

“Space-based Solutions for Disaster Risk Management and Emergency Response in Nigeria”  
13 to 15 April, 2021

## Multi-scale Flood Monitoring and Assessment Services for West Africa (MiFMASS)

– **Ganiy Agbaje, PhD, – Exec. Director, CSSTE**



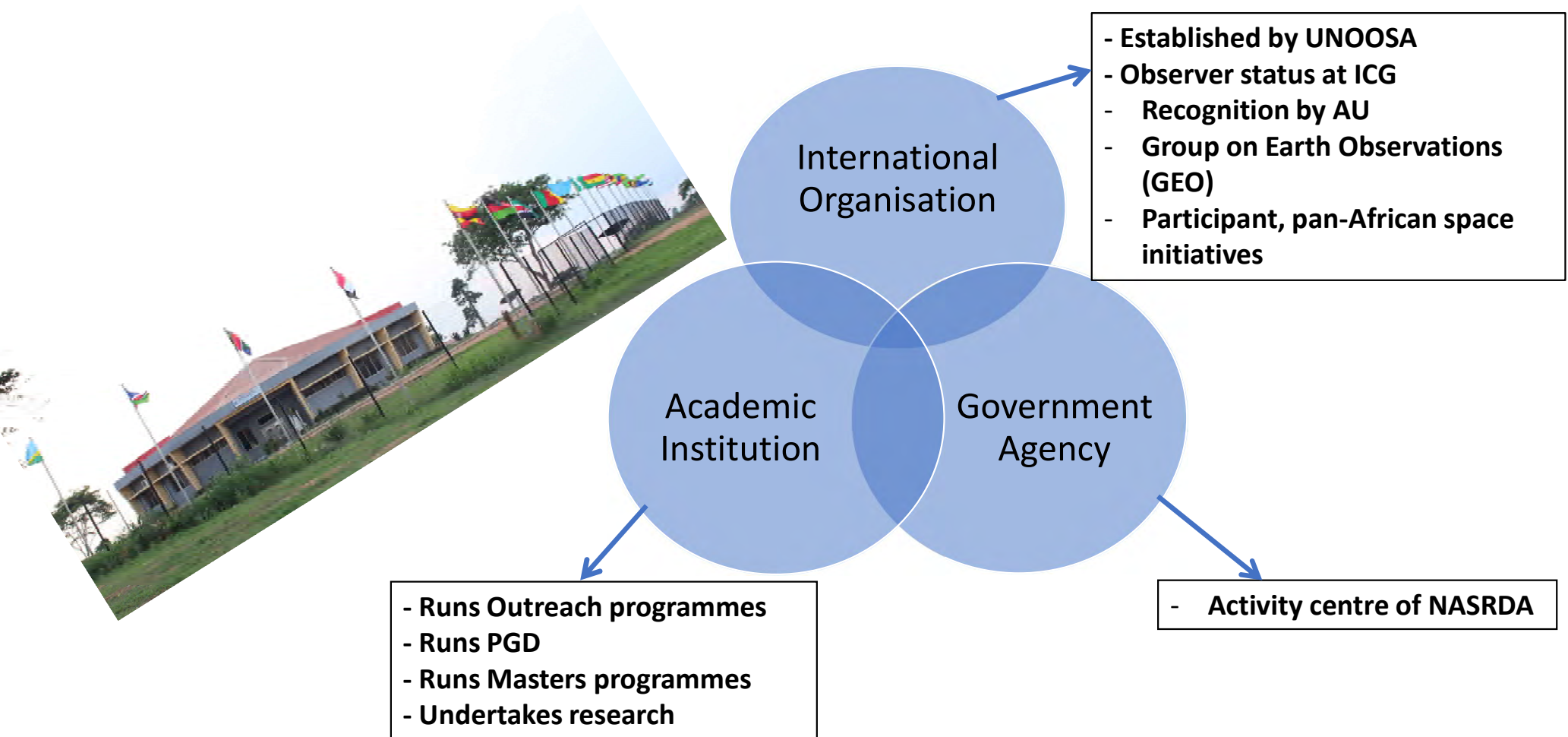
Component 1: Water Resources Monitoring

Theme 1: Surface Water Monitoring

L113 – Riverine Floods Monitoring and Assessment



## ARCSSTE-E/CSSTE – About Us



## Programmes of the UNOOSA Regional Centres

### Mission

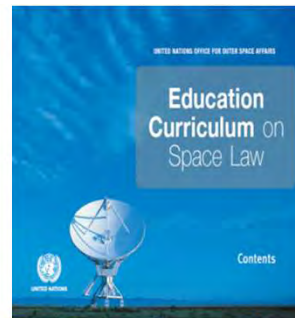
“Develop, through in-depth Education, Indigenous Capability in the Core areas of Space Science and Technology”

### Programmes

- PGD(9 months)
- Masters (18 months)
- PhD (48 Months) \*

### Core Modules

- Remote Sensing/Geographic Information Systems (GIS)
- Satellite Communication
- Satellite Meteorology/Global Climate
- Basic Space Science/Atmospheric Physics
- Global Navigation Satellite Systems (GNSS)
- Space Law



# Multi-scale Flood Monitoring and Assessment Services for West Africa (MiFMASS)

## CSSTE CONSORTIUM - PARTNERS



**GMES**  
AND AFRICA



**INE-NWI – National Water Institute, Benin**



**UG – University of Ghana, Department of Earth Sciences, Ghana**



**VBA – Volta Basin Authority, Burkina Faso**



**CSIR-WRI – Council for Scientific and Industrial Research-Water Research Institute, Ghana**



**ISESTEL - Institut Supérieur d'Etudes Spatiales et Télécommunications, Burkina Faso**



**CURAT - Centre Universitaire de Recherche et d'Application en Télédétection, Cote d'Ivoire**



**Centre for Space Science and Technology Education in English, Nigeria**  
**Consortium Lead and Regional Implementation Centre (RIC)**

**Seven Institutions across  
five (5) West Africa  
Countries – Ghana, Benin,  
Cote D'Ivoire, Burkina Faso,  
and Nigeria**



MiFMASS

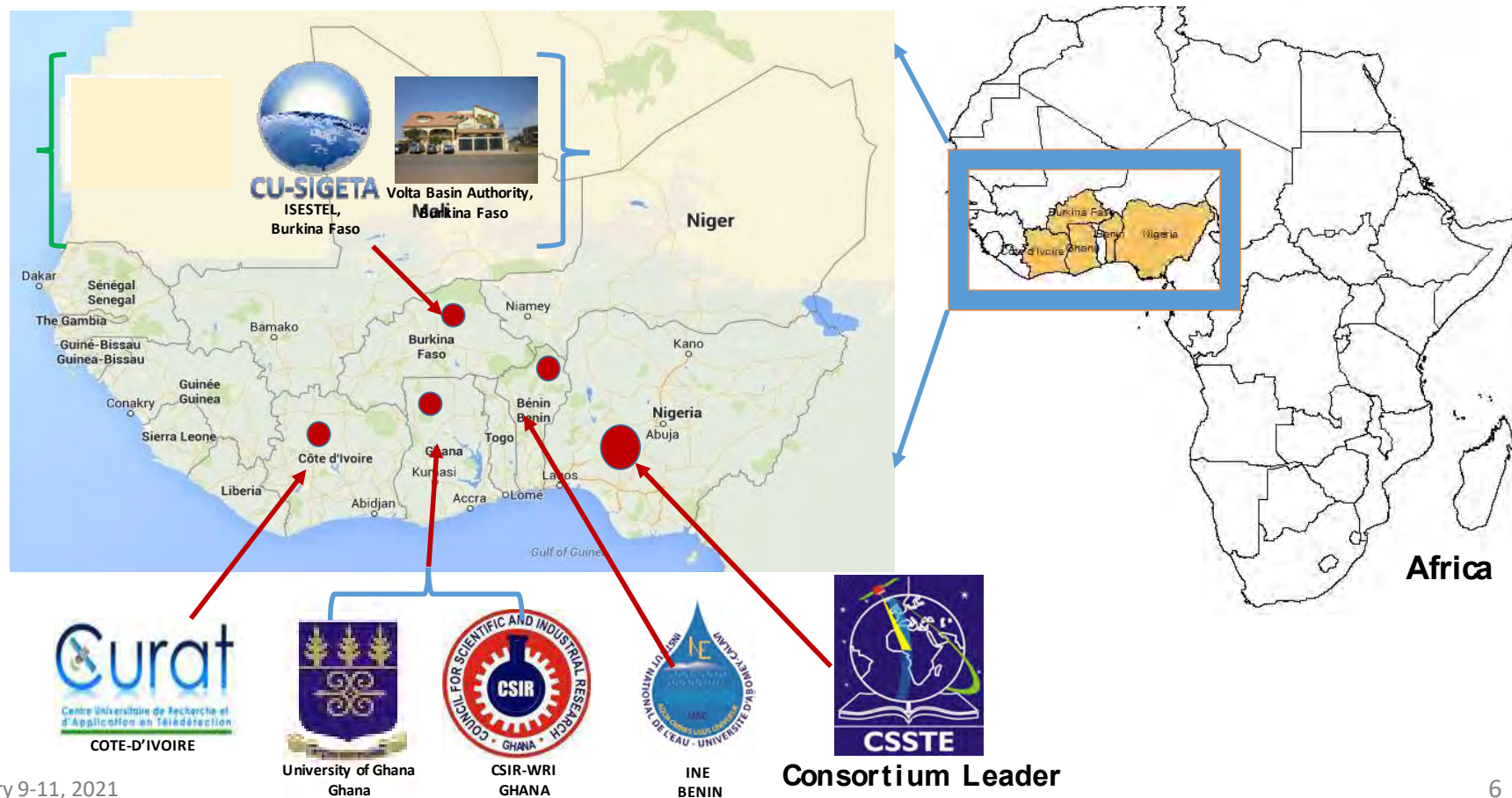
Intro.

