





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

GMES-MIFMASS GIS-BASED FLOOD DAMAGE IMPACT ASSESSMENT IN WEST AFRICA: BENIN, GHANA, BURKINA FASO, COTE D'IVOIRE & NIGERIA

CSSTE CONSORTIUM

DR. INNOCENTE. BELLO,

EMAIL: INNOBELLO@GMAIL.COM

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Burkina Faso



UG Ghana



CSRI Ghana



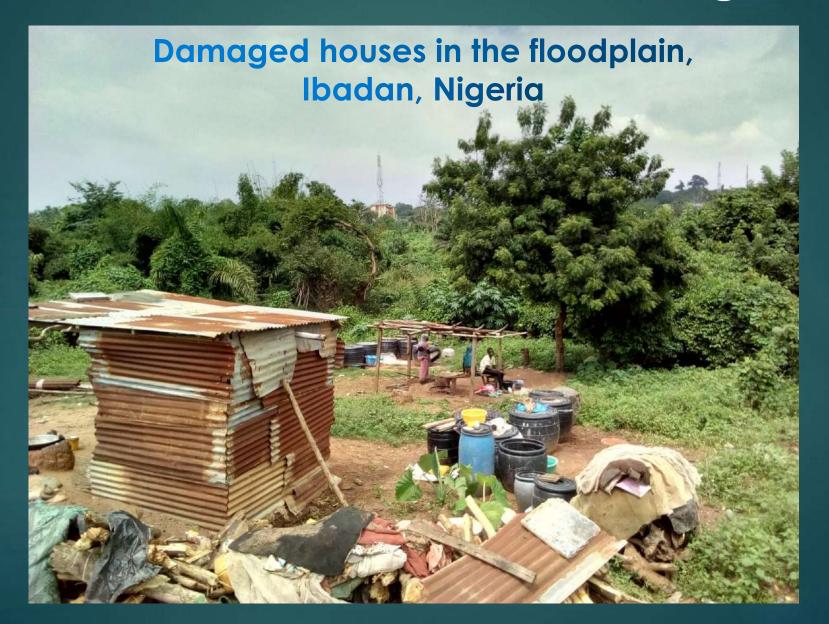
Benin



Burkina Faso



Evidence of Flood damage



MIFMASS aim & objectives

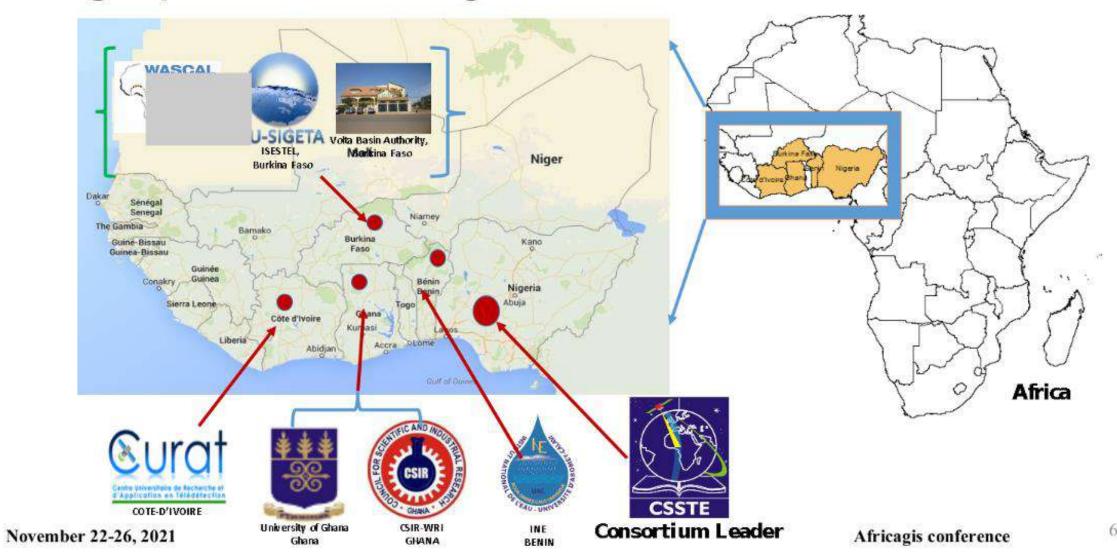
AIM

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

- 1) Establish an updatable flood event database
- 2) 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

Geographical coverage



Vulnerability - Building Risk Assessment

1. Extraction Flood Inundation Results from HEC-RAS model

- -Inundation boundary from RAS Mapper
- -Flood depth classification into magnitude in QGIS (<0 m = Low risk; 0-5 m = Moderate risk; 5-10 m = High risk; 10-15 m = Very high risk) Application of Union tool and erase
- -Quantifying flood risk extent

2. Flood Risk Area Intersect with Building Footprint

- -QGIS intersect tool and classification
- -Interpretation and quantification by magnitude

