

Mapping Indonesia for the Future

Indonesia Urgently Needs High-Quality Mapping



- In 2020, the President of Indonesia issued a regulation that the country must create a single, high-quality topographic map, called a basemap, by 2024, the end of his second term
- Basemaps are critical tools in policy formulation, decision making and implementation of activities such as natural resource management, disaster management and spatial planning
- Indonesia's capital city is sinking and basemaps will play an essential role in moving the capital from Java to Borneo – an imperative, strategic action to protect national security and promote national prosperity

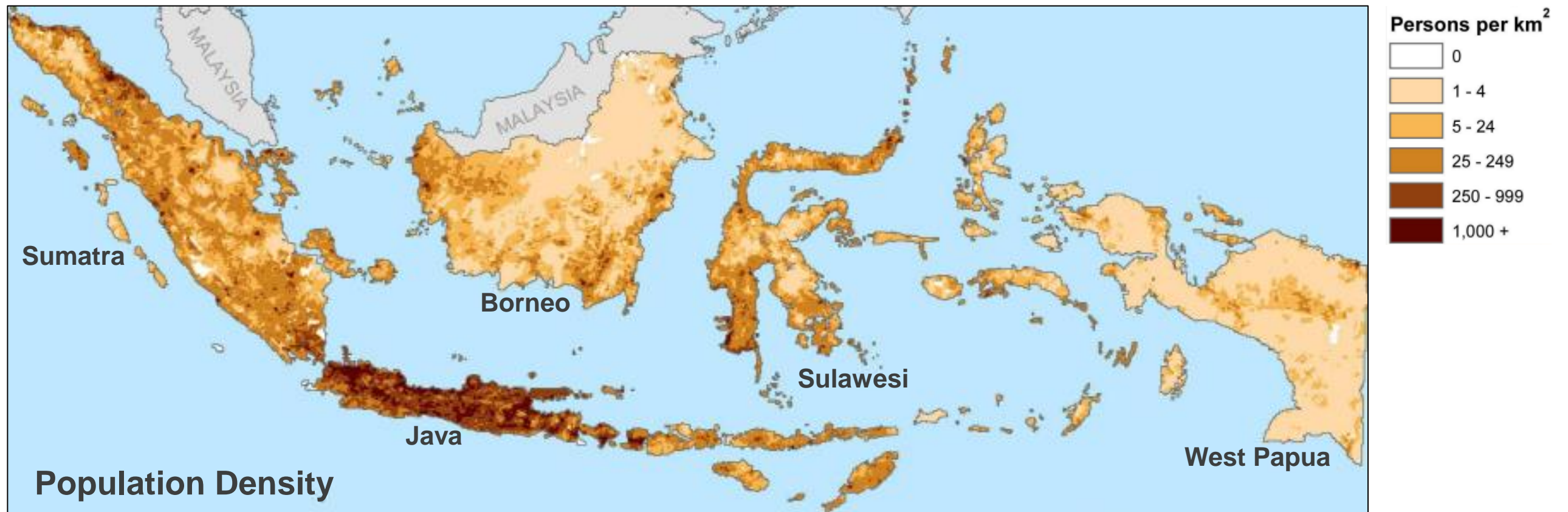
Indonesia's One Map Initiative

- The One Map Initiative establishes the path to create thematic maps and integrate them with official basemaps, creating a single, national reference map and eliminating multiple data licenses and conflicting land claims
- Indonesia's national geospatial agency, BIG, is the organizer of geospatial information and is assigned to provide a large-scale (1:5,000) basemap of the entire territory, especially for non-forested areas (rural and urban), with a target completion by 2024



Size and Population of Indonesia

- **Area:** 1.9 million km² (1/4 of the USA)
 - Archipelagic country with 16,677 named islands (over 17,000 islands total)
- **Population:** 273.5 million (2020)
- **Population density:** 151 people per km² (56.7% live on the island of Java)



Geographic Characteristics of Indonesia

Challenging for topographic mapping

- Topographically varies from flat to mountainous (up to 16,000 feet – higher than Mt. Whitney in CA)
- Mostly covered by cloud; some areas perpetually clouded
- Complex environment and landscape



Topography

Indonesia's Potential – Why Basemaps Are Critical

Indonesia is currently the **17th** largest economy in the world



4th Most populous country in the world



Top 3 Destination for attracting investors in Asia (the Economist)



Indonesia is projected to be the **4th** largest economy in the world in 2050 (World in 2050, PWC)



Top 5 Emerging markets with the best middle-class potential (Euromonitor)



