

National Space Research and Development Agency

APPLICATION OF INTERNATIONAL EARTH OBSERVATION SUPPORT MECHANISMS FOR OPTIMUM FLOOD RESPONSE IN NIGERIA

by

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**Mission Planning and Satellite Data Management Department
National Space Research and Development Agency**

Session 5: Effective emergency response

United Nations Workshop on Space-based Technologies for Disaster Risk Reduction

9th December 2022



OUTLINE

- Nigerian Space Programme
- Flood Simulation Exercise Workshop
- International Mechanisms for Disaster Management
- UN-SPIDER Recommended Practices
 -  Monitoring Lagdo Dam
- Charter Activation for Floods in Nigeria (2022)
 -  Mapping Flood Extent
 -  Flood Damage Assessment





THE NIGERIAN SPACE PROGRAMME

In 1999 the National Space Research and Development Agency (NASRDA) was established.





THE NIGERIAN SPACE PROGRAMME

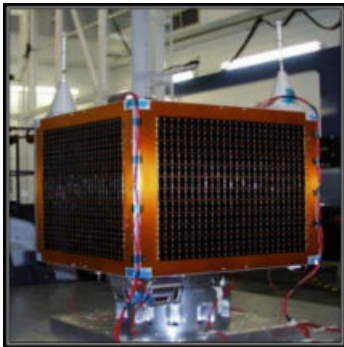
The National Space Council is the Highest Decision-Making Body for NASRDA and is Chaired by Mr. President with the Vice President as Vice Chairman.





NIGERIA SPACE ASSETS

The National Space Research and Development Agency has launched a total of 6 satellites namely:



Nigeriasat-1 (2003)



NigComSat-1 (2007)



Nigeriasat-2 (2011)



NigeriaSAT-X (2011)



NIGCOMSAT -1R (2011)



Nigeria EduSat-1 (2017)





FLOOD SIMULATION EXERCISE

(Emergency Operation Centre)





National Space Research and Development Agency



NASRDA/UN-SPIDER/ZFL Interinstitutional Workshop on “The Use of Space-Based Information for Flood Response and Early Warning” 12th to 15th September 2022

Total Number Of Organizations: 30

Total Number Of Participants: 104

Simulation Of Transboundary River Flood

Group 1: Search, Rescue and Shelter Provision:

FMHADMSD, NEMA, NASRDA etc

Group 2: Logistics: Armed Forces

Group 3: Impacts: NOSDRA, Works, etc

Group 4: External Support: International Community, World Bank etc





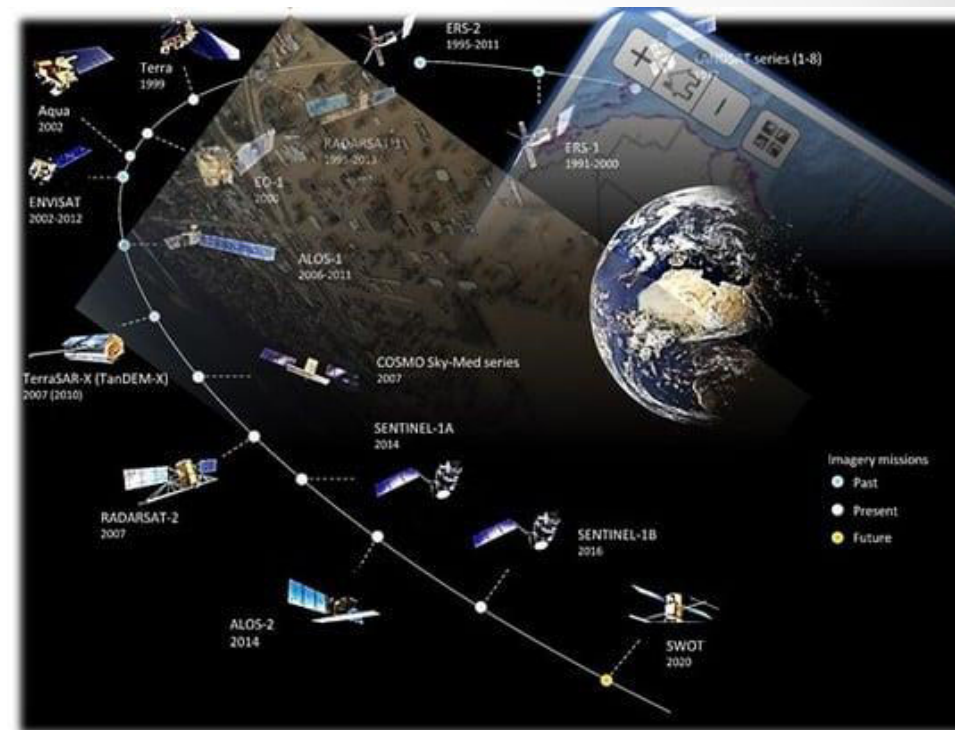
International Mechanisms for Disaster Management





International Mechanisms for Disaster Management

- UN-SPIDER Recommended Practice : Global
- International Charter Space and Major Disasters : Global
- Copernicus Emergency Management Service (EMS): Global
- Emergency Telecommunications Cluster (ETC): Global
- Sentinel Asia: Asia –Pacific Region
- SERVIR: Africa, Mesoamerica, Himalaya
- UNITAR Operational Satellite Applications Programme (UNOSAT): Global



Source: remotesensing-10-01230-ag-550.jpg (550x413) (mdpi.com)





UN-SPIDER Recommended Practice: Flood Mapping and Damage Assessment Using Sentinel-1 SAR Data in Google Earth Engine

Early Warning

- SAR-based flood mapping is a standard and reliable method for determining the extent of major floods.
- This Recommended Practice aims to be a simple and quick tool for users of any experience level to create information about flooding.
- The code is to be input into Google Earth Engine and run according to the area and dates specified by the user.
- After the process has run, the code will create a delineation of flood extent using SAR data and change detection methodology.
- The code will also produce information about cropland, urban areas and population density exposed.



UN-SPIDER Recommended Practice: Flood Mapping and Damage Assessment Using Sentinel-1 SAR Data in Google Earth Engine

Google Earth Engine Search places and datasets...

Scripts Docs Assets

Filter scripts... **NEW**

Owner (1)

- users/bellbeo/belindaodia
 - UntitledFolder
 - UntitledFolder2
 - This folder is empty.
 - UNSPIDER FLOOD SCRIPT

Writer

No accessible repositories. Click Refresh to check again.

Reader

No accessible repositories. Click Refresh to check again.

Archive

No accessible repositories. Click Refresh to check again.

Examples

UNSPIDER FLOOD SCRIPT * Get Link Save Run Reset Apps

```

70 ----->>> DO NOT EDIT THE SCRIPT PAST THIS POINT! (unless you know what you are doing) <<<-----
71 ----->>> now hit the 'RUN' at the top of the script! <<<-----
72 ----->>> The final flood product will be ready for download on the right (under tasks) <<<-----
73 ----->>>
74 ----->>>
75 ----->>>
76 ----->>>
77 ----->>>
78 ----->>>
79 ----->>>
80 ----->>>
81 // rename selected geometry feature
82 var aoi = ee.FeatureCollection(geometry);
83
84 // Load and filter Sentinel-1 GRD data by predefined parameters
85 var collection = ee.ImageCollection('COPERNICUS/S1_GRD')
86   .filter(ee.Filter.eq('instrumentMode', 'IW'))
87   .filter(ee.Filter.listContains('transmitterReceiverPolarisation', 'polarization'))
88   .filter(ee.Filter.eq('orbitProperties_pass', 'pass_direction'))
89   .filter(ee.Filter.eq('resolution_meters', 10))
90   .filter(ee.Filter.eq('relativeOrbitNumber_start', relative_orbit ))
91   .filterBounds(aoi)
92

```

Inspector Console **Tasks**

Use print(...) to write to this console.

Tiles selected: Before Flood (8) 350N
from 2020-07-02 to 2020-07-19 350N
* ImageCollection COPERNICUS/S1_GRD (8 el... 350N

Tiles selected: After Flood (8) 350N
from 2020-09-10 to 2020-09-17 350N
* ImageCollection COPERNICUS/S1_GRD (5 el... 350N

Estimated flood extent:
based on Sentinel-1 imagery from 2020-09-10 to 2020-09-17
156986 hectares

Estimated number of exposed people:
based on GHSL 2015 (250m)
194008

Estimated affected cropland:
based on MODIS Land Cover 2020 (500m)
29600 hectares

Estimated affected urban areas:
based on MODIS Land Cover 2020 (500m)
2265 hectares

Disclaimer: This product has been derived automatically without validation data. All geographic information has limitations due to the scale, resolution, date and interpretation of the original source materials. No liability concerning the content or the use thereof is assumed by the producer.
Script produced by: UN-SPIDER December 2019

