ADAPTATION FUND

Small Grant Innovation Project – SLAMDAM Uganda

Enhancing resilience to flooding in Uganda using an innovative mobile flood barrier.

Kampala, Uganda
December 9, 2024

Ministry of Water and Environment
REPUBLIC OF UGANDA

Project Background and Context

Problem Statement:

- **Impact of Climate Change**: Uganda faces increasing challenges due to climate change, particularly in the water sector.
- **Exacerbated Flooding**: Floods have intensified, posing significant risks to communities, infrastructure, and livelihoods.
- **Urgent Need for Innovation**: Traditional flood management measures are inadequate in the face of escalating flood risks.

Impact of Flooding on Uganda:

- **Economic Impact**: Floods have caused significant economic losses in Uganda. In 2020 alone, 173,000 people were affected, and 25,000 houses were destroyed in Kasese district, resulting in substantial property damage.
- **Environmental Impact**: Flooding has led to the destruction of infrastructure, farmlands, and natural habitats. Wetlands and riverbanks have been encroached upon, reducing their ability to control water flow during heavy rains.
- **Social Impact**: Floods have displaced thousands of people. Floods have also caused loss of life, with at least 200,000 deaths recorded from 1900 to 2018 due to natural disasters, including floods.

Project Objectives:

- Introduce **SLAMDAM** as a cost-effective and efficient solution to mitigate flood risks.
- Enhance community resilience to floods through practical, adaptable, and sustainable measures.
- Demonstrate the viability and scalability of innovative flood management technologies in the Ugandan context.

SLAMDAM's Impact Depends on Deployment Location & Timing

Pakistan, Gilgit Baltistan – Rural Area
Supported by World Bank and ADPC

The Netherlands – Urban Area
Supported by Water Authority

Mpanda Commune Burundi – Rural Area
Supported by UNEP

Kenya, Laikipia – Rural / Urban Area
Supported by SNV

Fiji, Ba Town – Urban Area
Supported by The Netherlands and Fiji

Iceland, Harbor – Urban Area
Supported by The Iceland Harbor

Uganda is in Need of Strengthened Resilience Agains Climate Change-Induced Floods

Floods victims in Obongi after river Nile burst its banks*

About Uganda

- Uganda is a landlocked country
- Uganda experiences differences in rainfall patterns across the country.
- Uganda is water-rich, with numerous lakes, rivers, and wetlands.

Impact Climate Change on Uganda

- Climate change has also greatly impacted Uganda's rainfall intensities
- Increased intensity of rainfall has led to greater impact of floods
- Foods impact 50,000 Ugandan people and cost over $62 Mio each year.

About Obongi District

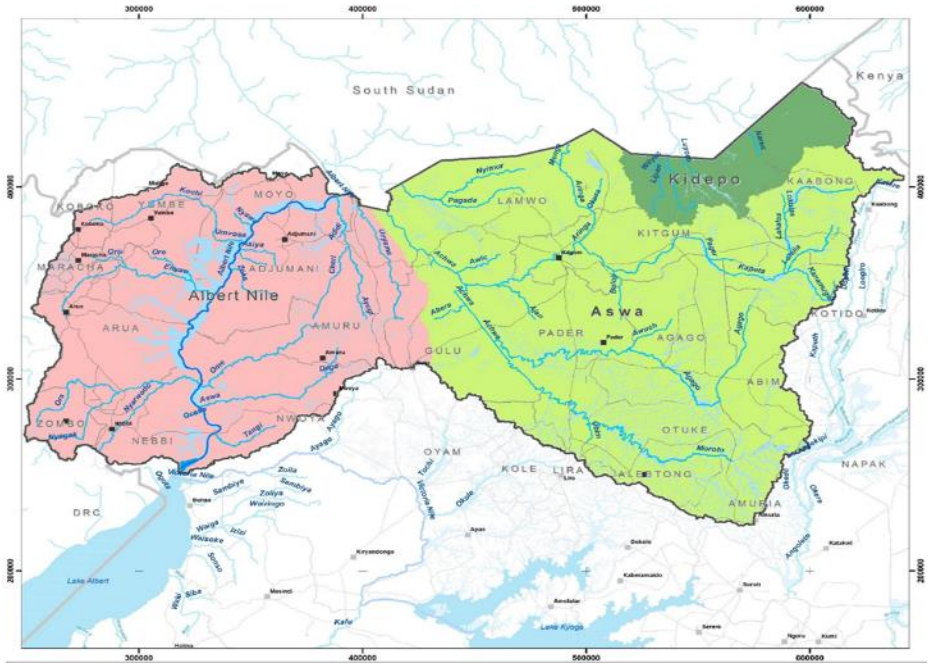
- Obongi District has been experiencing devastating floods.
- In 2020 more than 23,000 residents of Obongi District were displaced.

* *(File Photo courtesy of "The Independent")*

The Analysis Focused on the Upper Albert Nile Catchment Area

The Upper Nile Water Management Zone (UNWMZ) has:

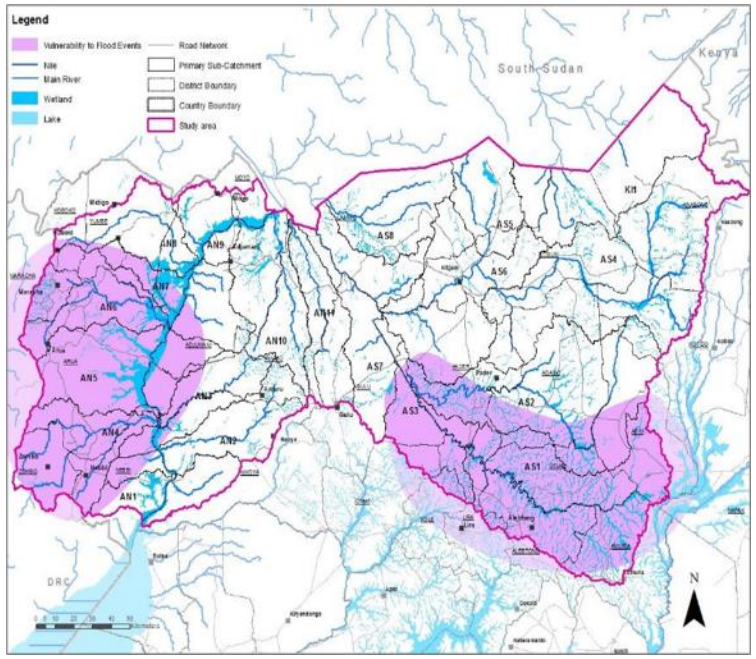
- An approximate Area of 50,000 km^2.
- Three major catchments are Aswa, Albert Nile, and Kidepo.
- 26 districts with a total population of 4.83 million people.



The Upper Nile Water Management Zone (UNWMZ)

Flood Vulnerability UNWMZ

- The UNWMZ is vulnerable to flood events.
- Towns have a high population density and infrastructures.
- High risk due to rivers slope and high surface runoff.



