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# New Developments in the Philippine Space Program and Policy



**Dr. Rogel Mari Sese**

*Program Leader, National SPACE Development Program  
Focal Person, Philippine Space Science Education Program*



# PH Space-Related Programs and Activities

Optical and Radio Astronomy since 1897

Rocket Development Program in the 1970s

AGILA-2 Telecommunications Satellite in 1990s

Philippine Space Science Education Program

10-Year Baseline Research of Space Science and Technology Applications (SSTA)

Cost-Benefit Analysis of a National Space Program

Philippine Microsatellite Development Program

Philippine Earth Data Resources Observatory

PHIL-LIDAR Program and Project NOAH

National SPACE Development Program

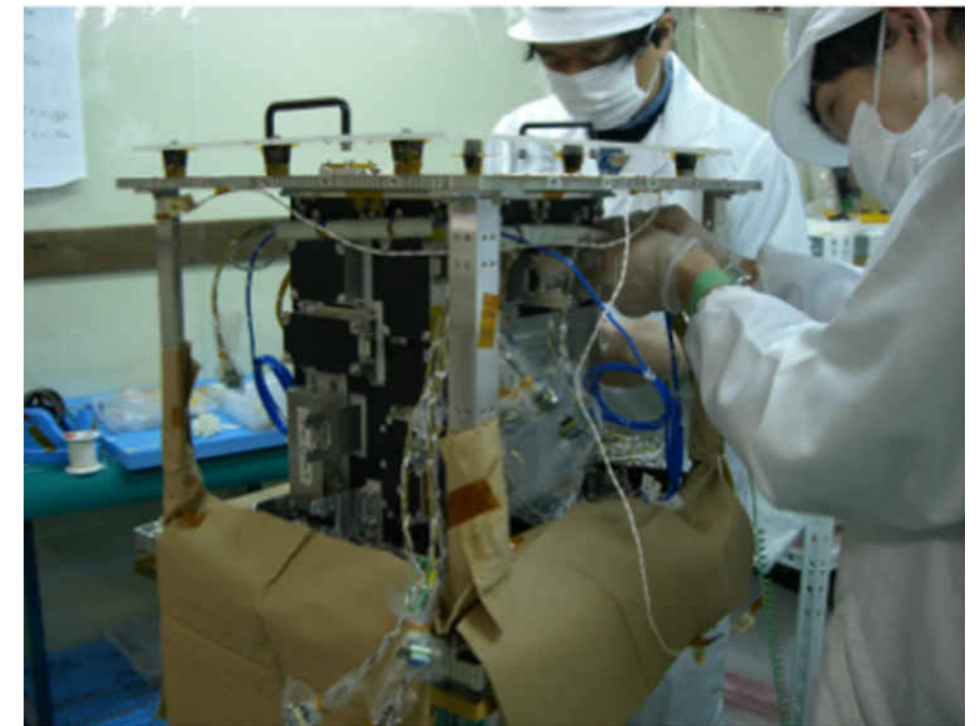
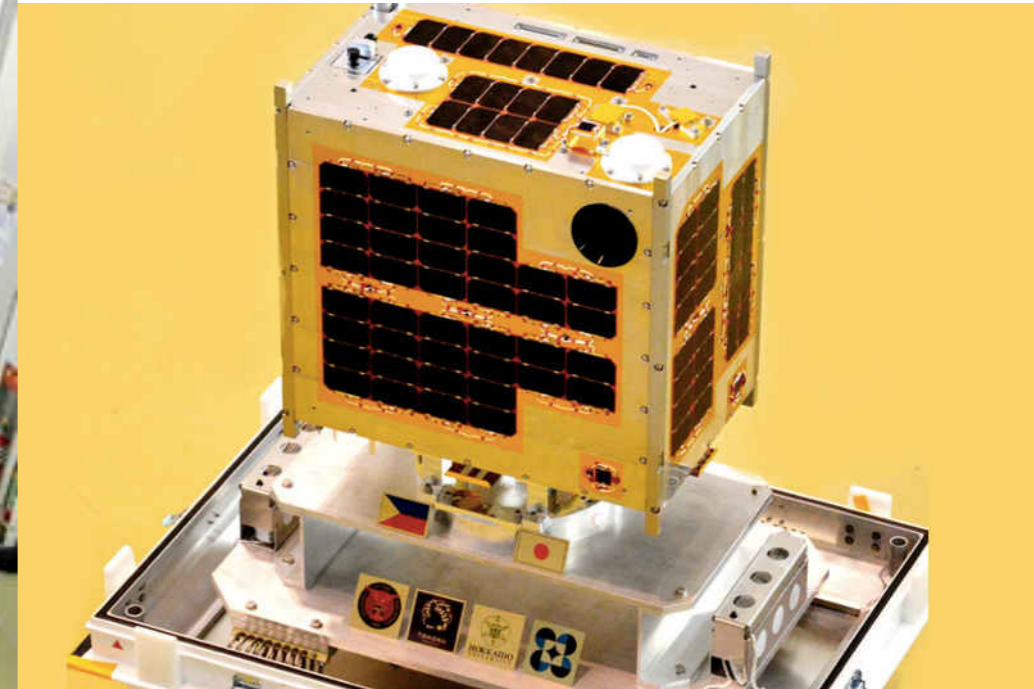
National Space Development and Utilization Policy and National Space Agency

House Bill 3637 Philippine Space Act of 2016





# PHL-MICROSATELLITE PROGRAM



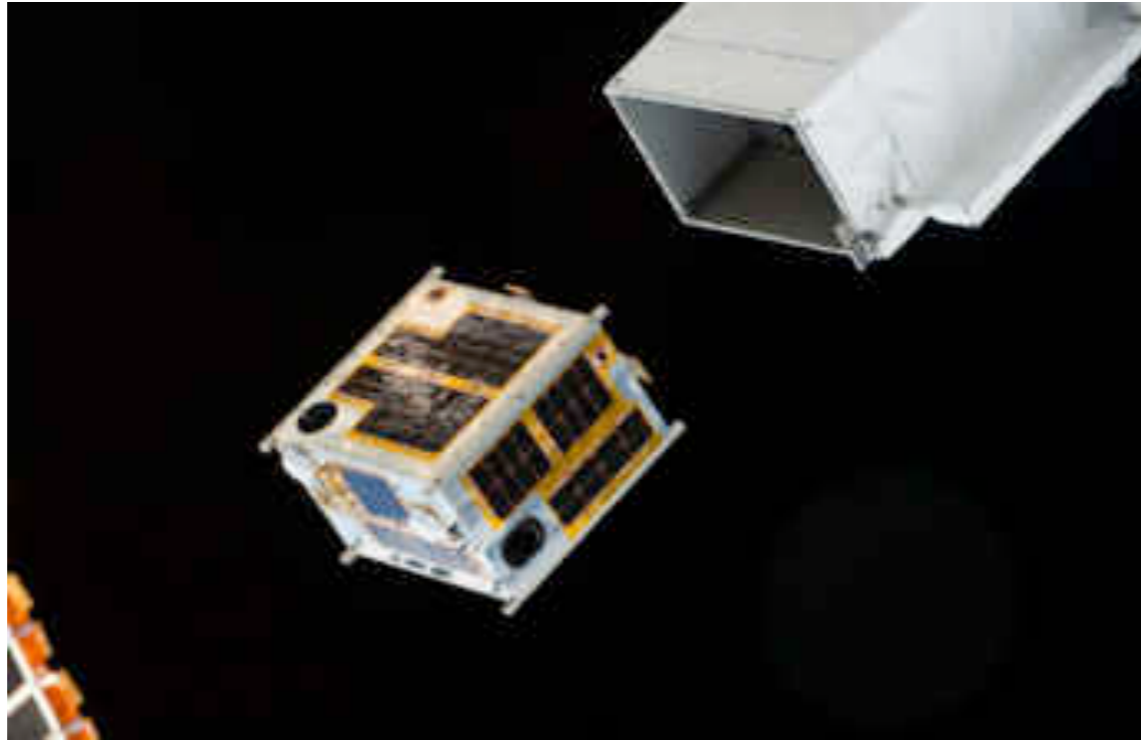
The Philippines has recently turned over **DIWATA-1** to JAXA and is scheduled for launch in the 1st half of 2016;