Legend

- potentially flooded areas
- affected cropland
- affected urban

Exposed population density

> 200

0

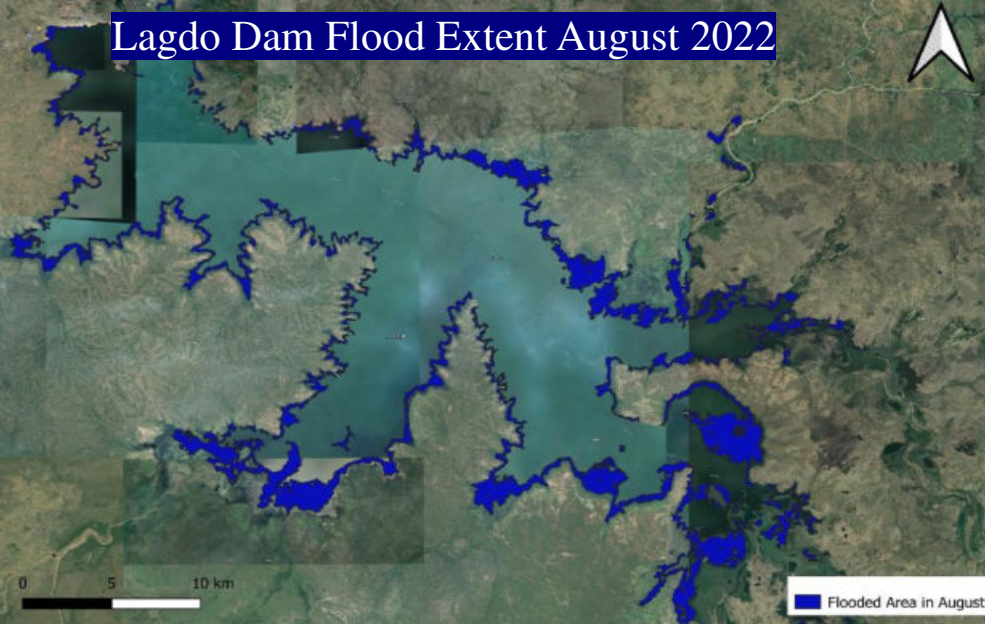
Layers Map Satellite

Keyboard shortcuts Map data ©2022 20 km Terms of Use

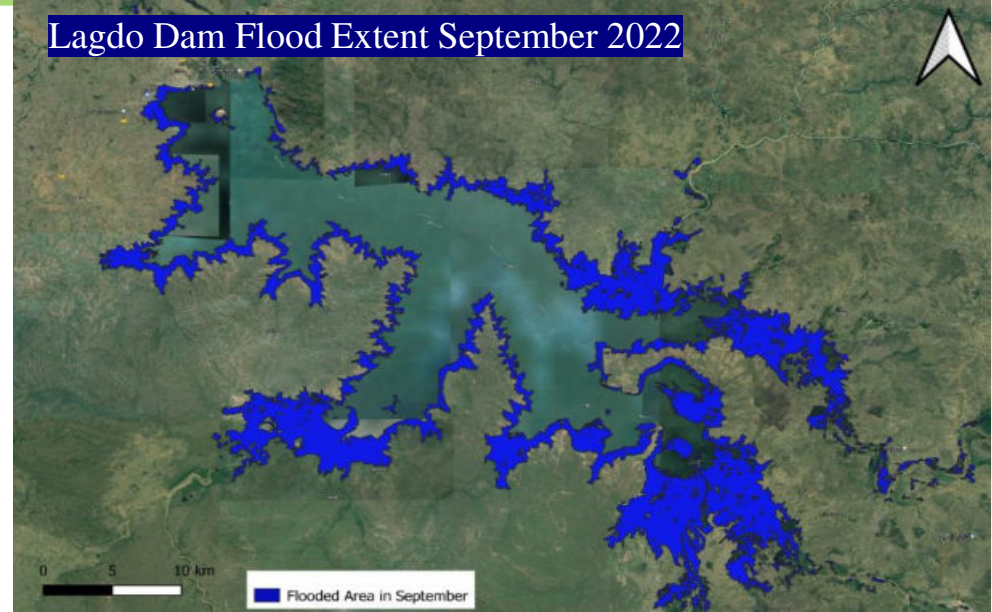


MONITORING LAGDO DAM

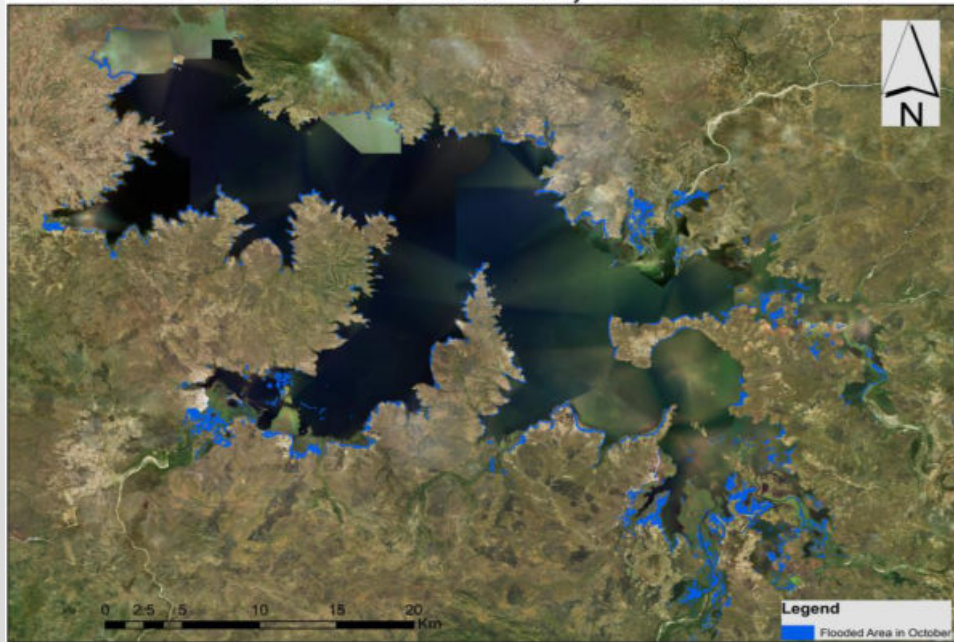
Lagdo Dam Flood Extent August 2022



Lagdo Dam Flood Extent September 2022



LAGDO DAM FLOOD EXTENT, OCTOBER 2022



LAGDO DAM FLOOD EXTENT, NOVEMBER 2022





CHARTER ACTIVATION FOR FLOOD IN NIGERIA



[Home](#) [About](#) [Activations](#) [News](#) [Library](#) [COS-2](#)

English

VA_UA_BOdia

Charter activations

Latest Activation

15 SEPTEMBER 2022

Flood in Nigeria

[Browse activations on map](#)



Type of Event:	Floods
Location of Event:	Nigeria
Date of Charter Activation:	2022-09-15
Time of Charter Activation:	17:48
Time zone of Charter Activation:	UTC+02:00
Charter Requestor:	NEMA
Activation ID:	777
Project Management:	Oyewumi Ademuyiwa





CHARTER ACTIVATION FOR FLOOD IN NIGERIA

ESA Charter Mapper [Act-777/Call-895] Flood in Nigeria

Acquisitions Datasets VA Products My Results VA-UA-CODiji

Filter results earth observation

Results

Filter Criteria

AoI Satellite Sensor type

Date Range

Resolution

Sort: Sensing date

Context Datasets

Results for series [chartercalibrateddataset,{callid895}]

- (CD) KANOPUS-V MSS-PSS L2B 2022-10-13 10:24:21
- (CD) WORLDVIEW-2 MSI LV1B 2022-10-13 09:56:04
- (CD) WORLDVIEW-2 MSI LV1B 2022-10-13 09:55:45
- (CD) PLANESCOPE PSB.SD L3B 2022-10-13 09:40:22
- (CD) PLANESCOPE PSB.SD L3B 2022-10-13 09:40:20
- (CD) KANOPUS-V MSS-PSS L2B 2022-10-12 10:42:52
- (CD) KANOPUS-V-1K MSS-PSS L2B 2022-10-12 10:24:02
- (CD) PLANESCOPE PSB.SD L3B 2022-10-12 09:06:31
- (CD) PLANESCOPE PSB.SD L3B 2022-10-12 09:06:29
- (CD) PLANESCOPE PSB.SD L3B 2022-10-12 08:40:04
- (CD) PLANESCOPE PSB.SD L3B 2022-10-12 08:40:02
- (CD) PLANESCOPE PSB.SD L3B 2022-10-11 09:48:13
- (CD) PLANESCOPE PSB.SD L3B 2022-10-11 09:48:08
- (CD) PLANESCOPE PSB.SD L3B 2022-10-11 09:47:56
- (CD) PLANESCOPE PSB.SD L3B 2022-10-11 09:47:56

Total results: 118

Map showing Nigeria and surrounding regions (Mali, Niger, Chad, Cameroon, Benin, Burkina Faso, Ghana, Togo, Equatorial Guinea) with flood areas highlighted in orange and yellow. The map includes a timeline at the bottom showing dates 2022-09-13 and 2022-10-12.

Processing Services

Services Jobs

Filter services

- COMBI-Plus: Advanced Multi-Sensor Band Composites
- IRIS: Change Detection Analysis
- STACK: Co-located stacking
- HASARD: Flood Extent Mapping HASARD
- COMBI: Multi-Sensor Band Composites
- PAN-Sharp: Optical Pan Sharpened Image
- OPT-Index: Optical Spectral Index
- SAR-Change: SAR Amplitude Change



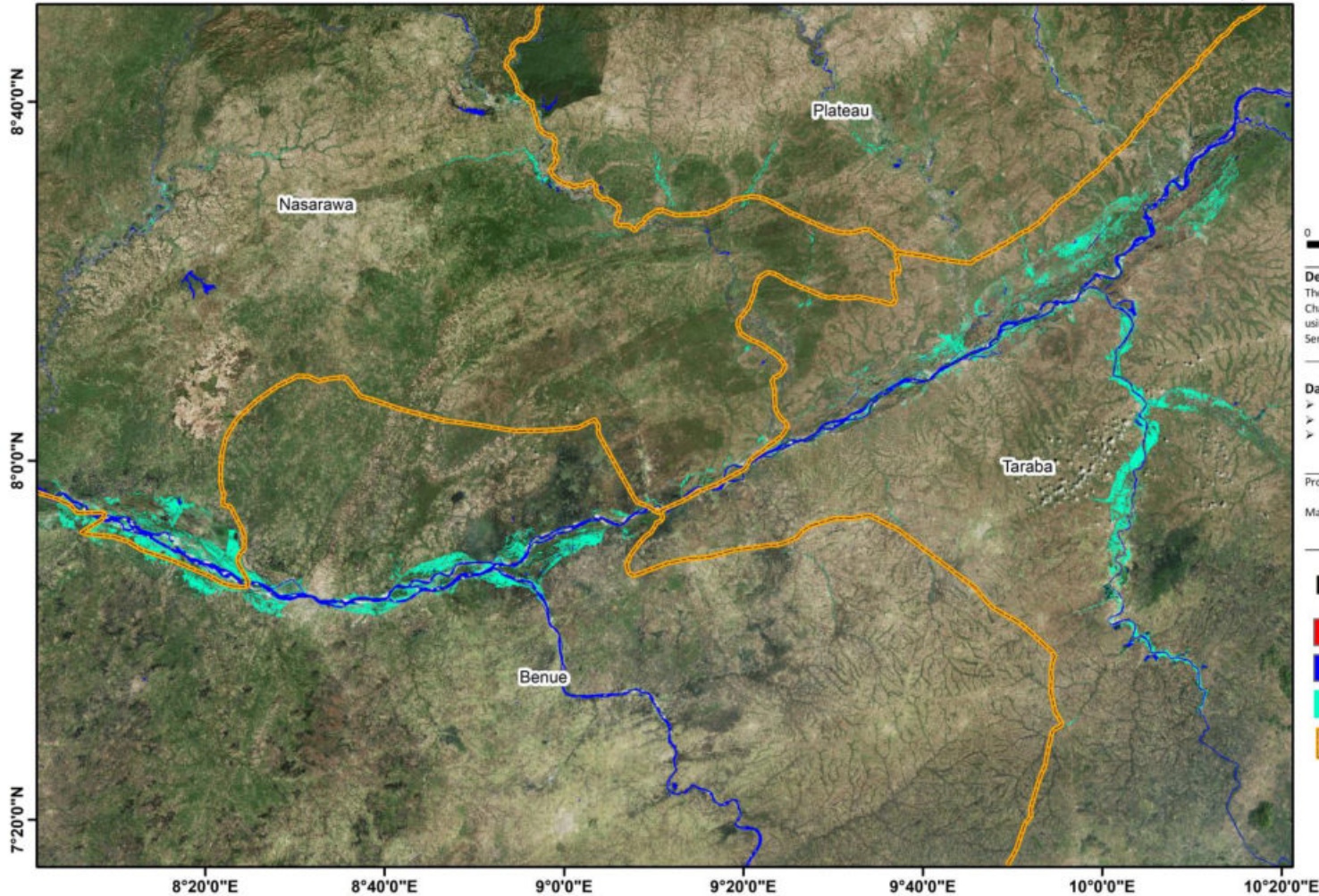


MAPPING FLOOD EXTENT





FLOOD EXTENT ALONG THE RIVER BENUE CHANNEL IN BENUE AND TARABA STATE (UPSTREAM LOKO)



Description

The map shows the flooded areas in Benue and Taraba State on the River Benue Channel upstream Loko. The HASARD algorithm was used to delineate flooded areas using a reference scene of 2022-09-14 and after event scene of 2022-09-26 of Sentinel-1 radar data.

