



Philippine Space Agency

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

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Supervising Science Research Specialist

Space Data Mobilization and Applications Division (SDMAD)

Space Information Infrastructure Bureau (SIIB)

The Philippine Space Agency

Building an integrated and sustainable national space program



08 August 2019

Signed by the President

03 September 2019

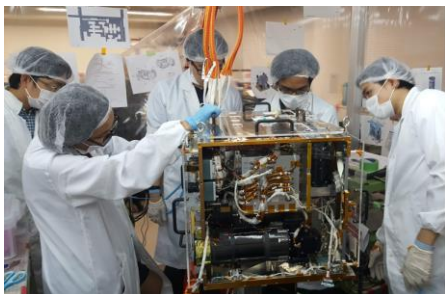
Effectivity of Philippine Space Act
R.A. 11363



Flagship Projects

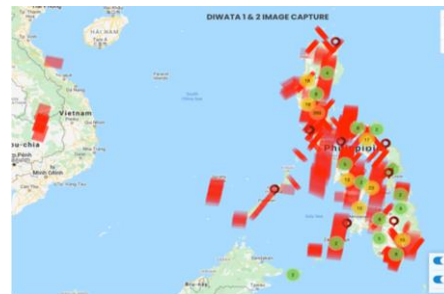
Space Science & Technology Applications (SSTA) Program

Build, Build, Build in Space (B3iS)



Philippine Satellites as
Vital Component of National
Information Infrastructure

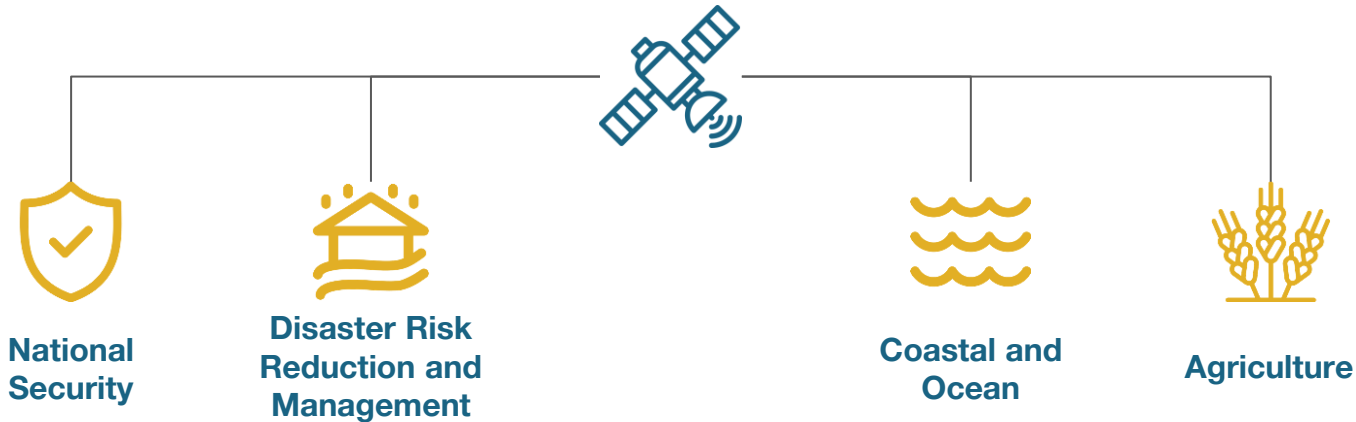
Mobilizing Space Data



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.



Common Satellite Data Sources in the Philippines

The infographic is divided into four main sections, each with a title and a brief description:

- Sovereign:** Satellites owned, operated, and tasked by the Philippines. It features two satellites: Diwata-2 and NovaSAR*.
- Commercial:** Satellites with paid subscription. This section is enclosed in a dashed white border and contains nine satellites: Komsat-5, GeoEye-1, Iceye**, Komsat-3, 3A, TerraSAR-X, Dove & Skysat**, Worldview-2,3,4, Pleiades Neo**, and SPOT-6, 7.
- Open:** Satellite images that are free to use and download. It features seven satellites: Terra and Aqua, Landsat-8, 9, Suomi-NPP, Sentinel-1A, 1B, Sentinel-3, and Sentinel-5P.
- Disaster Charter-Activated:** Satellite images shared through the International Charter: Space and Major Disasters for rapid response to major disasters. It features four satellites: RCM-2**, SAOCOM-1A, Goafen-2, and Kanopus-V.

Different satellite data and products are **being mobilized and shared to different stakeholders** for several environmental applications, i.e. utilization of images for disaster response and risk assessment

Enabling Timely Disaster Response

Rapid disaster response in Naga, Cebu
landslide (21 September 2018)

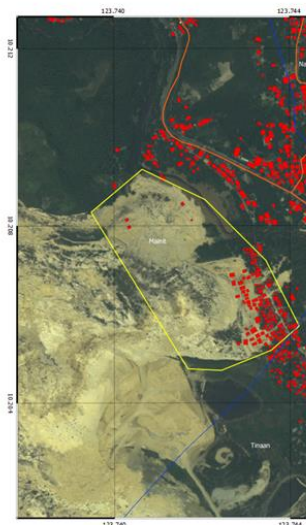
The images show the areas before and after the landslide event in Naga, Cebu. The map layout was immediately sent a team on the ground. The ability to generate this [map] information in a timely manner was crucial.

It enabled rescuers to prioritize areas for search and rescue.

NAGA CEBU LANDSLIDE - SEPT 21, 2018
NAGA, CEBU

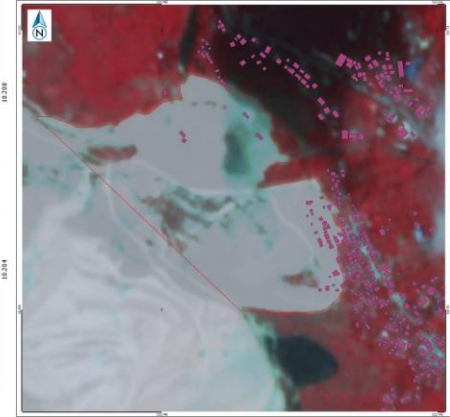


ESRI BASEMAP
PRE-LANDSLIDE



KOMPSAT 3 - SEPT 21, 2018
POST-LANDSLIDE

Satellite: KOMPSAT-3
Accessed via: DOST-ASTI PEDRO
Center
Capture date: September 21, 2018
Payload: Optical
Resolution: 0.5 m
Basemap: ESRI (Pre-landslide)

