UN-SPIDER NASRDA NEMA ZFL
National Virtual Expert Meeting

“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

- Established by UNOOSA
- Observer status at ICG
- Recognition by AU
- Group on Earth Observations (GEO)
- Participant, pan-African space initiatives
- Activity centre of NASRDA

- Runs Outreach programmes
- Runs PGD
- Runs Masters programmes
- Undertakes research
Programmes of the UNOOSA Regional Centres

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

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

Programmes
- PGD (9 months)
- Masters (18 months)
- PhD (48 Months) *
Multi-scale Flood Monitoring and Assessment Services for West Africa (MiFMASS)

CSSTE CONSORTIUM - PARTNERS

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 Télécomunications, 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

Seven Institutions across five (5) West Africa Countries – Ghana, Benin, Cote D’Ivore, 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)

• 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

EARTH OBSERVATION DATA -> PROCESSES -> PRODUCTS & SERVICES

Multi-sensor Remote Sens. Data
- Flood Event Database
- NRT precipitation., MET, SM, DEM, Etc.
- HR Optical and SAR, e.g. Landsat, S-1, 2
- Geospatial database (e.g. land use)

Flood Forecast
- Flood Hotspots Maps
- Flood Extent Mapping
- Extent of Floods/Damage
- Damage Assessment

Bulletinns
Advisory Services
Flood Forecast Maps
Flood Extent Maps
Flood Hazard Maps
Processed Satellite Data

CAPACITY BUILDING
- National Met Agencies
- Disaster Mgt. Organizations
- Academia/Students
- National Research Institutions
- Hydrological Service Agencies

Methodological Overview Of The Proposed Service
Multi-scale Flood Monitoring and Assessment Services for West Africa (MiFMASS)

Expected Services & Products

- 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

**Cote d’Ivoire:** District of Abidjan

**Benin:** Oueme Basin

**Nigeria:** Ogun-Oshun Basin

**Ghana:** Black Volta

**Burkina Faso:** Volta Basin – (Bobo – Dioulasso)
Background to the MifMASS Riverine Flood Modelling

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.
Ona Riverine Flood Mapping Boundary in Nigeria

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

Figure 3. Ona Study Area Extent Delineation and Flow simulation: Digital Elevation (12.5m Resolution)
Inundation and Flood Extent Map - part Ona River Basin, Ibadan, Nigeria Overlayed on Satellite imagery
Figure 7. T4.8 Identification of flood vulnerability hotspots
### Product and Service Delivery: Expected Product

<table>
<thead>
<tr>
<th>Expected products-Classification</th>
<th>Service packs-Packaging the service</th>
<th>Targeted users</th>
<th>Means of Service Delivery</th>
<th>Dissemination Channels and platforms</th>
<th>Periodicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flood Forecasting (How severe and for how long)</td>
<td>Textual Information (Colour code): ‘Green’ for Safe ‘Yellow’ for Unsafe ‘Red’ for Highly unsafe</td>
<td><strong>Nigeria:</strong> End-user – Local community: Ogunpa and Kudeti (Oyo State)</td>
<td>Radio announcements (To use a Radio Presenter who understands the subject matter and can speak the local language),</td>
<td>Local Radio station Social Media (Facebook and twitter)</td>
<td>Daily (During the Rainy season: March - October)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Benin:</strong> Oueme Basin Authority</td>
<td>Town Criers (community heads),</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Ghana:</strong> NADMO Local community in Black Volta Basin</td>
<td>SMS to CBOs or Community Leaders</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Burkina Faso:</strong> Ouagadougou commune</td>
<td>Internet,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expected products-Classification</td>
<td>Service packs- Packaging the service</td>
<td>Targeted users</td>
<td>Means of Service Delivery</td>
<td>Dissemination Channels and platforms</td>
<td>Periodicity</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>--------------------------------------</td>
<td>----------------</td>
<td>--------------------------</td>
<td>--------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Forecast Maps (Service) and Flood Event Database</td>
<td>Delineated maps (digital) with legend indicating severity of flood</td>
<td><strong>Nigeria</strong>: NEMA, Fed. Min of Environment NIHSA, and NIMET</td>
<td>Internet</td>
<td>MIFMASS webpage</td>
<td>Bi-Monthly - during Rainy Season</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Cote D’Ivoire</strong>: OCHA/DRR, SODEXAM,</td>
<td>Flood Alerts/Warning</td>
<td>Flood Alert Bulletins</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Benin</strong>: ANPC, SAP-BENIN, DGEau and Oueme Basin Authority</td>
<td>Scientific papers</td>
<td>Geo Journal and Journal of Environmental studies and Sciences - Springer</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Ghana</strong>: NADMO, Water Resources commission</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expected products-Classification</td>
<td>Service packs- Packaging the service</td>
<td>Targeted users</td>
<td>Means of Service Delivery</td>
<td>Dissemination Channels and platforms</td>
<td>Periodicity</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-------------------------------------</td>
<td>----------------</td>
<td>--------------------------</td>
<td>-------------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Capacity Building (EO Download and Processing Routine, Flood Event Database Development)</td>
<td>Capacity building on development of an updatable Flood Event Database and EO Download and Processing Routines</td>
<td>DMOs from each Partner Country</td>
<td>Workshop (one for English and French speaking)</td>
<td>Project website, Seminars, Workshops,</td>
<td>One Week training 2 times a year</td>
</tr>
<tr>
<td></td>
<td>Short term trainings and</td>
<td></td>
<td>Online (E-learning)</td>
<td>Nigeria: FUTA CURAT:Felix Houphouet Boigny University of Abidjan, Benin: NWI, University of Abomey-Calavi, Benin Ghana: Univ. of Ghana</td>
<td>18 Months Full time programme</td>
</tr>
<tr>
<td></td>
<td>Long term training: MSc</td>
<td></td>
<td>On-site training</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MPhil Hydrogeology, University of Ghana</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Product and Service Delivery: Expected Product

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

<table>
<thead>
<tr>
<th>Expected products-Classification</th>
<th>Service packs-Packaging the service</th>
<th>Targeted users</th>
<th>Means of Service Delivery</th>
<th>Dissemination Channels and platforms</th>
<th>Periodicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Damage Assessment</td>
<td>Lists of Frequent Flood hazards, Special Reports/Briefs, Reprints (on Rainstorms, Floods, Impacts, action plans)</td>
<td>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</td>
<td>Publications</td>
<td>Damage Assessment Information Booklet</td>
<td>Annual</td>
</tr>
</tbody>
</table>

**Insurance Companies**

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

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

MiFMASS: Multi-Scale Flood Monitoring and Assessment Services for West Africa (MiFMASS) is one of the actions under the Global Monitoring for Environment and Security and Africa (GMES & AFRICA).
Flood event database- Login page

http://gp.gmes-mifmass.net/mifmass/index
Flood event database - Dashboard
Flood Event Register
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
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.
Leader of the Consortium Address:
CSSTE
Ganiy AGBAJE
Executive Director
OAU, Ile-Ife, Nigeria
+2348028327463
http://gmes-mifmass.net/mifmass/
gagbaje@gmail.com