Data sources

- Modified Copernicus Sentinel-1 imagery (2022).
- Administrative boundary from OSGOF
- Background: Bing, Microsoft (2022)

Projection: UTM 31N, Datum: WGS 84

Map produced by National Space Research and Development Agency

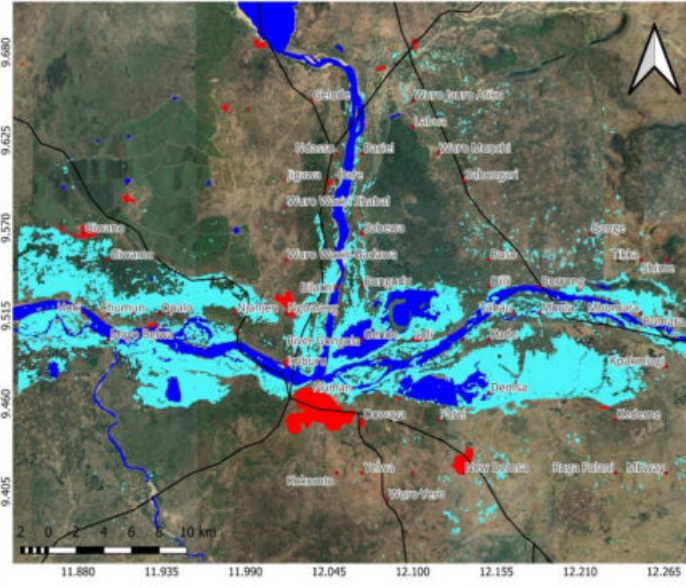
Legend

- Built-up
- Waterbody
- Flooded Extent
- State Boundary





FLOOD EXTENT BETWEEN IMBURU TO KABERE COMMUNITY



INTERPRETATION
 Situation report of the flood extent from Imburu to Kabere community based on based on Sentinel-1 imagery from 2022-09-04 to 2022-09-09 revealed that 15476 hectares of the channel was inundated, 6149 hectares of cropland, and 3798 people were exposed.

DATA SOURCES
 - Sentinel-1 imagery (2022). Acquired on September 10, 2022 provided by Europe Space Agency.
 - Google Script Engine produced UNSPIDER, 2019.
 - MODIS Land Cover 2020 (500m)
 - Population data (GHSL) provided by European Commission, Joint Research Centre (JRC); Columbia University, Centre for International Earth Science Information Network (CIESIN)

Legend

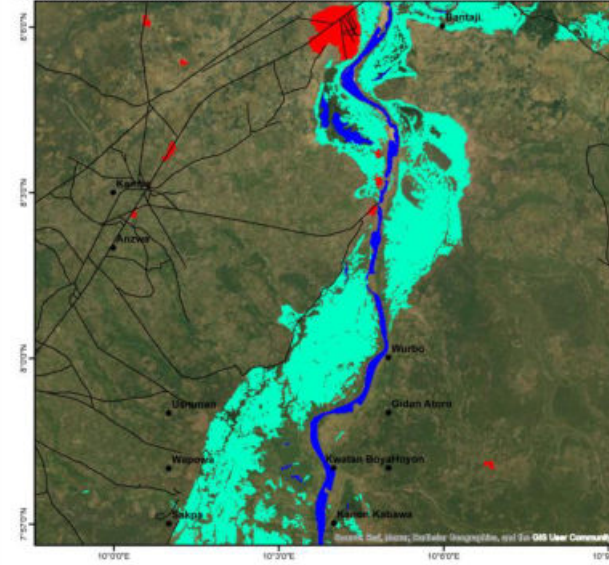
- Communities
- Interstate_Road

Features

Band 1 (Palette)

- Waterbody
- Built-up
- LGA Boundary
- Flooded Areas

INUNDATED AREAS: BANTAJI, WURBO, GIDAN ATORO, KWATAN BOYA, HOYAN, SAKPA AND KANON KABAWA COMMUNITIES ALONG THE RIVER BENUE CHANNEL



INTERPRETATION
 Situation report of the flood extent from Bantaji, Wurbo, Gidan Atoro, Kwatan Boya, Hoyan, Sakpa and Kanon Kabawa communities based on based on Sentinel-1 imagery from 2022-09-04 to 2022-09-09 revealed that 15476 hectares of the channel was inundated, 6149 hectares of cropland, and 3798 people were exposed.

DATA SOURCES
 - Sentinel-1 imagery (2022). Acquired on September 10, 2022 provided by Europe Space Agency.
 - Google Script Engine produced UNSPIDER, 2019.
 - MODIS Land Cover 2020 (500m)
 - Population data (GHSL) provided by European Commission, Joint Research Centre (JRC); Columbia University, Centre for International Earth Science Information Network (CIESIN)

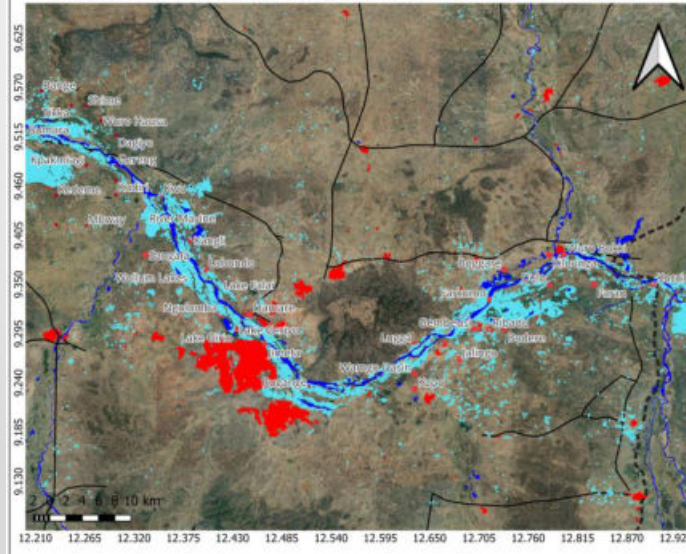
Legend

- Communities
- Roads

Features

- Built-up
- Waterbody
- Flooded Extent between 14-09-2022 and 26-09-2022

FLOOD EXTENT IN YOLA AND SURROUNDING COMMUNITIES



INTERPRETATION
 Situation report of the flood extent in Yola and surrounding communities based on based on Sentinel-1 imagery from 2022-09-04 to 2022-09-09 revealed that 3667 hectares of the channel was inundated, 678 hectares of cropland, and 4363 people were exposed.

DATA SOURCES
 - Sentinel-1 imagery (2022). Acquired on September 10, 2022 provided by Europe Space Agency.
 - Google Script Engine produced UNSPIDER, 2019.
 - MODIS Land Cover 2020 (500m)
 - Population data (GHSL) provided by European Commission, Joint Research Centre (JRC); Columbia University, Centre for International Earth Science Information Network (CIESIN)

Legend

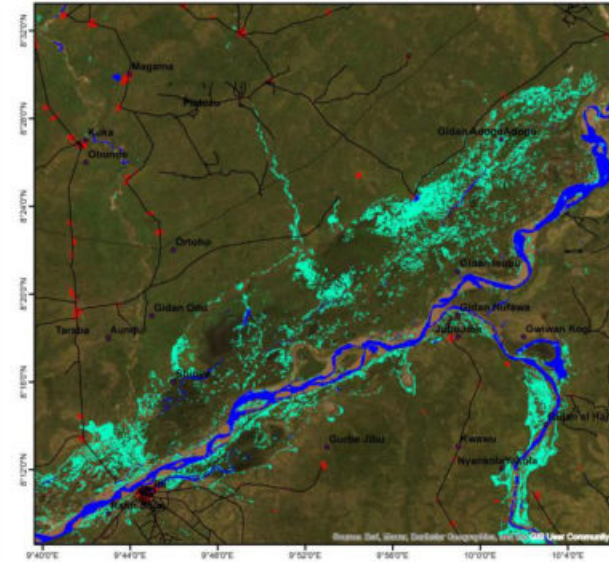
- Communities
- Interstate_Road

Features

Band 1 (Palette)

- Waterbody
- Built-up
- LGA Boundary
- Flooded Areas

INUNDATED AREAS: IBI, RAFIN SOJA, SHINYE, GIDAN ISUBU, GIDAN ADOGO, JUBUJIBU AND GIDAN EL HAJI COMMUNITIES ALONG THE RIVER BENUE CHANNEL



INTERPRETATION
 Situation report of the flood extent from Ibi, Rafin Soja, Shinye, Gidan Isubu, Gidan Adogo, Jubujibu and Gidan El Haji communities based on based on Sentinel-1 imagery from 2022-09-04 to 2022-09-09 revealed that 15476 hectares of the channel was inundated, 6149 hectares of cropland, and 3798 people were exposed.

DATA SOURCES
 - Sentinel-1 imagery (2022). Acquired on September 10, 2022 provided by Europe Space Agency.
 - Google Script Engine produced UNSPIDER, 2019.
 - MODIS Land Cover 2020 (500m)
 - Population data (GHSL) provided by European Commission, Joint Research Centre (JRC); Columbia University, Centre for International Earth Science Information Network (CIESIN)

Legend

- Communities
- Roads

Features

- Built-up
- Waterbody
- Flooded Extent between 14-09-2022 and 26-09-2022





Flood extent map over the Taraba State in Nigeria - Upstream Loko AOI

Analysis derived from a change detection of Sentinel-1 data acquired on 07 Aug 2022 (reference image) and 21 Sep 2022 (Flood image)



Over: 777024N-8952E (Location Nigeria)

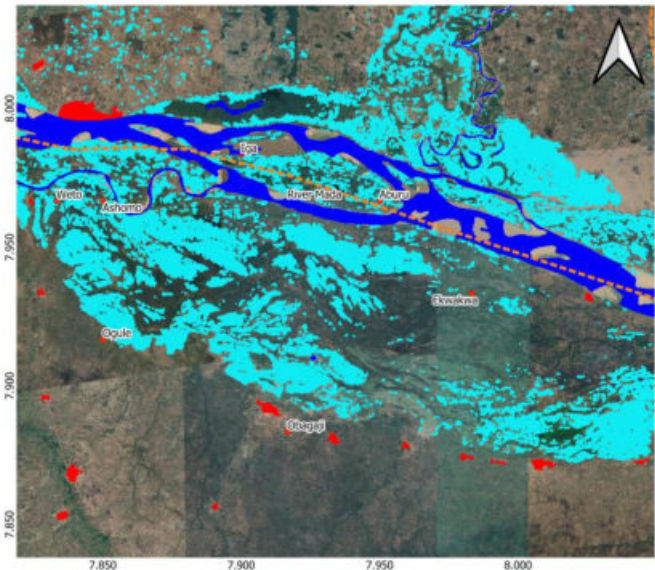
Downloaded via the Copernicus Sentinel-1 Mission. Sentinel-1 is a satellite-based Synthetic Aperture Radar (SAR) system with the capability to observe Earth in both visible and microwave frequencies with an almost global coverage. Sentinel-1 is the first SAR mission in the Copernicus programme. Sentinel-1 is a dual-polarization SAR mission with the capability to observe Earth in both visible and microwave frequencies with an almost global coverage. Sentinel-1 is the first SAR mission in the Copernicus programme.

Map Production Date: 2022-09-21
Map Production Time: 10:00 AM
Projection: UTM Zone 32N, Datum: WGS 84
Scale: 1:50,000

Map Scale (at 10m): 0 5 10 km

Map produced by National Space Research and Development Agency

INUNDATED AREA: OBAGAJI



Description
Situation report of the flood extent around Obagaji town along the river Benue channel based on Sentinel-1 imagery from September 1, 2022 to September 13, 2022. A change detection algorithm was performed on two Sentinel-1 radar scenes before and after flood event to detect flooded areas.