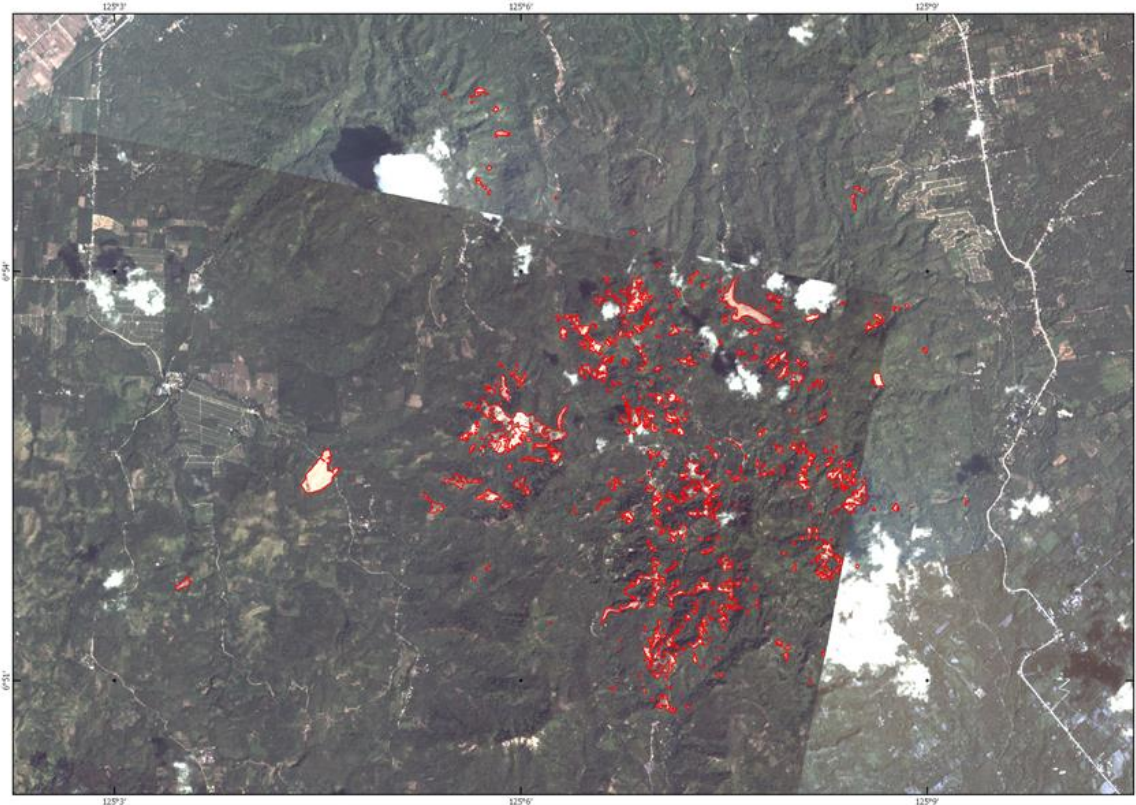


Assessing Earthquake Damage

Rapid detection and mapping of earthquake-induced landslides in Makilala, Cotabato

The image shows the areas potentially affected by earthquake-induced landslides in Makilala, Cotabato. Artificial Intelligence (AI) models were used to predict the bare soil and vegetation cover from PlanetScope satellite images.

Areas with changes from vegetation to bare soil are interpreted as the potential landslide areas. **The hazard event was triggered by multiple quakes that hit large parts of Mindanao in 29-31 October 2019.**



This image was shared with Philippine Institute of Volcanology and Seismology (PHIVOLCS) and the Cotabato LGU.

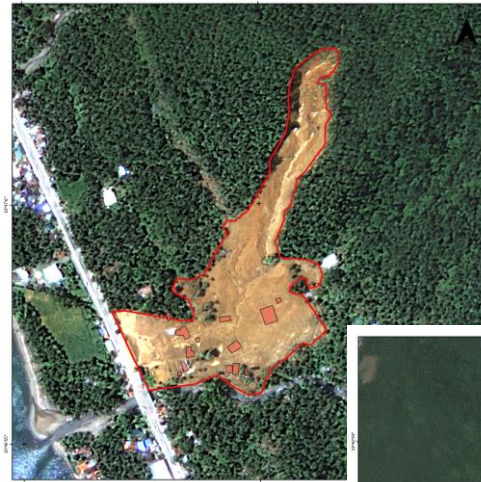
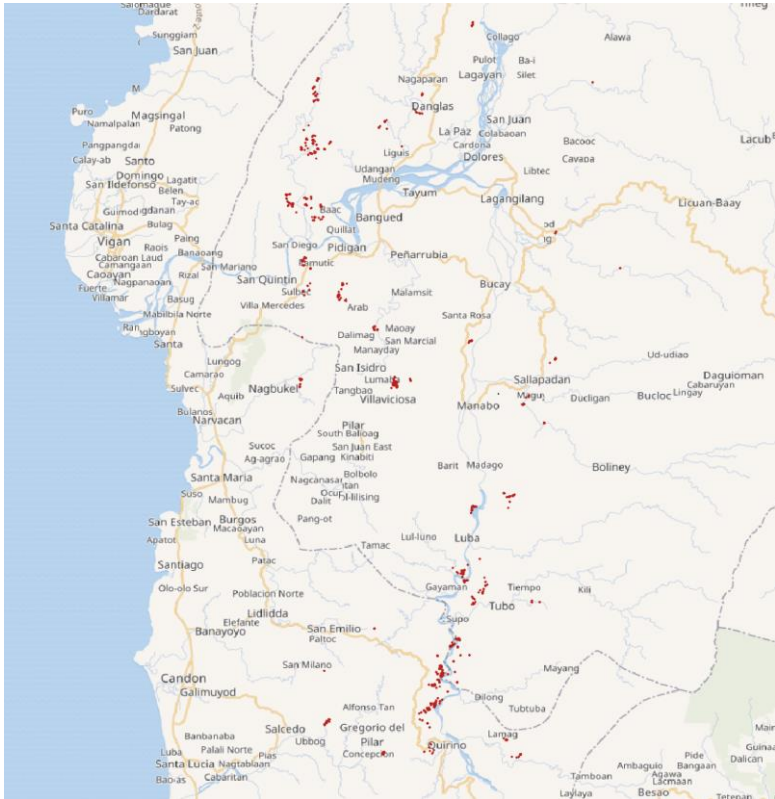
Satellite: PlanetScope
Accessed via: DOST-ASTIPEDRO
Center
Capture date: November 8, 2019
Resolution: 3m



Landslide areas



Assessing Landslide Damage



Assessing Landslide Damage Itogon Benguet

Dataset:

Planet (Dove Constellation)

Processing Time

~ 2 minutes

Released to:

- Office of Civil Defense
- DOST Regional Offices
- Social Media
- Others



*Natural Color of Planet Image (RGB:
321)
As of June 4, 2018*

Assessing Landslide Damage Itogon Benguet

Dataset:

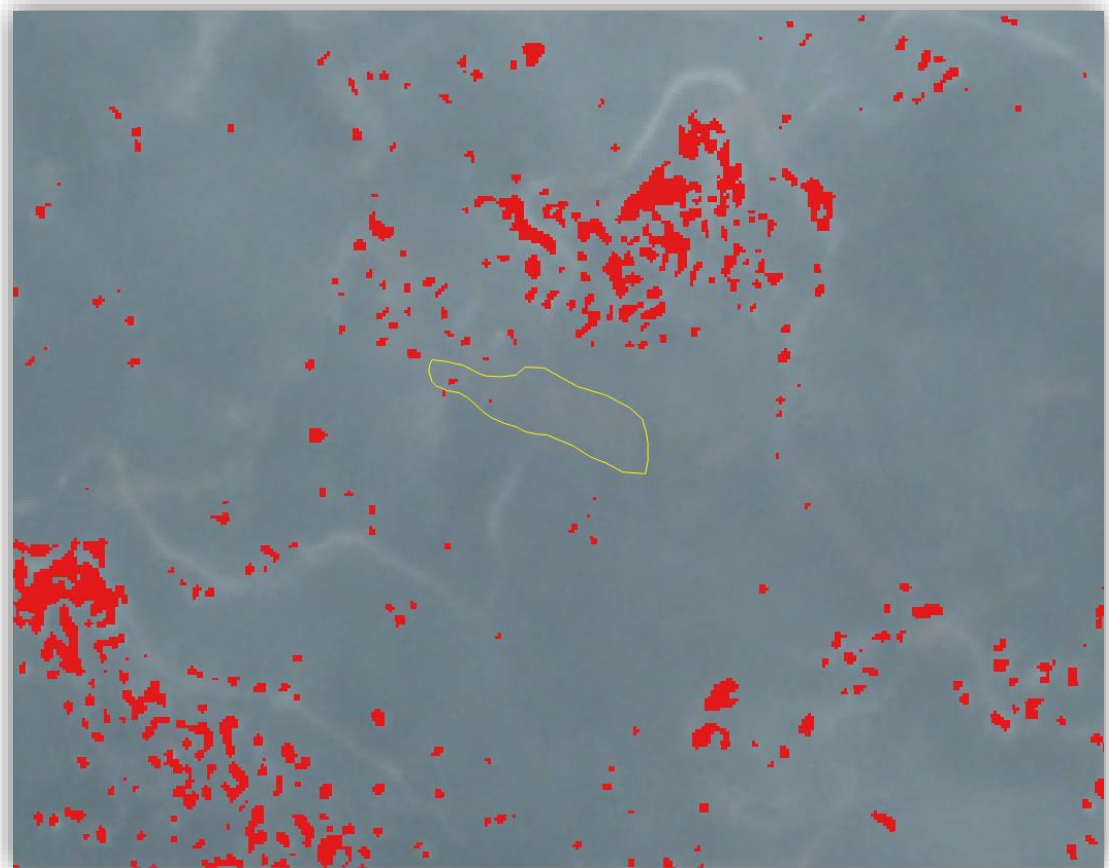
Planet (Dove Constellation)

Processing Time

~ 2 minutes

Released to:

- Office of Civil Defense
- DOST Regional Offices
- Social Media
- Others



*Natural Color of Planet Image (RGB: 321)
Red areas are Artificial Intelligence (AI)-predicted built-up areas.
Red areas are inside the landslide areas
September 18, 2018*



Detecting Damages

Tagging Typhoon-damaged Buildings using Disaster Charter Imagery

Damage tagging using satellite imagery is important in assessing the damages caused by disasters. In this example, damaged buildings caused by Super Typhoon Rai (Odette) in Carcar City, Cebu were tagged through. This shows the expanse and devastation the Super Typhoon left in its wake.

The red dots shows buildings with evident damages as seen from the optical image, as orange dots represents buildings with uncertain damages which needs to be confirmed on the ground.

