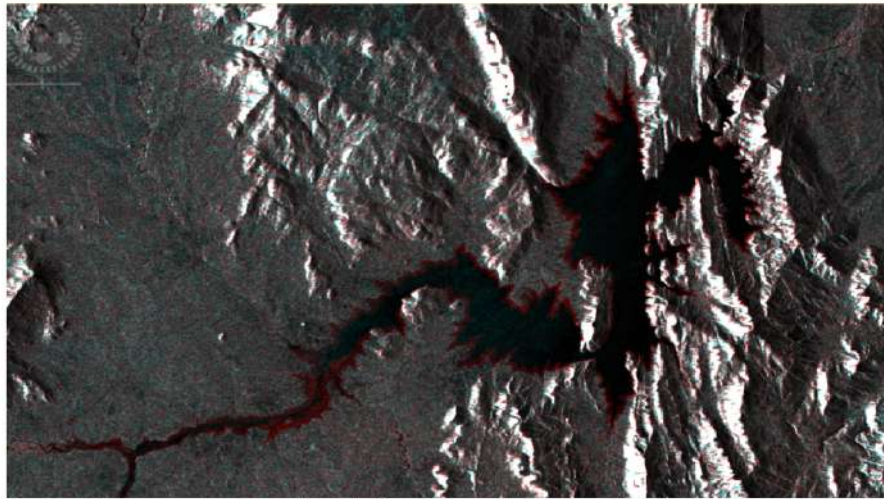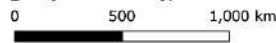# Using GIS to assess, model and analyse floods
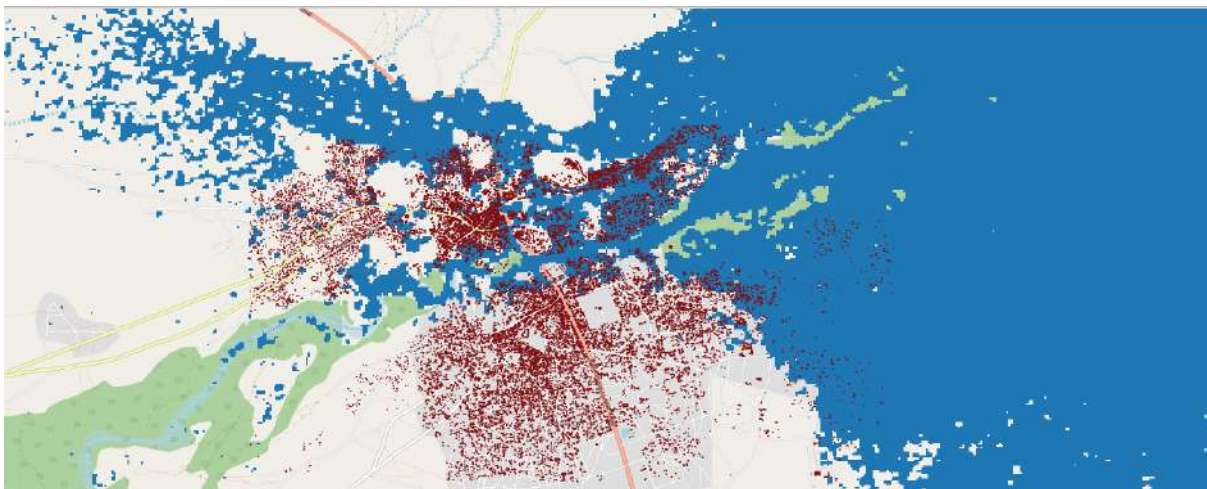# A case study at Turkwel dam and its basins

The flooded areas are shown in red. The river and permanent water bodies are very dark.
Data Source: Sentinel-1A SAR images (4th January, 2020 and 18th October, 2020)

Turkwel dam flood map

This shows the flood model of Lodwar Town, one of the basins in the Turkwel region. The red polygons depict the building footprints, and the blue represents the floods at a specific level.

OVERVIEW	
Flying Labs	Kenya Flying Labs
Geographic area	Turkwel Dam, County of West Pokot, Kenya
Date range	May - August 2021
Sector program	AidRobotics
Main SDGs	GOAL 11: Sustainable Cities and Communities GOAL 13: Climate Action GOAL 17: Partnerships to achieve the Goal

SCOPE	
Project stakeholders	County Government of West Pokot Kerio Valley Development Authority Kenya Red Cross Society
People impacted	Communities living in the basins of the Turkwel gorge basin
Number of people impacted	Approximately 16,000 people living in the basin
Challenge	In October 2020, Turkwel dam in West Pokot, Kenya, recorded the highest water level of approximately 147.72 m, leaving only 2.28 m of water height to spill over. This was due to the increase in the rain in the preceding months. This was feared to impact almost 16,000 people living in the basin if the water levels kept rising.
Scope	This project aimed to study Turkwel dam and create a flood model template of the basins. The first part of the project studied the dam situation in October 2020 compared to the driest month ever recorded and the second part analysed the basins of Turkwel in the case of the dam overflowing. The critical questions to answer were: Who would be affected? To what extent? What would be the volume of floods? Etc.
Outcome	We used satellite data from sentinel-1A and SRTM mission to study the flood situation in Turkwel since we did not manage to acquire a permit to fly the drone. A flood map of the dam was created to show the extent of water increase in the reservoir. We also created flood models for the basins that would be affected in case of a flood event. These flood models show the extent and volume of the floods.
Impact	This model will be quite useful in studying the flood situation in Turkwel basins, hence providing insights to the County Government of West Pokot and the Red Cross team on how to handle the flood situation. It will be important for the stakeholders to use it for assessing flood damage and also for the rescue operations.
Next steps	We signed a Memorandum of Understanding with the County Government of West Pokot to integrate our drones in their flood-related and other various projects.

COMMUNITY ENGAGEMENT AND STAKEHOLDER SUPPORT	
Consent for data acquisition	We visited the site with the various stakeholders and had discussions with them about the dam and the problems they were facing. We then kept in touch through phone calls and emails.
Activities to engage with the community	We held an official meeting with the staff at Kerio Valley Development Authority (KVDA), County Government of West Pokot and organized a flight demonstration for them.
Community groups engaged with	Government officials, local community and representatives from the Kerio Valley Development Authority
Community attendance	8 people from West Pokot County Government, 3 officials from KVDA and a few residents
Community feedback	At first the community was scared of the drones, since they associated them with tools used during wars. This showed the importance of community engagement and explaining the purpose of the project and the technology used.
Stakeholder support	After the completion of the project we held online meetings and took the stakeholders through the project. We showed them how to apply the same process in case of floods. We also shared PDF tutorials with them.

DATA ACQUISITION	
Size of area	Turkwel basin, which covers 23 740 km2 (2 374 000 ha)
Drone	N/A- Data was from Sentinel-1 satellite
Sensor(s)	C-band SAR
Flight plan software	N/A
Flight height	N/A
GSD (Accuracy)	10 m spatial resolution
Number of images acquired	N/A
Number of flights	N/A
Time invested in data acquisition	2 hours
Georeferencing	N/A

DATA PROCESSING & ANALYSIS	
Processing software	QGIS and SNAP
Processing time	2 weeks
Data products	Satellite images
Analysis tools	QGIS and SNAP
Analysis outputs	Flood maps and flood model
Final outputs shared with stakeholders	Report, QGIS file, flood model, detailed procedure for using the flood model
Data sharing	Email