SPACE ACTIVITIES IN THE PHILIPPINES

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Department of Science and Technology

Background

The Philippines, having its own micro and nano satellites—Diwata-1, Diwata-2, and Maya-1—launched into low Earth orbit, continues its pursuit of a sustainable and thriving space ecosystem in the country. Through various space initiatives led by the Department of Science and Technology (DOST), the Philippines is persistent in developing its nascent space sector by actively collaborating and engaging with various stakeholders, locally and internationally. Apart from orbiting satellites, the DOST is also investing on building people and infrastructure on the ground to support research, development, innovation, and academic activities relevant to space technology and applications.

The recent year highlights continuing activities on nano to micro satellites development done in country that would localize design of key modules and increase the involvement of domestic industries. This is done in the University Laboratory for Small Satellites and Space Engineering Systems or shorthand for ULyS^{3}ES (read as Ulysses), which serves as a pioneering academic hub for collaboration and multidisciplinary space initiatives. While in support of downstream activities, a second ground station has been established in the southern part of Mindanao to complement the ground station in Luzon island of the Philippines. These activities are further detailed in the succeeding discussions along with the eventual passing into law of Republic Act 11363, also known as the Philippine Space Act.

Small Satellites Development and Launch

Through funding support from DOST, the Space Technology and Applications Mastery, Innovation and Advancement (STAMINA4Space) Program leads the on-going efforts on in-country development of key technologies in nano and microsatellites. The program builds on a local industrial base and enhances local space science and engineering expertise, generally to aid in sustaining the momentum on small satellite development and in preparing for future missions.

In parallel to the localization activities, the country continues to contribute to the international space community by fostering partnerships and collaboration. Particularly, the Philippines is participating in the Joint Global Multi-Nation Birds Satellite project of the Kyushu Institute of Technology in Japan along with countries such as Paraguay, Nepal, and Turkey. In addition, the country is also participating in the Intelligent Remote-sensing and Internet Satellite (IRIS) Program of the National Cheng Kung University (NCKU) in Taiwan.

STAMINA4Space Program is jointly implemented by the DOST-Advanced Science and Technology Institute (DOST-ASTI) and the University of the Philippines Diliman (UPD). It follows the success of the program on Development of Philippine Scientific Earth Observation Microsatellite (PHL-Microsat), which built and launched the Diwata microsatellites and Maya cubesat.

Satellite Operation, Data Products and Utilization

On the downstream side, the DOST-ASTI houses several infrastructures and support facilities for satellite operation, data product development, and data management. The *Philippine Earth Data Resource and Observation (PEDRO) Center,* established in 2016, serves as a multi-mission ground receiving station (GRS) facility for operation of the Philippine small satellites and data acquisition from commercial satellites. For redundancy, a second GRS has been established last June 2019 in the Southern Mindanao region as an additional infrastructure to support satellite operations—increasing coverage and enabling robust and responsive observation over the country. The utilization of the satellite data is done through the *Remote Sensing and Data Science (DATOS) Help Desk.* DATOS produces relevant information useful and complementary to the current efforts of government agencies and key end-users, especially in terms of generating maps and radar data to aid disaster response as well as detection of high-value crops.

Generally, the utilization of satellite data in the Philippines is envisioned to provide relevant actionable information for added or complementing support to the country's 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.

The downstream activities are further supported by the *Computing and Archiving Research Environment (COARE)* for data management and the *Philippine Research, Education, and Government Information Network (PREGINET)* for high capacity interconnectivity, which is also the country's dedicated network for national research and education. In March 2019, PREGINET started hosting access for every Filipino to near real-time information from the Himawari-8 satellite of the Japan Meteorological Agency through a web portal developed by Japan's National Institute of Information and Communications Technology (NICT).

In addition to earth observation, the Philippines' Diwata-2 now operates with an amateur radio. This amateur radio was developed, built and designed in-country for voice and data messaging services useful in times of emergencies and disasters if regular telecommunications infrastructure become inoperative or inaccessible. The amateur radio in Diwata-2 is recognized internationally by the designation Philippines-OSCAR 101 (PO-101) and is being accessed by licensed ham users worldwide.

Space Activities in the University

The University Laboratory for Small Satellites and Space Engineering Systems (ULyS^{3}ES) in UP Diliman was inaugurated last August 2019. It is an interdisciplinary facility that serves as a pioneering academic hub for research & development (R&D) and instruction innovations in space technology in the Philippines. ULyS^{3}ES is a home for the STAMINA4Space Program and other future academe-based space initiatives. The first graduate program in the Philippines with a specialized track on nanosatellite engineering is nurtured through the ULyS^{3}ES with scholarship grant from the DOST-Science Education Institute (DOST-SEI) and research grant for CubeSats development and launch supported by DOST.

In addition to the activities done in UP, the DOST also supports space-related research and capacity building in various Universities across the country. The activities include studies relevant to urban planning and management, mitigation of flood hazards, environmental informatics, and light pollution assessment among others. Apart from research, there are activities that involve institutional and human resource development in these Universities.

Lastly, to empower the space ecosystem in the country, particularly across academic institutions, a university consortium in the country is established following the framework of the University Space Engineering Consortium (UNISEC). UNISEC Philippines is envisioned to offer a central platform for student and faculty exchange, provision of expertise on space science and engineering, and linking and fostering partnerships among member universities for the sharing of available facilities both locally and globally.

Conclusion

The abovementioned ongoing efforts on Space Technology and Applications have yielded important milestones on the development of technological know-how and local infrastructure through manpower and institution building, which now serves as the foundation for furthering local innovation that will continue to bring the benefits of space technology to the country. The cadre of pioneering Filipino engineers and scientists who have gained valuable hands-on experience in small satellite technology through PHL-Microsat is now the workforce behind the country's first academic program in nanosatellite development, value-adding industry engagement through localization of satellite components and the operation of the country's first ground stations for tasking, processing, archiving and distribution of geospatial data from earth observation satellites. Although much remains to be done in an inherently long-term endeavor such as space technology development, significant groundwork and momentum has been realized. These concrete advances and material progress on the ground have contributed fuel and substance to the proposal to establish the Philippine Space Agency and the solid footing for its passing into law on 08 August 2019 as Republic Act 11363 or known as the Philippine Space Act. It stipulates that the Philippine Space Development and Utilization Policy "... will embody the country's central goal of becoming a space-capable and space-faring nation within the next decade" through the establishment of "capacity building measure for human resources development".