

Space-based Data for Climate Change and Earth Observation in Indonesia

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Outline

- Climate Change and Earth Observation
- Satellite Data for Earth Observation
- Climate Change Mitigation: Space-based Data for Indonesian Carbon Accounting System (INCAS)
- Upgrading Ground Segment Facilities
- Development of Satellite Technology for Earth Observation
- International Cooperation
- Concluding Remarks

Climate Change and Earth Observation

- Climate change impacts on various sectors in Indonesia – agriculture, forestry, water resources, human health, sea level rise, marine & coastal ecosystems, biodiversity.
- Sustainable development – the needs for natural resources mapping and monitoring.

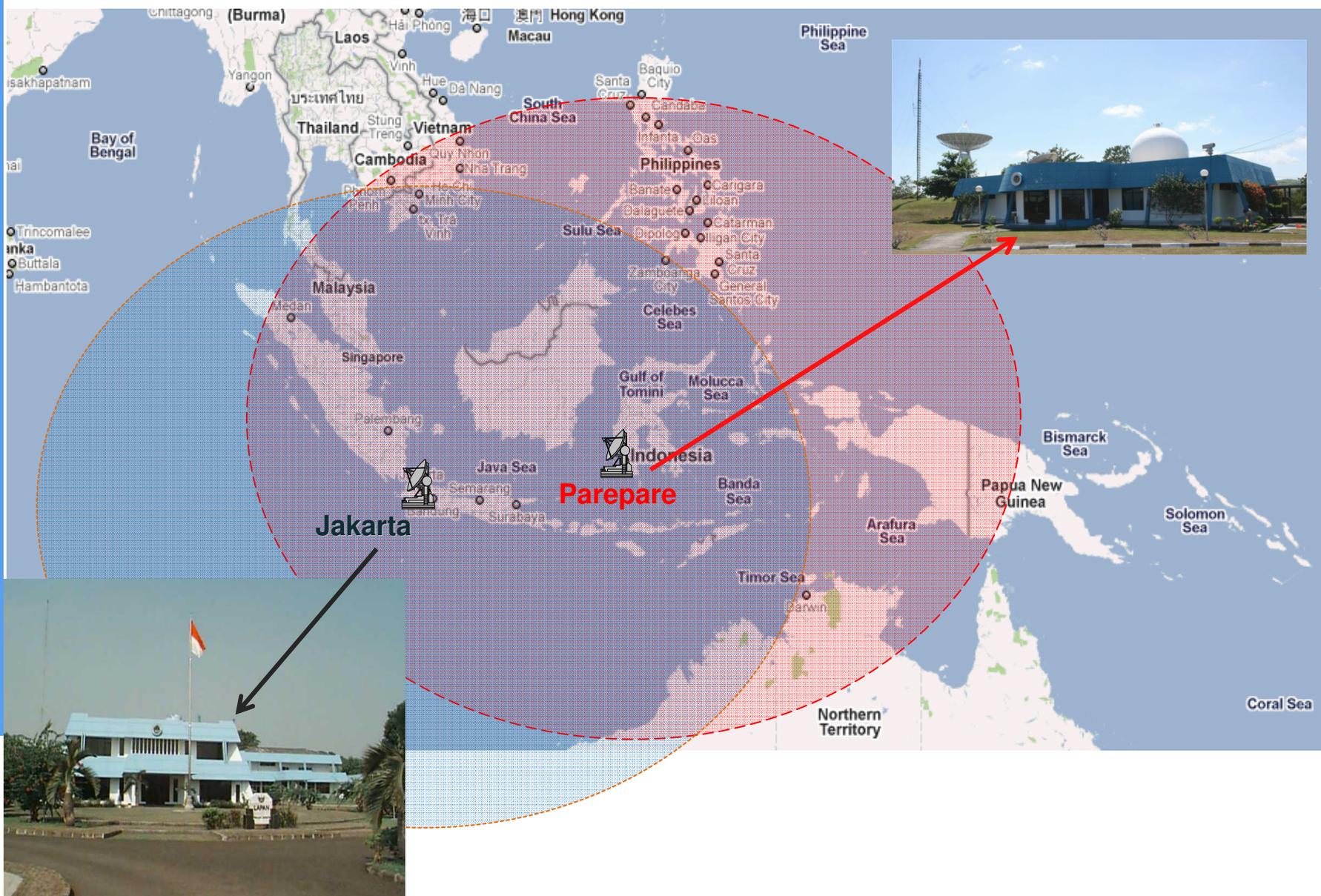
NEED

- Comprehensive **Earth Observation** – the need for space technology to provide reliable and continuous geospatial data.
- Ground receiving stations and data archiving since 1980s.

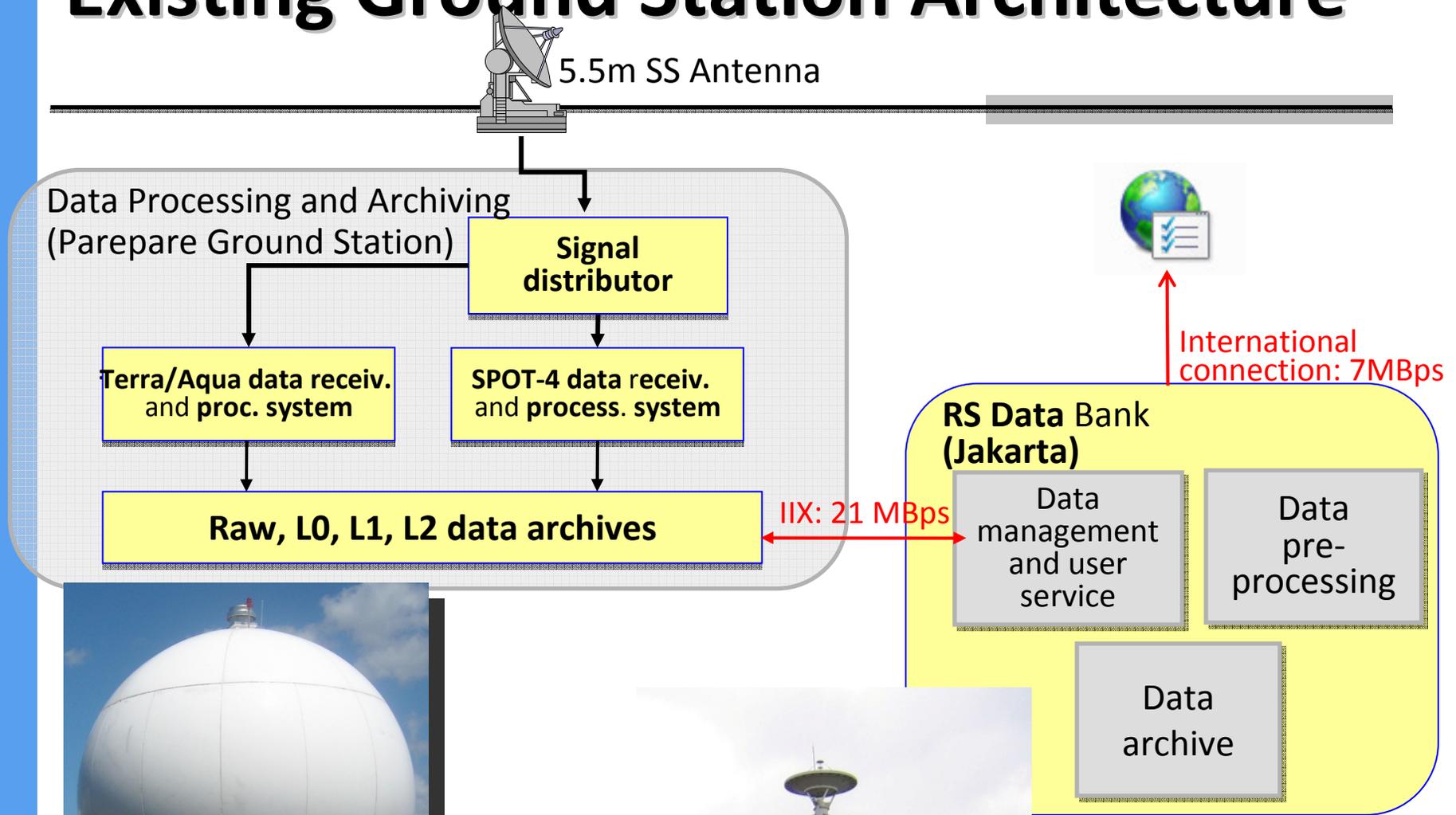


Satellite Data for Earth Observation in Indonesia

Ground Station Locations and Coverages



Existing Ground Station Architecture



Data pre-processing:

- Orthorectification
- Terrain correction
- Cloud masking
- Mosaicing

Landsat Archive Overview

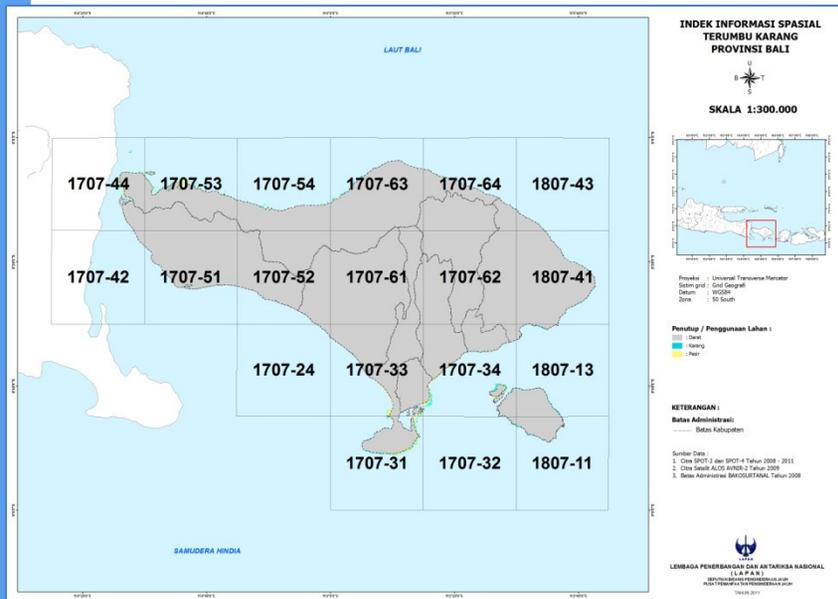
- ETM+: Landsat 7
5100 scenes (2002-2008 period)
- TM: Landsat 4 & Landsat 5
LS 5 TM: 1323 scenes (1994-2002 period)
- MSS: Landsat 1 through 5
LS 4 MSS: 5000 films (1984-1993 period)

Space-based Data for Earth Observation in Indonesia

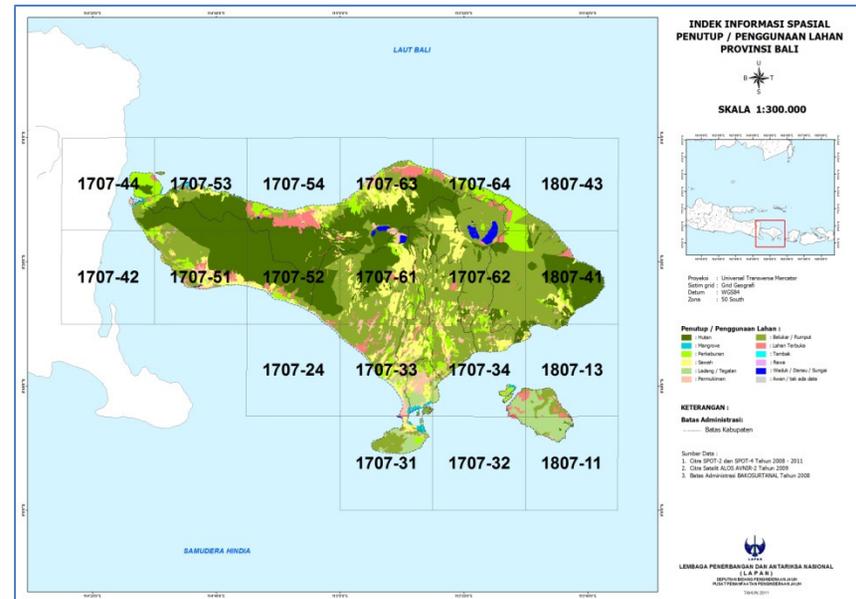
Utilization of Space-based Data:

- Land use/cover
- Agriculture
- Plantation
- Forestry
- Coastal and marine ecosystems
- Water resources
- Etc.

Land Use/Cover in Bali Province

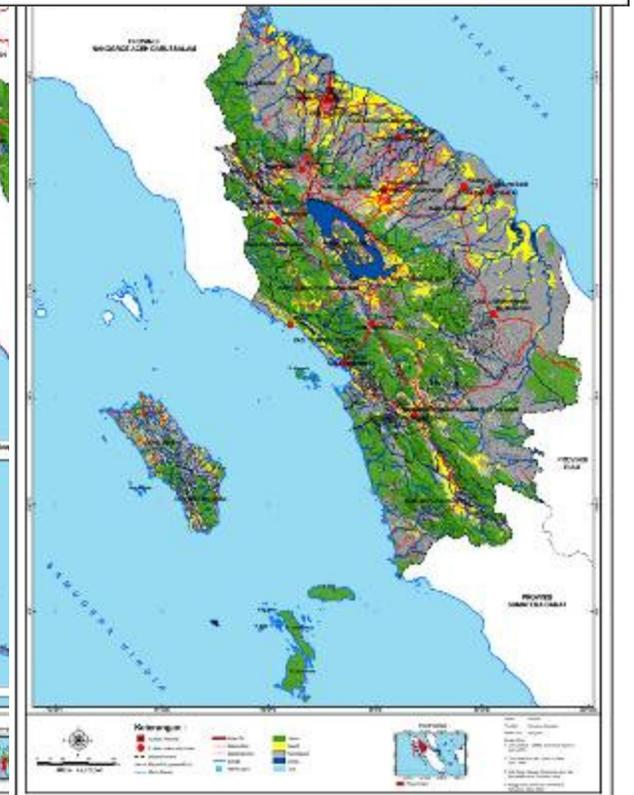
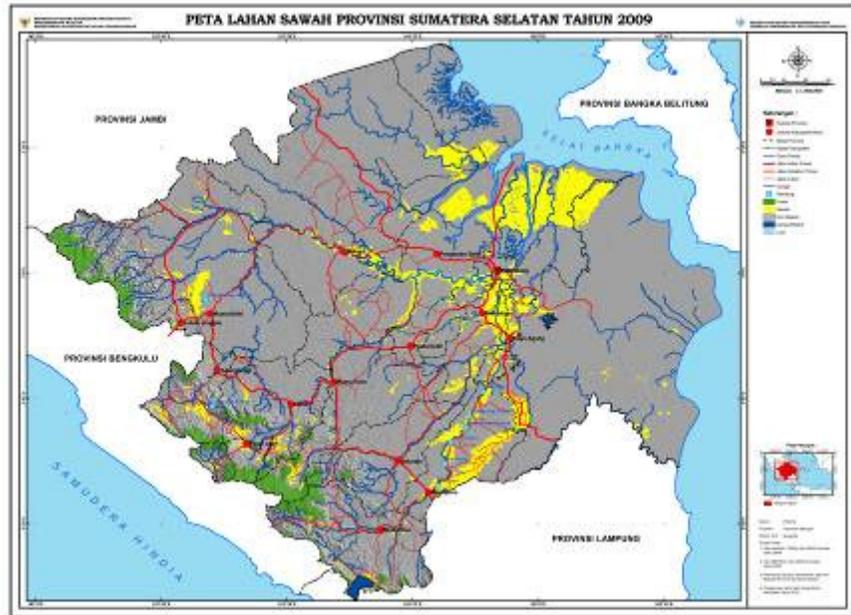


