compendium and database shall serve as the medium for data repository publication and sharing. The expected outputs will serve as basis for designing intervention for the improvement of mining, mineral processing, and marketing strategy for ASGM.



Project 4 – Contamination Pathway and Pollution Management of Artisanal and Small-scale Gold Mining (ASGM) in Selected Areas in Mindanao

**Caraga State University*

Project Leader: Engr. Ephraim Ibarra

The project shall monitor and assess environmental impacts attributed by the mining activities in Mindanao with a view to elucidate the contamination pathways for recommendation of appropriate pollution mitigation measures in the area.



Project 5 – Rehabilitation of Areas Affected by Nickel Mining in Caraga Region towards Eco-Restoration

**Caraga State University*

Project Leader: Dr. Rowena Varela

In Caraga Region, the nickel mining firms have started rehabilitation towards restoration of the areas affected by their operations and even in indirect impact areas, where siltation resulting from their operations flow. Nonetheless, in spite of their efforts, negative environmental effects are still visible that invite critics and environmentalists to call for 'mining ban'. Before ordering the mining firms to stop, it is sensible to assess the rehabilitation efforts of the mining firms and see if these can be improved to further reduce the negative environmental impacts. The project shall analyze the rehabilitation efforts in mining areas to identify gaps toward effective eco-restoration program. It shall also re-establish the population of keystone species through assisted natural regeneration (ANR) in mining areas. Reducing water contamination in freshwater wetlands through wetland restoration shall also be done.



Project 7 – Alternative Technology for Processing of Chromite and Laterite Ores: Crude Fe-Ni Cr Alloy Production

**Mindanao State University - Iligan State of Technology (MSU - IIT)*

Project Leader: Dr. Nathaniel Anacleto

The ultimate aim of the project is to achieve a detailed understanding of chromite and laterite ores blending to produce Fe-Ni-Cr-C (Iron-Nickel-Chromium-Carbon) alloy as a raw material for stainless steel production and to assess the feasibility of a new, more energy-efficient technology for the direct processing of crude stainless steel. Presently, the metal content the researchers get after smelting is about 8-12% Chromium (Cr) and 4-6%

Nickel (Ni). However, most of the chromite and laterite ores in the country have high iron contents. Thus, studies are continuing in order to maximize the Cr and Ni content in the crude alloy by changing the different parameters like temperatures, carbon addition and amount of fluxes. Also, an on-going study is conducted to overcome the high stickiness of the slag which will result to difficulty in slag and metal separation. The use of methane pre-reduced laterite ores and mixed with chromite ores to produce the Fe-Cr-Ni-C crude alloy without the use of solid carbon as reducing agent was studied.



Project 8 – Development of Alternative Technologies for Small-Scale Gold Mining in Caraga and South Cotabato Regions
**Mindanao State University - Iligan State of Technology (MSU - IIT)*
Project Leader: Engr. Ephraim E. Ibarra

The project is designed to examine the gold processing technologies currently being used by miners in the Caraga and South Cotabato Region, and identify

alternative mercury- and cyanide-free techniques that can be adopted in said regions. These processes follow cleaner technology; reduce the exposure of small-scale miners to toxic substances such as cyanide and mercury; minimize cyanide and mercury waste in the environment; furnish information on the feasibility of recovering gold using non-conventional techniques; and direct smelting recovers unliberated gold that amalgamation cannot recover.



Project 9 – ICT Support for Responsible Mining: Use GIS, Data Mining and DSS of Selected Mining Areas in Mindanao
**Caraga State University*
Project Leader: Dr. Rolyng Dagui

The development of the Information system of Responsible Mining and the integration of Geographic Information System (GIS) and Remote Sensing are the main activities of this project. The GIS component of the project is an aid in realizing the spatial analysis by integrating some various tools.



Sampling of raw ore (Image courtesy of S&T Responsible Mining in Mindanao Project 8)

Photonics

99mTc and 99mTc Radiopharmaceuticals: Preparation and Quality Control for Nuclear Medicine Applications



**Philippine Nuclear Research Institute (PNRI-DOST)*
Project Leader: Dr. Alumanda dela Rosa

The use of 99mTc labeled pharmaceuticals is expected to increase as we approach the new age in nuclear medicine. Being painless, safe and cost effective method of imaging, treating, and diagnosing organ function and diseases, the advantages of radiopharmaceuticals over medical surgery methods is recommendable. Nuclear imaging procedures often identify abnormalities in its early stages, thus allowing early and less serious prognosis. To extend the benefits of 99mTc radiopharmaceuticals available to the public and for use in government hospitals, this project established the local capability for the preparation of 99mTc generators, including the protocol for its production and associated quality control procedures. It also developed protocols for the preparation and characterization of commonly used 99mTc radiopharmaceutical kits and protocols for the preparation of 99mTc – biomolecules and radiolabelled compounds for medical research applications.



IAEA Director General Amano at the PNRI Technetium-99m Facility (top)
Technetium 99M Facility (above) Technetium-99M Equipment (right)
(Images courtesy of PNRI-DOST)



SmartWire Program

**Electrical and Electronics Engineering Institute (EEEI), University of the Philippines Diliman*

The economy of the future will be built on electricity-based innovation. Thus, the reliable generation and distribution of electrical energy will be essential in driving sustained economic growth beyond the 21st century. In order to support this, a future energy distribution that is secure, reliable, redundant, self-healing, and supports fast and massive reconfiguration will be needed. It is seen that by around 2030, smart grids will be in place, combining power delivery with data networks that ensure optimal, robust and sustainable power delivery, generation and utilization.



SmartWire team reviewing their design in preparation for fabrication
(Image courtesy of SmartWire Project 3)



Project 1 - Energy Efficient Data Acquisition and Conditioning for the SmartWire Sensor Node Project
Program Leader: Dr. Louis P. Alarcon

Energy efficient data acquisition and signal conditioning circuits for the SmartWire sensor node will be developed in this project. The circuits will be used to measure electric current and temperature information, as well as perform the necessary signal conditioning, allowing for energy efficient information transmission and storage. The main components of the data acquisition and signal conditioning subsystem are analog-to-digital converters (ADCs) and filters. In the context of the SmartWire, these circuits must be able to operate in an energy-limited and very noisy environment.



Project 2 - Integrated Energy Harvesting, Storage and Regulation for the SmartWire Sensor Node
Project Leader: Dr. Richard E. Hizon

The project will develop an efficient and reliable energy harvesting circuit technologies intended for the SmartWire sensor node. The energy harvesting circuit must be able to harvest energy from the power lines

The Smart Wire program, aims to develop the underlying hardware and software elements that will implement a fully integrated sensor node that can be embedded in electric transmission and distribution power lines. Such sensor nodes will feature (1) energy harvesting, (2) data acquisition and signal conditioning, (3) communications capability, (4) computation and control for node management, communication and data processing, and (5) an energy efficient network protocol for accessing sensor data. The four components to this program are as follows:

and/or from ambient radio-frequency radiation. It should be able to supply a current of at least 50mA for the worst-case communication energy requirement. It must also be able to operate in low power mode while on standby, making the average power consumed by the SmartWire sensor network negligible compared to the power of the grid. The two sources of ambient energy that will be studied will be the electromagnetic energy emitted by the power lines, and the ambient radio-frequency energy emitted by various radio sources. The power lines provide the energy during normal operation, while RF energy can be used to energize the nodes during power interruptions.



Project 3 - Energy Ultra-Low Power Computation and Communication for the SmartWire Sensor Node
Project Leader: Chris Vincent Densing

The aim of this project is to develop ultra-low power communication and computation circuits and architectures for the SmartWire sensor node. The communication subsystem will provide the physical layer interface to the communication channel, and could either be the power line for power line communications, or free space for radio-frequency (RF) communications. The computation subsystem manages the operation

of the whole SmartWire sensor node, including the protocol processing needed by the communication system, system- and circuit-level error correction and digital demodulation of the received signals. Both these subsystems must be able to operate at extremely low power levels and at with a supply voltage of 0.5V.



Project 4 - Resilient Data Transport
Project Leader: Nestor Michael C. Tiglao

As the latest addition to the SmartWire Program, this component project shall develop energy efficient and resilient data transport mechanisms for the

SmartWire sensor network. These mechanisms will span the medium access control (MAC), network, and transport layers of the network stack. Additionally, it is intended to leverage the cross-layer optimization design approach that has been shown to provide better network performance compared to the traditional layered approach. However, such approach needs to be used with caution. Hence, there is a need to develop suitable network protocols and mechanisms and ensure coordination of optimization processes at the different layers of the protocol stack.

Versatile Instrument System for Science Education and Research (VISSER)



**National Institute of Physics, University of the Philippines Diliman (UP-NIP)*
Project Leader: Dr. Giovanni A. Tapang

Science and technology education in the country is globally left behind. Out of the 142 countries, the Philippines ranked 113th in infrastructure and 115th in the quality of math and science education. This is also reflective to the situation of our science laboratories. DepEd records that out of every 10 public elementary schools in regions III, IV-A, X, XI, and XII, only one school has a science lab and 3 laboratories for every 10 elementary schools in the National Capital Region (NCR). Additionally, these laboratories are only furnished with typical equipment combination of a computer and an LCD projector.

In order to address the lack of modern science laboratories in Philippine secondary and tertiary schools, the VISSER project developed low-cost yet high impact handheld devices, experiment set-ups, and manuals. Through the use of these instruments, VISSER anticipates to improve students' learning and understanding in the fields of chemistry, physics, biology, environmental science, and engineering.



The VISSER Instruments (Image courtesy of the VISSER Project Team)

VISSER has manufactured 60 Filipino-made handheld devices and developed 61 home-grown experimental manuals in the following fields: 24 in chemistry, 9 in physics, 11 in biology, 5 in environmental science, and 12 engineering. Each experiment comes with a comprehensive background information, materials and procedure for the activity, and supplemental and integrative notes.

Other Projects on Electronics Technology



RxBox2: Integrating Medical Devices in the National Tele-Health Service Program
*National Telehealth Center, University of the Philippines Manila
Program Leader: Dr. Portia Fernandez-Marcelo

The RxBox2 is the second version of the Filipino telemedicine device. It resembles a box with a monitor on top with gadgets inside used for measuring blood pressure, pulse, heart movement, body temperature, the contractions of mother during labor and delivery, and even fetal heart rate. The data gathered are sent via internet and become an electronic medical record for the Community Health Information Tracking System or CHITS. The CHITS generates reports which health workers need and decision makers require for policy and budget allocation.

Project 3 – Field Deployment of Telemedicine Device

In 2013, 20 units of RxBox2 were field-tested in rural health units all over the Philippines. There was a notable improvement in the services provided by these health units. According to health workers who were able to use the device, the patient waiting time was shortened and they were more confident with their diagnosis than before. In relation to this, the project will identify the factors affecting the adoption of the device. Likewise, the usability and functionality of the device will be improved by engineers as feedback from users will be provided.

Moreover, the RxBox2 will be subjected to ethical review and clearance by the Department of Health. The project aimed to enhance the training program to develop and enhance the skills of health professionals in the use of telemedicine devices.

Additional 100 units were deployed in various rural health units this 2014.



The RxBox Unit (Image courtesy of RxBox Project)

Capacity-building in Support of the Pilot Testing of the DOST Tablet Computers



*Advanced Science and Technology Institute (ASTI - DOST)
Project Leader: Engr. Peter Antonio B. Banzon

This project provided the required number of DOST Tablet Computers to be used for the Science and Education Institute (SEI - DOST) project entitled, “Technology Package for Student Learning Empowerment: Pilot Testing of Courseware and Tablet PC”.

The project also ensured that the courseware modules developed by SEI and other contents necessary were properly installed in the tablet computers. Technical support for the use of these tablet computers was also provided through this project.

The DOST Tablet Computers are designed to develop grade school skills on Math, Science and English in support of DOST’s commitment to improve the quality of Philippine education. On the other hand, the Technology Package for Student Learning Empowerment project of SEI – DOST developed courseware for Grade 1 Mathematics and is on the process of developing and pilot-testing of Grade 2 – 6 courseware this year.

The Grade 1 courseware was pilot tested in 10 elementary schools including two schools each in the National Capital Region, Region 5, Region 8, and Region 10 and one each in Rizal and Cavite.



DOST PC Tablet Pilot Testing in Ilocos Norte (Image courtesy of STII)

3-D Gestures on 2-D Screen for User Interface



*Electrical and Electronics Engineering Institute (EEEI), University of the Philippines Diliman
Project Leader: Dr. Rowel O. Atienza

Enhancing mobile user experience is the primary goal of the project. Dr. Atienza’s team developed an algorithm or a program that will easily control or manipulate 3D objects on 2D screens.

To demonstrate how the algorithm works, the team created three (3) mobile games namely: Slash the Fruit, Alien Antics, and Holy Sheep. The user’s intended action or gesture like jumping to the next cloud, as in the case of Holy Sheep, are perfectly executed on the screen.

It is similar to popular 3D games that use pre-programmed actions. The problem with pre-programed responses is that they cannot execute all user-intended actions. A pre-programmed action may look accurate on a 2D screen but its 3D path is inaccurate resulting to missing the target.

The 3D Gestures on 2D Screen for User Interface Project was one of the finalists in the Research and Development Category of the 3rd ASEAN ICT Award.



Screenshots of Slash the Fruit (top, left) Holy Sheep (above) and Alien Antics (bottom, left) (Images from 3D Gestures Project)
With permission from Dr. Rowel O. Atienza

Interdisciplinary Signal Processing for Pinoys (ISIP) Project 6 - Philippine Languages Database for Mother Tongue-Based Multilingual Education and Applications



*Electrical and Electronics Engineering Institute (EEEI), University of the Philippines Diliman
Project Leader: Dr. Rhandley D. Cajote

Based on several studies here and abroad, the use of the learner’s mother tongue as the medium in teaching lessons is proven to be more effective compared to using the foreign language such as English. With this, huge efforts are geared towards the preparation of primary and elementary school materials for a mother tongue-based multi-lingual education from preschool to at least Grade 3.

To help advance Philippine education, the project developed databases of the ten major languages of the Philippines including Tagalog, Cebuano, Ilokano, Hiligaynon, Ilongo, Waray-waray, Kapampangan, Tausug, Central Bicolano, Pangasinense. These databases will serve as sources of information that will be useful in developing teaching materials and computer-based classroom applications.

The project was able to complete the databases for all ten languages. During the development of these databases, they have recorded at least 2,000 speakers who use these major languages as their mother tongue.



The ISIP 6 Website at <http://dspserver2.eeeupd.edu.ph/isip6/>

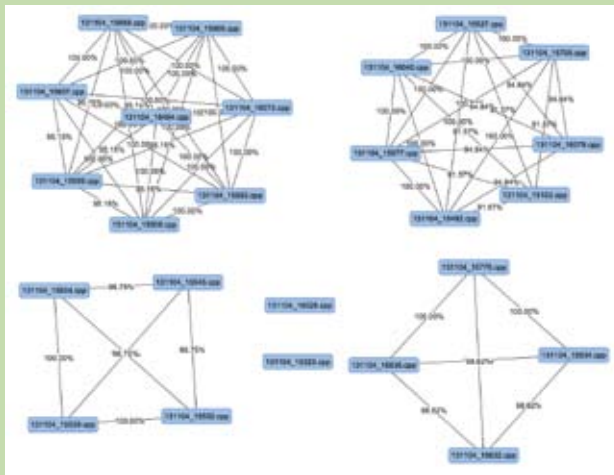


Test Coverage-based Automated Program Evaluation System

*College of Computer Studies, Ateneo de Naga University

Project Leader: Dr. Allan Sioson

When training a novice programmer, it is important to subject him or her to a battery of programming problem sets, where each set is meant to specifically test his or her knowledge in specific area. This programming problem set translates to 30 to 60 short programming problems or around 10 relatively complex programming problems or a combination of short programming problems and relatively complex problems. Manually evaluating programs that attempt to solve each problem poses a daunting task to a trainor. Since providing feedback is a critical part of the training, an automated feedback generation will benefit both the trainor and the trainee during the course of the training period. A software tool that does automatic assessment of program solutions will definitely become an indispensable tool for any trainor or training center.



Source Code Similarity Graph (Image courtesy of Dr. Allan Sioson)
With permission from Dr. Allan Sioson

While there have been attempts to do this abroad, the use of automatic program evaluation systems in the Philippines is largely unknown or limited. The project developed a web-based software system that supports test-based evaluation and program structure analysis on top of a source code submission management system. Testing system prototype in a specific programming training class to assess the system's technical performance and assess whether the system contributes to the success of trainees in solving programming problem sets was also done. The resulting system will primarily be used in Ateneo de Naga.

The developed system prototype could be deployed or used by partner training centers.

Metals and Engineering

Support Program for the Productivity and Competitiveness of the Metals & Engineering Industries

*Metals Industry Research and Development Center (MIRDC - DOST)



Capability Development and R&D on Electroplating of Various Non-Conductive Materials

Project Leader: Engr. Maria Gracia M. Peralta

The MIRDC is instituting surface finishing technologies to complement the stages of processes from mold design, prototyping dies and mold and, plastic injection and extrusion. Surface finishing of the extruded materials and components will be the last stage of the process. Moreover, the project focuses on R&D on electroplating various non-conductive materials which are important to the metals and other industries such

the gifts, toys and housewares (GTH) and automotive industry.



Development of Heavy Duty DC Inverter SMAW-GTAW Welding Machine (Shielded Metal Arc Welding-Gas Tungsten Arc Welding)

Project Leader: Engr. Isidro Millo

An inverter DC Welding Machine is a type of arc welding that incorporates inverter topology in its power supply. This machine uses a series of rectifiers and solid state switches to convert 60Hz alternating current (AC) input power into Direct current (DC). Inverter type welding

machine have many advantages including substantial reduction in size and weight of the transformer and a decrease in power consumption.

The project was conceived to promote locally developed technologies addressing the needs and problems of the metals and engineering industry in the country. This project is in support to the MAKIBAYAN (Makinarya at Teknolohiya Para Sa Bayan Program in recognizing equipment needs that will enhance the performance and productivity of various industries in the country.



Support to the Development of the Foreign Market of the Metals and Engineering Industries through Collaborative Efforts with the Metalworking Sector Asia Project - Philippines, of the Center for the Promotion of Imports from developing countries, Ministry of Foreign Affairs of the Kingdom of the Netherlands (CBI)

Project Leader: Mercedita G. Abutal

In an effort to tap the European and regional markets, the export competitiveness of the M&E sector will be developed through collaborative efforts with the Metalworking Sector Asia - Philippines project of the

Center for the Promotion of Imports from developing countries of the Netherlands Ministry of Foreign Affairs (CBI). The project likewise hopes to address the *obstacles identified in the value chain analysis conducted by CBI experts in coordination with stakeholders of the M&E sector.

The project will support the development of the export market of ten (10) metals and engineering firms classified as Level 2 partner companies. It also envisions to increase export turnover of partner companies by 10% by the end of 2016, and participate in the Export Coaching Program (ECP) and other capability building activities to be implemented by CBI. The CBI is identified as one of the Business Support Organization (BSO) of the Metalworking Sector Asia - Philippines project.

Collaborative efforts are undertaken with the metalworking sector Asia Project of the Center for the Promotion of Imports from developing countries, Ministry of Foreign Affairs.



First day of the local EXPRO seminar held at Platinum Auditorium, MIRDC on 15-17 October 2014. This was participated by partner companies and local CBI Project Team Members/ (Image courtesy of MIRDC-DOST)

Development of 12 hp Single Cylinder Diesel Engine – Year 1 & 2



**Metals Industry Research and Development Center (MIRDC - DOST)*
Project Leader: Jonathan Q. Puerto

A single cylinder engine is a type of combustion engine that features only one cylinder, or chamber in which a piston moves to engage combustion. This is the engine’s source of power, and since only one piston is doing the work, a single cylinder engine is primarily used on smaller vehicles and tools. It can produce a relatively large amount of power given its size, though the single cylinder engine is not especially adept at varying the power output quickly, making it less versatile for larger vehicles. These engines are lightweight and compact, making them a good choice for engine-powered tools such as weed whackers.

Cutting Flywheel Puller Disk



Engine Gear Assembly
(Images courtesy of MIRDC-DOST)



Intelligent Transport System (ITS) Program



Taxi Fleet Management Web App (Ongoing Development) (image courtesy of project team)



ITS 0. Development of the Philippine Metropolitan Advanced Traveler Information System (PhilMATIS)
**University of the Philippines Diliman*
Project Leader: Dr. Ricardo G. Sigua

PHILMATIS or Philippine Metropolitan Advanced Traveler Information System draws information from cameras and sensors installed in major locations using digital image processing techniques that will detect traffic and measure its characteristics (volume, speed, composition, etc). The Advanced Traveler Information System (ATIS) is operated with minimal human influence or factors on system outputs that can monitor traffic flow along different roads in a metropolis, derive rainfall and flood data from existing systems while also monitoring flood incidence at critical points in the road network. It is also an effective tool to address our country’s traffic congestion problems. Recently, 2 units of CCTV were installed in both directions of Maceda Street, Vicente Cruz and Lacson Street in Manila for the ongoing traffic surveys.



ITS 1. Advanced Traffic & Pollution Monitoring and Analysis System Based on GPS Trajectory Data, Air Quality Data and Engine Status Data collected from Taxis in Metro Manila
**Ateneo de Manila University*
Project Leader: Dr. Proceso L. Fernandez, Jr.

Project ITS 1 aims to improve traffic mobility in Metro Manila through provision of aggregated behavior of the Public Utility Vehicles (PUVs) to the PUV and Metro

Manila Development Authority (MMDA), induce efficient traffic flow through provision of public information regarding current and predicted traffic flow on major routes, and enhance policy formulation among government agencies and universities in the Philippines through provision of shared data for transportation planning and operation. The project has currently set-up a cloud-based infrastructure, with GPS connected, that stores and queries traffic trajectory data and air quality data from the GPS trackers installed. Further, 100 taxis have been identified to participate in the project through one (1) operator that accepted the Taxi Fleet Management App and Navigator Management App to be used in this research. The Taxi fleet Management app is more concerned on the maintenance operation monitoring of the taxi fleet. The Navigator app, on the other hand, is focused on providing the 3 best alternate routes.



ITS 2. Development of a Customized Local Traffic Simulator
**University of the Philippines Diliman*
Project Leader: Dr. Sean Hilario O. Palmiano

The research will come up with an application that can be used by local government units (LGUs) for traffic management. The application will have a user-interface that will enable the user to simulate any traffic environment with parameters on the behavior/ tendencies of traffic agents (drivers and pedestrians) that can be set uniformly or can follow some known distribution. The default parameters will be taken from a survey. With this application, addition of traffic infrastructures and implementation of new regulations

can be planned effectively by considering the possible traffic scenarios that may arise from them. Current problems that could be tackled will include optimal U-turn distance from the intersection, control of pedestrian loading and unloading, optimal combination of traffic light frequencies in intersections with optional U-turns, etc.



ITS 3. An Integrated and Optimal Scheduling of a Public Transport System in Metro Manila (PUBFix)

**De La Salle University*
Project Leader: Dr. Alexis M. Fillone

PUBFix is a two-year study that will focus on the planning of the public transport system in Metro Manila, under a 10-year and 20-year planning horizon, with public transport scheduling along a particular route like the EDSA, as one of specific scenarios to be modelled and tested.

Performance Testing of Five-Coach Centrally Powered Hybrid Electric Road Trains for Local Applications – Phase 2



**Metals Industry Research and Development Center (MIRDC - DOST)*
Project Leader: Dr. Rio S. Pagtalunan

The Metals Industry Research and Development Center (MIRDC) developed a Five-Coach Centrally Powered Hybrid Electric Road Trains. In this project, the performance of the five-coach hybrid electric road train that will serve as alternative mass transport for deployment to regular city roads in the country will be integrated, tested and evaluated. It shall also develop protocols in evaluating the road trains suited for local conditions.



The Five-Coach Centrally-Powered Hybrid Electric Road Train (CRT) (Image courtesy of MIRDC-DOST)



Prototype Development of a Five-Coach Centrally-Powered Hybrid Electric Road Train (CRT)

Project Leader: Dr. Rio S. Pagtalunan

The Road Train was introduced as one of the DOST’s proposed advanced transport systems that will help ease traffic conditions in Metro Manila and it was developed to be an effective means of transporting people on the road. This project, including automatic ticketing system will be demonstrated along Bay City, Pasay wherein the public acceptance of the new technology will be determined and the assessment of how the Road Train will affect metropolitan transportation needs. Moreover, it is considered one of the best approaches to encourage a low-polluting mass transit system.



Motor used in the CRT (Image courtesy of MIRDC-DOST)

Development of Prototype Trainset Year 1 and 2



**Metals Industry Research and Development Center (MIRDC - DOST)*
Project Leader: Engr. Pablo Q. Acuin

Rail transport is the most energy-efficient form of transportation as compared to other common modes of transportation. Developing locally-made trainset, including design and established material selection as well as fabrication and manufacturing of every part of the whole trainset, can contribute to the government’s long term program of decreasing traffic congestion caused by various modes of transportation currently being utilized. The project has finalized the design & technical specification of the coaches, chassis, bogies (powered and non-powered wheelset, gearbox, primary & secondary shock absorber & brake system). The five (5) units of Coaches and ten (10) sets of Bogie assembly will be delivered until February 2015.



Locally-made Trainset (Image courtesy of MIRDC-DOST)

Automated Guide-way Transit (AGT) System

**Metals Industry Research and Development Center (MIRDC - DOST)*

With air pollution in Metro Manila hitting higher than the acceptable level set by Republic Act 8749, and congested roadways causing high traffic related costs, the need for sustainable technology alternatives in the transport industry is imperative. As a proactive measure, a prototype AGT system was developed, funded by the DOST in partnership with the University of the Philippines Diliman.

