APLIKASI REMOTE SENSING

Konsep Dasar, Data, Validasi Data
dan Pemrosesan Citra

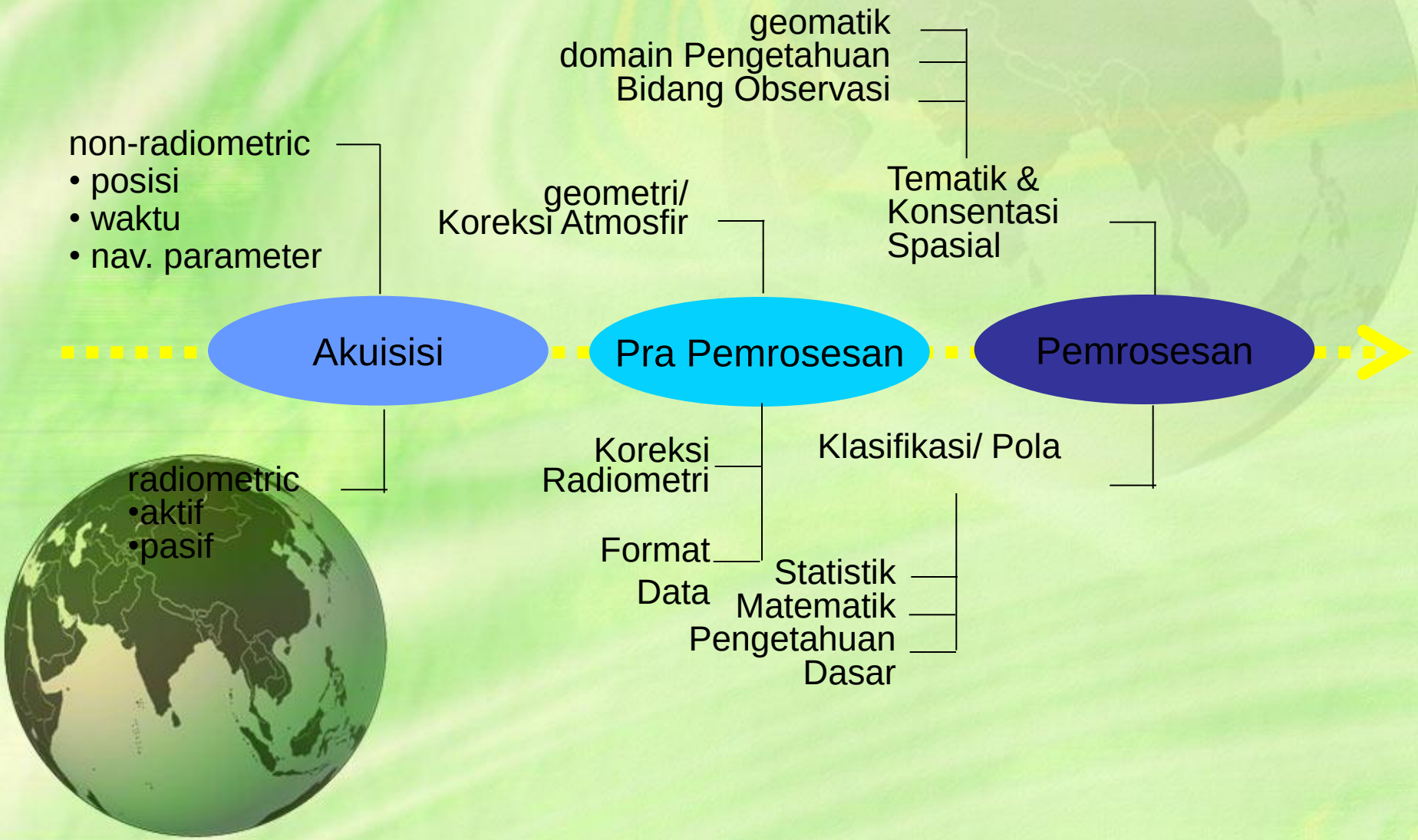
- *Konsep Dasar*
- *Data (Resolusi, Sumber, Skala Keluaran)*
- *Aplikasi Pemrosesan Citra*
- *Validasi Data*

Definisi

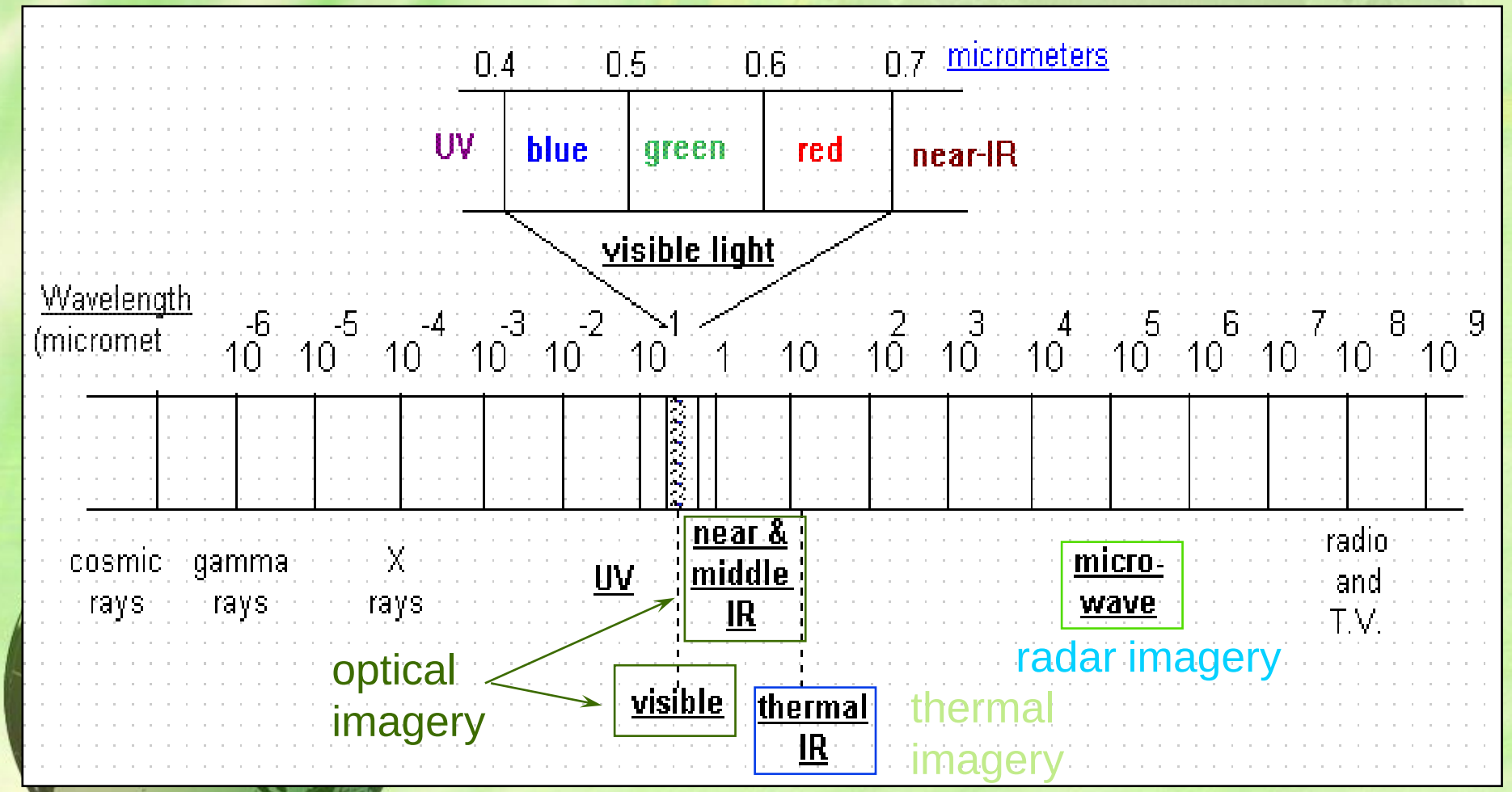
Penginderaan jauh adalah ilmu dan seni untuk memperoleh informasi tentang objek, daerah, atau fenomena melalui analisis data yang diperoleh tanpa menyentuh objek, daerah, atau fenomena yang dikaji

"Lillesan dan Kiefer (1993)"