**DIWATA-2** is undergoing mission planning and scheduled for launch in 2018;

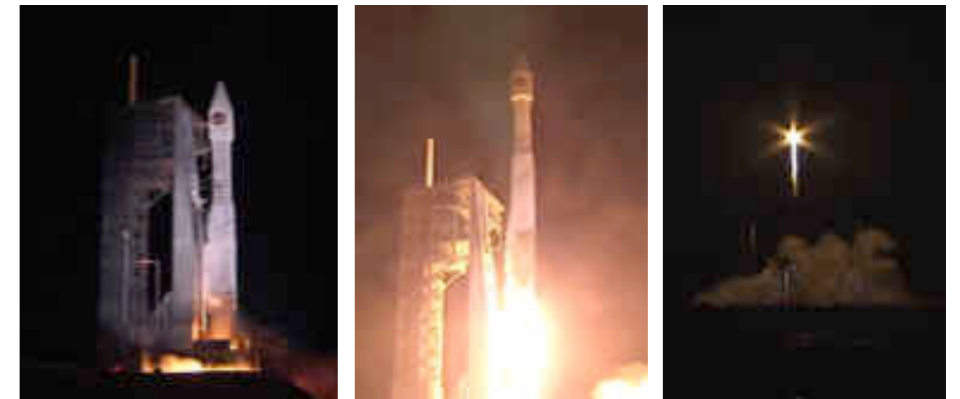
# PHL-MICROSATELLITE PROGRAM

## Diwata-1 release from ISS

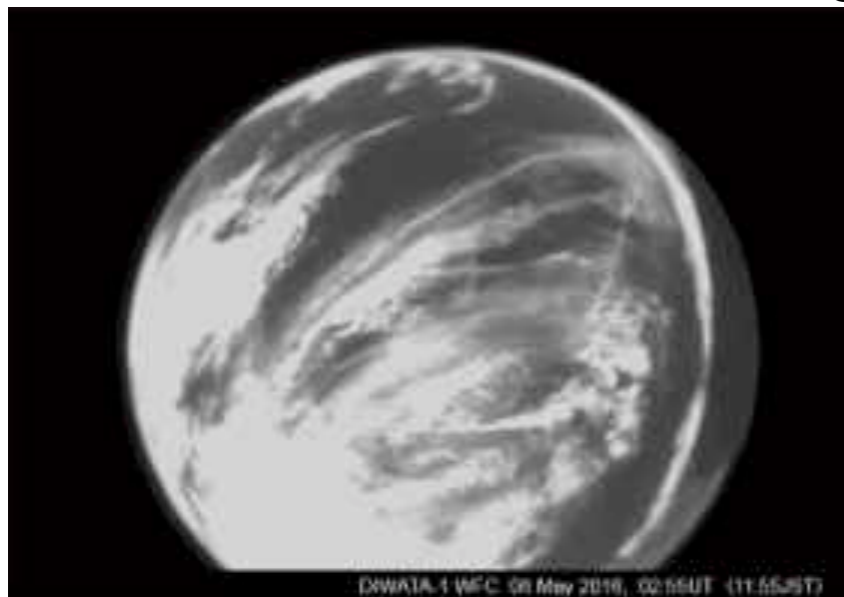
Diwata-1 was successfully deployed into low-earth orbit from the Japanese Experiment Module 'Kibo', April 27, 2016



Diwata-1 launch to space - March 23, 2016 - Cape Canaveral, Florida



Diwata-1 is in its initial testing phase and successfully captured and transmitted images





# DIWATA-1 MICROSATELLITE

## SMI with LCTF



**Spatial Resolution**  
3m

**Field of View**  
1.9 x 1.4km



**Spatial Resolution**  
80m

**Field of View**  
52 x 39km

**Target Applications**  
Assessment of the changes in Vegetation  
  
Assessment of ocean productivity

## Wide Field Camera



**Spatial Resolution**  
7km

**Field of View**  
180° x 134°

**Target Applications**  
Observation of cloud patterns and weather disturbances

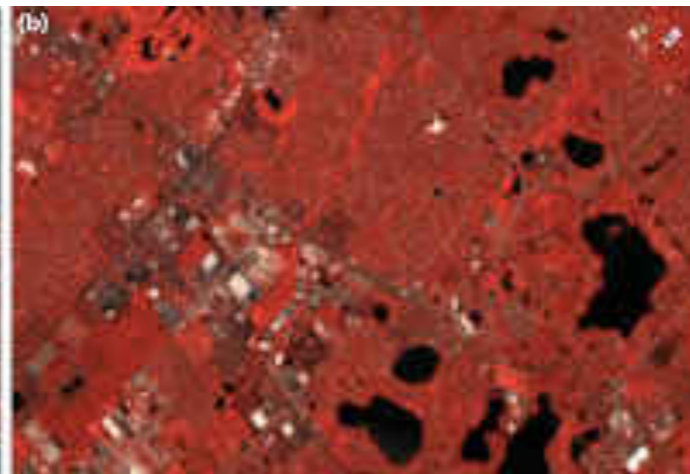


**Spatial Resolution**  
185 m

**Field of View**  
121.9 X 91.4 km

**Target Applications**  
Assists in determining the locations of images captured using the HPT and SMI

Diwata-1 is expected to pass 4 times per day with an average duration of 9 minutes per pass





