



**The DHARMA Project:  
Philippine Space Agency's  
contribution on the use of EO data for  
DRRM in the Philippines**

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Space Information Infrastructure Bureau (SIIB)



**PhilSA**

# The Philippine Space Agency

Building an integrated and sustainable national space program



08 August 2019

Signed by the President

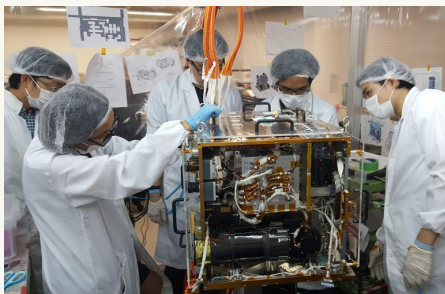
03 September 2019

Effectivity of Philippine Space Act  
R.A. 11363

# Flagship Projects

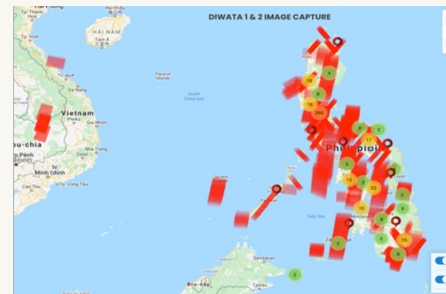
Space Science & Technology Applications (SSTA) Program

## Build, Build, Build in Space (B3iS)



Philippine Satellites as  
Vital Component of National  
Information Infrastructure

## Mobilizing Space Data

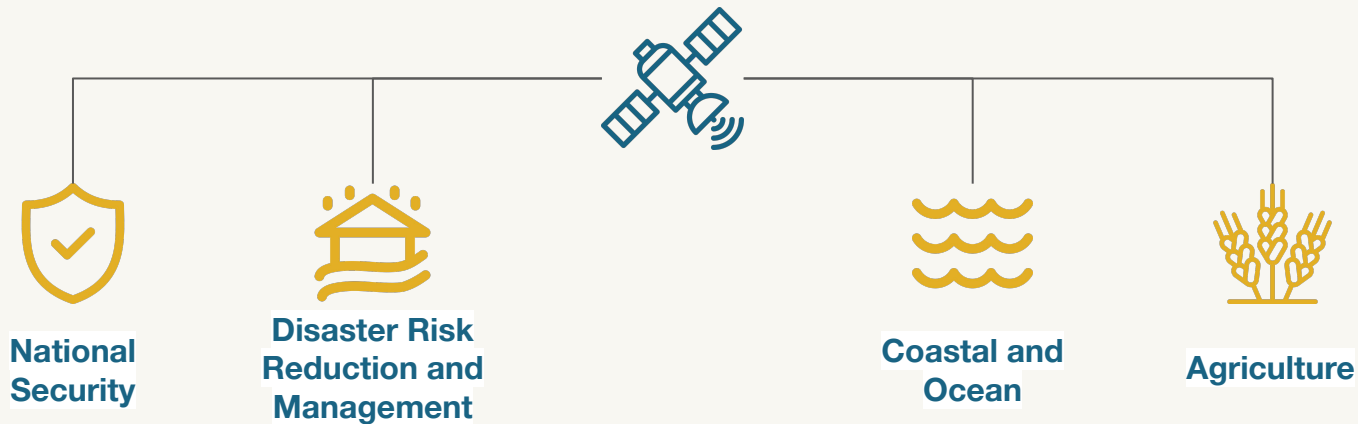


For Digital Inclusion,  
Economy, and Government



# Mobilizing Space Data for Digital Inclusion, Economy and Government

The PhilSA aims to further the development and application of remote sensing, artificial intelligence (AI), machine learning (ML), data science and other methodologies in producing space-enabled information to support the operations of various government agencies.



# Philippine DRR Overview

## Global

- Sendai Framework for Disaster Risk Reduction (SFDRR) 2015-2030
- Paris Agreement/COP26
- UN SDGs
- New Urban Agenda

## Regional

- Asia Regional Plan for Implementation of the SFDRR
- ASEAN Agreement on Disaster Management and Emergency Response (AADMER)
- APEC DRR Framework

## National

- Ambisyon Natin 2040
- Philippine Development Plan (2017-2022)
- National Climate Change Action Plan
- National Framework Strategy on Climate Change 2010-2022
- Among others

## DISASTER PREVENTION AND MITIGATION

Avoid hazards and mitigate their potential impacts by reducing vulnerabilities and exposure and enhancing capacities of communities

## DISASTER PREPAREDNESS

Establish and strengthen capacities of communities to anticipate, cope, and recover from the negative impacts of emergency occurrences and disasters