Abundant natural resources

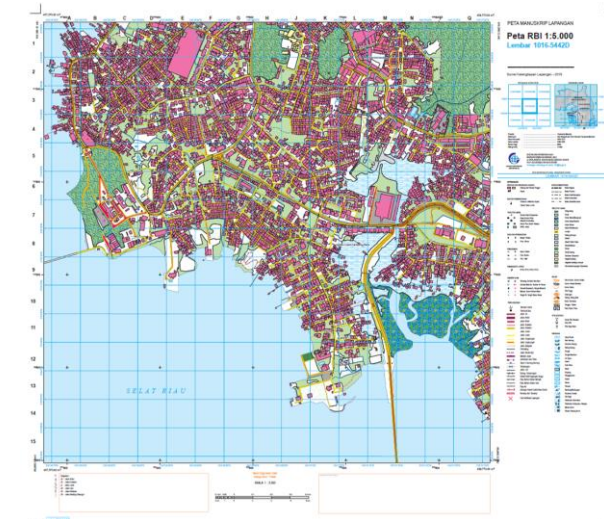
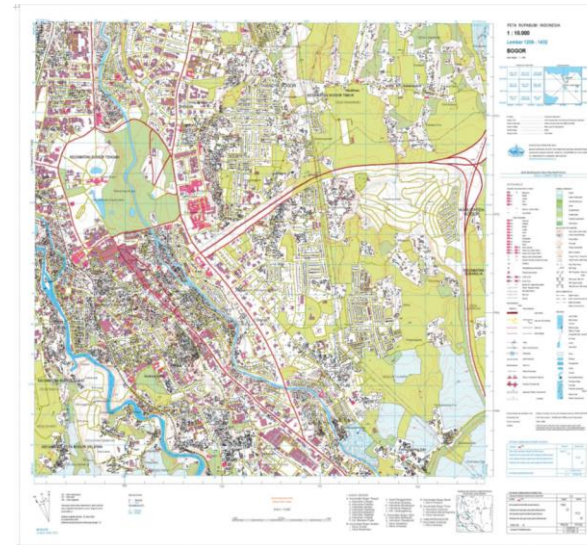
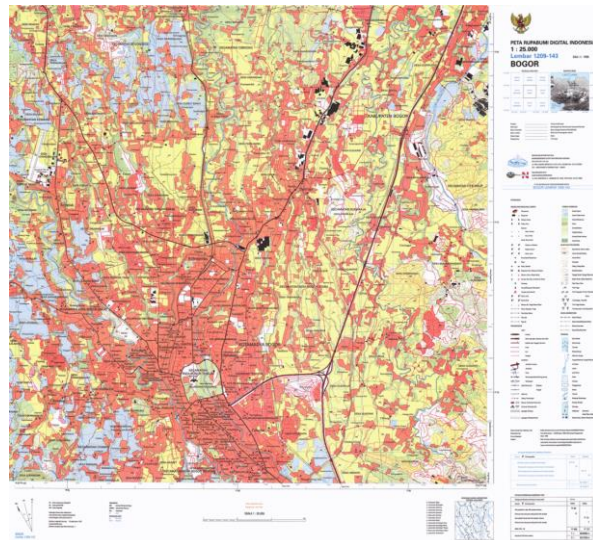