Data sources
- Sentinel-1 imagery (2022) acquired from European Space Agency
- Administrative boundary
- Background; Bing

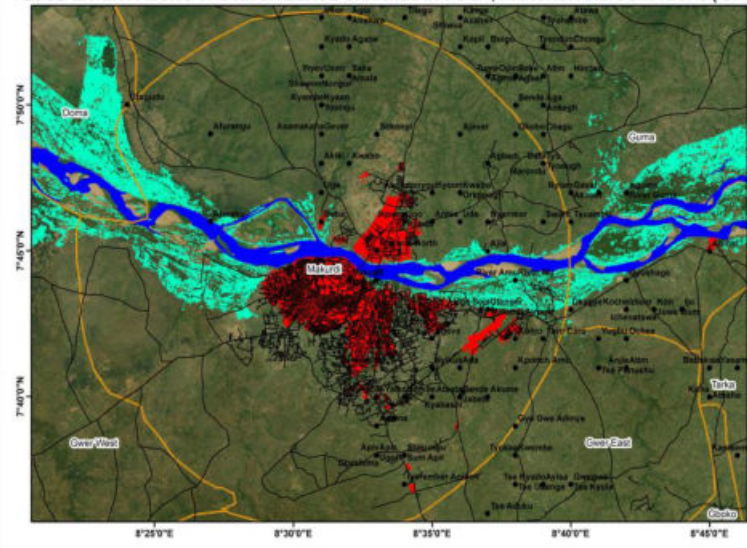
Projection: UTM Zone 32N, Datum: WGS 84

Map Production Date: 2022-09-21
Map Production Time: 10:00 AM
Projection: UTM Zone 32N, Datum: WGS 84
Scale: 1:50,000

Map Scale (at 10m): 0 2 4 km

Map produced by National Space Research and Development Agency

FLOOD EXTENT ALONG THE RIVER BENUE CHANNEL IN DOMA, MAKURDI AND GUMA LGAs (UPSTREAM LOKO)



Description
The map shows the flooded areas in Doma, Makurdi and GUMA LGA on the River Benue channel upstream Loko. The algorithm used to detect flooded areas using a reference image of 2022-09-14 and other event scenes of 2022-09-28 of Sentinel-1 data.

Data sources
- Modified Copernicus Sentinel-1 imagery (2022)
- Administrative boundary from OSGEO
- Background; Bing, Microsoft (2022)
- Road layers from OpenStreetMap

Projection: UTM Zone 32N, Datum: WGS 84

Map produced by National Space Research and Development Agency

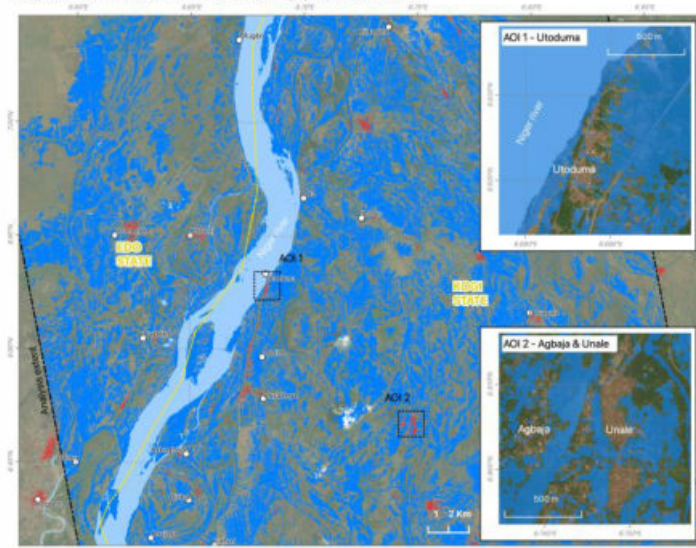
Map Production Date: 2022-09-21
Map Production Time: 10:00 AM
Projection: UTM Zone 32N, Datum: WGS 84
Scale: 1:50,000

Map Scale (at 10m): 0 2 4 km

Map produced by National Space Research and Development Agency

Flooded Villages Between Ojigagala and Abujaga in Kogi State, Nigeria - 30 Sep 2022

Analysis derived from RADARSAT Constellation Mission Imagery acquired on 30 Sep 2022



Description
The map shows the flooded areas in Ojigagala and Abujaga LGAs on the River Benue channel upstream Loko. The algorithm used to detect flooded areas using a reference image of 2022-09-14 and other event scenes of 2022-09-28 of Sentinel-1 data.

Data sources
- Modified Copernicus Sentinel-1 imagery (2022)
- Administrative boundary from OSGEO
- Background; Bing, Microsoft (2022)
- Road layers from OpenStreetMap

Projection: UTM Zone 32N, Datum: WGS 84

Map produced by National Space Research and Development Agency

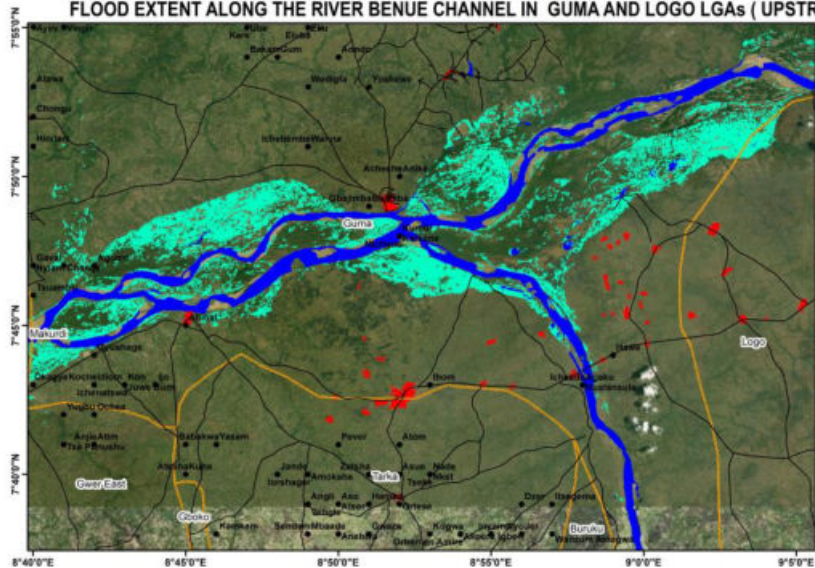
Map Production Date: 2022-09-30
Map Production Time: 10:00 AM
Projection: UTM Zone 32N, Datum: WGS 84
Scale: 1:50,000

Map Scale (at 10m): 0 1 2 km

Map produced by National Space Research and Development Agency



FLOOD EXTENT ALONG THE RIVER BENUE CHANNEL IN GUMA AND LOGO LGAs (UPSTREAM LOKO)



Description
The map shows the flooded areas in Guma and Logo LGA on the River Benue Channel upstream Loko. The URBAN3 algorithm was used to delineate flooded areas using a reference scene of 2022-09-14 and after event scene of 2022-09-26 of Sentinel-1 radar data.

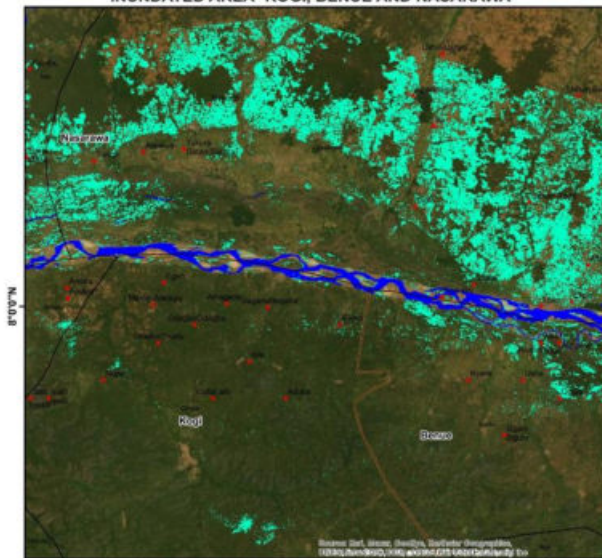
Data sources
Modified Copernicus Sentinel-1 imagery (2022)
Administrative boundary from 2022
Background Bing, Microsoft (2022)
Road layers from OpenStreetMap

Projection: UTM 32N, Datum: WGS 84
Map produced by National Space Research and Development Agency

- Legend**
- Communities
 - Roads
 - Built-up
 - Waterbody
 - Flooded Extent
 - LGA Boundary



INUNDATED AREA- KOGI, BENUE AND NASARAWA



Flood extent around Kogi, Benue and Nasarawa State. A change detection was performed on two Sentinel-1 radar scenes before and during the event to detect flooded areas.

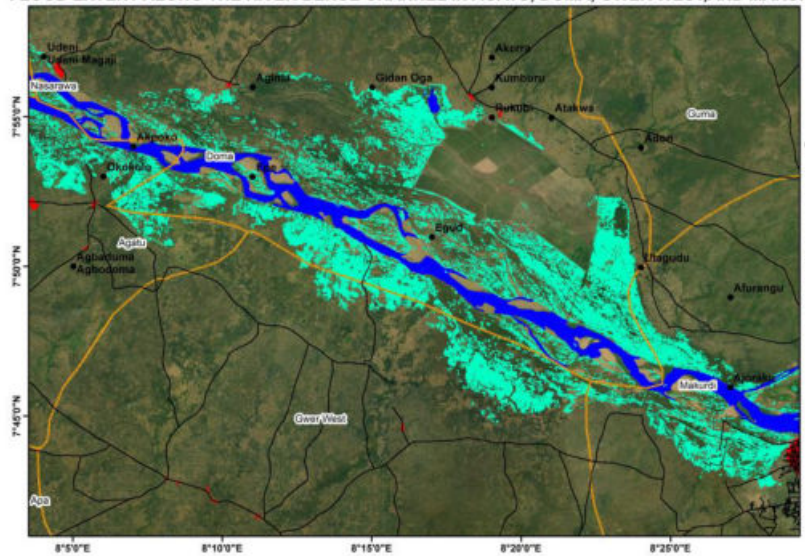
Data Sources
Sentinel-1 imagery (2022). Acquired from European Space Agency
Administrative boundary
Background: Bing

Projection: UTM 32N, Datum: WGS 84

- Legend**
- Communities
 - LGA Boundary
 - State Boundary
 - Waterbody
 - Flooded Areas



FLOOD EXTENT ALONG THE RIVER BENUE CHANNEL IN AGATU, DOMA, GWER WEST, AND MAKURDI LGAs (UPSTREAM LOKO)



Description
The map shows the flooded areas in Agatu, Doma, Gwer West and Makurdi LGA on the River Benue Channel upstream Loko. The URBAN3 algorithm was used to delineate flooded areas using a reference scene of 2022-09-14 and after event scene of 2022-09-26 of Sentinel-1 radar data.

Data sources
Modified Copernicus Sentinel-1 imagery (2022)
Administrative boundary from 2022
Background: Bing, Microsoft (2022)
Road layers from OpenStreetMap

Projection: UTM 32N, Datum: WGS 84
Map produced by National Space Research and Development Agency

- Legend**
- Communities
 - Roads
 - Built-up
 - Waterbody
 - Flooded Extent
 - LGA Boundary



INUNDATED AREA-NASARAWA AND TARABA



Flood extent around Nasarawa and Taraba State. A change detection was performed on two Sentinel-1 radar scenes before and during the event to detect flooded areas.