1

Optical Image

Satellite: Pleiades-1

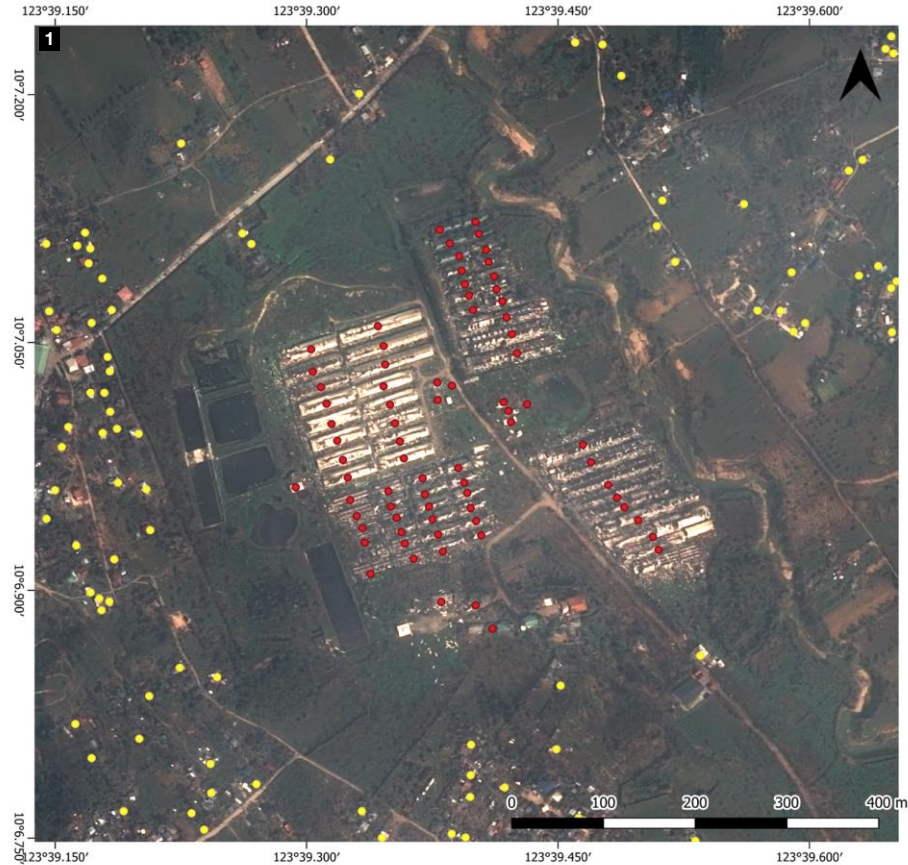
Accessed via: Disaster Charter

Capture date: 22 December 2021

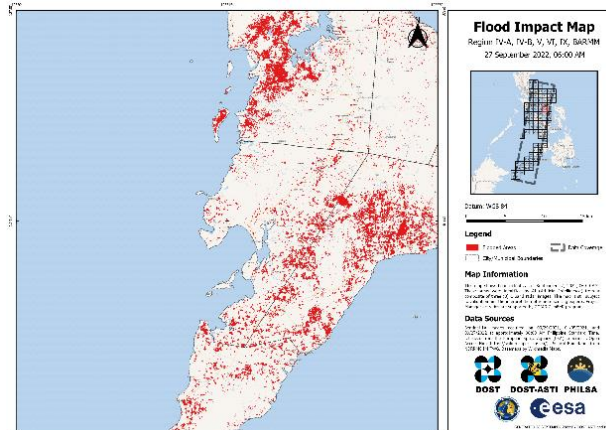
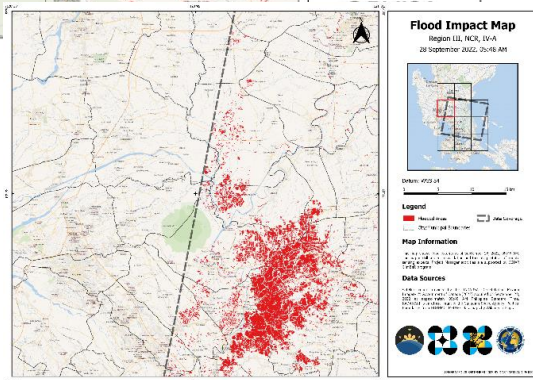
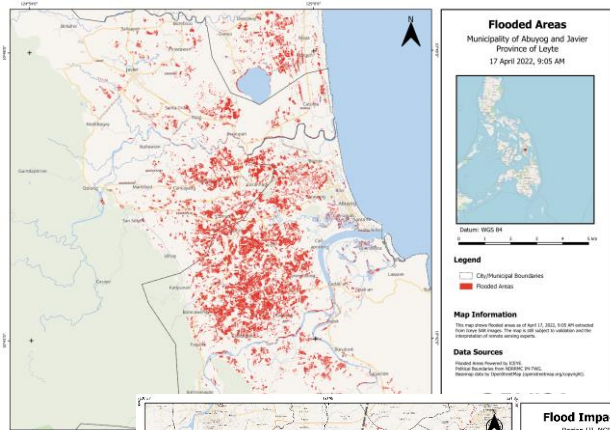
Resolution: 0.5m

Legend:

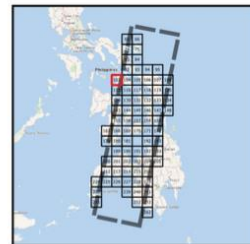
- Damaged Buildings
- Potentially Damaged Buildings



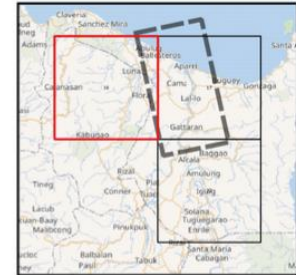
Assessing Flood Impacts



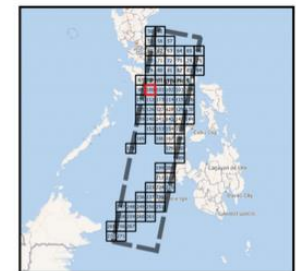
Flood Impact Map
Region V, VII, VIII, IX, X, XII, BARMM
28 October 2022, 06:00 AM