Indonesia needs maps to plan for a secure and prosperous future

4.5% of Indonesia Is Mapped in 1:5,000 scale



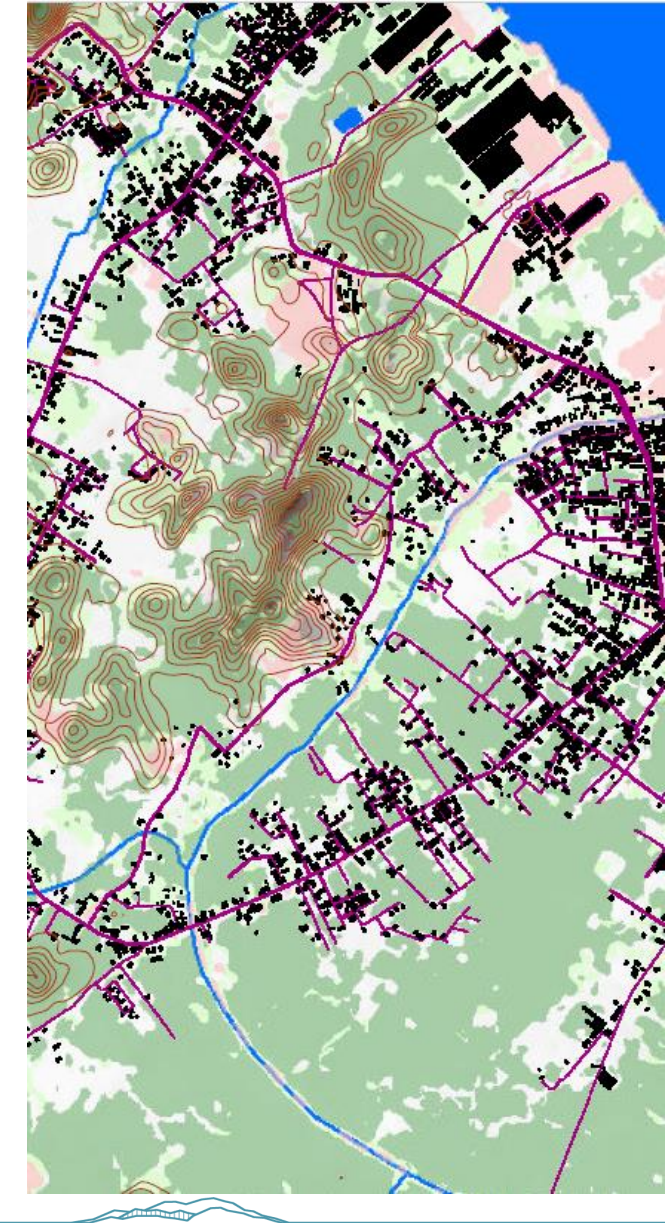
- Indonesia has mapped 4.5% of its territory to the high-resolution scale that its national mapping agency requires, which is 1:5,000 scale
 - 1:5,000 scale means that every 1 centimeter (0.4 inch) on a map is equivalent to 5,000 centimeters, or 5 meters (16 feet), far better than the average Rand McNally road atlas
- Mapping of the 4.5% was completed using traditional techniques, such as optical aerial imaging and aerial LiDAR, along with small numbers of high-resolution satellite images
- To create a basemap, high-resolution, high-quality remote sensing data in the form of imagery and a digital elevation model (DEM) are needed to extract information about buildings, roads, water, land cover, contour lines, terrain slope and other terrain details