@EUC Filming  
Mission (2020)



## MiFMASS Geographical coverage

CSSTE



February 9-11, 2021

Flood Monitoring and Flood Forecasting - Online

# Multi-scale Flood Monitoring and Assessment Services for West Africa (MiFMASS)

CSSTE

## • Status

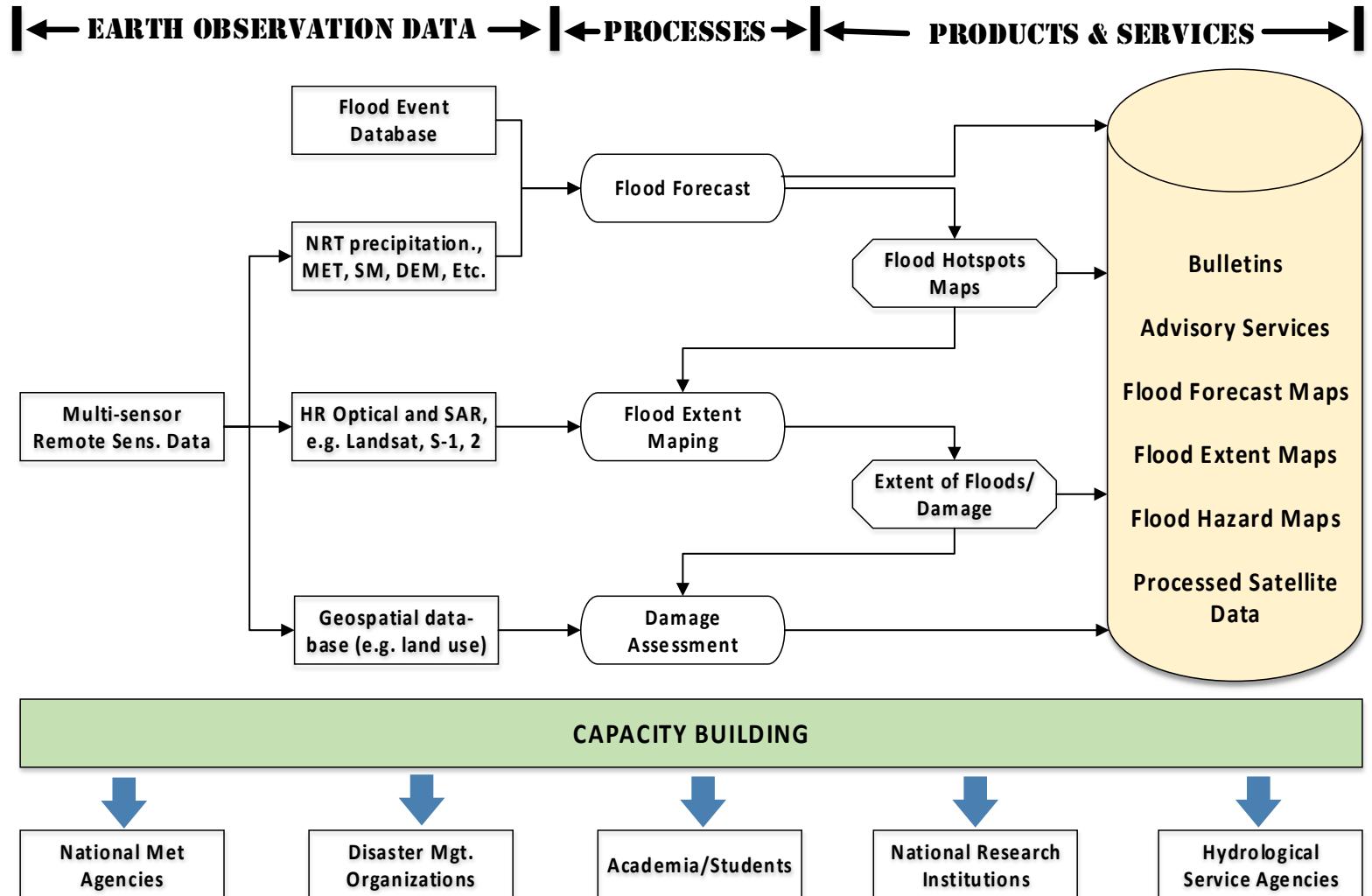
- To enhance the efficiency of flood monitoring, assessment and management in West Africa by providing **Earth Observation (EO) based services** on near real time basis to disaster management organizations and boosting their human capacity to adapt to these services.

## Specific Objectives

- Establish and **updatable flood event database**
- Provide DMOs timely information before, during and after flood events
- **Strengthen the capacities** of DMOs and other **target groups** (Farmers, Local residents along flood plains) in the use of Earth Observation data for flood monitoring, Assessment and management

**\*\* Data – Freely Available & accessible**  
**Software - Open Source**

# Methodology



Methodological overview of The Proposed Service



## Multi-scale Flood Monitoring and Assessment Services for West Africa (MiFMASS)

### Expected Services & Products

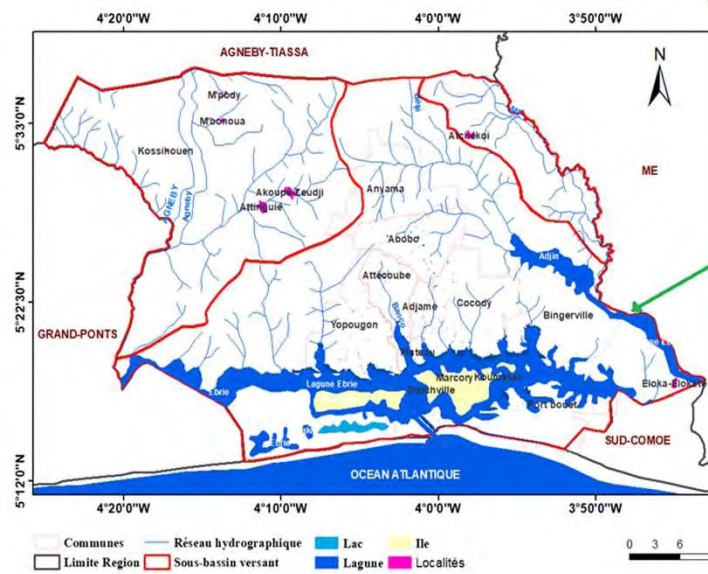
CSSTE

- ✓ Develop a regularly updated regional scale flood event database of the Study Area for the five countries
- ✓ Establish a Flood Forecasting and Assessment system
- ✓ Establish an image acquisition, processing and analysis system to map flood extent during, or immediately after, flood events from EO data
- ✓ Develop a damage assessment module that will assist DMOs evaluate the degree of damage after flood events
- ✓ Capacity Building