DATA on LULC/CRITICAL INFRASTRUCTURE AT RISK

- What is the volume of data? For the 5 study locations in West Africa
- Approximately 3 Terrabites
- Data: Data layers:
- a. Settlement layer
- b Hydrographic (streams) Network
- Landuse/Landcover layer
- d. Digital Elevation Model (DEM) of the river basin
- Catchment area/boundary
- t. Road network
- g. Critical Infrastructure (if any: such as Bridge, Industry, Farmlands, Power Plants, Transformers, etc.)
- h. Vegetation/Forest
- Town/Locality/District place names, and
- Farmland/Agriculture/Cultivation etc
- k. Hydrometeorological Data: (Drainage Discharge, Rainfall records + Alos Palser DEM for Flood Modeling)

MULTI-SCALE FLOOD MONITORING AND ASSESSMENT SERVICES

(MiFMASS)

GMESS & AFRICA CSSTE CONSORTIUM

Dear Partners May 2021

Questionnaire on Flood Vulnerability & Damage Assessment for Your Study Site Task 5.3: DAMAGE ASSESSMENT MODULE

PREAMBLE:

Flood and its attendant consequences have been regarded as major threat to man and his environment. Increasingly, flooding has destroyed lives and properties and rendered many homeless in West Africa and its sub-region (e.g. Ghana, Benin, Cote d'Ivoire, Burkina Faso and Nigeria). Assessing the nature, dimension and impact of flood with a view to providing mitigative measures towards amelioration damages led to this study (Task 5.3). As a representative of your Country in the CSSTE Consortium, kindly provide us with relevant information on your study site to enable use carryout detailed assessment. Your sincere response is highly solicited.

SECTION I: CHARACTERISTICS OF THE STUDY SITE IN EACH COUNTRY

1	Country Names Cote d'Issains	
Ι.	Country Name:Cote d'Ivoire	
2.	Survey Date:21/06/2021	
3.	Catchment Name: Bonoumin-Palmeraie	_
4.	Catchment Description:urban area	
5.	City:Abidjan	
6.	Centroid Coordinate: Longitude: Deg. 3 Min 77 Sec.	W
	Latitude: Deg. 5 Min 22 Sec.]	N
7.	Economic status (average monthly income in the study area): Use your local currency	to
	classify rate it: Amount:Rating: (a) High (), (b) Medium (), (c) Low (
8.	Rank the 3 major Occupations of the people within the riverine area in terms of ma	iin

What Sentinel(s) data did you use? EO (Sentinel 1: DEM data, 2. Multispectral images)

How did you access to it?

Developed Script for harvestion required dataset from

Copernicus and USGS glovis. Both were used to identify all satellite images that we needed for the five countries:

https://scihub.copernicus.eu/twiki/do/view/SciHubWebPortal/APIHub

- i. Cote d'Ivoire,
- ii. Benin,
- iii. Ghana
- iv.Burkina Faso
- v. Nigeria.

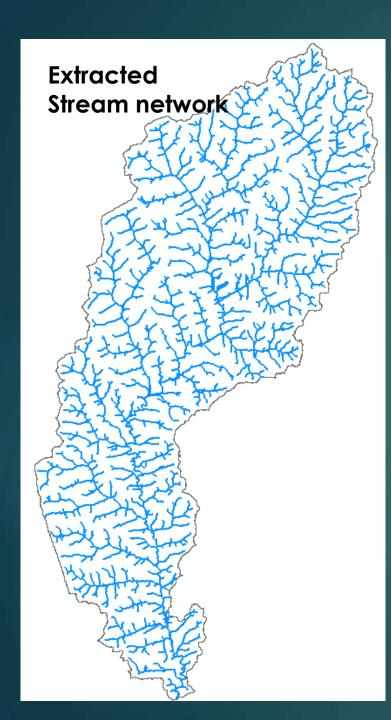
For what purposes do you use it?

Sentinel I:

- i. DEM data for terrain model,
- ii. Morphometric characterization of the various River Basins,
- iii. As input for Flood simulation model in HEC-HMS/HEC-RAS