The AGT System in Bicutan, Taguig City (Image courtesy of MIRDC-DOST)



Development of a Prototype Automated Guide-way Transit (AGT) System - Year 1 – 2

Project Leader: Engr. Jonathan Q. Puerto

Road traffic in the country is problematic as it leads to high fuel cost and affect the country economically as it relates to unearned monetary value among workers being stuck in traffic. These implications of traffic are severe; in fact, the Japan International Cooperation Agency reported that the country can lose 6 billion pesos daily by 2030 if traffic in the Philippines will not be addressed. Hence, building an Automated Guide-Way Transit (AGT) as an alternative technology and efficient transport model in the Philippines is imperative.

The project involves creation of a prototype AGT as an alternative and economical transit system model at the Science Community Complex for technology Demonstration. This includes the prototype development of the AGT; design and construction of the AGT system for technology demonstration within the DOST complex; testing and evaluation for the whole AGT system; and promotion and diffusion of the AGT system. In a nutshell, the AGT is an electric train and is a fully automated-driverless transit system (automatically steered). This will serve as a feeder system to MRT and LRT to address transportation concerns in the country. In general, this project seeks to address the country's severe lack of sustainable transport alternative.



The current AGT prototype in UP Diliman can carry a maximum of 30 passengers per coach and has two passenger sections with safety features. It already has a communication and automated fare collection system.



Development of 120-Passenger per Coach Capacity Automated Guideway Transit System (AGT120) – Phase 1

Project Leader: Engr. Joey G. Pangilinan

After the development of the AGT in UP-Diliman, development of an AGT prototype in Bicutan, Taguig was launched. This seeks to further promote advanced transport technologies in the area as it is frequently affected by traffic congestion. The project also seeks to address safety degradation, air pollution, and inefficient public transport concerns in the area.

The project involves the development of the AGT in an elevated test track, design of stations, layout of power supply and electrical power supply connections from the utility. In particular, the deliverables of the project will be a 2-station AGT running parallel to Gen. Santos Ave. in Bicutan, Taguig City. It will have an AGT on elevated guide-way, double car (articulated) and each coach will be able to approximately shoulder 60 passengers.

At present, the AGT in Bicutan can carry 120 passengers per coach having its target maximum speed at 60 kph.



Test and Evaluation of 120-Passenger per Coach Capacity AGT System - Phase 2

Project Leader: Engr. Joey G. Pangilinan

The second prototype of Automated Guide-way Transit (AGT) in Bicutan, Taguig City composed of two (2) coaches with a 120-passenger capacity per coach shall be tested and evaluated for its safety and reliability in this project, since this technology is first of its kind in the Philippines. This system is bigger than the first prototype in UP Diliman which can only accommodate 30 passengers per coach. Also, improvements in the design of the AGT in UP have been introduced in this new prototype. It is therefore a must that this system runs test and evaluation.



Study of Three (3) Potential Automated Guide-Way Transit System Routes

Project Leader: Engr. Joey G. Pangilinan

This project will develop and establish the detailed design, drawing and cost estimate of elevated test tracks, stations, maintenance depot, etc. of various identified routes equipped with safety features, communication and automatic fare collection system by conducting preliminary/preparatory activities in relation to the development of an operation-ready Automated Guide-Way Transit (AGT) System.

This year, eight (8) potential AGT station sites have been visited and surveyed along the 5 – 6 km AGT route Litex Road stretch in Commonwealth area in Quezon City. The site survey and subsurface soil investigation is necessary in coming up with an alignment and design for the footing of each column of track for each of the identified route.



Test and Evaluation of the AGT System in Bicutan, Taguig City (Image courtesy of MIRDC-DOST)

Design and Development of an Automated Guide-way Transit System Depot and Passenger Stations



**Metals Industry Research and Development Center (MIRDC-DOST)*
Project Leader: Engr. Rodnel O. Tamayo

In line with the development of the AGT prototype comes the design and development of its passenger stations. With the development of the AGT prototype, high ranking government officials, including President Benigno Aquino III, and other possible technology adopters had shown interest to support the technology. Hence, it is imperative to continually develop the AGT System including its depot, passenger station, safety features, communication, and fare system. The project aimed to design and develop an AGT system depot and passenger station that will function as a model unit for the demonstration of an operational advance transport technology.

In general, the project designed and developed an AGT System passenger station that functions as a model unit for the demonstration of an operational advance transport technology.

Among the project’s accomplishments are the following: concreting, backfilling, and raising of columns for both stations. A public demonstration run of the AGT system was also conducted which was opened to the public.



The AGT Passenger Station in UP Diliman (Image courtesy of MIRDC-DOST)



Simulation and Evaluation of an Automated Guide-way Transit (AGT) System Passenger Stations
Project Leader: Engr. Rodnel O. Tamayo

The development of the AGT system comes with the passenger stations which include an automatic ticketing system and communication and safety features. The project aims to achieve an AGT passenger station that is efficient in layout and has a well-organized operation. The project conducted simulation and evaluation of the AGT system passenger stations in UP-Diliman for a properly managed, maintained and safely operated passenger station. The project involves the operation, simulation and evaluation of the AGT System passenger station by giving permission for the public to ride.

OUTCOME 3

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



The establishment of state-of-the-art facilities is a vital component in advancing Science and Technology in the country to house R&D, training, product development and other activities to sustain innovation. In 2014, the PCIEERD continued its support on projects towards the enhancement and establishment of infrastructures as a response to DOST’s 3rd outcome.

Establishment of a Gear Making and Assembly Facility



**Metals Industry Research Development Center (MIRDC – DOST)*
Project Leader: Dr. Dominic S. Guevarra

Relative to the directive of DOST Sec. Mario G. Montejo, a study was conducted in 2013 to provide an assessment of the profile of the gear making industry in the Philippines in terms of facilities, technical capabilities and investment requirements. The gear making facility project is part of the DOST’s ardent support in making the local manufacturing sector become more productive and innovative through a more competitive metalworking industry through the provision of facilities, technology and manpower development. The project shall benefit manufacturers in line with the One ASEAN community in 2015.

Establishment of Innovation Center for the Motor and Parts Development (iMOVE)

**Metals Industry Research and Development Center (MIRDC – DOST)*



Project 1. Establishment of a Finite Element Analysis (FEA) Design Center
Project Leader: Engr. Remartin S. Maglantay

The country’s current land transport is dominated by Customized Local Road Vehicles (CLRVs) which are composed of jeepney, owner-type jeepney, Local Utility Vehicle (LUV), Filcab, jumbo jeepney, motorcycle engine-powered vehicle and mini-bus. The project focuses on the structural design analysis of CLRVs with the purpose of discerning safety and weight optimization. To ascertain safety, the analysis to be conducted are simulated crash scenarios. The tricycles which differ in design from city to city in the country will also be scrutinized. The same goes with jeepneys and mini-buses. Furthermore, other motor vehicles, e.g. designs of existing and planned e-vehicles, will also be subjected to analysis. In addition, FEA on commercial bus body design will be conducted to optimize weight.



Project 2. Revitalization of MIRDC’s Testing Facility in Support of the Automotive Components and Parts Manufacturing Sector - Year 1 and 2
Project Leader: Dr. Agustin M. Fudolig

As part the continuing effort of the government, the MIRDC will provide a testing facility that will enhance the competitiveness of the local automotive parts and components manufacturing industry seeking a cost effective material for their products. Aside from material characterization, the facility will be an opportunity for

the parts manufacturer for their testing needs in the conduct of their research and development for their products.



*MIRDC Personnel scanning the Axle of the Jeepney using 3D scanner
(Image courtesy of MIRDC-DOST)*



Project 3 – Establishment of a Die and Mold Solution Center in Support of the Components and Parts Manufacturing Industry
Project Leader: Engr. Fred P. Liza

This project is a continuation of the previous year’s related activities on “Assessing Capabilities of the Local Shops in the Manufacture of Currently Imported Dies, Molds and Toolings.” In this project, the activities focused on the acquisition of much needed technology and facilities that were previously identified in close coordination with the Philippine Die and Mold Association (PDMA) to support the competitiveness of the industry in the localization of currently imported dies and molds.

Strengthening of DOST Regional Metrology Laboratory Services



**Department of Science and Technology III*
Project Leader: Engr. Wilbert H. Balingit

The DOST Regional Metrology Laboratories (RMLs) were established and maintained as the implementing arms of the National Metrology Laboratory (NML) to carry out their functions and provide services to industries, laboratories and LGUs that have equipment/ instruments/ devices requiring test or calibration services. Due to the growing demands from the customers and to cope up with the needs of the times, the project upgrades the facilities and expands the scope of services of the DOST RMLs thereby sustaining the delivery of relevant, timely and quality services to priority industries in the regions.



*Equipment Installed in MetLab of DOST Cebu. Calibrating Bucket (top, left)
Platform Balance and Weights (top, right) Calibration Lab (bottom, left)
Pressure Calibrator (bottom, centre) Calibrating Bucket (bottom, right)*

Related Project on Metals and Engineering



Upgrading of Heat Treatment Facility
**Metals Industry Research and Development Center (MIRDC-DOST)*
Project Leader: Engr. Nelson Tumibay

Heat treatment and surface modification are vital technologies to cater to the demands of emerging challenges in industrial processing and materials technologies. Although there is an advent of new alternative materials to metal parts for automotive, machinery and other industrial equipment, metal is still the predominant component.

To meet the present needs of the industry on having available local Surface Engineering facility, the MIRDC is upgrading its capabilities by implementing new technology projects such as Pulse Plating and Anodizing, consequently upgrading its facilities.



Inspection of Furnace for Refurbishment (Image courtesy of MIRDC-DOST)

Rapid Electric Vehicle Charging Station (CharM)



*Electrical and Electronics Engineering Institute (EEEI), University of the Philippines Diliman
Project Leader: Engr. Niño Christopher B. Ramos

CharM is a fast charging system which can charge an Electric tricycle (E-trike) in less than 30 minutes. The project developed a charging system for electric vehicles (EV) similar to a conventional gasoline station where the EV user can quickly replenish the energy in the storage tank.

Four phases were undertaken: a) bench testing which involved the characterization of batteries, life cycle testing of batteries, and state-of-health and state-of-charge determination; b) on-vehicle testing wherein high-power DC power supply for fast-charging was used, as well as battery charging using appropriate charging rate and algorithm and data acquisition for

E-trike under normal operation; c) development of charging infrastructure and protocol comprised of Electric Vehicle Service Equipment (EVSE), battery management system and contactless payment scheme; d) pilot testing wherein the whole charging system was deployed in Mandaluyong City to service local e-trikes.

The EV is seen to transform the future of transportation in the country. Hence, with the effective development of CharM, integration of EVs in the transportation industry can be made easier through the vehicle's faster charging time.



Dr. Rowena Cristina L. Guevara and Mayor Benhur Abalos at the Launching of CharM at the Tricycle Regulatory Office in Mandaluyong City Hall on 24 November 2014 (left) CharM (right)

Establishment of Advanced Device and Materials Analysis Testing Laboratory (ADMATEL) Phase 3 (OPERATION OF ADMATEL)



*Industrial Technology Development Institute
Project Leader: Dr. Blessie Basilia

The Advanced Device and Materials Testing Laboratory more known as ADMATEL is the country's first national testing facility for the electronics and semiconductor industry. Inaugurated in 2013, this facility houses three laboratories with highly sophisticated equipment for collecting and analyzing information on the cause of defect of sample products.

By providing sophisticated failure analyses and advanced characterization testing services, companies need not send their materials and sample products abroad for testing, eliminating shipping cost and reducing the time for the results of the test to be released. This is especially helpful for companies who cannot afford to put up their own laboratories.

Furthermore, the facility does not only cater to the electronics and semiconductor industries but also to academe and allied industries such as metals, plastics,

chemicals, automotive, and pharmaceuticals, among others.

As of December 31, 2014, ADMATEL served a total of 88 clients and had a revenue of approximately P6.3M.

Services offered by ADMATEL include compositional analysis, failure/defect analysis, high resolution imaging, thermal analysis, and sample preparation and external visual inspection. Testing fees, detailed list of services and other important details can be found in their website at www.admatel.com.

ADMATEL is the answer to the growing industry of semiconductors and electronics. The industry generated \$30B total revenue in 2011 and is expected to increase to \$50B in 2016. The establishment of ADMATEL is a clear signal from the government to potential investors that the Philippines have a business environment that is conducive for globally competitive companies.



JAMP 9500F Field Emission Auger Electron Microprobe (bottom, left); A look inside the sample chamber of the Time of Flight - Secondary Ion Mass Spectroscopy (TOF-SIMS) - the sample chamber of the machine where analysis and detailed elemental and molecular information is obtained (top, left); Placing sample into the furnace of Thermo Mechanical Analyzer (TMA) to begin analysis (center); Sample preparation using polisher and grinder (right) (Images courtesy of ADMATEL)

Establishment and Operation of Philippine Electronics Product Development Hub



**Advanced Science and Technology Institute*
Project Leader: Engr. Peter Antonio B. Banzon

The electronic industry is a key player in Philippine progress being the leading industry contributing to as much as 67 percent of the country's export share. In 2010, revenue from this industry reached \$31B. But a market study conducted by Nomura showed that given a conducive business environment and the necessary facility support, revenue can reach up to \$50B in 2016.

This potential will be highly maximized with the establishment of the Philippine Electronics Product Development Hub. Normally, local electronic companies send samples abroad for product design and testing, which may cost as much as \$5,000 to \$30,000. Through the EPDC, cost will be reduced significantly and there will be a shorter turn-around time unlike results from tests conducted abroad, which may take months. Further, companies can also easily mitigate risks to avoid certification test failure because of its

accessibility. Thus, an increased foreign investment in electronics industry is expected.

The two-floor center will house state-of-the-art equipment and laboratory facilities specifically designed to cater to the electronics industry. The facilities will address the three major critical processes or steps in electronics product manufacturing, namely functional design, product prototyping, and product pilot releasing. These stages involve complex and highly important procedures to ensure products design quality and compliance to standard regulations.

Aside from the electronics industry, other potential users of the center include independent designers such as start-up businesses or incubation ventures, academe, other government agencies and household appliance manufacturers and importers.



The EPDC Building Perspective
(Image courtesy of the EPDC Project Team)

Capability Building in Research and Development on Genomics

Established in July 31, 2009, the Philippine Genome Center (PGC) utilizes the vast knowledge in genomics and bioinformatics in revolutionizing health care, forensics, agriculture and drug discovery and related researches in the Philippines. It is envisioned to be a world-class center of excellence in gene discovery and genomics research that effectively translates knowledge in genomics into applications beneficial to the Filipino people and to humanity as a whole.



*The Philippine Genome Center
Reception Area (Left) and
Laboratory (Right)
(Images courtesy of the PGC
Project Team)*



**Establishment of the Philippine
Genome Center (PGC): Core Facility
for Bioinformatics (CFB)**
**University of the Philippines Diliman*
Project Leader: Dr. Arturo O. Lluisma

As a research facility, the CFB will actively contribute to the development/further improvement of theoretical and practical bioinformatics methodologies and will collaborate with PGC researchers to help find solutions to computational biological problems.

Thus, the facility will pursue research in key areas of bioinformatics / computational biology, including data mining (such as drug discovery from transcriptome data; discovery of genetic markers associated with diseases in humans or with agronomic traits in livestock; systems biology, etc.); development of new platforms for high-performance Biocomputing (particularly as new hardware and internet-based technologies, e.g. cloud computing, become available); and algorithms, software, and databases development (new algorithms or new software for sequence analysis and genome annotation, data management, phylogenetic or evolutionary analysis, structure/function prediction, etc.). As a service facility, it will accept requests for a similar range of analyses as its research thrusts, as well as offer consultancy services to other academics and clients from both the government and private sectors. It hopes to be self-sustaining once the client base has been established, and it has generated or acquired the needed expertise.



**Establishment of the Philippine
Genome Center (PGC): DNA
Sequencing Core Facility (DSCF)**
**Philippine Genome Center*
Project Leader: Dr. Cynthia P. Saloma

The primary mission of the PGC DNA Sequencing Core Facility (DSCF) is to provide sequencing and genotyping services to academic research groups in the country and to the wider scientific community. It will service the sequencing needs of the health, ethnicity and forensics, agricultural and biodiversity programs of the PGC (proposals attached). Next-Generation DNA sequencing (NGS) technologies, phenotyping and bioinformatics tools are essential research infrastructure components of the genome center core facility.

Setting-Up of One-Stop Laboratory Services for Global Competitiveness (OneLab)

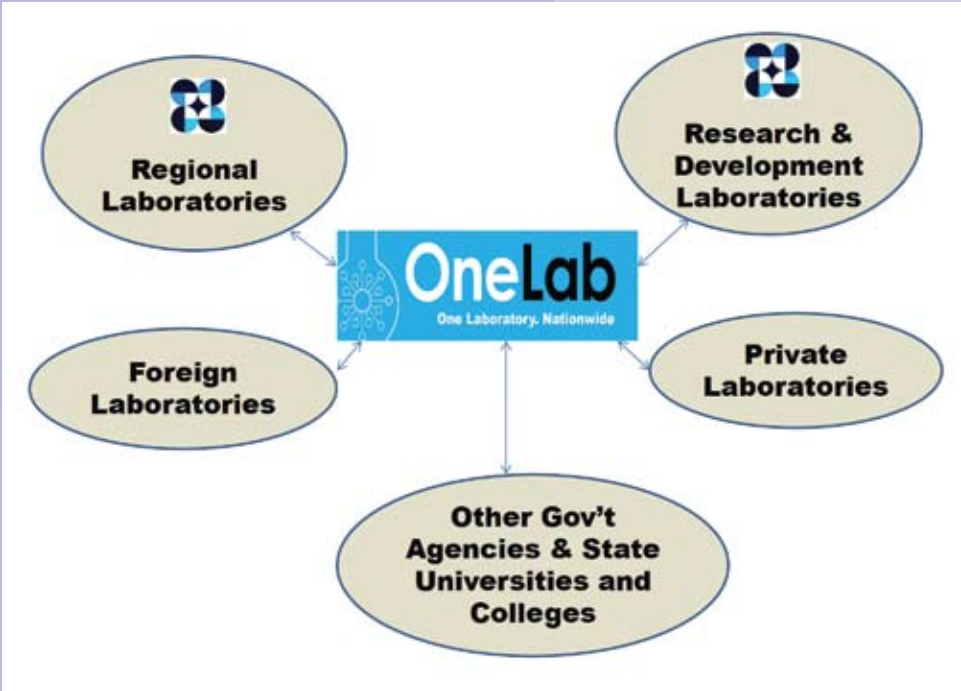


**DOST- Regional Standards and Testing Laboratories*
Project Leader: Dir. Brenda L. Nazareth-Manzano

The OneLab project aims to offer a complete range of laboratory testing services in a one stop place. For example, a DOST laboratory in Zamboanga or any DOST Regional Laboratory will be able to accept samples for the services being offered by the DOST R&D Institutes which are all located in Metro Manila and Los Baños and will be responsible for the release of the test results, and vice versa. These will be made possible through a referral system which will enable exchange of data related to the conduct of test and calibration. The referral system is backed by a ULIMS, a unified laboratory information system which is a window of all available laboratory test services and also status of all tests being conducted. This will therefore broaden public access to testing services, initially within the DOST System, by providing an ICT-mediated testing services. Eventually, it will link other public/government, private, and international laboratories.

Primarily, this project was implemented to address the challenge of shuttling from one laboratory to another since their testing needs are not available in one laboratory. The OneLab project also aims to address other problems of the bureaucracy such as duplication of specialized (involves acquisition of highly expensive equipment and specialized competence) laboratory testing services, different testing fee rates for similar tests, and absence of referral system posing confusion, inconvenience, and time wasted for the industry clients.

As of December 2014, the project has deployed the ULIMS to all DOST Laboratories. Other accomplishments of the project include the development of protocols on Payment Scheme, Issuance of Certificate; Consultation, Interpretation and Advice; Receiving, Sample Preparation and Transport; Arbitration and Court Litigation. By the second quarter of 2015, the Referral system will be fully functional/operational among DOST Laboratories. By the end of 2015, the OneLab project will provide an open web services platform to non-DOST Laboratories (public and private) for integration to the ULIMS and Referral System.



The Interfacing of Various Laboratories under the OneLab Network

Other Projects on Food and Feed



Strengthening the Testing and Analytical Capabilities of the Regional Laboratories to Support the Competitiveness of Local Industries (STARLABS)

**DOST- Regional Standards and Testing Laboratories (RSTL)*
Project Leader: Dir. Brenda L. Nazareth-Manzano

The project expanded test services of the DOST Regional Standards and Testing Laboratories (RSTLs) to cater to laboratory testing needs of MSMEs as well as to complement testing services of other government and private testing laboratories in the countryside. For instance, DOST CAR was equipped by the project to conduct complete tests for water and is the only accredited water testing laboratory by the Department of Health (DOH) in the region while DOST 11 was upgraded to be able to test for raw fish samples which are referred by BFAR to accommodate the large number of clients.

In addition, the project facilitated accreditation of the RSTLs with the Food and Development Authority (FDA) and to date, the RSTLs are the only government laboratories accredited by the FDA.

Moreover, the project also reviewed and rationalized testing fees of all DOST laboratories and this resulted to the issuance of the DOST Administrative Order No. 001, s.2014 Prescribed Fees for Testing Services of DOST Research and Development Institutes (RDIs) and RSTLs that took effect on 01 May 2014. This AO is in compliance to Malacañang Administrative order No. 31, s.2012 Directing and Authorizing All Heads of Departments, Bureaus, Commissions, Agencies, Offices and Instrumentalities of the National Government, Including Government- Owned and/or –Controlled Corporations (GOCCS), to Rationalize the Rates of Their Fees and Charges, Increase Their Existing Rates and Impose New Fees and Charges.



Upgrading of the FPRDI Furniture Testing Center (FFTC) into “One-Stop-Shop” National Furniture Testing Center (NFTC) and Establishment of Satellite Furniture Testing Center (SFTC) in Cebu

**Forest Products Research and Development Institute (FPRDI – DOST)*
Project Leader: Engr. Victor Revilla

The Philippines is dubbed as “the Milan of Asia” because it produces the best furniture in the world. However, these furniture must pass international standards to provide confidence that the products are fit for purpose and safety. Also, to achieve furniture safety and quality, it must be tested in an accredited and certified furniture testing laboratory equipped with complete facilities.

The DOST through FPRDI put this aim into a project to upgrade the FPRDI Furniture Testing Center (FFTC) into a “One-Stop-Shop” National Furniture Testing Center and to establish a Satellite Furniture Testing Center (SFTC) in Cebu. Establishing a satellite testing facility will make it cost effective for the furniture manufacturers especially in the Visayas and Mindanao areas since their furniture is being shipped to Manila and other countries for testing.

Through the project, the FFTC expanded its current testing services, established accreditation/affiliation to local and foreign laboratory accrediting bodies, and enhanced competence of its laboratory personnel. The new tests established are Lead Content Analysis, Corrosion Testing, UV testing for garden and outdoor furniture, and flammability testing. On the other hand, the SFTC in Cebu was established and is now capable of conducting structural evaluation of furniture (performance testing).



Establishment of Centralized Facility of Ultra High Temperature/High Temperature Short Time (UHT-HTST) Pasteurizer for Milk, Coconut Water and Other Juices

**Batangas State University*
Project Leader: Engr. Allan de Villa

This project was implemented in support to the DOST High Impact Technology Solutions (HITS) program to make low-cost, locally designed and fabricated food processing equipment available to MSMEs. Through this project, BatStateU was able to design and develop a Ultra High Temperature/High Temperature Short Time (UHT-HTST) pasteurizer, initially intended for the processing of coconut water (at HTST mode) which are waste products of the copra industry as well as for cow's milk (at UHT mode) which is one of the agricultural products of CALABARZON. The locally designed UHT/HTST is an innovation of imported existing technologies which are limited to one function capable of working at UHT or HTST modes.



Establishment of Complementary Baby Food Production Plant
**Metals Industry Research and Development Center (MIRDC-DOST)*
 Project Leader: Engr. Jose B. Ferrer

This project supports the government's effort in combating malnutrition problems in the country specifically for infants from 4 months to 2 years old.

Environment

Field-testing of the Integrated Copper and Gold Pilot Plant in the Regions



Field-testing of the Integrated Copper and Gold Pilot Plant in the Regions
**Department of Mining Metallurgy and Materials Engineering UP-Diliman*
 Project Leader: Dr. Herman Mendoza

This project promotes an environment-friendly, high yielding alternative process of extracting gold from

ores using flotation/gravity concentration technologies. It also addresses technology limitations of small scale mining to allow even small-scale operations to conduct recovery activities while eliminating adverse effects to health and environment. The alternative processes of Flotation and Gravity Concentration are emerging as the "GREENER" technologies which showed high recovery of gold and other valuable metals like copper at higher efficiencies.



Gold-Copper Integrated Mineral Processing Pilot Plant installed in UP-Diliman (Image courtesy of Project Team)

Other Environment Projects



Establishment of Production Centers for Ceramic Water Filter in Regions CAR, II, and VIII
**Department of Science and Technology Regional Offices*
 Project Leader: Armando Ganal

The DOST through the Industrial Technology Development Institute (ITDI) developed ceramic water filters to be deployed in the 16 regions of the country, especially in the far flung areas. In this project, the aim is to establish three production centers for ceramic water filter, and produce 60,000 filters to households with no access to safe drinking water in the regions. This project also seeks to contribute in achieving the Philippine Millennium Development Goal (MDG) target which is to increase the proportion of population with access to potable water (level I & II) from 82.9 percent in 2007 to 86.6 percent in 2016.



Radiation-induced Grafting of Nonwoven Fabrics for Tanning Industry Waste Water Treatment to Meet Class C Effluent Heavy Metal Standards
**Philippine Nuclear Research Institute (PNRI-DOST)*
 Project Leader: Jordan R. Madrid

The project will deal with the synthesis of an adsorbent from chemical resistant polymers (i.e. polyethylene and polypropylene) using electron beam-induced grafting of monomers in emulsion state. Afterwards, the synthesized adsorbents will be packed in columns

and its performance towards adsorption of metal ions and some organic compounds from synthetic and industrial wastewater will be evaluated.