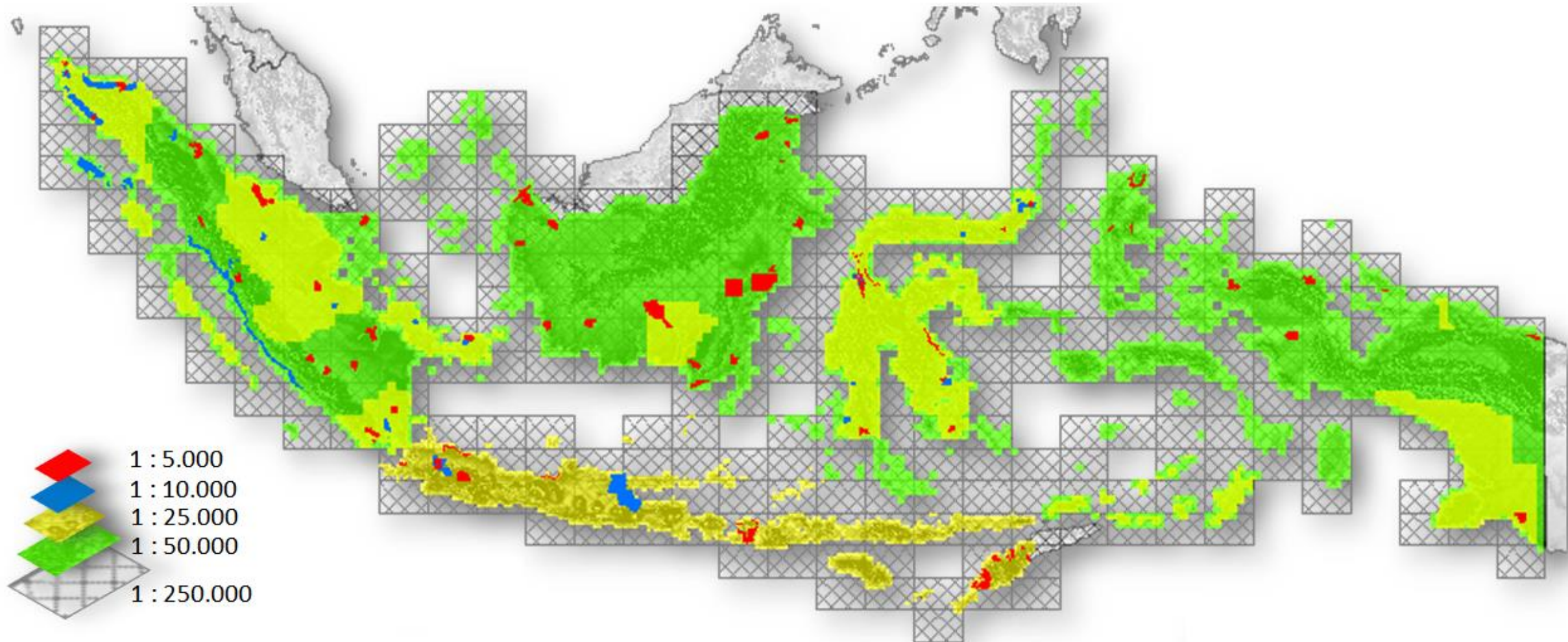
Strategic Value of Topographic Maps

The availability of a 1:5,000 scale basemap has key strategic values

- Basemaps are a prerequisite to improving the government's ability to conduct emergency response as well as rehabilitation and reconstruction after natural disasters
- Basemaps are the basis in realizing a one map policy, whereby the government has a single, authoritative map to use for decision making
- Basemaps are a prerequisite for building spatial development plans for high-priority regions
- Spatial development plans are a prerequisite for the implementation of Online Single Submission (OSS) – the government's web-based platform that aims to simplify business licensing and enable the economy to grow more quickly – as mandated by the President
 - Based on a recent government regulation (Electronically Integrated Business Licensing Services), licensing in OSS is based on a spatial detail plan. Therefore, a scaled basemap of 1:5,000 is a prerequisite for the implementation of OSS, which is needed to grow the economy
- The availability of a 1:5,000 scale basic map is needed for the acceleration of investment and efforts to restore the national economy after the COVID pandemic



Limited Availability of Topographic Basemaps at 1:5,000 Scale (2022)

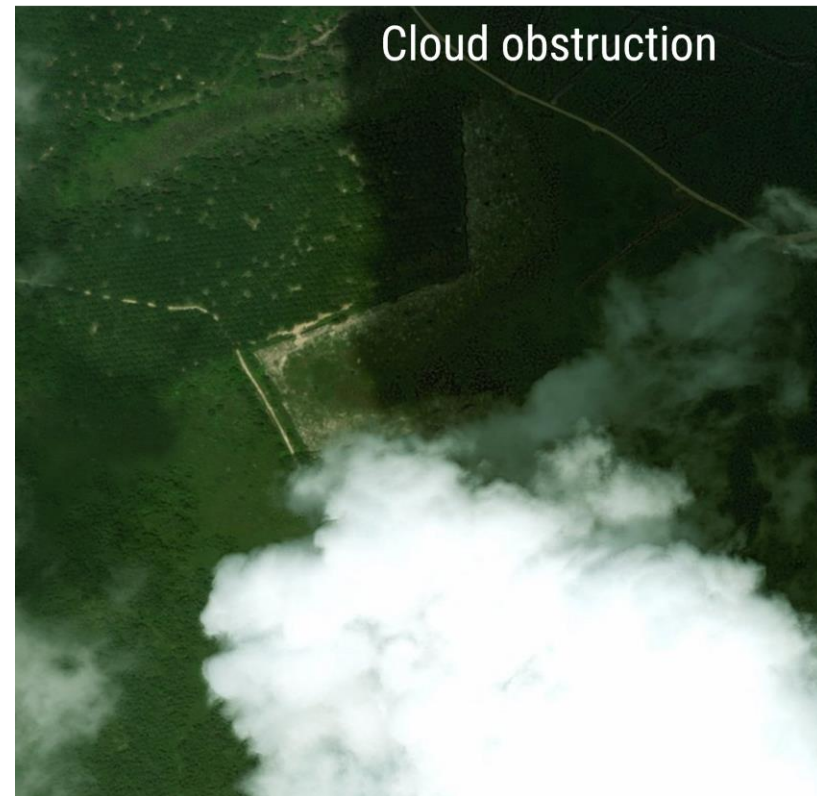


Basemap availability status of 1:5,000 scale is 4.5% of Indonesia after 20 years of effort. Intermap will create the other 95.5% in 4 years with its unique technology.