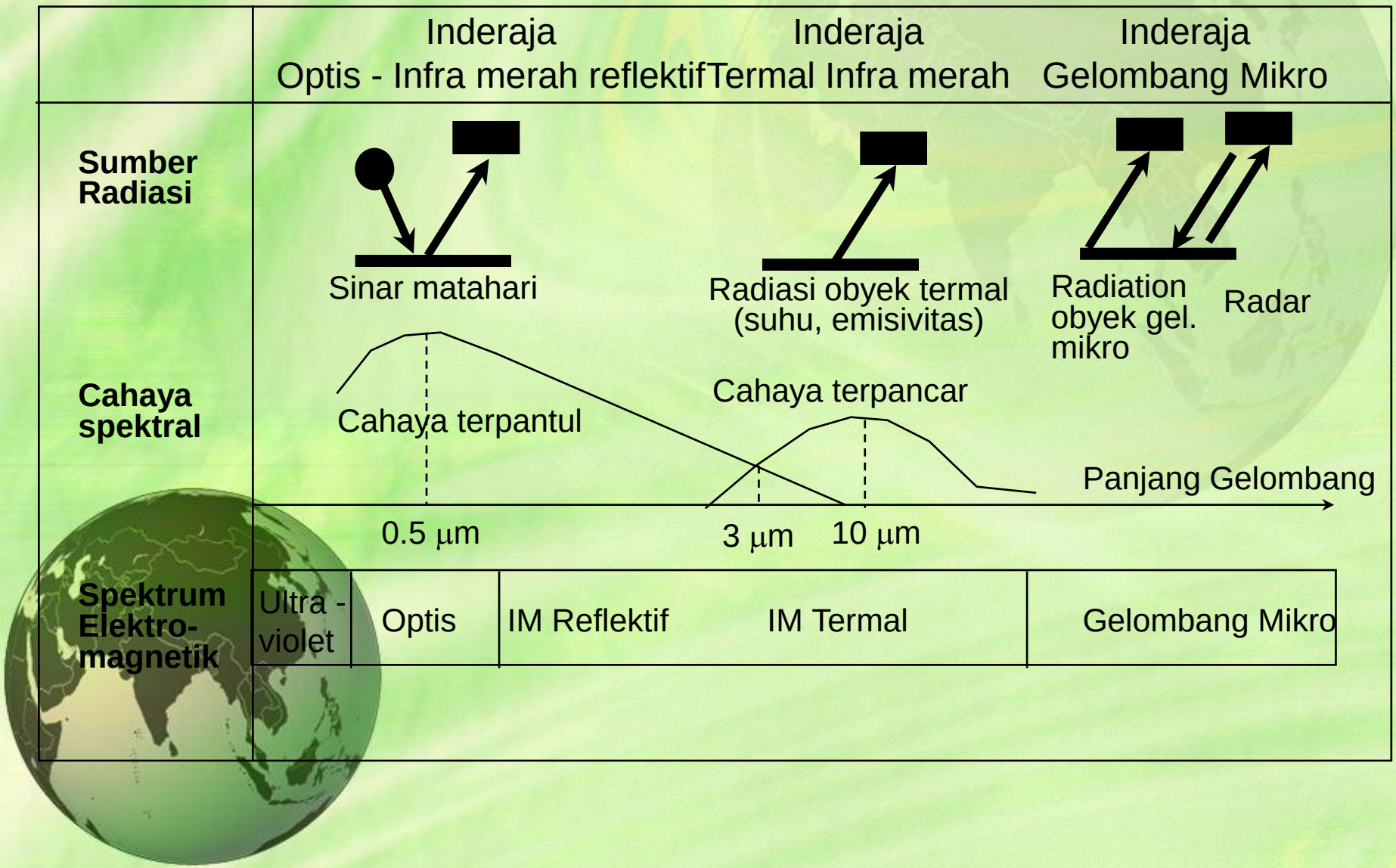
Alur Kerja


geomatik
domain Pengetahuan
Bidang Observasi
non-radiometric
• posisi
• waktu
• nav. parameter
geometri/
Koreksi Atmosfir
Tematik &
Konsentasi
Spasial
Akuisisi
Pra Pemrosesan
Pemrosesan
Koreksi
Radiometri
Klasifikasi/ Pola
radiometric
•aktif
•pasif
Format
Data
Statistik
Matematik
Pengetahuan
Dasar

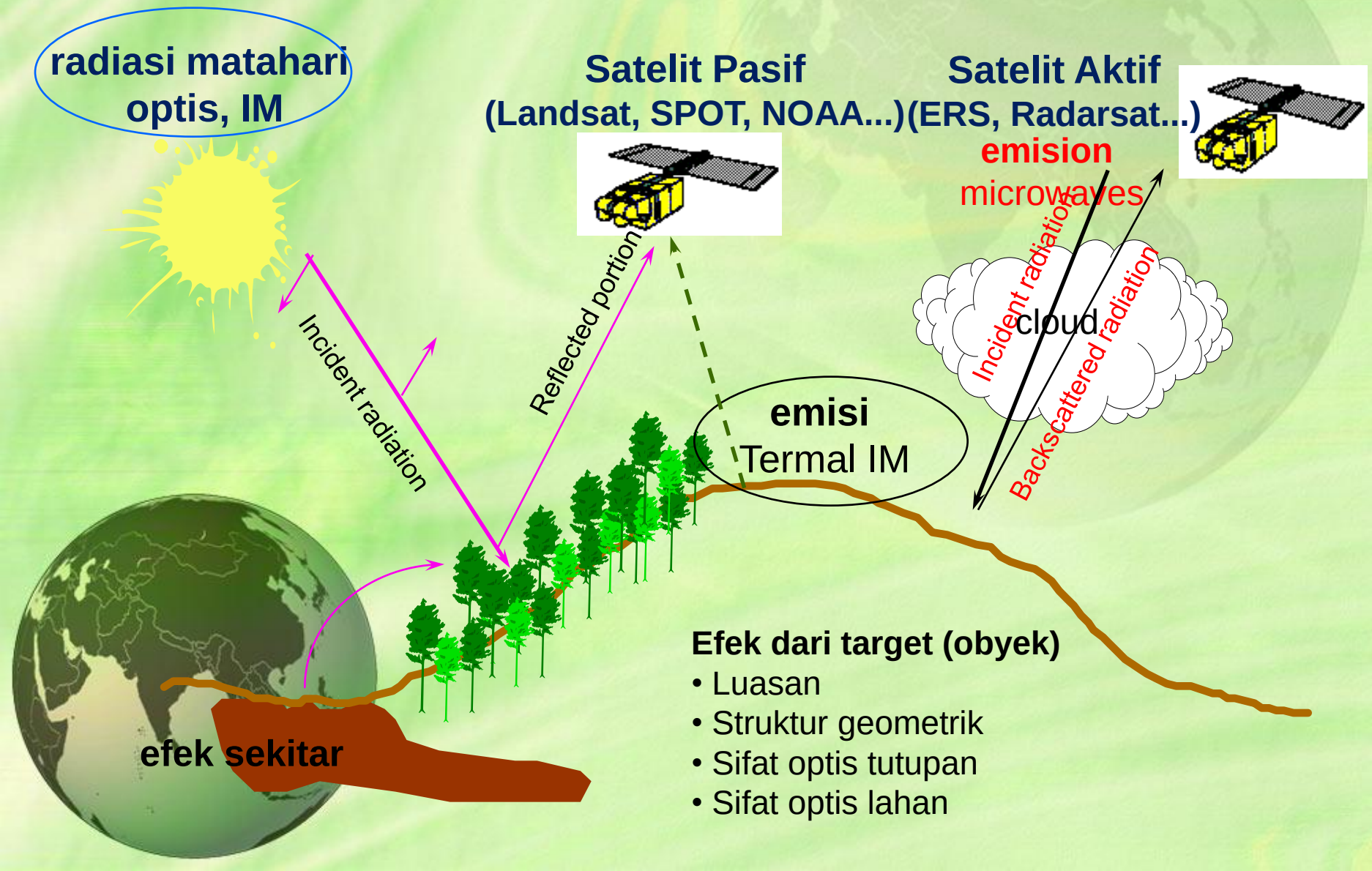
Elektromagnetic Spectrum



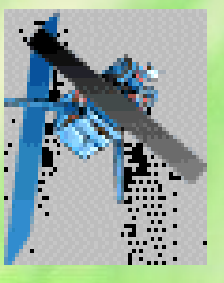
Tipe Remote Sensing



Tipe Satelit (berdasarkan cara Kerja)

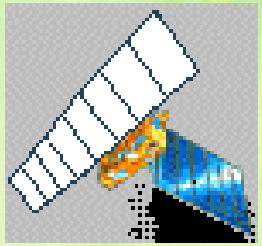


Tipe Satelit (berdasarkan Kepemilikan)



