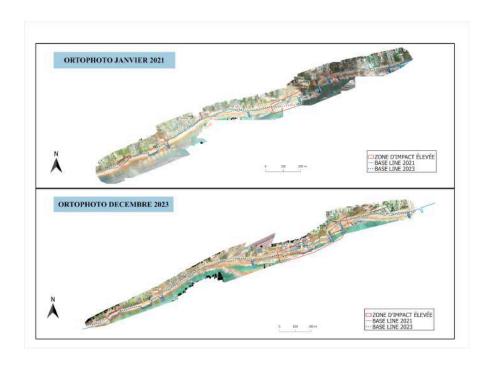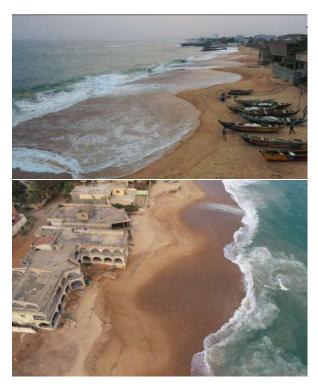# Mapping of the Baguida Coast to Assess Coastal Recession and its Impact on Local Residents

Map showing changes over the period 2021 to 2023 due to coastal erosion

TFL team during data collection

Rising waves and impact of erosion

OVERVIEW	
Flying Labs	Togo Flying Labs
Geographic area	Baguida, Lomé-Togo
Date range	January 2021 - December 2023
Sector program	EcoRobotics
Main SDGs	GOAL 11: Sustainable Cities and Communities GOAL 13: Climate Action

SCOPE	
Project stakeholders	Not applicable.
People impacted	Local stakeholders, decision-makers, environmental organizations and the Togolese coastal management and protection community.
Number of people impacted	About 1000 people.
Problem statement	Recently, the Togolese coastline, particularly around Baguida, is undergoing rapid erosion, threatening the homes of local residents.
Project objectives	The objectives of this mapping project are to: 1. Analyze coastal change: Provide a detailed assessment of geographical changes along the Baguida coast to understand trends in coastal recession. 2. Use drone technology to map vulnerable areas: Identify the areas most affected by coastal recession in order to target areas requiring particular attention. 3. Assessing the impact on local communities: Analyzing the consequences of coastal retreat on local populations in terms of safety, access to resources and infrastructure. 4. Raise awareness and provide information: Disseminate the results of the assessment to raise awareness among

	stakeholders and inform decision-makers, local residents and the organizations concerned. 5. Contribute to sustainable management: Provide usable data for more sustainable coastal management, integrating environmental, social and economic aspects. Together, these objectives aim to create a solid basis for informed decision-making and coordinated action in response to the challenges posed by coastal retreat in Baguida.
Scope	The main activities included; ● The planning of data collection missions using PIX4Dcapture ● Data acquisition using drones to obtain high-resolution images ● Data processing using PIX4Dmapper to produce an orthophoto ● Digital Terrain Models (DTMs) and Digital Surface Models (DSMs) ● Geospatial analysis using QGIS ● Drawing up recommendations based on the data collected ● Communicating the results via awareness-raising sessions and webinars. These activities will provide an in-depth understanding of the coastal situation, raise awareness among stakeholders and create an essential database to guide future coastal management decisions.
Outcome	This work was carried out in two stages: Phase 1: Processing and analysis of the captured data. Once image acquisition had been completed, the data was processed using PIX4Dmapper software to generate orthomosaics and digital terrain and surface models (DTM/DSM). Phase 2: processing in GIS software
Impact	● Short-term impact: raising awareness of those affected, more sustainable coastal zone planning, reduced risk of

	flooding, and emergency response planning in high-risk areas.
	● Long-term impact: implementation of action plans, reduction of risks associated with coastal retreat, and lasting positive change offering local communities a more resilient and sustainable future.
Challenges	Air traffic- the project area was overflown by helicopters from the Lomé Transport Base for coastal surveillance. To overcome this challenge, soldiers monitored the activity and established communication and coordination with the Lomé naval air base to prevent the drone from flying when the helicopters passed over.
Next steps	Next steps include: ● Integration of results into decision-making processes: The data and recommendations generated will be integrated into the planning and coastal management processes of local authorities and stakeholders involved in the development and protection of coastal zones. ● Implementation of recommendations: The recommendations made as a result of the data analysis will be implemented, which could involve actions such as building effective coastal protection, raising awareness of coastal risks among local populations, or putting in place adaptation measures to mitigate the effects of coastal retreat. ● Ongoing monitoring: Regular monitoring of the evolution of the Baguida coastline will be necessary to assess the effectiveness of the measures put in place and adjust strategies according to changes observed over time. ● Proposed training in the use of UAVs for coastal management.

COMMUNITY ENGAGEMENT AND STAKEHOLDER SUPPORT	
Consent for data acquisition	We obtained authorisation to fly a drone from the Togolese Ministry of the Armed Forces. We then traveled to Baguida to request the collaboration of the law enforcement team, as required by our authorization, to ensure the safety of our activity. As a result, we were able to carry out our activities successfully.

Community engagement activities	We have not organized any gatherings with the community before or during the event, but we plan to reach out to them through conferences and webinars to raise awareness of the risks of coastal erosion.
Community groups engaged with	We plan to engage engineers specializing in coastal management issues, the Agence Nationale de la Gestion de l'Environnement (ANGE), the WACA Programme (West African Coastal Management Programme), the Directorate of the Ministry of the Environment, universities and centers of expertise working in the field of environmental issues, and coastal communities.
Community attendance	N/A
Community feedback	N/A
Stakeholder support	N/A

DATA ACQUISITION	
Size of area	23 ha (0.233 km²)
Drone	Phantom 4 pro V2, Mavic 2 pro
Sensor(s)	RGB, 20 MP
Flight plan software	Control+DJI, PIX4Dcapture
Flight height	60m above ground
GSD (Accuracy)	1.72cm/pixel
Number of images acquired	2021 : 1906 double grid images 2023 :1072 Polygon images
Number of flights	2021: 12 flights 2023: 7 flights
Time invested in data acquisition	2021: 1 day (7 hours) 2023: 1 day (6 hours)

Georeferencing	Onboard GPS

DATA PROCESSING & ANALYSIS	
Processing software	PIX4Dmapper
Processing time	2021: 4 days 2023: 7 hrs 10 min
Data products	Orthophoto, Digital Terrain Model (DTM), Digital Surface Model (DSM)
Analysis tools	QGIS
Analysis outputs	The orthomosaic map showing a comparative study of the two periods
Final outputs shared with stakeholders	- JPEG images of high-impact areas - Raw data - Kml of the area - Orthomosaic - The orthomosaic map showing a comparative study of the two periods
Data sharing	Google Drive, hard drive