Sentinel II: Multispectral images

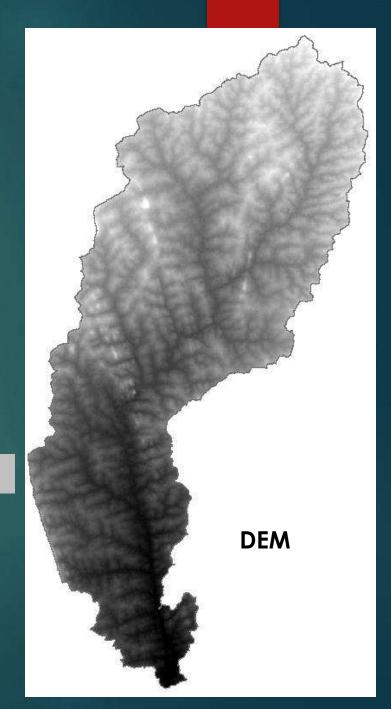
I. For LULC Extraction



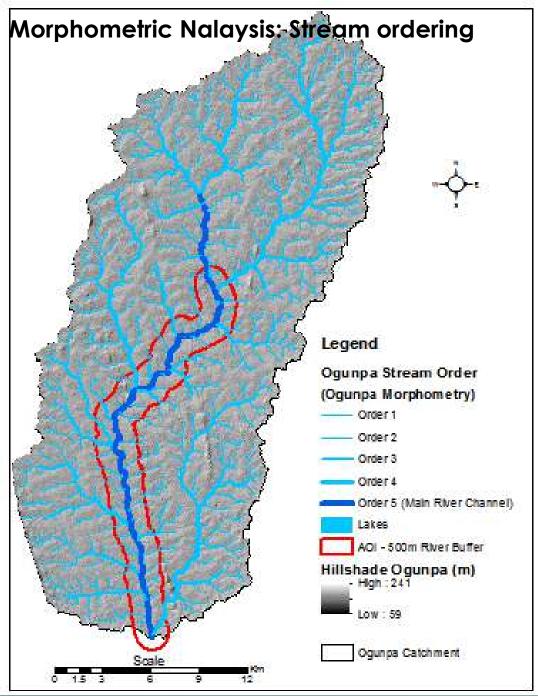
Data Modeling

Alos 12.5m DEM Input variable for Flood Flow direction modeling

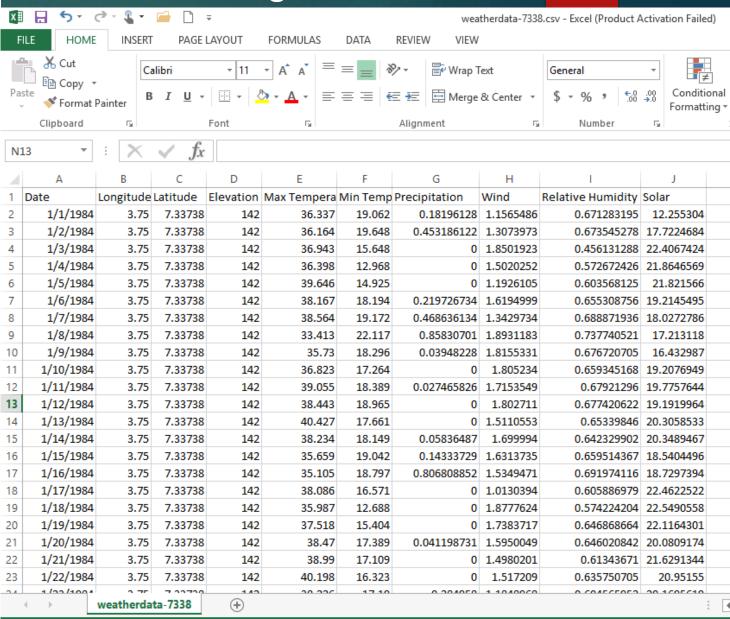
Extracted Drainage network for Riverine Flood Modeling



Nigeria LULC/Critical Infrastructure layers for Damage Assessment Lixisols/Regosols