Flood Vulnerability UNWMZ

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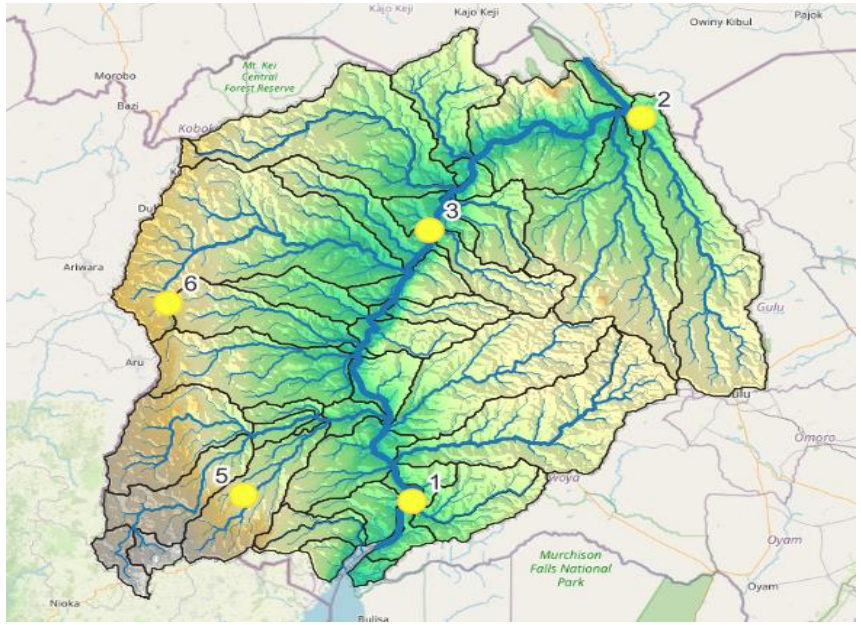
The Analysis Narrowed Down on the Vulnerable Obongi District

Project Site Selection Approach

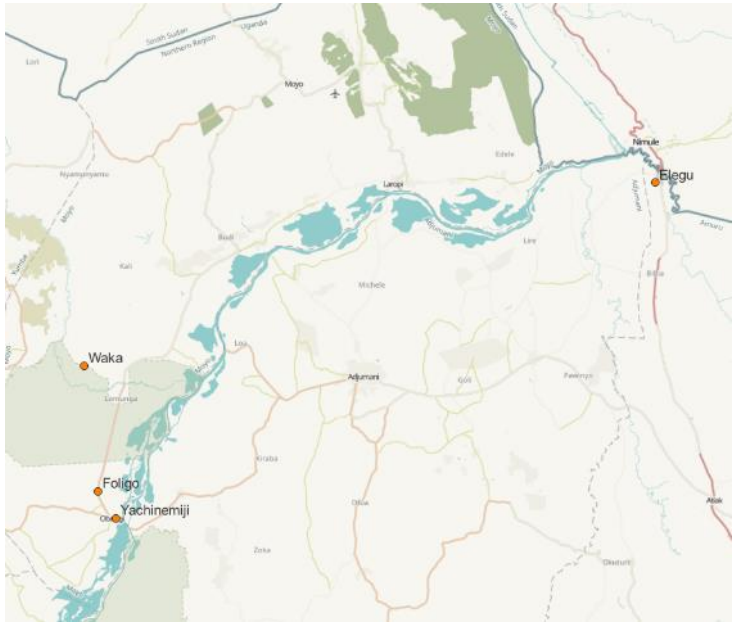
- Obongi District within UNWMZ is vulnerable to floods.
- Data-Driven flood risk assessment focused on Obongi.
- Field visits were conducted to support the risk assessment.



Five communities selected for the field study

Data-Driven Selection Project Sites

- Data was collected online and onsite.
- Sites were selected based on vulnerability and suitability.
- Priority sites are: Waka, Foligo, Yachinemiji, and Elegu.



Flood prone locations in the Obongi District (Waka, Foligo, Yachinemiji) and Elegu

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Decision Matrix Directed the Selection of the Waka Community

Decision Matrix focused on SLAMDAM Suitability and Location Vulnerability

Criteria	Obongi T=1 year			Elegu T=1 year	Obongi T=40 years (like flooding in 2020)			Elegu T=40 year
• ***Location number***	1	2	3	4	1	2	3	4
• ***Location name***	Waka	Foligo	Yekenimiji	Elegu	Waka	Foligo	Yekenimiji	Elegu
• ***Expected flood depth (m)***	0.5	0.5	1	1.5	2	2	1	
• ***Expected flow velocity (m/s)***	*The velocity is much less in the floodplain*	*The velocity is much less in the floodplain*	*The velocity is much less in the floodplain*		*The velocity is high is the main channel*	*The velocity is high is the main channel*	*The is much less in the main channel*	
• ***Return time flood (T)***	1	1	1	1	40	40	40	
• ***Duration of flood (d)***	14	7	7	2	90	90	14	4
• ***Effectiveness (++/--)***	+							

Overflow of Kochi River Causes Floods at the Waka Community

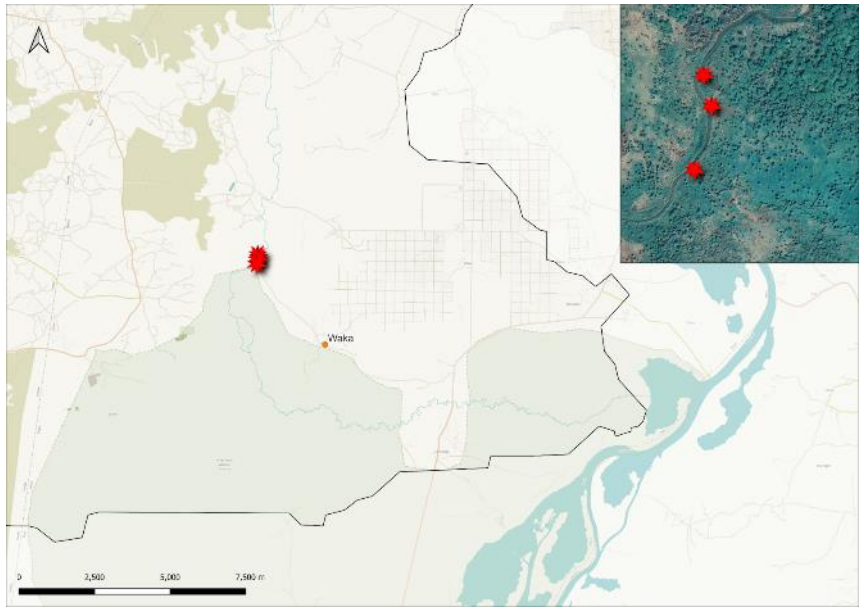
Waka Community was Selected

- The river flowing through Waka is the Kochi river.
- Most tributaries of the Kochi river originate from the East side.
- The outflow of the Kochi into the Nile, elevations of ~600 m.