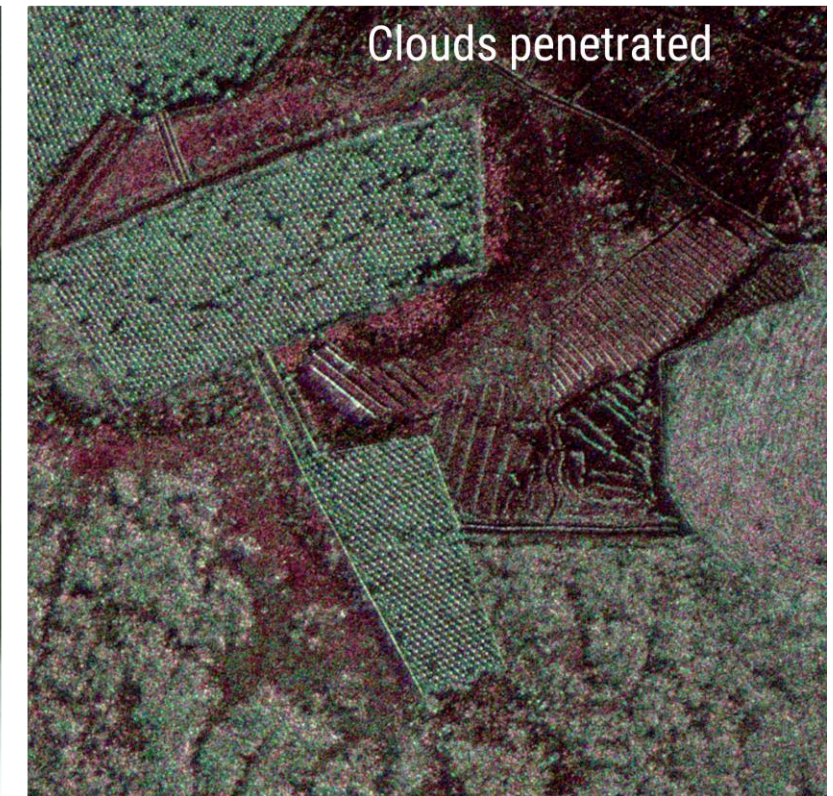
Global Cloud Belt Makes Mapping Challenging



- IFSAR technology is the only mapping solution that offers cloud penetrating capabilities
- 76 countries and 23 million square kilometers are in the Cloud Belt
- All of Indonesia is blanketed with clouds, and in some areas, cloud cover is permanent



Optical image from satellite / aerial camera



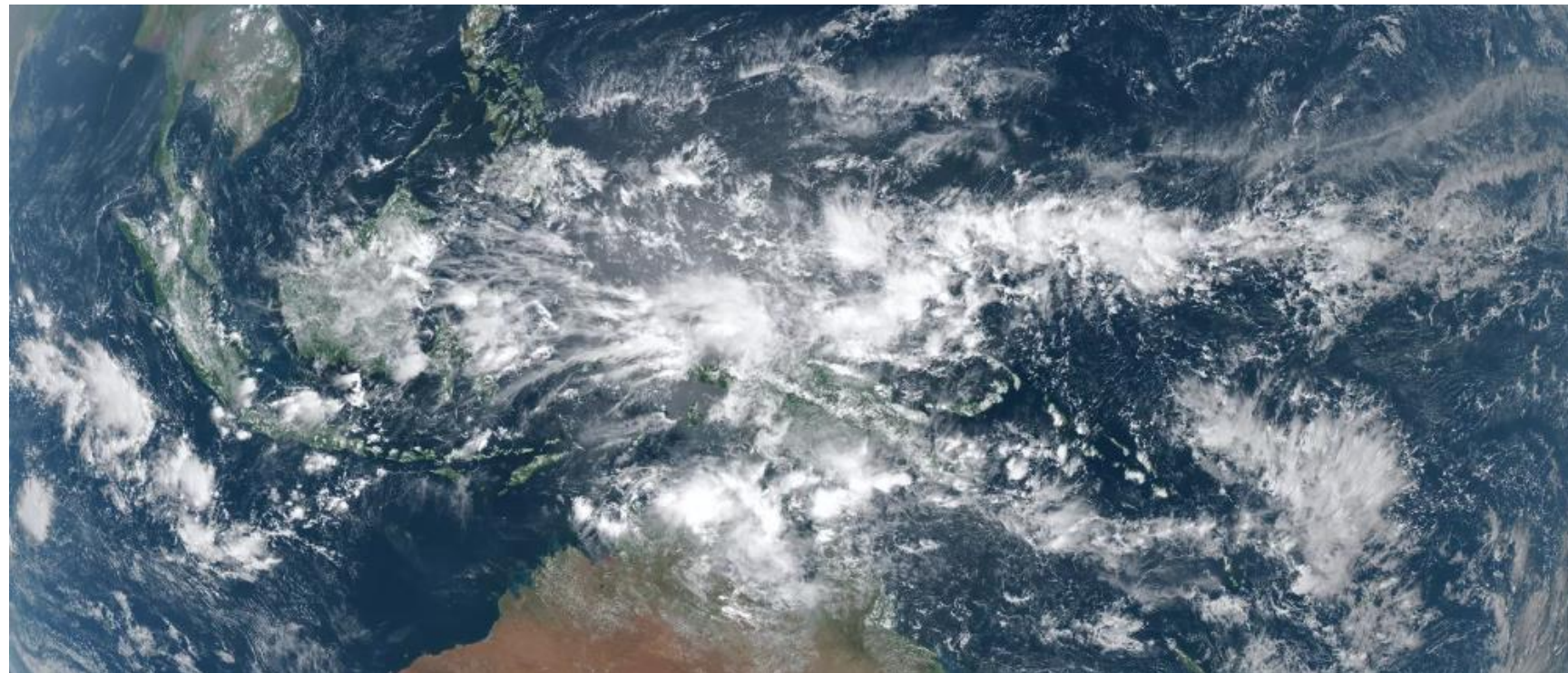
Intermap's radar image (IFSAR)