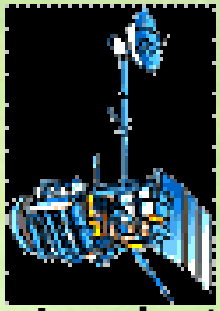
Europe

ERS
1- 2 - 3



Japan

JERS
1 - 2a - 2b
3a - 3b



USA

Landsat
1 - 2 - 3 - 4
5 - 6 - 7 - 8

France

SPOT
1 - 2 - 3
4 - 5a - 5b

IRS ***India***
1A - 1B
1C

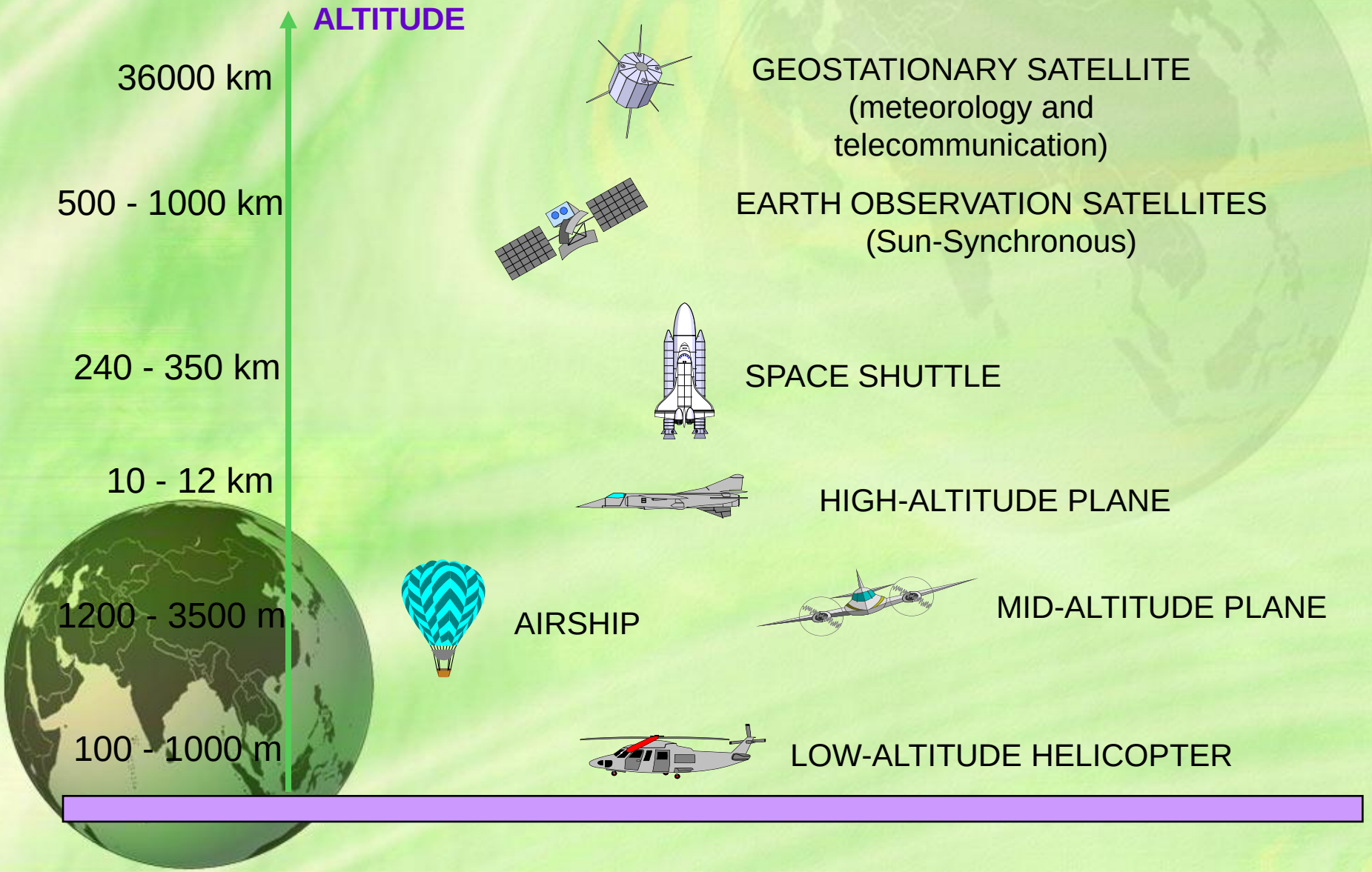
USA

NOAA
1->14

Radarsat ***Canada***
1 - 2 -3

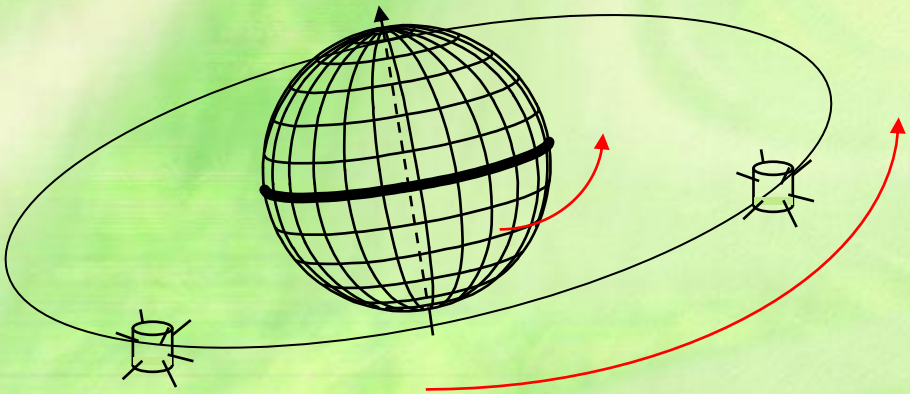
dll....

Tipe Satelit (berdasarkan Ketinggian Orbit)



Tipe Satelit (berdasarkan Karakteristiknya)

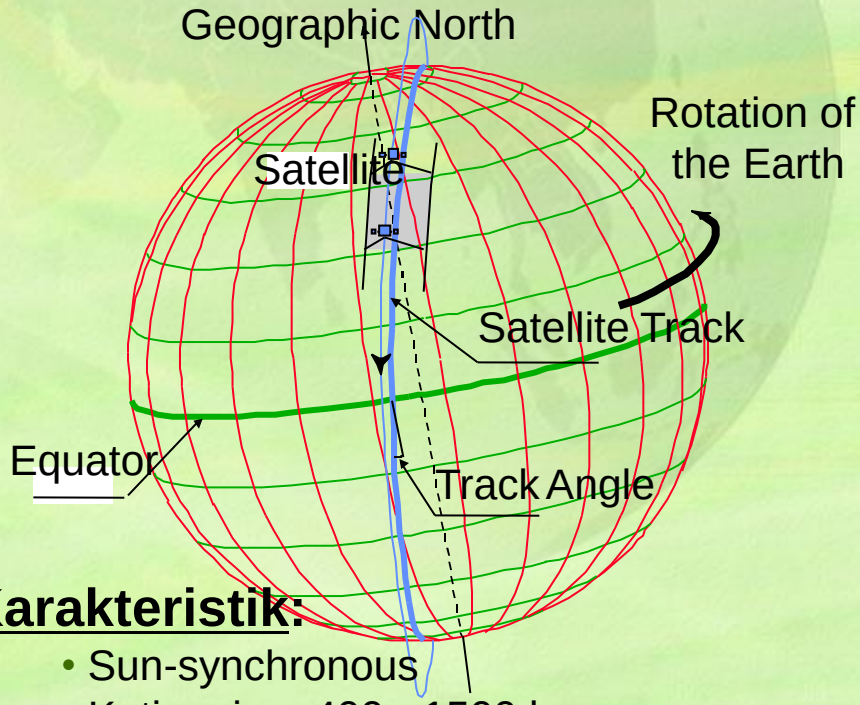
Geostationary Satellite
(Metosat, Goes)



Karakteristik:

- Periodenya sama dengan bumi
- Ketinggian: 36 000 km
- Resolusi rendah
- Jangka waktu lintas kembali pendek (jam)
- Orbit Equator
- Satelit Meteorologi

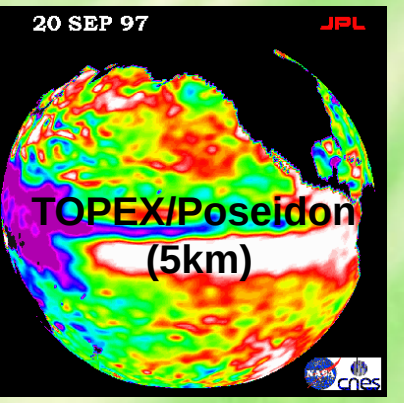
Near-polar Orbit Satellite
(Landsat, SPOT, IRS)



Karakteristik:

- Sun-synchronous
- Ketinggian: 400 - 1500 km
- Resolution tinggi
- Jangka waktu lintasan kembali lama (hari)
- Orbit dekat Polar
- Satelit observasi bumi

Resolusi Satelit



(1) Spatial resolution

NOAA/AVHRR:1100m; IKONOS/PAN:0.82m;
SPOT: 20, 10, 5, 2,5 m, QuickBird/PAN:0.61m, MS:2.4m

(2) Spectral resolution (band number)

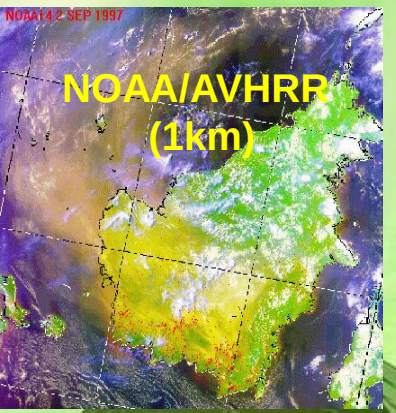
Landsat:8 ; MODIS:36, EO-1/Hyperion:220

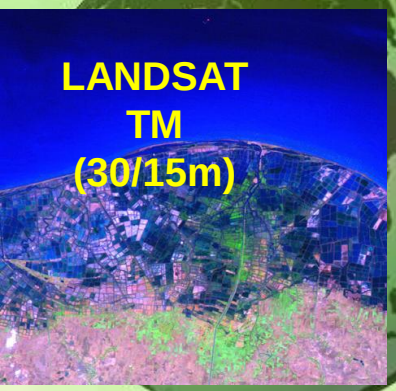
(3) Temporal resolution (recurrent days)

JERS:44, SPOT:26, Landsat:16; MODIS:1, NOAA:1

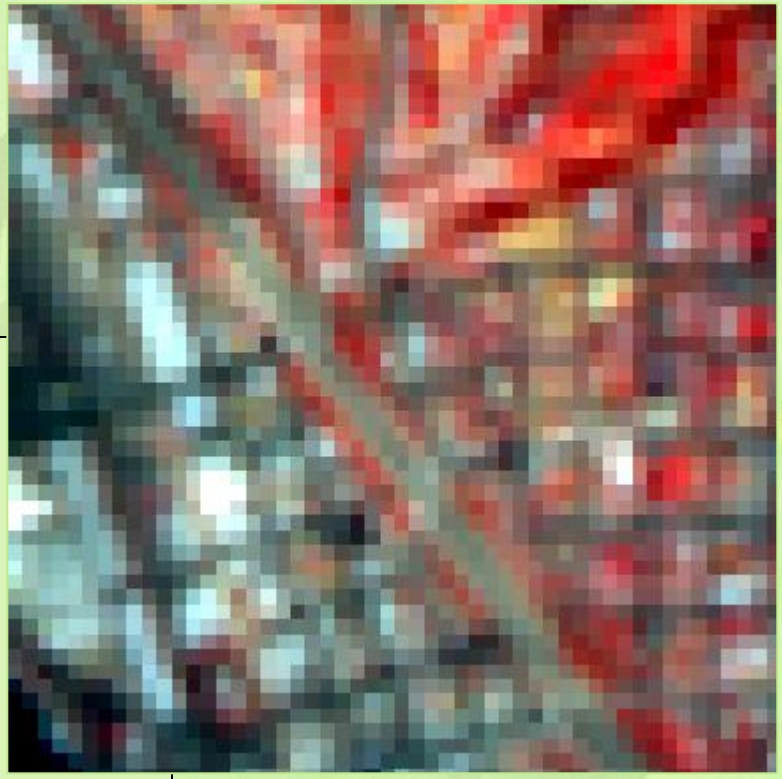
(4) All weather sensor SAR(Synthetic Aperture Radar)

Optical sensor : NOAA, SPOT, Landsat;
Microwave sensor : ERS, JERS, RADARSAT, ENVISAT