## DISASTER RESPONSE

Provide life preservation and meet the basic subsistence needs of affected population based on acceptable standards during or immediately after a disaster

## DISASTER REHABILITATION AND RECOVERY

Restore and improve facilities and living conditions and capacities of affected communities, and reduce risks in accordance with the "building back better" principle

# GOAL

For a safer, adaptive, and disaster resilient Filipino communities towards sustainable development

# FOUR THEMATIC AREAS

# The National Disaster Risk Reduction and Management Plan

Prevention and Mitigation	Preparedness	Response and Early Recovery	Rehabilitation and Recovery
<p><b>Key Result Area 1: Disaster Risk Reduction (DRR)</b></p> <p><b>Outcome 1:</b> Improved access, understanding and use of updated risk information and research</p> <p><b>Outcome 2:</b> Implemented risk-centered national, sub-national, and sectoral policies, plans, and budget</p> <p><b>Outcome 3:</b> Increased structural integrity of housing, building and critical infrastructure</p> <p><b>Outcome 4:</b> Institutionalized timely, responsive, context- and culture-specific early warning systems, reaching the last mile</p> <p><b>Outcome 5:</b> Communities have access to effective, responsive and inclusive social protection, risk financing, and insurance mechanisms</p> <p><b>Outcome 6:</b> Natural resources and ecosystem integrity are improved and sustained</p> <p><b>Outcome 7:</b> Disaster-resilient livelihoods and businesses</p> <p><b>Outcome 8:</b> Disaster-resilient human settlements</p>	<p><b>Outcome 9:</b> Enhanced risk awareness and risk-informed decisions and actions of governments and communities</p> <p><b>Outcome 10:</b> Increased institutional capacities of National and Local DRRM Councils and Offices</p> <p><b>Outcome 11:</b> Strengthened partnership and coordination among all key actors and stakeholders</p> <p><b>Outcome 12:</b> Implemented comprehensive and mutually-reinforcing national and local preparedness and response plans, policies, and systems</p>	<p><b>Key Result Area 2: Preparedness and Response</b></p> <p><b>Outcome 13:</b> Well-established disaster response operations with well-equipped workforce and volunteers</p> <p><b>Outcome 14:</b> Appropriate early actions are provided to communities</p> <p><b>Outcome 15:</b> Accurate, reliable and timely information management</p> <p><b>Outcome 16:</b> Affected communities are provided with gender-responsive, and conflict- and culturally-sensitive basic necessities and services</p> <p><b>Outcome 17:</b> Implemented an integrated system for early recovery</p>	<p><b>Key Result Area 3: Build Back Better</b></p> <p><b>Outcome 18:</b> Clear policy directions for rehabilitation and recovery</p> <p><b>Outcome 19:</b> Sustainable and socially-inclusive income sources for households are made available and stability of economic activities is restored</p> <p><b>Outcome 20:</b> Agricultural production is restored or increased and support services for farmers, fisher folks, and laborers are made accessible</p> <p><b>Outcome 21:</b> Affected families and individuals have access to: (a) affordable disaster-resilient housing that are located in safe zones where social services and public facilities are available; or (b) financing assistance to rebuild their houses in areas that are declared as safe zones.</p> <p><b>Outcome 22:</b> Affected individuals, families, and communities have access to responsive, appropriate and adequate education, health, and social protection services</p> <p><b>Outcome 23:</b> Disaster resilient standards in infrastructure are observed during rehabilitation and recovery</p>





# Disaster, Hazard, and Risk Mapping (DHARMA)



# Objectives

1. On-demand geospatial support before, during, and after disaster events using space data.
2. Develop rapid assessment workflows for disaster events.
3. Support recovery efforts of the government



# Where does **DHARMA** fit?



DISASTER  
PREVENTION AND  
MITIGATION

DOST

PHIVOLC's GeoriskPh  
PAGASA

DISASTER  
PREPAREDNESS

DILG

Oplan Listo - Disaster  
Preparedness Manual for City  
and Municipal LGUs

DISASTER  
RESPONSE

DSWD

NDRP (Hydromet, EQ and  
Tsunami, Terrorism-related  
Incidents)

DISASTER  
REHABILITATION  
AND RECOVERY

NEDA

Disaster Rehabilitation and  
Recovery Planning Guide

# BY THE NUMBERS

**12/** 23 outcomes

**19/** 50 outputs

**38/** 206 activities

Thematic Area	Outcome	Output	Activities	DHARMA activities
Prevention and Mitigation	7	3	17	-Risk/exposure Mapping (Flood, Landslide, Built-up, Infra/building/houses, roads/bridges) -satellite data provision
Preparedness	1	2	5	-Damage Forecast -Mapping (critical infra)
Response and Early Recovery	3	5	9	-Rapid Damage Estimation (infra, houses, agriculture) -Rapid Mapping (Flood, Landslide, Built-up, Infra/building/houses, roads/bridges) -Crop damage forecast
Rehabilitation and Recovery	2	4	7	-KHTT -damage assessment change detection -satellite data provision