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



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



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

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

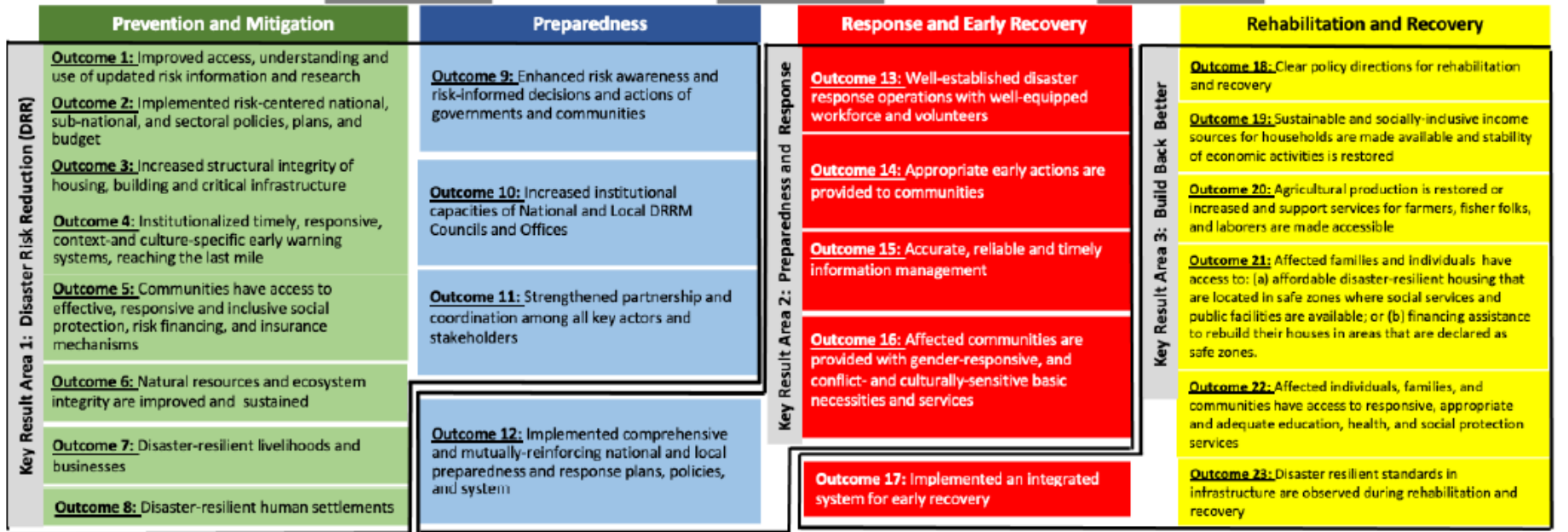
GOAL

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

FOUR THEMATIC AREAS



The National Disaster Risk Reduction and Management Plan



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



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	Pulillo Islands	Extreme winds and heavy rains in Pulillo Islands (Signal No. 5)	14.75695	121.942134	https://twitter.com/Cafico_Afonso/status/1372290118911452488 https://twitter.com/RecoRoOfficial/status/13722952027781127484 https://twitter.com/BeaRicoOfficial/status/1372292924299697488 https://twitter.com/SebastianRico/status/13722916648772324614 https://twitter.com/SebastianRico/status/13722916648772324614	Possible Infra Damage and Flooding	Location not exact	
25/09/2022	2:00PM	Palayan City	Flooding	15.530102	121.099745	https://twitter.com/b9v59M/status/137229144293949034 https://www.facebook.com/watib/70-233429253423248-1-10-10-10 https://twitter.com/Mex11.com/M11/status/13722988307723182819	Flooding	Unverified, No Photo/Video, Hearsay, Location not exact	
25/09/2022	6:30PM	Infanta Quezon	Torrential rainfall	14.7222517	121.6579294	https://twitter.com/Mex11.com/M11/status/13722988307723182819	Possible Infra Damage and Flooding	General Location in Infanta, video not geotagged	
25/09/2022	4:30PM	Panukulan, Pulillo Islands	Extreme winds and heavy rains in Pulillo Islands (Signal No. 5)	14.9756019	121.9104017	Facebook post: https://www.youtube.com/shorts/WerQb https://twitter.com/BayanLupin/status/13722988307723182819	Possible Crop and Infra damage		
25/09/2022		National Highway to Kabanakalan, Negros Occidental	Flooding	9.9589483	122.8391996	Facebook post: https://www.facebook.com/13722988307723182819	Flooding, crop damage, fallen trees		
25/09/2022		Patnanungan Island	Torrential rainfall	14.7095909	122.1838021	https://twitter.com/MSB0M/status/1372296138872123138	Possible Infra Damage and Flooding	General Location, video not geotagged	
25/09/2022		Ripa, Bonghin, Panukulan, Quezon	Extreme winds and heavy rains in Pulillo Islands (Signal No. 5)	14.9829111	121.8829517	Bayan_Ms_Internet_Ms Facebook Post	Possible Crop and Infra damage	Possibly taken from school which was used as an evacuation site	
25/09/2022		Pulillo Islands	Extreme winds and heavy rains in Pulillo Islands (Signal No. 5)	14.75695	121.942134	Facebook post by Beniel Mark Rose	Crop Damage	Location not exact	
25/09/2022		Silo Canyon, Irayawan canyon, Negros Occidental	Flooding	9.90187182	122.4594552	Facebook post by Ksa Blue	Flooding, Possible crop damage		
25/09/2022	5:50PM	Jamalig, Quezon	Fallen trees	14.6873449	122.3301512	Facebook post by Provincial Government of Quezon https://twitter.com/QuezonProvince/status/13722988307723182819 https://www.facebook.com/345842442922682066-101519435422224872	Fallen trees		
25/09/2022			Extreme winds and heavy rains in Pulillo Islands (Signal No. 5)			Facebook post by https://twitter.com/operadotcom/status/13719022575416366098 https://twitter.com/Chickof/status/13719022575416366098	Possible Infra Damage, Flooding	Location not exact	

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

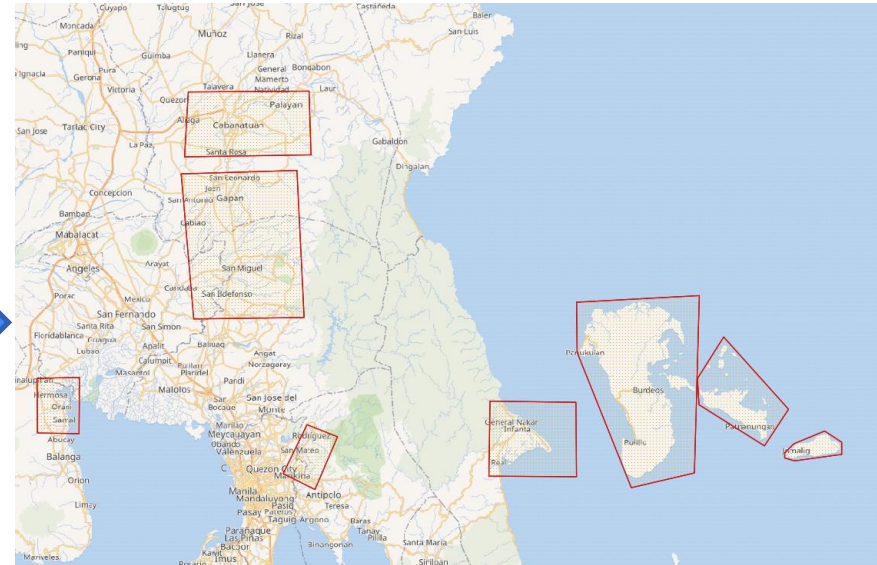
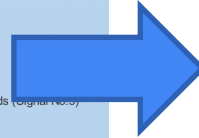
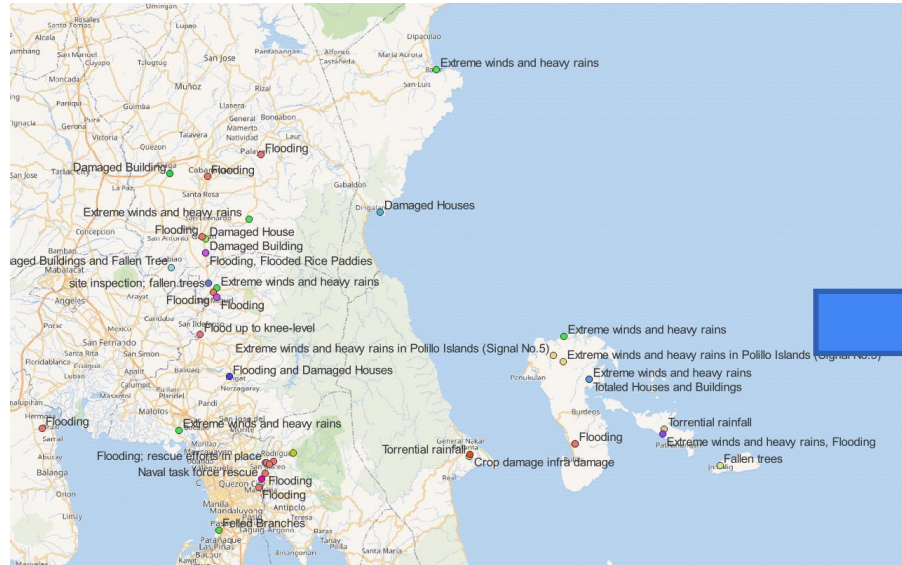
Took these photos along the National Highway going to Kabanakalan para dul-onig si Doc. Karding is now being classified as Super Typhoon and monsoon rains continue to elevate water levels in the south. Praying for the safety of those who are affected.
To all those traveling to far south, stay safe gid!
#KardingPH #AmbotSaKardingNgaMayBans

BAGYONG KARDING
867.1K views
0:04 / 0:29
448 Retweets 222 Quote Tweets 1,037 Likes
42 Comments 315 Shares

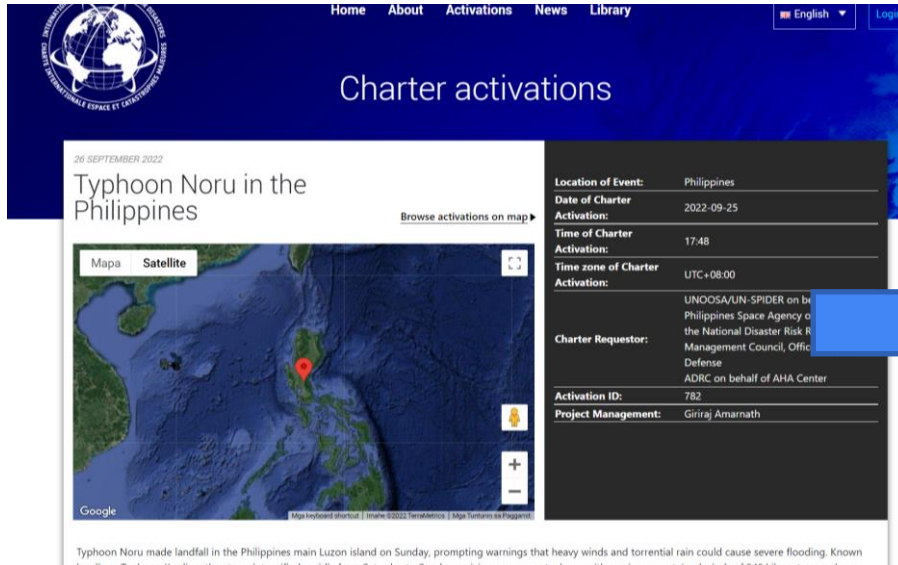
Shared to the disaster actors and volunteers, an excel file was distributed to consolidate social media reports, integrating validation links, description of the damage and/or incident, as well as map data (latitude, longitude) which was then integrated and compiled for map visualization.