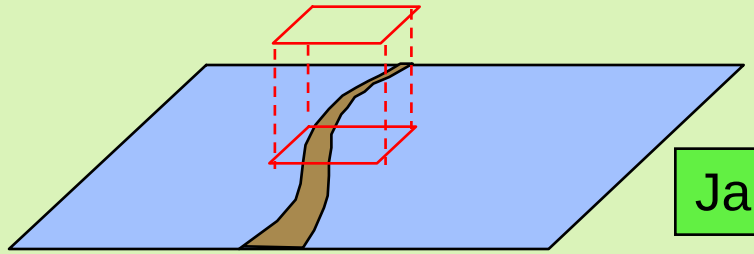




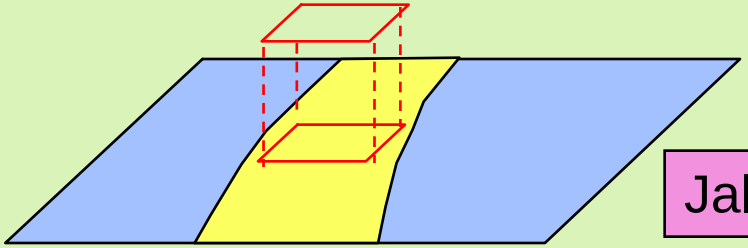
Efek Resolusi Spasial



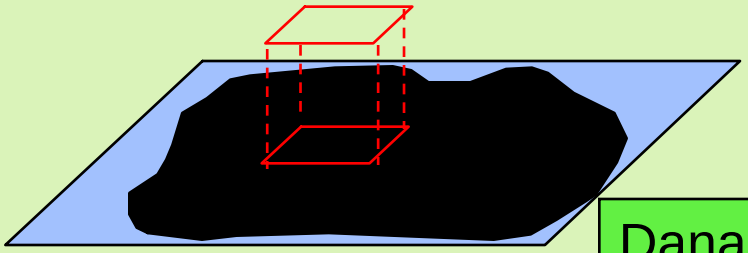
Resolusi Spasial (20 m)



Jalan (8 m)

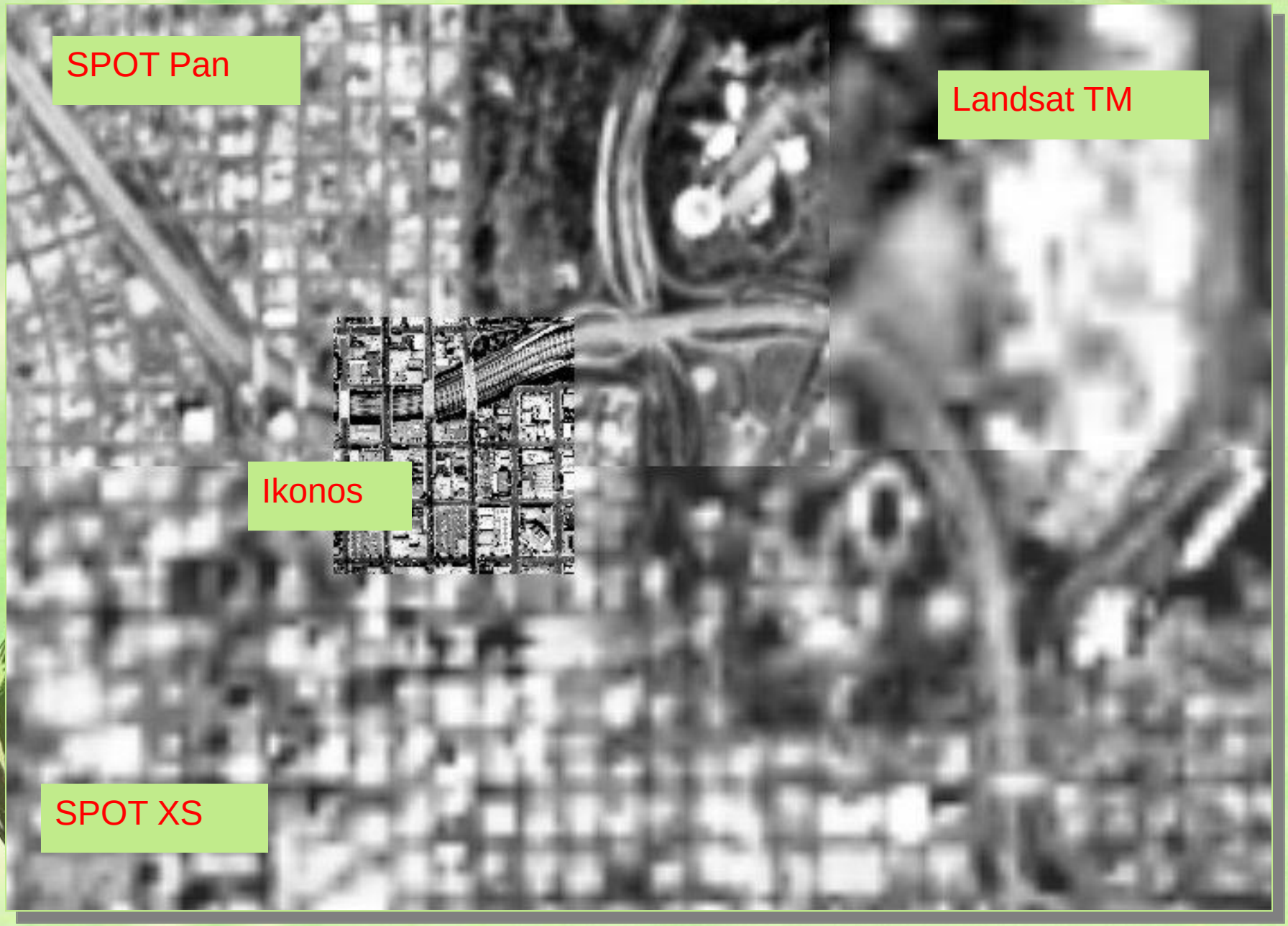


Jalan Raya (25 m)



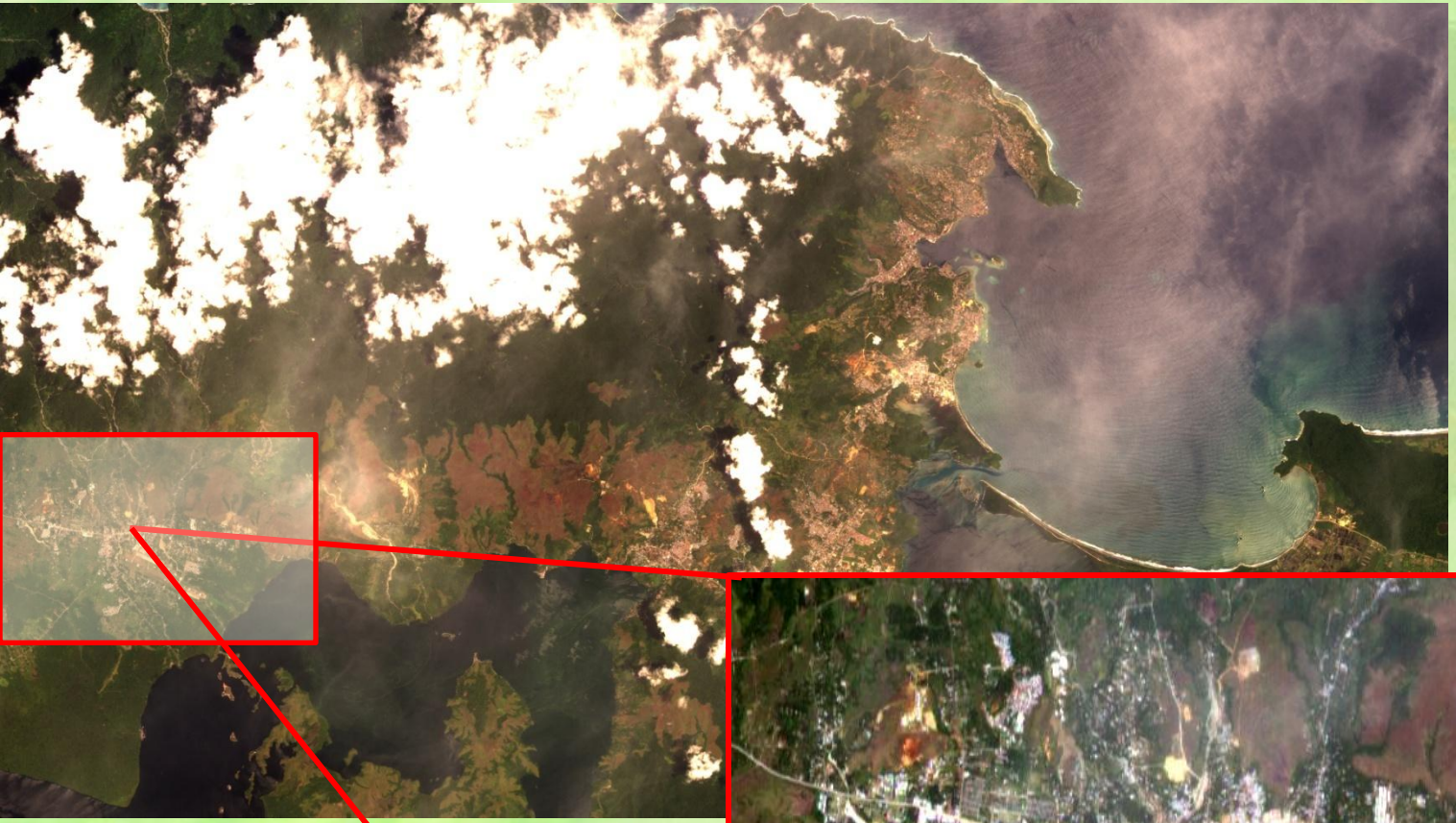
Danau (80-200 m)

Perbandingan resolusi citra



Landsat TM7 standard

Resolusi 30 meter



ALOS Resolusi 10 m

Landsat (30 m)

SPOT (20 m)

IKONOS (resolusi 1 m)