# How Do We Do it?

The Case of Super Typhoon KardingPH



Date	Time	Location	Description	Lat	Long	News Link	screenshot	Damage Type	COMMENTS
25/09/2022	2:00PM	Pulho Islands	Extreme winds and heavy rains in Pulho Islands (Digital No.5)	14.756595	121.942134	<a href="https://twitter.com/Carlos_Mfoss06/status/1473799331180151428">https://twitter.com/Carlos_Mfoss06/status/1473799331180151428</a> <a href="https://twitter.com/Bea0604/Woah/status/14737993207781177345">https://twitter.com/Bea0604/Woah/status/14737993207781177345</a> <a href="https://twitter.com/Bea0604/Woah/status/147379932499027448">https://twitter.com/Bea0604/Woah/status/147379932499027448</a> <a href="https://twitter.com/newspostarides/status/1473799361877326261">https://twitter.com/newspostarides/status/1473799361877326261</a> <a href="https://twitter.com/newspostarides/status/147379933660433668">https://twitter.com/newspostarides/status/147379933660433668</a>	Possible Infra Damage and Flooding	Location not exact	
25/09/2022	2:00PM	Palayay City	Flooding	15.530302	121.099745	<a href="https://twitter.com/LadyVikiM66/Media/15729242928358092">https://twitter.com/LadyVikiM66/Media/15729242928358092</a> <a href="https://www.facebook.com/watch/?v=133205939303938&amp;set=share">https://www.facebook.com/watch/?v=133205939303938&amp;set=share</a>	Flooding	Unverified, No Photos/Videos, Hearsay, Location not exact	
25/09/2022	6:30PM	Infanta Quezon	Torrential rainfall	14.7222517	121.6576194	<a href="https://twitter.com/Mercilooper057/status/1473798805771454849">https://twitter.com/Mercilooper057/status/1473798805771454849</a> Facebook Image	Possible Infra Damage and Flooding	General Location in Infanta, video not geolocated	
25/09/2022	4:36PM	Panukulan, Pulho Islands	Extreme winds and heavy rains in Pulho Islands (Digital No.5)	14.9756020	121.9104317	<a href="https://www.youtube.com/watch?v=0c1b60120">https://www.youtube.com/watch?v=0c1b60120</a> <a href="https://twitter.com/Revynatamem/status/1473798005109148672">https://twitter.com/Revynatamem/status/1473798005109148672</a>	Possible Crop and Infra damage		
25/09/2022		National Highway to Kabanikalan, Negros Occidental	Flooding	9.5896683	122.8395996	Facebook Post to 18 users: Timberella, Luper	Flooding, crop damage, fallen trees		
25/09/2022		Palmarungan Island	Torrential rainfall	14.7959009	122.1808023	<a href="https://twitter.com/ABC8ENBNews/status/1473963338532173118">https://twitter.com/ABC8ENBNews/status/1473963338532173118</a>	Possible Infra Damage and Flooding	General Location, video not geolocated	
25/09/2022		Iriga, Bangilay, Panukulan, Quezon	Extreme winds and heavy rains in Pulho Islands (Digital No.5)	14.9929311	121.8829517	<a href="https://www.facebook.com/Mark.Baer">Bryan Mo. Inatral Mo Facebook Post</a>	Possible Crop and Infra damage	Possibly taken from school which was used as an evacuation site	
25/09/2022		Pulho Islands	Extreme winds and heavy rains in Pulho Islands (Digital No.5)	14.756595	121.942134	Facebook post by Remil Mark Baer	Crop Damage	Location not exact	
25/09/2022		Vila Camero, Hapawan Cawayan, Negros Occidental	Flooding	9.90787192	122.4594352	Facebook post by Kya blog	Flooding, Possible crop damage		
25/09/2022	5:50PM	Jomalig, Quezon	Fallen trees	14.6973449	122.3301512	Facebook post by Provincial Government of Quezon <a href="https://twitter.com/chelekelem/status/1473798005109148680">https://twitter.com/chelekelem/status/1473798005109148680</a> <a href="https://www.facebook.com/chelekelem/status/1473798005109148680">https://www.facebook.com/chelekelem/status/1473798005109148680</a> <a href="https://www.facebook.com/chelekelem/status/1473798005109148680">https://www.facebook.com/chelekelem/status/1473798005109148680</a>	Fallen trees		
25/09/2022			Extreme winds and			Facebook <a href="https://twitter.com/raziel0dotcom/status/1473798005109148680">https://twitter.com/raziel0dotcom/status/1473798005109148680</a> <a href="https://twitter.com/theadward07/status/1473798005109148680">https://twitter.com/theadward07/status/1473798005109148680</a>	Possible Infra Damage, Flooding	Location not exact	