Erosion of the Kochi river banks due to high flow velocities

Kochi River is the Source of Floods at Waka

- The Kochi river receives the water through surface runoff.
- When water levels in the river rise, riverbanks overflow.
- Three breach locations along the Kochi River were identified



Breach locations along the Kochi river leading to flooding

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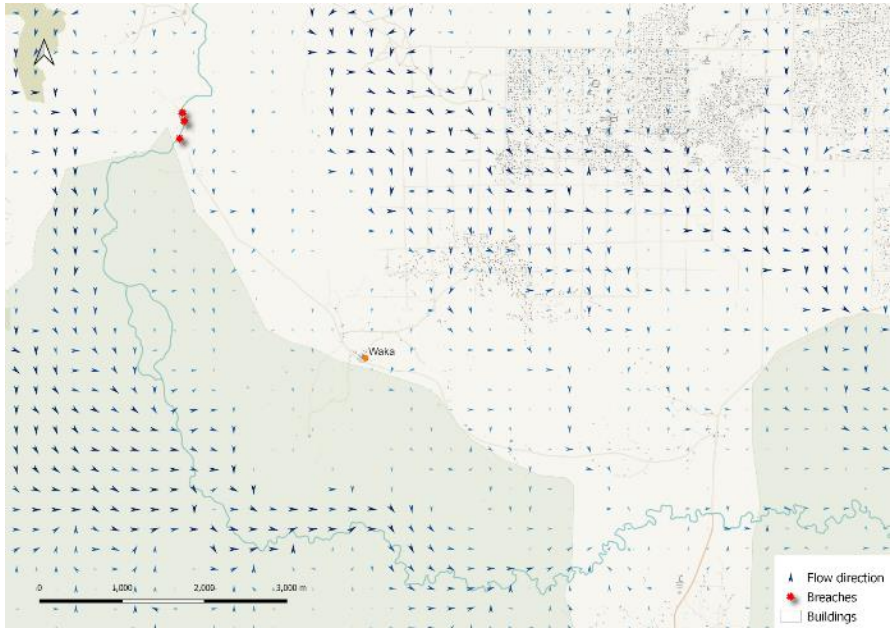
Hydrodymic Modelling of Kochi River Subcatchment

Environmental Officers of Obongi District were Interviewed

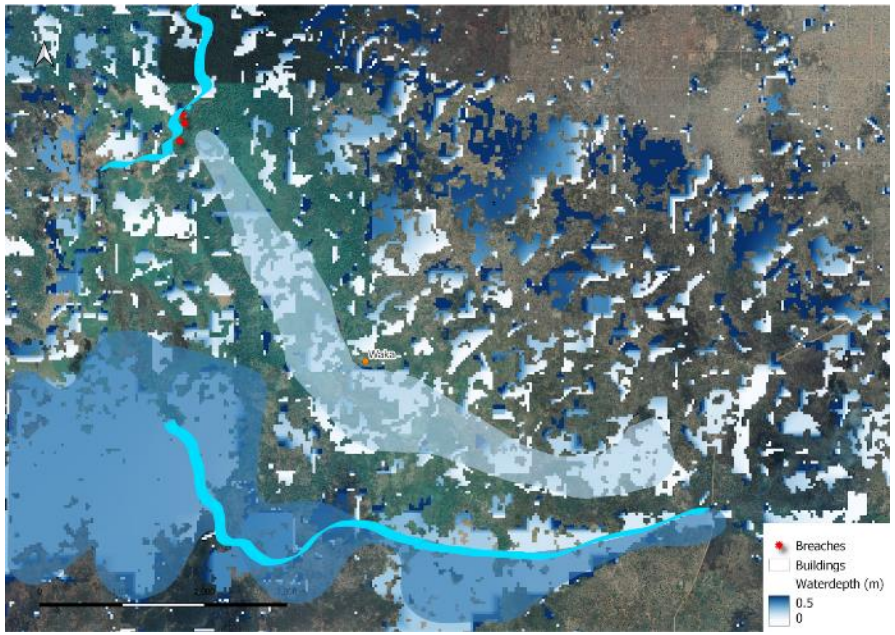
- Lack in weather data enforced reliance on local input.
- Flow directions were incorporated in the model.
- From the breaches, water flows into Waka.



Flow directions around Waka

Model Simulations were Conducted

- Flood observations were incorporated in the model.
- The model shows a large flood extent around Waka.
- Poor drainage is the second cause of flooding at Waka.



Flood extents and water depths around Waka

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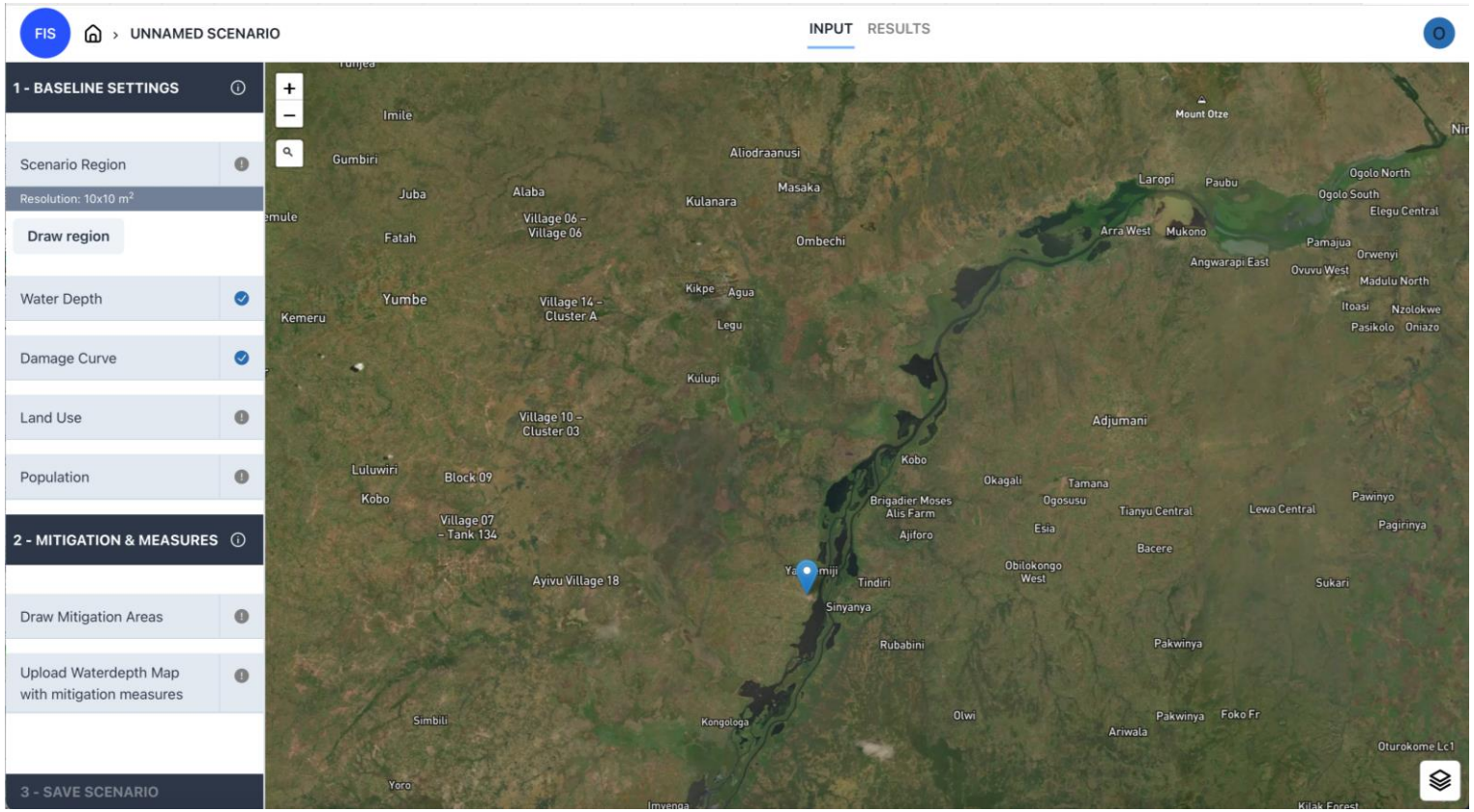
Validation of Hydrodynamic Model by Local Stakeholders