# DIWATA-1 MICROSATELLITE



MFC



HPT

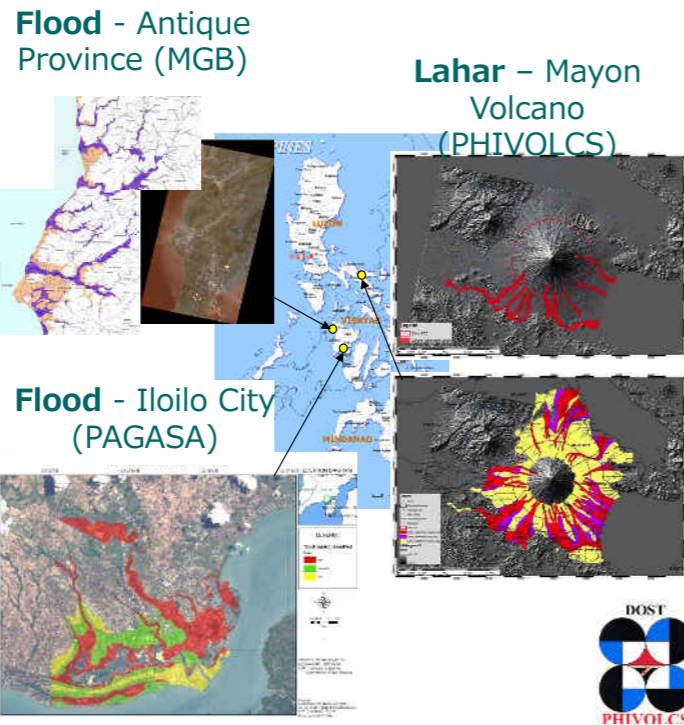
Location:  
Orlando, Florida  
Date acquired:  
30 June 2016



# SENTINEL-ASIA in the Philippines

## Phase I – Early 2009 to Early 2010

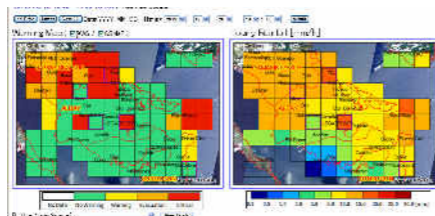
- **Capacity building:** training on basic ALOS image processing, SAR and optical image processing, DEM generation
- **Hazards assessment:** floods and debris flows (lahars)



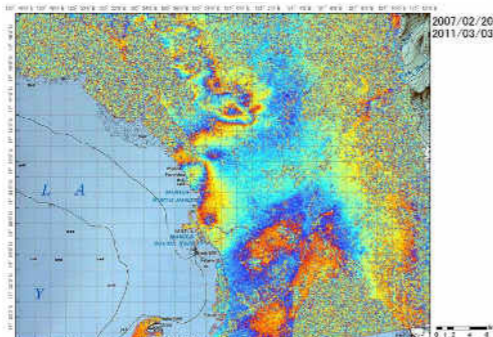
## Phase 2 – Mid 2010 to Early 2013

- **Capacity building:** training on Interferometric SAR, satellite rainfall data application, landslide warning by rainfall analysis
- **Monitoring and warning:** landslide warning prototype and fine tuning; InSAR application and validation in Metro Manila

### Web-based Landslide Warning Prototype for Albay Province



### Ground motion validation in Metro Manila by PALSAR data Mar 2011 – Feb 2007

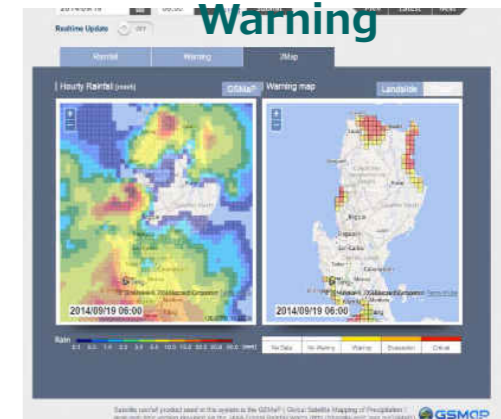


## Phase 3 – 2013 to 2014

- **Capacity building:** GSMaP data processing, landslide and flood warning system, Permanent Scatterer SAR
- **Monitoring and warning:** landslide and flood warning prototype for whole Philippines; PS-InSAR application in Mayon and Taal volcanoes, Metro Manila



### Web-based Flood and Landslide Warning



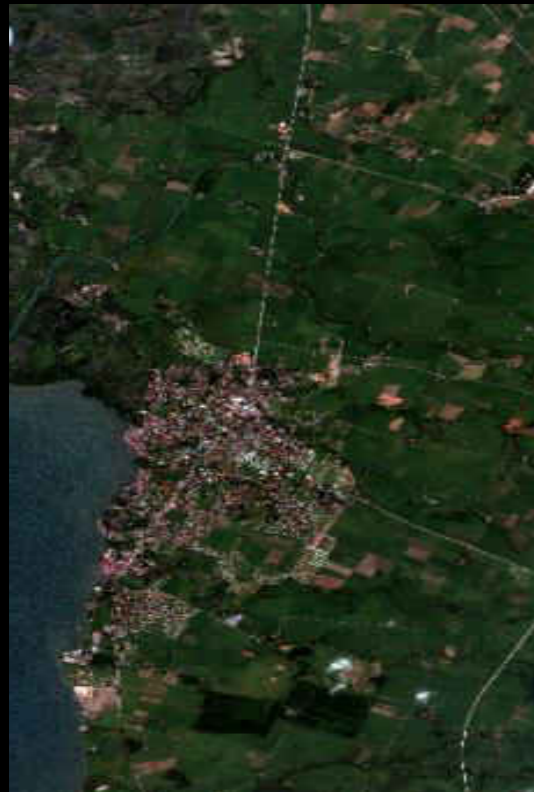
### PS-InSAR data for Taal Volcano 2011 – 2007





# Rapid Disaster Assessment Using Satellites for Typhoon Haiyan

## Preprocessing of Satellite imagery



Multispectral Satellite Imagery



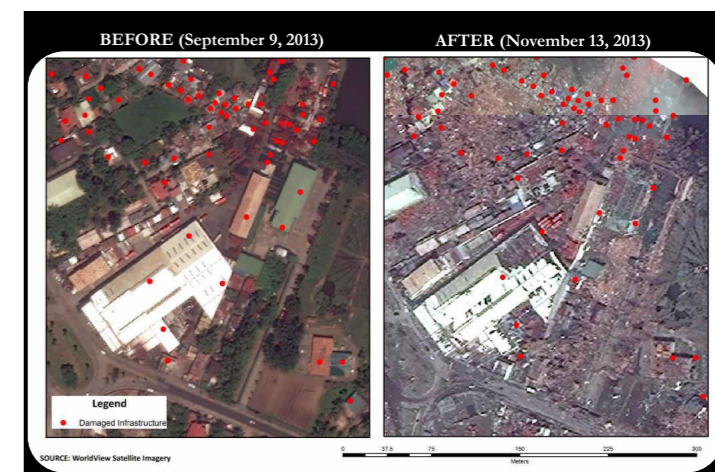
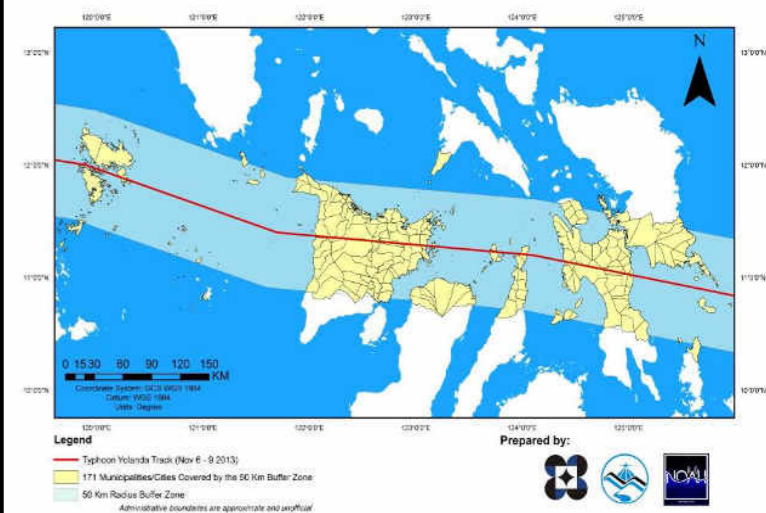
Hi-resolution Panchromatic Satellite Imagery



