



Presented at the FIG Working Week 2023,  
28 May - 1 June 2023 in Orlando, Florida, USA

# FIG WORKING WEEK 2023

28 May - 1 June 2023 Orlando Florida USA

Protecting  
Our World,  
Conquering  
New Frontiers

## Assessing the Quality of Photo Imageries from UAVs for Cadastral Purposes in Indonesia

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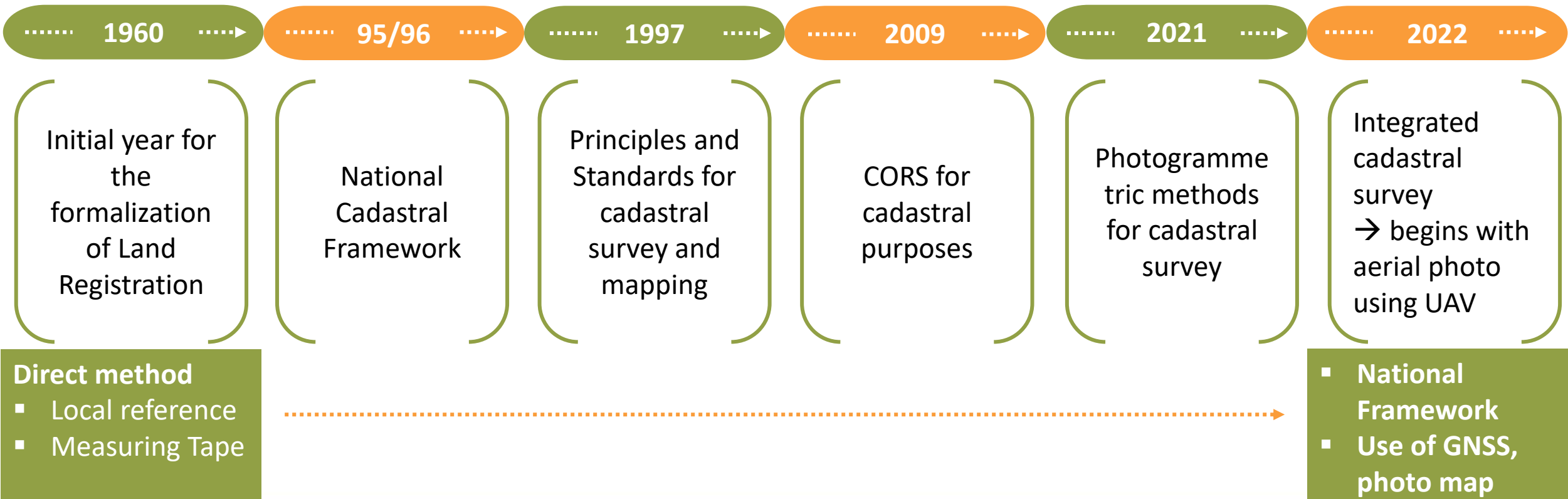
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## Development of Cadastral Survey and Mapping in Indonesia



## Capturing Photo Imageries Using UAV for Cadastral Survey in Indonesia

“Drone/UAV technology has been well known to its capability to easily adapt with the users’ needs”

The procedure of capturing photo imageries from UAV for cadastral surveys was firstly regulated in 2017 and changed in 2021 to be output-oriented.

### 2017 – Process + Output Oriented

- ✓ Mandatory Activities
- ✓ Equipment Specifications
- ✓ Technical Arrangements
- ✓ Output/product specifications

### 2021 – Output Oriented

- ✗ Mandatory Activities
- ✗ Equipment Specifications
- ✗ Technical Arrangements
- ✓ Output/product specifications

## Capturing Photo Imageries Using UAV for Cadastral Survey in Indonesia

### 2021 – Output Oriented

- × Mandatory Activities
- × Equipment Specifications
- × Technical Arrangements
- ✓ Output/product specifications

Colour	RGB
Forward Overlap	> 80%
Side Overlap	> 60%
Horizontal Accuracy	0,75 m
Vertical Accuracy	0,5 m
GSD	≤ 5 cm

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## Projects

12 Locations

180.000 Ha



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## Projects

12 Locations

180.000 Ha

### Area of Interest

Average 15.000 Ha per block location,  
smallest block 13.000 Ha, largest 16.000 Ha

### Platform

7 projects used industrial manufacturing UAVs,  
5 projects used local-custom (assembled) UAVs