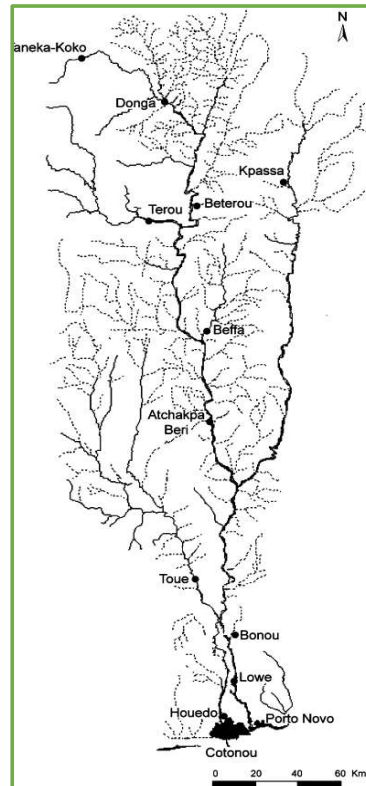
## Study Locations

CSSTE

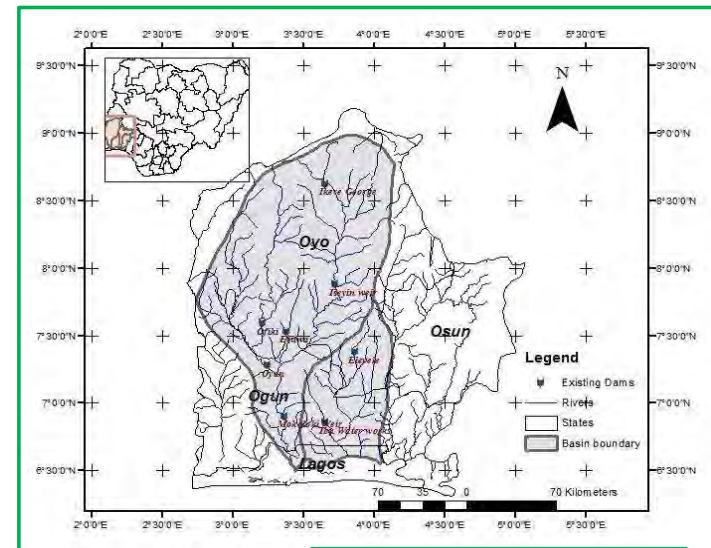


Cote d'Ivoire: District of Abidjan

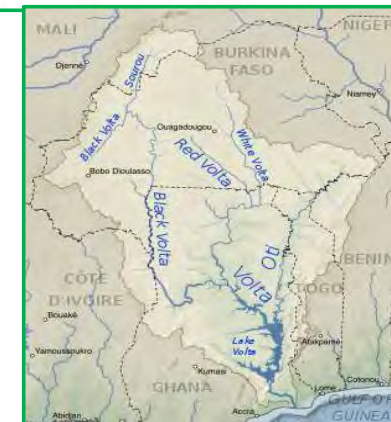
Nigeria: Ogun-Oshun Basin



Benin: Oueme Basin



Ghana:  
Black Volta  
Burkina Faso:  
Volta Basin – (Bobo  
– Dioulasso)



## Background to the MifMASS Riverine Flood Modelling

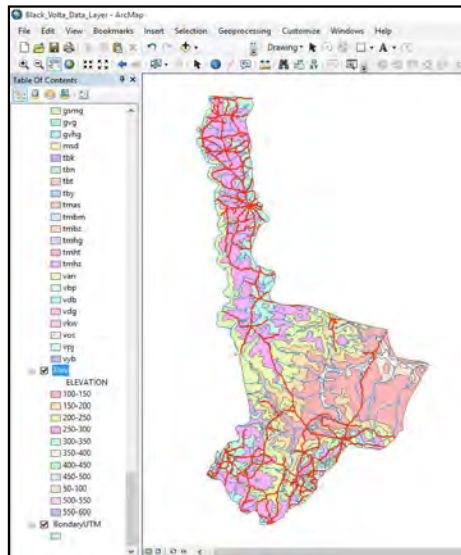
CSSTE

- Developed a framework for **Regional-scale Flood modeling** that integrates GIS and two (2) hydrological models:
  - Hydrologic Engineering Center-Hydrologic Modeling System (**HEC-HMS**)
  - Hydrologic Engineering Center-River Analysis System (**HEC-RAS**)

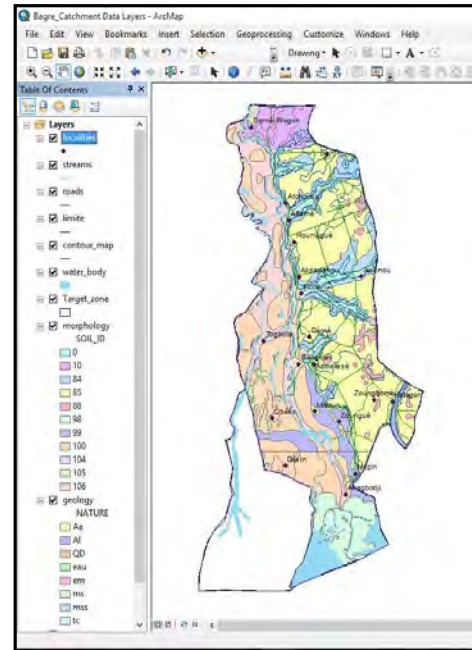
The two (2) models are used to simulate and **model relations between rainfall and runoff** in MifMASS Project sites (Benin, Burkina-Faso, Côte-d'Ivoire, Ghana and Nigeria)

- **The Model consists of:**
  - A rainfall-runoff model (HEC-HMS) that converts precipitation excess to overland flow and channel runoff
  - A hydraulic model (HEC-RAS) that models unsteady state flow through the river channel network based on the HEC-HMS derived hydrographs.

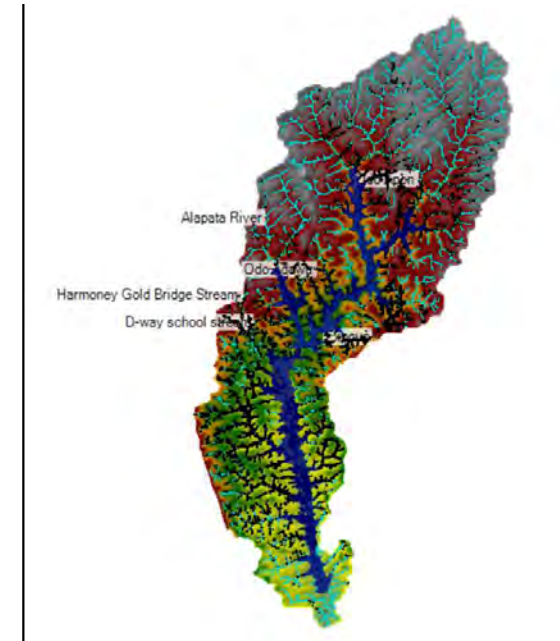
## Study Model Sites



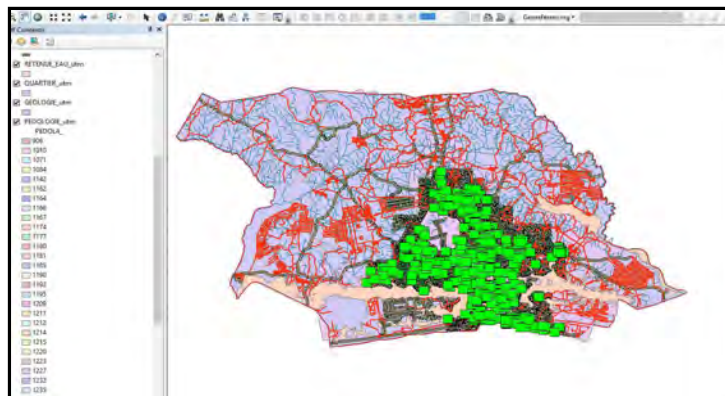
## Ghana Study Area: Black Volta



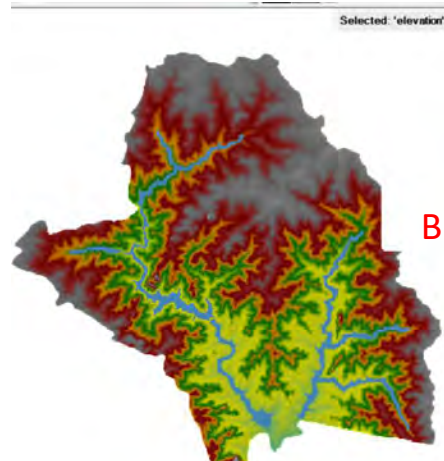
## Benin Rep Study Area



## Nigeria Study Area Extent



Cote\_D'Ivoire Study Area file overlay



## Burkina Faso Study Area Extent



## Ona Riverine Flood Mapping Boundary in Nigeria

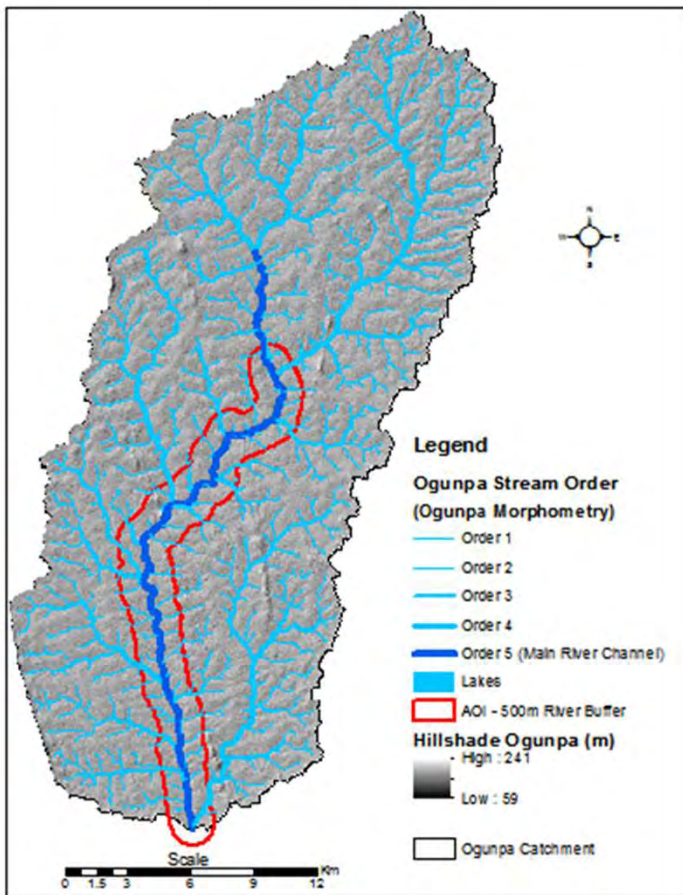


Figure 6. Catchment Boundary, Networks and Stream Order (see AOI extent)