Data Sources
Sentinel-1 imagery (2022). Acquired from European Space Agency
Administrative boundary
Background: Bing

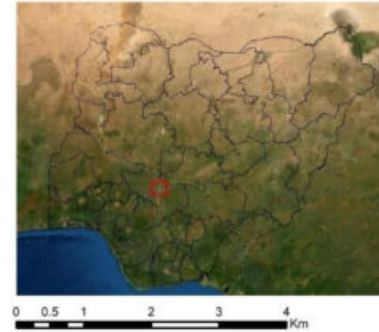
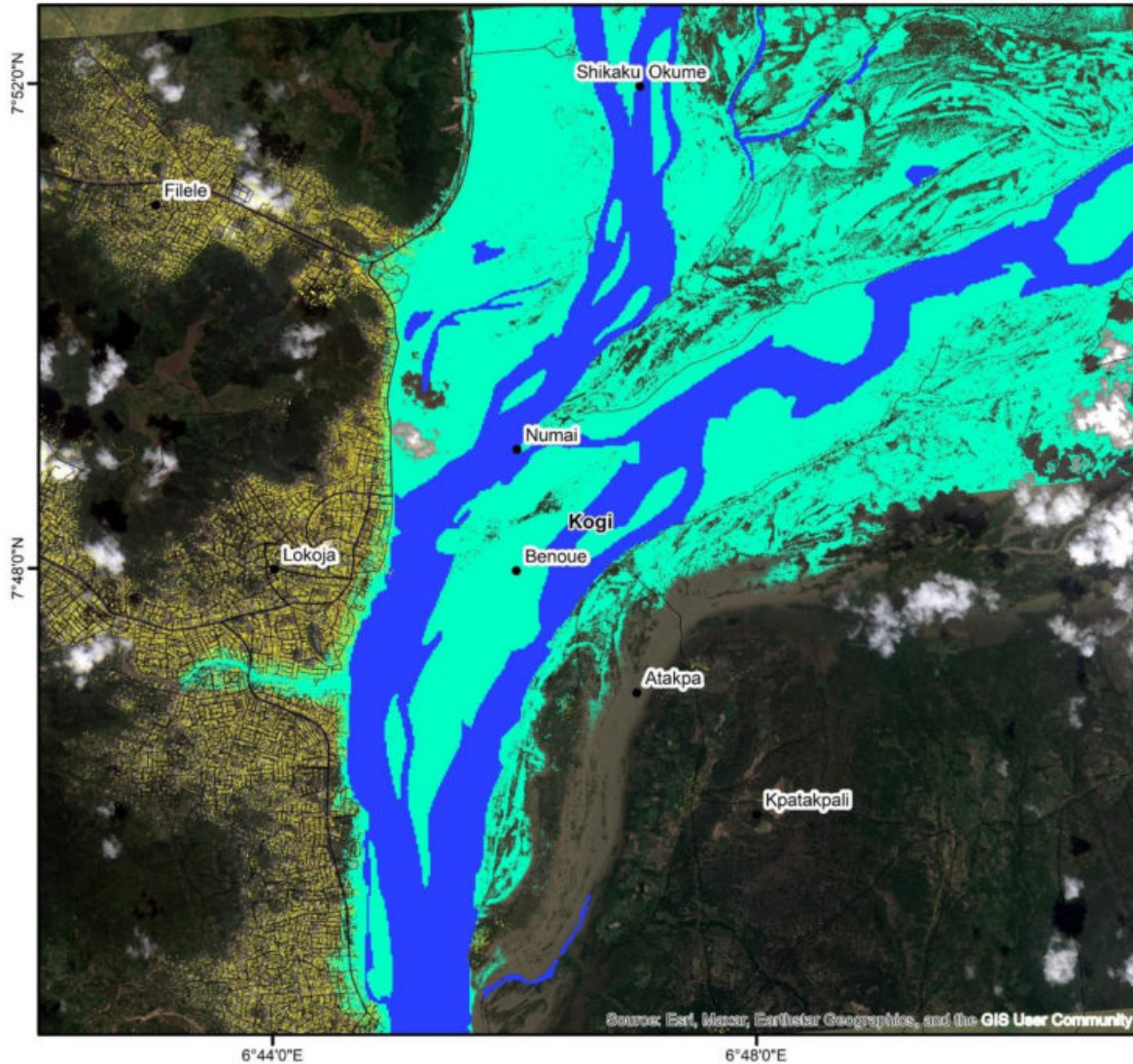
Projection: UTM 32N, Datum: WGS 84

- Legend**
- Communities
 - LGA Boundary
 - State Boundary
 - Waterbody
 - Flooded Areas





SYNOPTIC VIEW OF THE FLOOD EXTENT IN LOKOJA AS OF 4-10-2022



Description

Flooded extent of Lokoja, Kogi state as of 4-10-2022. The Advanced Multi-Sensor Band Composite was applied on the Komsat-3 satellite imagery to delineate the flood extent.

Data Sources

- > Komsat-3 imagery (4-10-2022)
- > Administrative boundary, Communities and Roads shapefile obtained from OSGOF
- > Background: Komsat-3, ESRI

Projection: UTM 32N, Datum: WGS 84

Produced by the National Space Research and Development Agency

Disclaimer

This product has been derived automatically without validation data. All geographic information has limitation due to the scale, resolution, date and interpretation of the original source materials. No liability concerning the content or the use thereof is assumed by the producer.

Legend

- Roads
- River
- Flooded Extent 04-10-2022

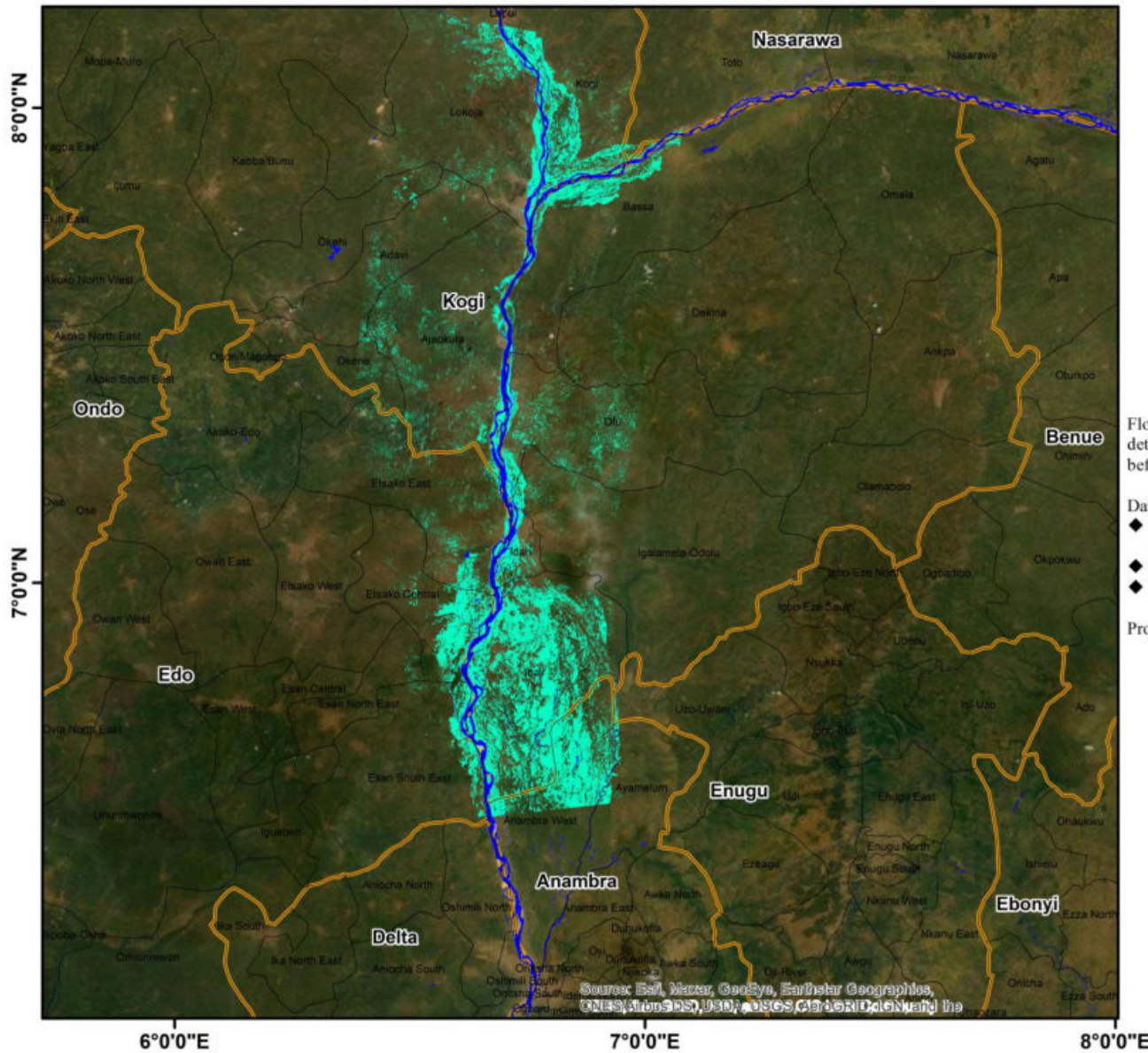


Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community





INUNDATED AREA- KOGI AND ANAMBRA



Flood extent around Kogi, and Anambra State. A change detection was performed on on two sentinel-1 radar scenes before and during the event to detect flooded areas.

Data Sources

- ◆ Sentinel-1 imagery (2022). Acquired from European Space Agency.
- ◆ Administrative boundary
- ◆ Background: Bing

Projection: UTM 31N, Datum: WGS 84

Legend

LGA Boundary

State Boundary

Features

Waterbody

Flooded Areas

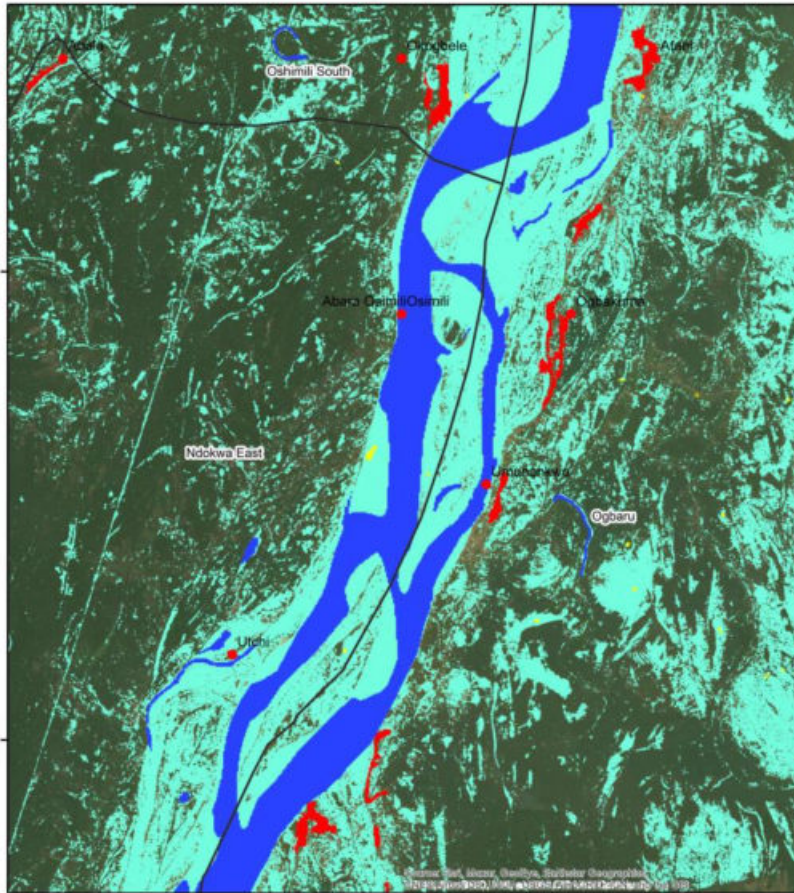


Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, AeroGRID, IGN, the





FLOOD EXTENT IN NDOKWA EAST, OSHIMILI SOUTH AND OGBARU LGA AS OF 12 OCTOBER, 2022



INTERPRETATION
 Situation report of the flood extent in Ndokwa East, Oshimili South and Ogbaru LGA as of October 12, 2022