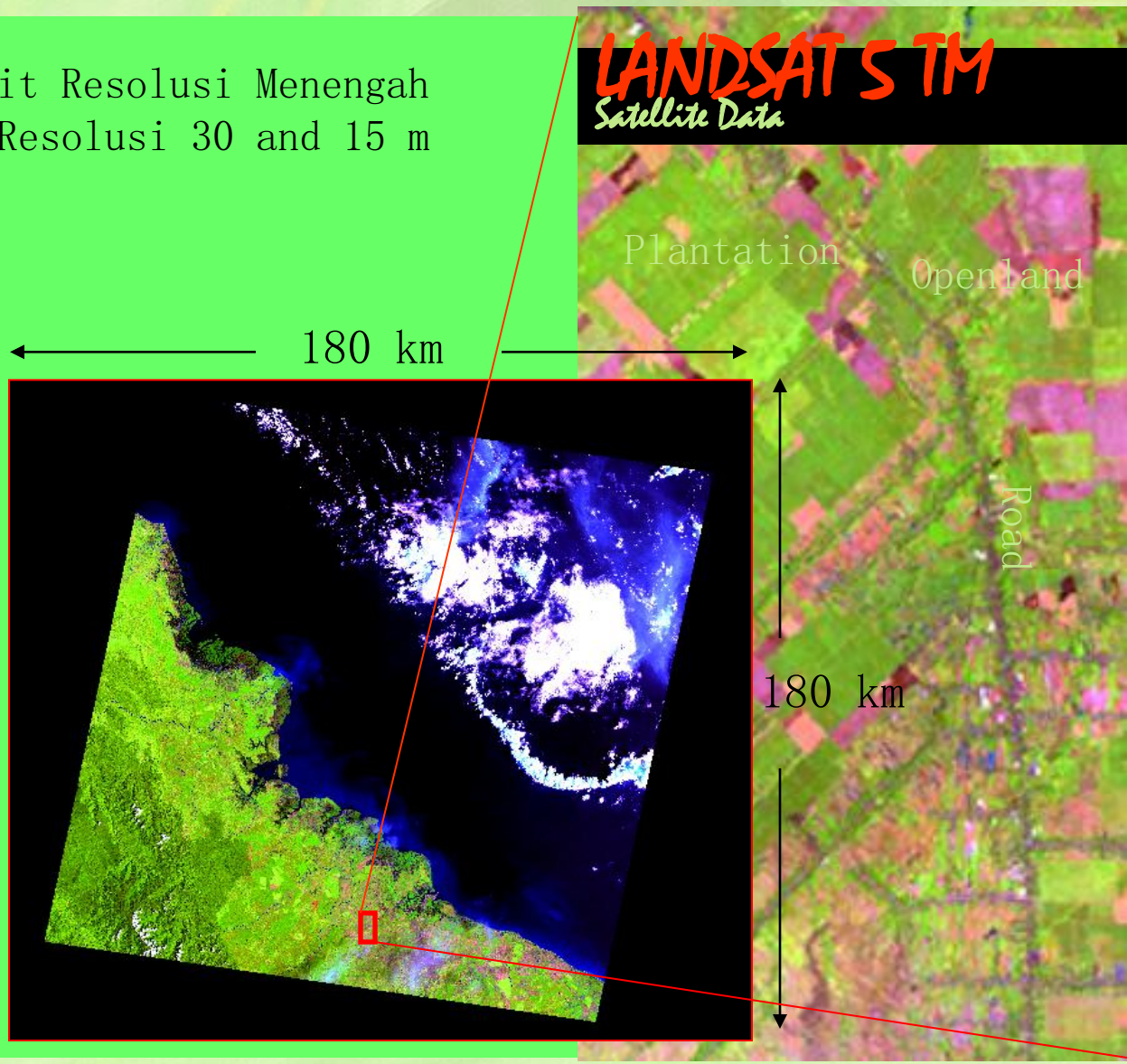
Quickbird (resolusi 0,6 m)

Spesifikasi

dan Kegunaan

Data Citra

Satelit Resolusi Menengah
Resolusi 30 and 15 m



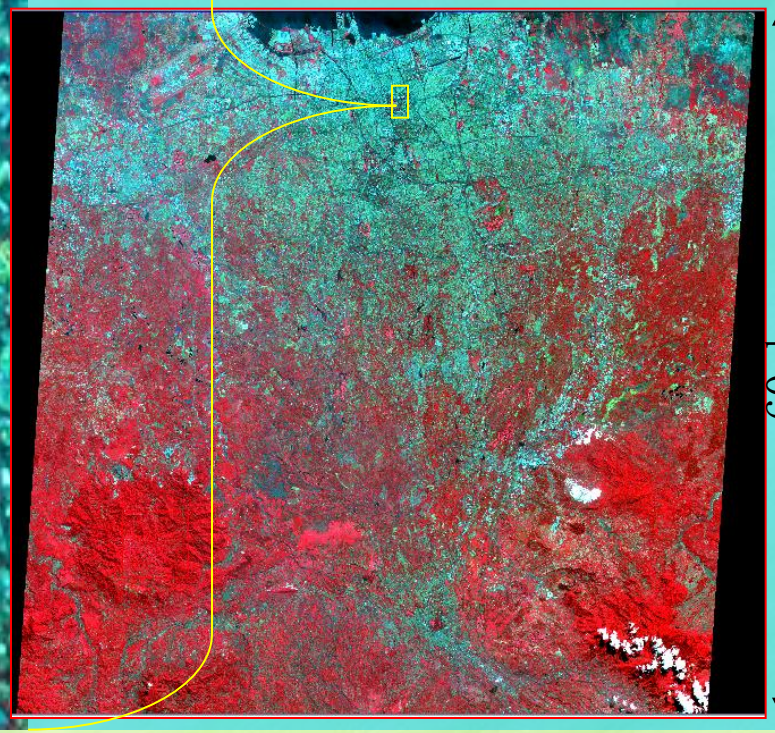
Bidang aplikasi :
Pemetaan Land Use
Kehutanan, perkebunan, kelautan, pertambangan, tataruang, dll

Price :
New Coverage $500/Scene
Archive $150/Scene

TERRA ASTER
Satellite Data

Citra Satelit Resolusi Menengah

Resolusi 30 and 15 m

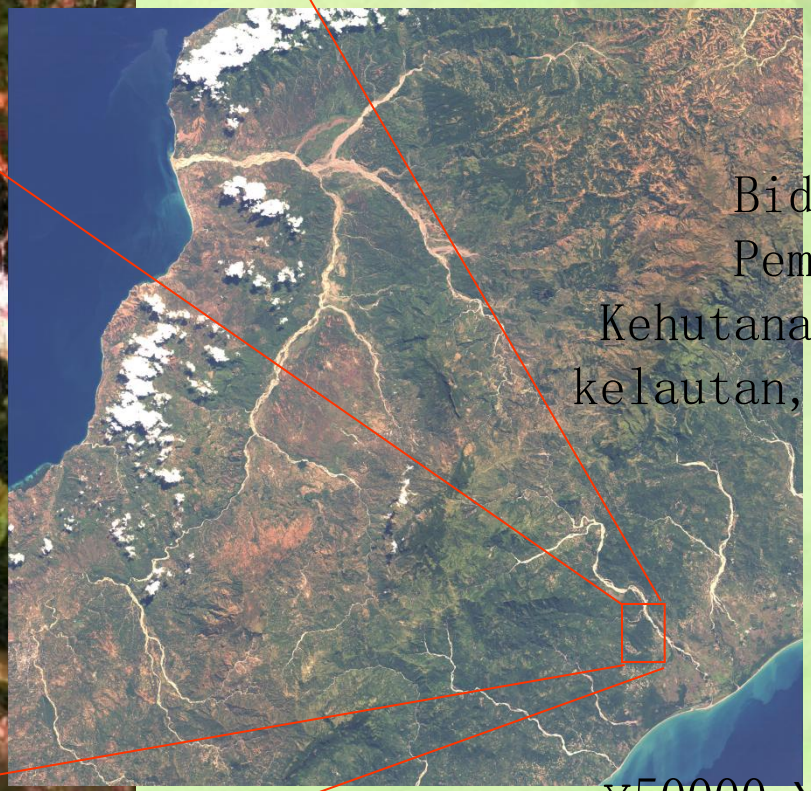


Bidang aplikasi :
Pemetaan
Land Use, tata ruang
Kehutanan, perkebunan, kelautan, pertambangan, dll

Price :
New Coverage
$550/Scene
Archive $130/Scene

ALOS
Satellite Data

Citra Satelit Resolusi Tinggi
Resolusi 10 and 2,5 m
AVNIR & PRISM



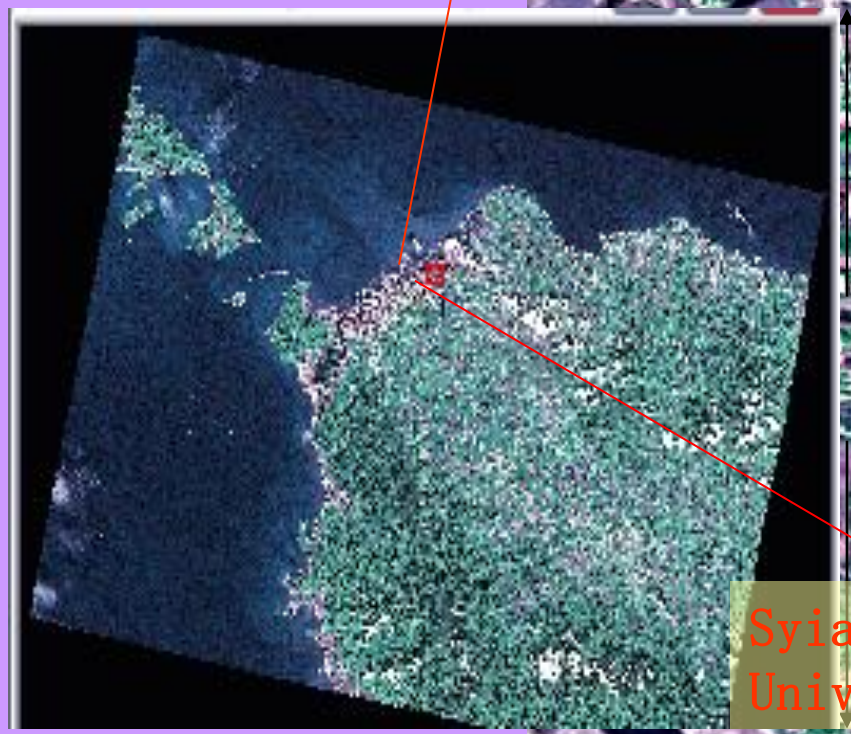
Bidang aplikasi :
Pemetaan Land Use
Kehutanan, perkebunan,
kelautan, pertambangan,
tataruang, dll

