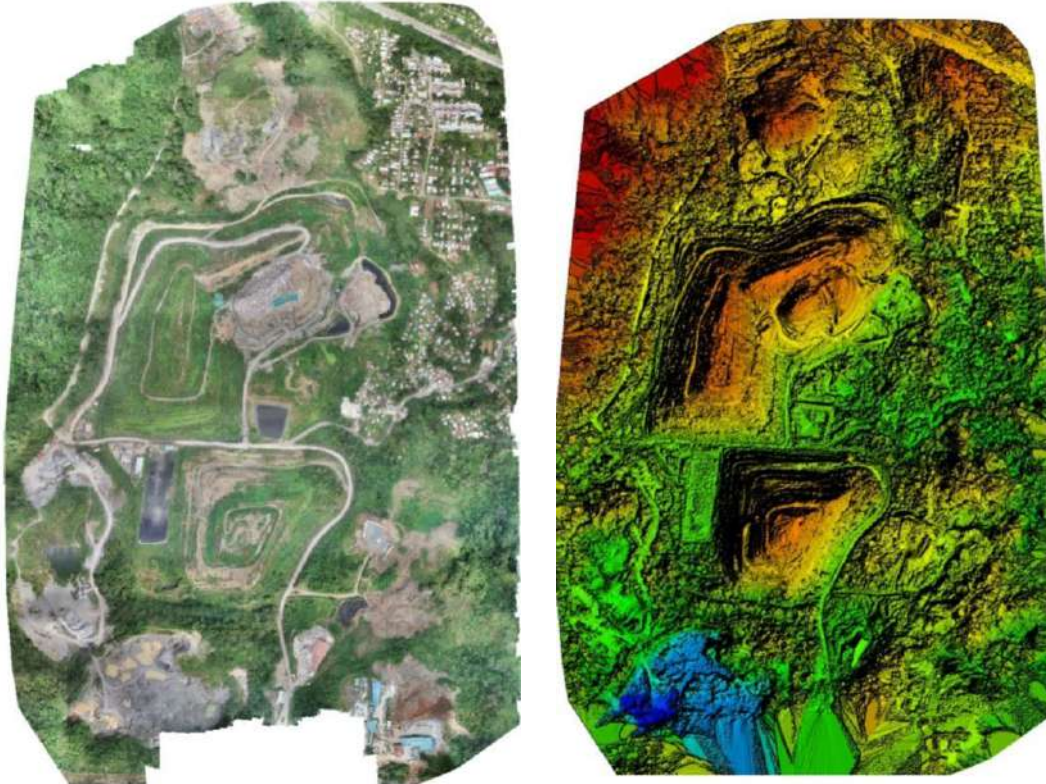


Cerro Patacón landfill monitoring and supervision



Orthomosaic and Digital Surface Model of the area



3D model of the landfill

OVERVIEW

Flying Labs	Panama Flying Labs
Geographic area	Ancón, City of Panamá (Panamá)
Date	October - December 2018
Sector program	DevRobotics

SCOPE	
Stakeholders (clients)	Panama Urban and Domestic Cleaning Authority (AAUD)
Challenge	In Panama City, there is only one sanitary landfill and since it is the only one, it is a large one. This makes the monitoring and supervision tasks complicated - currently, it is done on foot using hand-held digital cameras. This process is very inefficient, as it requires a significant amount of resources and generates high costs in the long run. It also prevents prompt planning and rapid response.
Scope	To show how, with the use of drones, the monitoring and supervision of the landfill can be carried out in a faster, more effective and cost-efficient way, relying on the capture of images for the generation of orthomosaics.
Outcome	<p>Phase 1: Train the personnel of the Cleaning Authority on the handling and use of drones, so that they can carry out the flights and landfill monitoring on their own.</p> <p>Phase 2: Drone flight over the Cerro Patacón landfill area.</p> <p>Phase 3: Processing and analysis of the captured data. The use of a drone for monitoring the Cerro Patacón landfill proved to be satisfactory. It made the monitoring process more efficient, saving the time necessary to reach the whole area on foot. Using orthomosaics introduced a significant improvement compared to using digital cameras.</p> <p>Phase 4: Train the personnel of AAUD in data processing and analytics.</p>
Next steps	After introducing drones as working tools, the Cleaning Authority team will be able to continue monitoring the Cerro Patacón landfill on their own, optimizing their everyday work more and more. Being able to generate new orthomosaics will allow them to easily compare the situation 'before' and 'after' and detect changes that have occurred in the landfill. Also, if there is a need for staff training for new personnel, Panama Flying Labs will be able to plan and implement such training.

DATA ACQUISITION	
Size of area	246.60 ha (2.466 km ²)
Drone	DJI Phantom 4 Pro V2
Sensor(s)	RGB camera
Flight plan software	Pix4Dcapture
Flight height	120 m above ground level
GSD (Accuracy)	4.61 cm/pix

Number of images acquired	2025
Number of flights	11
Time invested in data acquisition	1 hr 17min
Georeferencing	Onboard GPS

DATA PROCESSING & ANALYSIS

Processing software	Pix4Dmapper
Processing time	4 hrs 30 min
Data products	Orthomosaic, 3D model
Analysis tools	Pix4Dmapper, QGIS
Analysis outputs	Orthomosaic, map of selected areas of interest
Final outputs shared with stakeholders	Orthomosaic, map of selected areas of interest, short fly-through video of the 3D model
Data sharing	Hard drive