Integrated Waste Management Program in the DOST Bicutan Complex Project 1 Setting-up of Sewage Treatment Plant (STP) in the DOST Bicutan Compound
**Industrial Technology Development Institute (ITDI-DOST)*
 Project Leader: Engr. Reynaldo L. Esguerra

In 2004, RA 9275 or the Philippine Clean Water Act was made into law. It is a national policy of pursuing economic growth in a manner consistent with the protection, preservation and revival of the quality of fresh, brackish and marine waters. To achieve this policy, the framework for sustainable development shall be pursued. Treatment of sewage is essential to ensure that the receiving water into which the effluent is ultimately discharged is not significantly polluted. However, the degree of treatment required varies according to the type of receiving water. Under the Department of Environment and Natural Resources (DENR) Administrative Order (DAO) 35 Series of 1990, otherwise known as the "Revised Effluent Regulations of 1990", allowable pollutant concentrations are specified for industrial manufacturing plants and municipal treatment plants discharging more than 30 m3 of wastewater per day. This project aims to design, construct and evaluate the treatment efficiency of two (2) sequencing batch reactors (SBRs) in the removal of nitrogen and phosphorous of sewage effluents from the septic tanks of DOST buildings in support to the implementation and compliance of RA 927 and serve as demonstration facility. The construction of the facility started this year and will be operational by 2015.



Sewage Treatment Plant in the DOST Bicutan Compound

OUTCOME 7

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

Aside from researches on different science disciplines, the PCIEERD also supports projects that are geared toward strengthening the country's human resource and institutions for a world class pool of S&T experts.

Human Resource Development

DOST Online Practice Tests for PSHS and DOST SEI Examinations



*Department of Computer Science, University of the Philippines – Diliman
Project Leader: Dr. Susan P. Festin

With a firm belief in the capability and brainpower of Filipino students, the DOST encourages students to pursue S&T courses through the scholarship programs of the Philippine Science High School (PSHS) system and the DOST Science Education Institute (SEI).

Both institutions continue to provide scholarship benefits, allowing students to pursue their studies with strong encouragement to follow the Science and Technology track. These programs aim to train the best and brightest students in different fields of S&T.

However, a high demand for these scholarships have resulted to schools and external parties offering review classes. Though essential to increase the number of passing examinees, these classes are very limited.

To increase the chances of all students, from all walks of life, DOST- SEI and PSHS, along with the College of Engineering of the University of the Philippines, Diliman, developed an online practice test for the scholarship examinations.

The project provided free, internet-based reviewers or practice tests for potential scholars' broader accessibility to PSHS and SEI examinations. Being internet-based, those who cannot afford to enroll in private review centers or have no access to such reviews can have a chance to take the practice examinations.

This recently completed project will benefit students intending to avail scholarships offered by the DOST. With the online reviewers in place, more and more students will be confident in taking science and technology courses.



Screenshot from the DOST-SEI
Online Reviewer Website at <http://www.dostreviewer.org/>

Philippine Competitiveness Development Program (PCDP)

The Global competitiveness of a work force is measured in terms of abstract reasoning, English proficiency, computer literacy and service orientation. Recent data from the Business Processing Association of the Philippines reveal low scores for the current work force which results in low hiring rate for the business process outsourcing (BPO) industry. Filipino engineers who work abroad are classified as ‘technicians’ rather than engineers, and correspondingly receive lower salary.

The onset of K-12 by the Department of Education is an opportunity to change the Philippine workforce in accordance with standards of global competitiveness. However, the output and outcome of K-12 is still 8 years away. Presently, we have college graduates who are unemployed and we have underemployed Filipinos both locally and globally.



Improving Service Orientation Skills (SOS)

**Department of Psychology, University of the Philippines – Diliman*
Project Leader: Josefina Andrea R. Cantiller

In the Philippines, call centers account for 65% of the Information Technology Business Process Outsourcing (IT-BPO) industry which contributed 6-8% GDP in 2010. The need to stay globally competitive is imperative and majority of the industries serviced by our IT-BPO sector require that workers have a strong service orientation background. The Global Competitiveness Assessment Tool (GCAT) is an industry-initiated, online computer test that measures not only basic skills but also behavioral competencies or the service orientation skills of applicants into the Philippines’ growing knowledge-based economy.

Service orientation encompasses competencies linked to personality traits that generally refer to predispositions of agreeableness and this is considered desirable across most industry sectors. In employing organizations, strategic human resource management recognizes the value of determining the suitability of a job applicant to a service-oriented position. To some degree, service orientation is personality-based,

This program shall address the need to enhance the skills of Filipino workforce in terms of the measures of global competitiveness through standalone software programs for English proficiency, computer literacy and service orientation, and an online assessment tool for these skills.



Discussion of the Workplan Evaluation (Image courtesy of the FCAP Project)

but additional training can focus on the learning of values, attitudes and behaviors to enhance social interactions.

This plan shall be carried out by this project that aims to develop a standalone, computer-based learning program that will help improve the core service orientation skills of Filipino workers and graduates. Also, an assessment test will be designed that would determine the students’ current level of service orientation skills.

The learning modules will focus on emotional labor, sensitivity to others, sociability, respect for others and prosocial behavior.



Critical Learning and Problem Solving Skills (CTAPS)

**College of Engineering, University of the Philippines – Diliman*
Project Leader: Dr. Rhandley D. Cajote

Critical thinking and problem solving skills are seen to be one of the core skills required across the greater part of the employment sector, particularly for manufacturing and services. These are also identified as an area wherein skill gaps are most predominant in the Philippine labor pool.

In response to this problem, the Electrical and Electronics Engineering Institute of the UP Diliman developed a computer-based, standalone training module that aims to develop critical thinking and problem solving skills. It will also design assessment tests to measure these core competencies.



Focused Competencies Assessment Program (FCAP)

**Department of Psychology, University of the Philippines – Diliman*
Project Leader: Dr. Aurora Odette C. Mendoza

With globalization and information technology as primary drivers of continuing changes in the nature of organizations and jobs, there is now an increasing concern that our educational institutions may not be able to keep up in producing students that will enter the workforce with the competencies, knowledge, skills and abilities (CKSA).

To address this, this project is being developed to provide research-based recommendations for interventions, from the design to evaluation of capability building programs. More particularly, this study will examine the hiring needs of the Semiconductor industry, represented by the Semiconductor and Electronics Industries in the Philippines Inc. (SEIPI), and assess the skills and competencies of new graduates that are potential applicants to the industry. Data from this study will identify the worker requirements of the industry that are not adequately matched with the CKSAs of new graduates.

The succeeding phases will be based on the outputs of this study to allow for increased validity in the design of interventions such as training modules for new graduates, the implementation of training, and an evaluation of the effectiveness and utility of the training.



Computer Literacy (ComLit)

**Department of Computer Science, University of the Philippines – Diliman*
Project Leader: Dr. Susan P. Festin

In today’s knowledge economy, computer literacy is a skill that has increasingly become a basic requirement for students and workers. In the Global Competitiveness Assessment Tool (GCAT), an industry-initiated, online computer test taken by potential entrants into the Philippines’ growing knowledge-based economy, Computer Literacy skills had been identified as one of the top three gaps for GCAT examinees; this means that this is one of the skills that entrants to our workforce lack greatly.

To maintain our competitive advantage as well as to scale up to other sectors for IT-BPO, we need to ensure that our graduates have mastered these basic computer literacy requirements: basic data management, internet competency, and competency in basic applications. This is similar to what other regions and countries have initiated, such as the European Computer Driving License (ECDL) and the United Kingdom’s CLAIT (Computer Literacy and Information Technology) courses and examinations.

In order to address these concerns, this project shall develop a standalone, computer-based learning program that will improve the core computer literacy of Filipino workers and a way to assess what they already know and what they have learned.

The training module will include basic and advanced computer operations and functions, online skills, word processing, presentations, spreadsheets. It will also cover specific and focused topics such as databases, IT security, online collaboration and basic computer graphics.

Human Resource Development for Nanoscale Metrology, Tribology and Instrumentation and Control



**National Institute of Physics, University of the Philippines Diliman (UP-NIP)*
Project Leader: Dr. Arnel Salvador

Alongside the growing market for electronic gadgets with highly specialized functions, the need for manpower skilled in nanoscale metrology steadily increases. Thus, there is a need to train and develop the necessary manpower to address this demand.

For this reason, the DOST and universities from the academe, with funding assistance from PCIEERD created a project that will develop the needed competencies. This was done through experimental research studies and immersion activities involving real-industry problems.

This human resource development project will hone the capabilities of our scientists and engineers in metrology, the science of measurement; tribology, the science and engineering of interacting surfaces in motion; and instrumentation control, the use of measuring instruments to monitor and control a process, all at the nanoscale. These skills set covers

the diverse needs of the whole semiconductor and electronics industry in the country.

The project is a collaborative effort of researchers in the academe, spearheaded by the UP-NIP and Technological Institute of the Philippines (TIP) with the participation of the Mapua Institute of Technology. The venue for the immersion activities and samples that were studied was provided by the Western Digital/Hitachi Global Storage Technology Philippines (Hitachi GST).

Outputs from the project will be integrated in the metrology and optical characterization techniques that is currently offered at the UP-NIP and in the instrumentation and control at the TIP. A core group of people that possess the competencies required by the industry will also be created.



*Students working on the AFM (left) and microRaman (right) at the National Institute of Physics.
(Images courtesy of Dr. Arnel Salvador)*



Developing Capabilities for Biophysics Research at the University of San Carlos, Cebu

**University of San Carlos - Cebu*



Project 1. Coils in Gels: Developing Capability to Investigate Gel Composite Viscoelasticity
Project Leader: Dr. Rommel G. Bacabac

Biomaterials find immediate use in the development of additives or supplements for various applications (which includes the development of scaffolds for artificial tissue implants).

This project uses videomicroscopy and twin optical tweezers to study the microrheology of a viscoelastically tunable biomaterial using alginate-DNA composites as a model, with double stranded deoxyribonucleic acid (DNA) molecules as helical inserts. Since cells are mechanosensitive, the use of alginates would require the fine tuning of its viscoelastic properties for specific applications.

The end result of this study will therefore enable the development of a viscoelastically-tunable biomaterial using alginate- DNA composites as a model



Project 2. Flow to Gel: Developing Capability to Implement Optical Tweezers with Microfluidics for Homogenized Gelling
Project Leader: Dr. Josephine M. Castañares

The project addresses the need for developing a more creative use of emerging technologies for possible clinical applications based on the microrheology of modeled soft tissue material.

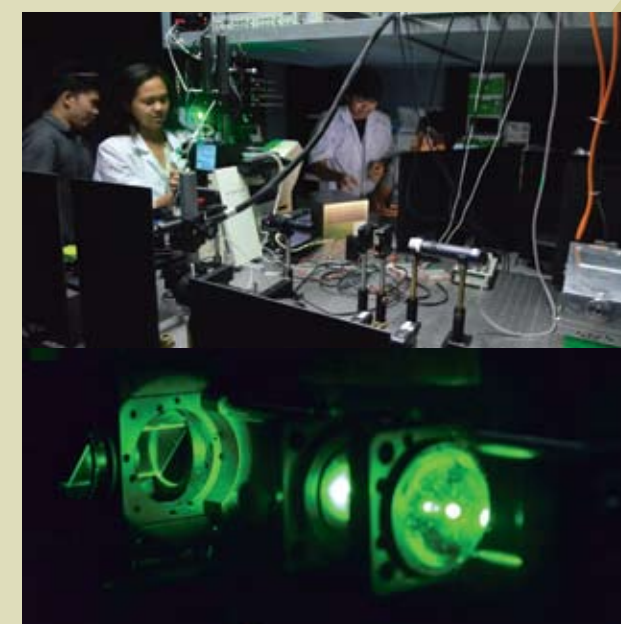
To develop a novel multi-mode microrheology application and contribute insights into the physical mechanisms driving biological function, this project will develop a twin optical tweezer system with microfluidics to investigate the on-site polymerization of a biomimetic model extra-cellular matrix (ECM) gel using fibrin (the essential material for a blood clot scaffold that form at the onset of the wound healing process).



Project 3. Cells as Gels: Developing Capability for High Throughput Cell Elasticity Sorting
Project Leader: Dr. Frances Edillo

This project addresses the characterization of cell viscoelasticity for potential biomedical applications. The technology to be developed will use microfluidics and optical tweezers to enable measurements of mechanical properties at microscopic level (microrheology) by monitoring probe particle fluctuation using back focal plane interferometry. The approach will be able to investigate single red blood cell and fibroblast viscoelastic properties.

The study will employ videomicroscopy and high precision instrumentation with optical tweezers and microfluidics for characterizing the viscoelastic properties of living cells. This would further lead to insights in the design of a prototype microfluidic chamber technology based on red blood cell sorting by elasticity, which have potential applications as an immediate supplementary diagnostic tool. Also, the optical tweezer-microfluidics tandem would remain a valuable tool for investigating the mechanics of living cells of various lineages down to the study of aggregates and single molecules.



Video Microscopy Assembly

Human Resource Intervention for Sustainable Growth, Productivity and Competitiveness of the Metals and Engineering Sector: Development and Implementation of Appropriate Training Curriculum Design for Computer Numerical Control (CNC) Machine Tool Programming and Operations



**Metals Industry Research and Development Center (MIRDC - DOST)*
Project Leader: Dr. Danilo N. Pilar

As a response to pressing national problem on brain drain, particularly of CNC machining skilled workers (machinists, programmers and operators), development and implementation of an effective training curriculum to ensure the availability of competent CNC programmers and operators in meeting the manpower requirement of the domestic metalworking firms will be involved in this project.

This project is also supported by the Technical Education and Skills Development Authority (TESDA), Metalworking Industries Association of the Philippines, Inc. (MIAP), Philippine Die and Mold Association, Inc. (PMAI), Aerospace Industries Association of the Philippines, Inc. (AIAP), Iloilo Science and Technology University (ISAT-U) and Don Mariano Marcos Memorial State University (DMMMSU)-La Union.

The MIRDC CNC training facility, seven Regional Training Centers of TESDA in NCR, CAR, Batangas, Talisay, New Lucena, Cebu and Davao, and two other

conventional machining facilities of universities in Iloilo & La Union were utilized as training centers. This is expected to produce 800 CNC machinists/programmers/ operators.

Qualified applicants are preferably those with basic knowledge and skills in conventional machining (turning or milling) and basic computer operations. In addition, applicants must either be high school graduates with machining course from TESDA or TESDA-accredited training institutions; vocational/trade course graduates (preferably Mechanical Technology or related course); or college level students who completed at least two years of study, preferably in an engineering course. The 62-day training program includes basic to complex competencies that are further honed through actual machining and industry immersion.

The training is free for unemployed participants and a daily allowance of P300.00 is provided to trainees for the entire duration of the CNC Training Program.



Students working on the AFM (left) and microRaman (right) at the National Institute of Physics. (Images courtesy of MIRDC-DOST)

Joint Research Program: Dual Planar Magnetron for Titanium Dioxide (TiO₂)-based Photocatalytic Wastewater Treatment Facilities

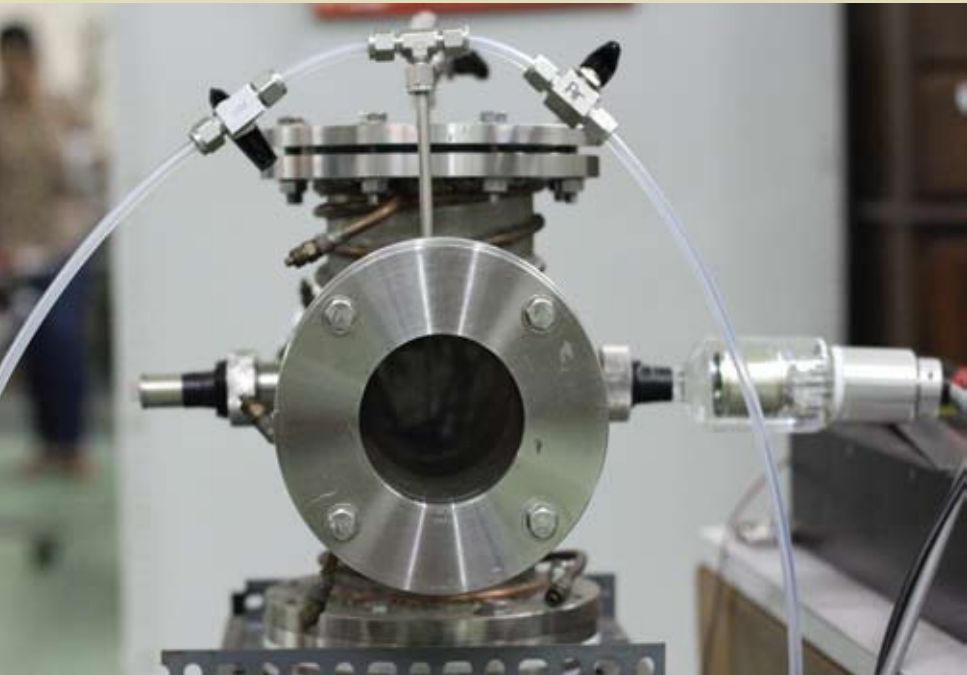


**National Institute of Physics, University of Philippines Diliman (UP – NIP)*
Project Leader: Dr. Henry J. Ramos

The DOST-JSPS Joint Scientific Cooperation Program is an inter-institutional cooperative arrangement for Scientific Cooperation between the Department of Science and Technology (DOST) and the Japan Society for the Promotion of Science (JSPS).

The Program is designed to create high potential research in the fields of natural sciences, social sciences and humanities. Ultimately, the program fosters and looks after the next generation of leading researchers in the country.

One project under this program, led by Dr. Henry Ramos of UP – NIP, will develop an advanced configuration machine, the “Spherical Dual Magnetron” in Japan while designing and building a compact table top versatile machine locally. The project will accelerate related research and development efforts towards the optimization and industrial applications of more efficient Dual Planar Magnetron Devices. Likewise, the synthesis of functional materials like TiO₂ for wastewater treatment and other applications will be undertaken using the devices developed under the project.



Compact Planar Magnetron Device for TiO₂ Deposition (Left) and Oxygen Plasma (Right) (Images courtesy of the Dual Planar Project)

Developing PNRI Capability for Electron Beam Technology Applications



**Philippine Nuclear Research Institute (PNRI – DOST)*
Project Leader: Luvimina G. Lanuza

Electron radiation processing involves modification of the structure and properties of a material using electrons of high energy. Similar to the old process which uses chemicals to harden, cure, or change the composition of polymers and plastic based products, radiation from electron beams strengthen the materials. This makes them more resistant to corrosion, heat and chemical damage. Notable applications are found in industries involved in making tires, wires, cables, batteries, fabrics, paints and food packaging.

Electron beams have been employed worldwide for R&D, commercial and industrial applications. In recent years, the electron beam technology has surfaced as more advantageous source since it produces higher dose rates that speeds up the process, resulting to high throughput.

This opens the doors to more potential applications such as better waste management, nanotechnology and enhancement of quality of products like automobile parts, plastics, fibers and semiconductors.

To catch up with the international community, the PNRI has established an Electron Beam Irradiation Facility. This will be the first electron beam irradiation facility

in the country that is intended for full-scale R&D and semi-commercial irradiation services.

Along with the establishment of this facility is developing PNRI's capability for electron beam technology applications, which involves training of staff and conduct of R&D activities such as synthesis and characterization of polymers and development of radiation sterilized honey-alginate wound dressing. In line with this, PNRI scientists also aim to develop metal ion adsorbents for water purification, catalysts for desired chemical reactions and chemical sensors, among others. These involve polymer grafting where desired polymer chains/ substrates are "grown" on the surfaces of the main polymer/material.

Considering the recent disasters/ calamities that hit some of our islands, practical applications of electron beam radiation involve production of shelf-stable food for emergency rations, production of nanogels for delivery of topical drugs and production of functional materials for wastewater treatment.

With the facility and a pool of trained personnel in place, it is hoped that the institute's capability will soon be at par with other ASEAN countries.



Compact Planar Magnetron Device for TiO2 Deposition (Left) and Oxygen Plasma (Right)
(Images courtesy of the PNRI-DOST)

Gitara ni Juan: Development of Prototype Design and Standardization of the Guitar-making Process for Quality Classical Guitars Using selected Philippine Woods



**College of Music & EEI – University of the Philippines – Diliman*
Project Leader: Nathan Neil Manimtim

Currently, almost all the high quality guitars available in the market are created by famous luthiers from around the world. Made with spruce, cedar or rosewood, these guitars can be expensive with prices ranging from \$2000 to more than \$6000.

With this challenge in mind, this project was crafted to set a control standard for the construction of classical guitars by analyzing the process of building the guitar using imported high quality woods. It will also look into the possibility of using Philippine woods on the guitars. With this information, a luthier guide or compendium will be built and locally-made prototypes in the UP Diliman College of Music shall be launched.

This project will benefit our local guitar making industry and will create more income opportunities for Filipino instrument makers. Moreover, tree plantation farms will be developed to sustain the supply of the local woods that will be used in making these classical guitars, and therefore provide additional jobs for those working in the agriculture industry.

Because of this project, quality and affordable classical guitars will become accessible to ordinary, low-income Filipinos who have the desire to learn the art of classical guitar playing.



Recording Guitar Sound Sample using Mechanical Mechanism
(Image courtesy of the Gitara ni Juan Project Team)

Establishment and Operation of the Philippine Institute for Integrated Circuits (PIIC)



**Electrical and Electronics Engineering Institute (EEEI), University of the Philippines Diliman*
Project Leader: Dr. John Richard E. Hizon

In the country's efforts to strengthen the electronics and semiconductor industry, the DOST and the UP Diliman EEEI established the Philippine Institute for Integrated Circuits (PIIC).

As the Philippines slowly becomes known as a location for Integrated Circuits (IC) design activities and the number of multi-national semiconductor companies increase, there has been a shortage of skilled human resource.

The PIIC now offers the opportunity to increase the number of skilled workforces for the industry. Furthermore, it will enhance the electronics and semiconductor industry in the Philippines through the development of skilled R&D personnel by improving microelectronics education and through the Integrated Circuits design training.

The Institute intends to strengthen the fundamentals of microelectronics in the academe. This is achieved by improving the teaching capability of the faculty members in these universities and the hosting of students interns to work on specific IC design related activities. It will also encourage academe-industry

linkage through graduate level R&D activities, thereby further enhancing the programs in target universities.

Engineers who wish to pursue a career in microelectronics may avail of certification-based training courses. PIIC offers industry defined basic courses that will allow the engineer to directly apply in IC design companies. In addition, a training curriculum that will address both short-term and long-term needs of the industry in close coordination with the academe will be developed. The PIIC also aims to enable Filipino-owned companies to develop home-grown Intellectual Property (IP) by providing a venue for real-world technology and applications exposure.

In 2014, the PIIC was able to conduct benchmark examinations, develop training modules, deliver trainings, conduct an immersion program, start the Industry Advisory Board and participate in the National Science and Technology Week (NSTW).

The establishment of the PIIC will ultimately supply the need for engineering talent and introduce the Philippines as a leading destination for IC design activities.



The PIIC Project Team
(Image courtesy of PIIC)



PIIC Research Assistant Developing Circuit Experiments for Training using industry EDA tools
(Image courtesy of PIIC)



Human Resource and Institution Development

To fully complement the human resource and R&D needs and requirements of the industry, energy and emerging technology sectors, PCIEERD implements two Capability Development (CapDev) Programs namely the Human Resource Development Program (HRDP) and the Institution Development Program (IDP).

Human Resource Development Program (HRDP)

The HRDP aims to:

- develop and enhance Filipino R&D capabilities through degree programs, conduct of research activities, and expert mobility in the industry, energy and emerging technology fields in order to meet the present and future human resource requirements;
- develop and enhance R&D capabilities in the industry, energy and emerging technology sectors of academic institutions as well as the DOST agencies; and
- encourage Filipino researchers to be more productive researchers by providing support for disseminating their research outputs in the industry, energy and emerging technology sectors in local and international conferences, fora and similar events.



Dr. Arnold Lubguban (2nd from left) with Dr. Arnold Alguno and Dr. Jinky Bornaes of MSUIT, Dr. Luzviminda Simborio of CMU, Dr. Jaime Montoya of PCHRD, Ms. Ermie M. Bacarra and Ms. Glenda Sacbabit of PCIEERD during the Balik Scientist Program Gala held on October 10, 2014.

The components of the Program are as follows:

Visiting Expert Program

The Program is open to institutions needing faculty/experts from another institution that possesses the required expertise not available in the requesting institution. The expertise should be within the PCIEERD priority areas.

This year, the Program was able to support the Physics Department of the MSU-Iligan Institute of Technology (MSU-IIT) through the visit of Dr. Arnold Lubguban, who is also a BSP awardee. The Physics Department Head of the university, Dr. Arnold Alguno, requested PCIEERD’s support for a one-month visit of Dr. Lubguban. This was after his short visit to MSU-IIT under the auspices of BSP. As Visiting Expert, Dr. Lubguban conducted lectures, hands-on workshops and consultancy on polyols and polyurethane applications. He was also assigned to mentor graduate students under the DOST-ASTHRDP, other graduate students and faculty researchers of the department doing bio-based polyols and polyurethane research at the Materials Science laboratory.

Faculty Immersion Program

The Program is open to faculty members who wish to gain research experience by engaging in a research activity under a mentor from a PCIEERD delivering institution or other recognized industry/organization.

The Program was able to support the immersion of Engr. Juanito Burguillos of St. Louis University in Baguio City for the conduct of his research entitled, “Design, Construction and Performance Evaluation of Reflective and Absorptive Bodies Indirect Active Integral Hybrid Solar Dryers for Crop Preservation” from May to November 2014. His host researcher was Dr. Jessie Elauria of the Institute of Agricultural Engineering, College of Engineering and Agro-industrial Technology, UP Los Banos. The project involves the fabrication of two solar dryers with opposite thermal properties; reflective and absorptive. These will be constructed and evaluated for their performance on the drying of selected agricultural products. As of November 2014, the construction of the reflective and absorptive hybrid solar dryers was completed. Drying tests for mangoes and cacao beans and moisture analysis of dried products, along with other tests were also conducted. Engr. Burguillos is in the process of completing the

trials and the preparation of the write-up of the results of the tests.