## Gathered reported damage from reports from social media platforms (i.e., Facebook, Twitter, Youtube, and Instagram)

Took these photos along the National Highway going to Kabanikalan para dul-ong si Dec. Karding is now being classified as Super Typhoon and monsoon rains continue to elevate water levels in the south, Praying for the safety of those who are affected.

To all those traveling to far south, stay safe gid!  
#KardingPH #AmbotSaKardingNgalMayBangs



Shared to the disaster actors and volunteers, an excel file was distributed to consolidate social media reports, integrating validation links, description of the damage and/or incident, as well as map data (latitude, longitude) which was then integrated and compiled for map visualization.

**BAGYONG KARDING**

Like Comment Share

867.1K Views

1:04 PM · Sep 25, 2022 · Twitter for Android

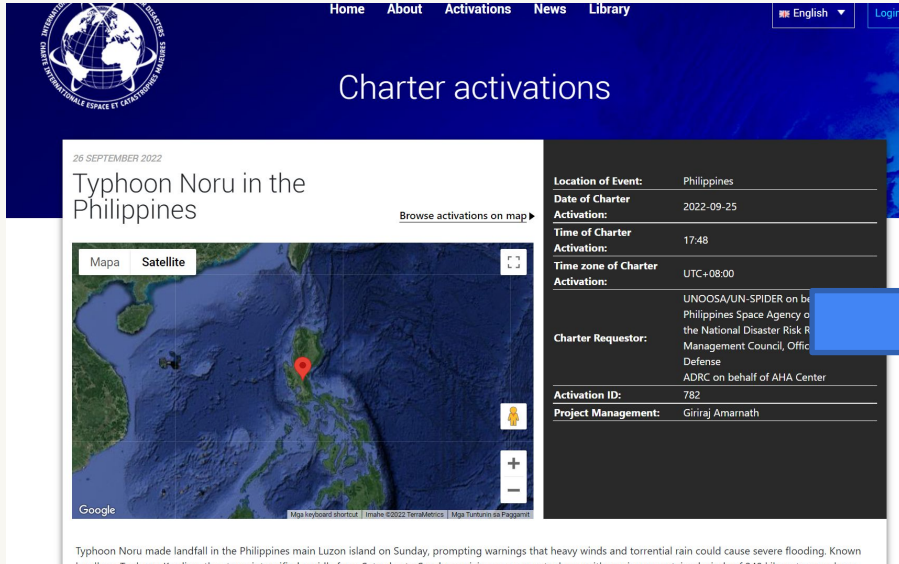
448 Retweets 222 Quote Tweets 1,037 Likes