Price :
New Coverage
¥50000-¥220.000/Scene

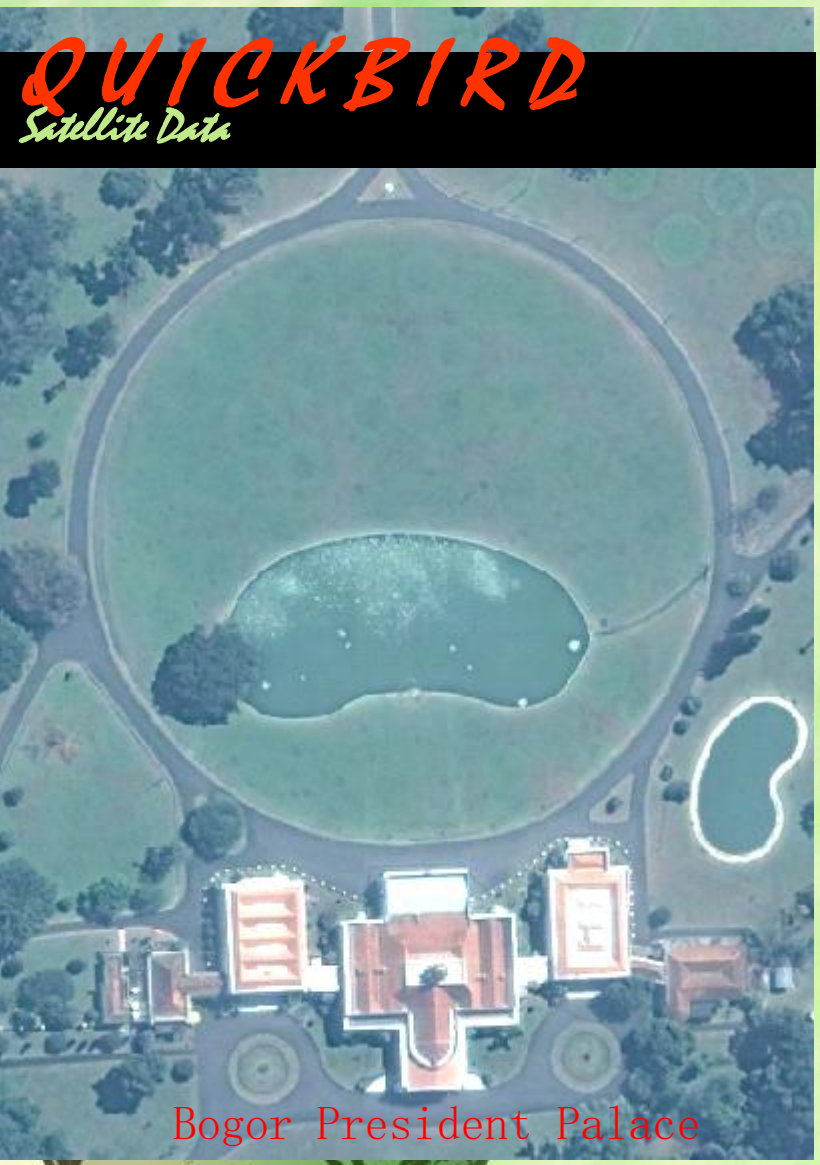
Citra Satelit Resolusi Tinggi
Resolusi 2.5m, 5m, 10m and 20 m

Bidang aplikasi :
Pemetaan
Land Use, tata ruang
Kehutanan, perkebunan, kelautan, pertambangan, dll

Price :
New Coverage $3700 - $10000/Scene



QUICKBIRD
Satellite Data



Citra Satelit Resolusi Tinggi
Resolusi 0.6m and 2 m

Penggunaan :
Pemetaan Detail, Pemetaan tata ruang detail, perkebunan : Pemetaan blok, tegakan, dll

Price :
New Coverage $47/km2
Archive $18/km2

IKONOS
Satellite Data

a high resolution satellite imagery
Resolution 1m and 4 m

Penggunaan :
Pemetaan Detail, Pemetaan tata ruang detail, perkebunan : Pemetaan blok, tegakan, dll

