

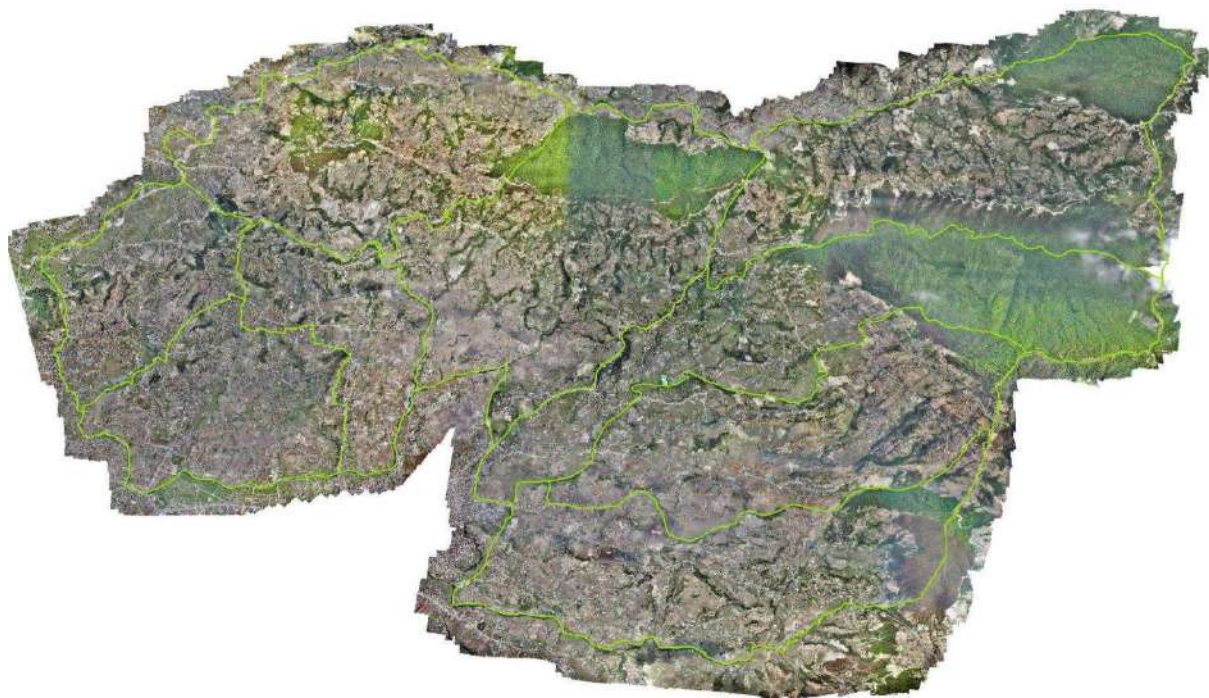
## High-Resolution Aerial Mapping for Urban Municipalities During the COVID-19 Lockdown (Changunarayan and Thimi Municipality)



*Drone pilot checking electronics before take-off*



*Pilot crew getting ready for the drone flight*



*Changunarayan Municipality orthophoto*

OVERVIEW	
<b>Flying Labs</b>	Nepal Flying Labs
<b>Geographic area</b>	Kathmandu Valley, Nepal
<b>Date range</b>	May - June 2020
<b>Sector program</b>	<a href="#">DevRobotics</a>