Coral Reef Mapping



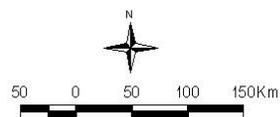
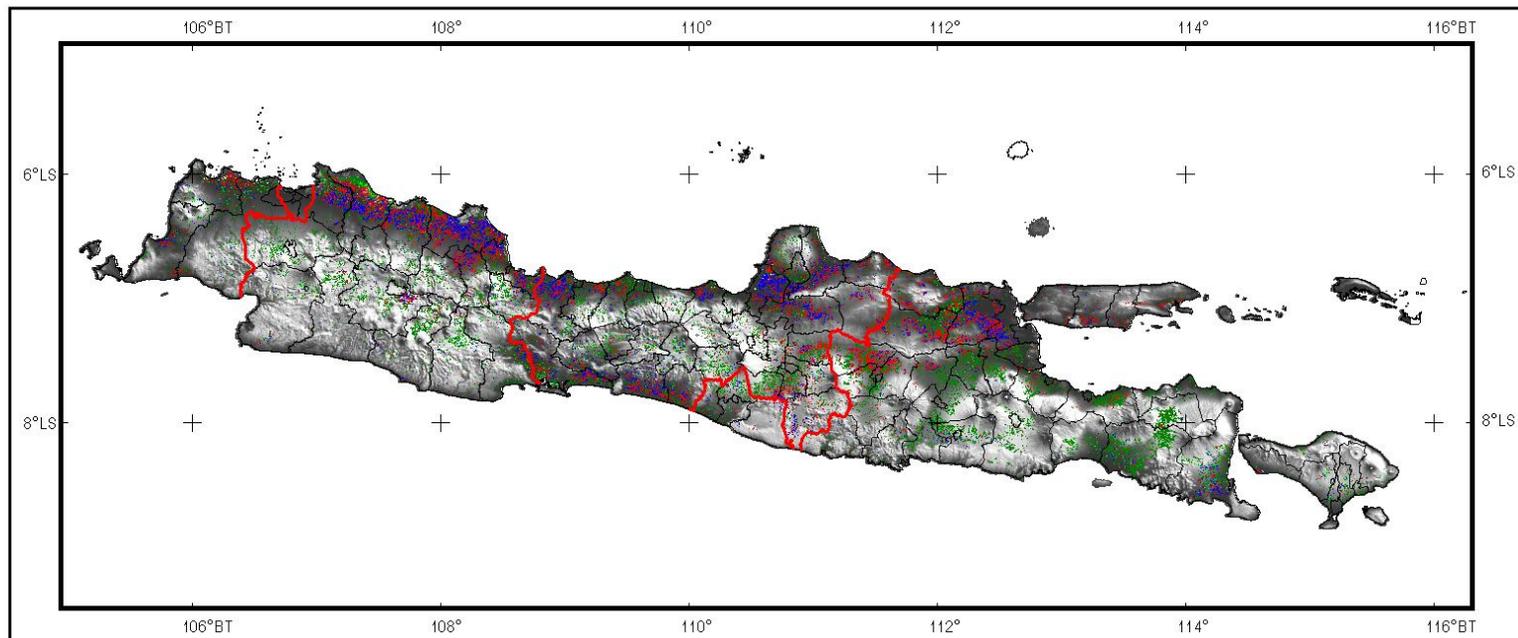
Land use/cover Mapping

Paddy Field Mapping



Paddy Growth Monitoring

FASE TANAMAN PADI SAWAH DI PULAU JAWA BALI PERIODE 24 - 31 OKTOBER 2011



Datum :WGS 84
Proyeksi :Geodetik
Sistem Grid :Grid Geografi

LEGENDA:
Fase Vegetasi:
Air
Bera
Vegetatif 1
Vegetatif 2
Generatif 1
Generatif 2

Sumber Data:

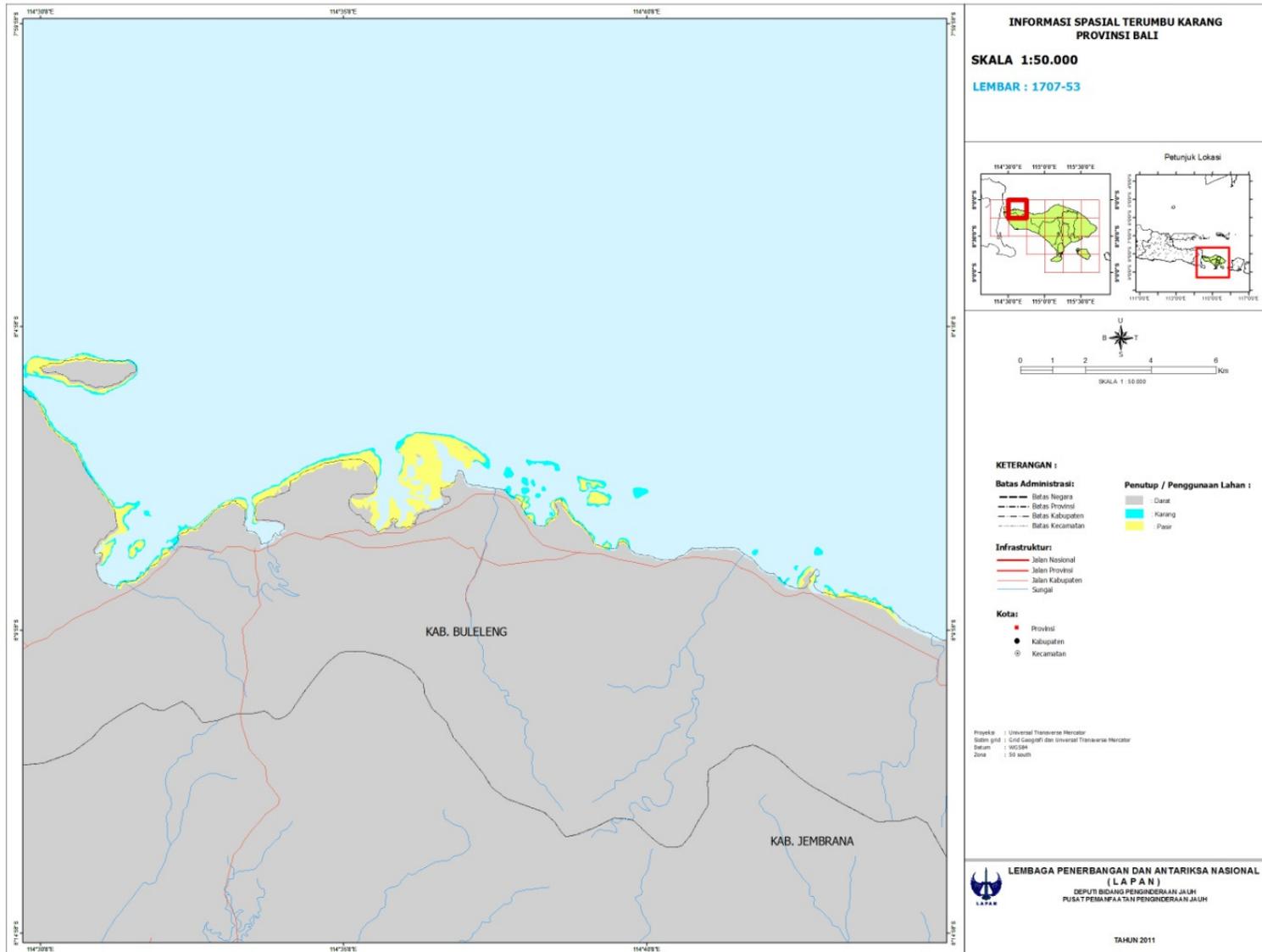
1. Data Terra-MODIS
2. Batas Administrasi Jawa dan Bali
3. Data DEM SRTM 90 m