Research Attachment

The Program is open to MS and Ph.D. students, researchers and project staff of a PCIEERD- or DOST-funded project in the science and engineering fields who needs to conduct research in a host institution, including foreign universities and research institutions to avail of the host institution’s facilities and research expertise.

This year, the Council supported three young researchers who are project staff of the PCIEERD-funded project entitled, “COILS, CELLS, AND GELS” implemented by the University of San Carlos-Physics Department with Dr. Rommel Bacabac as the project leader. They are Mary Ann Ruelan, Stephen Flores and John Philip Billiones. The three-month research is conducted at the Experimental Biophysics Laboratory of the Kyushu University, Japan for 1) measurements of the properties of alginate-DNA composites using standard rheometer and feedback microrheology; 2) measurements of the properties of reconstituted fibrin using a standard rheometer and feedback microrheology; and 3) measurements of the mechanical properties of mammalian cells using feedback microrheology.

Grants for Paper Presentations in and Attendance to Conferences, Seminars, Trainings, and Workshops

The program covers support to researchers, faculty and other S&T personnel of academic and research

institutions for presentation of research results in refereed scientific/technical conferences, fora, seminars, workshops, and trainings, etc. It aimed at seeking recognition for Filipino researchers, soliciting peer review, developing professional growth, and acquiring specialized skills and new knowledge in support of the Harmonized R&D Agenda and the PCIEERD sectoral priority areas.

For 2014, the Council provided financial support to 14 grantees for paper presentations and attendance to trainings/workshops/seminars in South Korea, Myanmar, Thailand, Indonesia, Malaysia, Japan, New Zealand and U.S.A.



Presentation of Dr. Yvonne Musico, of Technological Institute of Philippines, entitled, “Graphene-based modified membrane filters for inactivation and removal of bacteria.” (Image courtesy of Dr. Yvonne Musico)

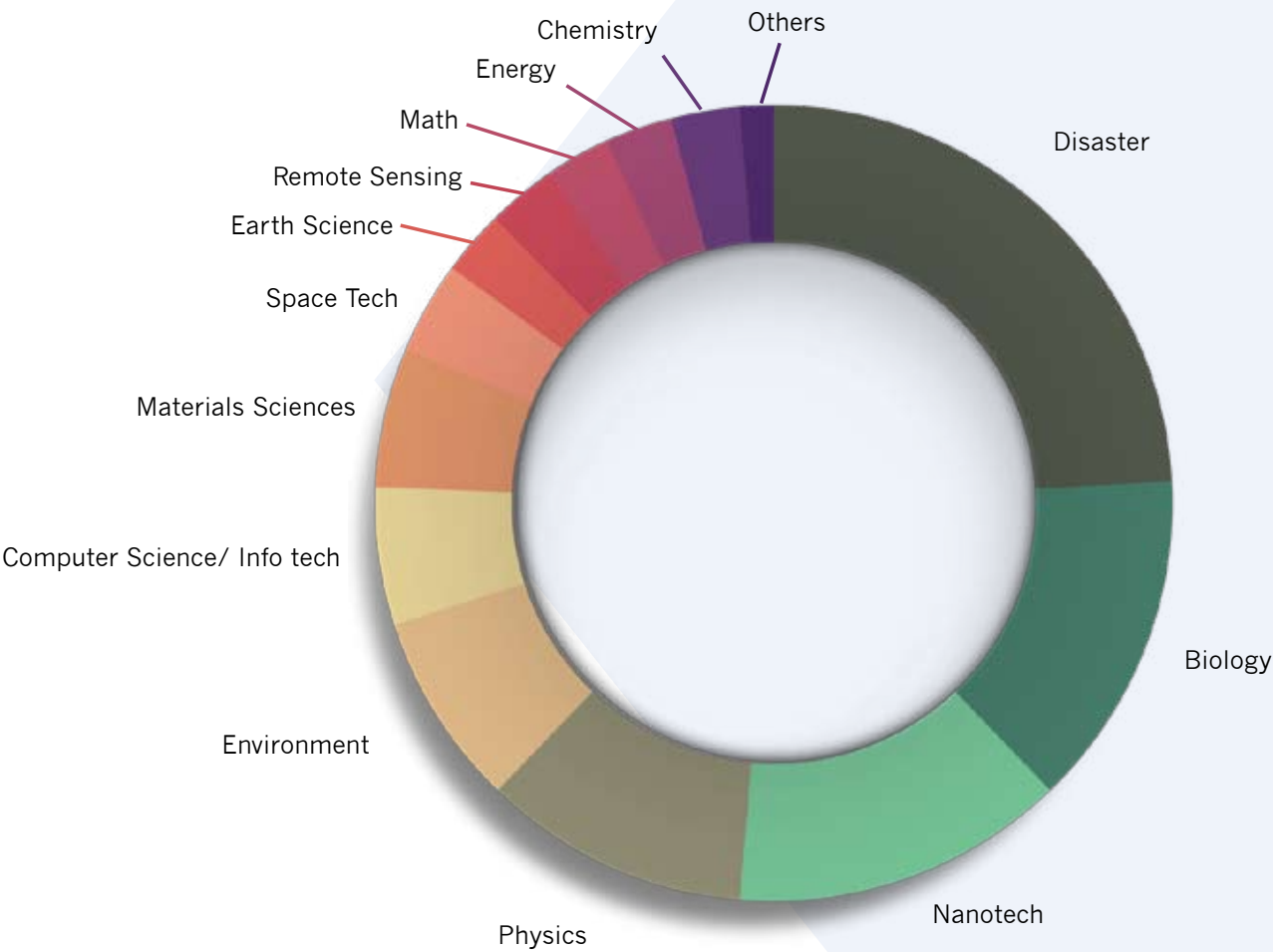


Engr. Meriam M. Santillan of Caraga State University presenting her paper on “Species Distribution Modeling to Aid Remote Sensing of the Starch-Rich Sago Palm in the Philippines” (Image courtesy of Engr. Meriam M. Santillan)

Support to Conduct of Conferences, Seminars, Trainings

This grant covers support for the conduct of technical conferences, seminars, trainings, scientific presentations aimed at developing professional growth and acquiring specialized skills and new knowledge in PCIEERD’s identified R&D priority areas of concern.

This year, PCIEERD was able to provide support to a total of 25 institutions or scientific organizations. Below is a distribution of the grantees per priority area. The list of grantees can be found on the appendices.



The Balik Scientist Program

As defined by the guidelines of the Balik Scientist Program (BSP), a “Balik Scientist” refers to a science and technology expert who is a Filipino citizen or a foreigner of Filipino descent, residing abroad and contracted by the Government to return and work in the Philippines on his/her field of expertise. The BSP enjoins foreign-based Filipino scientists, engineers, technology entrepreneurs of Filipino descent to return and work, and actively participate in the government’s efforts to fast track the Philippines’ S&T development and, consequently, socio-economic progress. Being at the forefront of both knowledge creation and diffusion, the DOST hopes to strengthen the scientific and technological human resources of the academe, the public and private institutions through the BSP.

the ingenuity of Filipinos in the field of science and technology here and abroad was conducted on 10 October 2014. The Balik Scientist Program Gala Night dubbed as “A Night with the Balik Scientists” provided opportunities for past and on-going BSP Awardees to meet potential host institutions for future collaborative works.



The PCIEERD also conducted information and education campaign (IEC) on the BSP in 11 provinces, where participating government agencies, local government units and educational institutions identified their needs for BSP assistance which will be used as basis for link-up with prospective BSP applicants.

A gathering of the Balik Scientist Awardees to celebrate

BSP STATUS

Availment	Short Term	Long Term
On-going from previous years	7	3
Approved in 2014	10	2
Total Monitored for 2014	17	5
Completed as of December 2014	11	2

Profiles of Balik Scientists under PCIEERD Completed in 2014

Short-term Category



Ms. Corazon Salumbides
MA in Education Administration
BSP Duration: 02 January – 31 March 2014
01 April – 31 May 2014 (Voluntary extension without DSA)

A graduate of M.A. in Education Administration at the San Francisco State University in 1989, Ms. Corazon Salumbides shared her expertise on microscale techniques in chemistry education, benefiting the Philippine Foundation for Science and Technology as her host institution as well as general science and chemistry teachers.

Under her stint as Balik Scientist (January 2 to March 31, 2014), she was able to generate 2-3 episodes of microscale chemistry instructional video in cooperation with STII and PCIEERD; develop a training module for Hands-On Minds-On: Microscale Chemistry (HOMOMICH) workshops to be used for echo trainings; produce “Lab in a Box” kits used by workshop participants; and train at least 300 general science and chemistry teachers in microscale technique in teaching chemistry.



Dr. Lawrence L. Ilag
Ph. D. in Molecular Biology
BSP Duration: 06 January – 28 March 2014

With a Ph.D. in Molecular Biology from Yale University and a Juris Doctor at Yale University, Dr. Ilag shared his expertise on Intellectual Property with various institutions such as the Philippine Genome Center; the Center for Technology Transfer and Entrepreneurship of UPLB - Institute of Plant Breeding; University of San Carlos; DOST-PCAARRD and DOST-Technology Licensing Office from January 6 to April 14, 2014.

Dr. Ilag's versatility as a researcher and patent expert provided him a better understanding on how to assist Philippine research institutions in translating research outputs into products in the marketplace. His recommendations included the engagement of patent counsel and competent full time, in-house patent agents who can be trained with the technology underlying the patent application. He also advised research institutions to be proactive in pursuing market studies and opportunities.

During his visit, Dr. Ilag conducted seminars, workshops and lectures on intellectual property rights (IPR) strategies. Moreover, he convened consultation meetings with management personnel regarding existing and planned mechanism for pursuing IPR as well as with scientists and researchers on the conduct of research activities vis-à-vis IPR strategies, literature reviews and evaluation of patentability of research outputs.



Dr. Marites P. Melancon
Ph.D. in Biomedical Science Major in Biochemistry and Cancer Biology
Assistant Professor, Department of Diagnostic Imaging
The University of Texas MD Anderson Cancer Center Houston, Texas
BSP Duration: 15 March – 15 April 2014

Dr. Marites P. Melancon is an expert in cancer nanotechnology and has extensive background in chemistry, with specific training in organic synthesis, analytical chemistry, bioconjugation, drug delivery systems and instrumentation. She had developed novel near infrared that is able to activate nanocarriers for the selective treatment and diagnosis of cancer.

Her contract enabled her to touch base with the Ateneo de Manila University as her host institution where she was a tenured faculty before moving to the United States. She also visited UP Diliman, De La Salle University, University of San Carlos and the Medical City. These institutions benefitted from her expertise on gold-nanoparticle based cancer theranostics through a series of lectures and hands-on workshop. The possibility of cooperation beyond her BSP grant was also discussed including developing a diagnostic tool for dengue fever, in-vitro and in-vivo characterization of mesenchymal stem cell for bone regeneration, and sandwich program/training in Dr. Melancon's laboratory.



Dr. Arnold A. Lubguban
Ph.D. in Chemical Engineering, University of Missouri
BSP Duration: 24 March – 13 June 2014

Dr. Arnold A. Lubguban earned his Ph.D. in Chemical Engineering from the University of Missouri in May 2009. He filed a Sabbatical leave from being a radiochemist at the Precision Nuclear, LLC to share his expertise on polymerization to universities and research institution in the Philippines under the Balik Scientist Program.

In his short-term stay (March to June 2014), Dr. Lubguban conducted experimental demonstrations at Chemrez Technologies to study and show the potential of biomass-based polyols as viable commercial products. His visit also resulted in partnerships between Chemrez Technologies, Uratex and MSU-IIT to pursue plans of commercializing bio-based polyols and polyurethanes.

Dr. Lubguban conducted lectures and demonstrations on biobased polyols and polyurethanes in Ateneo de Manila University, MSU-IIT and Xavier University. He also assisted in conceptualizing a proposal on the conversion of rice hull into polyols which can be used as substrate for semiconductors. Dr. Lubguban also reviewed a project done by the ITDI on the synthesis and properties of polyurethane from coco-biopolyol, where he suggested alternative reaction routes to process coconut oil.



Dr. Manuel V. Hernandez
Ph.D. in Mechanical Engineering
BSP Duration: 31 March – 18 July 2014
Subsequent visit in 2014:
Phase 1: 03 November – 12 December 2014
Phase 2: 05 January – 27 February 2015

Dr. Hernandez earned his Ph.D. in Mechanical Engineering at the University of Florida in 1983, where he also finished his graduate studies on the same field in 1979. Prior to this, he completed his BS in Mechanical Engineering at UP Diliman. He held different positions in the academe, government and private sectors.

Dr. Hernandez has contributed in the implementation of various DOST High Impact Technology Solutions (HITS) projects such as the Automated Gateway Transport (AGT), road train, railway train, harvester, hand tractor attachments as well as the "Support Program for the Productivity and Competitiveness of the Metals and Engineering Industries" project using locally developed technologies to address industry needs. In addition, his vast experience in Machine Design and knowledge in advance transport system has been valuable in the capacity building through mentoring and guidance of DOST-PMEDSO and MIRDC engineers.



Dr. Alejandro Tongco
Ph.D. in General Engineering
BSP Duration: 12 May – 15 August 2014

Dr. Tongco earned his doctoral degree in General Engineering from the Oklahoma State University and presently serves as a research specialist in the same institution. He obtained his MS in Agricultural Engineering at UP Los Baños and his BS in Mechanical Engineering at the University of San Jose Recoletos. Dr. Tongco possesses advanced technical skills in Geographic Information System (GIS) and has substantial experience in the academe. He is the founding director of the Philippine GIS Data Clearinghouse (<http://www.philgis.org>), a self-funded public service volunteer organization dedicated to provide free GIS data and technical advice to Philippine GIS researchers and data users.

During his BSP engagement, Dr. Tongco conducted trainings, workshops and seminars on GIS, acted as guest lecturer in various institutions, assisted in the preparation of 13 GIS-based project proposals for submission to various funding agencies, assisted in the preparation of a course syllabus for a proposed BS Geographic Information Systems Technology at the Southern Luzon State University and co-authored a chapter "GIS as a tool for risk analysis" for the book project of Ateneo de Davao University on risk assessment and climate change adaptation in Mindanao.



Dr. Felixberto Buot
Ph.D. in Theoretical Condensed Matter Physics
BSP Duration: 15 July – 15 October 2014

Dr. Buot finished his BS in Mechanical Engineering at the Cebu Institute of Technology and was one of the top ten in the Mechanical Board Exam. He earned his MS in Electrical Engineering at the Stanford University, and eventually his Ph.D. in Theoretical Solid-State Physics at the University of Oregon under the NSDB Scholarship Program. He is a noted scientist at the US Naval Research and, in 2000, was awarded as one of the Ten Outstanding Cebuanos in America selected by the National Association of Cebuanos USA.

As Balik Scientist, Dr. Buot systematically tailored a general course-path offering at the University of San Carlos for Ph.D. graduate courses. He also started research activities in formulation of non-equilibrium quantum transport equations for switching-device physics in nanoelectronics, spintronics, nanomagnetism, molecular electronics and topotronics, numerical simulation techniques and computer simulation of nano-device fast-switching dynamics, speed/power performance, and reliability, for computers, sensors and communication systems applications. His outputs included the publication of one (1) research paper, research advising for two MS and one Ph.D. students, preparation of Samahang Pisika ng Pilipinas (SPP) reviewer, conduct of advanced graduate lecture series for 3 hours per week and preparation of research proposal for submission to possible funders.

Long-term Category



Dr. Elmer S. Estacio
Ph.D. in Physics
BSP Duration: 01 June 2012 – 31 My 2014

Dr. Elmer S. Estacio’s expertise in Physics specifically in Terahertz Optoelectronics, Semiconductors, and Optical Spectroscopy has been very valuable to the UP-NIP, which served as his host institution for two years (June 2012 to June 2014).

In his long-term contract as Balik Scientist, Dr. Estacio conceptualized and implemented the design and construction of the Terahertz-time domain spectrometer (THz-TDS) system; trained students to have competency in performing THz-TDS measurements and understanding the results; performed the THz-TDS experiments based on the ideas and locally-grown samples that have been initially discussed with professors of the Condensed Matter Physics Laboratory (CMPL); investigated THz emission and possibly THz transmission properties of grown materials and devices such as solar cells, radio frequency (RF) devices, magnetic materials, novel wide-gap nanomaterials and high Tc-superconductors; and designed/ constructed 1.55mm laser-based THz-TDS system and surveyed possible collaboration with other NIP research laboratories.

Balik Scientist Program Awardee Profiles

Name of BSP Awardee	Specialization	Duration	Host Institution/s
Abenes, Fiorello	Biofuels	01 Nov 2013 – 31 Jan 2014	Mariano Marcos State University Central Luzon State University Philippine Rice Research Institute
Buot, Felixberto	Physics/Quantum Transport	15 July – 15 Oct 2014	University of San Carlos
Capareda, Sergio	Renewable Energy Technologies and Environment	(P1) 5 June – 08 July 2014 (P2) 01 Dec 2014 – 15 Jan 2015 (P3) 15 May – 21 June 2015	Mariano Marcos State University University of the Philippines Diliman University of the Philippines Los Baños
Cayetano, Mylene	Environmental Science and Engineering (Water and Air Quality)	2012 2014	Clean Air Asia
Estacio, Elmer	Physics/Terahertz Optoelectronics, Semiconductors Optical Spectroscopy	2012 – 2014	University of the Philippines Diliman
Hernandez, Manuel	Mechanical Engineering	13 Nov – 12 Dec 2014 05 Jan – 27 feb 2015	Metals Industry Research and Development Center
Ilag, Lawrence	Technology Transfer, Patenting and Licensing	06 Jan – 28 March 2014	Philippine Genome Center Center for Technology Transfer for Entrepreneurship Technology Licensing Office, DOST
Jacobs, Ma. Felicia	Green Building Design/ Leadership in Energy and Environmental Design	(P1) 08 – 20 Oct 2014 (P2) 04 – 20 Nov 2014 (P3) 1- 16 Dec 2014 (P4) 7- 31 Jan 2015 (P5) 21 Feb – 28 March 2015)	Philippine Genome Center
Lubguban, Arnold	Chemical Engineering/ Petroleum-based and Biological Polymer	24 March – 13 June 2014	Chemrez Industries Ateneo de Manila University Mindanao State University – Iligan Institute of Technology Industrial Technology Development Institute
Magbanua, Zenaída	Molecular Biology	03 Nov 2014 – 20 Feb 2015	University of the Philippines Diliman
Marquez, Leorey	Geodetic Engineering	06 Jan – 30 March 2015	University of the Philippines Diliman
Melancon, Marites	Biomedical Science/ Cancer Research	15 March – 15 April 204	Ateneo de Manila University
Molina, Francis	Science Education/K-12	1 Oct – 16 Nov 2013 17 Jan – 14 March 2014	National Institute for Science and Mathematics Education Development
Salumbides, Corazon	Science Education/K-12	02 Jan – 31 March 2014	Philippine Foundation for Science and Technology
Serafica, Gonzalo	Nanocomposites Research and Technology Commercialization	2013 – 2015	University of the Philippines-Diliman Mindanao State University – Iligan Institute of Technology Philippine Nuclear Research Institute
Tongco, Alejandro	Geographic Information System	12 May – 15 Aug 2014	Ateneo de Davao University Southern Leyte State University University of Immaculate Conception, Davao City
Villalobos, Annabelle	Biochemistry/ Biotechnology	(P1) 04 Jan – 20 Feb 2015 (P2) 04 June – 19 July 2015	Central Mindanao University
Yu, Eizadora	Biochemistry and Molecular Biology	2014 - 2016	University of the Philippines Diliman

DOST-BCDA PROJECT: “Bridging the Human Resource Competency Gaps in Support of the National R&D Agenda”

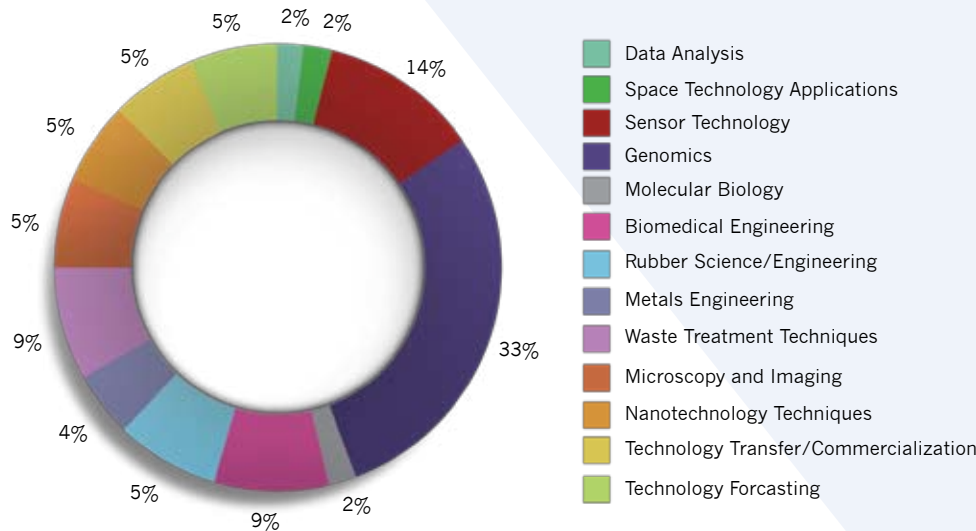
Aiming to develop human resources and institutions for its various programs in the industry, energy and emerging science and technology fields, the DOST implemented the project funded by virtue of Republic Act No. 7917, “An Act Amending Section 8 of R.A. 7227, otherwise known as the Bases Conversion and Development Act of 1992,”. This states that two percent (2%) from the sale of portions of Metro Manila Military Camps will be allotted to finance the scholarships and training of thousands of young Filipino scientists and students identified by the DOST and the Study Now Pay Later Program for poor but deserving youths who shall enroll or are enrolled in S&T courses.

The training opportunity is open for scholars, faculty and research/technical personnel of the National Science Consortium (NSC), Engineering Research and Development for Technology (ERDT) Institutions, State Universities and Colleges (SUCs), the DOST R&D Institutes (RDIs), Regional Offices (ROs), Sectoral Planning Councils, and Service Institutes.

Majority of applicants are into space technology applications. Genomics and rubber science/engineering, on the other hand, rank third among the areas being taken up by the grantees. Likewise, the high percentage of interest in the rubber science/engineering area can be linked to the goals of various government agencies including the DOST, finance institutions and other industry stakeholders to revive and double the production in the near future of the rubber industry. This is in the desire to make the Philippines as one of the major natural rubber-producing countries in Asia.

Out of 131 applications received, 85 had been approved by the BCDA Project Monitoring Working Group (PMWG) for Individual Trainings, 15 for Sandwich Program and one (1) for Post-Doctoral Fellowship. A group training for Grade 1 public school teachers was also approved, attended by a total of 565 teachers from various public elementary schools in the country. The teachers were trained in using the mathematical courseware under the SEI project “iTEACH Math (Improving Technology-Enhanced Activities for Creative Honing of Mathematics).”

Total disbursements as of December 1, 2014 amount to P33,067,247.42 or thirty four percent (34%) of the total amount released to PCIEERD, plus P13,950,594.99 for 29 applications approved as of November 24, 2014, bringing the total amount released and committed to P47,017,842.41 (49%). Another batch of applications was deliberated for approval by the PMWG on December 12, 2014 amounting to P10,076,285.60.



Percentage distribution of priority areas taken up by the grantees as of December 1, 2014

Science & Technology Marketing and Promotion

In PCIEERD, the dissemination and promotion of S&T information have become integral parts of a project from planning and implementation to completion. It sees into these activities with the same importance as the conduct of projects. PCIEERD has instituted a number of dissemination and promotion activities making sure that its publics are well informed about developments in its sectors, including other S&T-related activities. In serving its publics, PCIEERD also continuously looks for avenues by which its messages are communicated well with the end goal of stimulating change in mindsets especially for the better appreciation and application of science and technology in everyday life.

In 2014, the Council used all means of communication tools to reach and inform every Juan about S&T developments particularly in its sectors. Like in the past, the mass media (broadsheets, radio and television) continue to play a major role, but this year, PCIEERD resolved to get in the loop by aggressively using the social media (Facebook and Twitter) to sustain and make its information dissemination activities readily accessible.

Marketing and Institutional Events

The PCIEERD 4th Founding Anniversary



The Kabalikat Awardees 2014



TÜV Rheinland awards the ISO 9001:2008 Certification to the Council during its 4th Anniversary's "An Evening with Partners"

On its 4th anniversary, the PCIEERD organized a forum with the theme “Juana Invest? Reaping the Returns from R&D” that featured selected presentations on starting a business, technology entrepreneur stories, success stories, investment financing, and a portfolio of investment opportunities from its R&D projects. The forum was held on June 27, at the Edsa Shangrila Hotel, Ortigas Center.



Sen. Cynthia A. Villar graces the PCIEERD 4th anniversary as the Special Guest (from left to right: Usec. Amelia P Guevara, Dr. Rowena Cristina L. Guevara, Sen, Cynthia A. Villar, Usec. Fortunato T. Dela Peña)



Plenary Speakers of Juana Invest (from left to right: Ms. Diana Angela D. Eustaquio, Ms. Josephine Santos, Mr. Ramon I Castillo, and Dr. Gonzalo C. Serafica

The First Electronics Design Competition



The PCIEERD held its first Electronics Design Competition (EDC) that showcased the skills and talents of young Filipinos in developing designs that are aligned with DOST’s Smarter Philippines program. The EDC has given high hopes and inspiration to the young engineers to pursue their careers and build their own markets in the electronics industry of the country.