February 9-11, 2021

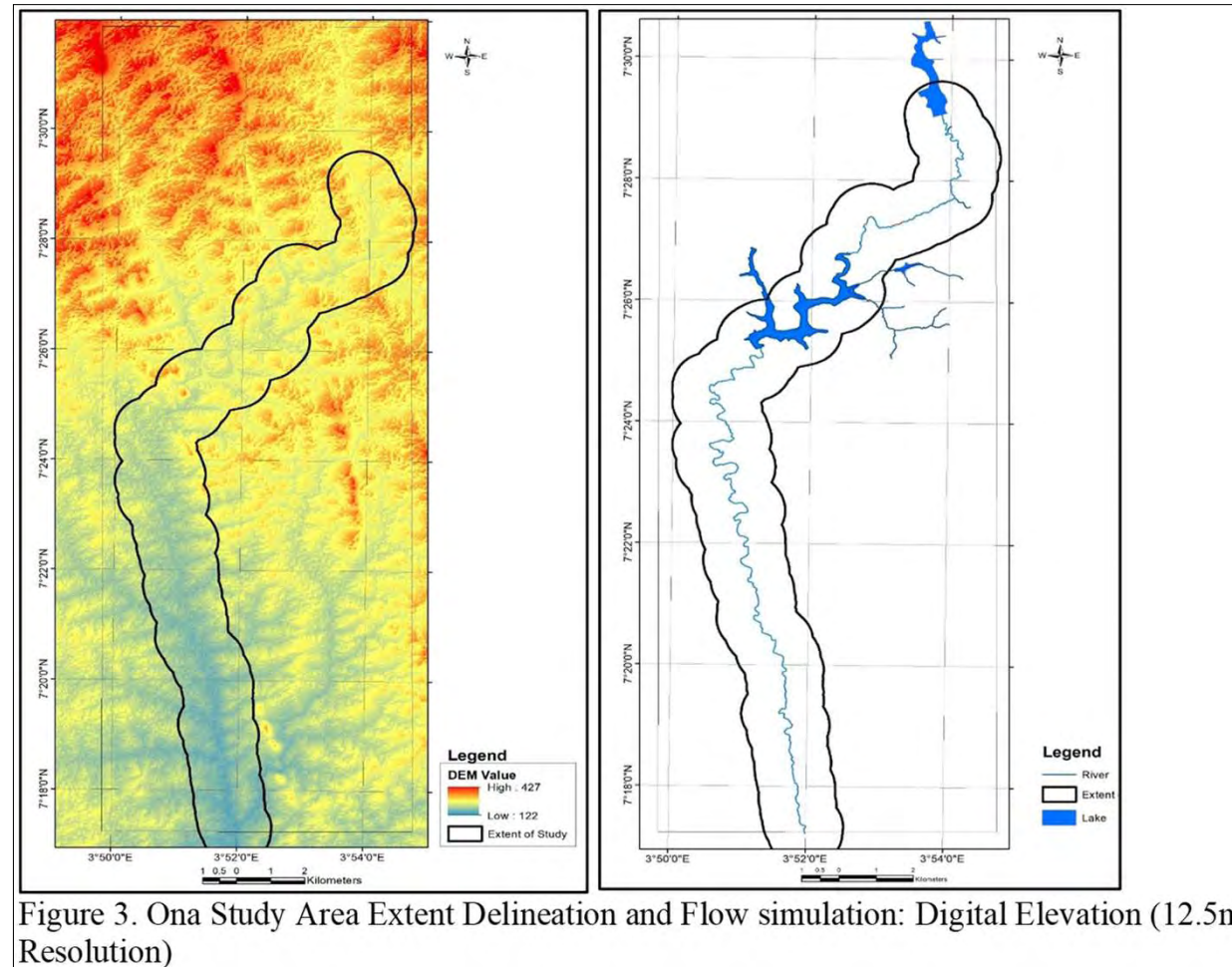
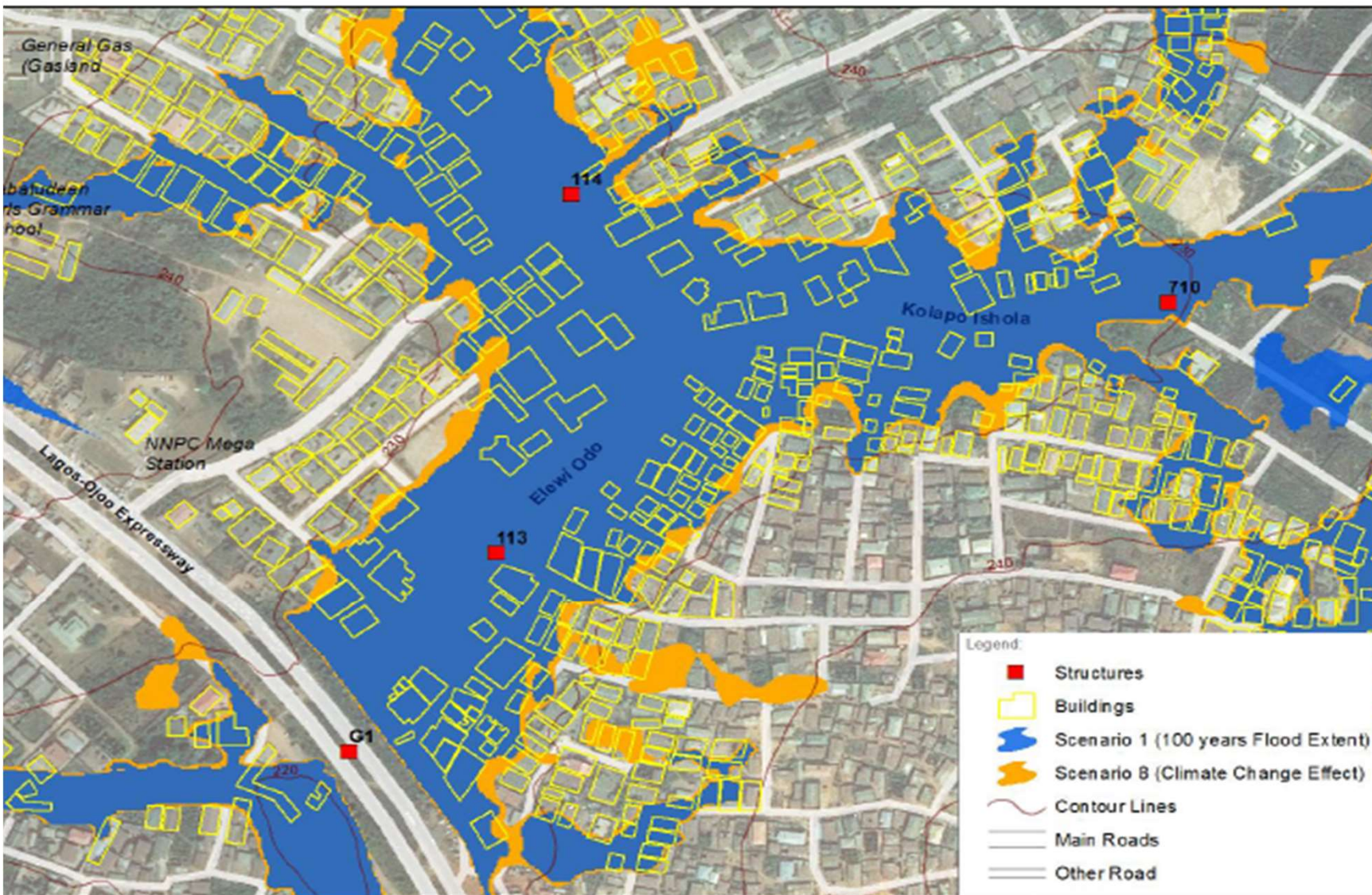


Figure 3. Ona Study Area Extent Delineation and Flow simulation: Digital Elevation (12.5m Resolution)