Pengolahan Data Oleh :

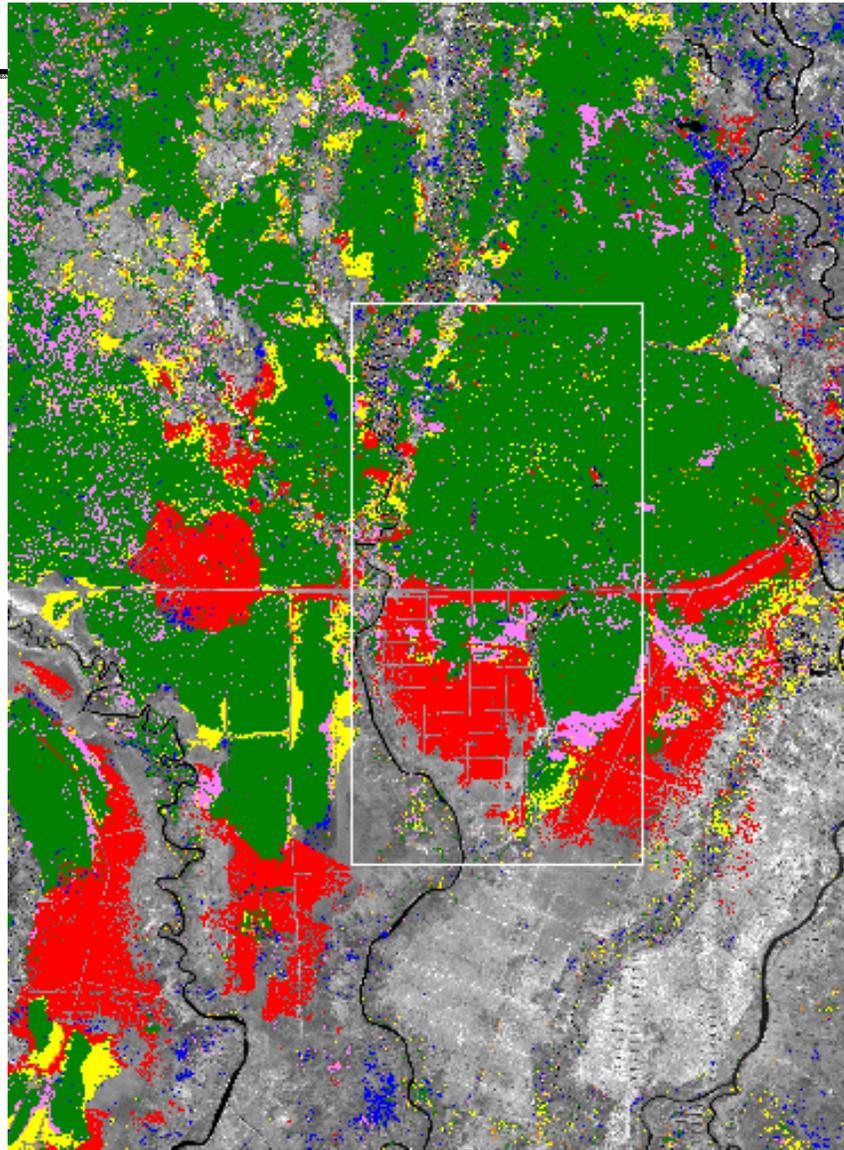


PUSAT PEMANFAATAN PENGINDERAAN JAUH
LEMBAGA PENERBANGAN DAN ANTARIKSA NASIONAL
email: simba@lapan.go.id
<http://www.rs.lapan.go.id/SIMBA>

Coral Reef Mapping (Scale 1:50.000)



Deforestation Analysis for Central Kalimantan



- Forest 1997-2008
- Deforestation 1997-2001
- Deforestation 2001-2002
- Deforestation 2002-2005
- Deforestation 2005-2008
- Regrowth 1997-2008

Climate Change Mitigation: Indonesia

Carbon Accounting System (INCAS)

- Progress on Indonesia's National Carbon Accounting System:
 - International cooperation plays important role in acquiring Landsat data and other medium resolution satellite data.
 - Interoperability with other data types should be used to solve the cloud cover problem (the typical problem for the tropics).
- Supports REDD+ program.
- In line with Measurable, Reportable, Verifiable (MRV) provision under UNFCCC.

Acquired Landsat data for INCAS

(as per 26 April 2011)

Landsat data acquired in LAPAN

Source	# Scenes
USGS (1G Path)	625
USGS (1T)	1947
GA (Australia)	1336
GISTDA (Thailand)	1214
LAPAN	2872
Total	7994

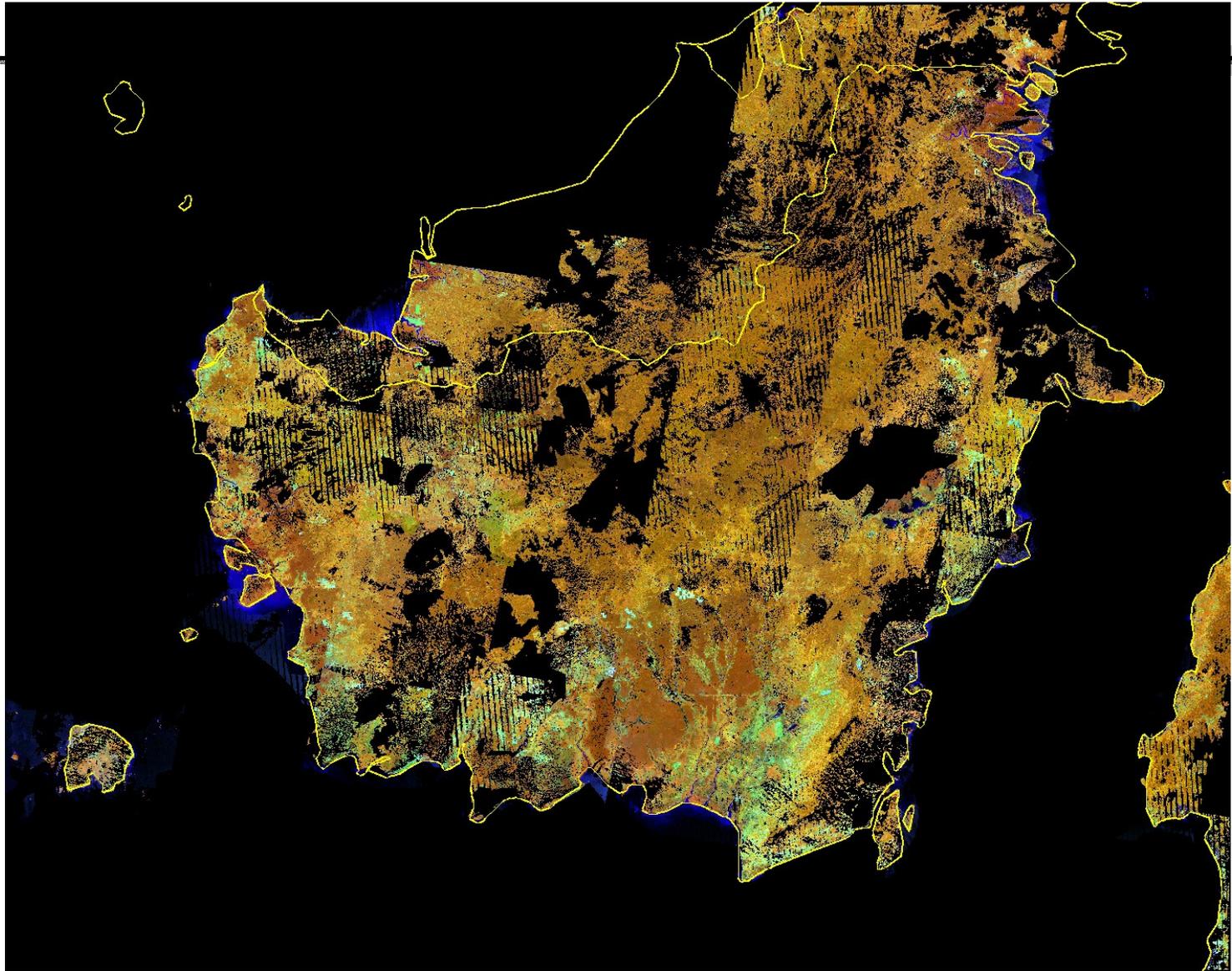
Landsat data in INCAS archive
(after scene selection)