The competition, which was launched during PCIEERD’s 2013 anniversary, challenged teams of undergraduate electronics, electrical, and computer engineering students from universities and colleges all over the Philippines who went head-to-head with their own innovative and practical solutions to different pressing national problems. From more than 70 entries, 18 were chosen to have a chance at converting their designs into actual prototypes. The winning groups were:

1st Place

Title Entry: “3D PrintEarth: A Linear Delta Robot as a 3D Printer with Scrap Plastic from Bottles as its Printing Material”
Team Name: Team RAL
School: Electrical and Electronics Engineering Institute, University of the Philippines Diliman
Faculty Adviser: Dr. Manuel C. Ramos, Jr.
Team members: Juan Paolo E. Espiritu, Martin Jude Z. Borja, Carissa Norielle L. Cruz, Emilio Vicente T. Gomez, Kevin Matthew B. Yatco

2nd Place

Title Entry: “Low Cost Wi-fi Based Building Energy Monitoring System”
Team Name: Low-Cost WiFi Based BEMS
School: Electrical and Electronics Engineering Institute, University of the Philippines Diliman
Faculty Adviser: Dr. Jhoanna Rhodette Pedrasa
Team members: Anna Katrina O. Gomez, Dan Neil Q. Ramos, Anthony Kristianne G. Tan

3rd Place

Title Entry: “Homebrew Microcontroller-based Solar/Wind Power Generator”
Team Name: RTU-ECETSS
School: College of Engineering and Industrial Technology, Rizal Technological University
Faculty Adviser: Engr. Wilfredo L. Timajo
Team members: Renz Benhar O. Bobadilla, Rhenne-Ann A. Orayan, Florimund Bryan G. Garalde, James Brandon G. Masikip, Enrico C. Feliciano



This project aims to lower the cost of 3D printing by designing a cost friendly 3D printer which uses scrap plastic instead of expensive material.



The project provides energy consumption visualization for building administrators. It is low-cost and requires minimal changes in the electrical infrastructure of a building unlike similar commercially available products in the market today.



The Homebrew Microcontroller-Based Solar/Wind Power Generator harvests energy from readily available sources such as solar irradiance and gusty winds to help cut down the cost of electricity. Most of the materials used in the project are recycled.

The National S&T Week (NSTW) 2014

The PCIEERD led the exhibit and events for Outcome 3: Industry Competitiveness together with the ITDI, TRC, FPRDI, PTRI and MIRDC. Outcome 3 featured technologies and projects on biotechnology, nanotechnology, ICT, food processing technologies, mass transport, textile and dyeing technologies, rubber and wood processing technologies, mining and environment related projects and TRC-supported Technology Livelihood Resource projects. The highlight of the outcome 3 exhibit is the DOST initiated Aerospace Program featuring a locally-assembled light sports aircraft.

Five fora were also organized by the Outcome 3 working group revolving around the theme “Ang galing ni Juan para sa Bayan, para sa ASEAN”. The six fora were:

- 1. PCIEERD - Scientific Forum on Emerging Technologies, July 24, 1-5pm
- 2. TRC - Magsimula Ka, July 25, 10am-12
- 3. PCIEERD - 3rd ERDT Congress, July 25, 8-5pm
- 4. PNRI - Radiation: May Benepisyo Ito!, July 25, 10am-12
- 5. PTRI - Nat Dyes: Dito Mabubuhay Ka!, July 27, 1-5pm
- 6. MIRDC - Beep..Beep.. FEA Nandito Na! Ligtas Na Sasakyang Pamasada, Arangkada Na! and Ang Kalawang, ayaw ni Juan. sa DOST, may Paraan

The PCIEERD partnered with the Department of Transportation and Communications (DOTC) on the hanging of 26 posters in 13 MRT stations from Taft Avenue to Monumento. The Council also created a 30-second infomercial for the NSTW event played in three major SM Cinemas: SM Mall of Asia, SM Megamall and SM North Edsa from July-16-23, 2014.



The Regional S&T Fair (RSTF)

The PCIEERD brought to the regions selected technologies from Outcome 3 for the regional celebration of the S&T Week. The following exhibit and events were held:

- Southern Luzon S&T Cluster - August 18-20
- Northern Luzon S&T Cluster - September 2-4
- Central Visayas S&T Cluster - October 1-4
- Mindanao S&T Cluster - October 21-23

The first RSTF was held at Ibalong Centrum for Recreation, Legazpi City, Albay, Bicol for the Southern Luzon Cluster from August 18-20. Visitors feasted on the various exhibits on Surface Engineering, ADMATEL, and NML.

Conducted at Red Eagle Gymnasium, Cagayan State University, Tuguegarao City from September 1-5, the second RSTF was attended by students, university faculties, and LGU representatives. The PCIEERD also initiated an Information Education and Communication (IEC) Campaign on September 4 about environmental management techniques.

The third RSTF was held in J Centre Mall, Mandaue City, Cebu from October 2-4. Visitors flocked on the MIRDC Hybrid Road train model. Another IEC was conducted by PCIEERD on October 3 with the theme on food industry innovations.

Lastly, the RSTF for 2014 was concluded in the Mindanao Cluster. The fair was held from November 12-15 at SMX Convention Center, SM Lanang, Davao City and was graced by DOST Secretary Mario G. Montejo. The honorable secretary lauded the DOST committee for the successful conduct of the four RSTFs and for their active participation in strengthening S&T promotion in the country. As part of the event, the Council conducted an IEC addressing environmental hazards on November 15.



The 10th National Biotechnology Week



This year, DOST participated in the 10th year celebration of the National Biotechnology Week, spearheaded by the Commission on Higher Education (CHED). With the theme “Edukasyon sa Bioteknolohiya: Pagyamanin para sa Kinabukasan Natin,” the event was held last November 24 – 28, 2014 at CHED Central Office, Diliman, Quezon City. The PCIEERD was the DOST’s Focal Agency for the 10th NBW celebration. To ensure the successful participation of DOST, the DOST Committee for 10th NBW was constituted, composed of representatives from the three Councils (PCIEERD, PCAARRD and PCHRD) as well as FNRI, ITDI, SEI, PSHS, STII, TAPI, DOST Region 4A, NAST, NRCP and the DOST Biosafety Committee. In line with this year’s NBW, PCIEERD, together with NRCP, conducted a Forum on Experience in Biotechnology Research and Career Orientation towards Biotechnology with Dr. Eureka Teresa M. Ocampo of UPLB and Dr. Gonzalo C. Serafica, Independent Consultant and Balik Scientist, as speakers. The forum aimed to increase students’ appreciation of biotechnology as a field of study and to encourage them to get interested in pursuing a career in biotechnology research and development. It was attended by around 160 high school and college students in Quezon City. Also, PCIEERD tied up with STII to host this year’s DOSTKusyon, DOST’s own press conference for the 10th NBW. Engr. Raul C. Sabularse, PCIEERD’s Deputy Executive Director presented DOST’s line up of activities for NBW. Dr. William G. Padolina, President of NAST, was also present as the event’s resource person.



NBW Open Forum on Career Orientation and Experience in Biotechnology Research (Left); Awarding of Certificates to Forum Participants (Right)



Career Orientations towards Biotechnology

Information Education and Communication (IEC) Campaign on PCIEERD Technologies

In line with the celebration of the DOST Regional Science and Technology Fairs (RSTF), the PCIEERD conducted three IEC Campaigns nationwide from September to November 2014. The event is part of PCIEERD’s initiative to strengthen Science and Technology (S&T) in the country through information dissemination of results from S&T-based research projects.

The first IEC Campaign on Environmental Management Techniques for the Rehabilitation of Rivers and Creeks was held last September 2 at the Cagayan State University, Tuguegarao. The first topic presented was entitled “Dissolved Oxygen (DO) for Management Strategies of the Pasig River System”, discussed by Dr. Eligia D. Clemente, Assistant Professor from the University of the Philippines Diliman. Engr. Bryan Clark B. Hernandez, University Research Associate from the UP Diliman, presented the second project entitled “Hydraulic and Hydrologic Characterization for Remediation Technologies”. One hundred and fifty engineering and environmental science students took part in the event.

Focused on Food Industry Innovations, the second IEC showcased two PCIEERD monitored projects. It was held at Mandaue City on October 3 and was attended by 50 participants from the private and government sectors including the Department of Health and private food manufacturing companies. The first project entitled “Proficiency Testing (PT) Service for Proximate Analysis of Processed Food” was delivered by Ms. Ma. Rachel V. Parcon, Science Research Specialist I, from the Food and Nutrition Research Institute (FNRI). The second speaker, Ms. Maria Elsa M. Falco, Senior Science Research Specialist from the Industrial Technology and Development Institute (ITDI), presented the quality profile and functional properties of Makapuno in her discussion.

The last leg for the conduct of IECs focusing on Addressing Environmental Hazards was held at the SMX Convention Center, SM Lanang, Davao City. Sixty participants from Local Government Units (LGUs) and State Universities and Colleges (SUCs) from the region attended the event. The topics presented were focused on advocating disaster preparedness and promoting environment sustainability. Mr. Oscar Victor V. Lizardo, Chief Science Research Specialist of Web GIS under DOST-Project NOAH, presented an overview of the project and how it is geared towards disaster preparedness. Meanwhile, Ms. Rachel R. Habana, Senior

Science Research Specialist from PCIEERD, presented the results of the project entitled “Capacity Building on Methane Emissions Recovery and Utilization from Landfills in the Philippines”.



IEC Campaign on Environmental Management Techniques and Rehabilitation of Rivers and Creeks at the Cagayan State University, Tuguegarao



IEC Campaign on Food Industry Innovations at the J Centre Mall, Mandaue City, Cebu



IEC Campaign on Addressing Environmental Hazards at the SMX Convention Center, Davao City

Projects on Technology Marketing, Communication and Advocacy



Strategic Communication Intervention for the Nationwide Operational Assessment of Hazards (NOAH) Program
*Science and Technology Information Institute (STII-DOST)
Project Leader: Asec. Raymund E. Liboro

The project processed and packaged relevant and up-to-date information from the seven components of the NOAH program for public use. The program involved flood mitigation that targeted a six-hour flood early warning system for communities along 18 major river basins in the country. It also enhanced geohazard maps and storm surge vulnerability maps. The results of the NOAH program were disseminated through information, education and communication campaign (IECs) for its target end users and beneficiaries.



Science Content Transformation and Visualization for Disaster Risk Reduction
*Science and Technology Information Institute (STII-DOST)
Project Leader: Asec. Raymund E. Liboro

Visualization of hydro-meteorological phenomena provides two purposes. First, it is a tool that technical personnel can use for data compression and interpretation. Second, it is an effective means of communicating abstract relationships (statistical data, mathematical equations) and complex natural processes (wind and precipitation patterns, typhoon forecasts) into digestible form for the appreciation of the general public. The basic goal in hazard communication is not to simplify the information but to provide detailed but understandable information using an effective format.

The Science Content Transformation and Visualization for DRR project shall incorporate modelling/ equipment output of PAGASA and Project NOAH including the 5-day forecasts, Doppler Radar imagery, automatic rain gauges (ARGs), flood and storm surge maps, and other DRR technology datasets that will be made into animations to be distributed for TV broadcasts. Animated infographics and flash animations shall also be created to disseminate information about natural processes.



Promoting World Class Philippine Nuclear Science and Technology Applications at the International Atomic Energy Agency (IAEA) General Conference Exhibition
*Philippine Nuclear Research Institute (PNRI – DOST)
Project Leader: Dr. Alumanda Dela Rosa

The Philippines participated in the International Atomic Energy Agency (IAEA) General Conference exhibition in 2006. The poster exhibit highlighted the country’s partnership with the international community on the peaceful uses of nuclear science and technology. The proposed participation of the country in the IAEA 58th General Conference Exhibition will provide a better occasion to promote to the Member-States and other international audiences on the various significant accomplishments of the Philippines in nuclear science, technology, innovation and safety.



OYSI as Agent of S&T Growth and Development in the Countryside
* Outstanding Young Scientists, Inc.
Project Leader: Dr. Felino P. Lansigan

The project is envisioned as an innovative strategy to develop a science culture among researchers in the regions by building the capacity of young and budding researchers from state colleges and universities (SCUs), and also from the regional R&D consortium in preparing good quality and highly competitive research proposals for possible funding by donors.

The project involved the conduct of three separate sessions of a two-day training workshop on writing research proposals, and logical frameworks in three regions, namely: Ilocos Region for Northern Philippines; Bicol Region for Southern Luzon; and Bukidnon for Southern Philippines.



Capability Building and Sustainable Biotechnology Information, Education and Communication (BIOTECH-IEC) for DOST and LGU Key Personnel

**National Academy for Science and Technology (NAST-DOST)*
Project Leader: Academician Evelyn Mae Tecson-Mendoza

The project is an initiative of the National Academy of Science and Technology to transfer biotechnology knowledge to influential communication channels in hopes of expanding acceptance of modern biotechnology, specifically genetic engineering applications in agriculture. It set in place a sustainable IEC promotion of biotechnology among key personnel and officials of the DOST and local government through capability building and engagement of qualified resource persons in the different regions of the country.



Development and Fabrication of Interactive Science Exhibit on Environment for Display at the Philippine Science Centrum's Earth Science Gallery (PFST)

**Philippine Foundation for Science & Technology (PFST)*
Project Leader: May M. Pagsinohin

The Philippine Science Centrum created exhibits that are hands-on, manipulative and interactive. Unlike in other museums where the displays are all static objects or art pieces, the Science Centrum allows the visitors to tinker, manipulate and play with the exhibits. PFST was established to mold the Filipino youths' science consciousness and literacy in the context of the global economy and culture. It seeks to integrate the most useful components of formal and informal education to sustain student's motivation and maximize learning outcome. To provide better substance and information for visitors' appreciation and understanding, eight (8) interactive exhibits were developed such as Battle of the Bulbs, Biodegradation, Biogas Generator, Dual Flush, E Waste, Let's Recycle, Standby Power, and Surface Run-off as an upgrade to the Science centrum. The exhibits were launched last February 2014.



Displays at the Earth Science Gallery

Understanding and Communicating Risk for a Community-based Disaster Risk Reduction (DRR) Program

The DOST have been supporting researches, technologies and innovations to improve the country's disaster risk reduction management (DRRM) planning towards national preparedness and resiliency. The department sees people's aspects of disasters relevant to complement and sharpen these advanced DRRM technologies and methods.

This program dubbed as the first "Social Technology" supported by the DOST shall give face to people experiencing the disasters, first-hand.



*Participatory Risk Mapping (PRM) in Guiuan Eastern Samar
(Image courtesy of Voices of Yolanda Project Team)*



*Community risk assessment (CRA) workshop in Bgy Banaag, Guiuan, Eastern Samar
(Image courtesy of Action Research Project Team)*



Voices of Yolanda: Narratives of Risk and Coping among Survivors of Typhoon Yolanda in Tacloban City, Guiuan Eastern Samar and San Francisco Cebu

**College of Social Sciences and Philosophy, University of the Philippines Diliman (UP-CSSP)*
Project Leader: Dr. Soledad Natalia M. Dalisay

The six-month project utilizes the ethnographic approach and it aims to provide Disaster Risk Reduction and Management (DRRM) planners with a better understanding of risk perceptions of people within the context of disaster evacuation and resettlement. Oftentimes, evacuation prior to hazard event is a source of headache for many DRRM program implementers. People who refuse to evacuate are perceived to be hard headed and ignorant of the risks they face as they refuse to leave their homes which come in the way of an impending hazard. With the project entitled Voices of Yolanda, people's perceptions of risk and vulnerability in the face of typhoon Yolanda in three areas in the Visayas should be able to provide a context specific to the awareness and understanding of why people acted the way they did that resulted in thousands of lives lost and billions of property devastated. It will also look at what worked in areas where people had actually heeded warnings and evacuated their homes for safer ground.



Action Research on Strengthening Community Structures and Mechanisms for Disaster Risk Reduction and Management

**College of Social Work and Community Development, University of the Philippines Diliman (UP-CSWCD)*
Project Leader: Dr. Aleli B. Bawagan

The "technology of participation" challenges the dominant ways of thinking and doing where people and communities are regarded as mere beneficiaries and passive receivers of development programs. In the context of research and building safe, secure and resilient communities thru DRRM, "participation" is seen as a value and as a strategy to put people at the heart of understanding the hazards they are exposed to, their vulnerabilities, and capacities so they themselves may be able to develop appropriate, relevant, and long-term preparedness, prevention, response, and recovery measures. In this manner, the production of knowledge thru research also becomes a vehicle for people to take action which they may claim as their own.

This project will draw lessons from institutional and individual responses to typhoon Yolanda in Leyte, Samar and Cebu. It includes facilitation of education and awareness-raising sessions involving the community and the Local Government in the sites mentioned, particularly on post-disaster recovery and community-based DRRM.

Media Relations

PCIEERD considers the media as its strongest ally in its information dissemination and promotional activities. They have such influence in creating opinions as well as changing the mindsets of the public in general. Realizing this, the PCIEERD continues to establish and maintain strong linkage with the media providing “good news” to every Juan.

In 2014, the Council was proactive in engaging the media and enlisted not only the PCIEERD management, project leaders in interviews but also made a point to enlist the PCIEERD technical monitors and staff as well as its scholars and Balik Scientists in radio and television interviews. This is our effort to bring closer the media and the S&T community, and the major players in R&D projects.



Dr. Reynaldo V. Eborá (wearing black), Director BIOTECH, UPLB discussed the state of biotechnology in the country in terms of research, technologies and products. Dr. Cynthia P. Saloma (wearing red), Program Director, Philippine Genome Center, discussed the services of the DNA Sequencing Core Facility and their projects.

This resulted to an all-time high 40 interviews in TV (17) and radio (23) and a total of 36 press releases and articles written for the PCIEERD website, Pinoy Innovations, S&T Post and the quad media (broadsheets, RTV and cyber media).



Engr. Loreto Carasi’s interview about CharM in the Net25 TaumBahay program on 30 October 2014



Engr. Ermie Bacarra’s interview about the Balik Scientist Program in NBN4’s Good Morning Boss on 27 October 2014.



CoaTiN Launch Press Con (Image courtesy of OVCRD-UP Diliman ©)



The PCIEERD 4th Anniversary Press Con



Electronics Design Competition Champion featured on Umagang Kay Ganda of ABS-CBN



Ms. Laarni Piloton of ITDD-PCIEERD’s interview about the Eco Sep Project on NET25’s TaumBahay program



NBW Press Conference (top) NBW Conference featured on NET25’s Tech News

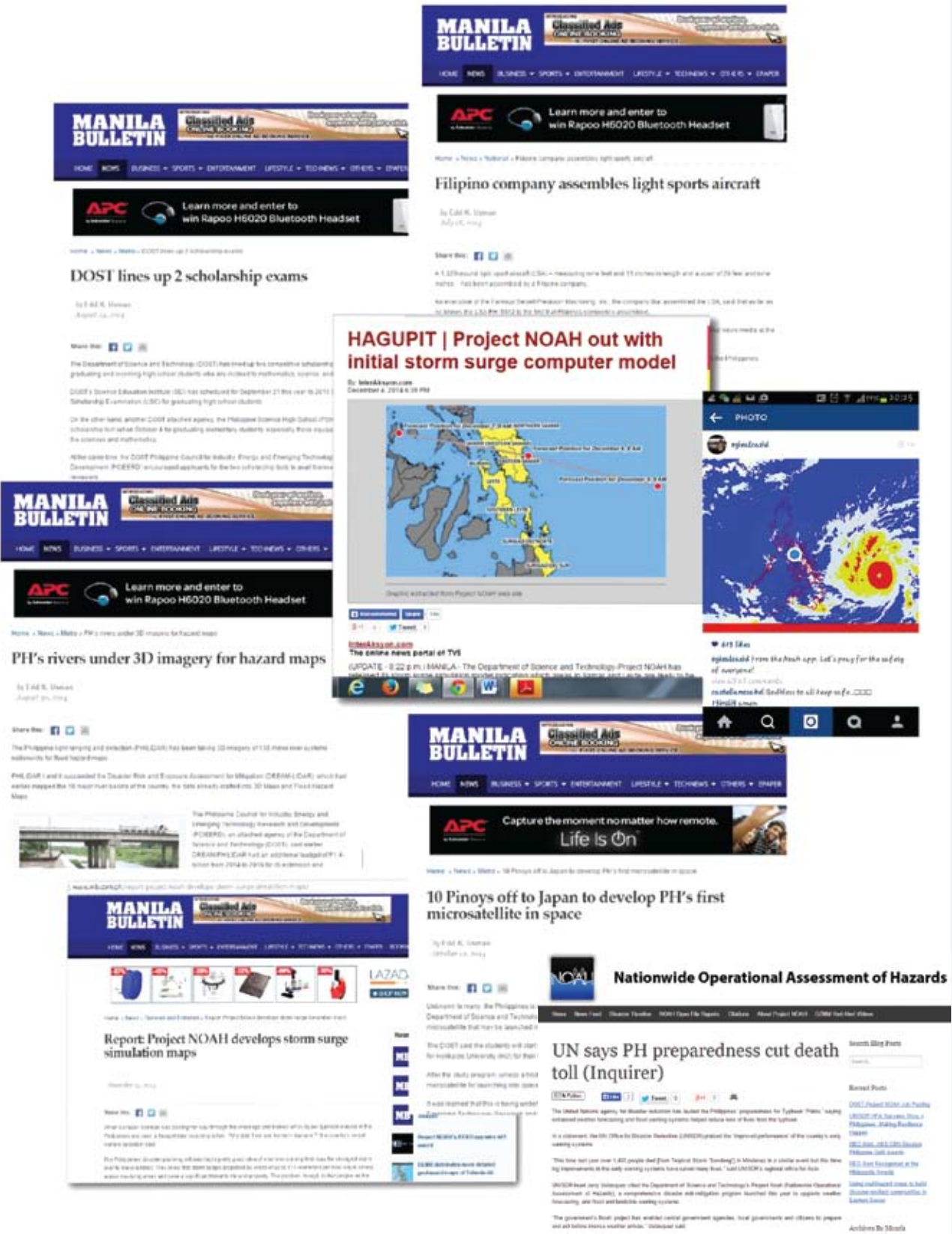


Engr. Patrick Montero of EUSTDD-PCIEERD’s interview about Smart Home Project on DZRH News’ Radyo Henyo



PCIEERD’s Ms. Aleah P. Orendain and ITDI’s Edrian Joseph Eloriaga’s interview about DOST’s Packaging Program on NET25’s TaumBahay prog.

PCIEERD IN THE NEWS



“Sa DREAM-LiDAR project sa ilalim ng Project NOAH, halimbawa, napapadali ang pagtukoy kung saan ang mga lugar na pinakababahain. Nakamapa na po ang 19 sa target nating 20 river systems para matukoy kung ano ang mga lugar na agad naaapektuhan tuwing bumubuhos ang ulan.

Dahil mas eksakto na ang pagtukoy natin kung kailan at saan tatama ang epekto ng bagyo, ngayon po, napapaaga ang paghahanda at pagbibigay-babala ng ating mga LGUs. Maaga na ring naililikas ang kanilang mamamayan. Kung ang maayos na forecasting, tatambalan pa natin ng mahusay na LGU, talaga naman pong maraming buhay ang maililigtas. Sa Albay na hinagupit kamakailan lang ng bagyong Glenda, walang naitalang pumanaw dahil sa bagyo, salamat sa mabuting pamamahala ni Governor Joey Salceda. [Palakpakan] At kung kaya itong gawin ng isang probinsya na siya ngang parang natawag na nga pong highway ng mga bagyo, bakit naman tayo magdududa na kakayanin ng iba pang hindi highway ng bagyo?”

Excerpt from State of the Nation Address of Pres. Aquino in 2014
(Delivered at the Session Hall of the House of Representatives, Batasang Pambansa Complex, Quezon City, on July 22, 2014)



Pinoy Innovations
Pinoy Innovations is the official quarterly newsletter of the PCIEERD which started on the last quarter of 2013. The publication contains programs, projects, technologies and innovations within the sectoral coverage of the council.

With the maiden issue published last December 2013, the Pinoy Innovations now has two editions for 2014 which are all available at the PCIEERD website. The newsletter is distributed to all partner agencies, including government, private and the academe.

The first and second issue for 2014, combined in one publication, highlighted the certification of PCIEERD under ISO 9001:2008 and the council's 4th anniversary celebration. The most recent issue featured the activities during the 3rd quarter such as the National Science and Technology Week (NSTW) and the Regional Science and Technology Fairs (RSTF) conducted by the Council.

Through the Pinoy Innovations, PCIEERD showcases activities, programs and projects that are geared towards building a science nation.

Technology Transfer and Commercialization



Technology Assessment and Business Development

Technology Assessment

Out of the 2013 completed projects of PCIEERD, two (2) technologies were endorsed for technology assessment: okara powder as food ingredient developed by the UP College of Home Economics and the Automated Guideway Transit System of the MIRDC. The PCIEERD Technology Assessment Protocol includes creation of an external Technology Assessment Team (TAT) that will cover the different criteria for assessment: Social, Technical, Economic, Environmental and Political. The TAT shall evaluate the technology using the above criteria and determine further refinements/improvements with the technology and/or readiness for commercialization and transfer.

Market and Financial Analysis of Thirty (30) DOST R&D Technologies through Market Discovery-Based Planning and Pitch Session Engagement

This project shall equip researchers with the knowledge to validate the relevance of their research and determine the cost/price of their technologies. This intervention shall facilitate the conduct of the preliminary market analysis of 30 identified technologies funded and/or monitored by PCIEERD. The consultants tapped for this activity will help the researchers understand their market and prepare them to face potential investors during the pitching session. The end-product of this engagement shall be a market and financial analysis for each of the 30 technologies and a pitching event for 15 of the selected researchers and scientists.