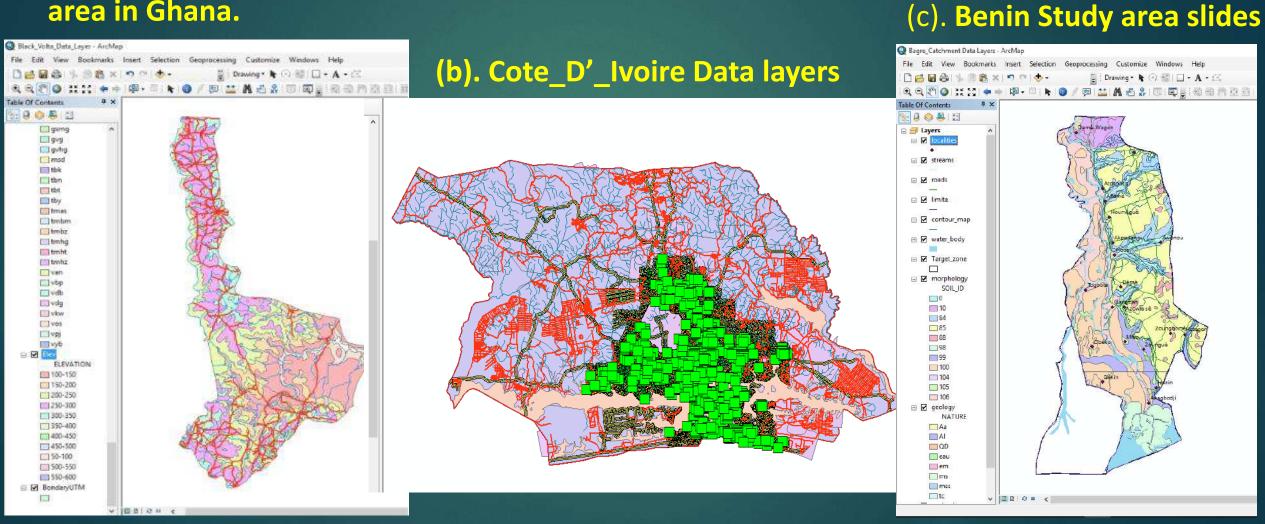


Meteorological data: Rainfall



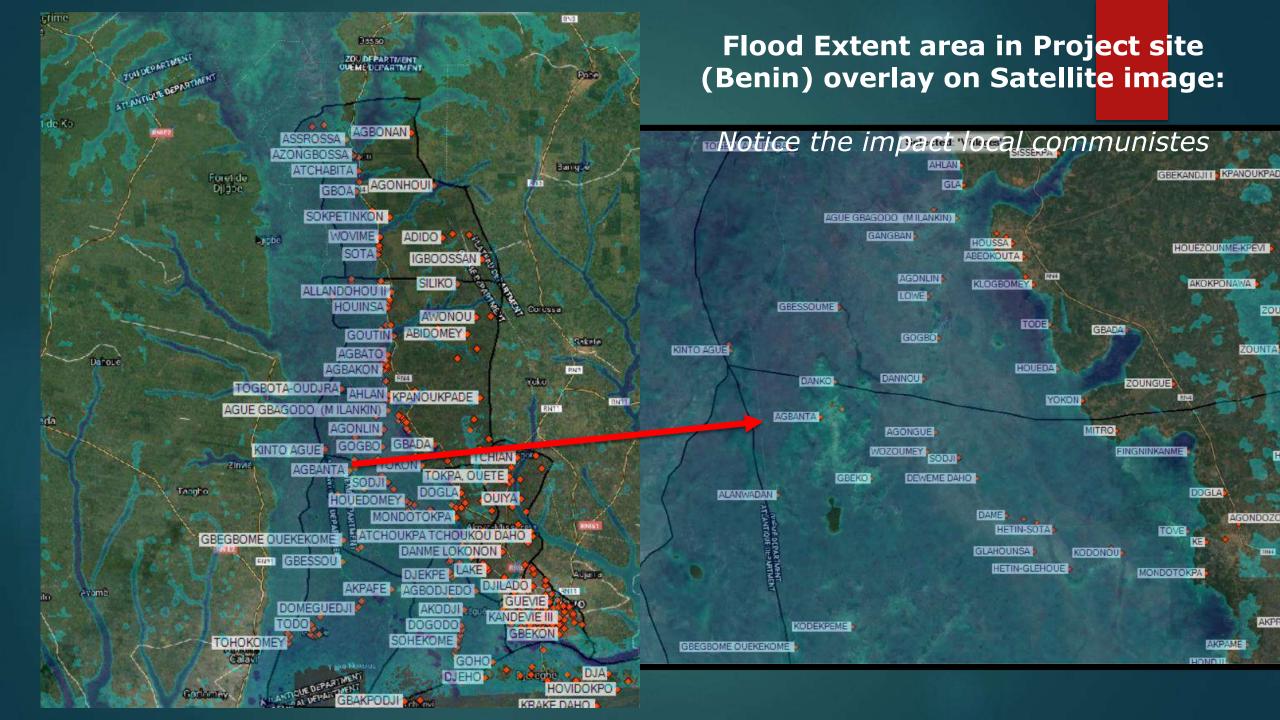
Combined (overlay) layers for study sites in other countries

(a) Black Volta study area in Ghana.