Source	# Scenes
USGS (1G Path)	387
USGS (1T)	1947
GA (Australia)	930
GISTDA (Thailand)	870
LAPAN	262
Total	4369

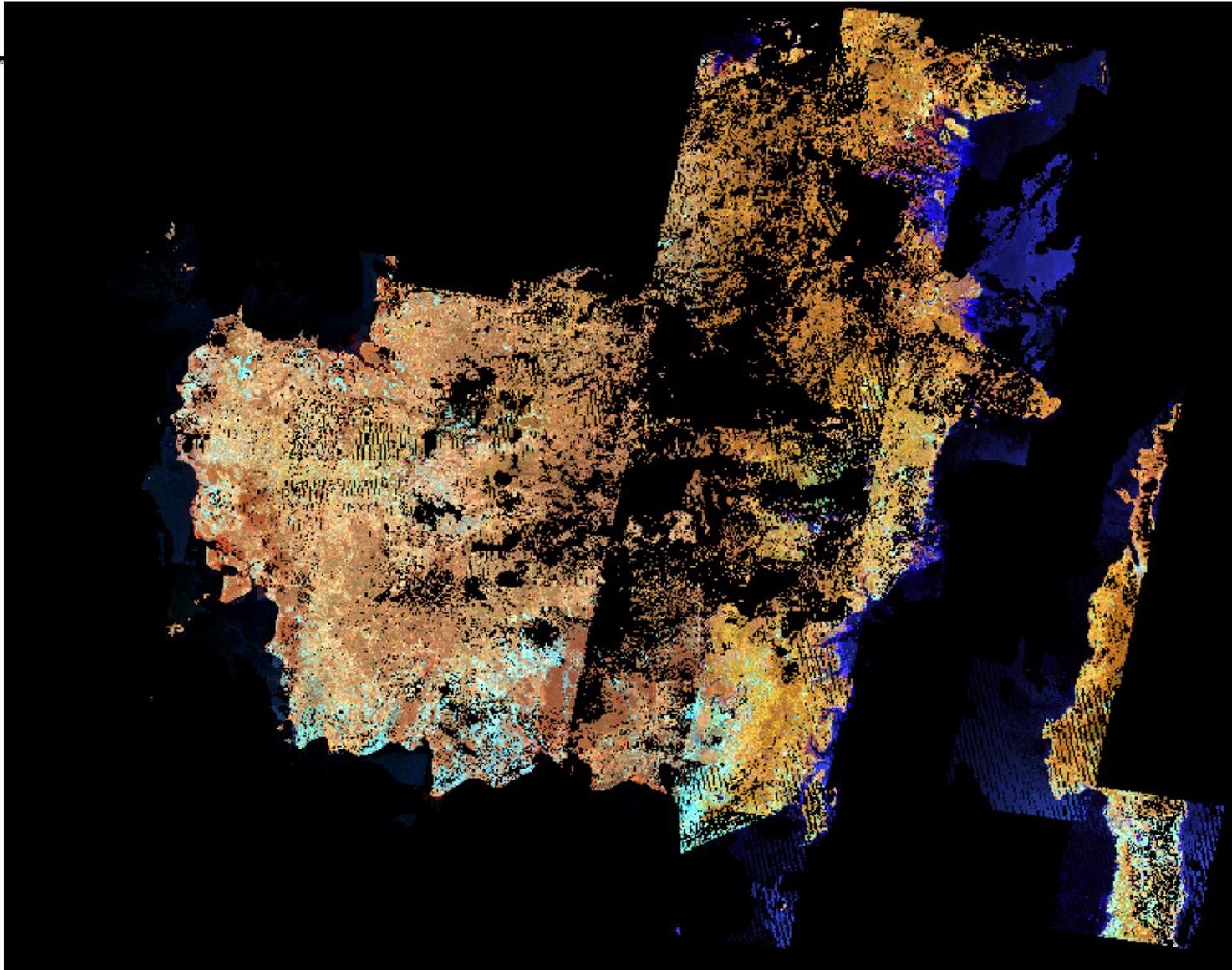
Note: Data from LAPAN overlaps with those from USGS, GA, and GISTDA.



Terrain-corrected and cloud masked mosaic images of Kalimantan (2008)



