

Flying Sensors for Ultra-High Resolution Flood Risk Identification at Local Scales in Mozambique



Jan van Til

19 May 2016

Understanding Risk Forum, Venice, Italy

HiView

FutureWater

Research and consultancy for a
sustainable future of our water resources

Content

- > Introduction FutureWater & HiView
- > GFDRR and DFID Challenge Fund
- > Flood Management in Mozambique
- > Flying Sensors
- > Processing images
- > Outlook



Company profile



- Expertise: research and consulting on water resource management
- Offices at Wageningen (NL) and Cartagena (ES)
- Topics
 - water, food, irrigation, drainage, climate change, droughts, remote sensing, models
- Outputs
 - technical reports, policy reports, scientific publications, training, datasets, models, operational services
- Partners/Clients
 - NWO, World Bank, Asian Development Bank, Governments, River Basin Organizations, Research Entities, Science Foundations, Companies



Company profile



- Established 2012, located at Wageningen, The Netherlands
- Core business: exploitation of aerial data from Flying Sensors, based on satellite remote sensing expertise (FutureWater)
- Applications
 - Glacier monitoring (Nepal)
 - Agricultural advisory (Mozambique, The Netherlands, Spain)
 - Nature Estates (UK, The Netherlands)
 - Water boards (The Netherlands)
 - Environmental studies (The Netherlands)
- Partners: DFID (Nepal), ESA (UK), ICIMOD (Nepal), USAID (Mozambique), ISRIC (NL, Spain), MIT, Rijkswaterstaat, Prov. Brabant, Natuurmonumenten, Waterboard Fryslan (NL)



GFDRR and DFID Challenge Fund

- > New and innovative approaches
- > Strengthen disaster and climate risk decision-making
- > Bridging the gap between technology and on-the-ground user needs
- > Disaster risk identification
- > Support the development of data, products and approaches



Floodings in Mozambique

Torrential rains hit Mozambique, flooding feared

Mozambique: Thousands evacuated from
ris

Mozambique 'to evacuate thousands' bec

Floods threaten thousands in
Mozambique

AFRICA

Mozambique Flooding Update

Up to date information from travelers, using the Zimbabwe – Mozambique roads. Recent heavy rainfall has caused the Pungue River to burst its banks, causing flooding throughout the province.

“Anyone travelling this road should take into consideration this info. Bill and I intend to do the trip on Monday, and I will give you a



Mozambique
some
cause
levels
say.

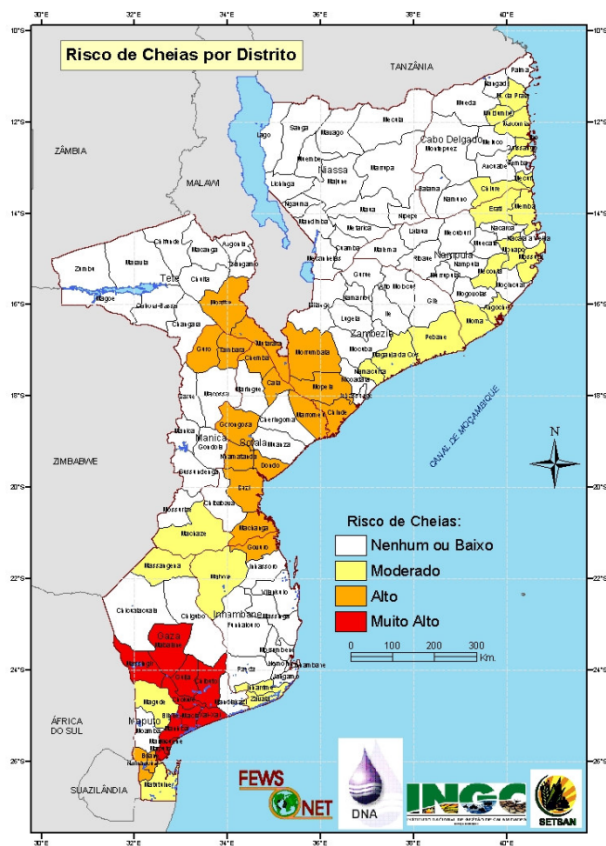
"We are
areas,
relief a

The so
have c

Heavy
homes.
forces
Ribeiro
keep go
Accord
emerge
budget

Mapu
follow
The M
Mafar
The r
sectio

Flood prone zones in Mozambique



Challenges in Mozambican context

- > Mozambique's major rivers flood at a regular basis
 - Hard accessible flood prone locations