The reports are plotted and used to create AOIs



AOIs are submitted to the International Charter Space and Major Disasters for Disaster Charter activation



Home About Activations News Library English Login

Charter activations

26 SEPTEMBER 2022

Typhoon Noru in the Philippines

[Browse activations on map](#)

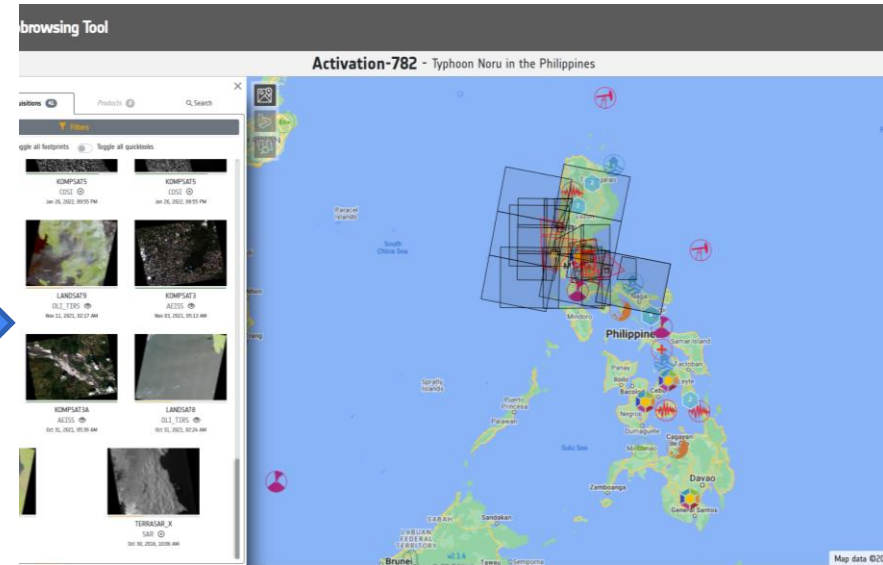
Mapa Satellite

Google

Map keyboard shortcuts | © Inmap 2022 TerraMetrics | Mapa Tuntunan BRPaggapani

Typhoon Noru made landfall in the Philippines main Luzon island on Sunday, prompting warnings that heavy winds and torrential rain could cause severe flooding. Known

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



browsing Tool

Activation-782 - Typhoon Noru in the Philippines

Home Search

Toggle all footprints Toggle all quicklinks

KOMPASAT 0201 01 Nov 20, 2022, 00:00 AM

KOMPASAT 0202 01 Nov 20, 2022, 00:15 AM

LANDSAT 011_TIRS 01 Nov 20, 2022, 02:27 AM

KOMPASAT 0203 01 Nov 20, 2022, 00:30 AM

KOMPASAT 0204 01 Nov 20, 2022, 00:45 AM

KOMPASAT 0205 01 Nov 20, 2022, 01:00 AM

KOMPASAT 0206 01 Nov 20, 2022, 01:15 AM

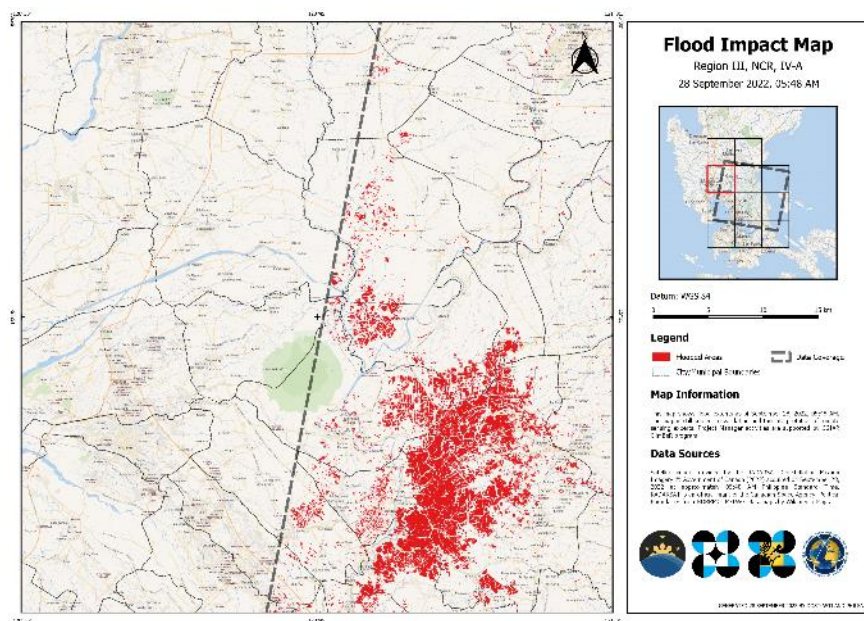
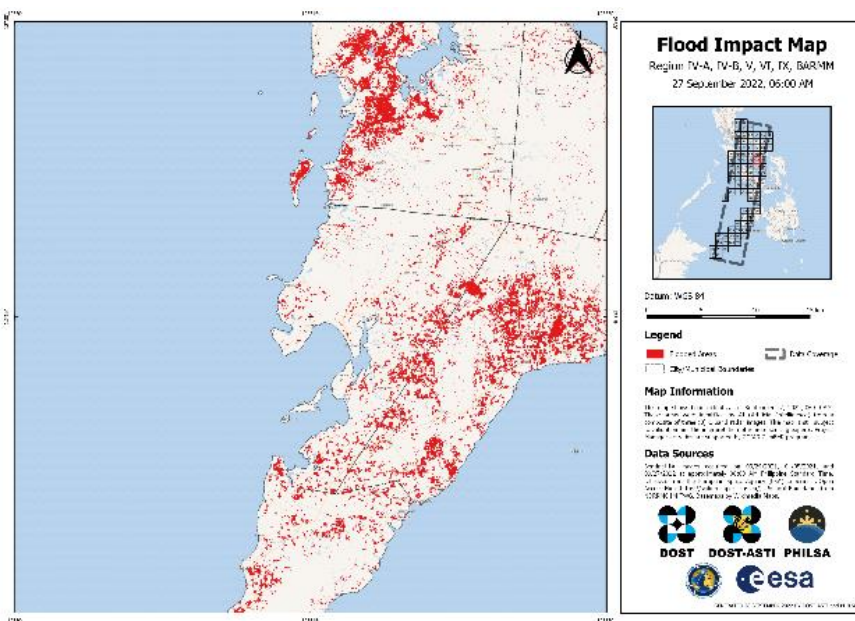
KOMPASAT 0207 01 Nov 20, 2022, 01:30 AM