RESULTS of Flood Damage Extent



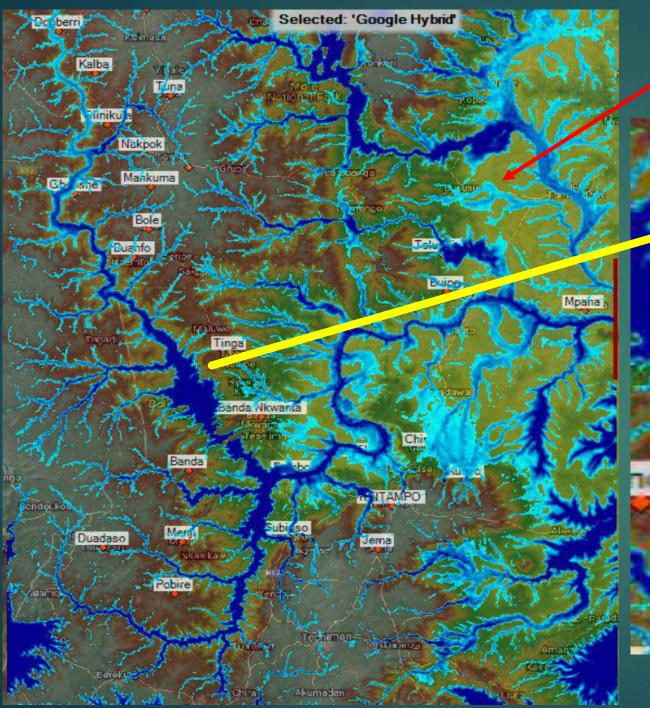






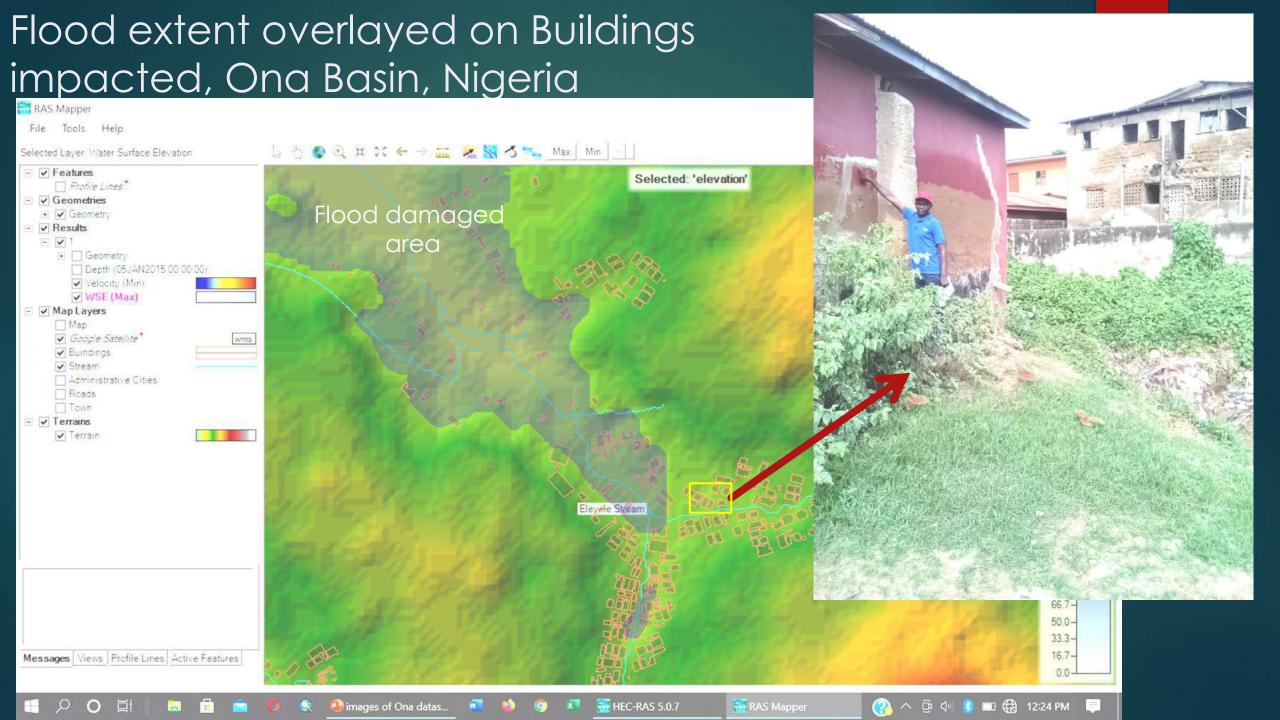
Flood extent map in Cote d'Ivoire project site





Flood extent map in Black Volta (project site in Ghana)



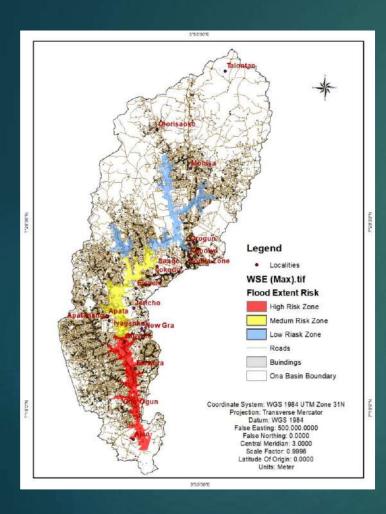


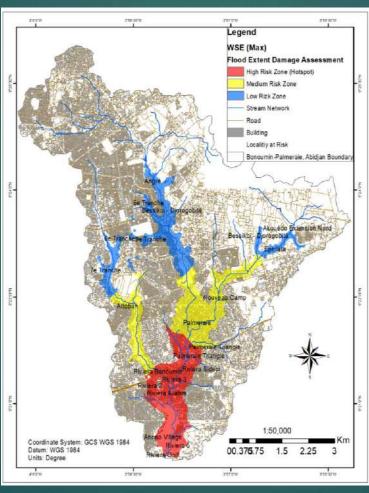




Flood Risk/Susceptability Mapping

Legend

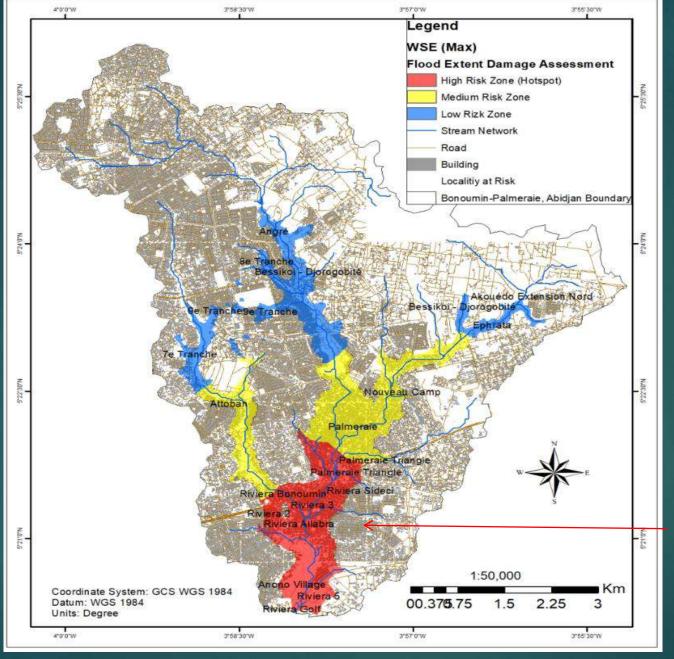




 Localities WSE (max) Flood Extent Damage Risk High Risk Zone Medium Risk Zone Low Risk Zone Hydro bagre (Stream) ADM Commune (District) Nakanbe catchment, BurkinaFaso Coordinate System: WGS 84 UTM zone 30N Projection: Transverse Mercator Datum: WGS 1984 false easting: 500,000.0000 false northing: 0.0000 central meridian: -3.0000 scale factor: 0 9996 latitude of origin: 0.0000 0 5,5001,000 22,000 33,000 44,000 Units: Meter