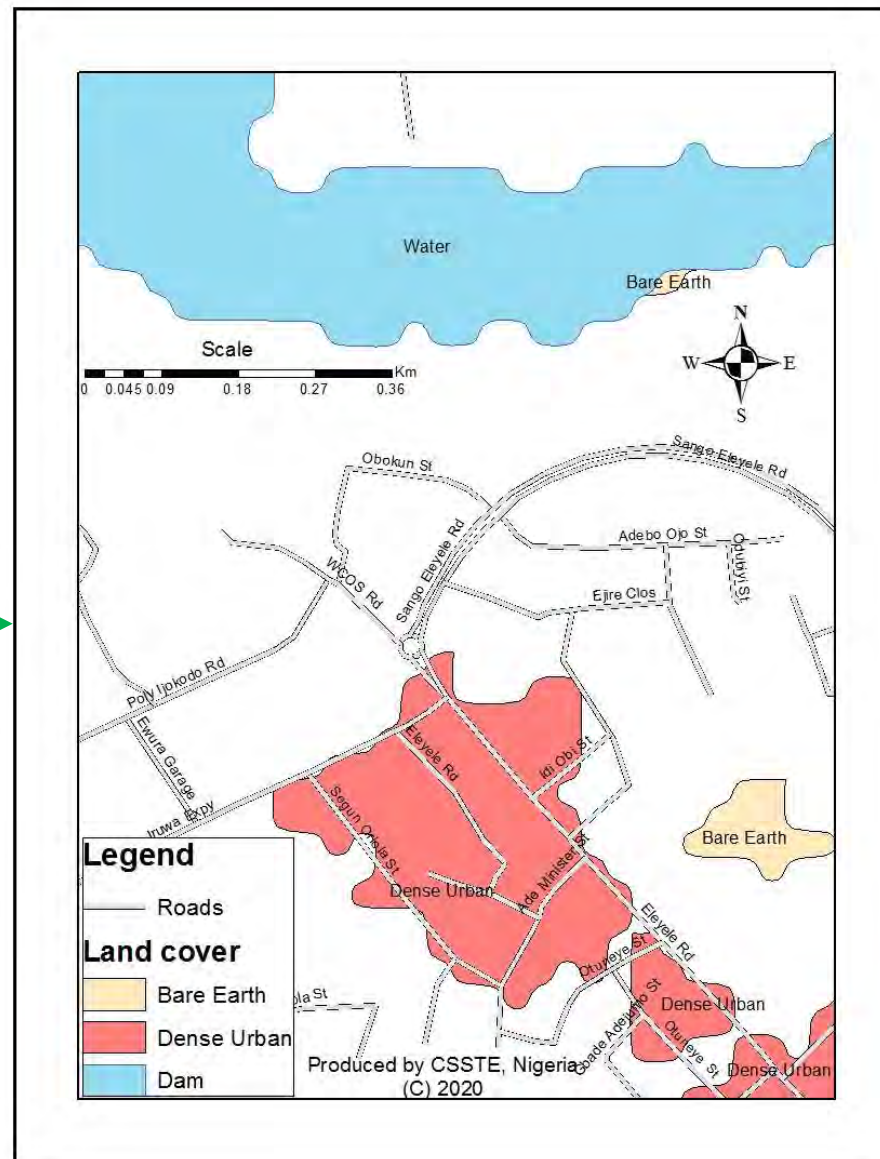
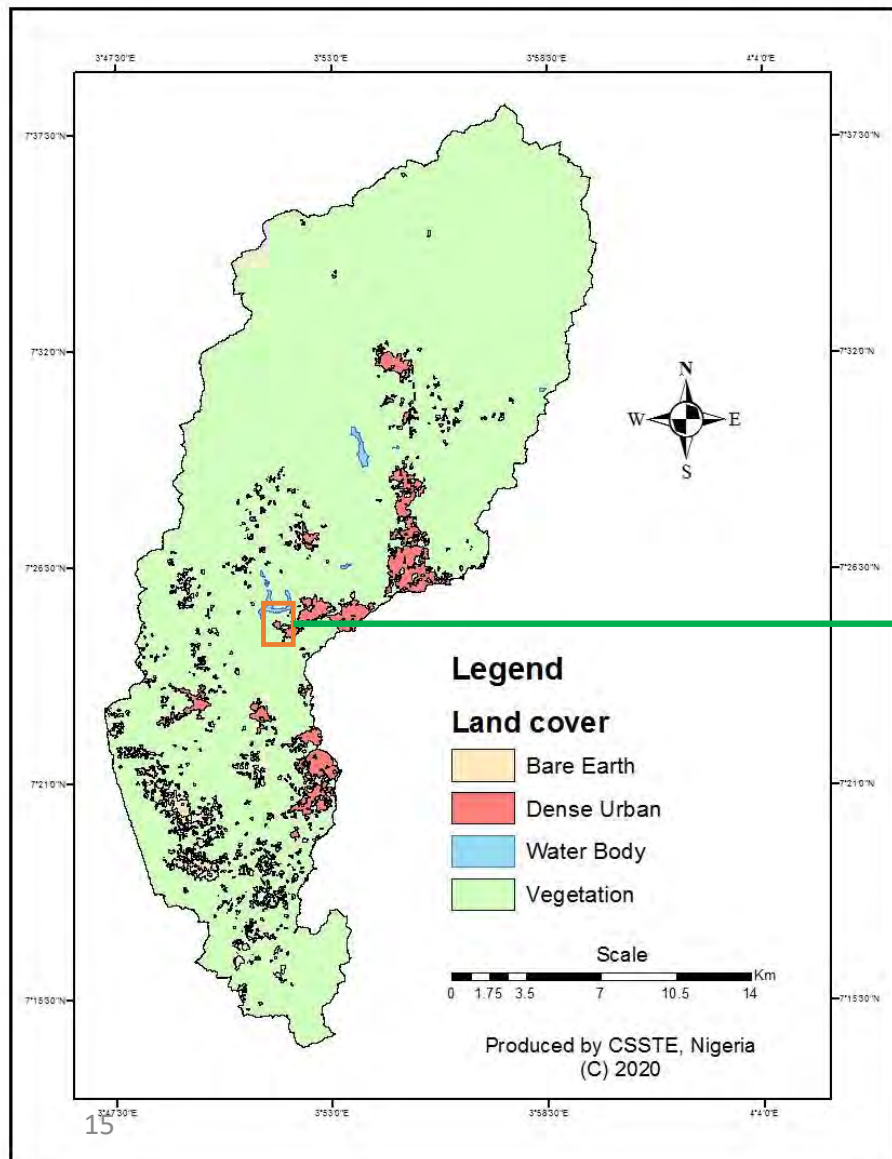
Flood Monitoring and Flood Forecasting - Online



**Inundation  
and Flood  
Extent Map -  
part Ona River  
Basin, Ibadan,  
Nigeria  
Overlayed on  
Satellite  
imagery**







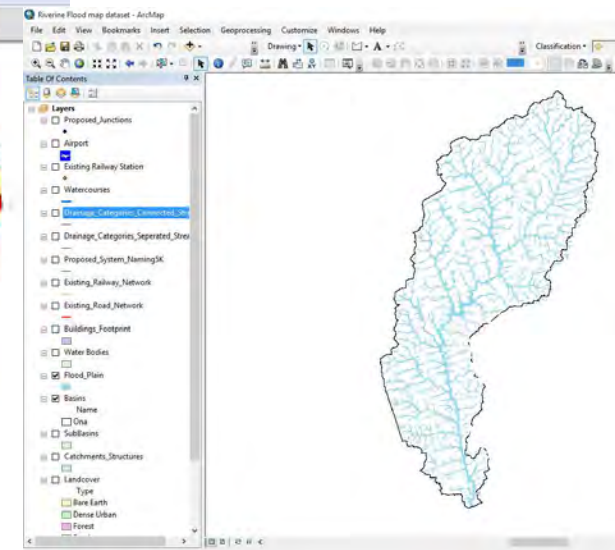
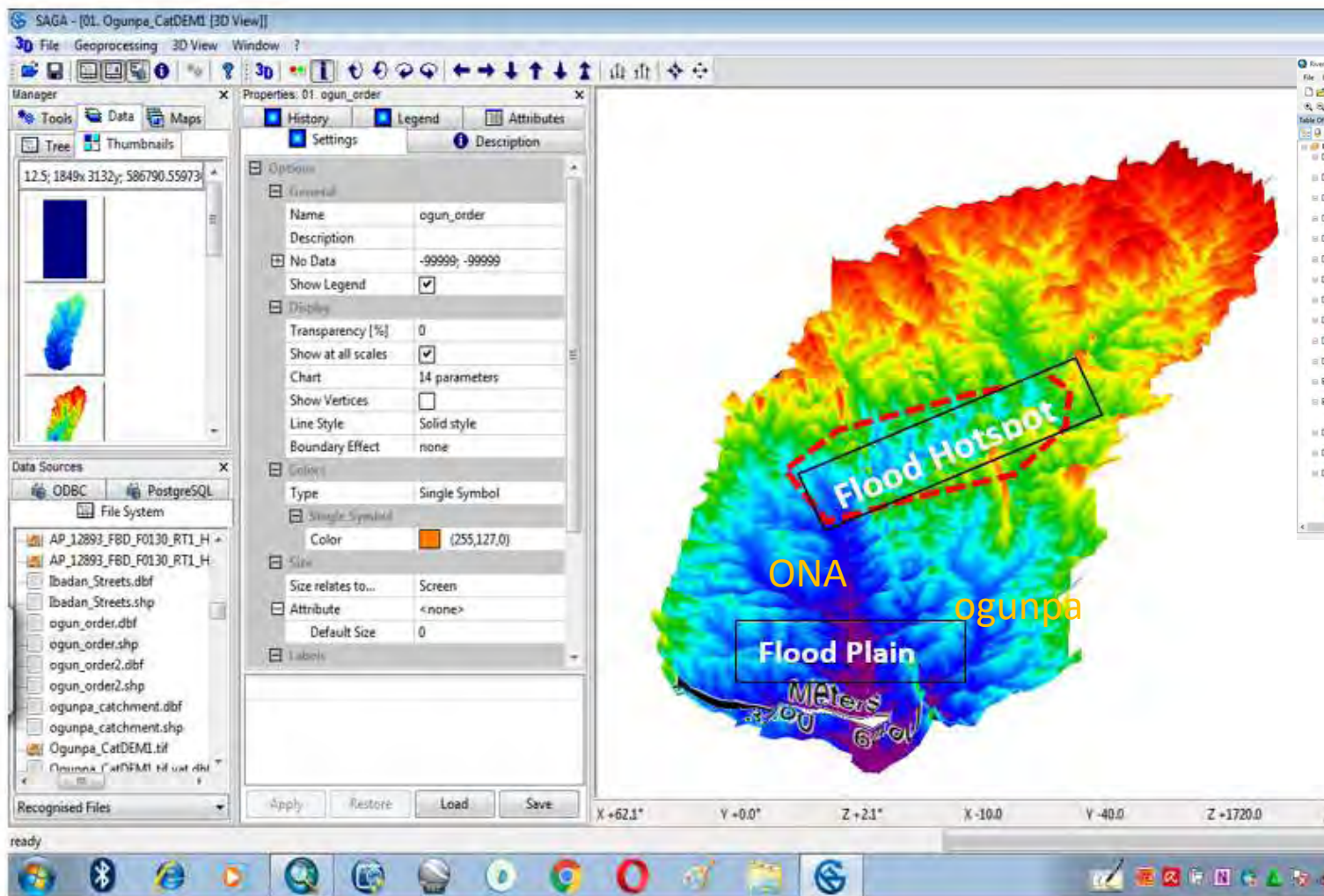