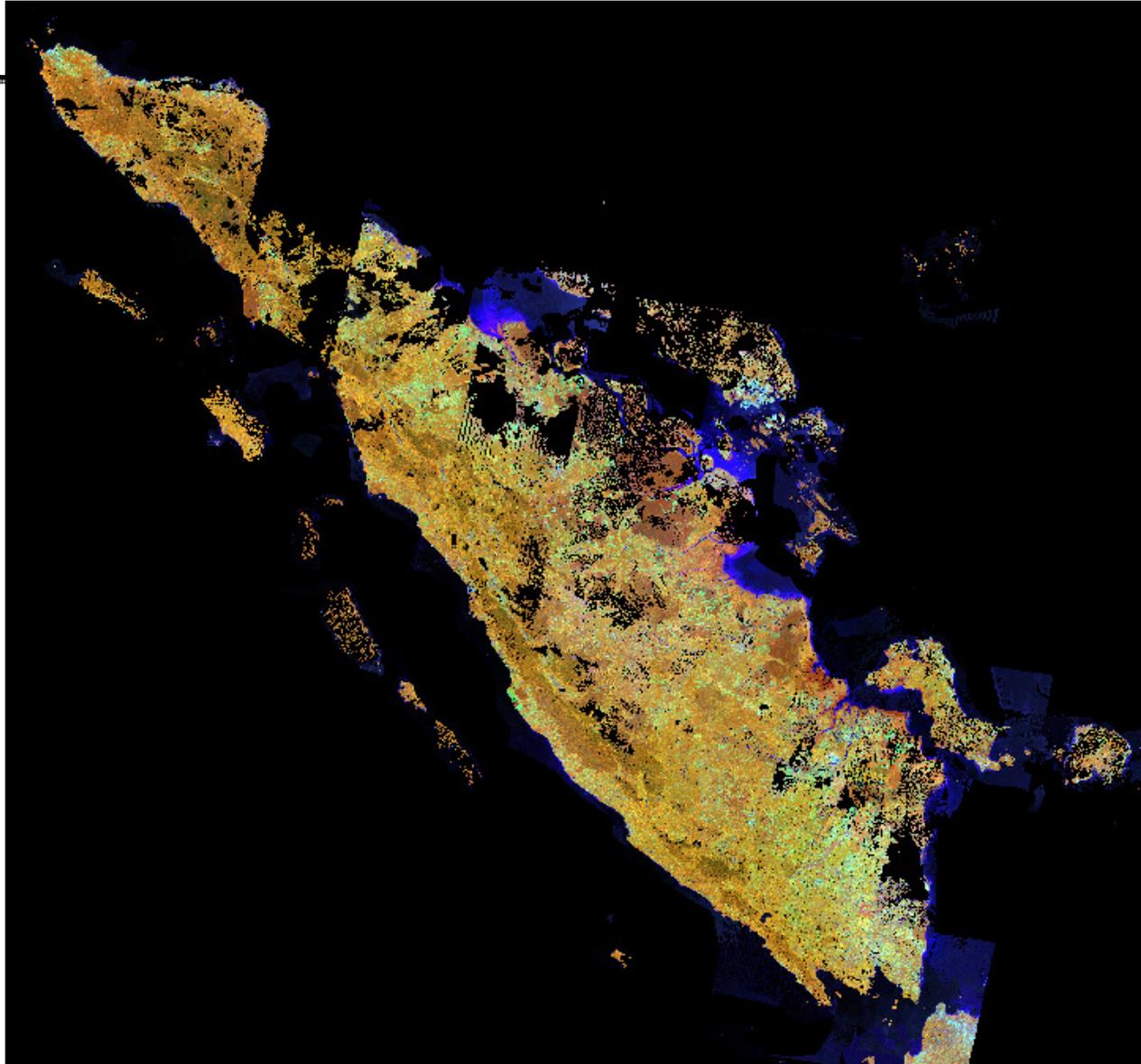
Terrain-corrected and cloud masked mosaic images of Kalimantan (2006)



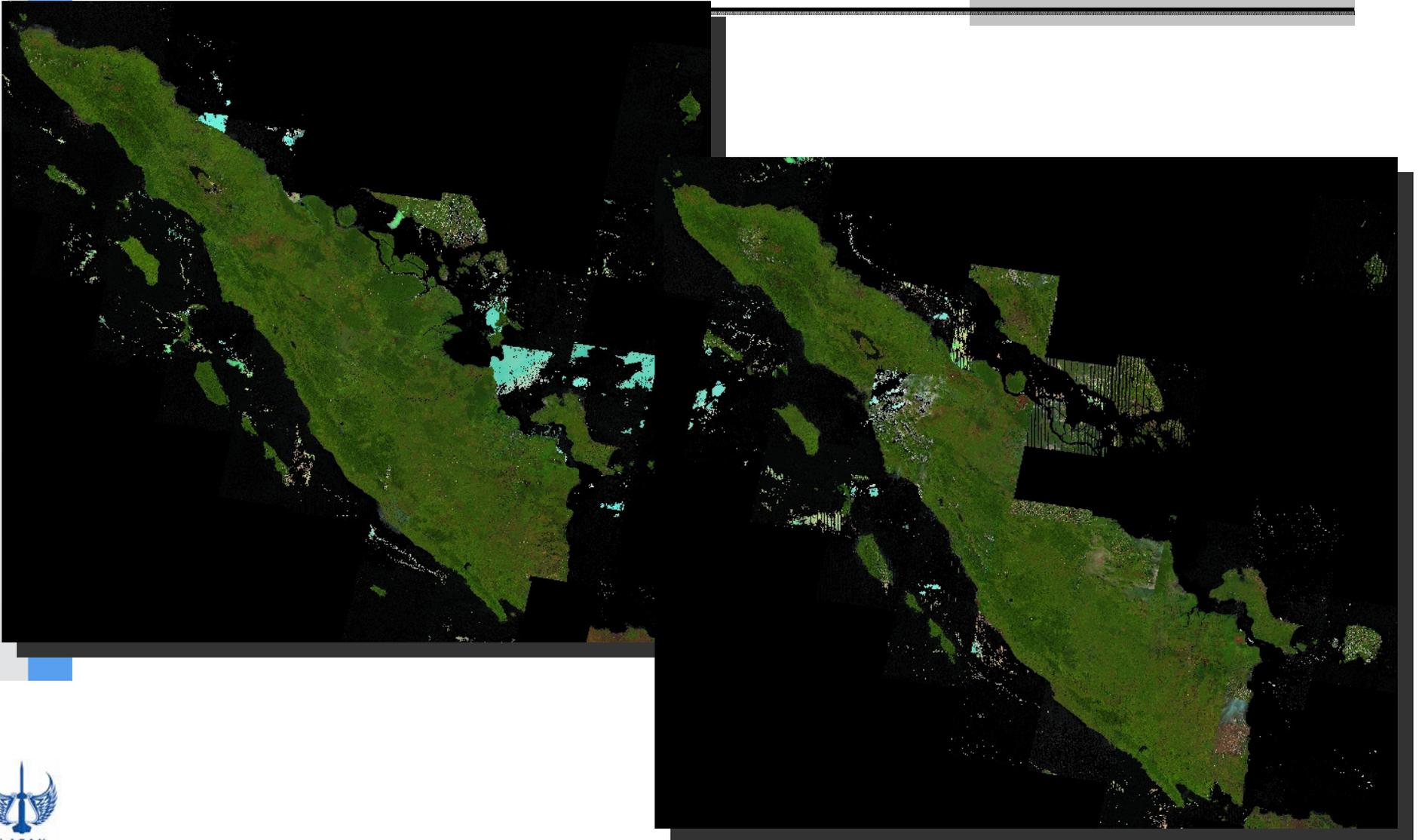
Orthorectification corrected mosaic images of Kalimantan (2000)



Terrain-corrected and cloud masked mosaic images of Sumatera (2008)



Orthorectification corrected mosaic images of Sumatera (2000 and 2006)