Fused Multispectral and Panchromatic Satellite Imagery

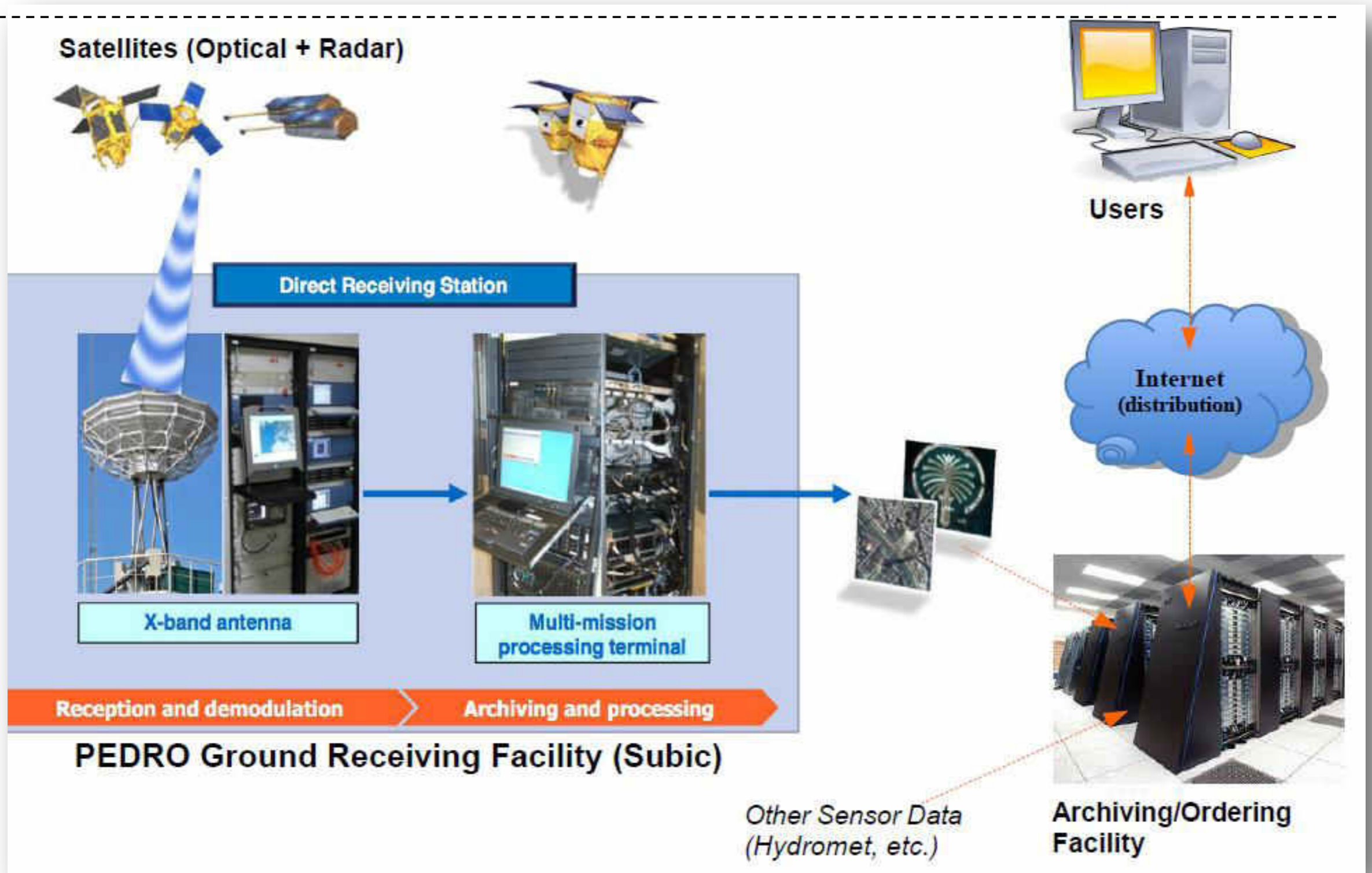


Municipalities/Cities Affected by Typhoon Yolanda





# Philippine Earth Data Resources Observatory



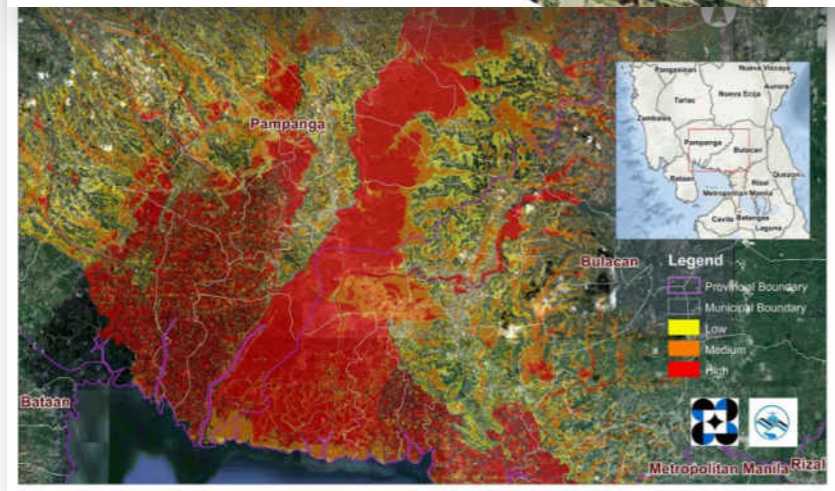
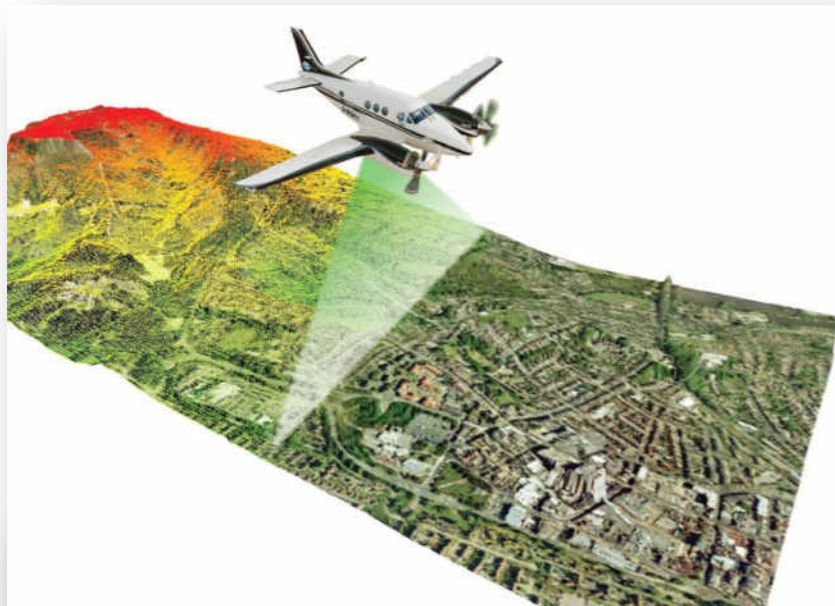