Airborne SAR Is Essential to Create Basemaps



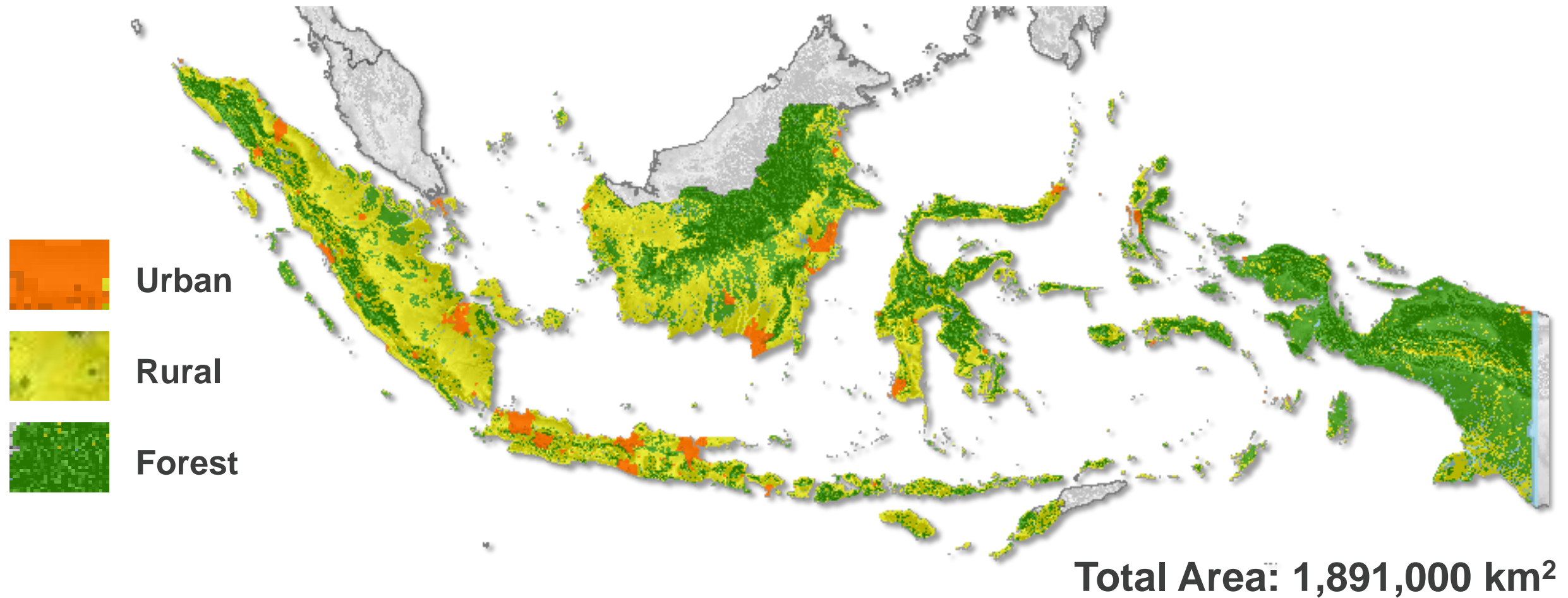
- Indonesia experiences persistent and often permanent cloud cover, smoke, smog, fog and haze and consists of rugged terrain with mountains and dense jungles, which make it challenging for an aircraft or satellite to collect images
- An alternative to airborne SAR, spaceborne SAR satellites can collect imagery in Indonesia's environment, but it does not produce high enough quality elevation models



Mostly Rural & Forest Land Cover, Ideal for IFSAR

Rural and forest areas are ideal for airborne IFSAR data collection

- Airborne IFSAR can quickly collect data over a large area, penetrating through dense canopy and foliage



Urgency of Creating High-Quality Basemaps



If basemaps are created using the traditional approach, the provision of a 1:5,000 scale basemap would take 17 years to collect the imagery and data (processing time not included) and require a budget of over US\$1.5 billion