Technology Assessment Orientation Meeting of AGT



Elevator Pitching Kick-off Activity led by Dr. Luis G. Sison

Technology Business Incubation (TBI)

The TBI Program is one of the policy instruments for accomplishing the commercialization of R&D results that fosters entrepreneurship through collaborations with academe. The PCIEERD has partnered with universities to establish technology business incubators that bolster the development of technology-based firms by providing services that enable them to tolerate pressure from business environment until they become sustainable and have the capacity to survive the outside competition. In 2014, there are three (3) TBI projects funded:

1. Establishment of a Green Technology Business Incubation (GTBI) Facility in West Visayas State University
2. Support for the Establishment of the DOST-UP Cebu TBI at the South Reclamation Project (SRP) campus of the University of the Philippines Cebu
3. Enterprise Center for Technopreneurship: Outreach



Dr. Rowena Cristina L. Guevara (left) at the Ceremonial Blessing and Inauguration of the WVSU TBI in Iloilo (right)

Projects on TBI and Business Development



Establishment of a Natural Products Business Incubation Facility in West Visayas State University (WVSU)
**West Visayas State University*
Project Leader: Dr. Gerard L. Penecilla

In 2010, a feasibility study funded by PCIEERD was conducted for the establishment of a Green Technology Business Incubation in West Visayas. Fifty-eight (58) potential users responded to the survey: 27 from manufacturing sector, 17 from trading industry and fourteen 14 from the service sector. More than half of the total respondents are catering to the local and regional clientele while the rest markets nationwide.

Given the result of the study and the strong demand to “professionalize” the natural/herbal producers in the region, WVSU came up with this project to provide the local industry a facility that offers shared services and business development in Western Visayas.

The TBI facility shall be a multi-tenancy facility and will cover a wide range of services such as office space, production facilities for natural and herbal, consultation services in areas of technical, business management, subsidies, and access to venture capital for start-up, organization of internal and external education and training, promotion/marketing of the tenants via media, databases, etc.

The TBI will have direct and indirect impact on rural economic transformation that will eventually lead to diversification of rural activities such as creation of opportunities for employment and increase the chance of start-ups to succeed in the market.



Enterprise Center for Technopreneurship: Outreach
**DOST-UP Enterprise Center for Technopreneurship*
Project Leader: Dr. Luis G. Sison

Since its founding in 2009, Enterprise has been developing and fine-tuning a program for supporting the formation of technology startups in UP Diliman, and for developing a culture of technopreneurship among ERDT scholars through a mandatory technopreneurship class. The core of this effort is the Innovation Acceleration Program (IAP) that takes technology generators from the academe and other

potential technopreneurs through a structured process of opportunity identification, market validation, and venture development.

As the IAP becomes more efficient at producing new ventures from UP Diliman, its impact can be increased by expanding the program to active R&D institutions outside of the ERDT network. The Outreach initiative will increase inter-university collaboration, accelerate the formation of a critical mass of innovators, and provide a bigger pool from which future ventures can form. It will also plant the seeds for the establishment of additional TBIs and the expansion of the technopreneurship support ecosystem in the Philippines.

The Outreach project is initially focused on building the network and linkages with few Universities and colleges that offer or are planning to offer technopreneurship classes. The Outreach project will benefit the participating Universities by helping them breed their own technopreneurs and market-ready ventures.

While Outreach is primarily focused on academic institutions, a secondary target is to strengthen linkages with private sector startup and development of ICT events. The Outreach will provide a formal mechanism for tapping the potential of these teams by providing proper support through the Innovation Acceleration Program of Enterprise.



Support for the Establishment of the DOST-UP Cebu TBI at the UP Cebu – SRP Campus
**University of the Philippines Cebu (UP-Cebu)*
Project Leader: Atty. Francis Michael Abad

In view of expanding the operations of the TBI in Cebu, the project shall create an environment, known as the DOST-UP Cebu Technology Business Incubator at the SRP Campus of UP Cebu (TBI-SRP), a satellite location of the TBI based in Lahug, where entrepreneurs in technology-based businesses are given the opportunity to succeed by providing them with office space, services, and training.

The TBI-SRP is also planned to host collaborative projects, involved in developing technological innovations to solve real problems, consisting of members from different sectors(e.g., academe,

industry, government) and from different disciplines (e.g., scientists, engineers, business analysts), and organizations. The center will also serve both local and international startup companies who want to locate in that area. It is envisioned that that area will soon be transformed into another IT hub and will be occupied with all the major IT companies.



Intellectual Property and Technology Transfer

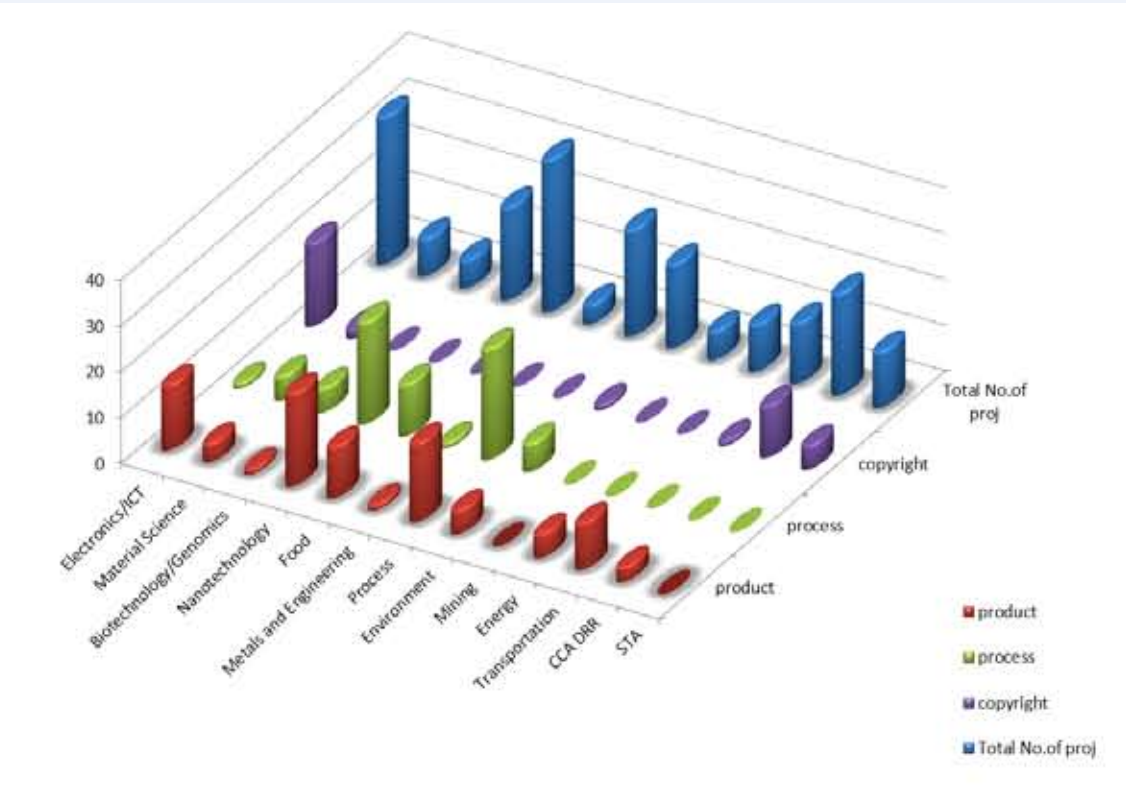
IP Inventory

The IP inventory aims to gather an overview of potential IPs from PCIEERD-funded and monitored projects that were completed in years 2013 and 2014. Specifically, the activity intends to produce a portfolio of intangible assets summarizing the potential IPs. The inventory covers the 59 projects completed in 2013, as well as the 155 projects completed in 2014 and near-completion in 2015. These projects are being monitored by PCIEERD’s five technical divisions, namely: Industrial Technology Development Division (ITDD), Energy and Utilities Systems Technology Division (EUSTDD), Emerging Technology Development Division (ETDD), Research Information and Technology Transfer Division (RITTD), and Human Resource and Institutional Development Division (HRIDD).

These projects, which were extracted from PCIEERD’s Project Management Information System (PMIS), were filtered to identify potential intellectual properties. The preliminary list of IPs identified from these projects is undergoing inventory, assessment, and IP patentability assessment.

These projects and the corresponding preliminary IPs identified are distributed as follows:

PCIEERD Intellectual Property Assets



PROJECTS	PRODUCT	PROCESS	COPYRIGHT	TOTAL IPs
2013				
59	20	12	15	47*
2014				
155	142	126	41	157**
TOTAL: 207	91	75	38	204

*Undergoing IP Patentability Assessment

**Undergoing Inventory and Assessment

Intellectual Property Copyright (IPC) Audit of the DOST-Funded Project NOAH (Nationwide Operational Assessment of Hazards)

The audit was initiated to determine and verify the ownership, restrictions on use, relevance to operations and/or other projects of intellectual property assets (specifically copyright assets) owned/co-owned or those resulting from the research and development activities of Project NOAH. The audit shall include an assessment of the adequacy of applicable provisions in existing agreements between DOST, implementing agency and other collaborators. Overall, the project shall provide recommendations to effectively manage the IP assets of Project NOAH to protect the interest and provide incentive to the researchers while maximizing data/research results of Project NOAH for public use. Eventually, the result of this project shall generate recommendations to effectively manage NOAH-related IP assets as well as remedies and strategies for future IP asset management.

Projects on Technology Transfer



Field Deployment and Effectiveness Testing of “Learning English Application for Pinoys (LEAP)” Software

**Department of Computer Science, University of the Philippines Diliman*
Project Leader: Dr. Susan P. Festin

The two-year project entitled Learning English Application for Pinoys or LEAP is a standalone, computer-based training program for English language skill improvement. It was completed in 2013 and as a follow-up, this study conducted a one year field deployment and effectiveness testing of the LEAP software and its training modules. The deployment also involved training in the use of LEAP. The software can be checked via <http://dostproject7.com/>.



Screenshot from the LEAP Website at <http://dostproject7.com/>

Showcasing Rice Fortification Program in Region XI through Techno-Transfer: A Strategy towards Security



Project 1 – Technology Transfer to Private Mills

**Food and Nutrition Research Institute (FNRI – DOST)*
Project Leader: Marcela Saises

The project created positive behavior of millers/ investors towards the production of Iron Premix Rice (IPR) and Iron Fortified Rice (IFR) to make the product available for consumption of Filipinos through the conduct of training and technology transfer on the production of IPR and IFR to prospective rice millers.



Project 2 – Monitoring and Evaluation of Impact of Iron Fortified Rice and Program Sustainability

**Food and Nutrition Research Institute (FNRI – DOST)*
Project Leader: Dr. Imelda Angeles-Agdeppa

The second project assessed the effects of consuming Iron Fortified Rice (IFR) on the prevalence of anemia among targeted population groups in Davao del Norte, Davao del Sur, Davao Oriental, and Compostela Valley.



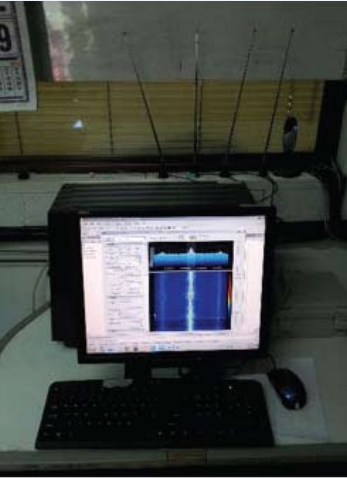
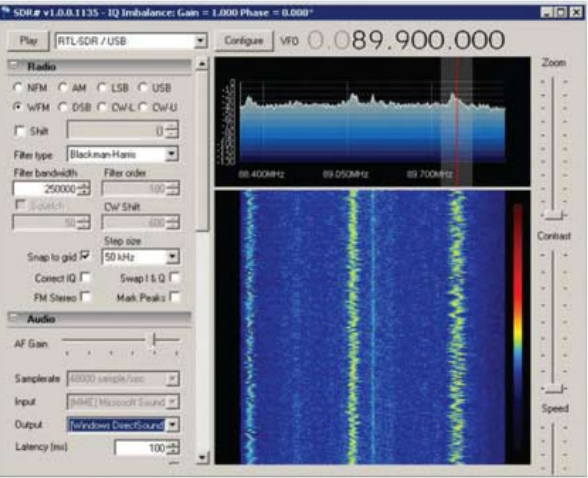
Powerice (Left) and Iron Fortified Rice Sample (Right) (Images courtesy of FNRI-DOST)



Systems Enhancement and Market Testing of Automated Broadcast Monitoring (Orchestrack)

**Orchestronix Corp.*
Project Leader: Ms. Maria Unicka Sta. Ana

ORCHESTRACK offers automated broadcast monitoring of content being aired 24/7 from various sources such as radio and TV. It automatically ingests broadcast feeds, auto-identify content such as commercials or music, collate data and publish reports on real-time. It generates data such as title, source, owner, duration, airplay date and time from captured broadcasts, and then aggregates data into various outputs such as feeds, dashboard and reports.



Recording using SDR-Sharp (Image courtesy of the Orchestrack Project)



Science and Technology Academic and Research-Based Openly Operated Kiosk Station (STARBOOKS)

**Science and Technology Information Institute (STII-DOST)*
Project Leader: Assistant Secretary Raymund E. Liboro

Science and technology (S&T) information is vast and numerous locally and globally. It encompasses and applies to many fields of study. But the role of S&T in the advancement of the country is very crucial. Providing accurate and timely S&T information to the public serves as a potent strategy to achieve greater benefits on the use of S&T information.

The need for effective and efficient access for relevant S&T information especially those available in the Philippines on food and nutrition, health and medicine, emerging technologies, energy, environment, and appropriate livelihood technologies would greatly help empower the citizens to discover and adopt new scientific knowledge and information. This will result to better education, stimulate research and entrepreneurial interests among our young generations, thus helping improve the quality of life of the people.

The S&T Academic and Research-Based Openly-Operated Kiosks (STARBOOKS), is a standalone, onsite research kiosk that provides free access on S&T information for academic and livelihood use. Users can have access to the scientific information physically available at DOST's Science Information Network (DOST-SciNET) and the Philippine eLib project sources. It is the first digital S&T library in the Philippines. It is an improvement of existing library services using the present technology. It is also STII's action of shifting its current library set-up into a Digital Library.



The DOST STARBOOKS Kiosk (Image courtesy of STII-DOST)



ON3 Technology Entrepreneurship Acceleration Program

**Department of Trade and Industry – Office of Special Concerns/Development Assistance Office*
Project Leader: Dir. Lydia R. Guevarra

The ON3 Technology Entrepreneurship Program is an acceleration program aimed at helping Philippine-based technology startups to accelerate the commercialization of their ideas into the worldwide marketplace. The ON3 project features an Immersion Program in Silicon Valley wherein participants will be provided an opportunity to participate in mentoring, coaching and training programs (financial analysis, sales and marketing, competitive analysis, and communication and presentation skills). The Immersion Program will train start-up companies on how to present to an international investor audience to help secure additional funding necessary for their companies to establish a global presence.



*FindShare being presented in Plug and Play Expo
(Image courtesy of ON3 Project Team)*

**Technology Innovation for Commercialization (TECHNICOM):
Management Support Program**

**DOST- Technology Application and Promotion Institute*

The TECHNICOM Program was created to provide assistance to accelerate the commercialization of locally-developed technologies in the country. Since 2013 when TAPI has started handling the implementation of the Management Support Component of the Program, funds have been made available to private and government research institutes and academe to support pre-commercialization activities of technologies that are geared towards market-readiness and industry adoption. The assistance provided by the TECHNICOM Program is a gateway for the R&D outputs to reach its intended users by converting laboratory-scale results to market-viable products and processes. For CY 2014-2016, the TECHNICOM Program has been prioritizing projects with completed R&D phase funded/generated by the DOST system. This is to provide the necessary impetus to the commercialization of the innovations developed and supported by the DOST

Recent activities on technology transfer

Assistance provided for the Visit of Dr. Elsie W.T. Huang of the Industrial Technology Research Institute (ITRI) and Ms. Yen-er Hsu of the Department of Industrial Technology, Ministry of Economic Affairs of Taiwan.

The first meeting was held on December 8, 2014 with Dr. Luis Sison of the UP Enterprise Center on TBI initiatives in the Philippines. On December 9, 2014, a meeting with the Technology Transfer Offices and Business Development Units of DOST RDIs and Councils was organized to share practices and programs on technology transfer and commercialization.

Simultaneous to the technology transfer and commercialization meeting was the S&T Forum on Intelligent Transport System (ITS) held at the UP International Center for Transportation Studies (UP NCTS). Topics discussed were on the four (4) Philippine Intelligent Transport System (ITS) Program project components: Philippine Metropolitan Travellers' Information System (PhilMATIS), Advance Traffic and Pollution Monitoring and Analysis System (ATPMS), Integrated Optimized Public Fixed Route (PUBFix), and Customized Local Traffic Simulator (LOCALSIM). A talk on Urban Flood Monitoring Sensors in Metro Manila (Urban Sensors) was also presented by Engr. Alvin E. Retamar, Chief SRS from ASTI-DOST. The forum was graced by the Taiwan Automotive Research Consortium Adviser, Dr. Jet P.H. Shu, who introduced his country's best practices in ITS and its transport program.

Exploratory meeting on the possible In-Country and Outbound Capacity Building Project with the IC2 Institute, Global Commercialization Group of the University of Texas at Austin. The meeting was held last December 19, 2014 for the technology transfer offices and business development units of DOST agencies and on December 20, 2014 for the two TBIs supported by PCIEERD: UP Enterprise and UP Open TBI. A visit at the Ayala TBI was also included to give a glimpse of the operation of a privately-led TBI in the Philippines.



Participants to the ITS Forum and Tech Transfer Meeting

1st Row (In Sitting Position): From left to right: Dr. Kardi Teknomo, Dr. Hilario Sean Palmiano, Dr. Ricardo Sigua, Dr. Bernie Justimbate, Dr. Jet P.H. Shu, Engr. Nonilo A. Peña, Dr. Alexis M. Fillone

2nd Row (In Standing Position): From left to right: Art Caraño, Diane Bernardo, Armela Razo, Dr. Elsie W.T. Huang, Dr. Yen-er Hsu, Karlo Robosa, Dr. Adrian Roy Valdez, Engr. Marlon C. Aguilar, Rachel R. Habana, Mike Torres, Alma C. Dupagan, Dr. Karl Vergel, Ms. France Bicomong, Prof. Gerald Jo Denoga, Carminda Tandelcarmen, Engr. Luthar James Co, Russell Pili, Norly Villar, Jose Raphael Lemiac



Linkages and Networks

While success in industries and enterprises that adopt the S&T community’s offer of technological and innovative interventions may be measured in terms of their competitiveness and profitability, the growth of a research and development body like PCIEERD may be gauged by its sustained linkages that continue to support it with technical expertise and in terms of funding to attain its mandated vision and mission.

In 2014, the Council not just maintained its existing local and foreign networks but also gained allies and broke new ground in coming up with worthy research proposals that reached joint implementation.

COSTA MILESTONES and LINKAGES IN 2014

PCIEERD as Focal Institution of the Regional Space Applications Programme (RESAP) of the United Nations Economic and Social Commission for Asia and the Pacific (UN-ESCAP)

The United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) is the regional development arm of the United Nations for the Asia-Pacific region. It is composed of 53 Member States, including the Philippines. One of its programs is the Regional Space Applications Programme (RESAP), with PCIEERD-DOST as its focal agency in the country.

RESAP aims to promote and coordinate regional space cooperation for development, as well as organize and implement space application projects of regional interests. It also provides technical assistance, such as advisory body on national policies and programs and planning related to the establishment of space agencies, and other related space applications requirement in general.

UN-ESCAP PROVISION OF FREE SATELLITE IMAGES AFTER TYPHOON RUBY

United Nations Operational Satellite Applications Programme (UNOSAT) is a technology-intensive program delivering imagery analysis and satellite solutions to relief and development organizations within and outside the UN system to help make a difference in critical areas such as humanitarian relief, human security, strategic territorial and development planning. UNESCAP provided free satellite image maps and analysis after the devastating hit of Typhoon Ruby in the Philippines in December 2014.

MICROSATELLITE AND SATREP PROJECTS DEVELOPMENT WITH HOKKAIDO UNIVERSITY

Hokkaido University and Tohoku University visited and provided inputs to the Philippines possible development of microsatellite. Microsatellite offers wide variety of possible applications including disaster risk management, hazard risk assessment, and environmental monitoring. It is more affordable

and practical for the Philippines than that of the small satellites. Continuous coordination was made until the project was approved for DOST funding from 2014-2016.

PHILIPPINES A MEMBER OF THE ASIAN ASSOCIATION ON REMOTE SENSING

After more than five (5) years of inactivity, the Philippines has finally renewed its membership in the Asian Association on Remote Sensing (PhilRSS). The PCIEERD, through the Committee on Space Technology Applications and its affiliated Philippine Remote Sensing Society, has supported this endeavor to revive the participation of the country in this prestigious association. The PhilRSS was fortunately granted the opportunity to host the 2015 ASIAN Conference on Remote Sensing in the Philippines.

PCIEERD – CNES – MANILA OBSERVATORY TV CONFERENCE ON “FRENCH SPACE POLICY”

Founded in 1961, the Centre National d’Etudes Spatiales (CNES) proposes and implements French space policy. CNES represents France at the Council of the European Space Agency (ESA), which comprises 20 European States. CNES represents France in international bodies and supports the French space industry’s exports. It is the majority shareholder in a number of commercial companies, including Arianespace. On May 6, 2014, CNES met with PCIEERD and the Manila Observatory for a teleconference for the sharing of insights and experiences regarding space policy and development strategies.

PCIEERD – JAXA MEETING at PCIEERD-DOST, BICUTAN, TAGUIG CITY

The PCIEERD and JAXA meeting held on 08 September 2014 provided a venue for the exchange of information on Space Technology Applications Programs and Initiatives. JAXA encouraged PCIEERD and DOST to host the 23rd Asia-Pacific Regional Space Agency Forum (APRSAF) in December 2016.



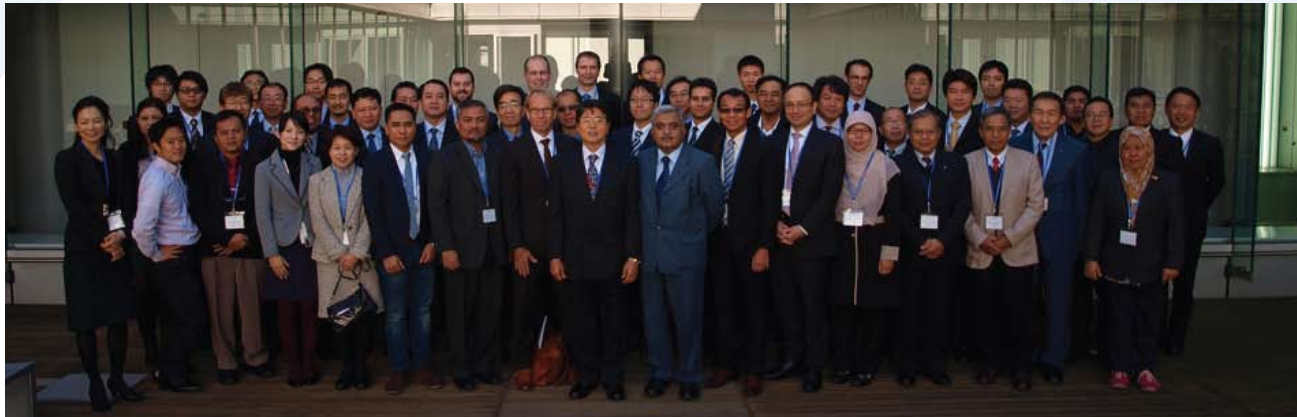
PCIEERD – JAXA Meeting on STA Programs of DOST held at PCIEERD office on 08 Sep 2014 (Photo L-R: CLARINDA REYES; DR. ROWENA CRISTINA L. GUEVARA; TSUJI MASANOBU (MR.), Executive Secretary, APRSAF, Manager for International Cooperation Promotion, JAXA. MIKA OCHIAI (MS.), Administrator, International Relations Division, JAXA; ENGR. RAUL C. SABULARSE; DARWIN SANTOS

ASIA-PACIFIC REGIONAL SPACE AGENCY (APRSAF)

The Asia-Pacific Regional Space Agency Forum (APRSAF) was established in 1993 to enhance space activities in the Asia-Pacific region. Space agencies, governmental bodies, and international organizations, such as the United Nations, as well as companies, universities and research institutes from over 30 regional participants take part in APRSAF, the largest space-related conference in the Asia-Pacific region. The twenty-first session of the Asia-Pacific Regional Space Agency Forum (APRSAF-21) successfully concluded its 4-day program on Friday, December 5, 2014, in Tokyo, Japan. Approximately 580 participants from 30 countries and 12 international organizations attended the session. The Philippines through the sponsorship of PCIEERD was able to send seven delegates from PHIVOLCS, PAGASA, UP Institute of Environmental Science and Meteorology (UP-IESM), UP Electrical and Electronics Engineering Institute (UP-EEEI), ASTI, and two from PCIEERD. APRSAF 21 commended the Philippines for its Success Story on Sentinel Asia and for its 1st Country Report to APRSAF. Philippines’ proposed hosting of APRSAF-23 in 2016 was approved during the event.



Space Utilization Technical Working Group of APRSAF-21 in front of the Miraikan Museum, Tokyo, Japan on 05 December 2014. Photo: From the Left (6th, 7th and 11th in front) are Engr. Alvin Retamar of DOST-ASTI, Dr. Joel Joseph Marciano of UP-EEEI, and Dr. Renato Solidum of DOST-PHIVOLCS (Image courtesy of APRSAF-21)



Space Utilization Technical Working Group of APRSAF-21 in front of the Miraikan Museum, Tokyo, Japan on 05 December 2014 (Image courtesy of APRSAF-21)

Sub-Committee on Sustainable Energy Research (SCSER)

Among the ASEAN S&T Cooperation Program implemented by the SCSER with ASEAN Dialogue Partners in 2014 are as follows: Under the ASEAN-India S&T Cooperation, the wind energy training program co-organized by ASEAN-SCSER and Centre for Wind Energy Technology (C-WET) was held last 07-30 May 2014 in Chennai, India. It was attended by participants from the ASEAN Member States. The training has disseminated technical knowhow in wind resource assessment, installation, operation and maintenance, design, and financial analysis of wind energy projects.