- > On-the-ground water managers are confronted with lack of information:
 - On the assessment of vulnerable dikes and levees
 - During floods on appropriate responses and mitigation
 - Data at coarse resolution

- > Tune different sectors at national and local scale:
 - Hydraulic/water management
 - Agrarian producers
 - Disaster management



Flood management in Mozambique

- > INGC (1999), Instituto Nacional de Gestão de Calamidades
 - In close contact with INM, Instituto Nacional de Meteorologia
 - Supported by Germany, Brasil
- > NAPA (2007), National Adaptation Programme of Action (in response to climate changes)
 - Improving disaster early warning system focussing on agrarian & hydraulic sector in coastal areas.
 - Bridge gap between national administration and local decision makers
- > Local water management organizations. Our partners: ARA Centro & RBL
 - Appointed flood manager yes/no
 - Yes: ARA Centro (waterboard of middle Mozambique)
 - No: RBL (irrigation scheme Xai Xai)



Our contribution: Flying Sensors

- > Main characteristics:
 - Aerial photography at ultra-high resolution
 - Real time video
 - Highly deployable
 - Short term processing of aerial images
 - Reduction of exposure to danger
 - Cost-efficient



Our contribution: Flying Sensors

> Applications for **PPRR**

- **P** Prevention
- **P** Preparation
- **R** Response
- **R** Recovery



Our contribution: Flying Sensors

- > Applications for **P** Prevention
 - Flying Sensor imagery for land & water monitoring
Useful for risk assessment. Identification of:
 - flood prone locations
 - weak constructions and structures
 - river basins: cross sections, height measurements
 - Results:
 - Better mapping & planning
 - Mitigation of risks
 - Situational awareness



Our contribution: Flying Sensors

- > Applications for **P** Preparation
- Use of Flying Sensor to embed in current flood management
 - Integration in flood management manual of:
 - Checklists for use and maintenance of Flying Sensors, batteries, equipment
 - Protocols for various flood scenarios
 - Priority lists of flood prone locations
 - Risk identification matrix



Our contribution: Flying Sensors

> Applications for **R** Response

- Quick response
- Tools:
 - Real time video
 - Photography
 - Short term imagery processing: Orthomosaics, DEMs, KLZ
 - Tablet mapping for embedding in Google Earth
- Results
 - Incentives for action:
 - Rescue & evacuation
 - Damage control



Our contribution: Flying Sensors

- > Applications for **R** Recovery
 - Damage identification
 - Tools
 - Photography
 - High resolution imagery processing:
Orthomosaics, DEMs, KMZ, Models
- Results
 - Assessment of damage:
 - overview
 - details



Flying in Mozambique



Imagery processing

> Results:

- Orthomosaic
- DEM
- KMZ/KML
- VR models
- Tablet mapping



Imagery processing

> Results:

- Orthomosaic

River Pungwe near Beira,
Mozambique



Imagery processing

> Results:

- Orthomosaic detail

River Pungwe near Beira,
Mozambique

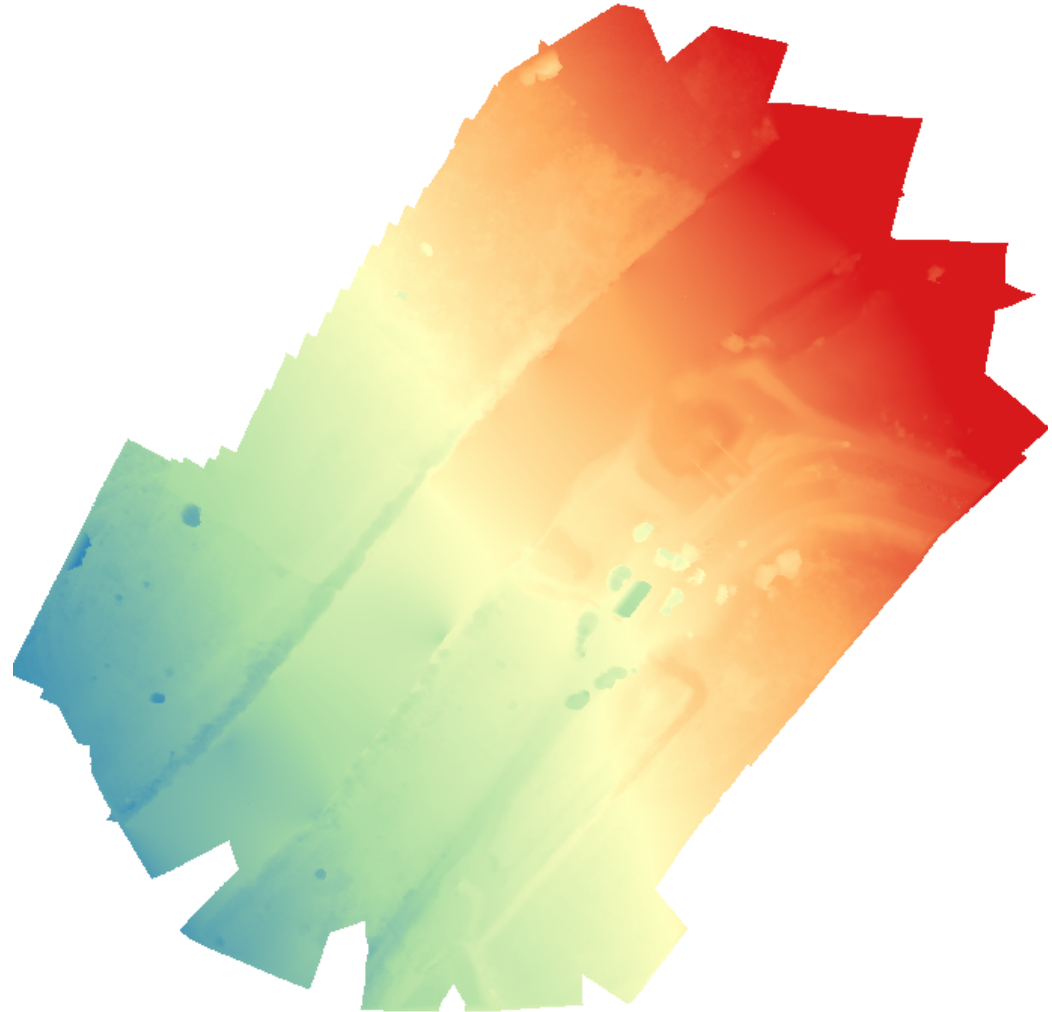


Imagery processing

> Results:

- DEM

River Pungwe near Beira,
Mozambique



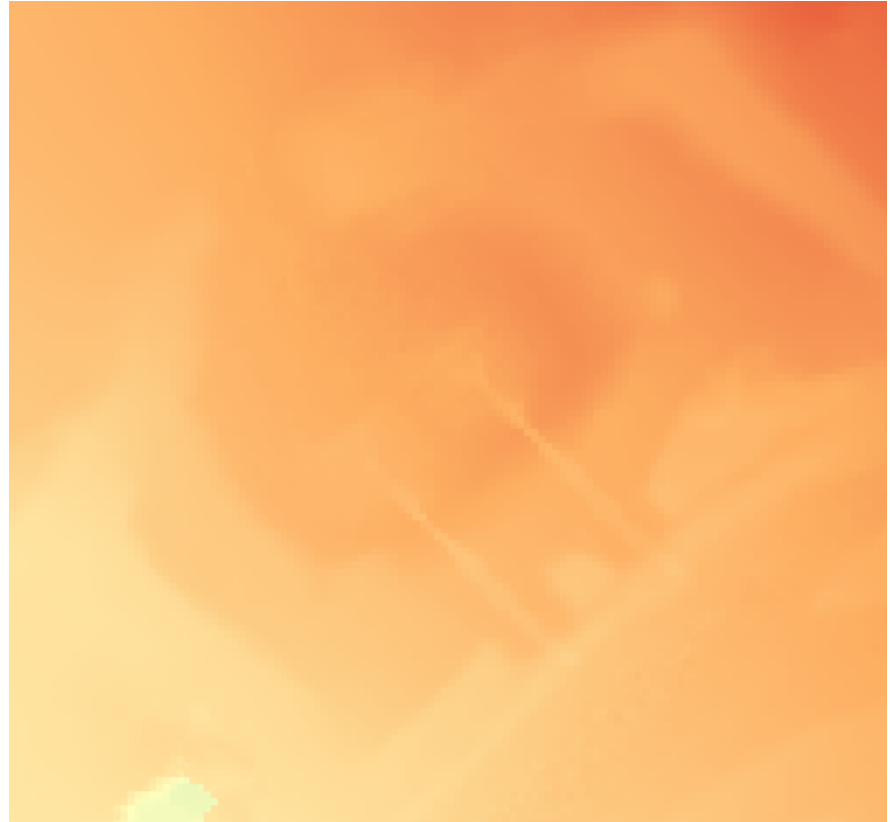
Imagery processing

> Results:

- DEM

detail

River Pungwe near Beira,
Mozambique



Imagery processing

> Results:

- **KMZ/KML**

River Pungwe near Beira,
Mozambique



Imagery processing

> Results:

- VR models

<https://skfb.ly/OqS6>

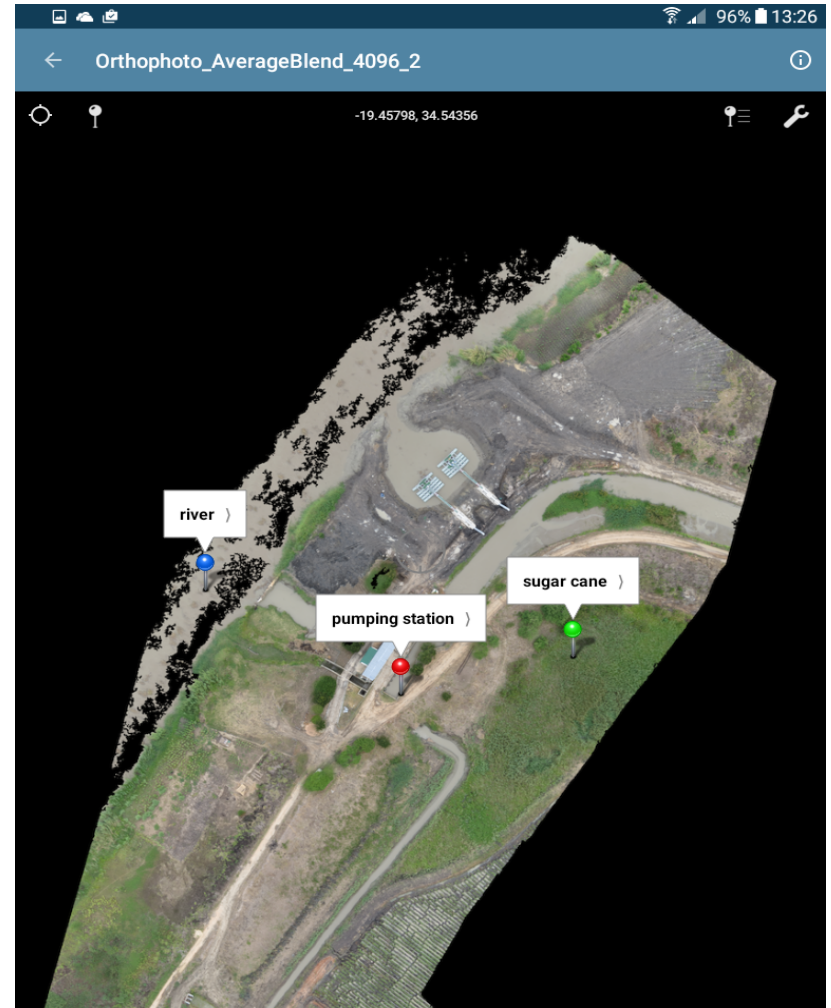


Imagery processing

> Results:

- **Tablet mapping**

River Pungwe near Beira,
Mozambique



Outlook: objectives

- > Local Flying Sensor operator to work autonomously
- > Gender policy: promoting equal access to flood management tasks
- > Integration of Flying Sensor info into management manual
- > Promoting sources from the public domain
- > Conveying Flying Sensors info to public and local platforms
- > Flying Sensors for humanitarian purposes like micro-transportation:
 - Mobile phones, live lines, medicine
- > Expansion to other flood prone zones
- > Further inventory of needs at local scale
- > Further exploration of national and local disaster management practice



Let`s work for a Happy End!

Thank you!

谢谢!

Obrigado!

ارکشا!

Grazia!

Merci!

Danke!

Dank u!

Asante!

Merci!

Grazie!

Kalimambu!