Communities and especially vulnerable groups were involved and consulted.

The breach locations were inspected to explore where SLAMDAM should be deployed.

Innovative Flood Intelligence Service (FIS) Tool to Calculate Flood Damages



Screenshot FIS Tool Obongi District

Step 1: Select Obongi District

- Search for and select Obongi District.

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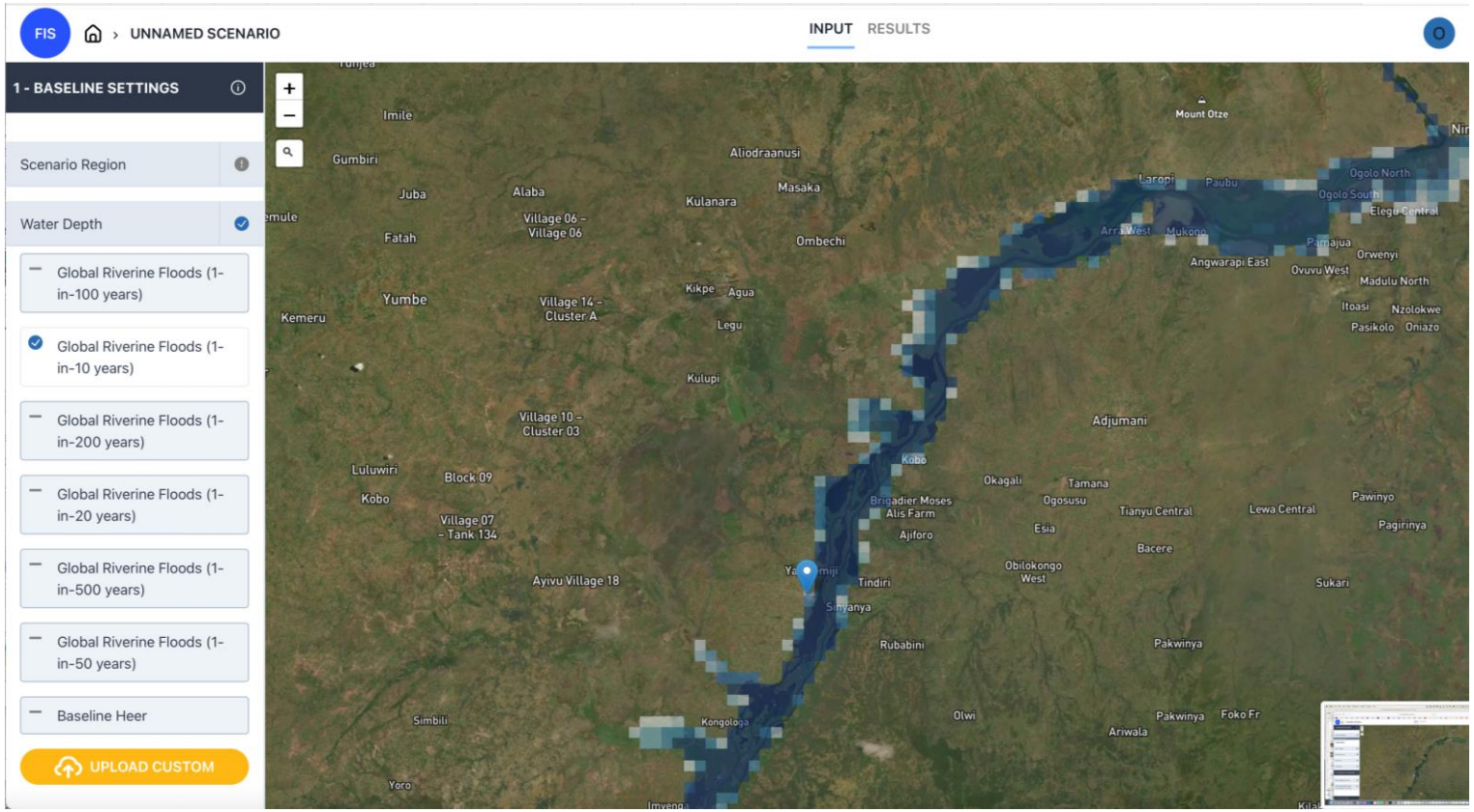
FIS Analysis for 1/10 year Flood Event



Screenshot FIS Tool 1/10 year Flood Event at Obongi District

Step 2: Select Flood Type

- Select flood map for 1/10 year flood event.