Figure 7. T4.8 Identification of flood vulnerability hotspots





**GMES  
AND AFRICA**

## Product and Service Delivery: Expected Product 1



Expected products- Classification	Service packs- Packaging the service	Targeted users	Means of Service Delivery	Dissemination Channels and platforms	Periodicity
<b>Flood Forecasting</b> <i>(How severe and for how long)</i>	Textual Information (Colour code): 'Green' for Safe 'Yellow' for Unsafe 'Red' for Highly unsafe	<b>Nigeria:</b> End-user – Local community: Ogunpa and Kudeti (Oyo State)  <b>Benin:</b> Oueme Basin Authority  <b>Ghana:</b> NADMO Local community in Black Volta Basin  <b>Burkina Faso:</b> Ouagadougou commune	Radio announcements (To use a Radio Presenter who understands the subject matter and can speak the local language),  Town Criers (community heads),  SMS to CBOs or Community Leaders  Internet,	Local Radio station  Social Media (Facebook and twitter)	Daily (During the Rainy season: March - October)



**CSSTE**

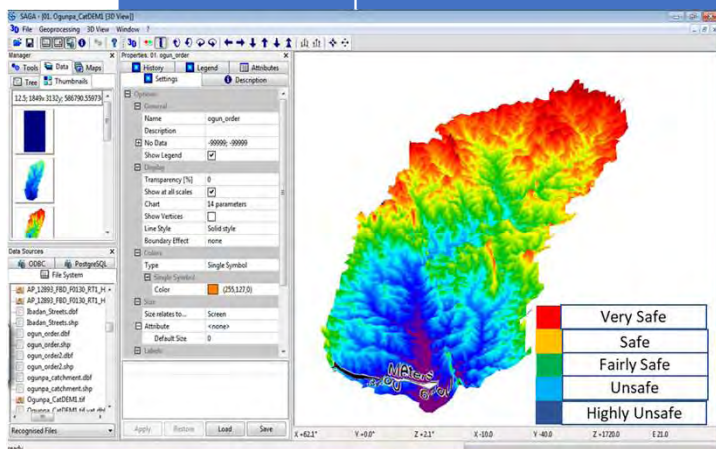


**GMES  
AND AFRICA**

## Product and Service Delivery: Expected Product 2



Expected products- Classification	Service packs- Packaging the service	Targeted users	Means of Service Delivery	Dissemination Channels and platforms	Periodicity
<b>Forecast Maps (Service) and Flood Event Database</b>	<b>Delineated maps (digital) with legend indicating severity of flood</b>	<p><b>Nigeria:</b> NEMA, Fed. Min of Environment NIHSA, and NIMET</p> <p><b>Cote D'Ivoire:</b> OCHA/DRR, SODEXAM,</p> <p><b>Benin:</b> ANPC, SAP- BENIN, DGEau and Oueme Basin Authority</p> <p><b>Ghana:</b> NADMO, Water Resources commission</p>	<p>Internet</p> <p>Flood Alerts/Warning</p> <p>Scientific papers</p>	<p>MIFMASS webpage</p> <p>Flood Alert Bulletins</p> <p>Geo Journal and Journal of Environmental studies and Sciences - Springer</p>	<b>Bi-Monthly - during Rainy Season</b>



**GMES AND AFRICA**

[Town Name]

### Be Flood Ready !!

Come to let's discuss opportunities to make our community safer.

[month day, year]  
[time]  
[location]

For more information and to RSVP contact:  
[Name]  
[phone]  
[email]

**Enlightenment Flyers**



**CSSTE**



**GMES  
AND AFRICA**

## Product and Service Delivery: Expected Product 3



Expected products- Classification	Service packs- Packaging the service	Targeted users	Means of Service Delivery	Dissemination Channels and platforms	Periodicity
<b>Capacity Building (EO Download and Processing Routine, Flood Event Database Development)</b>	Capacity building on development of an updatable Flood Event Database and EO Download and Processing Routines  Short term trainings and  Long term training: MSc  MTech.  MPhil Hydrogeology, University of Ghana	DMOs from each Partner Country     Successful applicants from 5 Partner countries for the MSc Scholarship	Workshop (one for English and French speaking)  Online (E-learning)    On-site training	Project website  Seminars, Workshops,  <b>Nigeria:</b> FUTA CURAT:Felix Houphouet Boigny University of Abidjan. <b>Benin:</b> NWI, University of Abomey-Calavi, Benin <b>Ghana:</b> Univ. of Ghana	One Week training 2 times a year          18 Months Full time programme





**GMES  
AND AFRICA**

## Product and Service Delivery: Expected Product

4



Expected products- Classification	Service packs- Packaging the service	Targeted users	Means of Service Delivery	Dissemination Channels and platforms	Periodicity
<b>Flood Mitigation and Management</b>	Enlightenment, and knowledge sharing sessions to aid Flood mitigation policies/plans	Decision-makers (House and Senate Committees on Disaster and Heads of Hydrological and Disaster Mgt. Organisations)  Water Resources Commission, Ghana	Outreach (Workshop/Symposi um)  Enlightenment Flyers  Media: Broadcast: Radio Nigeria, NTA  Print: Tribune	On-site interaction    Broadcast media channels	Once a year



### FLOOD MANAGEMENT

Nigeria, 4 Other West African Countries Synergize  
Towards Managing Scourge Through Space Technology

**ait News**

**CSSTE**



**DR GANIY AGBAJE**  
Executive Director, Centre for Space Science and Technology Education (CSSTE) Nigeria






**GMES  
AND AFRICA**

## Product and Service Delivery: Expected Product

5



Expected products- Classification	Service packs- Packaging the service	Targeted users	Means of Service Delivery	Dissemination Channels and platforms	Periodicity
<b>Damage Assessment</b>	<b>Lists of Frequent Flood hazards, Special Reports/Briefs, Reprints (on Rainstorms, Floods, Impacts, action plans)</b>	<b>Decision Makers and DMOs above as listed above,  Insurance Companies (AIICO, IGI)  Humanitarian Organisations (Nigeria Red Cross), OCHA  NGOs – World Vision Ghana; Catholic Relief Services, CRS</b>	<b>Publications</b>  	<b>Damage Assessment Information Booklet</b>  <b>Insurance Companies</b>	<b>Annual</b>



**CSSTE**



## Project Scholars - Masters' Students

### Short Term Trainings

S/N	Date & Venue	Title (Status)	# of Target Trainees
1	26 – 28 November 2019, Benin Republic	Flood Database Management <b>(Completed)</b>	30
2	18 -19, August, 2020 (Online)	Acquisition and Use of Sentinel 1, 2 & 3 Data: Processing and Application <b>(Completed)</b>	59
3	9 - 11February, 2021 (Online)	Flood monitoring and Forecasting Modeling <b>(Completed)</b>	70
4	23 -25 February, 2021 (Online)	API development interfacing services into information on mobile applications, mail, and sms diffusion systems <b>(On-going)</b>	70
5	6-89 -11 March 2021, (Online)	Training on E-station installation, operations and trouble shooting <b>(Outstanding)</b>	70
6	6-8 April 2021, (Online)	Training on technique for sharing, validating and dissemination of products <b>(Outstanding)</b>	70