Ona Catchment, Ibadan, Nigeria

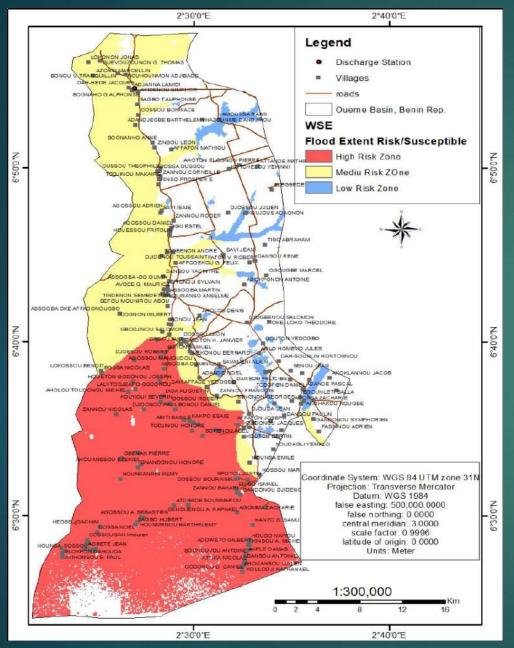
Bonoumin-Palmeraie Catchment, Abidjan



Flood Risk Extent (Hotspot) Map of Bonoumin-Palmeraie River Basin, Abidjan, Cote D'Ivoire

FLOODD RISK MAPPING

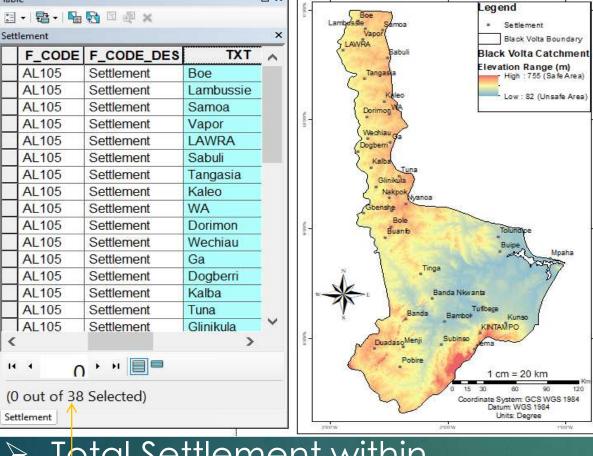
More of deposition of silt



Legend WSE (Max) Flood Damage Extent Flood Risk/Hotspot Map High Risk Zone (Hotspot) Medium Risk ZOne Low Risk Zone Stream Road Black Volta Basin 15 30 120 Coordinate System: WGS 1984 UTM Zone 30N Projection: Transverse Mercator Datum: WGS 1984 false easting: 500,000.0000 false northing: 0.0000 central meridian: -3,0000 scale factor: 0.9996 latitude of origin: 0.0000 Units: Meter 3,0,0,M

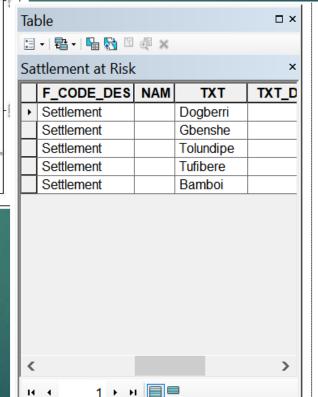
Black Volta Catchment, Ghana

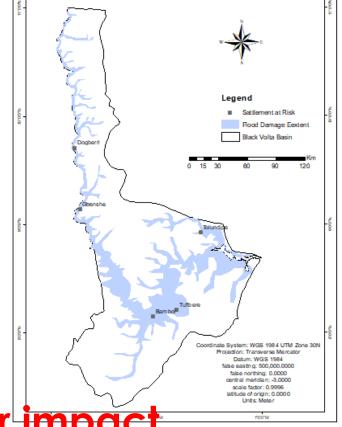
Maximum Flood Extent Risk Model of Oueme Catchment, Benin



DAMAGE ASSESSMENT IMPACT:

e.g Settlement





Total Settlement within studied Black Volta, Ghana:

-38

> Settlement at Risk:

5 (13.2%)