An International Training Program on Solar Energy Technology and Applications was co-organized by ASEAN-SCSER and the National Institute of Solar Energy (NISE) under the Ministry of New and Renewable Energy (MNRE), Government of India, which was supported under the ASEAN-India Fund (AIF). It was held last 19-30 May 2014 in Gurgaon, India and participated by ASEAN Member States. The training provided a venue for technical information sharing on solar resource assessment, solar photovoltaic testing, installation, system design and techno-economic analysis of solar energy projects.

A Regional Training Workshop was organized on Small Hydropower and Solar Energy System for Rural Electrification last 14-18 July 2014 in Hangzhou, China. This is part of the regional capacity building activity of the ASEAN-SCSER. The workshop was supported under the ASEAN-China S&T Cooperation Fund. This capacity building activity was implemented by the Hangzhou Regional Center for Small Hydropower of China.

Philippines-United States of America Joint Science and Technology Committee

The DOST and the US State Department organized the 1st Philippines-United States of America Joint Science and Technology Committee Meeting was convened on 27-28 October 2014 in Manila with the purposes of strengthening scientific, technological, and institutional capabilities of the Parties, broaden and expand relations between the scientific and technological communities in both countries, and promote scientific and technological cooperation in areas of mutual benefit.

PCIEERD was designated to lead the Climate Change/ Disaster Resilience Technical Working Group. The aim of the collaboration is to implement the agreement between PH and US on Scientific and Technological Cooperation. PH-US Joint S&T collaboration areas identified on Climate Change/Disaster Resilience were: 1) Multi-hazard Observation, Monitoring and Early Warning Systems; 2) Hazard Impact Assessment and Modelling; 3) Climate Change Adaptation and Disaster Risk Reduction for Critical Infrastructures; and 4) Methods and Technologies for Community Resilience to Climate Change Impacts and Disasters.

International Networks for PCIEERD's Fellowships in Advanced S&T (FAST) and Visiting Professorship

The PCIEERD Fellowship in Advanced Science and Technology continued to be funded under the Council's Human Resource Development Program, is being implemented by sending scholars to universities abroad.

This year, the Philippines sent two (2) scholars from UPLB BIOTECH, namely: Mr. Johnry Maloles and Ms. Cristine Marie Brown, to the International Center for Biotechnology (IC Biotech) at the Osaka University in

Japan for the conduct of their thesis research work under the UNESCO Biotechnology School in Asia. The program runs from July 27 2014 to July 27, 2015. On the other hand, Mr. Joel Paulite Sadol of the Central Bicol State University of Agriculture is now on his third year and is finishing his Doctor of Engineering in Remote Sensing and Geographic Information Systems (GIS) at the Asian Institute of Technology in Thailand. His proposed dissertation is entitled, "Lake Eutrophication Model Development for Philippine Lake Buhi."

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

The Philippines continues to be part of the Sub-Committee on Materials Science and Technology (SCMST). In April this year, Engr. Ermie M. Bacarra of the PCIEERD HRIDD, Philippine Focal Person for the SCMST since 2004, attended the SCMST meeting in Singapore where she ensured Philippine participation in SCMST collaborative projects such as ASEAN-Pakistan Conference on Materials Science (APCoMS) scheduled on November 24-26, 2014 where the Philippines was allocated two (2) slots. Unfortunately the slots were not utilized.

ASEAN-GIZ Cooperation Programme for the creation of the ASEAN Policy Framework on Private Sector Partnerships for Technology Development and Innovation

The cooperation programme is a GIZ project to assist the ASEAN COST through the Sub-Committee on Infrastructure and Resources Development (SCIRD) in order to establish a policy framework for strategic partnerships in technology development, knowledge and technology transfer. The Working Group was created to develop the guidelines on cooperation for ASEAN member states (AMSs). With guidance from the GIZ, the conditions that affect the ability of actors in the Innovation System (IS) of AMSs to undertake successful technology commercialization shall be examined and analyzed. The initiative shall also provide a typology that helps AMSs identify the right framework according to individual national circumstances. The end-product for the cooperation programme shall serve as a tool to facilitate capacity building, shape innovation policies and address technology development, knowledge and technology transfer cooperation between IS actors. Lastly, the policy framework shall serve as a tool for national and regional STI cooperation and economic integration.



Members of the Working Group for the ASEAN Policy Framework on Knowledge and Technology Transfer

LINKAGES with the University of Limoges, France

After the nominations of Ms. Aleena Laganapan of UP Diliman and Mr. Jess Gambe of MSU-IIT for Ph.D. scholarships in the University of Limoges in 2012 and 2013. The University sought the help of PCIEERD through Engr. Ermie Bacarra in the selection of candidates for Ph.D. scholarship in the field of crystal chemistry for 2014. The University of Limoges chose Mr. Kiveen P. Suycano of DLSU for the work on "Understanding of the crystal chemistry of tellurium oxide-based materials by synthesis, structural study and modeling of lone-pair elements".

LINKAGES with the University of Toronto

The PCIEERD was able to establish linkage with the University of Toronto when it hosted the Forum on "Science and Technology Entrepreneurship: Sharing the Canadian Experience" held on April 30, 2014. The forum was conducted under the leadership of Dr. Cynthia Goh, founder of the TECHNO program that engages science and engineering graduate students in translating their knowledge into technology products and guides them in commercializing their innovations. She was with four young entrepreneurs who are products of the program.



Participants to the "Science and Technology Entrepreneurship: Sharing the Canadian Experience" forum

S&T Governance and Management



In order to carry out PCIEERD’s programs towards Science and Technology advancement, activities that hone world-class science culture and deeper involvement and understanding of science-related programs are supported by the Council.

The PCIEERD values its work force’s growth skillfully and professionally. Moreover, it ensures personnel exposure to S&T related trainings and further studies that allow them to participate in the programs of the Council equipping them to excellence and global competitiveness.

PCIEERD Personnel in Scholarships in 2014

The following employees were engaged in undergraduate and graduate studies supported by the Council in 2014:

- Ruby Raterta**
Ph.D. in Biological Science
University of Santo Tomas

Carminda Tandelcarmen
Masters in Public Management
University of Makati

Ryan Christopher P. Viado
MS in Geography (thesis grant)
University of the Philippines Diliman

May-Rose B. Pariñas
Masters in Technology Management
University of the Philippines Diliman
- Meraida D. Reyes**
Masters in Technology Management
University of the Philippines Diliman

Rolando A. Yanquiling
BS in Information Technology
Polytechnic University of the Philippines

Ulysses M. Palmones
Masters in Developmental Studies
University of Sto. Tomas

PCIEERD Staff Complement for 2014

STATUS	MALE	FEMALE	TOTAL
PERMANENT	42	26	68
CONTRACTUAL	33	16	49
DETAILED	6	8	14
JOB ORDER	2		
TOTAL	50	81	133

PCIEERD's ICT Advantage

1. Since the PCIEERD staffs are becoming more mobile, the ITMU conducted trainings on the use of Google Drive, Calendar and Applications which are more accessible than the cloud software/app.
 - Orientation on GovMail, Google Drive and Productivity Tools (Batch 1) September 17, 2014; 9:30am PCIEERD Multipurpose Hall
 - Orientation on GovMail, Google Drive and Productivity Tools Batch 2) June 20, 2014; 1:30pm PCIEERD Conference Room
2. As part of the PCIEERD's initiative to come out with the new e-Proposals, the internal users were also trained on the Enhanced PMIS integrated with the new e-Proposals (January 22, 23 & 27, 2014)
3. PCIEERD was also one of the first DOST/government agencies to comply to the A.O. No. 39 in using the Government-Wide Web Hosting Service (GWHS) Website Template last March 2014.
4. The following are the information systems, forms and automations initiated by the ITMU to support the Quality Management System initiative of PCIEERD:
 - Development of the new e-Scholars for tracking and monitoring the PCIEERD scholarship grantees.
 - Development of the ConExion or the Contacts and Experts Information System of PCIEERD for easy reference and retrieval of the pool of experts in various sectors and disciplines.
- Development of the online helpdesk for PCIEERD internal clients. The system will be used to handle all IT service requests electronically.
- Design of Online Customer Feedback Forms using Google Forms in support of the PCIEERD's focus on customer satisfaction and continual improvement.
- Design of an automated point system for the PCIEERD's Strategic Performance Management Information System (SPMS)
5. Due to the increasing number of demands for on-line conferencing, the ITMU also initiate to develop and deploy the following:
 - Development of kits for the web, video and teleconferencing including hardware, software and complete guidelines.
 - Deployment of new access points for strategic areas in PCIEERD for BYODs (Bring-Your-Own-Devices) and EODs (Employee-Owned Devices).
 - Strengthening the network connectivity experience by employing new proxy server with load balance capability and 0 data packets loss.
6. The new PCIEERD Information Systems Strategic Plan Year 2015-2017 was submitted to MITHI last 21 March 2014. This serves as the blueprint of the Council's ICT requirements.



The IT Management Unit of PCIEERD

PCIEERD's Gender and Development (GAD) Initiatives

Ensuring a gender-fair work environment, this year activities were focused on continuing the initiatives on strengthening gender sensitivity and creating gender responsive R&D programs and projects. PCIEERD personnel have actively participated in different gender and development activities that promote gender sensitivity and responsiveness. These activities were geared towards the institutionalization of gender perspective in all activities of the Council this 2014:

1. PCIEERD GAD Mainstreaming: STRENGTHENING GAD SENSITIVITY AND CREATING AN ENVIRONMENT FOR GENDER RESPONSIVE R&D PROGRAMS AND PROJECT PHASE II May 25 – 25, 2014 –Orientation-workshop on GAD Sensitivity
2. Review of PCIEERD's Information System to enhance the gender-related statistics and database generation from PCIEERD's program/projects/activities
3. DOST Celebration of Women's Month - Walkathon, Seminars (March 23, 2014)
4. Provisions of MS/PhD scholarships and thesis/dissertation grants, post-graduate fellowship, visiting professorship
5. Integrated gender perspective in preparation and evaluation of project proposals
6. Sustained systematic collection of gender-oriented information of PCIEERD programs/projects/activities
7. Orientation-Training on Gender Mainstreaming Monitoring System (GMMS)
8. Maintained GAD Nook
9. Preparations for GAD FILM FESTIVAL (Soft launch 27 January 2015) – a strategy to increase awareness and recognition of importance of gender perspective.



PCIEERD GAD Mainstreaming



PCIEERD GAD Mainstreaming



GAD Film Festival Preparation

Financial Management



The PCIEERD Approved Budget in 2014 amount to P 356,682,000.00, 17% higher than 2013 Budget. Total budget was broken down as follows: Personnel Services (PS) 37,387,000.00, Maintenance and Other Operating Expenses (MOOE) 497,595,000.00 and Capital Outlay (CO) 1,700,000.00. 97% of MOOE was allocated to PCIEERD Grants-in-Aid (GIA) to support the Council’s thrusts and programs for CY 2014. Major Programs supported are competitive industries, sustainable energy, sustainable mass transport, environment, climate change adaptation & disaster risk reduction.

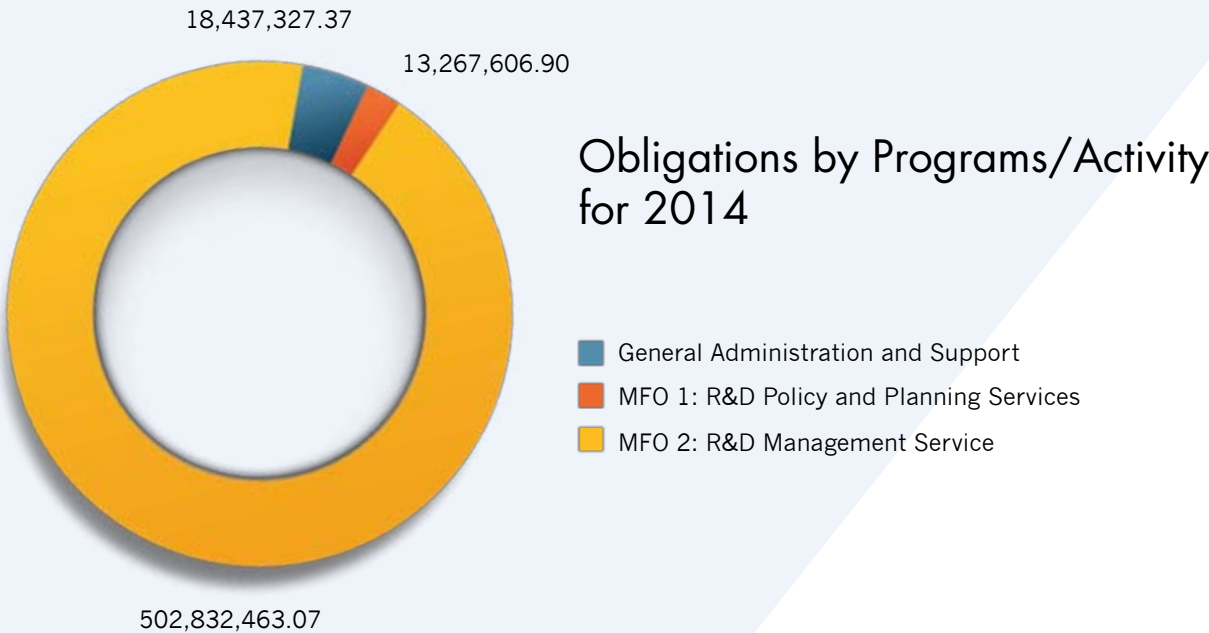
The Performance-Informed Budget Structure was introduced in 2014. Through this structure, all Major Final Output of the Council corresponds to the Performance Indicator and Targets committed to achieve during the budget year.

For CY 2014, PCIEERD utilized 99.61% of the total approved budget. Additional allotment was also received to augment the Council’s budgetary requirements for the full implementation of Magna Carta Benefits, Monetization of Leave Credits of PCIEERD permanent personnel, Retirement Gratuity and Terminal Leave of personnel separated/ retired from the service.

The breakdown of Allotment and Obligations are as follows:

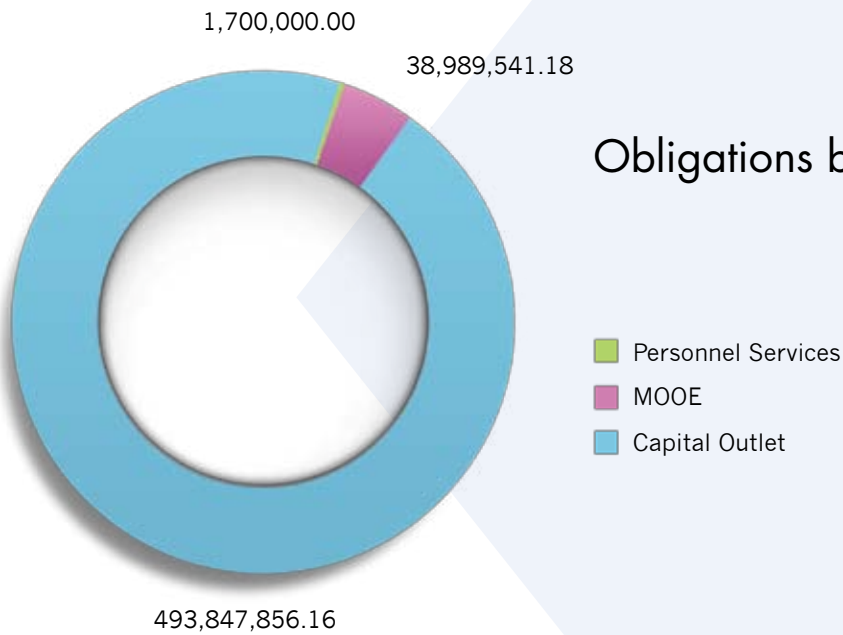
A. By Programs / Activity

PROGRAM	AL LOTMENT e	OBLIGATIONS	BALANCE
General Administration and Support	18,810,000.00	18,453,327.37	356,672.63
MFO 1:R&D Policy and Planning Services	13,311,000.00	13,219,606.90	91,393.10
MFO 2:R&D Management Service	504,561,000.00	502,864,463.07	1,696,536.93
TOTAL	536,682,000.00	534,537,397.34	2,144,602.66



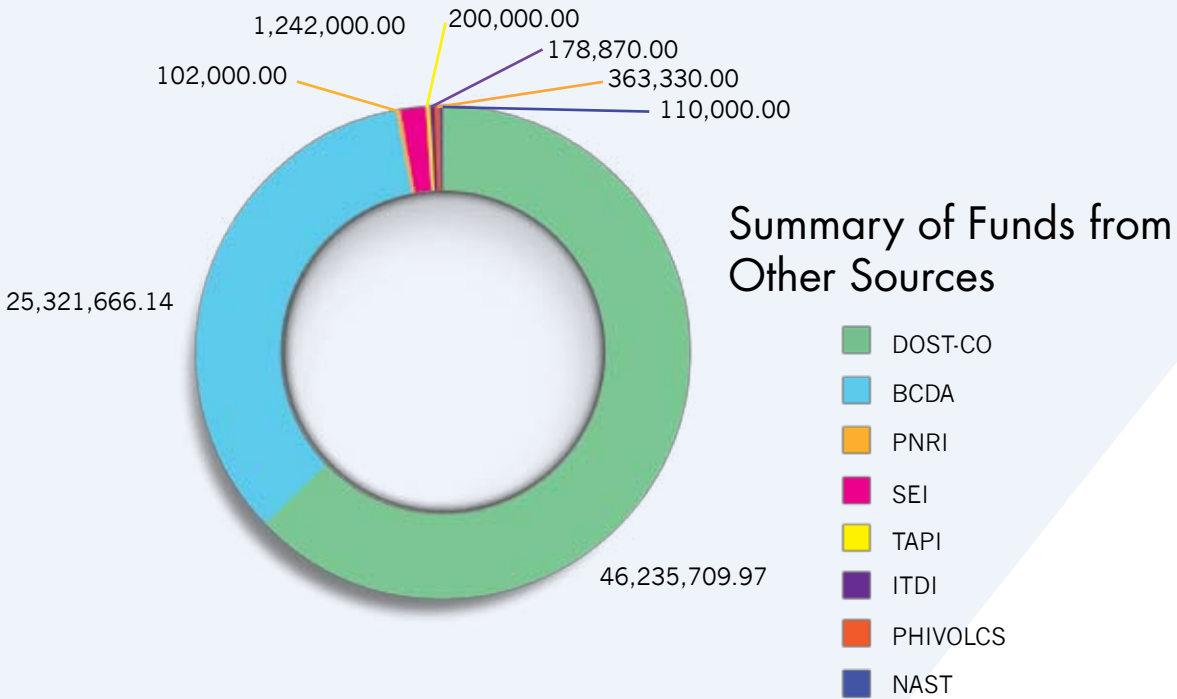
B. By Expense Class

EXPENSE CLASS	ALLOTMENT	OBLIGATIONS	BALANCE
Personnel Services	39,087,000.00	38,989,541.18	97,458.82
MOOE	495,895,000.00	493,847,856.16	2,047,143.84
Capital Outlay	1,700,000.00	1,700,000.00	-
TOTAL	536,682,000.00	534,537,397.34	2,144,602.66



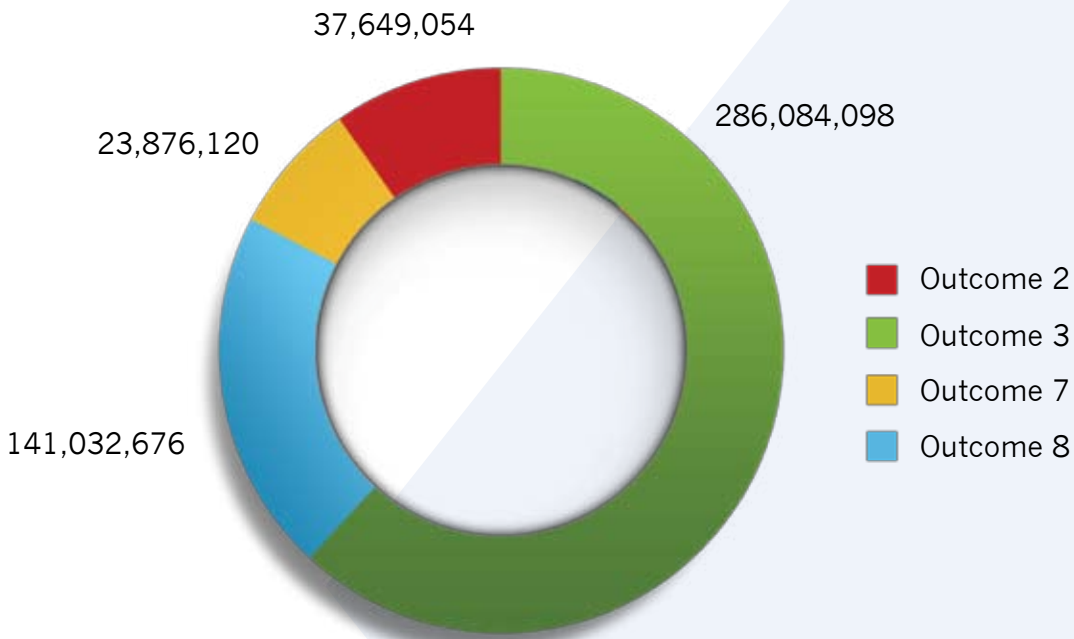
For CY 2014, the Council generated funds from external sources amounting to P 73,753,576.11. 60% of the fund was for the implementation of Balik Sciecntist Program (BSP), Accelerated Science & Technology Human Resource Developent(ASTHRDP) & Bridging the Human Resource Competency Gaps in Support of the National R&D Agenda. The remaining 30% represents implementation of other activities assigned and indirect cost for various projects monitored by PCIEERD.

AGENCIES	AMOUNT
DOST-CO	46,235,709.97
BCDA	25,321,666.14
PNRI	102,000.00
SEI	1,242,000.00
TAPI	200,000.00
ITDI	178,870.00
PHIVOLCS	363,330.00
NAST	110,000.00
TOTAL	73,753,576.11



2014 Grants-in-Aid (GIA) Allocation per DOST Outcome

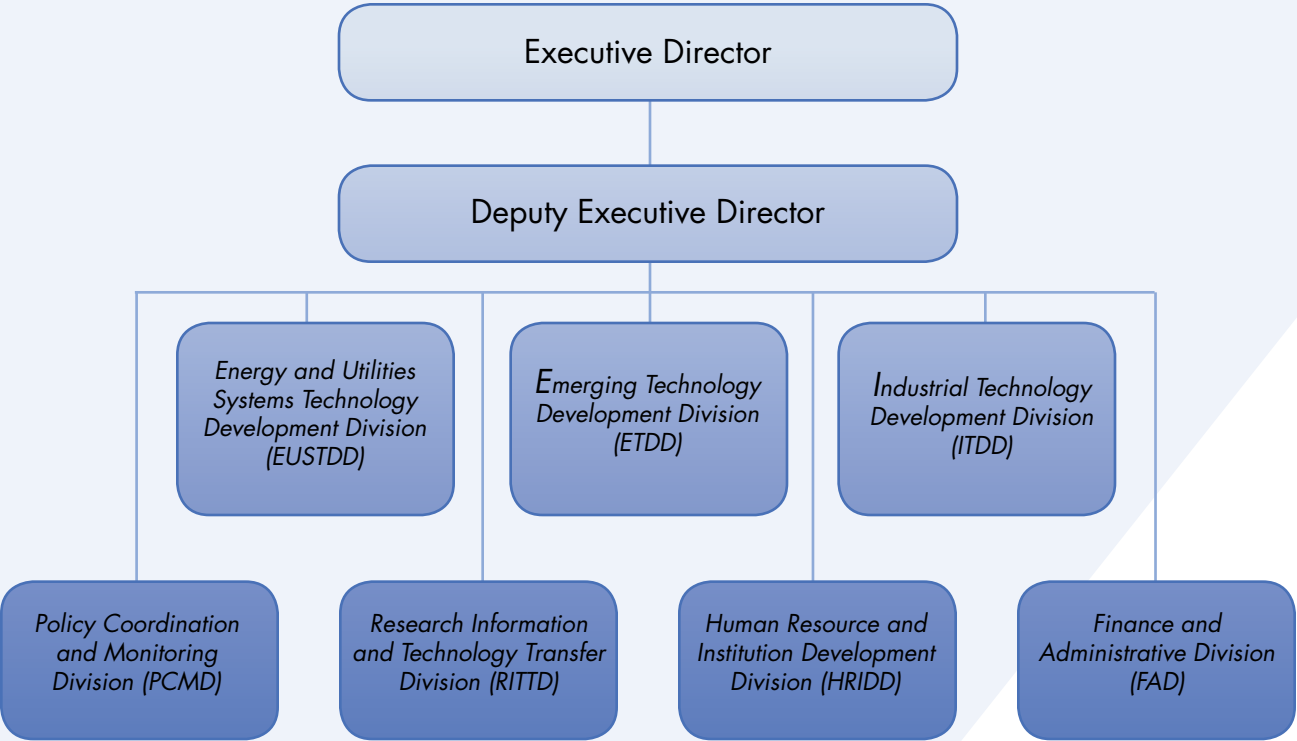
In 2014, the Council invested 58% in addressing the development & production of competitive products that meet world-class standards (Outcome 2). The remaining 52% addresses the state-of-the-art facilities (29%), highly skilled and globally competitive S&T human resources (7%) and science-based weather information and climate change scenarios with associated impact assessments (8%)