KOMPASAT 0208 01 Nov 20, 2022, 01:45 AM

KOMPASAT 0209 01 Nov 20, 2022, 02:00 AM

TERRASAR-X 0101 01 Nov 20, 2022, 00:00 AM

Map data ©2022



#KardingPh FLOOD IMPACT MAPS Inbox x

P drmm@phlsa.gov.ph 11:38 AM (16 minutes ago) ☆ ↻ ⓘ
 to Ryan, ocd, ooddamonilla, ocd.operationsservice, ndrmmoc, ncr, civiledefensencr, region3, ocdregion3, region4a, jbpatalinjuglii, ncr, records, dost4a, mipablay, official, dost.ro5rd, do

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/3Rog01n>

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.

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!

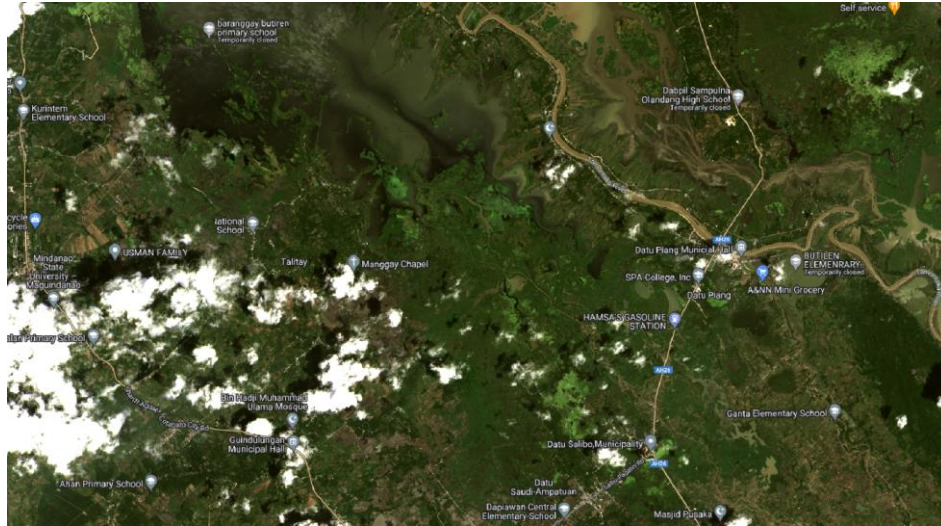
The value-added products are distributed to mandated agencies and other stakeholders **for free**, through email and social media.