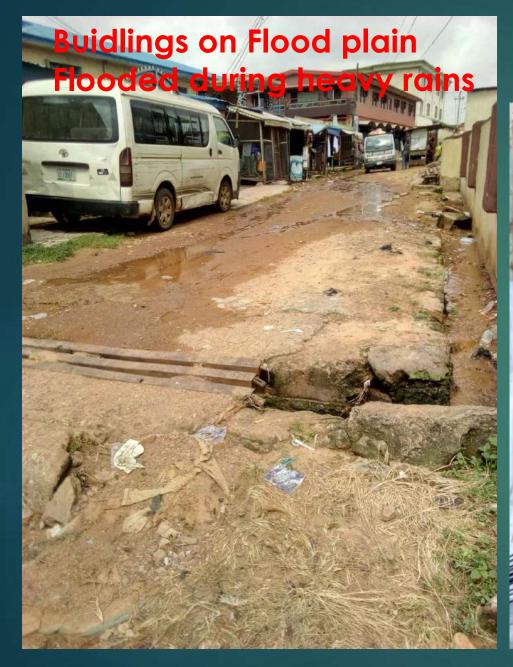
Cost calculated based on no. of features under impact

FLood Impact Assessment: Management & Control

Road at Risk from flood extent damage assessment in the various River

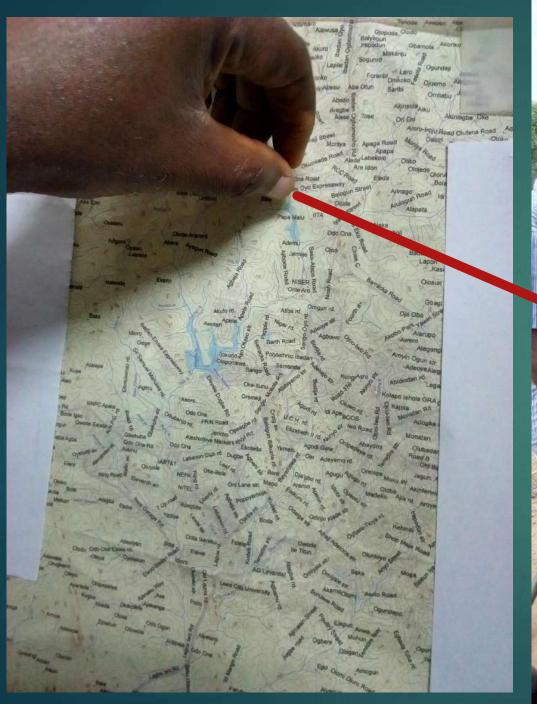
Country	Total Road Length (m)	Road At Risk Length (m)	% length of Road at Risk	Land Area at Risk of Flood Damage (M²)
Bonoumin_Palmarai e, Abijan, Cote D'Ivoire	886,383.3	228,541	25.8%	8,540,845/47,672,144 (17.9%)
Black Volta, Ghana	3,659,649.7 m	364,948.1	10%	7852610000/32675437442 (24%)
Kakanbe, White Vlta, Burkina Faso	719,540	16,302m	2.27%	11447449504m/27905338 11 (6.9%)
Ona Basin, Ibadan, Nigeria	4,039,532.7 m	1,044,922m	25.9	432,897.2/68,386,868.7 (6.3%)
Oueme Basin, Benin Republic	251,339	69,402	27.6%	719762014.2/1088320000 (66.1%)

COST OF REPAIR: varies from country to country as captured in the main report from damage a



Documenting lost due to flood for compensation & social welfare support.

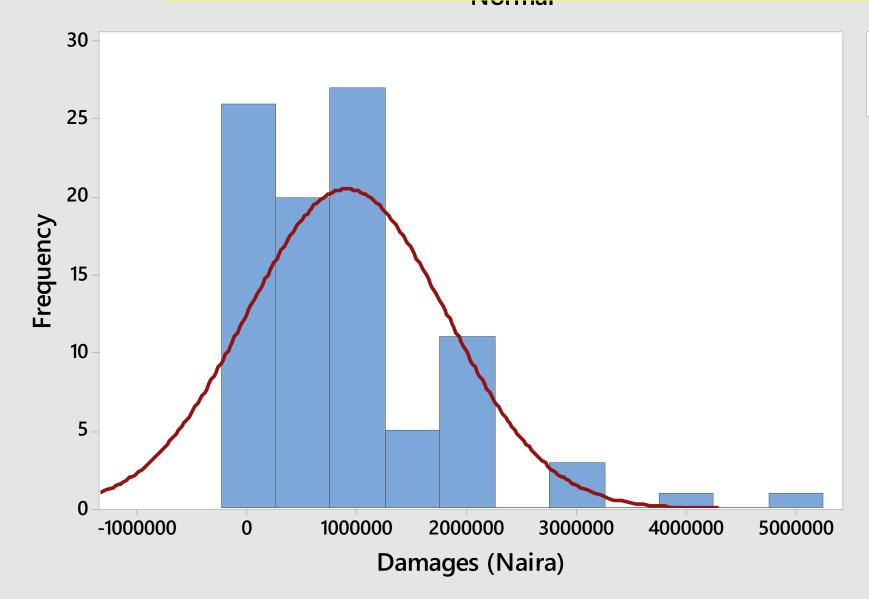




Social impact Assessment:
Ul Inundated Area
(Counting: lost/cost)