Price :
New Coverage $37/km2
Archive $37/km2

Sumber Data

USGS
http://glovis.usgs.gov

GISTDA Thailand
www.gistda.or.th

TRFIC MSU
www.landsat.org

ACRES Australia
www.ga.gov.au/acres

ERSDAC Japan
http://glovis.usgs.gov

BTIC DATAPORT

MACRES Malaysia
www.macres.gov.my

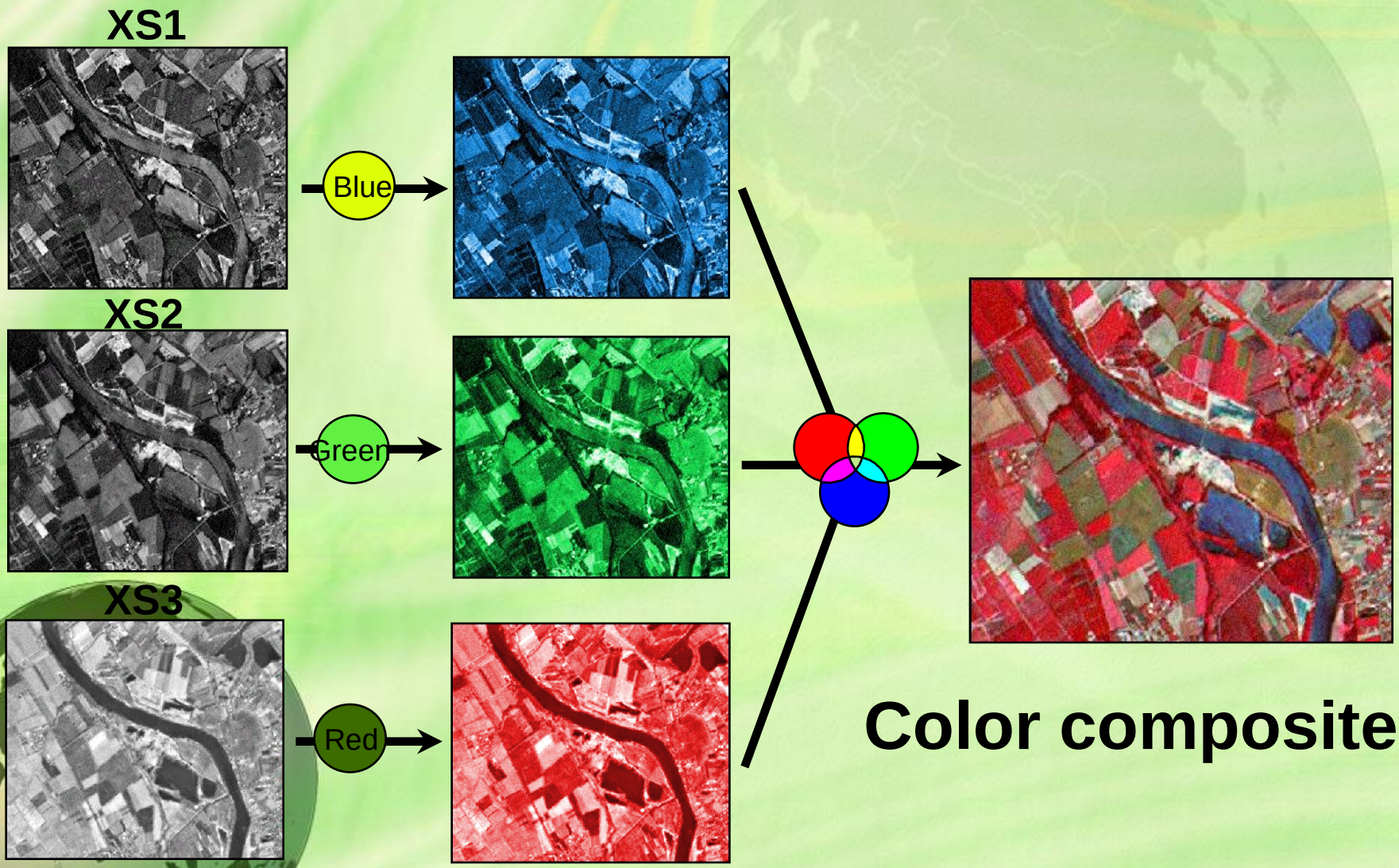
Digital Globe
www.digitalglobe.com

Space Imaging
www.spaceimaging.com

CRISP Singapore
http://crisp.nus.edu.sg

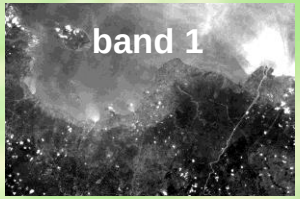
Aplikasi Pengolahan Citra

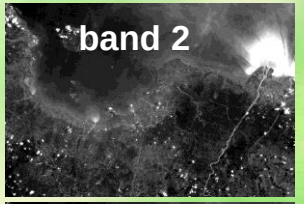
Tampilan citra satelit

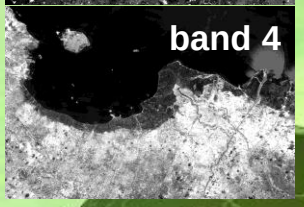


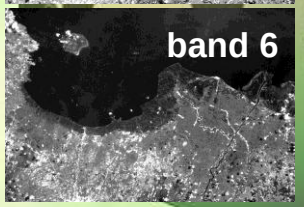
Color composite

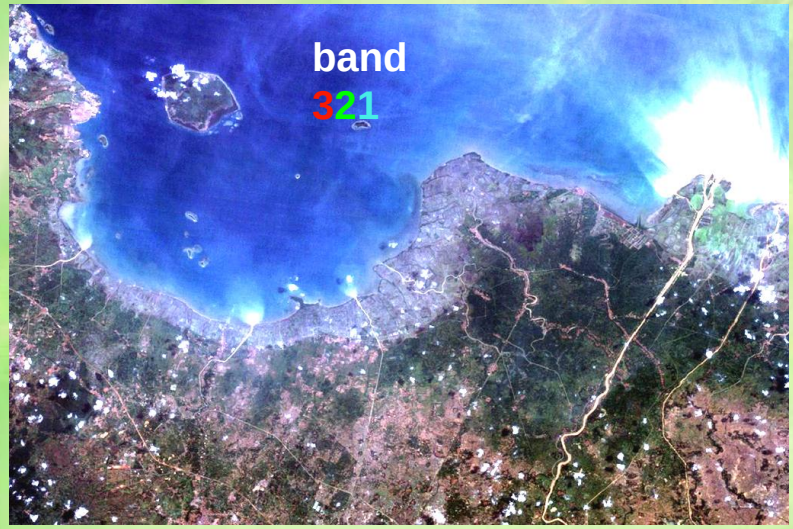
Komposisi warna citra Landsat TM

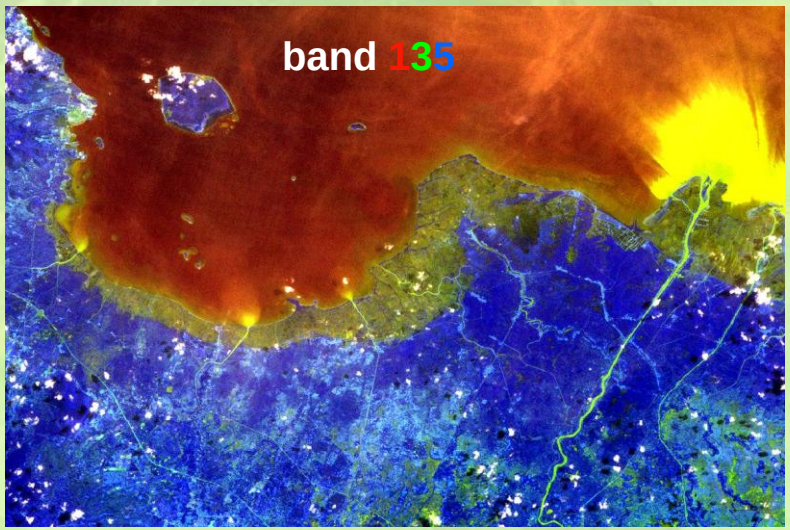


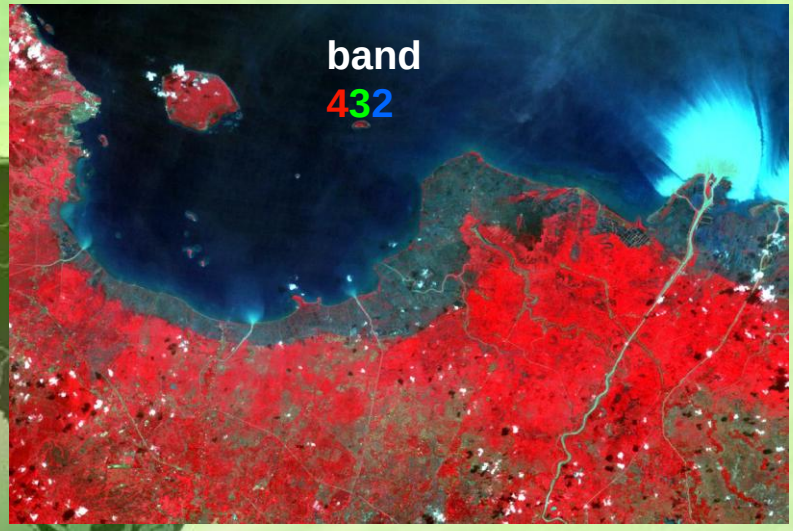




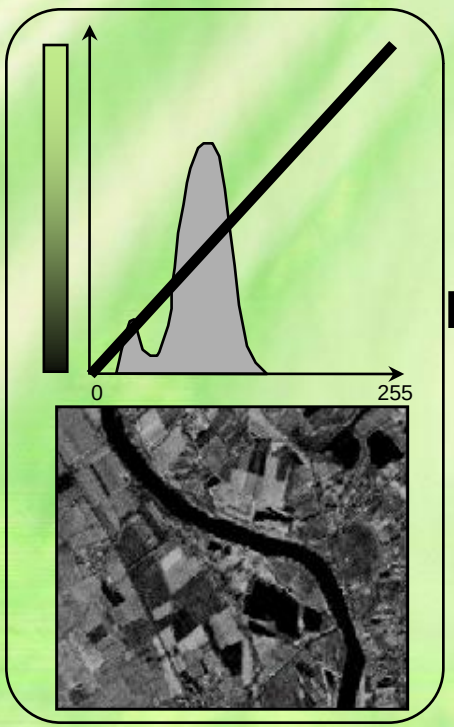






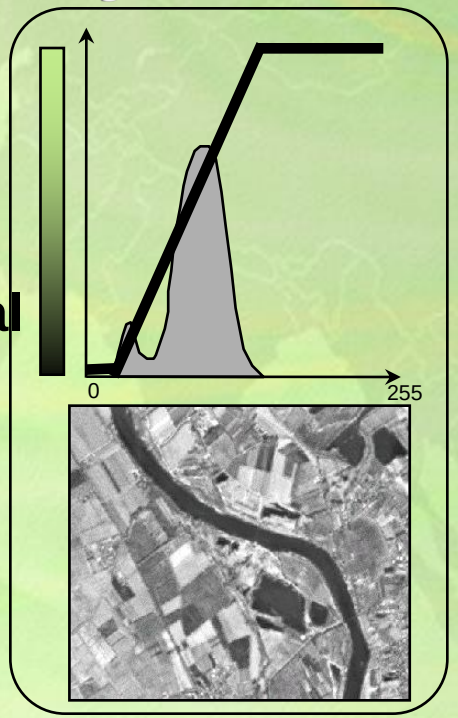


Penajaman visual

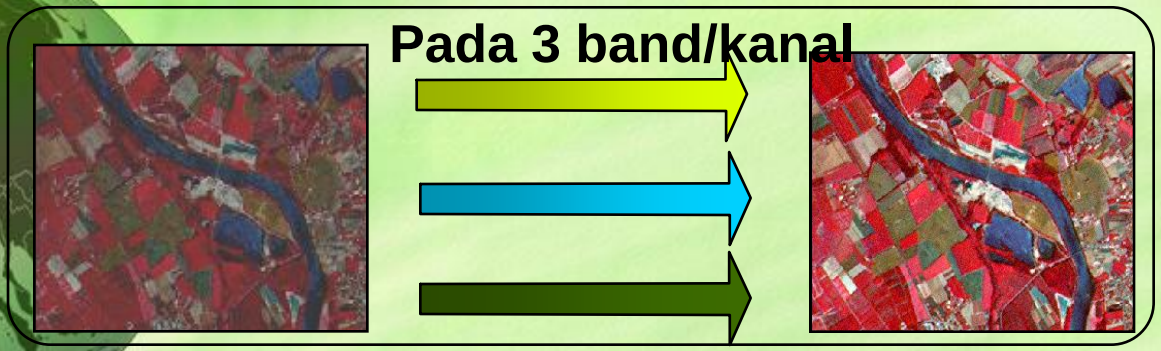


Stretching

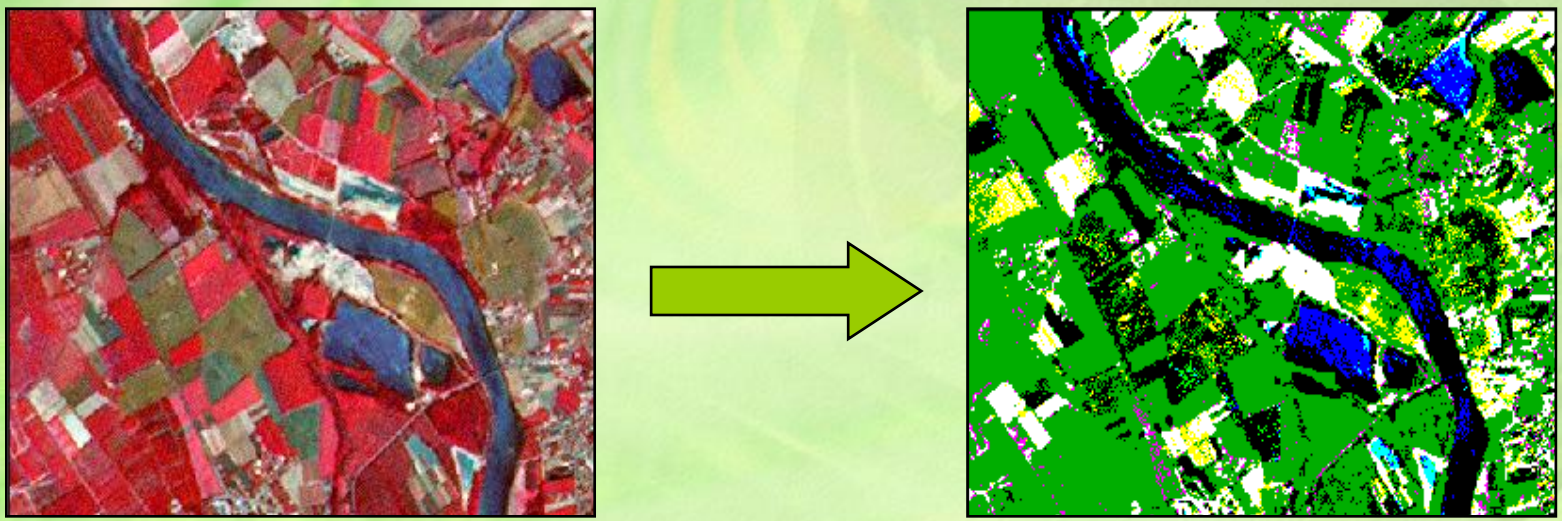
Pada satu band/kanal



Pada 3 band/kanal



Klasifikasi Citra (Image Classification)



Konsep dasar :

Tujuannya untuk mengelompokkan citra mentah (raw image) ke dalam beberapa kelas untuk membuat peta tematik.