# DREAM-LIDAR Mapping Program

## DREAM - 3D LiDAR MAPPING

**UP-TCAGP (2 yrs)  
12/11-12/12 , P1.6 B**

**Extended until Dec 2014**



[www.dream.upd.edu.ph](http://www.dream.upd.edu.ph)

### Objective

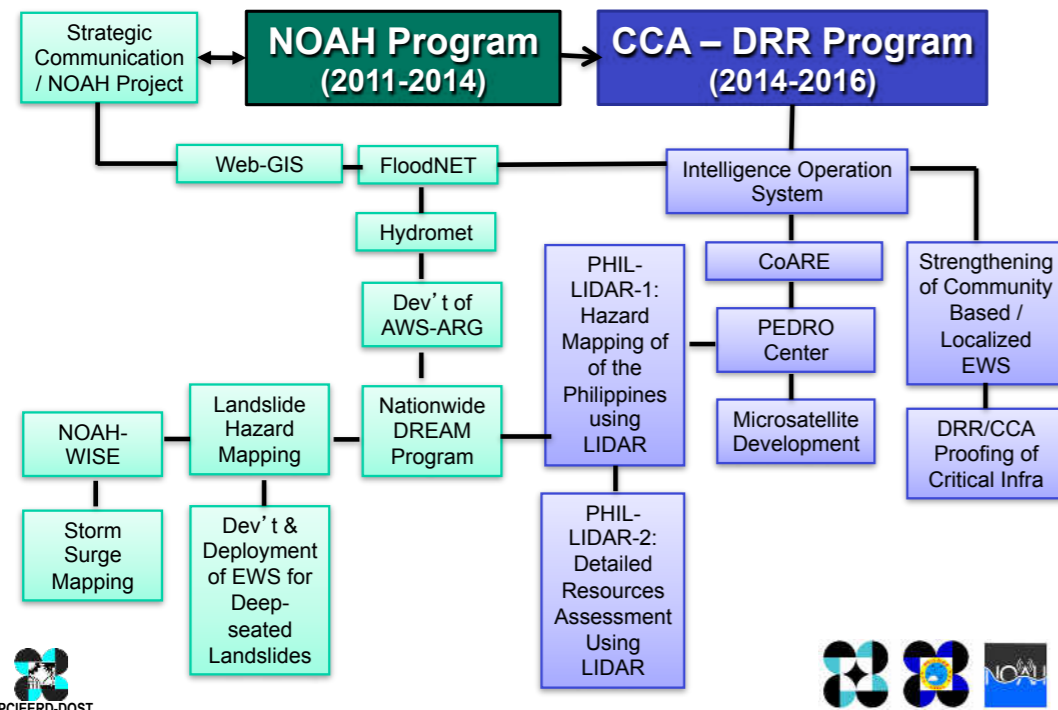
To produce high resolution and up-to-date detailed national elevation 3D maps that will help meet the country's information needs for hazard assessment and other applications such as water resources management, land-use planning, forest and agricultural monitoring

### Accomplishments

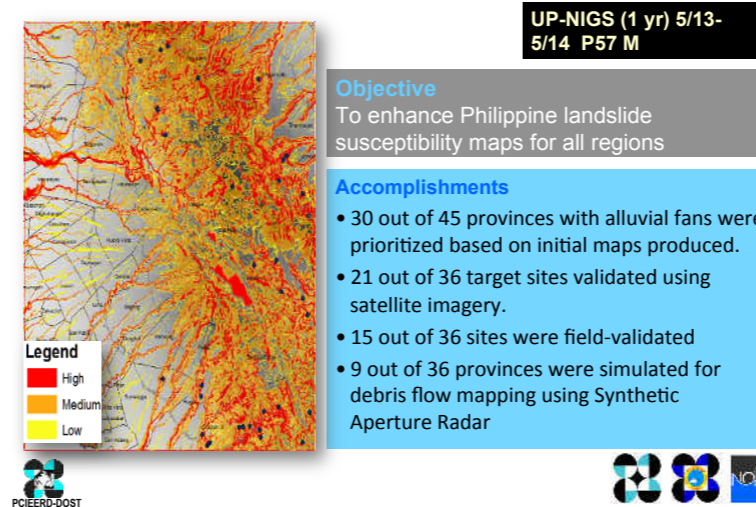
- Acquired LIDAR and SAR data for 18 out of 18 major river floodplain
- Conducted ground validation surveys of 18 out of 18 major river systems
- Produced Digital Elevation Models (DTM/DSM) for the 18 flood plains
- Flood hazard maps available for 18 sites
- Data Access Policies
- Data used for rapid post-disaster assessment of Typhoon Sendong, Pablo and Yolonda; and Bohol Earthquake
- Data transferred to Office of the President, LGUS, HEIs, etc.
- Trainings / seminars / workshops conducted for DREAM staff, students, researchers, decision-makers, and practitioners