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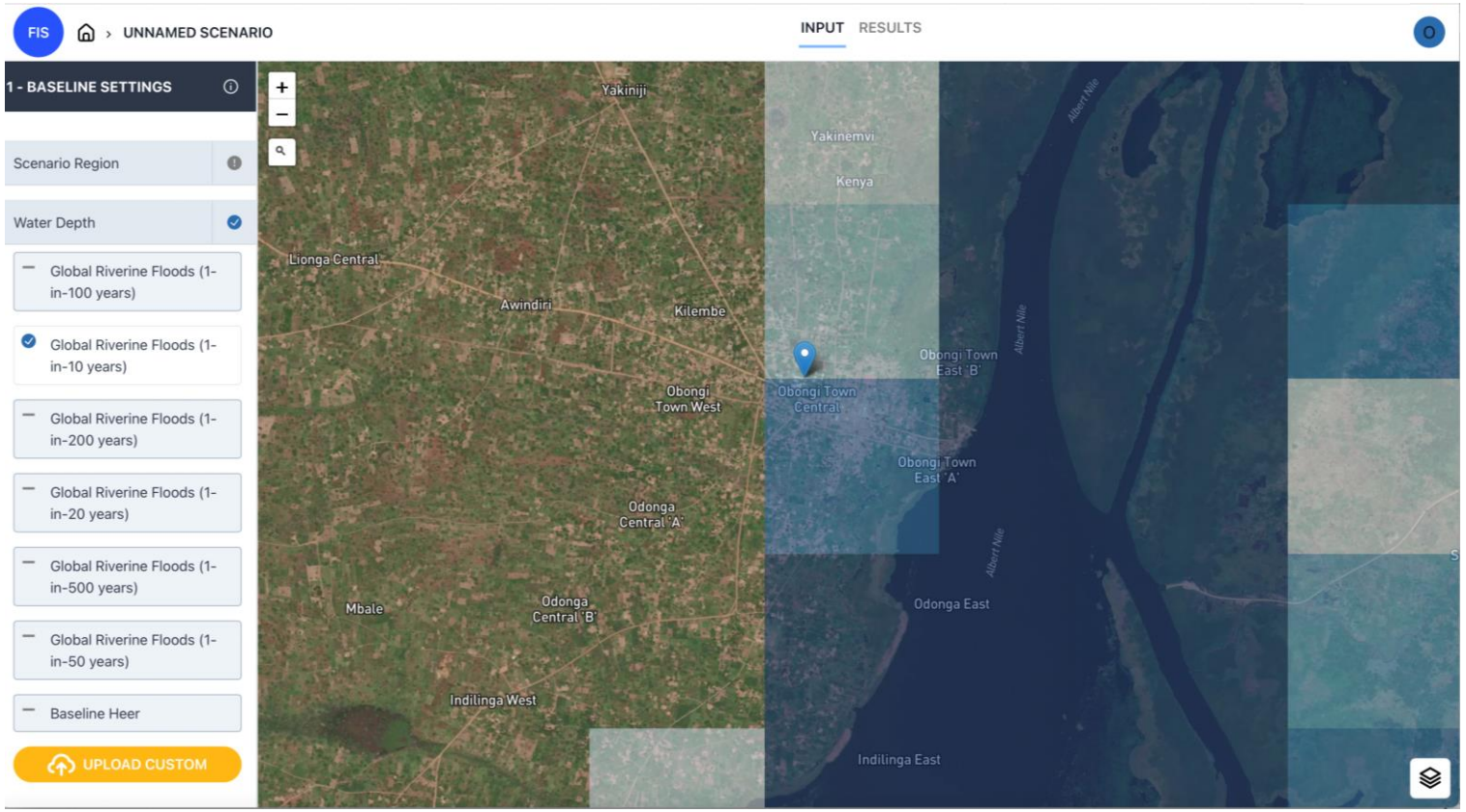
FIS Analysis Zooming in within Obongi District



Screenshot FIS Tool 1/10 year Flood Event at Obongi District

Step 3: Zoom in

- Zoom in the increase level of detail.

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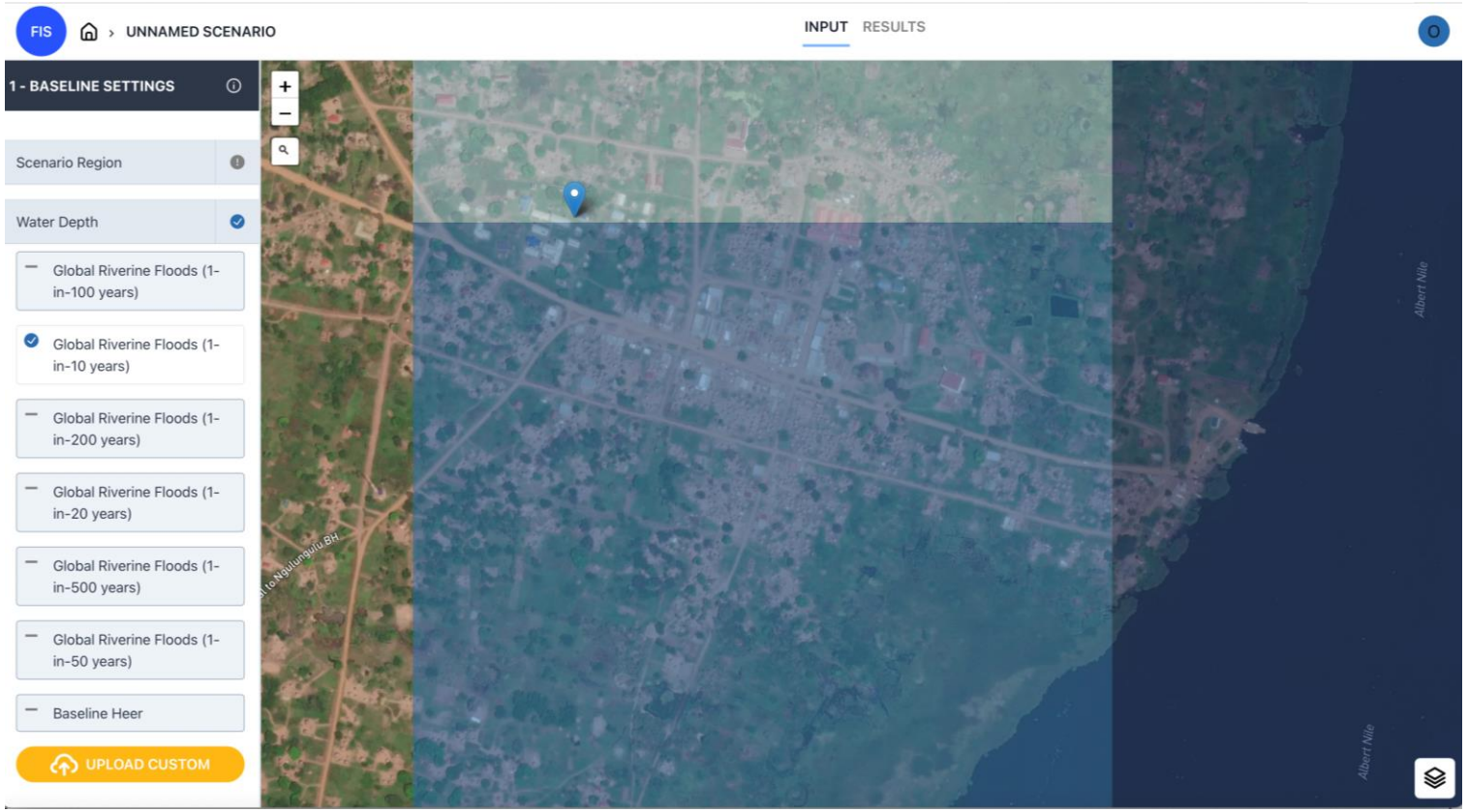
FIS Analysis Further Zooming in within Obongi District