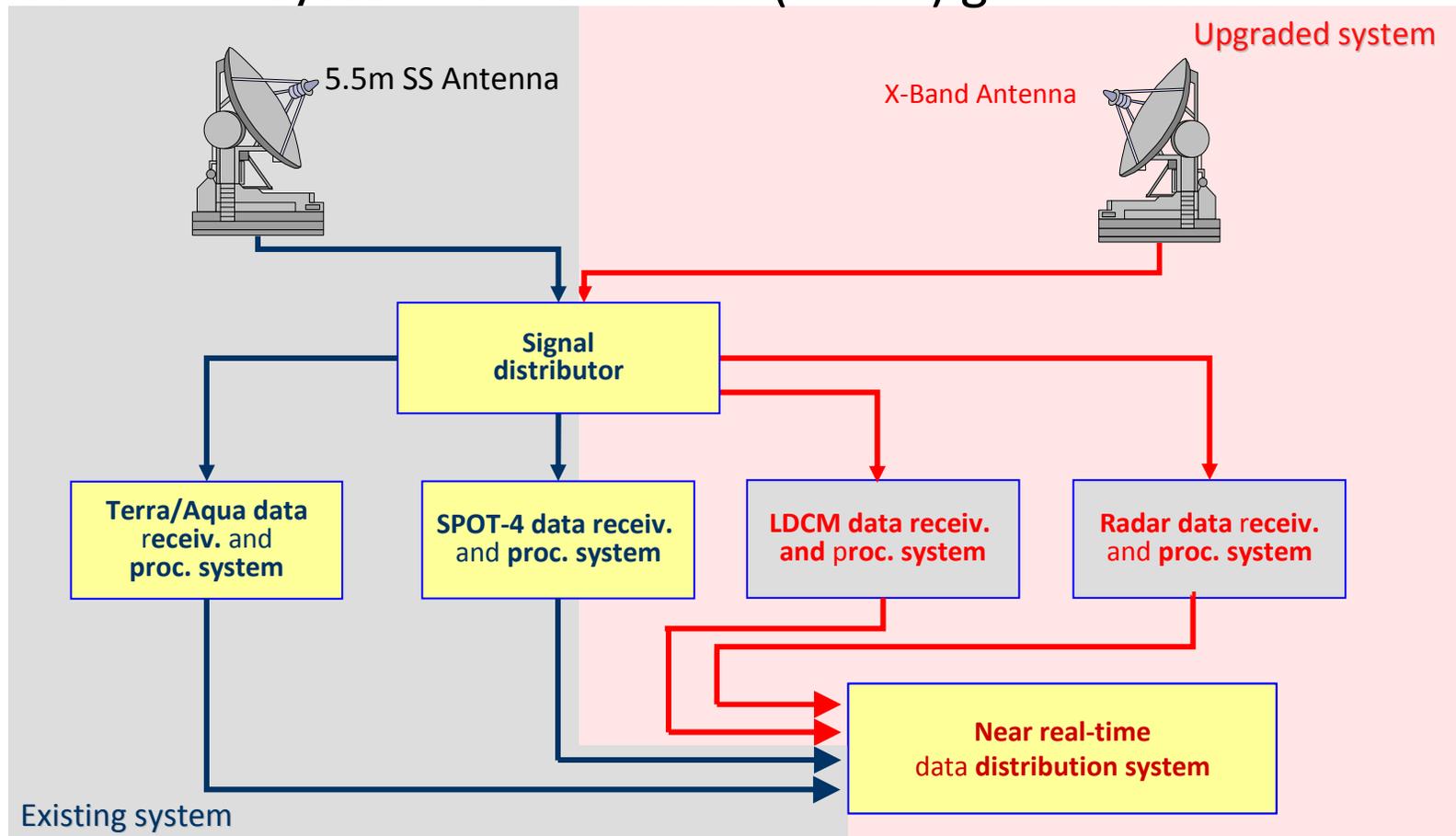




Landsat Ground Station Upgrading

Landsat 8 (LDCM) Ground Station Readiness

- LAPAN has been preparing facilities in Parepare to establish a down-link system for Landsat 8 (LDCM) ground station.



Web Catalog System

The screenshot displays the LAPAN web catalog system interface. The main page, titled "Database Katalog", provides information about the remote sensing ground station and offers a search interface. Below the search options, there are two buttons: "LANDSAT" and "SPOT".

The search results page shows a table of data with the following columns: Name, Dates, Satelit, K, J, Format, Tingkat, Sensor, Cloud Cover, and Preview. The table contains two rows of data:

Name	Dates	Satelit	K	J	Format	Tingkat	Sensor	Cloud Cover	Preview
20090316SP4284362S0G2AXI	2009-03-16	SPOT 4	284	362	GEOTIFF	2A	XI	1	
20090316SP4284362S0G2AMN	2009-03-16	SPOT 4	284	362	GEOTIFF	2A	MN	1	

The detailed view page for the selected scene (20090628SP4284362S0G2AXS) shows a large satellite image and a table of general information and dataset sources:

General Information	
W.Order	S090628055231618
S.ID	42843620906280319522X
Name	20090628SP4284362S0G2AXS
Date	2009-06-28
Time	03:19:52 GMT
Satelit	SPOT 4
K	284
J	362
Shift	0
Level	2A
Sensor	XS
Dataset Sources	
Instrument	HRVIR 2
Incidence Angle	17.8606
Sun Azimuth	37.7471
Sun Elevation	52.3935
Image Dimensions	
Number of columns	3893

Technical/architecture changes planned as a result of the community's trend toward web-enabling data





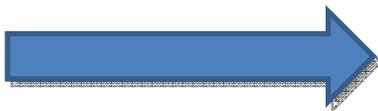
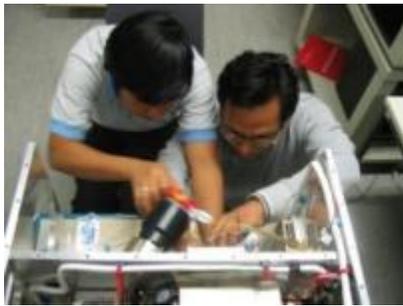
Satellite Technology Development for Earth Observation in Tropical Region

SATELLITE TECHNOLOGY CAPABILITY DEVELOPMENT



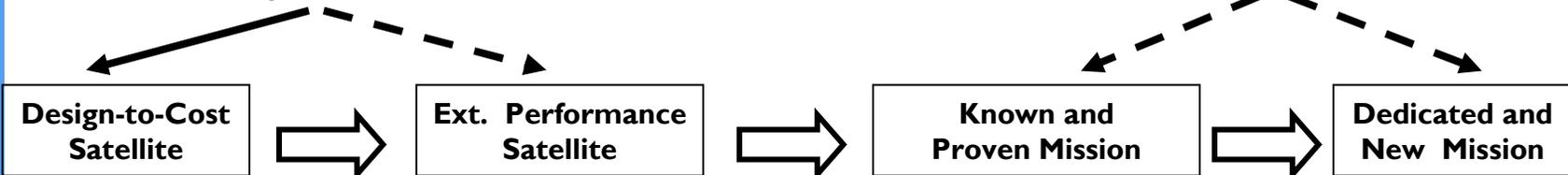
Development of Capability

Development of Mission and Technology



Focus on knowledge on satellite design, integration, test, launch and operation.

Focus on knowledge on satellite-based application and stakeholder management.



Phase I
LAPAN-TUBSAT
(50 kg class)

Phase 2
LAPAN-ORARI & LAPAN-IPB
(70 kg class)

Phase 3
LAPAN-A4
(100 kg class)

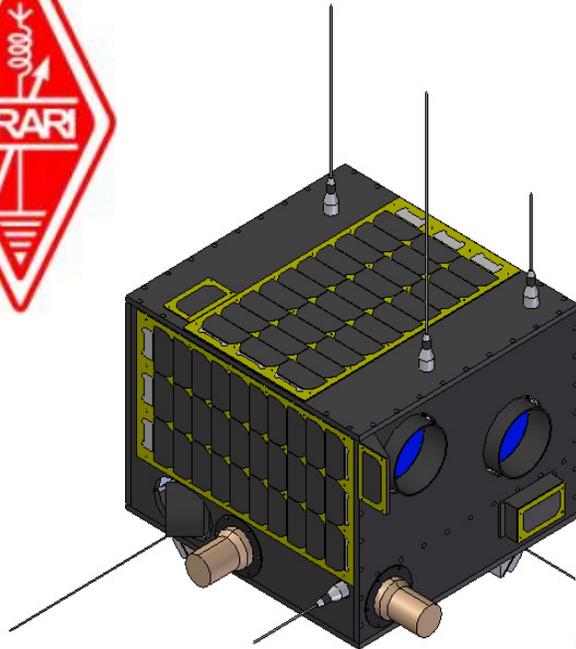
Design, integration and test in Germany	Facilities development	Design, integration and test in Indonesia	Redundance local components; user defined mission	Continuing national & international collaboration
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**LAPAN TUBSAT imagery:
Cement factory in West Java, taken on 25 May 2010**

LAPAN-ORARI Satellite



Mission:

- Earth observation, maritime traffic monitoring, and amateur radio communication (text & voice).
- Flight proving LAPAN's reaction wheel

First satellite to be designed, integrated and tested in Indonesia.

