

Using drones to update the land register in downtown areas of Ouidah



Benin Flying Labs team acquiring drone data in Ouidah



Data products created from drone data: orthomosaic (left) and plan of the area (right)

OVERVIEW	
Flying Labs	Benin Flying Labs
Geographic area	Benin, Ouidah
Date range	May - July 2021
Sector program	DevRobotics
Main SDGs	GOAL 11: Sustainable Cities and Communities

SCOPE	
Project stakeholders	<p>The town council of Ouidah The land office of Ouidah The tax office of Ouidah The residents of four areas of the downtown city of Ouidah The local leaders (<i>chefs quartiers</i>) The Civil Aviation Authority</p>
Who benefits?	Town council, the residents of four areas of the downtown city of Ouidah and the tax office
Challenge	<p>In many cities in Benin, urbanization is driving an increase in city populations, land pressure and conflicts, and the lack of control over the tax base. This situation creates an enormous shortfall for the communes, which cannot mobilize the necessary financial resources to meet the increased need.</p> <p>Added to this is the obsolescence of spatial management tools and spatial data that does not provide a sufficient knowledge of the current situation. In the commune of Ouidah, as in other communes in Benin, subdivision operations have always been carried out using total stations and GPS for individual plot surveys. However, this operation is costly and time-consuming, which justifies, among other things, the difficulties of the communes in regularly updating the base plans.</p>
Scope	<p>Benin Flying Labs team proposed using drones to map specific downtown neighborhoods to update the Urban Land Register of the city of Ouidah, as this method has the advantage of speed, accuracy, and cost. The mapped areas were: Ahoundjigo, Fronsamé I, Fronsamé II, Dangbéhouè, Agbadjahonto, Ganvè, Hèhounli, Zongo-Malècomè, Lèbou-Alafia.</p>
Outcome	<p>In the past, paper documents were used to collect attribute information and topographers were hired to go from one place to another to manually collect spatial information. The work was difficult and time consuming. Using drones to facilitate this process proved to be faster, more precise and less expensive than previously used methods.</p> <p>The information collected not only completed the existing data but it also brought in new information that was lacking in terms of cartography and spatial information.</p> <p>We also organized a training session for the land department, including providing feedback. The purpose of this training was to teach them how to use the QGIS software.</p>

Impact	Thanks to this project, it will be easier for the land office agents to monitor land activities, carry out prevention and handling of land disputes and better manage spatial data.
Next steps	<p>Integration of drones into the daily workflow of the town council for updating the land information system.</p> <p>Working hand in hand with the Benin Flying Labs for further activities related to the land information system.</p> <p>The use of drones to update land information can be applied to other cities for the same purpose.</p>

COMMUNITY ENGAGEMENT AND STAKEHOLDER SUPPORT

Consent for data acquisition	We first met the mayor of the city of Ouidah, then the land office staff. Then we met the local leaders for decentralized sensitization. We held discussions with all these stakeholders to get their consent before moving forward.
Activities to engage with the community	<p>May 20: official meeting with the mayor and an official of the land affairs office</p> <p>May 26: official meeting with the head of the land register office</p> <p>May 27: meeting and a demo session with seven local leaders and local authorities</p> <p>June 2: second meeting with the local leaders and on the same day we met with the tax inspector</p> <p>June 3: meeting with the head of the land information system</p>
Community groups engaged with	Government officials, local community, local leaders
Community attendance	We held in-person meetings. The number of attendees varied from 2 to 15 people.
Community feedback	Following the training, the participants expressed their satisfaction and they committed to promoting Benin Flying Labs' expertise when using their new knowledge and tools.
Stakeholder support	To turn the data into action we held two major events: first a restitution session and second a training

DATA ACQUISITION	
Size of area	108 ha (1.08 sq km)
Drone	DJI Phantom 4 Pro
Sensor(s)	RGB/ DJI PHANTOM 4 Pro
Flight plan software	Map Pilot
Flight height	72 meters above ground level
GSD (Accuracy)	2 cm/pix
Number of images acquired	1600
Number of flights	8
Time invested in data acquisition	2 days
Georeferencing	Yes, using onboard GPS and Ground Control Points

DATA PROCESSING & ANALYSIS	
Processing software	Agisoft Metashape Pro
Processing time	40 hours
Data products	Orthomosaic, DTM
Analysis tools	QGIS
Analysis outputs	Building counting
Final outputs shared with stakeholders	Orthomosaic, land survey database, area plan
Data sharing	Hard drive