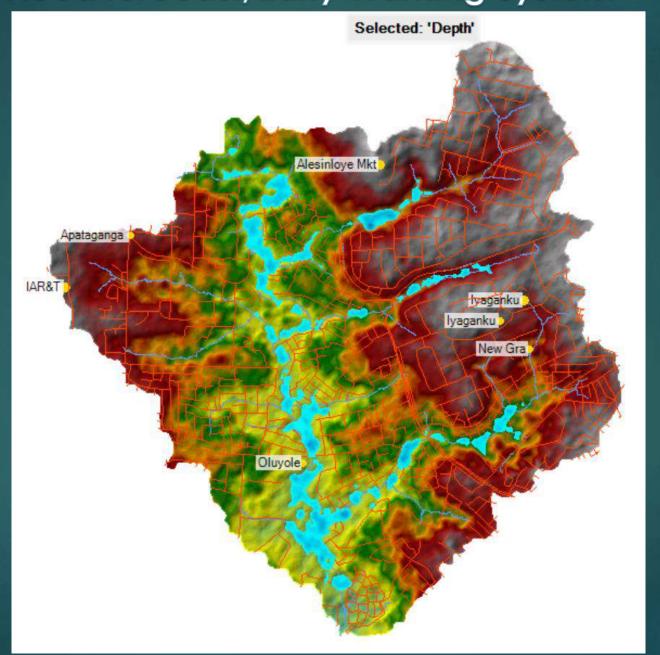


Financial Cost due to Flood Damage

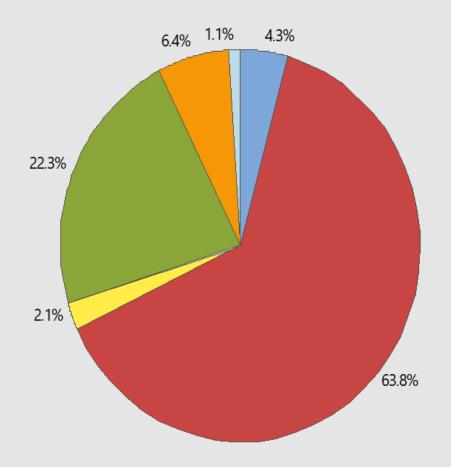


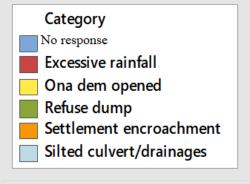
Mean 900638 StDev 914045 N 94

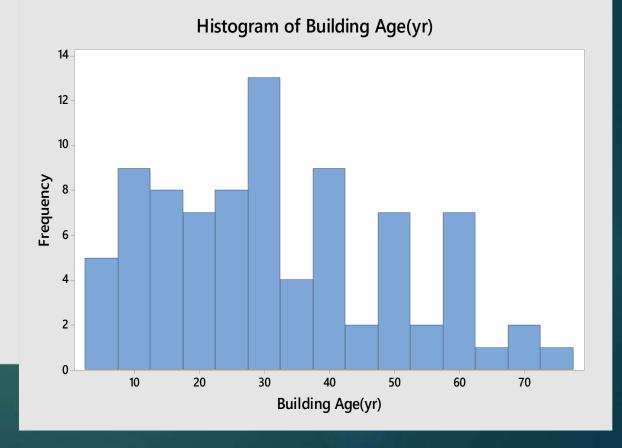
Flood forecast/Early Warning System



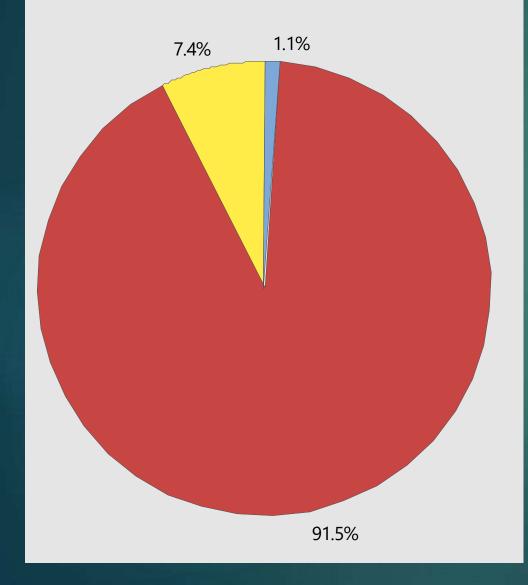
Pie Chart of Causes of flood







Pie Chart of primary impact



Category Life properties properties/

What kind of in-situ data are you using?

i. Rainfa & Flood Discharge Data (though not for all sites, precipitation in-lieu)

Challenges

- i. Flood Discharge data not readily available across West Africa
- ii. Not all layers were uniformly available due to differences in Basin locations.
- iii. Gaps and not well documented historic rainfall/flood event data

Recommendations

- i. Continous updating of national/regional Hydro-meteorological data (Rainfall, discharge, etc.) using the dveloped updatable FLOOD REPORTER
- ii. Continous in-house DMOs trainings with the data generation model.



Construction on River Flood Plain – Odo Ona Area Building constructed right within the river channel

THANK YOU FOR YOUR ATTENTION

Asana Asante/Merci



Cote d'Ivoire



Burkina Faso UG Ghana





CSRI Ghana



Benin



Burkina Faso