874 42 Comments 315 Shares



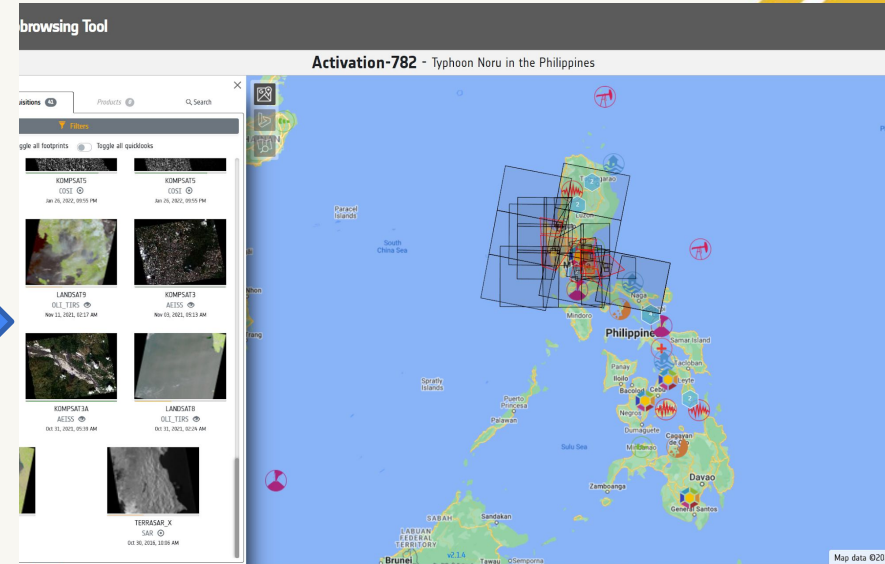


# AOIs were submitted to the Disaster Charter for activation



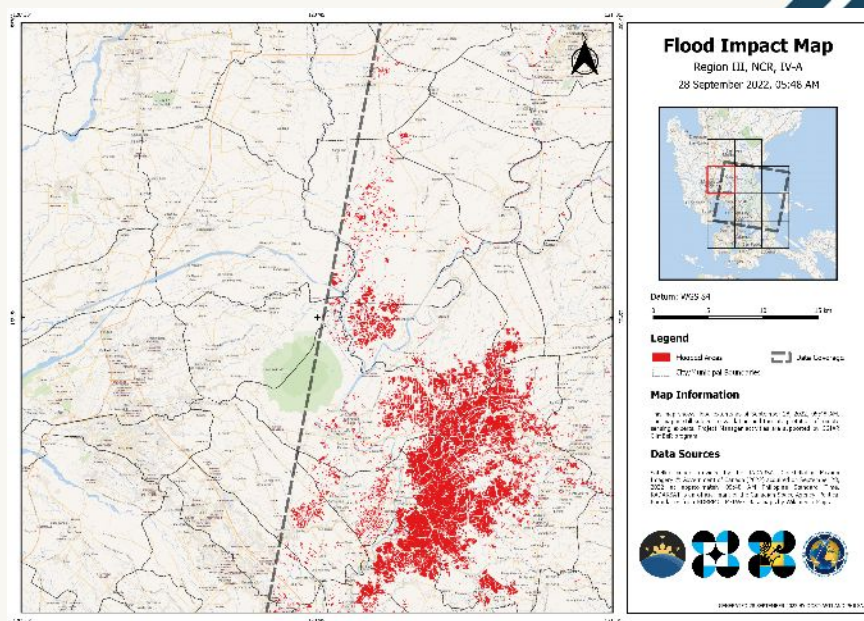
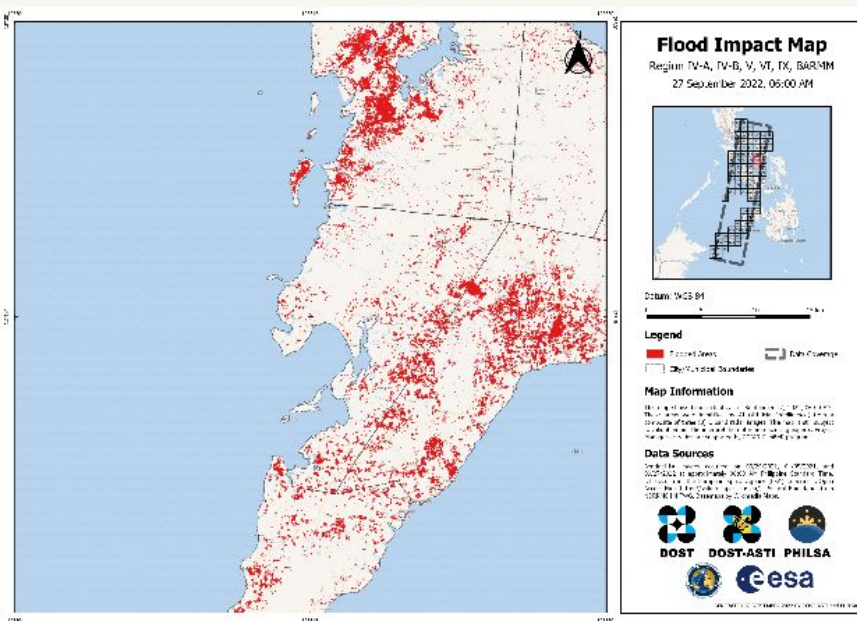
The screenshot shows the PhilSA website's "Charter activations" page. The header includes navigation links for Home, About, Activations, News, and Library, along with a language selector set to English and a Login button. The main heading is "Charter activations". Below this, a card for "Typhoon Noru in the Philippines" dated 26 SEPTEMBER 2022 is displayed. It features a satellite map of the Philippines with a red location pin and a "Browse activations on map" link. To the right of the map is a detailed metadata table for the activation.