<b>Main SDGs</b>	<a href="#">GOAL 9: Industry, Innovation and Infrastructure</a> <a href="#">GOAL 11: Sustainable Cities and Communities</a> <a href="#">GOAL 17: Partnerships to achieve the Goal</a>
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SCOPE	
<b>Project stakeholders</b>	Kathmandu University, International Center for Integrated Mountain Development (ICIMOD), Nepal Flying Labs, DroNepal, Naxa, Pathway, Airlift, and the whole consortium.
<b>People impacted</b>	Changunarayan and Thimi Municipalities residents.
<b>Number of people impacted</b>	The project impacts about 55,430 and 83,036 citizens of Changunarayan and Thimi municipality respectively, who will benefit from the services that the municipality will be able to develop based on the data captured in this project.
<b>Challenge</b>	Both municipalities are rapidly urbanized areas in Kathmandu Valley. Accurate geospatial data and updated maps for those locations are needed for urban planning and other development activities. Both of these areas have very dense building clusters, hence they are difficult to map using satellite-based techniques.
<b>Scope</b>	This project helped obtain a high-resolution, accurate, and updated dataset that both municipalities can utilize to properly plan disaster management and development activities.
<b>Outcome</b>	The Changunarayan Municipality utilized the 2D orthophoto maps generated from the project in further activities. The municipality used it as baseline data to plan the municipal house numbering and addressing system project.
<b>Impact</b>	<p>In the short term, this data can be utilized by the municipalities to update the municipal geodatabase. In the long run, the municipalities can utilize this for a range of use cases such as:</p> <ul style="list-style-type: none"> <li>● Developing interactive urban-based maps of the municipality.</li> <li>● Utilizing Digital Elevation Model (DEM) data for hazard analysis as both locations are prone to flood and landslides.</li> <li>● Utilizing the high-resolution orthophoto map for household numbering such urban planning initiatives.</li> </ul>
<b>Next steps</b>	The next step after data capture is to process the images and then hand over the processed data to the Municipality office. A list of potential datasets used shall also be shared with the local

	government office so that they can understand how these datasets could be useful for the municipality and its citizens.
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COMMUNITY ENGAGEMENT AND STAKEHOLDER SUPPORT	
<b>Consent for data acquisition</b>	Both municipalities on behalf of the consortium secured drone flight permissions from all relevant ministries.
<b>Activities to engage with the community</b>	The project included a flight demonstration followed by a press meeting during the official kick-off of the project where the mayors and other stakeholders were present. Furthermore, a series of briefing meetings with government officials were organized.
<b>Community groups engaged with</b>	We engaged with both municipalities and district-level government officials.
<b>Community attendance</b>	Approximately 50 people attended the kick-off event at both locations.
<b>Community Feedback</b>	The project was carried out during the time of lockdown due to the Covid-19 pandemic. There was very little mobility, hence the project team didn't have a chance to interact with many community people. Those who participated expressed concerns about what was being done, where the datasets would be used, how it would benefit the local planning-related work, etc. Overall, they supported the work and communicated with locals from other municipalities regarding how great they thought it was that their municipality was bringing all these new tools and technologies.
<b>Stakeholder support</b>	<p>A wider group of stakeholder engagements were conducted to successfully implement this project. Among them, the Changuarayan Municipality and Thimi Municipality were the major ones. After the completion of the data capture-related works, the technical team at ICIMOD and Kathmandu University prepared orthophoto maps for both locations. The maps were printed in the form of a community board map and handed over to both municipalities organizing a one-day dissemination event.</p> <p>After the dissemination of data, NFL and other drone consulting companies further followed up with Changuarayan Municipality. The datasets combined with other data captured later are being used to develop a municipal-level integrated geodatabase. Also, the municipality used the 2D orthophoto maps to organize a residential workshop with all elected representatives to identify and map all roads within the municipality.</p>

DATA ACQUISITION	
Size of area	7710 ha (77.1 km <sup>2</sup> )
Drone	WingtraOne (42mp), SenseFly eBee Classic, Foxtech Nimbus
Sensor(s)	RGB sensor
Flight plan software	eMotion, Wingtra Hub
Flight height	250 meters above ground level
GSD (Accuracy)	5 cm/pixel
Number of images acquired	11000
Number of flights	36 flights
Time invested in data acquisition	8 days
Georeferencing	Drone survey with PPK was carried out. No Ground Control Points were installed for Thimi Municipality.

DATA PROCESSING & ANALYSIS	
Processing software	Agisoft Metashape
Processing time	12 hours
Data products	Orthomosaic, DEM
Analysis tools	N/A
Analysis outputs	N/A
Final outputs shared with stakeholders	<ul style="list-style-type: none"> <li>● Raw datasets.</li> <li>● A 4 feet by 5 feet in size community board map which was handed over to both municipalities in a small project closure function organized by the municipality office.</li> </ul>
Data sharing	The datasets were shared on a hard drive with each municipality. ICIMOD also uploaded the datasets to their regional database.