DATA SOURCES
 ◆ RCM-1 GRD Imagery (2022). Acquired on October 12, 2022 provided by CSA
 ◆ Administrative Boundary provided by OSGOF
 ◆ Background image: ESRI

Projection: UTM 32N, Datum: WGS 84
 Map produced by National Space Research and Development Agency

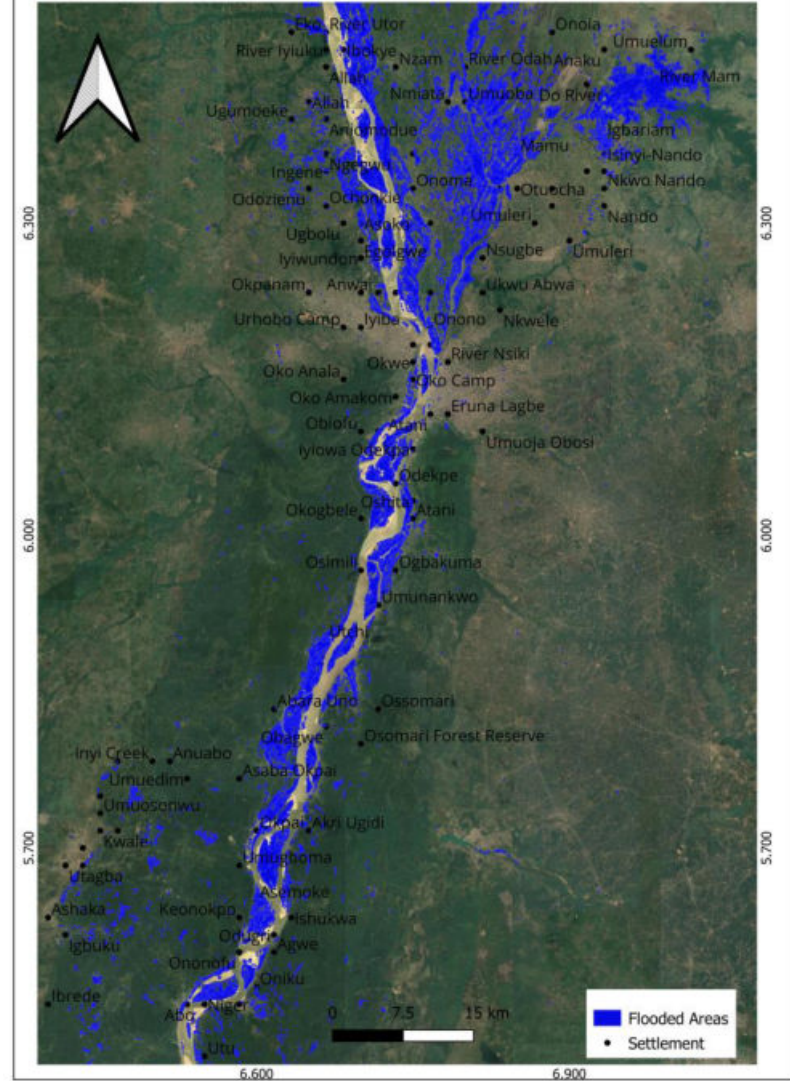
Disclaimer
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Legend

- Settlement
- ⬭ LGA Boundary
- ⬭ Flooded Extent
- ⬭ Waterbody
- ⬭ Built-up



FLOOD EXTENT IN ANAMBRA AND NIGER- DELTA COMMUNITIES ALONG

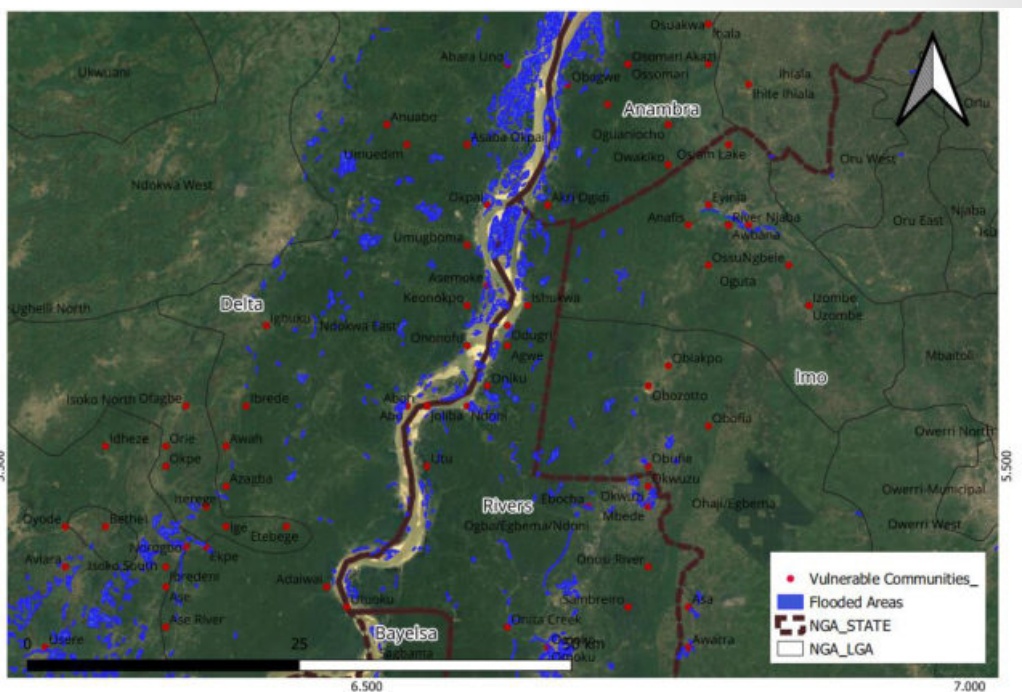
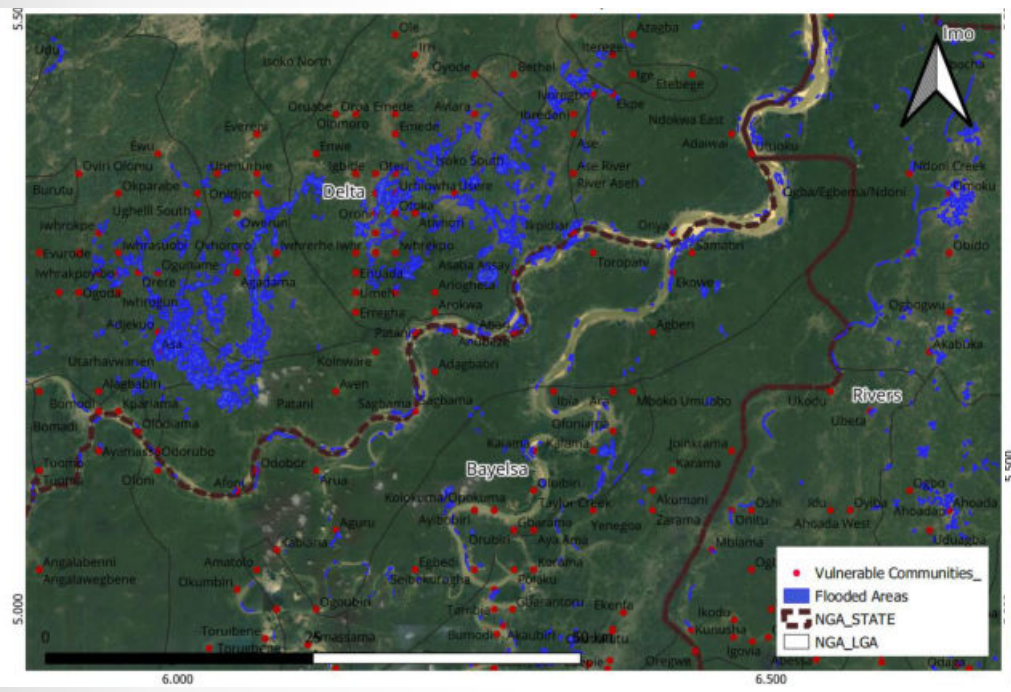


- Flooded Areas
- Settlement



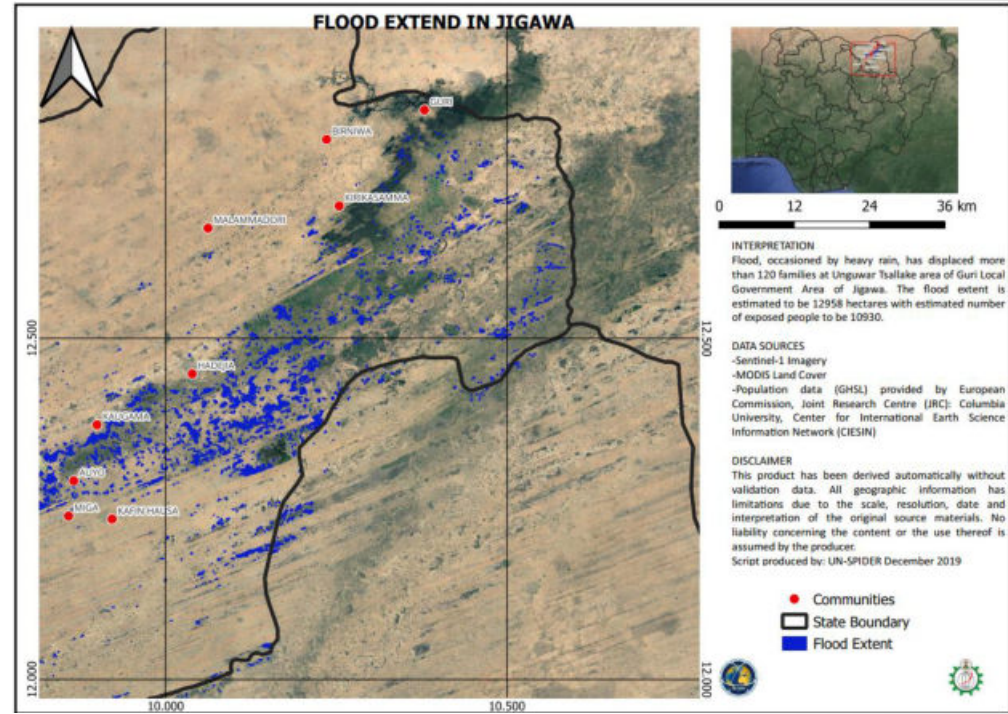
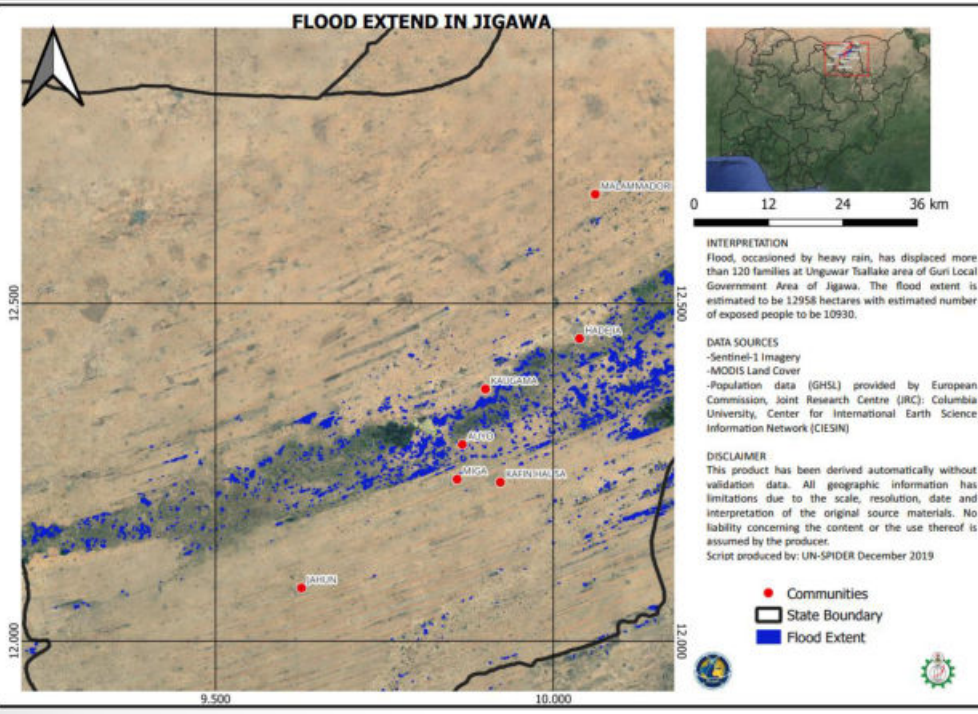