<b>Location of Event:</b>	Philippines
<b>Date of Charter Activation:</b>	2022-09-25
<b>Time of Charter Activation:</b>	17:48
<b>Time zone of Charter Activation:</b>	UTC+08:00
<b>Charter Requestor:</b>	UNOOSA/JUN-SPIDER on behalf of Philippines Space Agency of the National Disaster Risk Management Council, Office of Defense
<b>Activation ID:</b>	782
<b>Project Management:</b>	Giriraj Amarnath



The screenshot shows a "browsing Tool" interface for "Activation-782 - Typhoon Noru in the Philippines". It features a map of the Philippines with several overlapping rectangular Area of Interest (AOI) boxes. A sidebar on the left lists various satellite imagery products, each with a thumbnail and metadata:

- KOMPASAT 0355 (Nov 03, 2022, 03:55 PM)
- KOMPASAT 0355 (Nov 03, 2022, 03:55 PM)
- LANDSAT 9 OLI\_TIRS (Nov 02, 2022, 02:17 AM)
- KOMPASAT 0355 (Nov 03, 2022, 03:55 PM)
- KOMPASAT 0355 (Nov 03, 2022, 03:55 PM)
- LANDSAT 9 OLI\_TIRS (Nov 02, 2022, 02:17 AM)
- KOMPASAT 0355 (Nov 03, 2022, 03:55 PM)
- LANDSAT 9 OLI\_TIRS (Nov 02, 2022, 02:17 AM)
- TERRASAR-X (Nov 02, 2022, 10:09 AM)



The value-added products are distributed to mandated agencies and other stakeholders **for free**, through email and social media.

#KardingPh FLOOD IMPACT MAPS Inbox x

**P** **drmm@phlsa.gov.ph** to Ryan, occd, occdamonilla, occ.operationsservice, ndrirmoc, ncr, civildefensencr, region3, occregion3, region4a, jbpatalinjuglii, ncr, records, dost4a, mjpablay, official, dost-ro5rd, do... 11:38 AM (16 minutes ago) ☆ ↶ ⋮

Good day, everyone!

The [Philippine Space Agency](#) and [DOST-ASTI](#)'s DRR Teams have generated flood impact maps from the recent onslaught of #KardingPh. The maps show potentially flooded areas extracted from [RadarSat](#) and [Sentinel](#) satellites captured on 27 and 28 September 2022, respectively.

Please be advised that the thematic accuracy of the flood maps might be lower in urban and forested areas due to inherent limitations of the SAR analysis technique, hence, this is still subject to the validation and interpretation of remote sensing experts.

You can download the maps and shape files on these folders:

- Sentinel: <https://bit.ly/3E2m3k8>
- RadarSat: <https://bit.ly/3RogO1n>

Please use and disseminate these maps and data as you see fit. If you have any questions, please do not hesitate to respond to this email, cc: [datos@asti.dost.gov.ph](mailto:datos@asti.dost.gov.ph).

You may also visit the Facebook pages of [DATOS](#) and [PhilSA](#) for near real time updates of our weather monitoring efforts.

Thank you very much!



PhilSA

# Activities



# Charter Activation

Date	International Event Name	Local Event Name
31 October 2022	Nalgae	Paeng
26 September 2022	Noru	Karding
23 August 2022	Ma-On	Florita
13 April 2022	Megi	Agaton
16 December 2021	Rai	Odette





# Landslide Mapping



**Landslide-Affected Areas**  
Brgy. Kantagnon, Baybay, Leyte  
15 April 2022

Date: 1925 84

Scale: 0 100 200 300 400 500 m

**Legend**

- Buildings/Houses
- Landslide Extent

**Map Information**

This map was generated using satellite imagery and processed on April 15, 2022. The map is not intended to be used for navigation or the responsibility of any government agency.

**Data Sources**

This map was generated using satellite imagery from Sentinel-2. It is provided by PhilSA as a public service.

DOST DOST-ASTI PHILSA  
COARE SAGS

PREPARED ON APRIL 15, 2022



**Landslide-Affected Areas**  
Brgy. Pibar, Abuyog, Leyte  
16 April 2022

Date: 1925 84

Scale: 0 100 200 300 400 500 m

**Legend**

- Buildings/Houses
- Landslide Extent
- City/Township Boundaries

**Map Information**

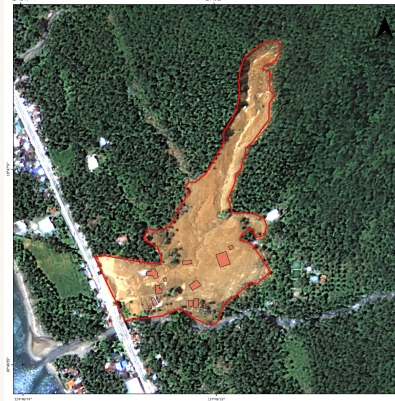
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**Data Sources**

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DOST DOST-ASTI PHILSA  
COARE SAGS