### Flying altitude

200-450 m AGL

### GSD

$\leq 5$  cm

### GCPs

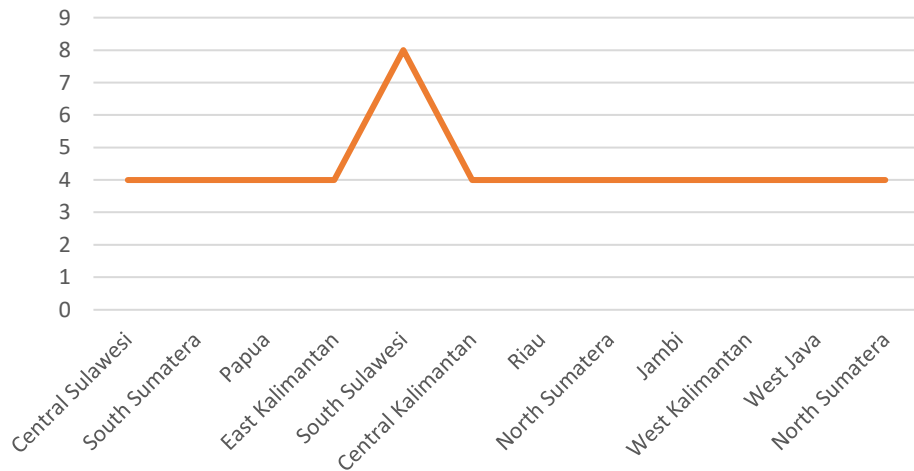
5 to 34 points

### ICPs

20 to 46 points

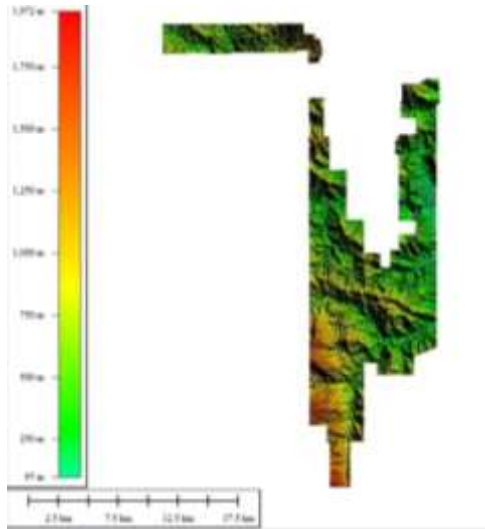
## Results & Discussion

Spatial Resolution (GSD, cm)



- For the output requirement of a GSD value of less than 5 cm, only 1 province does not meet these provisions, which is located in South Sulawesi;
- The topographical conditions in South Sulawesi are an area with complex topography – extreme valleys and slopes found at that location; and
- This affected the flying height of the drones where it became vary greatly, even reaching a height of 1000 meters from the valley. This condition was quite challenging to achieve the minimum technical specification of 5 cm GSD.

## Results & Discussion on **Project Location: South Sulawesi**



The topographical conditions in South Sulawesi are an area with extreme valleys and slopes.



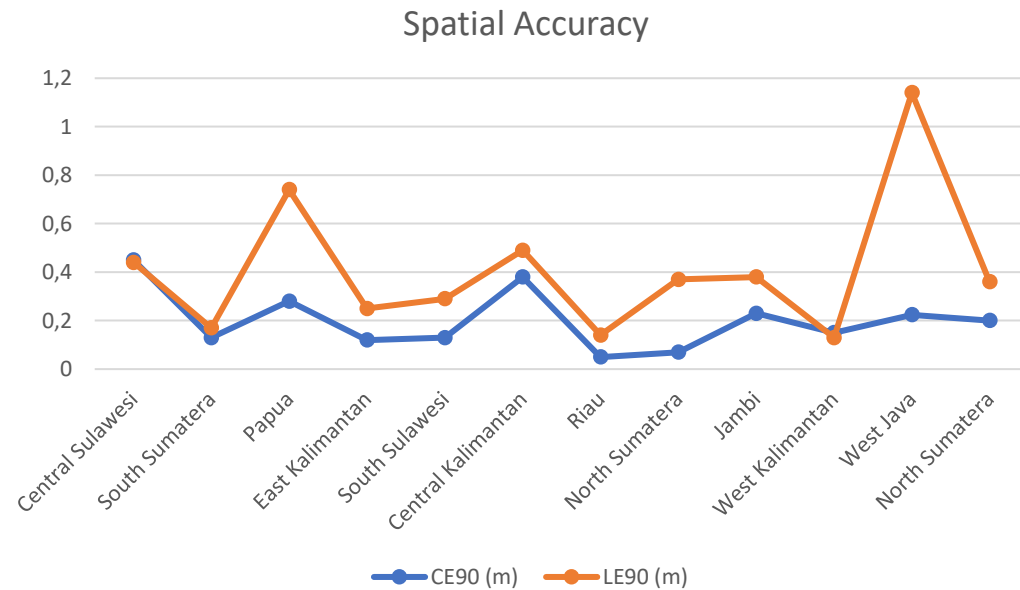
Extreme topography and cloud coverage in the hilly became issues during the data acquisition.



The team experienced 3 crashes during the data acquisition.



## Results & Discussion



- From the 12 photo map projects carried out, all locations have horizontal accuracy values (CE 90) that meet the specified technical specifications;
- while for vertical accuracy values (LE 90), 2 locations do not meet the specified specifications: location in West Java and Papua Provinces;
- The photo map project in the provinces of West Java and Papua both used an assembled drone type;
- Another factor that might affect the data is the topographical conditions at the two locations: both have varying topography. The topographic condition is considered an obstacle throughout the data acquisition as it gave difficulties in capturing the imageries in these two Aol, where the UAV experienced crashes and went out of the flight path

## Summary

- Photo maps generated using UAVs show that it generally meets the technical specification for cadastral purposes;
- Extreme topography affected the data acquisition process and caused a significant impact on the output of photo maps – especially on vertical accuracy and the GSD of the photo map;
- It is necessary to allocate more time and apply a risk management system in the preparation stage to avoid/minimize the disrupted incidents during the data collection procedure;
- Considering the land management function is within the same organizational body of the Ministry of Agrarian Affairs and Spatial Planning (ATR/BPN), it is promising to conduct further research towards the utilization of UAVs for land use monitoring.