FLOODED AREAS IN NIGER-DELTA IN OCTOBER 2022



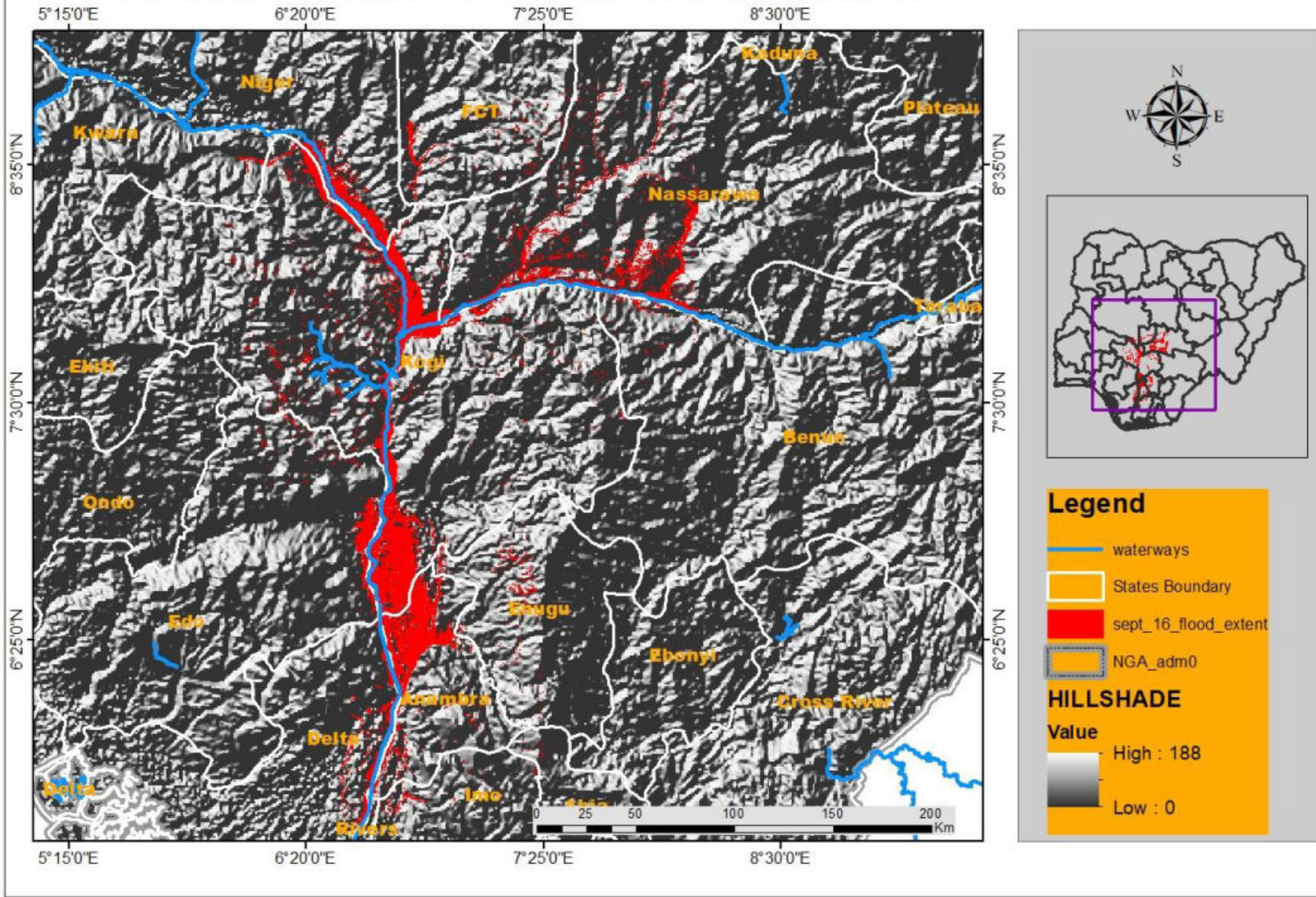


FLOODED AREAS IN JIGAWA STATE





FLOOD INNUDATED AREAS FOR 4TH AND 16TH SEPTEMBER, 2018





FLOOD DAMAGE ASSESSMENT





SYNOPTIC VIEW OF THE FLOOD EXTENT IN LOKOJA AS OF 4-10-2022



Description

Flooded extent of Lokoja, Kogi state as of 4-10-2022. The Advanced Multi-Sensor Band Composite was applied on the Kompsat-3 satellite imagery to delineate the flood extent.

Data Sources

- > Kompsat-3 imagery (4-10-2022)
- > Administrative boundary, Communities and Roads shapefile obtained from OSGOF
- > Background: Kompsat-3, ESRI

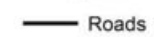
Projection: UTM 32N, Datum: WGS 84

Produced by the National Space Research and Development Agency

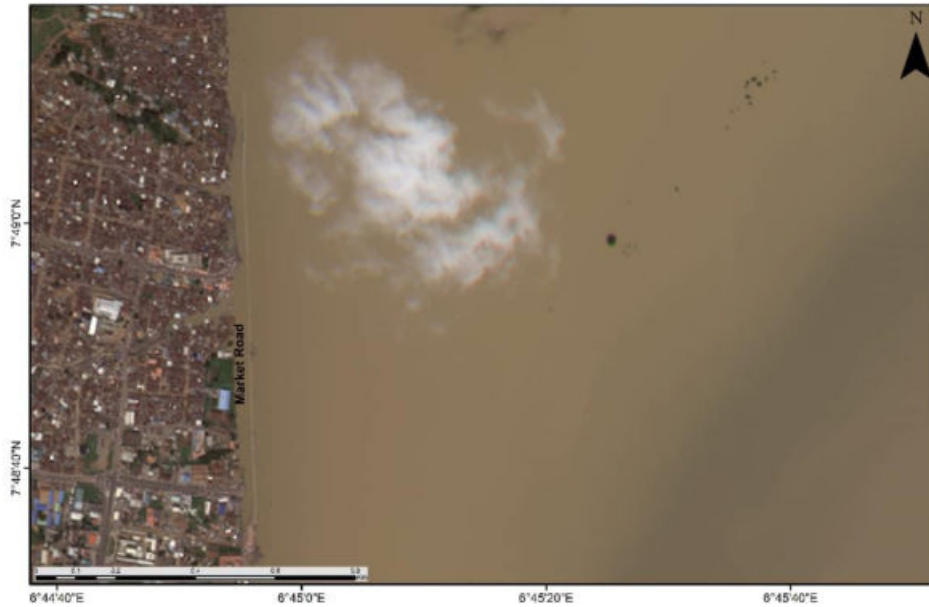
Disclaimer

This product has been derived automatically without validation data. All geographic information has limitation due to the scale, resolution, date and interpretation of the original source materials. No liability concerning the content or the use thereof is assumed by the producer.

