



Volumetric Analysis of Waste Management of Memelakha



Image captured by Drone

OVERVIEW	
Flying Labs	Bhutan Flying Labs
Geographic area	Memelakha, Thimphu, Bhutan
Date range	May 19, 2024
Sector program	<u>DevRobotics</u>
Main SDGs	

SCOPE	
Project stakeholders	Thimphu Thromde
People impacted	Citizens of Thimphu, Bhutan.
Number of people	About 3500 households that live at Thimphu Thromde.
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Problem Statement	 The Memelakha landfill lacks precise data on the volume of accumulated and remaining waste capacity, making it difficult to manage space efficiently and plan for future waste disposal. Traditional monitoring methods are inefficient; there is a need to adopt drone-based volumetric analysis to enable data-driven decision-making for sustainable and effective
	waste management.

Scope Outcome	 To capture aerial data using DJI Air 2S and generate 3D models to accurately estimate the volume of waste and remaining capacity at Memelakha landfill. To provide data-driven insights that support effective waste management planning and demonstrate the use of drone technology for sustainable landfill monitoring. The project successfully generated accurate volumetric data of the Memelakha landfill using drone-based 3D mapping, enabling effective waste monitoring and supporting data-driven decisions
	for sustainable landfill management.
Impact	The project enabled smarter and more sustainable waste management at Memelakha by introducing drone-based volumetric analysis, paving the way for technology-driven environmental monitoring and informed policy-making in Bhutan.
Next steps	To collaborate with relevant authorities to integrate drone-based monitoring into regular landfill management and expand its use to other waste sites in Bhutan.

COMMUNITY ENGAGEMENT AND STAKEHOLDER SUPPORT	
Consent for data	The permission for taking the data was granted by the Thimphu
acquisition	Thromde
Activities to engage	No activities that involved the community were done.
with the community	
Community groups	No community groups were engaged.
engaged with	
Community	-
attendance	
Community feedback	-





Stakeholder support	Support from the Thimphu Thromde and collaboration with local
	waste management authorities were key to facilitating drone
	access, data collection, and promoting the adoption of
	innovative solutions for sustainable landfill monitoring.

DATA ACQUISITION	
Size of area	200 Ha/2 Km ²
Drone	DJI Air 2 S
Sensor(s)	RGB Integrado
Flight plan software	DroneDeploy
Flight height	90 meters above ground
GSD (Accuracy)	1.4 cm/pix
Number of images	50 images
acquired	
Number of flights	1

Time invested in data	30 minutes
acquisition	
Georeferencing	With onboard GPS

DATA PROCESSING & ANALYSIS	
Processing software	DroneDeploy
Processing time	2 hours
Data products	DTM
Analysis tools	PIX4Dreact
Analysis outputs	Analysis of contaminants on the area
Final outputs shared	1. Raw data
with stakeholders	2. Orthophoto
	3. Digital Elevation Model (DEM)
Data sharing	1. Google Drive