PREPARED ON APRIL 16, 2022



**Landslide-Affected Areas**  
Brgy. Bunga, Baybay, Leyte  
15 April 2022

Date: 1925 84

Scale: 0 100 200 300 400 500 m

**Legend**

- Buildings/Houses
- Landslide Extent

**Map Information**

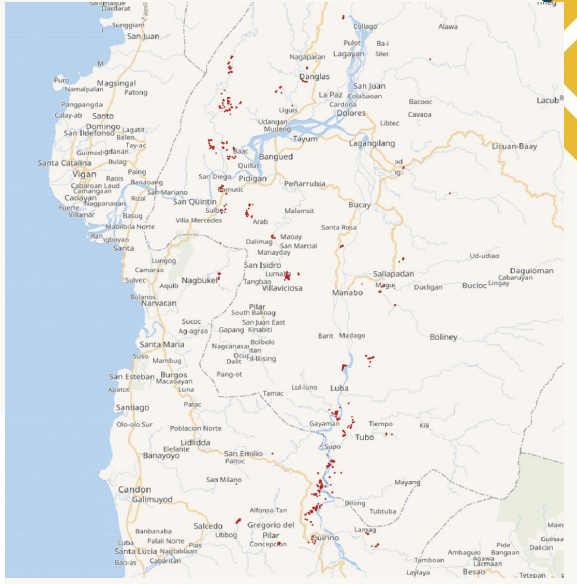
This map was generated using satellite imagery and processed on April 15, 2022. The map is not intended to be used for navigation or the responsibility of any government agency.

**Data Sources**

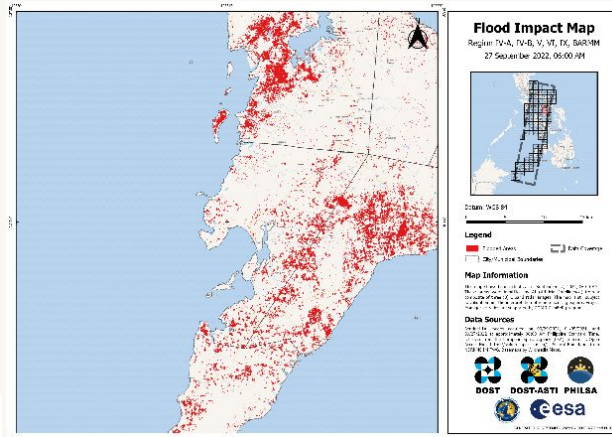
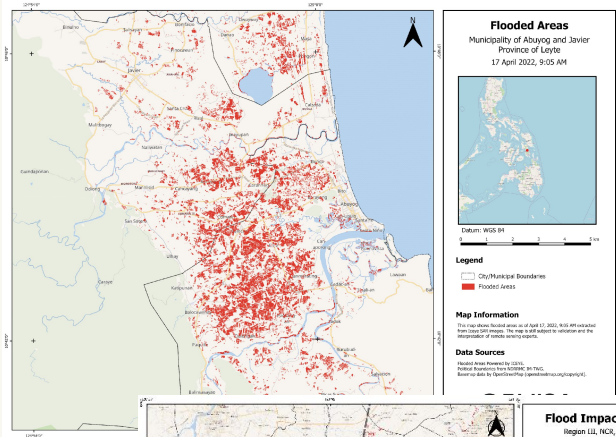
This map was generated using satellite imagery from Sentinel-2. It is provided by PhilSA as a public service.

DOST DOST-ASTI PHILSA  
COARE SAGS

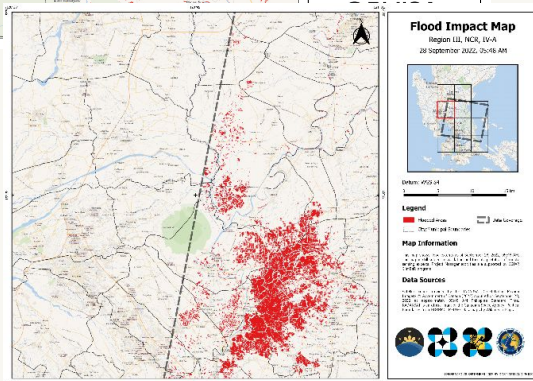
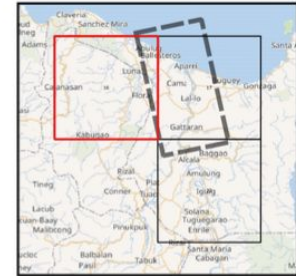
PREPARED ON APRIL 15, 2022



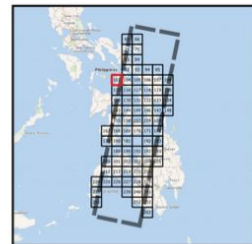
# Flood Mapping



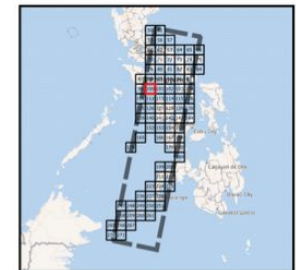
**Flood Impact Map**  
Province of Cagayan  
01 November 2022, 01:49 AM