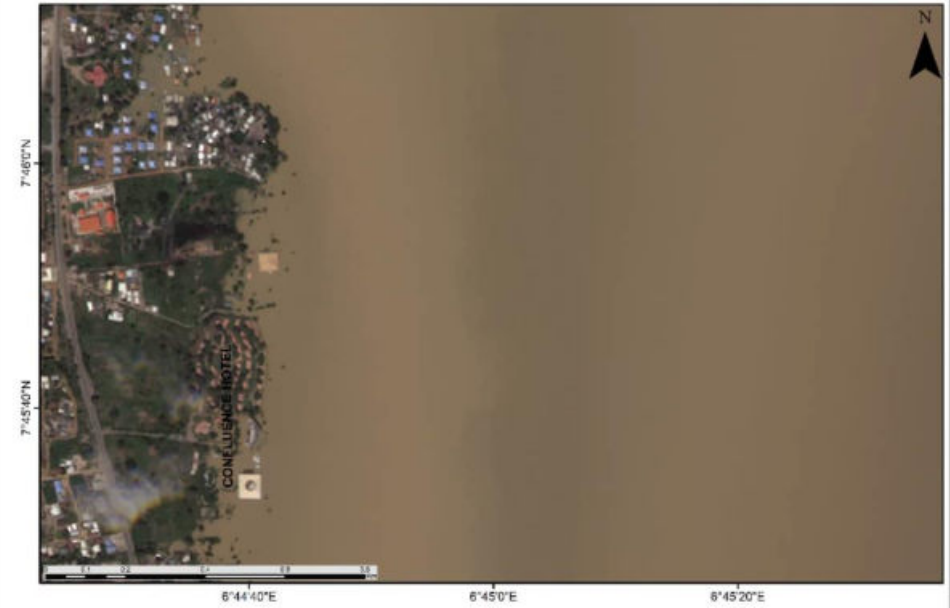
Legend



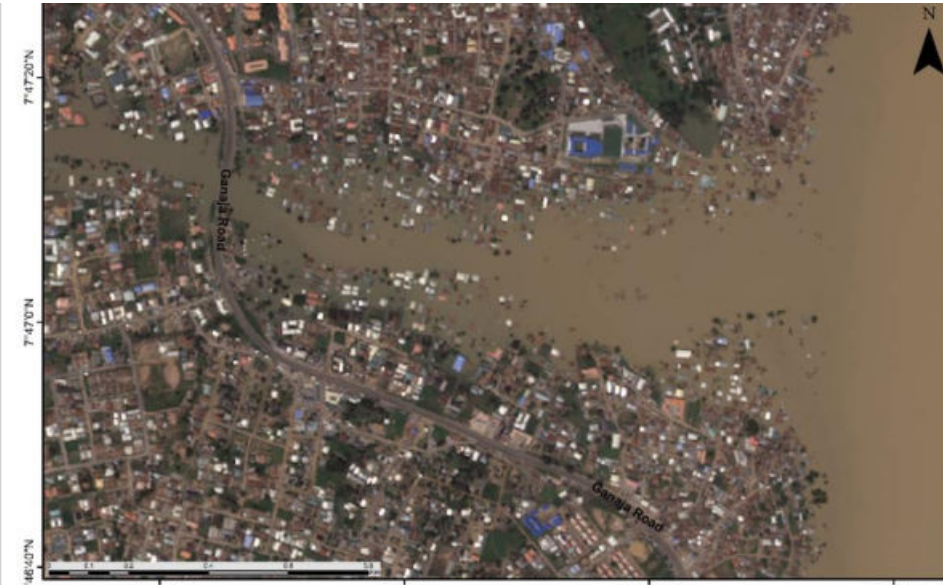
MARKET ROAD



CONFLUENCE HOTEL



Ganaja Junction



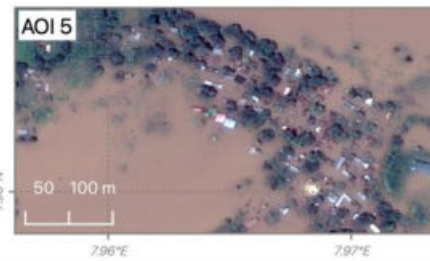
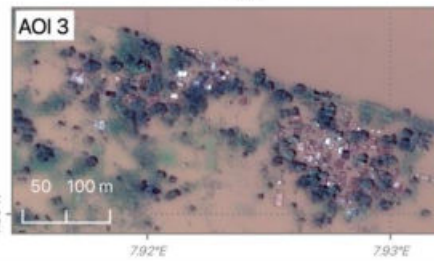
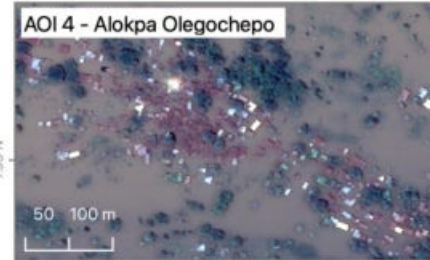
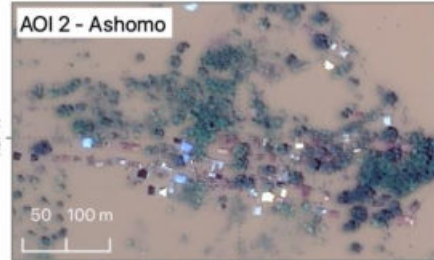
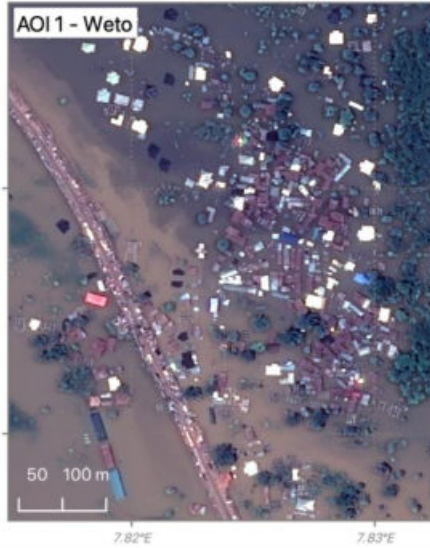
NATACO JUNCTION





Flooded Villages Between Loko and Ekwakwa in Benue State, Nigeria - 24 Sep 2022

Analysis derived from Pleiades-1A Multispectral EO data acquired on 24 Sep 2022



[Act-777/Call-895] Flood in Nigeria

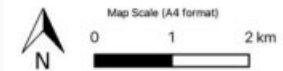


Torrential rain has caused flooding in Nigeria. Jigawa state is particularly experienced heavy flooding. The floods have submerged buildings and agriculture, and there are concerns that the Niger and Benue Rivers may flood as their water levels rise. This map illustrates a True Color hand composite from optical data acquired on the 24/09/2022 by the Pleiades-1A satellite over the Benue state, Nigeria. This preliminary analysis shows multiple villages between Loko and Ekwakwa in Benue State potentially affected by the large flood of the Benue river. EO data has been processed with the ESA Charter Mapper processing environment developed and operated for ESA by Terradue.

Legend

- Populated place
- AOI
- Road
- ESA WorldCover 2020 Permanent water
- DLR World Settlement Footprint 2019 Built Up

Map Publication Date: 2022-09-24
 Map resolution: 300 dpi
 Coordinate System: WGS 1984 Web Mercator
 Auxiliary Sphere
 Projection: Mercator Auxiliary Sphere
 Datum: WGS 1984



Satellite data: Pleiades-1A ORTHO product acquired on 24/09/2022 at 09:43:35 UTC.
 Other data: World Settlement Footprint 2019, ESA World Cover 2020, H2020SM.
 Copyright: Pleiades © CNES (2022), Distribution Airbus DS. EO data processed by Terradue. Value Adder: VA_ESA_Marcorace

This is a preliminary analysis and has not been validated in the field. No liability concerning the contents of the map issued is assumed by Terradue. The information has limitations due to the quality and resolution of the original data sources and cloud coverage.





FLOOD DAMAGE EXTENT IN ONITSHA , OCTOBER 12, 2022

Before



After





FLOOD DAMAGE EXTENT IN ONITSHA , OCTOBER 12, 2022

Before



After





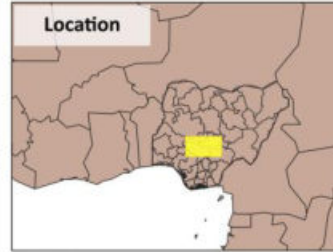
Flooded Cropland - Benue River; Benue-Niger confluence. Situation on 2022-09-19. Overview Map, Close-Up Maps and Table on Flooded Cropland Area per District.

Background
Torrential rainfall has caused severe riverine floods across the Niger and Benue rivers throughout Nigeria.

Description
This flood map shows areas flooded by water by the Benue and Niger rivers across multiple states in central Nigeria with a focus on flooded cropland (cropland as of 2020, as classified by the ESA WorldCover product). The HASARD Flood extent algorithm was applied, using a reference scene from 2022-08-02 compared to the situation on 2022-09-19 using Sentinel-1 radar data. The table on the right-hand side lists the districts within the processed region that contain affected cropland. **Within the processed region, a total area of over 272 km² of cropland were inundated as of 2022-09-19.** Note that within districts which are not fully covered by the processed area, further cropland might be flooded that is not shown on this map and not accounted for in the tabular data. This data is not verified.

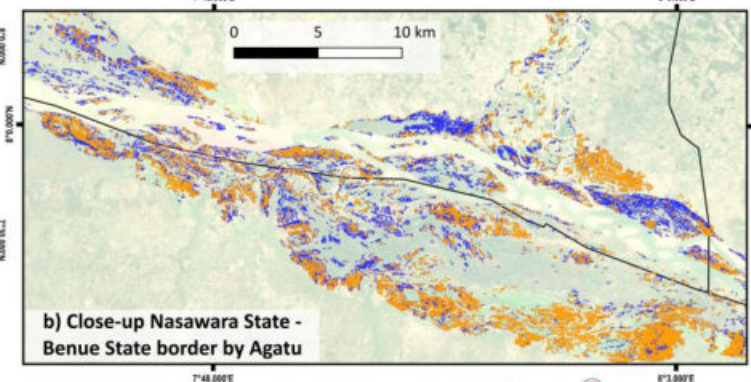
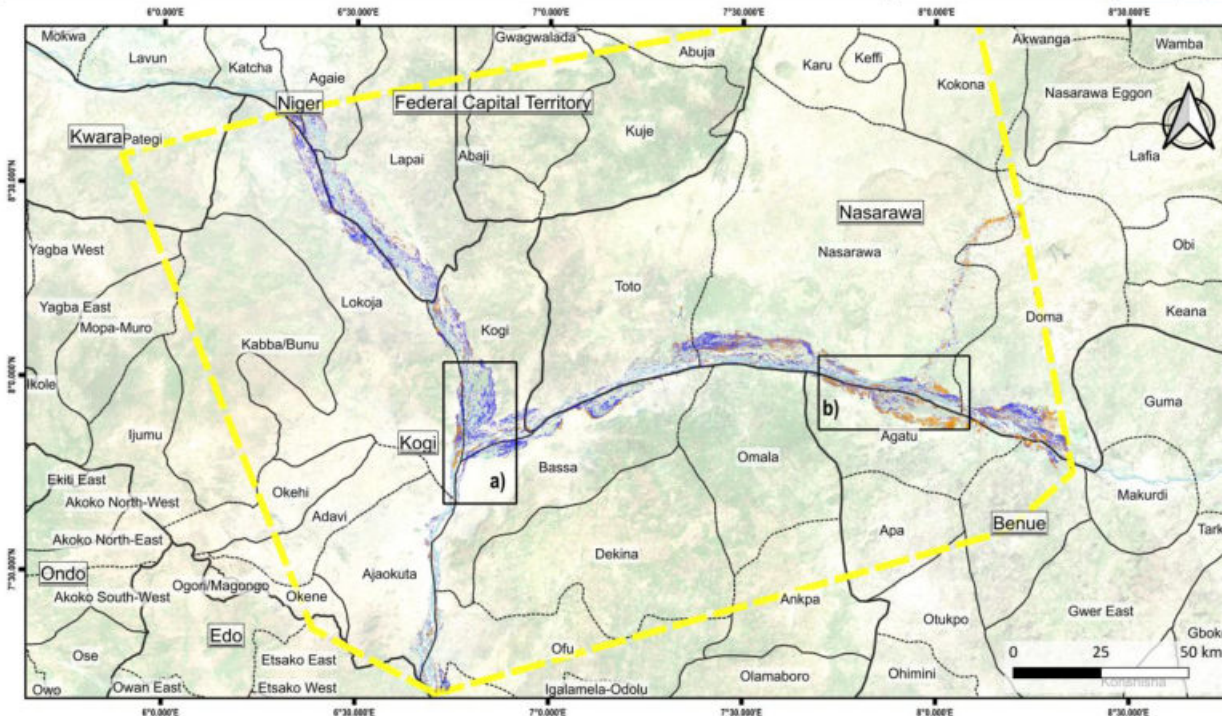
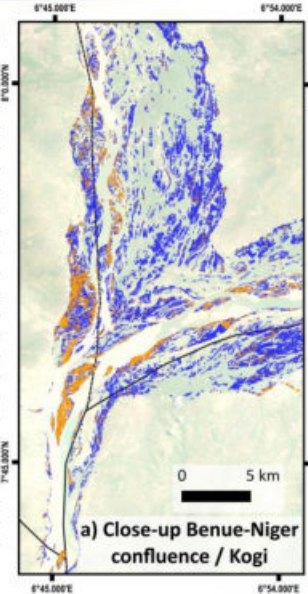
Legend

- Processed Area
- Flooded Cropland
- Flooded Area (in general)
- District Borders
- State Borders



Flooded agricultural area by district (within processed area)
Sorted from high to low

State	Administrative District	Flooded Cropland [km ²]
Nasarawa	Nasarawa	71,71
Benue	Agatu	50,56
Nasarawa	Doma	38,02
Kogi	Kogi	24,37
Kogi	Lokoja	24,25
Niger	Lapai	16,63
Kogi	Bassa	11,15
Nasarawa	Toto	10,47
Kogi	Ajaokuta	7,45
Benue	Gwer West	5,58
Kogi	Ofu	5,24
Niger	Agai	3,32
Niger	Katcha	1,98
Federal Capital Territory	Kwali	0,48
Kogi	Igalamela-Odolu	0,39
Kogi	Omala	0,20
Federal Capital Territory	Abaji	0,07
Nasarawa	Kokona	0,07
Nasarawa	Karu	0,04
Benue	Apa	0,02
Kwara	Pategi	0,02
Federal Capital Territory	Abuja	0,01
Edo	Etsako East	< 0,01
Total in processed area		272,04



Data sources Contains modified Copernicus Sentinel data [2022] Administrative boundaries: GADM Background: © here, BING, Microsoft (2022)
Contains modified Copernicus Sentinel data (2020) processed by ESA WorldCover consortium
Local projection: UTM 32N, Datum: WGS 84





Conclusion

- One of the advantages of satellite remote sensing is access to information without being in physical contact with the source of the information.
- Moreover, the synoptic view of the area of interest is provided.
- These advantages will continue to support all phases of disaster management cycles.
- The Agency is planning a workshop with the disaster management agency in Nigeria to discuss feedbacks on the efficacy of the maps products.





Thank You