Photo Gallery



# Snapshots From MIFMASS Geoportal Services

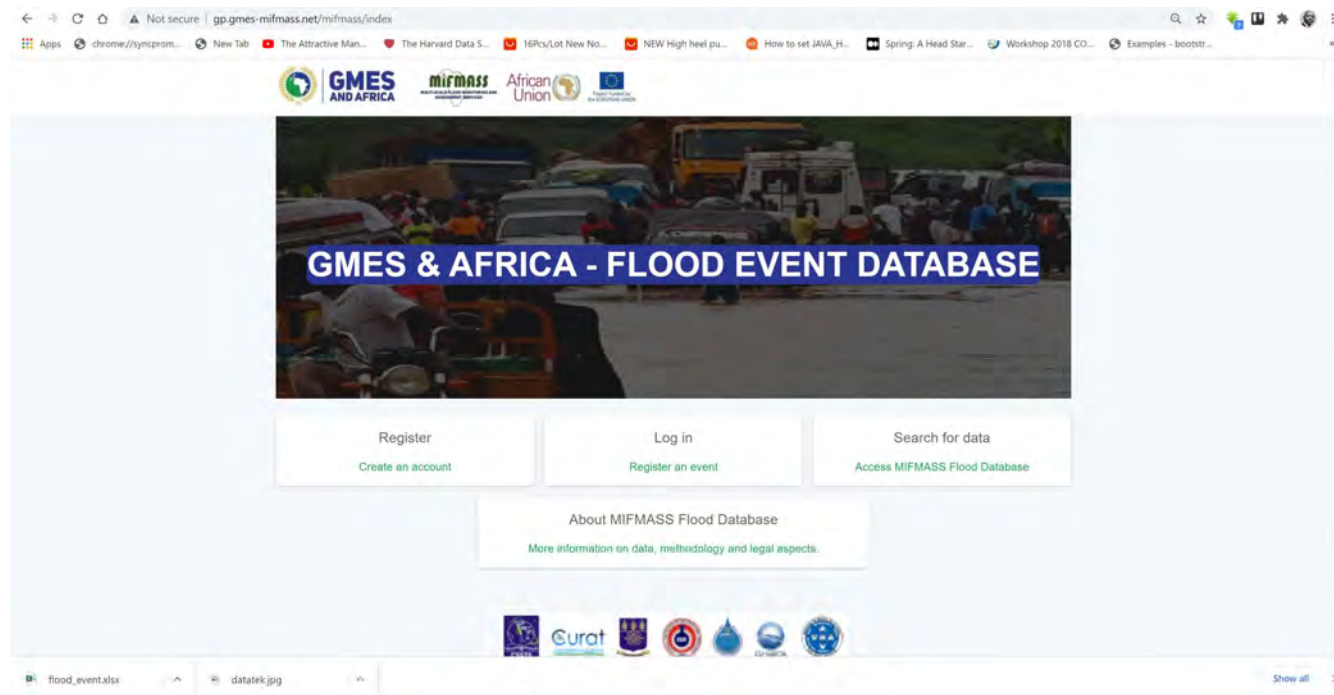


# Project website cont'd

<http://gmes-mifmass.net/mifmass/>

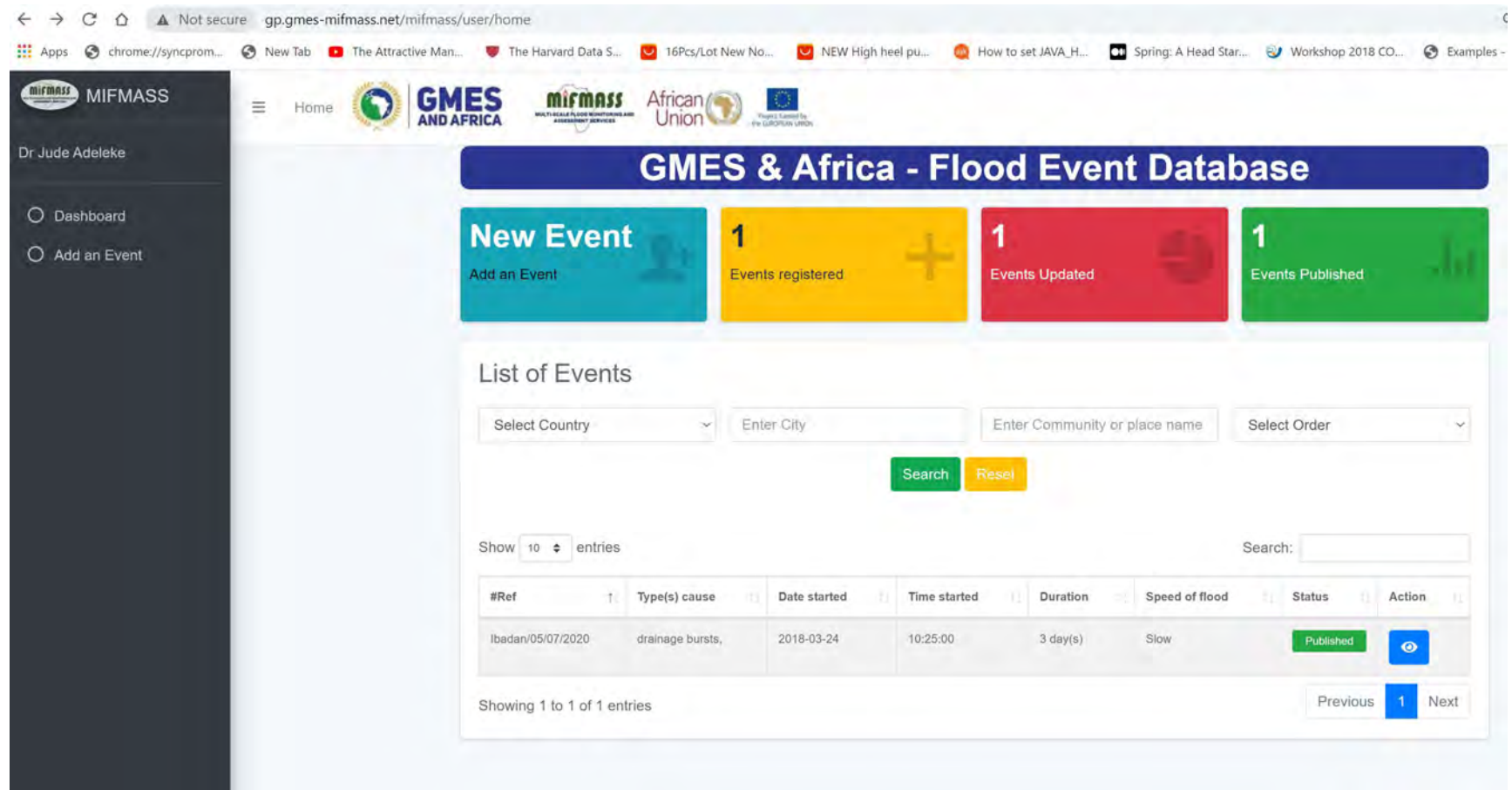


## Flood event database- Login page



<http://gp.gmes-mifmass.net/mifmass/index>

# Flood event database - Dashboard



← → ↻ ⌂ Not secure gp.gmes-mifmass.net/mifmass/user/home

Apps chrome://syncprom... New Tab The Attractive Man... The Harvard Data S... 16Pcs/Lot New No... NEW High heel pu... How to set JAVA\_H... Spring: A Head Star... Workshop 2018 CO... Examples -

**MIFMASS**

Dr. Jude Adeleke

- Dashboard
- Add an Event

**GMES & Africa - Flood Event Database**

**New Event**  
Add an Event

**1**  
Events registered

**1**  
Events Updated

**1**  
Events Published

**List of Events**

Select Country  Enter City  Enter Community or place name  Select Order

**Search** **Reset**

Show  10 entries

Search:

#Ref	Type(s) cause	Date started	Time started	Duration	Speed of flood	Status	Action
Ibadan/05/07/2020	drainage bursts,	2018-03-24	10:25:00	3 day(s)	Slow	Published	


Showing 1 to 1 of 1 entries

Previous **1** Next


# Flood Event Register


← → ↻ ⚙ ⚠ Not secure | gp.gmes-mifmass.net/mifmass/user/new\_event


Apps chrome://syncprom... New Tab The Attractive Man... The Harvard Data S... 16Pcs/Lot New No... NEW High heel pu... How to set JAVA\_H... Spring: A Head Star... Workshop 2018 CO... Examples - boostr...