Traditional Approach	Intermap's Solution
✓ Using aerial photo technology and LiDAR	✓ Using Airborne SAR technology
✓ Obtains diverse data (spatial and temporal) and covers 12.2% of the area in Indonesia	✓ Obtained homogeneous data and covers the entire territory of Indonesia (nationwide)
✓ Takes 17 years to collect the imagery & DEM	✓ Takes 4 years from collection to processing to delivery
✓ Requires a budget of over US\$1.5 billion for acquisition	✓ Requires a budget of a few hundred million USD
✓ To complete all of Indonesia, it would take an estimated 136 years to process the data and a budget nearly 8x the accelerated scenario with SAR	

Indonesia Approved Intermap's Technology as the Best Solution



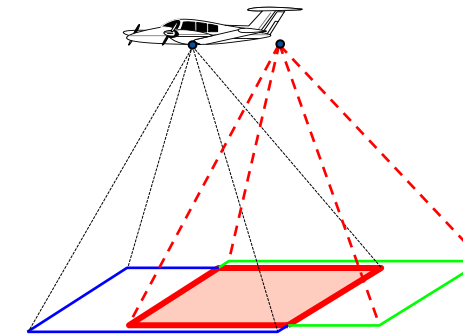
Intermap's IFSAR is now approved by the Indonesian government as a technology capable of achieving the required basemap standards.

Intermap worked with the Indonesian government for ten years through various proposals, pilot projects and initiatives to define a vision and demonstrate that airborne IFSAR is the best solution, offering:

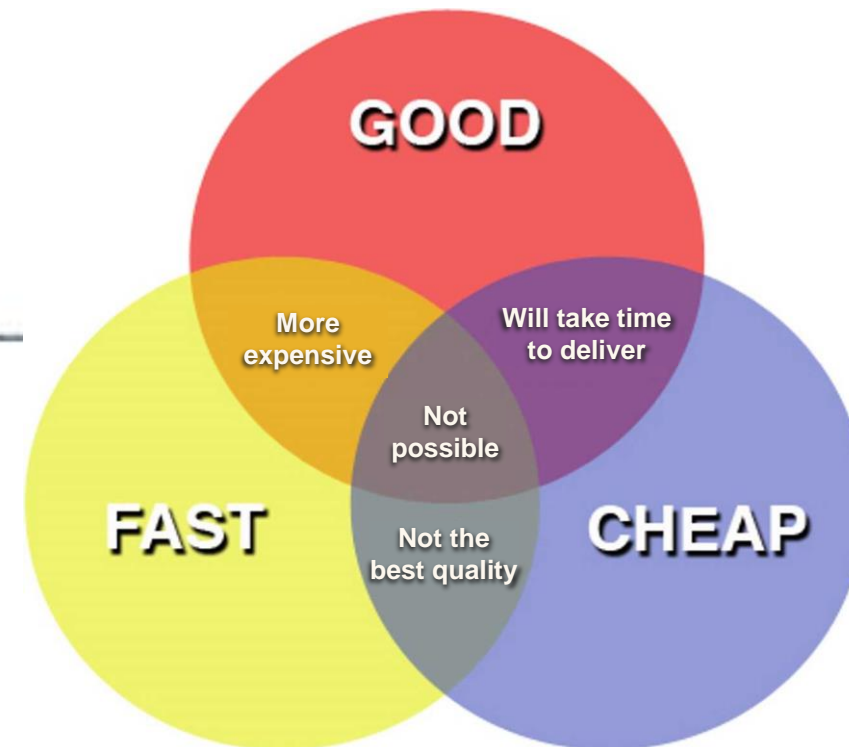
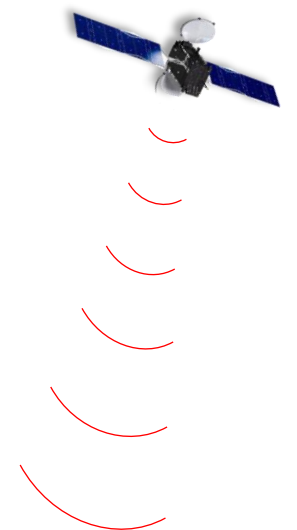
1. Highest quality
2. Fastest delivery
3. Lowest price