# Nationwide Operational Assessment of Hazards ( Project NOAH)

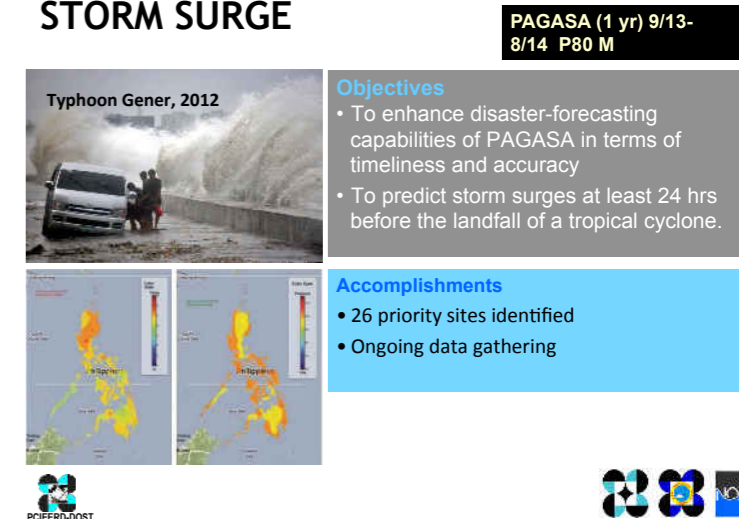
## Evolution of NOAH Program to CCA-DRR



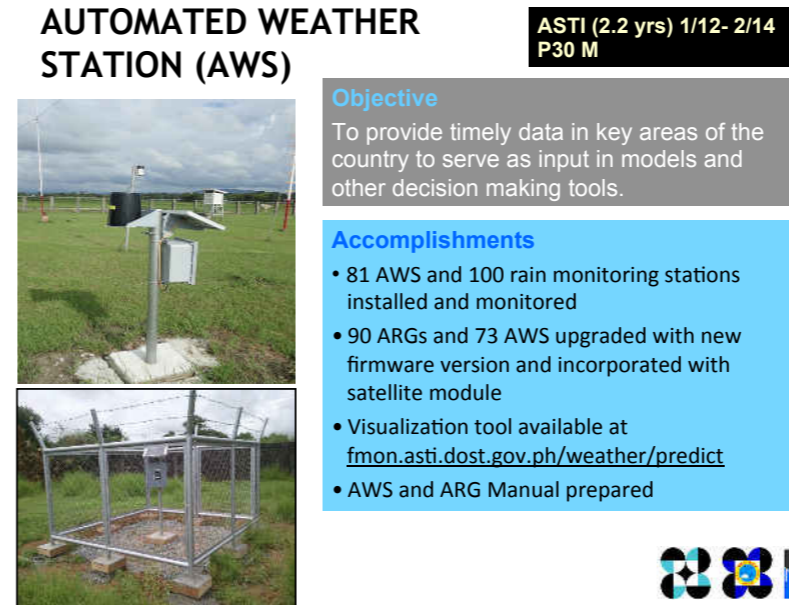
## LANDSLIDE HAZARD MAPPING



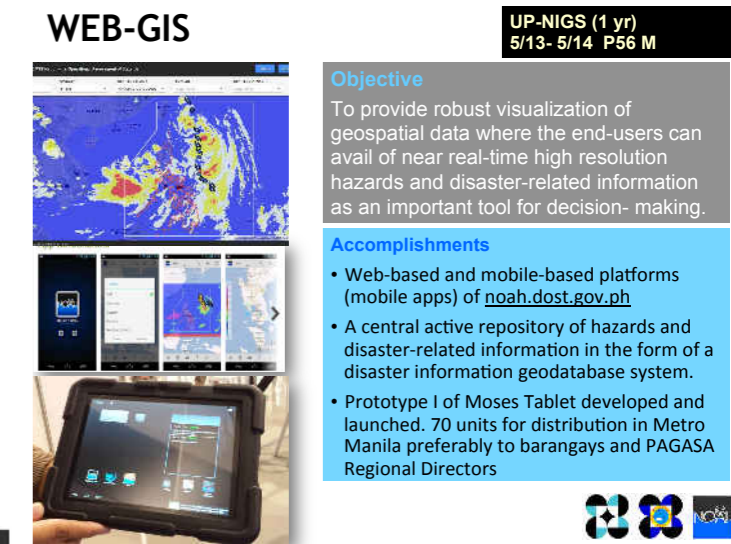
## STORM SURGE



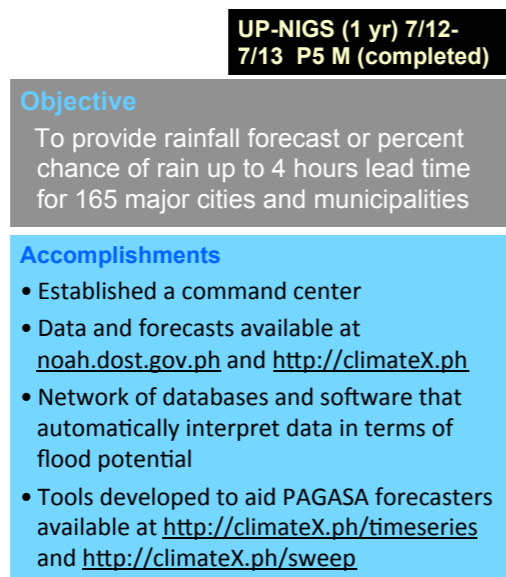
## AUTOMATED WEATHER STATION (AWS)



## WEB-GIS

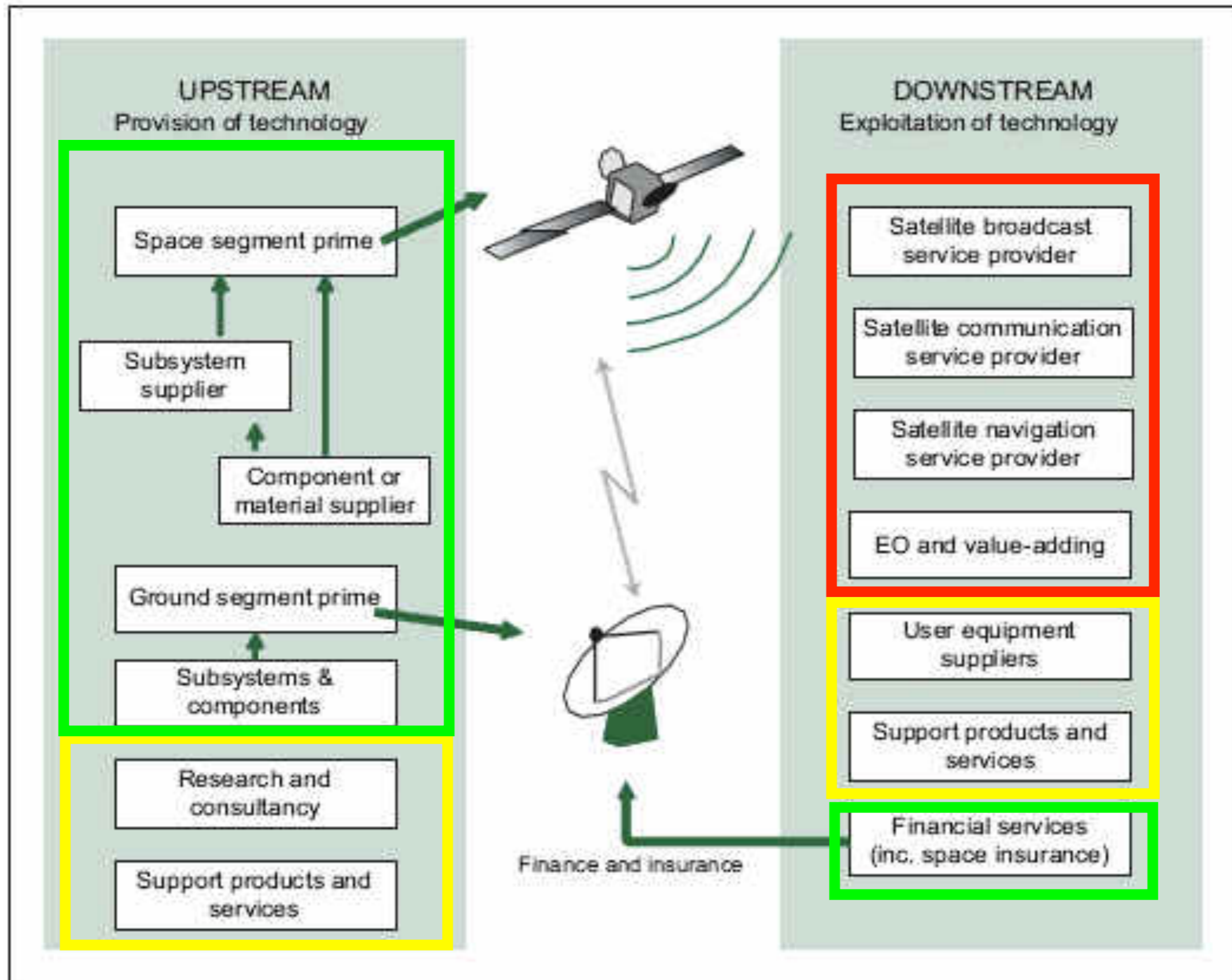


## FloodNET





# Moving Up the Space Technology Ladder



# National Space Program Development Timeline

Republic of the Philippines  
HOUSE OF REPRESENTATIVES  
Quezon City

SEVENTEENTH CONGRESS  
First Regular Session

HOUSE BILL NO. 3637



AN ACT ESTABLISHING THE PHILIPPINE SPACE DEVELOPMENT AND UTILIZATION POLICY AND CREATING THE PHILIPPINE SPACE AGENCY (PSA) AND DEFINE THE PURPOSE AND SCOPE OF ITS ACTIVITIES.