**Flood Impact Map**  
Region V, VII, VIII, IX, X, XII, BARMM  
28 October 2022, 06:00 AM



**Flood Impact Map**  
Region IV-A, IV-B, V, VI, IX, BARRM  
02 November 2022, 06:00 AM





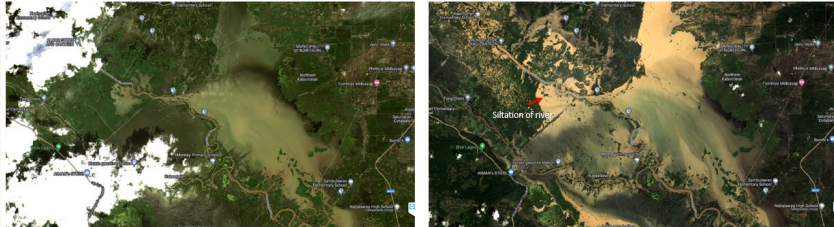
# Change Detection

## Rio Grande de Mindanao – Southwest Cotabato City Area AOI3



14 October 2022

30 October 2022



Siltation and flooding on agricultural and built-up areas as seen on Landsat 9 imagery.

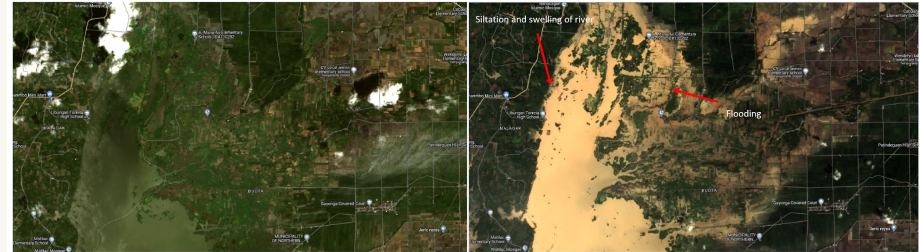


## Malagak – Northern Kabuntalan Maguindanao | AOI 5



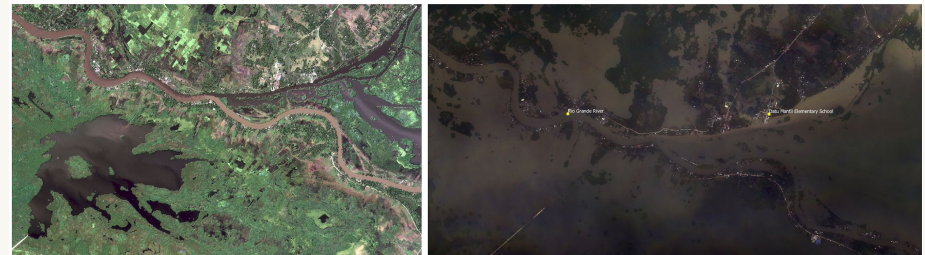
14 October 2022

30 October 2022



## PEDRO Center Satellite Image Subscription

Pigcawayan, North Cotabato via KompSAT-3



09 November 2018

02 November 2022





# UN SPIDER Technical Advisory Mission to the Philippines

September 26-30, 2022

## UN disaster experts emphasize importance of space in DRRM during Ph Technical Advisory Mission

Posted by: Philippine Space Agency

26 October 2022



UN-SPIDER experts, PhilSA officials and personnel, and the participants of the UN-SPIDER TAM Workshop (29 September 2022, Novotel Manila Araneta City)



UN-SPIDER meets with PhilSA and NDRRMC representatives (27 September 2022, Eastwood Richmond Hotel)



UN-SPIDER delegates receive tokens of appreciation from the Philippine Space Agency. L-R: PhilSA Deputy Director General Dr. Gay Jane P. Perez, Dr. Rul Kotani, Dr. Giriraj Amarnath, Dr. Komali Kantamaneni, Victoria Leat, Dr. James Carl Hagen, PhilSA Director General Dr. Joel Joseph S. Marciano, Jr., Dr. Shirish Ravan, Dr. Arjit Roy, Dr. Manzul Hazarika, Abhineet Jain (29 September 2022, Novotel Manila Araneta City)



# Contact the Philippine Space Agency



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<https://twitter.com/philspaceagency>



<https://www.instagram.com/philspaceagency/>



<https://www.linkedin.com/company/philspaceagency/>



<https://philsa.gov.ph/>



[info@philsa.gov.ph](mailto:info@philsa.gov.ph)