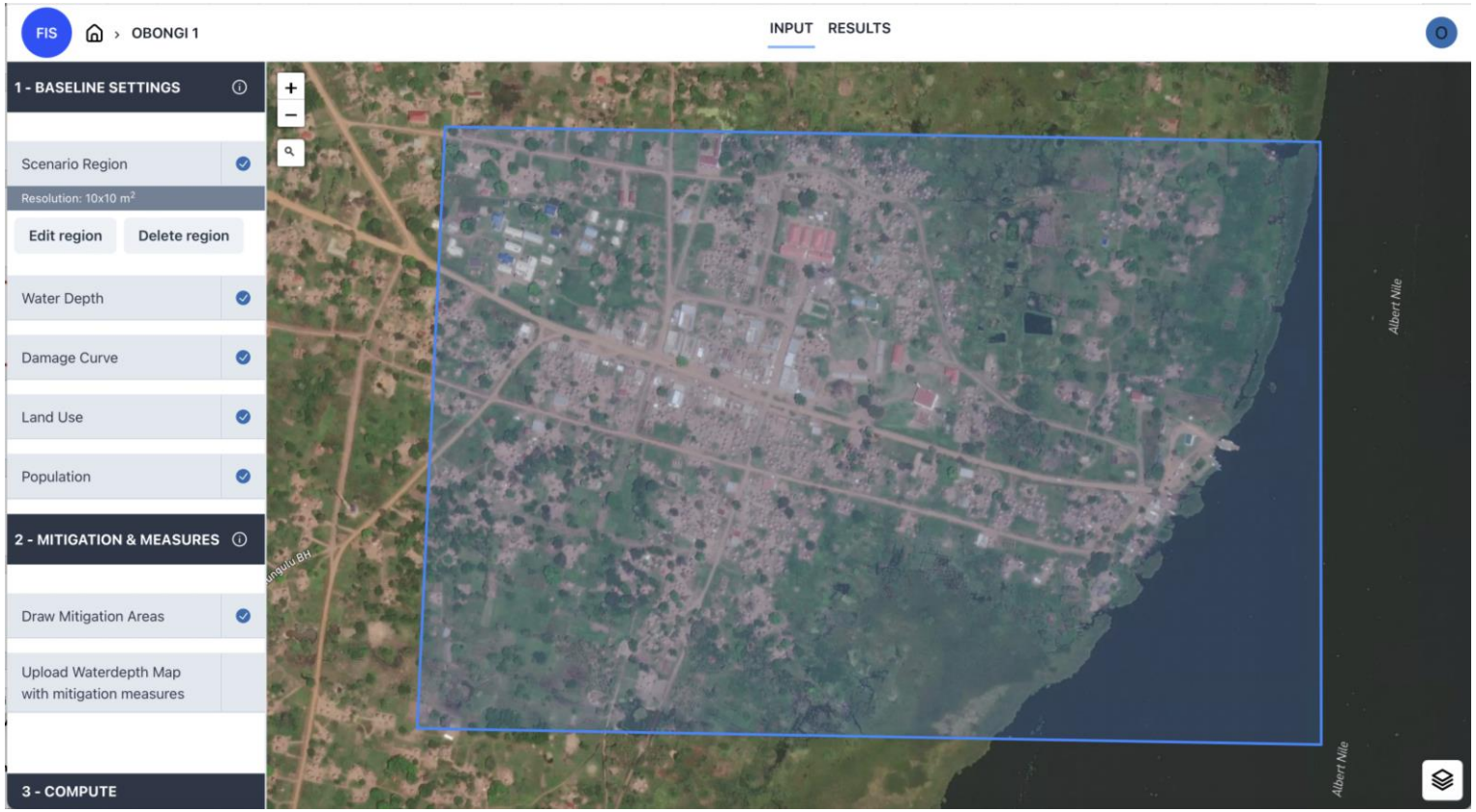


Screenshot FIS Tool 1/10 year Flood Event at Obongi District

Step 4: Zoom in

- Further zooming to increase level of detail.

FIS Analysis Selecting Area of Interest



Screenshot of selected area of interest in the FIS Tool

Step 5: Select Area of Interest

- Select area using a polygon.
- Flood damages will be calculated for the selected area.

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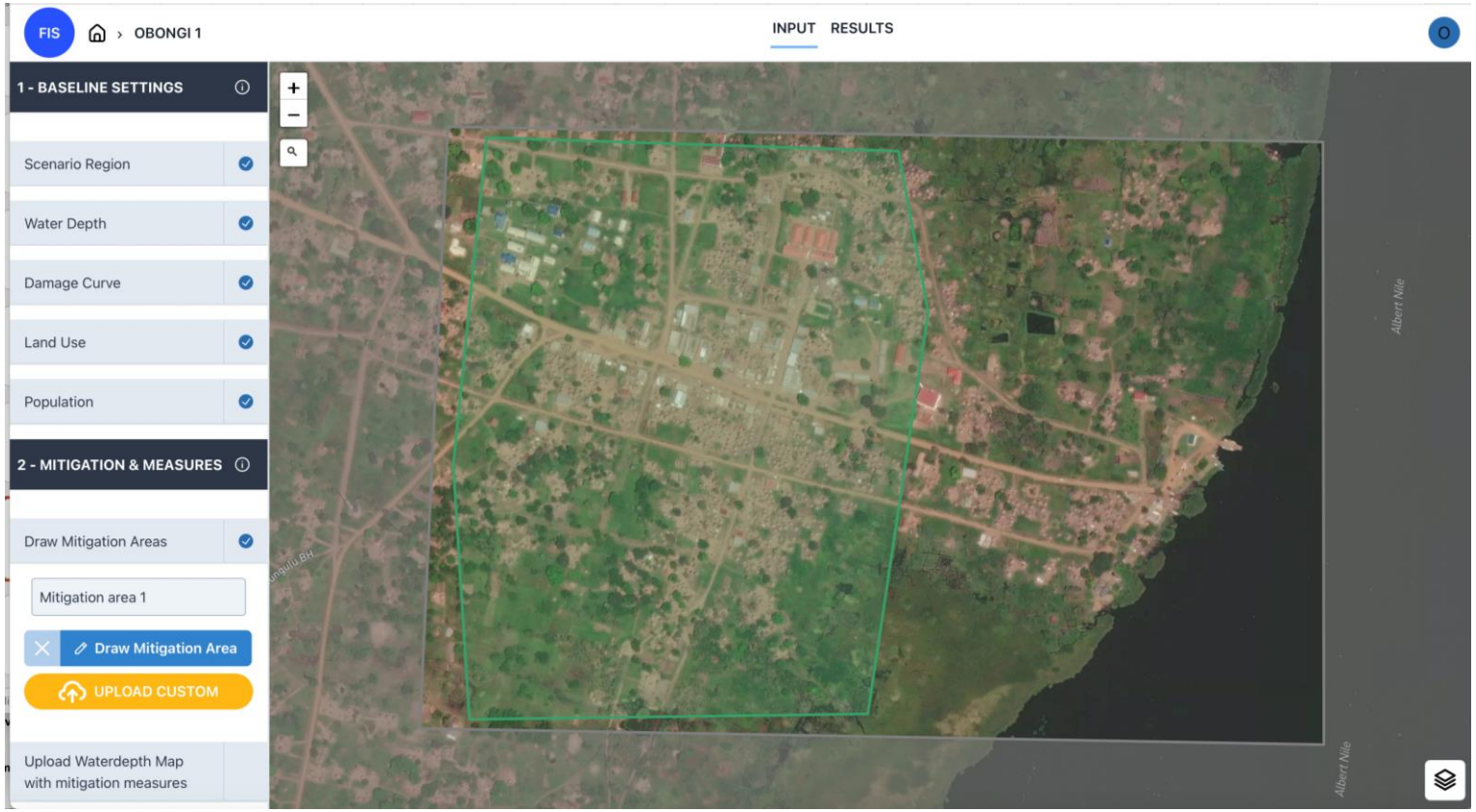
FIS Analysis Selecting Area to be Protected from Floods