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Introduced by Hon. Erico Aristotle C. Aumentado and  
Hon. Seth Frederick P. Jalosjos

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# National Space Development and Utilization Policy

The NSDUP serves as the primary strategic roadmap for national space development in the next decade focusing on areas of space science and technology applications that would address national issues and concerns.

The Policy focuses on six (6) Key Development Areas namely:

**National Security and Development**  
**Hazard Management & Climate Studies**  
**Space Research and Development**  
**Space Industry Capacity Building**  
**Space Education and Awareness**  
**International Cooperation**



The **National SPACE Development Program** is a DOST-PCIEERD funded program tasked to lay the groundwork and necessary infrastructure necessary prior for the creation of the **Philippine Space Agency**.

National Space Research and Development Agenda  
Satellite Development Roadmap  
Satellite Data Sharing and Management Policy  
Space Industry Development Roadmap  
Collaborations and Linkages with space agencies and companies

# Space Research and Development Agenda (SRDA)

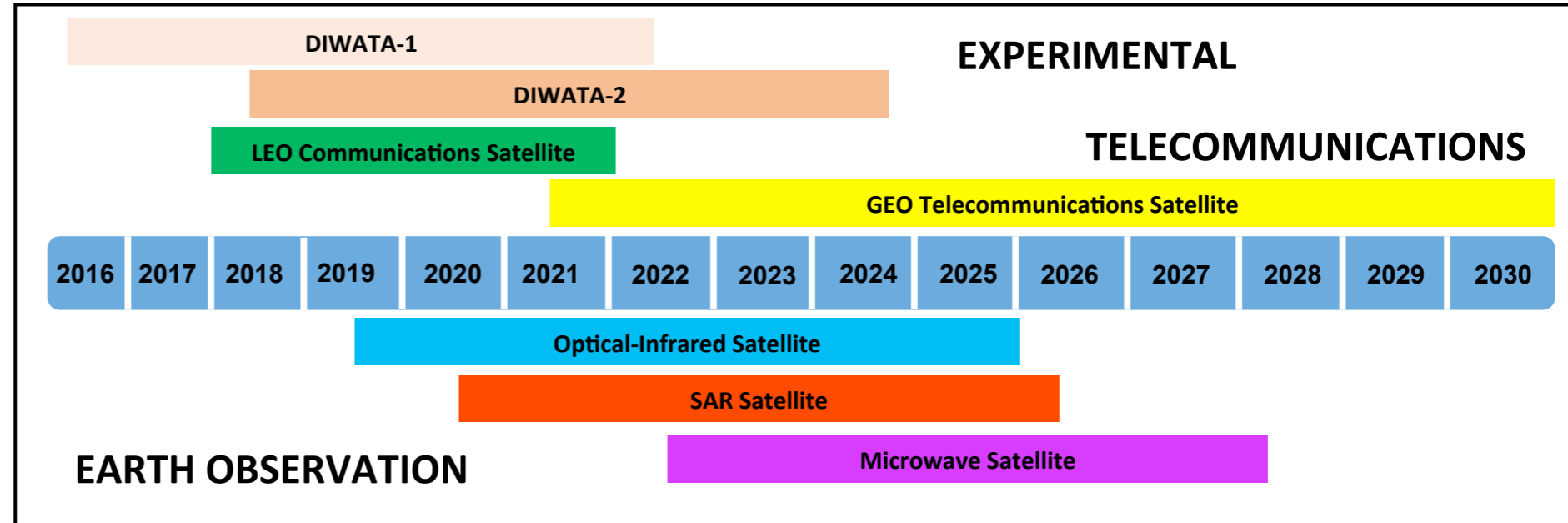
The SRDA is divided into **five (5) research clusters**, each containing development areas that are relevant and integral to strengthening space-based initiatives in the country.

Research Cluster	Development Areas
<b>Earth Observation for the Environment</b>	Meteorology and Climate Change, Oceanographic Monitoring, Agriculture and Fisheries, Environmental Monitoring, Disaster Assessment and Risk Monitoring, GNSS Utilization, Space Weather and Solid Earth Dynamics,
<b>Safety and Security</b>	Human and Resource Security, Internal and External Defense, Maritime Awareness, Air and Land Navigation, Space Law and Policy,
<b>Space Systems and Facilities</b>	Small Satellite Technology, High to Fine-Resolution and Multi and Hyperspectral Sensor Payloads, Synthetic Aperture Radar (SAR), Light Detection and Ranging (LIDAR), Small Satellite Assembly, Integration and Testing (AIT) Facilities, Ground Control Stations, Launch Systems and Facilities
<b>Space Education and Development</b>	Nano-Satellite Experiments, Teacher Training and Development, Materials and Curriculum Development, Education System Integration, Public Awareness and Outreach.
<b>Space Science and Innovation</b>	Observational Astronomy, Computational Astrophysics, Ethnoastronomy, Microgravity Experiments, Space Exploration, Emerging Technologies



# Satellite Development Roadmap (SDR)

The **Satellite Development Roadmap** seeks to address the satellite requirements of the Philippines for the next 10 to 15 years.