THE PCIEERD ORGANIZATION



The PCIEERD Executives and Personnel



The PCIEERD Organizational Chart

PCIEERD MANAGEMENT TEAM



Dr. Rowena Cristina L. Guevara
Executive Director

Engr. Raul C. Sabularse
Deputy Executive Director

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

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



Engr. Nonilo A. Peña
Chief, Energy and Utilities
Systems Technology
Development Division (EUSTDD)

Engr. Albert G. Mariño
Chief, Policy Coordination and
Monitoring Division (PCMD)

Engr. Ermie M. Bacarra
Chief, Human Resource and
Institution Development Division
(HRIDD)

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

Ms. Sonia P. Cabangon
Chief, Administrative Officer
Finance and Administrative
Division (FAD)

PCIEERD DIVISIONS



OFFICE OF THE EXECUTIVE DIRECTOR AND DEPUTY EXECUTIVE DIRECTOR (OED & ODED)

From left to right (standing): Rolando A. Yanquiling, Rolly H. Pactores, Mark Deniel D. Forbes, Richie P. Rodriguez
Seated: Raquel O. Atun, Aileen N. Luching, Dr. Rowena Cristina L. Guevara, Engr. Raul C. Sabularse, Jesusita C. Venturina, Mary Ann P. Magnaye



EMERGING TECHNOLOGY DEVELOPMENT DIVISION (ETDD)

From left to right (standing): For. Mary Joy C. Buitre, Jezza R. Jao, Diana Marie D. Jimenez, Erika Lorraine C. Gaw, Darwin V. Santos, Hector Manuel Jon C. Brizuela, Desiree D. Vera, Jachin Jane O. Aberilla, Janina Catrina H. Fuentes, Jenny Leigh A. Daquioag
Seated: May-Rose B. Pariñas, Joanna Rose A. Guardiano, Ruth A. Gonzales, Engr. Nelson P. Beniabon, Edna C. Nacienceno, Clarinda G. Reyes, Meraida D. Reyes



POLICY COORDINATION AND MONITORING DIVISION (PCMD)

From left to right (standing): Ruel A. Pili, Mark Anthony A. Zosa, George DC. Monroyo, Engr. Albert G. Mariño, Ulysses M. Palmones, John Ernie S. Evalle, Joseph R. Escorial
Seated: Edelyn Joy L. Gamalando, Carlota P. Sancho, Marivic A. Legista, Arlene R. Romasanta, Mary Jane S. Dabela, Cydsyl Ann Z. Prestado, For. Tony Rose A. Consignado



INDUSTRIAL TECHNOLOGY DEVELOPMENT DIVISION (ITDD)

From left to right (standing): Engr. Ronaldo Q. Dominguez, Joni Mae D. Gonzaga, Aleah P. Orendain, Myrna M. Blah, Liz Ahren C. Peñaflor, Engr. Stephanie Ann M. Blanco, Laarni T. Piloton, Mark John N. Ratio
Seated: Ma. Cristina S. Ilaw, Engr. Katrina B. Landicho, Grace F. Estillore, Engr. Niñaliza H. Escorial, Dr. Ruby Raterta, Mary Grace G. Buenavides, Kristina Paula Y. Anacleto
Not in Photo: Engr. Mylene K. Toyoken



ENERGY AND UTILITIES SYSTEMS TECHNOLOGY DEVELOPMENT DIVISION (EUSTDD)

From left to right (standing): Engr. Luthar James S. Co, Engr. Julius C. Mayorga, Engr. Patrick E. Montero, Engr. Lucky John Q. Florido, Engr. Nonilo A. Peña, Engr. Loreto C. Carasi, Raymundo H. Habal, Carluz R. Bautista, Engr. Marlon C. Aguilar
 Seated: Engr. Emelita A.S. Dimapilis, Ma. Monina Hazel B. Garcia, Kasfhi Nicole Patricio, Carminda R. Tandelcarmen, Rachel R. Habana, Alma C. Dupagan, Gladys Mae H. Chavez
 Not in Photo: Ryan Cristopher P. Viado



HUMAN RESOURCE AND INSTITUTION DEVELOPMENT DIVISION (HRIDD)

From left to right (standing): Arnel M. Bisnar, Mary Joy G. Borromeo, Leonila P. Valdez, Mary Joy A. Zabala, Roxanne E. Delos Reyes, Engr. Jonathan G. Muñoz
 Seated: Annaliza R. Monterey, Marie Christie B. Santos, Engr. Ermie M. Bacarra, Glenda Dorcas T. Sacbibit, Quinn Eidel T. Eda



RESEARCH INFORMATION AND TECHNOLOGY TRANSFER DIVISION (RITTD)

From left to right (standing): Engr. Sandro S. Flores, Engr. Edward Paul H. Apigo, Norly B. Villar, Lanquin Seyer R. Gacusan, Engr. Efren V. Reyes
 Seated: Janina Myn Z. Villapando, Edgilyn R. Alcasid, Engr. Tarhata M. Mariano, Magdalena F. Frando, Ms. Russell M. Pili, Maria Elena A. Talingdan, Jennifer D. Antonio, Leizl D. Sueno, Arlyn Joy P. Amata



FINANCE AND ADMINISTRATIVE DIVISION (FAD)

From left to right (standing, 3rd Row): Lord Alfred I. Aberte, Jayson Ryan G. Salunson, Leslie John A. Nuyda, Ricardo G. Palad Jr., Rodolfo A. Veloso Benjie B. Villanueva, Joselito B. Velasquez, Nomer T. Evangelista, Godfrey M. Parayno, Roland S. Rendon
 From left to right (Standing, 2nd Row): Charlemagne P. Valdez, Emmeric C. Quema, John Paul S. Canillas, Aileen L. Ventura, Divina B. Almazar, Elaine Annette C. Salma, Chingky N. Silverderio, Allen Z. Manibog, Sonia S. De Leon, Mary Ann F. Bangunan, Julieta H. Lacsa, Dayanara B. Herras, Grace I. Sablan, Queenie Ann A. Gacayan, Pancho A. Certeza
 Seated: Antonio L. Reduta, Isidro V. Querubin Jr., Marissa G. Dalay, Ena R. Conde, Sonia P. Cabangon, Mildred F. Cabradilla, Vilma Rose C. Borja, Alex R. Gesmundo, Anthony D. Dela Cruz

PCIEERD **GOVERNING COUNCIL**

Chairman
Hon. MARIO G. MONTEJO
Secretary
Department of Science and Technology

Dr. AMELIA P. GUEVARA
Undersecretary for Research and Development
Department of Science and Technology

Representatives from the Government Sector

Dr. ROWENA CRISTINA L. GUEVARA
Executive Director
PCIEERD

Usec. MARIO L. RELAMPAGOS
Undersecretary
Department of Budget and Management

Hon. ROGELIO L. SINGSON
Secretary
Department of Public Works and Highways

Alternate: Dr. Judy F. Sese

Hon. CARLOS JERICHO L. PETILLA
Secretary
Department of Energy

Alternate: Dir. Jesus T. Tamang

Dr. MINELLA C. ALARCON
Commissioner
Commission on Higher Education

Atty. ADRIAN S. CRISTOBAL
Undersecretary for Industry Development and Trade
Policy Group and Managing Head
Bureau of Investments

Alternate: Dir. Ma. Corazon H. Dichosa

Asec. JAIME RAPHAEL C. FELICIANO
Assistant Secretary for Planning
Department of Transportation and Communications

Alternate: Dir. Florencia A. Creus

Representatives from the Private Sector

Dr. MARITA V.T. REYES
Clinical Professor
University of the Philippines Manila

Dr. ALMA BELLA P. MADRAZO
Country Manager
AECOM

Dr. ANTONIO B. VILLAFLO
Quality Director
STMicroelectronics, Inc. Philippines

Engr. ANCIETO ABNER VILLAHERMOSA
Assistant Vice President (Retired)
San Miguel Corporation



Appendices

List of Grantees (Attendance to Seminars)

Sending Institutions	Name	Title of activity	Date	Venue	Amount of grant
Central Luzon State University	Dr. Nemesio Macabale, Jr.	16th International on Advanced Communication Technology	Feb 16-19, 2014	Pyeong Chang, South Korea	80,906.20
Technological Institute of the Philippines	Dr. Yvonne Ligaya Musico	4th International Symposium on Graphene Devices	Sept 20-26, 2014	Washington, USA	196,407.68
UP Diliman	Ms. Eloise Anguluan	ASEAN Workshop on Solar Cells and Solar Cell Materials	Sept 29- Oct 10, 2014	Bangkok, Thailand	162,343.60
Caraga State University	Ms. Meriam Santillan	35th Asian Conference on Remote Sensing	Oct 27-31, 2014	Nay Pyi Taw, Myanmar	81,226.88
UP Cebu	Mr. Kurt Junshean Espinosa	World Congress on Engineering and Computer Science – International Conference on Machine Learning and Data Analysis	Oct 22-24, 2014	San Francisco, USA	182,894.52
MSUIT	Mr. Melchor Potestas	2nd International Conference on Functional Materials Science	Nov 12-13, 2014	Lombok, Indonesia	67,201.00
PCIEERD	Mr. Rolando Yanquiling	Effective Management and Good Governance through TQM	Nov 16 – Dec 16, 2014	Kuala Lumpur, Malaysia	313,883.99
Central Mindanao University	Heidi Porquis	2014 International Conference on Environment Pollution and Prevention	Nov 12-14, 2014	Auckland, New Zealand	93,687.84
UP Los Baños	Dr. Emmanuel Florido	4th Thailand International Nanotechnology Conference 2014	Nov 25-28, 2014	Pathumthani, Thailand	56,327.85
UP Diliman	Ms. Doreena Karmina Pulutan	Training on Microsatellite Development	Sept 16-25, 2014	Hokkaido, Japan	27,089.64
UP Diliman	Mr. Mark Edwin Tupas	Training on Microsatellite Development	Sept 16-25, 2014	Hokkaido, Japan	31,653.44
UP Diliman	Dr. Gay Jane Perez	Training on Microsatellite Development	Sept 16-25, 2014	Hokkaido, Japan	31,653.44
UP Diliman	Dr. Rowel Atienza	2014 ASEAN ICT Awards under R&D Category	Sept 14, 2014	Kuala Lumpur, Malaysia	20,160.00
Visayas State University	Dr. Flora Mia Duatin	20th Anniversary Celebration and International Congress and General Meeting of the International Society for Southeast Asian Agricultural Sciences	Nov 8-10, 2014	Tokyo, Japan	97,812.61
TOTAL					1,443,248.69

PCIEERD Staff Attendance in Local Seminars/ Conferences

NAME	TRAINING/ SEMINAR ATTENDED	DATE	VENUE
PATRICIO, Kasfhi Nicole	The Date with the Changing Climate	February 14, 2014	De La Salle Araneta University
QUERUBIN, Isidro C. VENTURA, Aileen L. SALMA, Elaine Annette C.	Training on Philippine Public Sector Accounting Standards and Revised Chart of Accounts	February 17-21, 2014	COA, Quezon City
DALAY, Marissa G. CABANGON, Sonia P.	Consultative Assembly of DOST System FAD Chiefs, Accountants and Budget Officers for FY 2014	February 20-21, 2014	Batangas
REYES, Clarinda G. VERA, Desiree D. MANABAT, Ma. Clarissa M. JAO, Jezzel R.	Molecular Biology Training/ Workshop	February 24-28, 2014	PGC-DSCF, UP Diliman
BACARRA, Ermie M. ORENDAIN, Aleah P.	75th Piche National Convention	February 26 - March 1, 2014	Manila Hotel Philippines
LANDICHO, Katrina B.	1st Philippine Conference on Vetiver	March 5-7, 2014	Intercontenental Manila
BACARRA, Ermie M.	APEC National Workshop on S&T in Education	Mar 18-19, 2014	DFA Manila
BISNAR, Arnel M. PENAFLO, Liz Arhen	Reboot Philippines: Business Destination of Choice	March 26, 2014	Oriental Mandarin Hotel, Makati
ZOSA, Mark Anthony A. PILI, Ruel A. MARIANO, Tarhata M.	Hands-on Training on the Use of Thomson Innovation and Free Database	March 24-26, 2014	CSRC Bldg., UP Diliman
FRANDO, Magdalena F. DIMAPILIS, Emelita A. S.	Jumpstarting Instruction, Research and Policy Analysis in the Economics for the Electricity Sector	April 8, 2014	Acacia Hotel, Muntinlupa City
NACIANCEÑO, Edna C. VERA, Desiree D. JAO, Jezzel R.	29th Philippine Chemistry Congress: Building Stronger Bonds Towards Global Competitiveness	April 9-11, 2014	Villa Caceres Hotel, Camarines Sur
QUERUBIN, Isidro C. LACSA, Julieta TANDELCARMEN, Carminda R.	PAGBA: Public Financial Management and Climate Change Resiliency Towards Responsive and Transparent Governance	April 23-24, 2014	APO view Hotel, Davao City
CABANGON, Sonia P. CABRADILLA, Mildred F.	Gearing Towards ASEAN Integration through Strategic HR	April 24-25, 2014	Lahug, Cebu
MUÑOZ, Jonathan G.	Agriculture Engineers: Harnessing Renewable Energy Technologies for Food Security and Climate Change Mitigation	April 21-26, 2014	VSU, Baybay City, Leyte
CARASI, Loreto C. HABANA, Rachel R.	The Metro Manila Traffic: Scenario for the Future	May 9, 2014	AIM Conference Center, Makati City
MANABAT, Ma. Clarissa M.	43rd PSM Annual Convention & Scientific Meeting	May 15-16, 2014	Radison Blue Hotel, Cebu City
CONDE, Ena R. QUEMA, Emmeric C.	“GACPA: Sustaining Public Trust through Accountability, Credibility and Transparency	May 21-24, 2014	Palawan

NAME	TRAINING/ SEMINAR ATTENDED	DATE	VENUE
CARASI, Loreto C. ROMASANTA, Arlene A.	Executive Orientation on Managing Successful Programmes	May 20-22, 2014	DAP, Pasig City
GUEVARA, Rowena Cristina L.	4th CES Thought Leaders' Congress (TLC) Leader in Times of Crisis: Lessons from the Front Line	May 29, 2014	Diamond Hotel
SABULARSE, Raul C.	HURIS: Strategic and Critical Thinking	May 29-30, 2014	Berjaya Makati Hotel
EVANGELISTA, Nomer T. Forbes, Mark Deniel D.	Developing Controlled Vocabulary for Records Management"	June 17-19, 2014	Puerto Princesa, Palawan
AMATA, Arlyn Joy P. GACUSAN, Lanquin Seyer R.	Desktop Publishing with Adobe InDesign CS6	July 4-6, 2014	2247 Don Chino Roces Ave., Makati City
MARIANO, Tarhata M. VILLAR, Norly B.	Stakeholders Workshop on Critical Aspects of Nanotechnology R&D Management	July 24-25, 2014	Midas Hotel, Pasay City
NACIANCENO, Edna C. VERA, Desiree D. JIMENEZ, Diana Marie D. GAW, Erika Lorraine C.	MICROSCOPY: A Tool for Advance Materials Characterization and Failure Analysis	August 1-2, 2014	ITDI-DOST
EDA, Eidel Quinn T. AMATA, Arlyn Joy P. ALCASID, Edgilyn R. VILLAPANDO, Janina Myn Z.	Seminar Workshop on News and Feature Writing	August 14-15, 2014	AIJC, Sampaloc, Manila.
ESCORIAL, Joseph R.	DOST-HRDP In-house Training on Supervisory Development Course (Tracks 2&3)	August 11-14, 2014	Excecutive Lounge, DOST Bicutan, Taguig City
RENDON, Roland S.	Fire Fighting and 1st Aid Seminar	19-Aug-14	Executive Lounge, DOST Bicutan, Taguig City.
BISNAR, Arnel M. BUITRE, Mary Joy C. PARIÑAS, May Rose B.	4th National Remote Sensing Conference: New Era of Sensing for A More Resilient Philippines	August 28-29, 2014	UP Diliman, Quezon City
PILI, Ruel A. RENDON, Roland S.	Program on Disaster Risk Management" to be conducted by PAGASA	September 3-4, 2014	Amihan Conference room, PAGASA Central Office Bldg, Diliman, Quezon City
REYES, Clarinda G. PARIÑAS, May Rose B.	AGIA: Basic Accounting and Internal Control for Non-Accountants	September 3-5, 2014	Hotel Kimberly, Malate Manila
FRANDO, Magdalena F. VILLAR, Norly B. Sueno, Leizl D.	63rd Annual Convention PhilAAS	September 11-12, 2014	DLSU, Manila
HABANA, Rachel R.	22nd Annual Science Society of the Philippines (TSSP): Preparing for the ASEAN Integration	September 12, 2014	Diversion 21 Hotel, Iloilo City
AMATA, Arlyn Joy P. PILI, Ruel A. GONZAGA, Joni Mae D.	Results-Based Monitoring and Evaluation of S&T Programs/ Projects	September 15-19, 2014	PCAARRD, Los Baños, Laguna
MONTEREY, Annaliza R.	AGIA: Philippine Financial Reporting System (PFRS)	September 17-19, 2014	Hotel Kimberly, Malate Manila
PILI, Russell M. MARIANO, Tarhata M. VILLAR, Norly B. SUENO, Leizl D.	Business Development: Exploitation of IP	September 17-18, 2014	Heritage Hotel, Pasay City
LUCHING, Aileen A.	The Aquino Administration: Two Year Overview	September 25, 2014	SGV Hall, AIM Conference Center, Makati City

NAME	TRAINING/ SEMINAR ATTENDED	DATE	VENUE
PILI, Russell M. MARIANO, Tarhata M. VILLAR, Norly B. PARIÑAS, May Rose B. SUENO, Leizl D.	Intellectual Property Packaging and Preparation for Technology Transfer	September 30-October 1, 2014	Heritage Hotel, Pasay City
FRANDO, Magdalena F. VILLAPANDO, Janina Myn Z.	Protocol and Social Graces	October 1-2, 2014	Executive Lounge, DOST Compound
CONSIGNADO, Tony Rose A.	Administration of Surveys and FGDs with Qualitative Analysis	October 7-10, 2014	PSHS Main Campus, Diliman, Quezon City
PILI, Russell M. MARIANO, Tarhata M. VILLAR, Norly B. SUENO, Leizl D.	Negotiating Technology Licensing Agreements	October 15-16, 2014	Heritage Hotel, Pasay City
TALINGDAN, Maria Elena A. VILLAPANDO, Janina Myn Z.	4th Philippine Anti-Counterfeiting & Piracy Summit	October 20, 2014	Marriott Manila, Pasay City
BENIABON, Nelson P. CO, Luthar James S. AGUILAR, Marlon C. BLANCO, Stephanie Ann M. MORYAGA, Julius	62nd National Convention of Philippine Mechanical Engineers	October 22-25,2014	SMX Convention Center, Pasay City
GACUSAN, Lanquin Seyer R. ALCASID, Edgilyn R. VILLAPANDO, Janina Myn Z.	Science Reporting to the Layman	October 22-24, 2014	FNRI, Bicutan, Taguig City
MONROYO, George D. ZOSA, Mark Anthony A.	Training for IT Personnel of the OneLab Projects	November 3-7, 2014	ITDI, Bicutan Taguig City
CABANGON, Sonia P. CABRADILLA, Mildred F.	4th Luzon Convention of Human Resource Management Practitioners	November 18-20, 2014	Subic Bay Exhibition and Convention Center
MARIÑO, Albert G.	Transformational Leadership	November 19, 2014	AIM Conference Center Manila, Makati City
DABELA, Mary Jane S. CONSIGNADO, Tony Rose A.	Training Workshop on How to Use Prezi	November 19, 2014	DOST Executive Lounge, Bicutan, Taguig City
ESTILLORE, Grace F. APIGO, Edward Paul H, JIMENEZ, Diana Marie D.	Course on Advance Monitoring and Evaluation	November 19-21, 2014	DAP Building, Pasig City
ROMASANTA, Arlene A. DABELA, Mary Jane S.	Open Computer Conference	November 25-26, 2014	Shangri-La Hotel, Makati City
GACAYAN, Queenie Ann A.	The ABC's of Human Resource Management	November 27-28, 2014	Lourdes Suites Hotel, Makati City
ANACLETO, Kristina Paula Y. DELOS REYES, Roxanne E.	The 2nd National Nutrigenomics Conference	November 27-28, 2014	The Heritage Hotel, Pasay City
REYES, Meraida D. ILAW, Ma. Cristina JAO, Jezza R. GAW, Erika Lorraine C.	41st Annual Convention: Society of Biotechnology and Molecular Biology	December 4-5, 2014	Marco Polo, Cebu City
CONDE, Ena R. TALINGDAN, Maria Elena A. GACUSAN, Lanquin Seyer R.	Managing Social Media Records and Information	December 9-11, 2014	Grand Octagon Resort, Laoag City, Ilocos Norte
MUÑOZ, Jonathan G.	National Summit on Youth Apprenticeship	December 15, 2014	Astoria Plaza, Ortigas, Pasig City

PCIEERD Staff Attendance in International Meetings, Seminars, and Conferences

NAME	TRAINING/ SEMINAR ATTENDED	DATE	VENUE
ESCORIAL, Niñaliza H. PILI, Russell M.	Rubber Testing Benchmarking Activities	January 27-30, 2014	Kuala Lumpur, Malaysia
GUEVARA, Rowena Cristina L.	13th International Nanotechnology Conference and Exhibition (NANOTECH 2014)	January 29-31, 2014	Tokyo, Japan
	Asia-Pacific Economic Cooperation (APEC) First Senior Officials Meeting (SOM 1) and Related Meeting	February 15-20, 2014	Kuala Lumpur, Malaysia
PILOTON, Laarni T.	International Clean Technology	February 10 – March 6, 2014	Israel
GUEVARA, Rowena Cristina L.	e-ASIA Join Research Program (e-ASIA JRP) 1st Scientific Advisory Council (SAC) Meeting	February 21, 2014	Kuala Lumpur, Malaysia
	Promote and enhance the collaborative activities between DOST and the Space Mission Center of Hokkaido University	February 24-27, 2014	Japan
	Discussant – APEC Research & Technology Program 2014	March 3-7, 2014	Guangzhou, China
ESCORIAL, Niñaliza H.	APEC Research and Technology (ART) 2014 Program University Collaboration	March 3-7, 2014	Guangzhou, China
PILI, Russell M.	Benchmarking Mission of the Philippine Rubber Technical Working Group (PHILRUBBER)	March 23-29, 2014	Shanghai, China
GUEVARA, Rowena Cristina L. SABULARSE, Raul C. BACARRA, Ermie M. PEÑA, Nonilo P. SACBIBIT, Glenda T.	67th ASEAN COST Meeting	April 21-22, 2014	Singapore
BUENAVIDES, Mary Grace	Rubber Benchmarking Activity	April 21-26, 2014	Bogor, Indonesia
BACARRA, Ermie M.	International Conference on Human Resource Development for Nuclear Power Programs: Building and Sustaining Capacity	May 12-16, 2014	Vienna, Austria
MONTERO, Patrick E.	Wind Turbine Technology and Application	May 7-30, 2014	Chennai, India
DIMAPILIS, Emelita A.S.	Consultative Workshop on Indonesia National Strategy to Increase Affordability of Sustainable Energy Options through South-South Cooperation	May 12-13, 2014	Jakarta, Indonesia
HABANA, Rachel R.	2014 APEC Cooperative Forum on Internet of Vehicle	May 18-20, 2014	Shanghai, China
FLORIDO, Lucky John	Solar Energy Technology and Application	May 19-30, 2014	India

NAME	TRAINING/ SEMINAR ATTENDED	DATE	VENUE
SACBIBIT, Glenda T.	5th INCO Conference: Addressing Future Challenges	June 2-4, 2014	Athens, Greece
PEÑA, Nonilo A.	ASEAN-China Workshop on Small Hydropower and Solar Energy for Rural Electrification	July 13-19, 2014	Hangzhou, China
GUEVARA, Rowena Cristina L.	Visit to Japan Ministry of International Affairs and Communications (MIC)	June 22-26, 2014	Japan
	ASEAN PLAN of Action on Science and Technology (APAST) Retreat	July 17-28, 2014	Bangkok, Thailand
SABULARSE, Raul C.	Philippine Delegation that will study the Visionary Leaders for Manufacturing (VLFM)	July-August 4, 2014	Mumbai, India
MARIANO, Tarhata M.	ASEAN Science and Technology Park (Development Zone) International Training Workshop	August 5-25, 2014	Beijing, China
MONTERO, Patrick E.	Climate Change & Energy Sustainability	August 11-12, 2014	Singapore
CARASI, Loreto C.	APEC Workshop on Energy for sustainable Asia-Pacific Community and APEC Training Course on Energy Efficiency	August 25-28, 2014	Taiwan
ESCORIAL, Niñaliza H. BUENAVIDES, Mary Grace	Integration of Testing Services for Rubber and Rubber Products	October 7-10, 2014	Kuala Lumpur, Malaysia
ESTILLORE, Grace F. BUENAVIDES, Mary Grace	1st IMEKO FOODS Metrology Promoting Objective and Quality Safety	October 12-15, 2014	Rome, Italy
VILLAR, Norly B.	Converting Technology to Wealth-Technology Transfer Training at IC ² Institute, The University of Texas at Austin	October 15-16, 2014	Austin, USA
YANQUILING, Rolando A.	Total Quality Management	November 16 – December 15, 2014	Kuala Lumpur, Malaysia
LANDICHO, Katrina B.	Occupational Health and Safety Leadership	November 17 – December 12, 2014	Perth, Australia
VERA, Desiree D.	4th Thailand International Nanotechnology Conference 2014 (NanoThailand2014): Nanotechnology for Better Living	November 25-28, 2014	Thailand, Science Park, Pathumthani, Thailand
SABULARSE, Raul C. REYES, Clarinda	The 21 st Session of the Asia-PACIFIC Regional Space Agency Forum	December 1-5, 2014	Tokyo, Japan
SABULARSE, Raul C. PILI, Russell M.	Promoting Innovation & Technology in ASEAN Countries	December 17-19, 2014	Vietnam



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