Screenshot of area to be protected from floods (green polygon)

Step 6: Select Area to be Mitigated

- Select area to be protected from floods.
- Select the anticipated reduction in water level.

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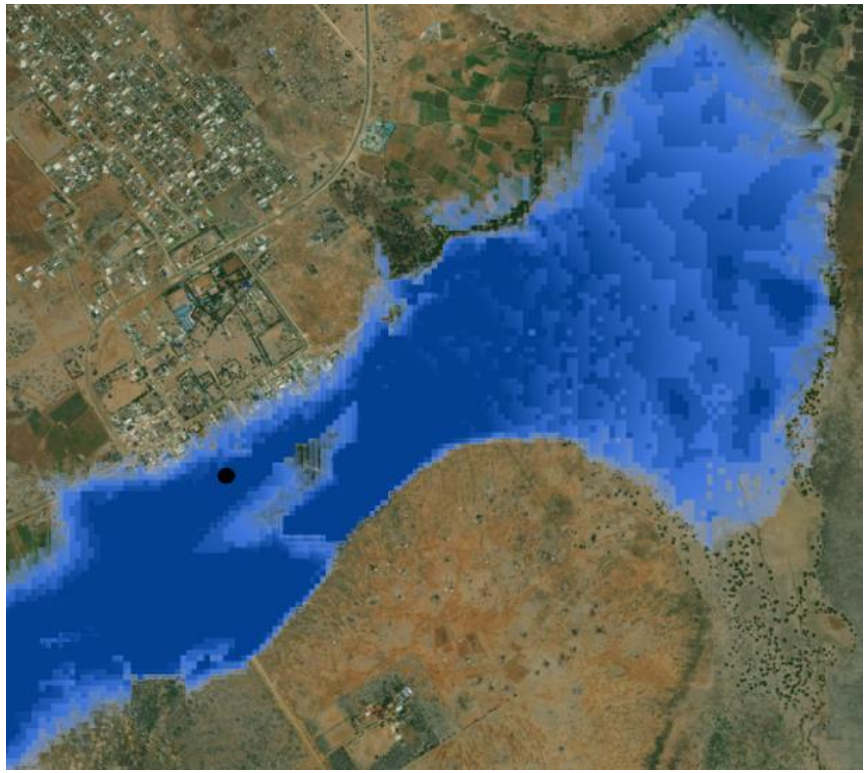
Optimal Dam Locator Tool Selects Best Possible Location to Deploy SLAMDAM

Adaptation Benefits (ABs) are calculated by comparing the ***Baseline Scenario*** (No SLAMDAM) with the ***Adaptation Scenario*** (With SLAMDAM). The SLAMDAM location is selected with the help of the “Optimal Dam Locator” tool.

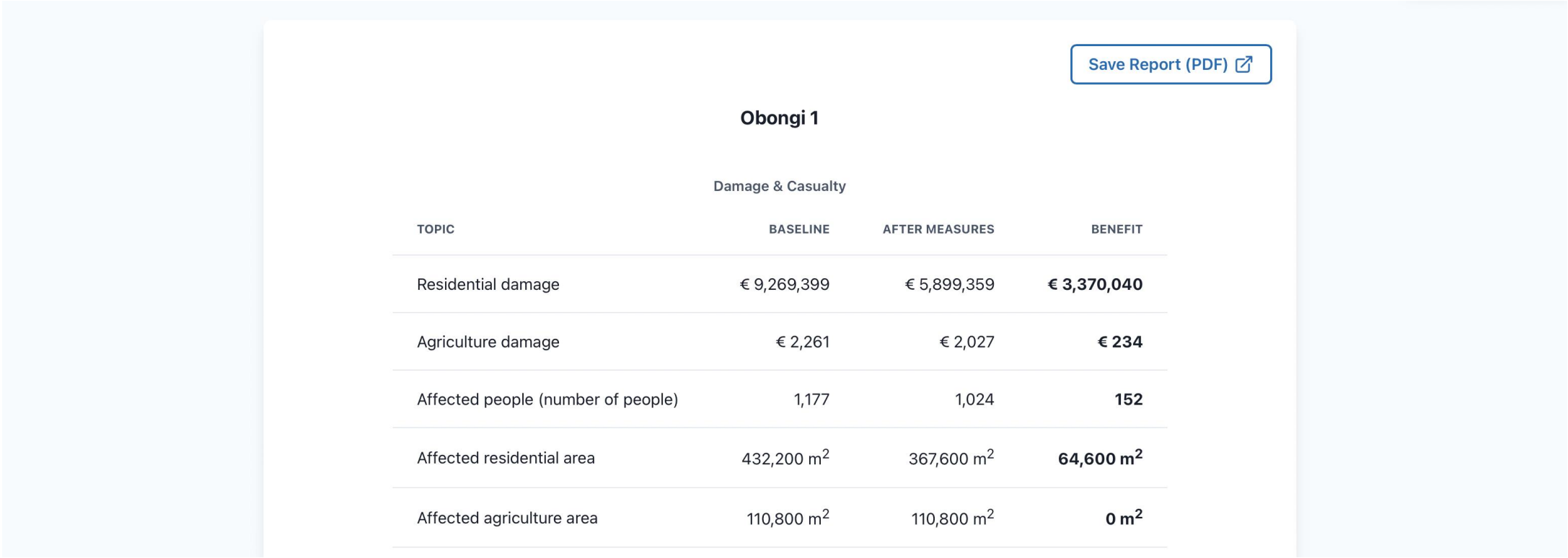


Baseline Scenario i.e. no SLAMDAM

Adaptation Scenario i.e. including SLAMDAM

FIS Computes Results from Analysis at Obongi District.