Will be placed at near equatorial low earth orbit (8 deg inclination and 650 km altitude) to obtain more frequent overpass over Indonesia.

Satellite mass is around 70 kg. The design is based on space proven LAPAN-TUBSAT satellite.

Planned launch on early 2013 by PSLV (Astrosat mission).

Payload:

High Resolution resolution video camera (heritage from LAPAN-TUBSAT)

Resolution: 5 m; Swath : 3,5 km

High resolution Digital Camera (f = 1000 mm)

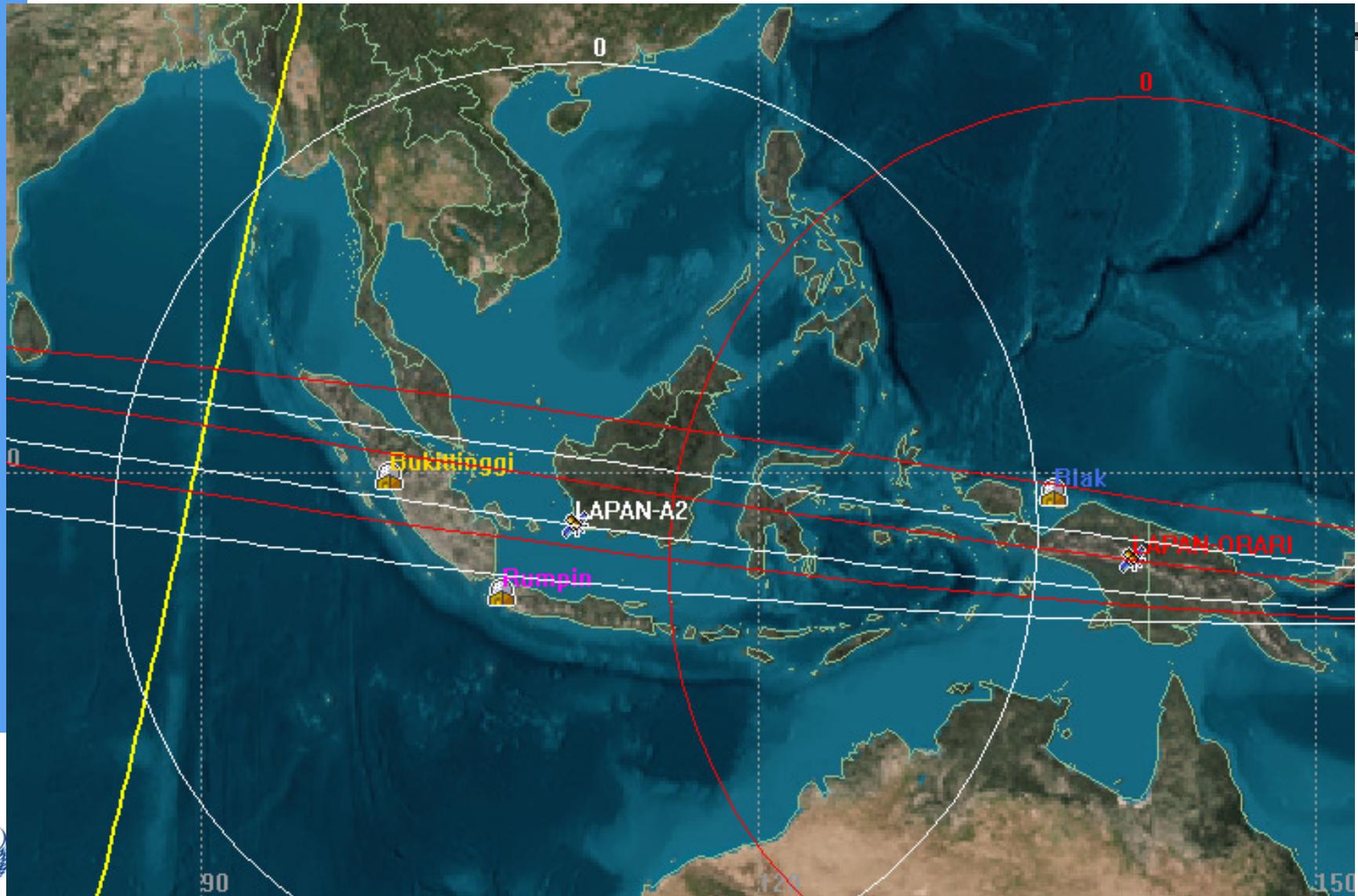
Resolution: 5 m; Swath : 12 km

Automatic Identification System (AIS) receiver : for observation of maritime traffic.

Automatic Packet Reporting System (APRS) digital data relay and analog voice relay communication systems

LAPAN-ORARI ORBIT PROFILE

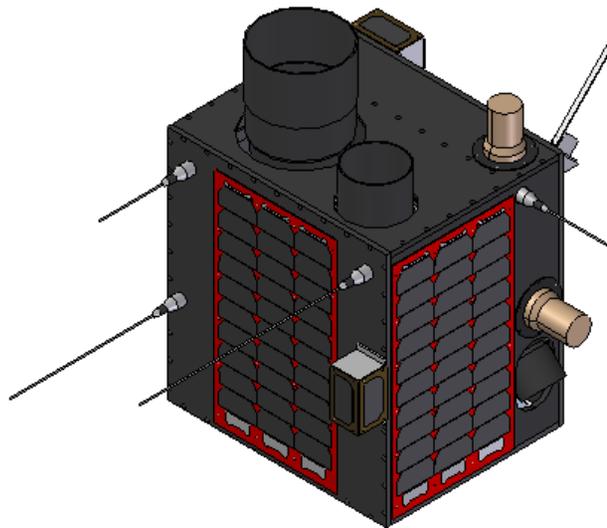
(14 pass per 24 hr / orbit time 100 minutes and stay above horizon at about 10 minutes)



Future mission LAPAN-IPB Satellite

Mission:

- Earth Observation (remote sensing), amateur radio communication, AIS.
- Flight proving LAPAN's star sensor



Orbit:

SSO altitude 650 km. Launch end 2013

Payload:

ORARI amateur radio Automatic Position/Packet Relay System (APRS) digital data relay and analog voice relay communication systems.

4 band push broom multi-spectral imaging camera (Landsat band : B, G, R, NIR)

Resolution: 18 m

Coverage: 110 km

Panchromatic imager with 5 m resolution and coverage 12 km

Automatic Identification System (AIS)

International Cooperation

Indonesia has participated in various international cooperation in space-related activities:

- APRSAF & Sentinel Asia
- ASEAN SCOSA
- UNESCAP
- World Food Programme
- GEO - GEOSS
- RSO UNSPIDER Readiness
- APSCO
- Bilateral – SEA countries, Australia, China, Germany, India, Japan, USA, others

Concluding Remarks

- Climate change is a strategic issue, in which space technology could play important roles in enhancing the capacity in climate change mitigation and adaptation.
- Space technology is beneficial tool for Earth observation, but reliability and sustainability of space-based data provision is essential.
- International cooperation is necessary to enhance the capacity and promote the use of space technology and its applications.



**THANK YOU
FOR YOUR ATTENTION**