PaengPH Examples

Salibo-Pagati Maguindanao Area | AOI 4

14 October 2022

30 October 2022



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

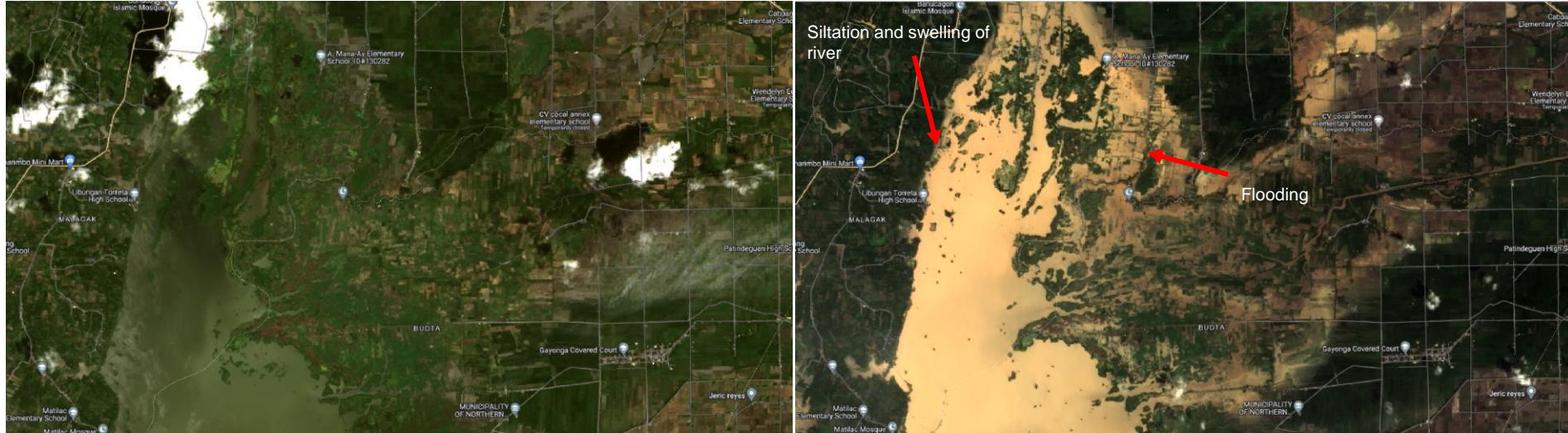


Malagak – Northern Kabuntalan Maguindanao | AOI 5



14 October 2022

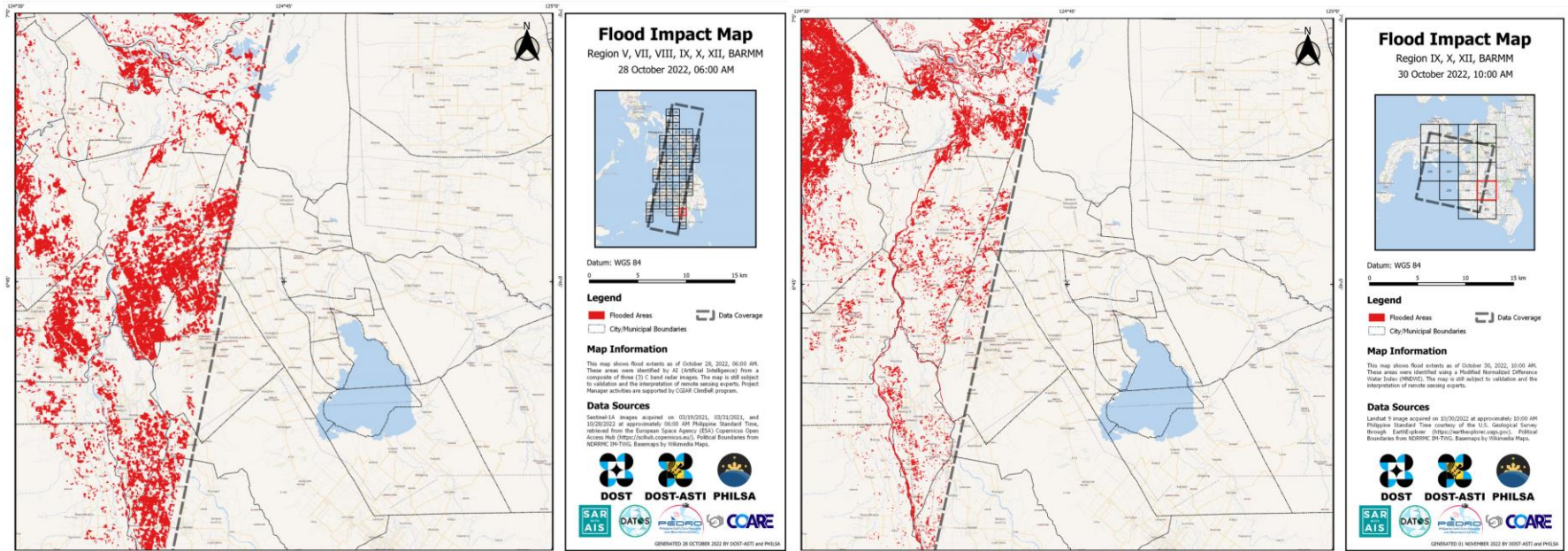
30 October 2022



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



Flood Impact Maps



Generated from Optical and SAR satellite images

Disaster Incidence ODK



Disaster Incidence

Event Name
(Typhoon name, Disaster location, etc.)

Disaster Incidence

*** Type of Incident**
Select the incident classification of the event.

- Flood
- Landslide
- Earthquake
- Damages
- Others

Disaster Incidence

Remarks
Additional information about the incident.

Disaster Incidence

*** Location**
Click start GeoPoint and wait for your device to detect your gps location.

Start GeoPoint

Add "Add a photo.?"

Do not add Add

Disaster Incidence

Add a photo. > 1

*** Photo**
Take a picture of the incident.

Take Picture

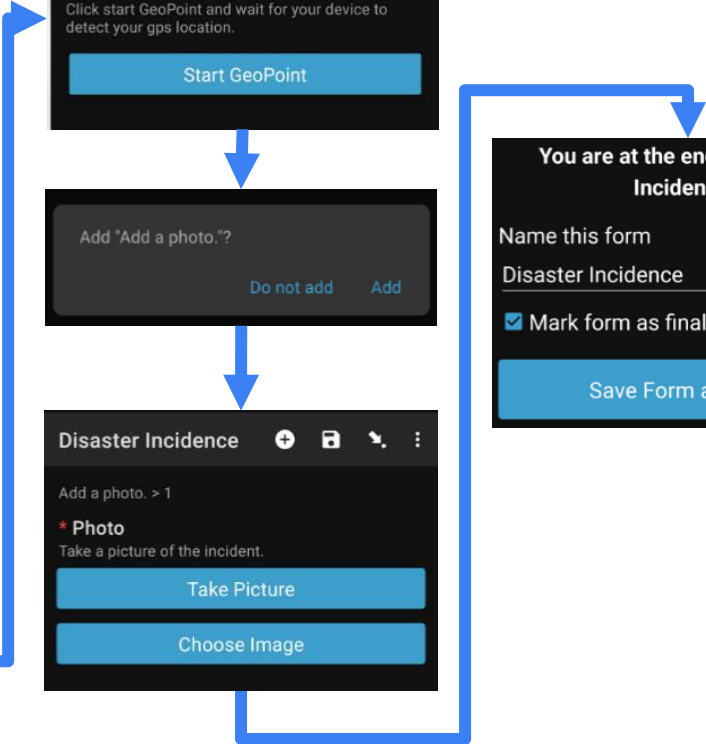
Choose Image

You are at the end of Disaster Incidence.

Name this form
Disaster Incidence

Mark form as finalized

Save Form and Exit



Date	Time	Location	Description	Lat	Long	News Link	screenshot	Damage Type	COMMENTS
25/09/2022	2:00PM	Pulillo Islands	Extreme winds and heavy rains in Pulillo Islands (Signal No. 5)	14.75695	121.942134	https://twitter.com/Caños_#Karding/status/1517299111891142188 https://twitter.com/Becky0809/status/1517299270778117264 https://twitter.com/Becky0809/status/1517299324299077248 https://twitter.com/tearstenteds/status/1517299366877312614 https://twitter.com/tearstenteds/status/1517299366877312614	Possible Infra Damage and Flooding	Location not exact	
25/09/2022	2:00PM	Palayan City	Flooding	15.530102	121.099745	https://twitter.com/sb95694/status/15172993429398928 https://www.facebook.com/watsh/101525292532423818-ct=tag https://twitter.com/Merck110001/status/1517299305772312859	Flooding	Unverified, No Photo/Video, Hearsay, Location not exact	
25/09/2022	6:30PM	Infanta Quezon	Torrential rainfall	14.7222517	121.6579294	https://twitter.com/Merck110001/status/1517299305772312859	Possible Infra Damage and Flooding	General Location in Infanta, video not geotagged	
25/09/2022	4:30PM	Panukulan, Pulillo Islands	Extreme winds and heavy rains in Pulillo Islands (Signal No. 5)	14.9756019	121.9104017	https://www.youtube.com/watch?v=3bM620 https://twitter.com/tearstenteds/status/1517299305772312859	Possible Crop and Infra damage		
25/09/2022		National Highway to Kabanakalan, Negros Occidental	Flooding	9.9589683	122.8391996	https://www.facebook.com/1517299305772312859	Flooding, crop damage, fallen trees		
25/09/2022		Patnanungan Island	Torrential rainfall	14.7095909	122.1838021	https://twitter.com/MSCK08/status/1517299313857212318	Possible Infra Damage and Flooding	General Location, video not geotagged	
25/09/2022		Ripa, Bonghin, Panukulan, Quezon	Extreme winds and heavy rains in Pulillo Islands (Signal No. 5)	14.9829311	121.8829517	Bogin_Ma_Internet_Mis Facebook Post	Possible Crop and Infra damage	Possibly taken from school which was used as an evacuation site	
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25/09/2022		Silo Campo, Inayawan canyon, Negros Occidental	Flooding	9.9078732	122.4594552	Facebook post by Ena Blue	Flooding, Possible crop damage		
25/09/2022	5:50PM	Jamalig, Quezon	Fallen trees	14.6873449	122.3301512	Facebook post by Provincial Government of Quezon https://twitter.com/cebuhawnews/status/1517299305772312859 https://www.facebook.com/1517299305772312859 https://www.facebook.com/1517299305772312859	Fallen trees		
25/09/2022			Extreme winds and			Facebook post by Isoperdo.com/Status/1517299257561806898 https://twitter.com/Isoperdo.com/Status/1517299257561806898	Possible Infra Damage, Flooding	Location not exact	

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

448 Retweets 222 Quote Tweets 1,037 Likes

42 Comments 315 Shares



Contact the Philippine Space Agency



<https://www.facebook.com/PhilSpaceAgency>



<https://twitter.com/philspaceagency>



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



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



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