Airborne Photo - LiDAR



Spaceborne - Optical & SAR



Strategic Value of Airborne SAR

Other technologies have been thoroughly vetted by BIG, but not approved

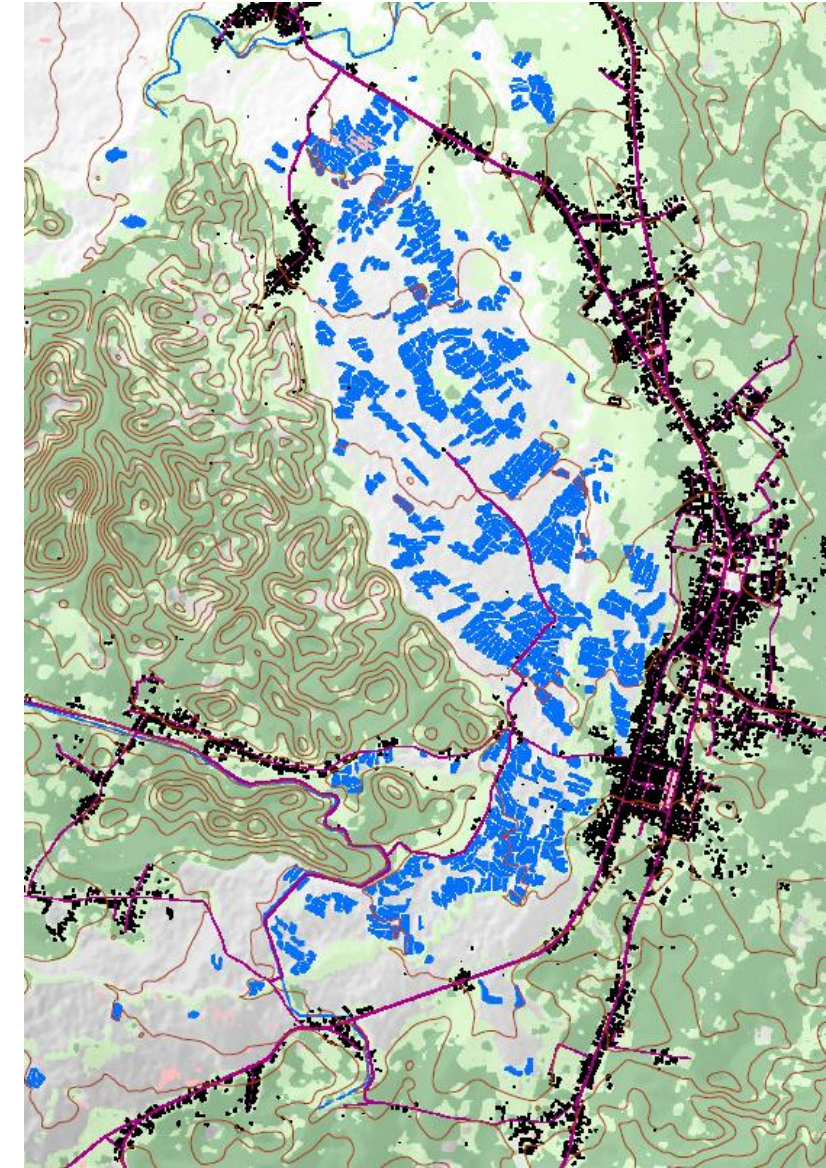
- Spaceborne optical satellite imagery cannot complete the task due to cloud cover, high costs of new collection and the time required for repeat pass coverage
- Spaceborne SAR operators proposed to capture very high-resolution (VHR) 25cm ORI and create countrywide DEM, but:
 - Spotlight mode is needed, and the footprints for spotlight mode acquisition are small as each satellite consumes its energy in a matter of minutes
 - This means repeat passes are needed, greatly expanding acquisition time beyond the project scope, in addition to providing temporally inconsistent data whereas Intermap data have far less temporal decorrelation
 - Even if enough areas are captured using high-resolution, additional ground control points are needed along with various radar reflector calibration sites
 - Even if satellite altimetry using other DEM is provided to expedite timing, DEM processing constraints and lack of proven production experience are concerns
 - Intermap's solution is still best because we have dual-band sensors, specifically P-band to reach the canopy floor, in addition to having enhancement using IRIS

Intermap's airborne, dual-band, temporally consistent SAR and proven DEM production, including DEM enhancement with IRIS, is the best solution



Summary

- There is a Presidential regulation requiring high-quality maps to be produced urgently to secure a safe and prosperous future
- Indonesia is in the process of moving its capital city from Jakarta to Kalimantan and will need high-quality basemaps to aid the transition and new capital city development
- Indonesia does not have the technology to make the necessary basemaps
- Indonesia requires a new approach that is efficient and cost effective. Intermap is uniquely positioned to provide the solution
- Intermap continually updates its airborne radar and processing technologies to ensure compliance with Indonesia's mapping standards
- The first phase of the project, mapping the Island of Sulawesi, represents 10% of the country's land area and 10% of the One Map program and will generate \$20 million in revenue in 2024
- Follow-on work is expected over the subsequent four years to complete the remaining 90% of Indonesia's land area, supporting the country's national infrastructure program and long-term development



Geospatial Intelligence at Mission Speed