**MIFMASS**  
Dr Jude Adeleke  
  
☐ Dashboard  
☐ Add an Event

Home

**GMES AND AFRICA**

**mifmass**  
The African Flood Management and Mitigation Initiative

**African Union**



Logout

NB : All fields with \* are required

### Flood event information

Type cause	Others (specify)	
<input type="text" value="--Select--"/>	<input type="text" value=""/>	

Date flood started	Time started	Duration *
<input type="text" value="03/3d/yyyy"/>	<input type="text" value="7:04 PM"/>	<input type="text" value="0"/>

Depth *	Extent *	Speed of flood *
<input type="text" value="0"/>	<input type="text" value="0"/>	<input type="text" value="--Select--"/>

Flood scene 1 (Image)	Flood scene 2 (Image)	Flood scene 3 (Image)
<input type="button" value="Choose File"/> No file chosen	<input type="button" value="Choose File"/> No file chosen	<input type="button" value="Choose File"/> No file chosen

Description

### Flood location informations

Place name of the flood plain *	Longitude *	Latitude *
<input type="text" value=""/>	<input type="text" value="0"/>	<input type="text" value="0"/>

Name of the local community *	Name of the District *	Name of the District *
<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>

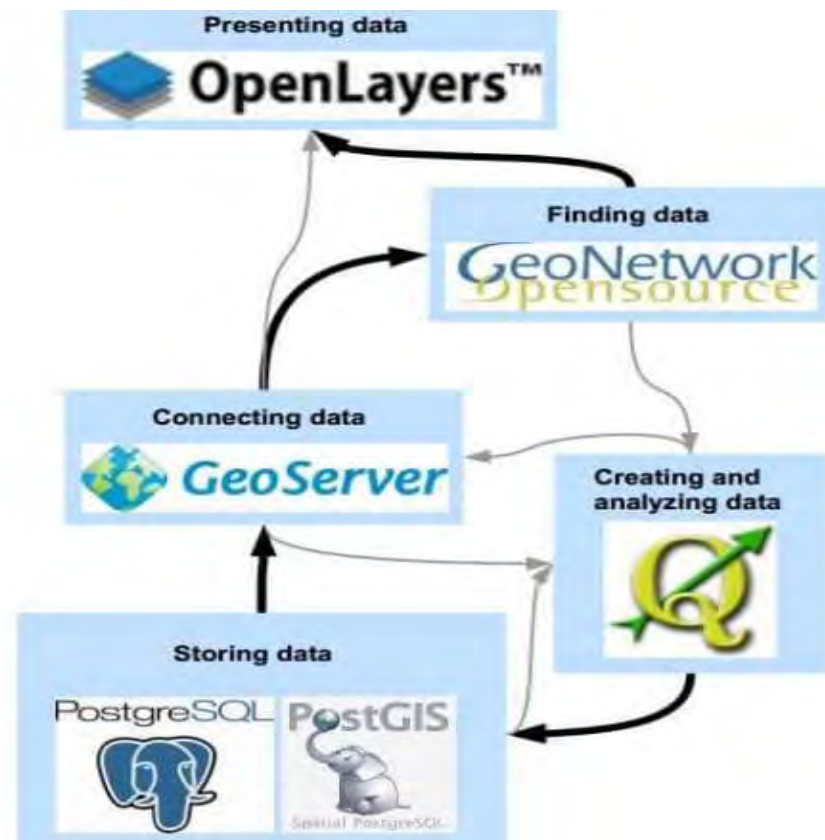
Show all

**gp.gmes-mifmass.net**

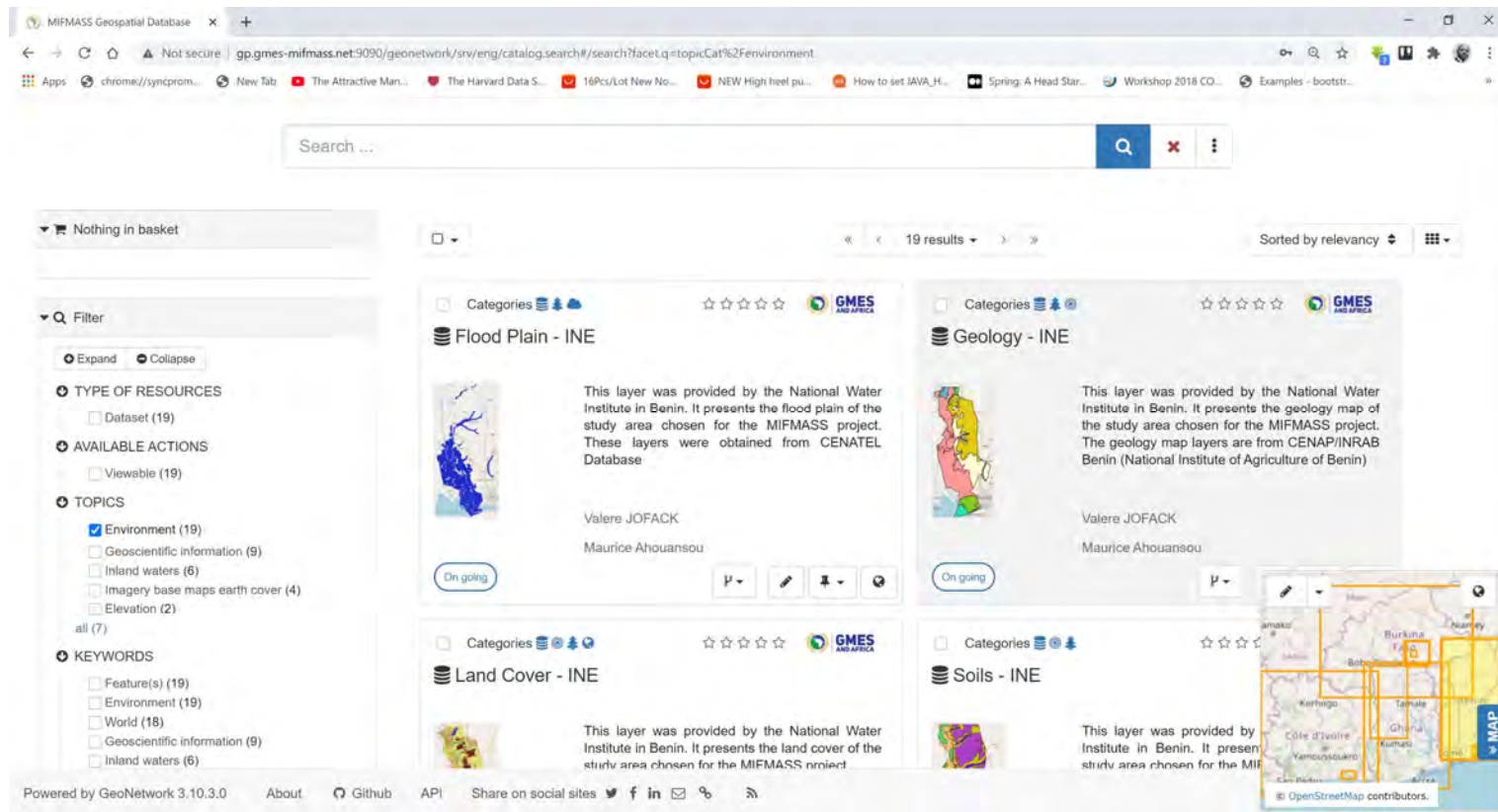


## Geo-spatial Database and catalogue

The cloud-based geo-database comprises of different technologies



# Geo-spatial Data catalogue for all the participating countries



<http://gp.gmes-mifmass.net:9090/geonetwork>

# Geo-spatial Data catalogue organized in categories

The screenshot displays the MIFMASS Geospatial Database web application. The browser address bar shows the URL: `gp.gmes-mifmass.net:9090/geonetwork/srv/eng/catalog.search#/home`. The page features a grid of map thumbnails organized into categories, with tabs for 'Latest news' and 'Most popular'. The categories visible are:

- Stream - CSSTE
- Soils - CSSTE
- Geology - CSSTE
- Land U
- Landmark - CSSTE
- Infrastructures - CSSTE
- Buildings - CSSTE
- Admin
- 10 m Contour - CSSTE
- Villages - Volta Basin
- Spot Heights - Volta Basin
- Soils -

A 'Filter' sidebar is open on the right, showing a search bar and a list of filterable attributes:

- Expand
- Collapse
- TYPE OF RESOURCES
- AVAILABLE ACTIONS
- TOPICS
- KEYWORDS
- CONTACT FOR THE RESOURCE
- PROVIDED BY
- REPRESENTATION TYPES
- UPDATE FREQUENCIES
- STATUS
- SCALE
  - ☐ 500000 (11)
  - ☐ 300000 (5)

The bottom of the page shows a URL bar with a specific metadata link: `gp.gmes-mifmass.net:9090/geonetwork/srv/eng/catalog.search#/metadata/62b940f269c7f6238d18262518c4769b35114e34`.

## Summarizing .....

The project aims “to enhance the efficiency of flood monitoring, assessment and management in West Africa by providing Earth Observation (EO) based services on real time basis to disaster management organizations and boosting their human capacity to adapt to these services”.



# Finally

CSSTE  
**This Project belongs to all of us we need your input!**

**Collaboration with Relevant Stakeholders, to get Buy-in,  
Ownership and Domestication are Key**

**We are ready to listen and Partner to Domesticate the  
developed Services**



**Different categories of beneficiaries** have been identified, namely; Disaster Management Organisations (DMOs), Communities around flood prone areas, Media, Non-governmental Organisations (NGOs) & Community Based Organisations (CBOs), Policy-makers and Hydrological/Meteorological Agencies.

*Thank  
you*

*Merci Beaucoup*

Leader of the Consortium Address:

CSSTE

Ganiy AGBAJE

*Executive Director*

OAU, Ile-Ife, Nigeria

+2348028327463

<http://gmes-mifmass.net/mifmass/>

[gagbaje@gmail.com](mailto:gagbaje@gmail.com)