SATELLITE	TECHNICAL SPECIFICATIONS	APPLICATIONS	END USERS/BENEFECIARIES	TARGET LAUNCH DATE
<b>Constellation of LEO Communications Satellite</b>	<ul style="list-style-type: none"> <li>Orbital Altitude: ~ 550 km (LEO)</li> <li>Orbital Inclination: 25°</li> <li>Expected Lifetime: 5 years</li> <li>Frequencies: X-band</li> <li>Auxiliary Payload: AIS Receiver</li> <li>Number of Satellites: 3 to 5</li> <li>Mass: 10 kg/satellite</li> </ul>	<ul style="list-style-type: none"> <li>Data and Radio Communication Relay for immediate disaster response</li> <li>Support communication system for remote areas in the Philippines</li> <li>Secure low-bandwidth transmission for military assets</li> </ul>	<ul style="list-style-type: none"> <li>Armed Forces of the Philippines</li> <li>National Disaster Risk Reduction and Management Council</li> <li>Department of Agriculture</li> <li>Department of Transportation</li> </ul>	Q1 2018 to Q4 2018
<b>Optical-Infrared Satellite</b>	<ul style="list-style-type: none"> <li>Orbital Altitude: ~ 600 km (LEO)</li> <li>Orbital Inclination: 25°</li> <li>Expected Lifetime: 6.5 years</li> <li>Payloads: optical and infrared</li> <li>Auxiliary Payload: AIS Receiver</li> <li>Resolution (optical): 0.3m/pixel</li> <li>Resolution (infrared): 5m/pixel</li> <li>Mass: 250 kg</li> </ul>	<ul style="list-style-type: none"> <li>Agricultural Monitoring</li> <li>Forest Coverage Management</li> <li>Environmental Assessment</li> <li>Land Use Planning</li> <li>Climate Studies</li> <li>Coastal Monitoring and Ocean Studies</li> <li>Disaster Risk Reduction and Management</li> <li>National Security</li> </ul>	<ul style="list-style-type: none"> <li>Armed Forces of the Philippines</li> <li>Office of Civil Defense</li> <li>Department of Environment and Natural Resources</li> <li>Department of Agriculture</li> <li>DOST-PAGASA</li> <li>Department of Transportation</li> <li>Department of Environment and Natural Resources</li> </ul>	Q3 2019
<b>SAR Satellite</b>	<ul style="list-style-type: none"> <li>Orbital Altitude: ~ 600 km (LEO)</li> <li>Orbital Inclination: 25°</li> <li>Expected Lifetime: 6 years</li> <li>SAR Imaging Frequency: X-band</li> <li>Auxiliary Payload: AIS Receiver</li> <li>Mass: 300 kg</li> </ul>	<ul style="list-style-type: none"> <li>Agricultural Crop Classification</li> <li>Forest Tree Classification</li> <li>Land Cover Assessment</li> <li>Land Use Planning</li> <li>Coastal Monitoring and Ocean Studies</li> <li>Flood Monitoring</li> <li>Disaster Risk Reduction and Management</li> <li>National Security</li> </ul>	<ul style="list-style-type: none"> <li>Philippine Navy</li> <li>Office of Civil Defense</li> <li>DOST-PAGASA</li> <li>Department of Transportation</li> <li>Department of Agriculture</li> <li>Department of Environment and Natural Resources</li> </ul>	Q3 2020
<b>GEO Telecommunications Satellite</b>	<ul style="list-style-type: none"> <li>Orbital Altitude: ~ 36,000 km (GEO)</li> <li>Location: 98 °E or 121 °E</li> <li>Expected Lifetime: 15 years</li> <li>Number of Transponders: 18</li> <li>Mass: 2,000 kg</li> </ul>	<ul style="list-style-type: none"> <li>Data and Radio Communication Relay</li> <li>Mobile Telephony</li> <li>Tele-services</li> <li>Electoral Returns Transmission</li> <li>TV/News Broadcast Services</li> <li>Broadband Communications Services</li> </ul>	<ul style="list-style-type: none"> <li>Department of National Defense</li> <li>Armed Forces of the Philippines</li> <li>NDRMMC</li> <li>Department of Education</li> <li>Department of ICT</li> <li>Department of Health</li> </ul>	Q3 2021
<b>Microwave Satellite for Water-Based Applications</b>	<ul style="list-style-type: none"> <li>Orbital Altitude: ~ 600 km (LEO)</li> <li>Orbital Inclination: 25°</li> <li>Expected Lifetime: 6 years</li> <li>Microwave Frequency: P-band</li> <li>Auxiliary Payload: AIS Receiver</li> <li>Mass: 350 kg</li> </ul>	<ul style="list-style-type: none"> <li>Climate Studies</li> <li>Coastal Monitoring and Ocean Studies</li> <li>Flood Monitoring</li> <li>Disaster Risk Reduction and Management</li> <li>Human and Food Security</li> </ul>	<ul style="list-style-type: none"> <li>Department of Agriculture</li> <li>DOST-PAGASA</li> <li>Department of Environment and Natural Resources</li> <li>Department of Transportation</li> <li>NDRMMC</li> </ul>	Q2 2022

# Satellite Data Sharing Policy (SDSP)

The **Satellite Data Sharing Policy (SDSP)** serves as the guide in the acquisition, procurement, utilization, archiving, distribution and sharing of raw to low-level satellite data from Philippine satellites and ground receiving stations in the country.

**Satellite Data Procurement.** The National Space Agency shall function as the clearinghouse of all satellite data of the Philippine government to avoid duplication; government agencies/institutions will be requested to submit annual satellite data plans for consolidation.

**Satellite Tasking and Operations:** Data to be tasked according to the purpose of the satellite and the priorities consistent with NSDUP and SRDA; operations and management of Philippine satellite will be under the National Space Agency.

**Open Access:** Satellite data shall be made available to the government agencies and the public, generally free of charge; however, the data to be pre-screened for security and technological protection measures shall be implemented; Foreign states and companies on a formal agreement.

**Standards and Interoperability:** Datasets shall be stored and distributed in open standards and formats consistent with Philippine government and international standards;

**Commercial:** Commercial entities shall observe the terms and conditions as part of the agreement; Royalty fee will be paid to the National Space Agency.



# Space Industry Development Roadmap (SIDR)

## Niche Area 1: Space Sub-System Production

Given a thriving semiconductor industry, the Philippines can venture into the production of space sub-systems such as electronic components as Tier 2 or Tier 3 suppliers. For some companies, this is already being done here in the aerospace industry.



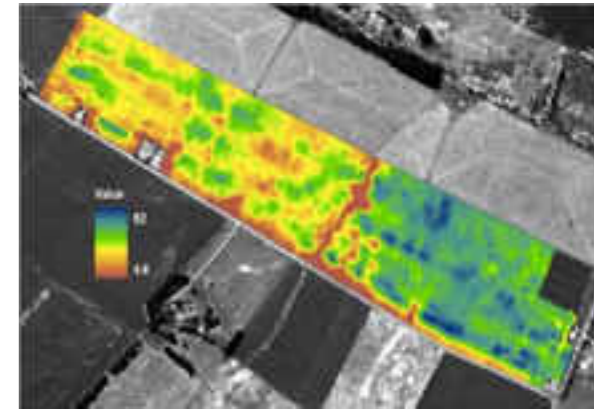
## Niche Area 2: Satellite AIT

To achieve vertical integration, the Philippines can venture into having a facility for outsourced satellite assembly, integration and testing to take the lead in the Southeast Asian region;



## Niche Area 3: Space Applications and Services

Once the Philippines possess its own satellites (or even ground stations), the data obtained can be marketed as applications, broadcast services can be leased and navigation data can be sold.



## Niche Area 4: Launch Vehicle Services

Given the location of the Philippines, it is a suitable launch site for rockets. Coupled with a suitable business environment, the Philippines can be a competitive launch service provider for satellites and even space tourism, one of the few in the equatorial region (other than India and French Guiana).







# THE 23RD SESSION OF THE ASIA-PACIFIC REGIONAL SPACE AGENCY FORUM

BUILDING A FUTURE THROUGH SPACE SCIENCE, TECHNOLOGY, AND INNOVATION

**NOVEMBER 15-18, 2016**  
**SOFITEL, MANILA**  
**PHILIPPINES**

CO-ORGANIZED BY THE DEPARTMENT OF  
SCIENCE AND TECHNOLOGY (DOST),  
DEPARTMENT OF FOREIGN AFFAIRS (DFA),  
MINISTRY OF EDUCATION, CULTURE, SPORTS,  
SCIENCE AND TECHNOLOGY OF JAPAN (MEXT), AND  
JAPAN AEROSPACE EXPLORATION AGENCY (JAXA).

I  **MANILA**

