Working Session #2:
Coastal Flooding & Inundation Case Study

Delphine Lobelle (Fugro) & Kenneth Mubea (Digital Earth Africa)
Over the past twenty years, at least 1.6 billion people having been affected by floods (World Bank, 2021)
- Climate, weather and water-related extremes → 15 times more deadly hazards for people in Africa, South Asia, South and Central America, and small island states.
- Over the last 50 years, nearly 70% of deaths from climate-related disasters have occurred in the 46 poorest countries.
Co-design for digital solutions required for decision-making

The challenges of the African coastal communities

A common understanding to reach a solution

The challenges of data

Your knowledge

Our knowledge

Your knowledge

Our knowledge
A digital co-design process
A flexible shared approach to improve digital solution design

**Phase 1**
- Understand your Geo-data challenges
- Map your needs through discovery workshop

**Phase 2**
- Explore solution possibilities with our experts
- Rapidly test ideas through the Digital Lab

**Phase 3**
- Deliver tailored solution to meet your needs

**Workshop**
- Workshop report
- Solution design presentation
- Prototyping (online meetings)
- Final design

1.5 hours - 1.5 days
1 – 2 months
6 months
12 – 18 months

**1. Do we have a challenge to solve together?**
**2. Is there an agreed way to solve the challenge?**
**3. Do we want to invest in building?**
Sea’ties-SPREP co-design workshop in Nadi, July 2023

Pacific region decision-makers require more access to data and digital tools to support climate adaptation planning and management

18 participants from 10 Pacific islands (including NZ)
1. What do we need to plan for?
2. What matters most? And, when do we need to act?
3. What are our options for each area of interest?
4. How do we implement the plan?
5. How do we finance the plan?
6. Is the plan effective?

User journey

User actions with Geo-data

Pain points

Political engagement and leadership
Data and analysis to support planning decisions
Managing socio-cultural challenges
Financial support and resources
Reducing investment risk through transparency

Data solutions

Low-resolution analysis
Typically, satellite or open-source analysis
Coastal mapping survey
Model
Multi-hazard scenario and impact analysis
Adaptation pathways
Data driven strategic planning
Cost optioneering
Data analysis to support financial planning
Nature-based solutions
Evaluating sites that will deliver the most impact
Geo-risk management framework
Coastal engineering design analysis

Data driven decision making solutions

Implement plan!
Monitor and evaluate plans
Adjust plans based on outcomes
Low-cost regional multi-hazard assessment
Land use analysis
Scenario risk analysis
Evaluate strategic options
Strategic planning
Community engagement
Cost analysis and finance strategy

Data visualisation
Support stakeholder engagement
Monitor
Measure change of critical parameters over years to understand planned vs actual outcomes

The Geo-data value chain

Low resolution analysis
Typically, satellite or open-source analysis
Coastal mapping survey
Model
Multi-hazard scenario and impact analysis
Adaptation pathways
Data driven strategic planning
Cost optioneering
Data analysis to support financial planning
Nature-based solutions
Evaluating sites that will deliver the most impact
Geo-risk management framework
Coastal engineering design analysis

Map
Spatial land use assessment

Geo-data value chain

Implement plan!
Aim of workshop is to map:

- the stakeholders
- the challenges
- the decision-making process & associated challenges
- where EO can solve challenges in decision-making process
- draft of a pilot solution
# Draft of the pilot solution

## Pilot Solution Description

<table>
<thead>
<tr>
<th>End Users</th>
<th>Target Audience</th>
<th>Decision Points</th>
<th>Benefits</th>
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## Technical resources

<table>
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<tr>
<th>Locally Available</th>
<th>Internationally Sourced</th>
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## Scalability

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<th>Time</th>
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## Financial Scheme


## Product Impact Assessment


## Long-term Commitment


## Self-Evaluation

<table>
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<tr>
<th>Strong Points</th>
<th>Weak Points</th>
<th>Improvements</th>
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## Unique Selling Points

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<tr>
<th>Feasibility</th>
<th>Engagement</th>
<th>Impact Potential</th>
<th>Added Value</th>
<th>Attractive</th>
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Fugro is an active member of numerous UN Ocean Decade programmes for Coastal Resilience & Digital Twins

Digital Twins of the Ocean
Official partner

CoastPredict
Aquarius project within PredictOnTime Core Project

Ocean Decade Africa Roadmap
Jaco Stemmet – representing the private sector on the task force

Ocean Decade Corporate Data Group &
Ocean Decade Data Coordination Group
Via IOC-UNESCO partnership
Aquarius project

- European-African collaboration
  - 4 African partners: Benin, Mozambique, South Africa, Cabo Verde
- Aims:
  - Deliver coastal predictive products for coastal zones vulnerable to extreme natural hazards.
  - Near-real-time insights through observations, modelling and forecasts
  - Deliver early-warning capabilities to support decision-making, policy development and capacity development
  - Protect people, nature and infrastructure via coastal resilience and preparedness.
  - Co-design of products to support decision-making
II. Major Hazards and Impacts

Climate Change Factors

Rising sea levels
- Flooding and inundation
- Erosion of coastal areas

Extreme weather conditions
- Tropical cyclones
- Storms
- Floods
- Wind

Coarse overview of hazards and vulnerability of Mozambican coast (source: INGC 2011)
**myDewetra** is a platform for creating risk scenarios in real time, which allows preventive measures to be taken and reduces the impacts of the predicted event.

**MULTI-RISK PREDICTION AND MONITORING PLATFORM**

**PREDICTORS**

- Observations and Predictions
- Exposed Features

**DECISION-MAKERS**

- Real-time risk scenarios
RAPID AND ACCURATE INFORMATION

AGGREGATE MULTIPLE SOURCE

OVERLAP

COMMUNICATING
High-resolution coastal mapping baseline is critical to decision-making for coastal resilience

Satellite-based global flood model

Fugro digital elevation model (DEM)-based flood model (bathtub)
**Pilot Solution Description**

Mozambique Digital Twin of early warning for cyclones and storm surge (multi-hazard impacts)

**End Users**

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<tr>
<td>Mozam Emergency Centre (e.g. Alberto Armando)</td>
<td>When to evacuate people, where the recurring hotspots are predicted</td>
<td>Save lives, livelihoods, reduce economic loss from damages</td>
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**Technical resources**

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<td>myDEWETRA platform</td>
<td>Fugro + other near-realtime data, models and analytics to feed into platform</td>
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<td>3-year project (monitoring timescale)</td>
<td>Cyclones/storm surge</td>
<td>Hotspots of past storm surges</td>
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### Draft of the pilot solution

**Financial Scheme**
Prototypes built with in-kind contribution from Fugro Innovation team, scaled solution by International Funding Institution funding (e.g. World Bank)

**Product Impact Assessment**
Workshops with local stakeholders at the Emergency Centre to understand the usability, likeability and improvements to past systems. Continue improving the tool to ensure it is fit-for-purpose

**Long-term Commitment**
Set-up a recurring tool subscription model with ensured post-production support and continued feedback sessions. Signed contract to keep collecting near-real-time data via satellite

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<td>Highest resolution analyses</td>
<td>Near-real-time is not always possible</td>
<td>Tool usability</td>
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