The results of the FIS tool compare damages in the ***baseline scenario*** with the ***adaptation scenario***; reductions in flood damages are the benefits



Screenshot of results page from FIS analysis at Obongi District

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FIS Visualizes Flood Damage Reductions at Obongi District

Screenshot of visualized damage reductions at Obongi using FIS tool

Damage Reductions

- Reduced land areas impacted by floods.
- Reduced number of affected people.

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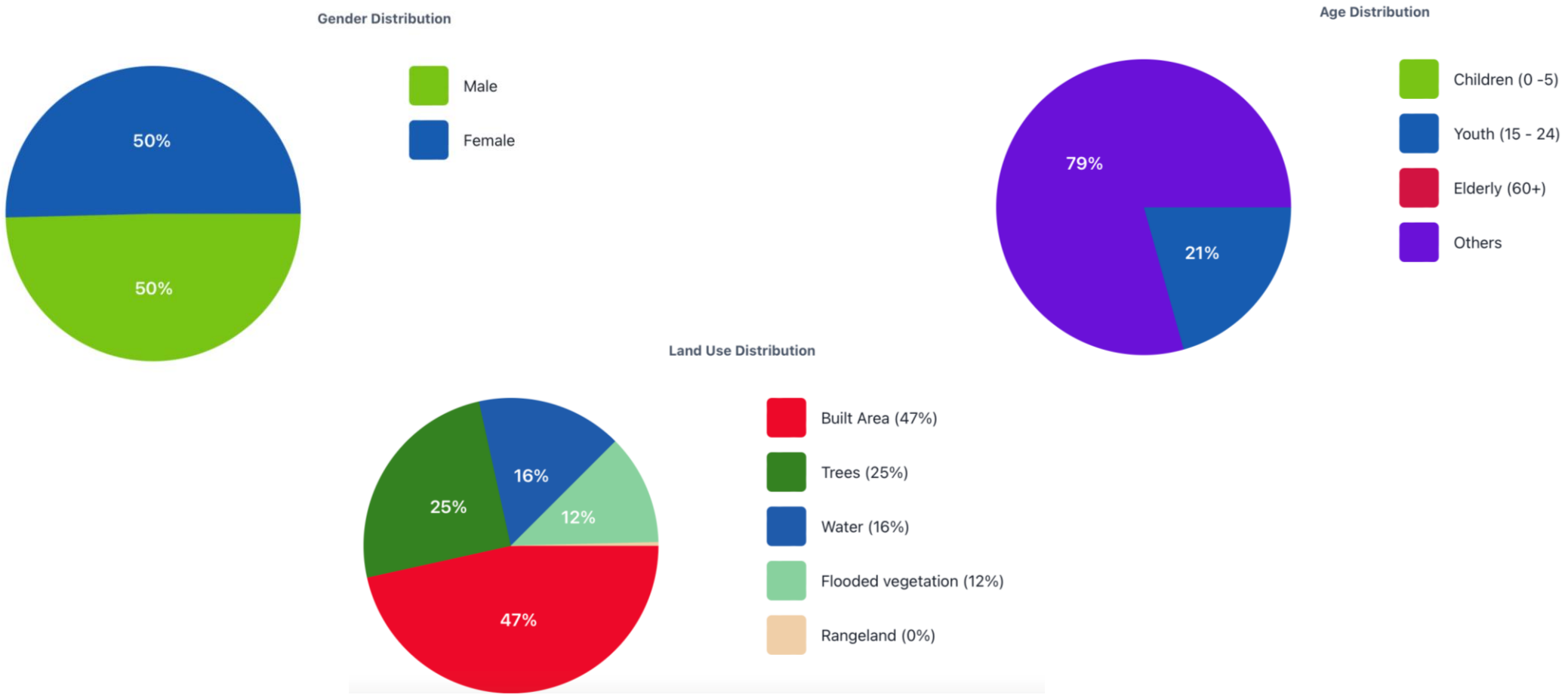
FIS Disagregates Flood Damage Reduction Results



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SDGs and Co-Benefits Statement SLAMDAM at Waka

SDG 2: Zero Hunger: SLAMDAM enhances water security for crops and livestock production to support consistent food production, reducing hunger and malnutrition.

SDG 6: Clean Water and Sanitation: SLAMDAM's ability to harness and store rainwater can contribute to better access to clean drinking water and support water management and sanitation efforts.

SDG 11: Sustainable Cities and Communities: SLAMDAM can help in building resilient infrastructure, supporting disaster risk reduction, to enable the development of sustainable and resilient urban areas.

SDG 13: Climate Action: By providing solutions to flooding and drought—two challenges exacerbated by climate change—SLAMDAM supports broader climate change adaptation strategies.

SDG 15: Life on Land: By controlling flooding and enabling sustainable water use for agriculture, SLAMDAM supports the sustainable management of ecosystems and limits land degradation.

The following co-benefits apply for this project.

Equality to Vulnerable Groups:

The interests of vulnerable groups, incl. women, are prioritised as they are impacted the heaviest by flooding and drought.

Sustainable Behaviours:

Behavioural change will strengthen the community's resilience to not only flooding and drought, but to climate change in a broader sense e.g. through improved waste management.

Job Creation:

The economy will improve likely leading to new job opportunities to support economic growth.

Improved (Mental) Health:

Improved resilience and increased food and water security will result in reduced anxiety, diseases and improved access to health care facilities.

Capacity Building at Waka Community

Capacity Building Involving Women

The Waka community and other local stakeholder underwent capacity building sessions and training to strengthen their skills to manage climate change-induced floods effectively. Capacity building and training emphasized the involvement and interests of **vulnerable groups** such as **women**.

Local community being trained on how to use SLAMDAM

Community Deployed SLAMDAM Independently

SLAMDAM was Deployed by the Community

After capacity building efforts and training sessions, the community members were able to deploy SLAMDAM independently.

SLAMDAM was deployed independently by community

SLAMDAM was Successfully Deployed During a Real-Life Flood

SLAMDAM Reduced Flood Damages

El Nino led to rising water levels of the Kochi River sub-catchment, leading to a risk of flood damages at the Waka Community. SLAMDAM was deployed successfully, effectively preventing flood damages. The barrier was intact when the risk of floods had subdued.

SLAMDAM was successfully deployed during a flood event in June 2024

Monitoring and Evaluation (M&E) Framework to Calculate Benefits and Establish Learning Curve

Objective M&E

The objective of the M&E framework is to continually assess the impact, effectiveness, and efficiency of the SLAMDAM technology.

Data Collection Methods

- Surveys and questionnaires
- Interviews with key stakeholders
- Field observations

Evaluation Criteria

- Deployment Adequacy
- Achievement of Targets
- Stakeholder Engagement

Reporting Frequency

- After each flood event,
- Annual evaluation of all events

Local community at Waka who will be involved in M&E