Ada 2 tipe klasifikasi:

1. Tanpa bimbingan(unsupervised classification) dan
2. Terbimbing (supervised classification, dengan check lapangan)

1. Klasifikasi tanpa bimbingan (Unsupervised Classification)

Definisi : Klasifikasi yang prosesnya berdasarkan komputer secara otomatis tanpa training data (tanpa supervisi)

Contoh:

- Isodata Clustering
- Fuzzy Clustering
- Minimum Distance

2. Klasifikasi Terbimbingan (Supervised Classification)

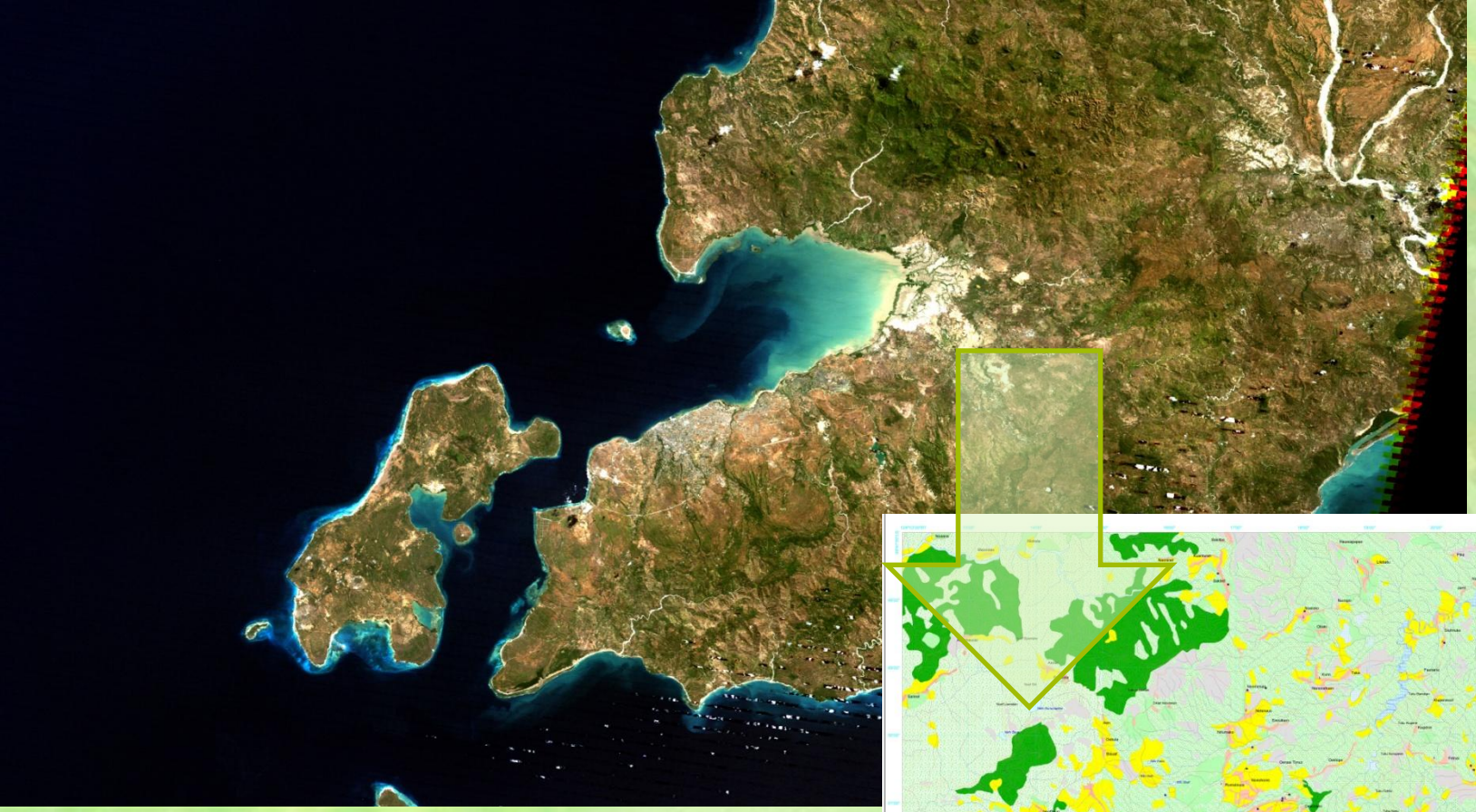
Definisi : Klasifikasi yang prosesnya berdasarkan training data (dengan supervisi)

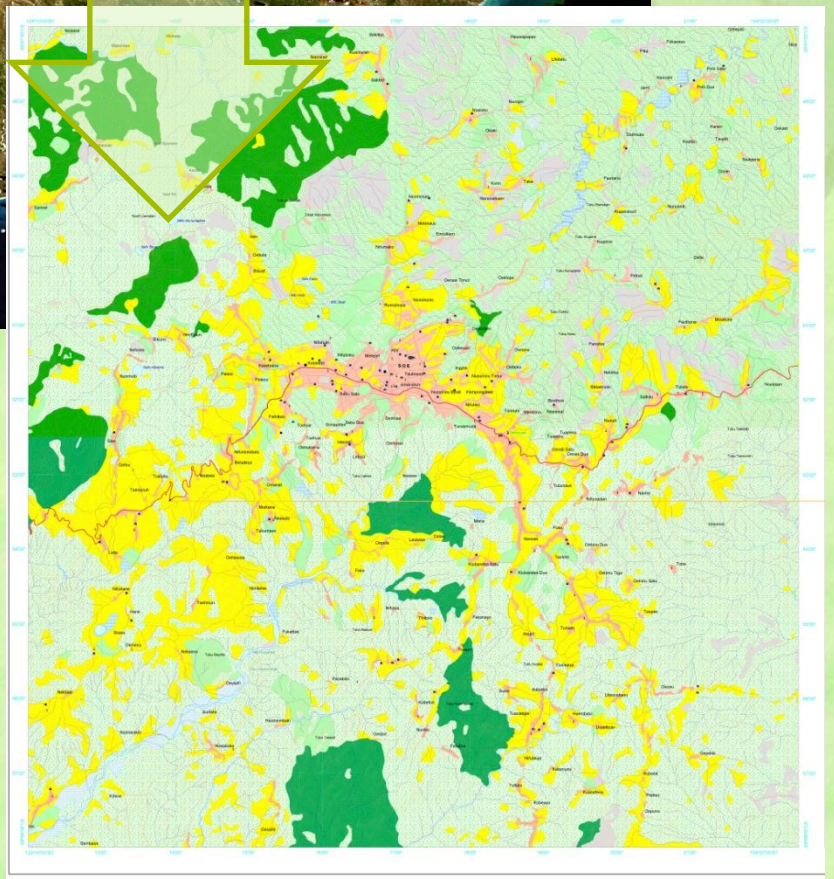
Contoh: "*Pendekatan Statistik*"

- Maximum Likelihood Method
- Paralelliped Method, dll

Skala Hasil Pengolahan Citra Satelit

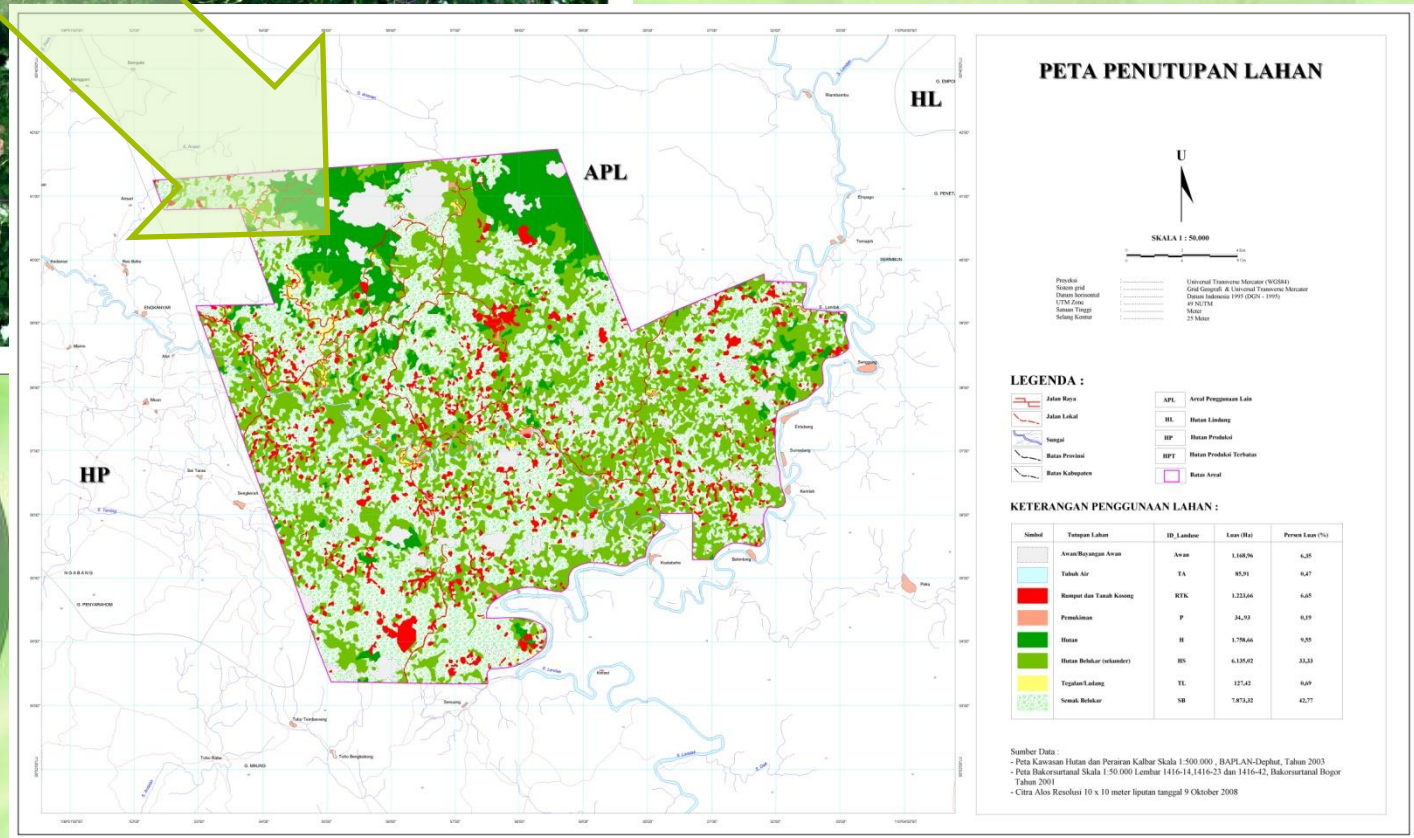
Jenis Satelit	Resolusi Spasial	Skala Peta
NOAA-AVHRR SEASTAR RESURS - O ADEOS-2	1 km 1 km 210 m	2.500.000 500.000
LANDSAT7 –ETM dan 5TM ASTER SPOT 4 (FRANCE) SPOT 5 ALOS	15 m - 30 m 15 m 10 m - 20 m	50.000 - 100.000 50.000 - 100.000 50.000 - 25.000
IKONOS-2 (USA) SPIN2 (RUSIA) SPOT 5 ORBVIEW-3	1 m - 4 m 2,5 m 2 m	10.000 5.000
Quickbird	0,6 m	5.000 2.500 1.000



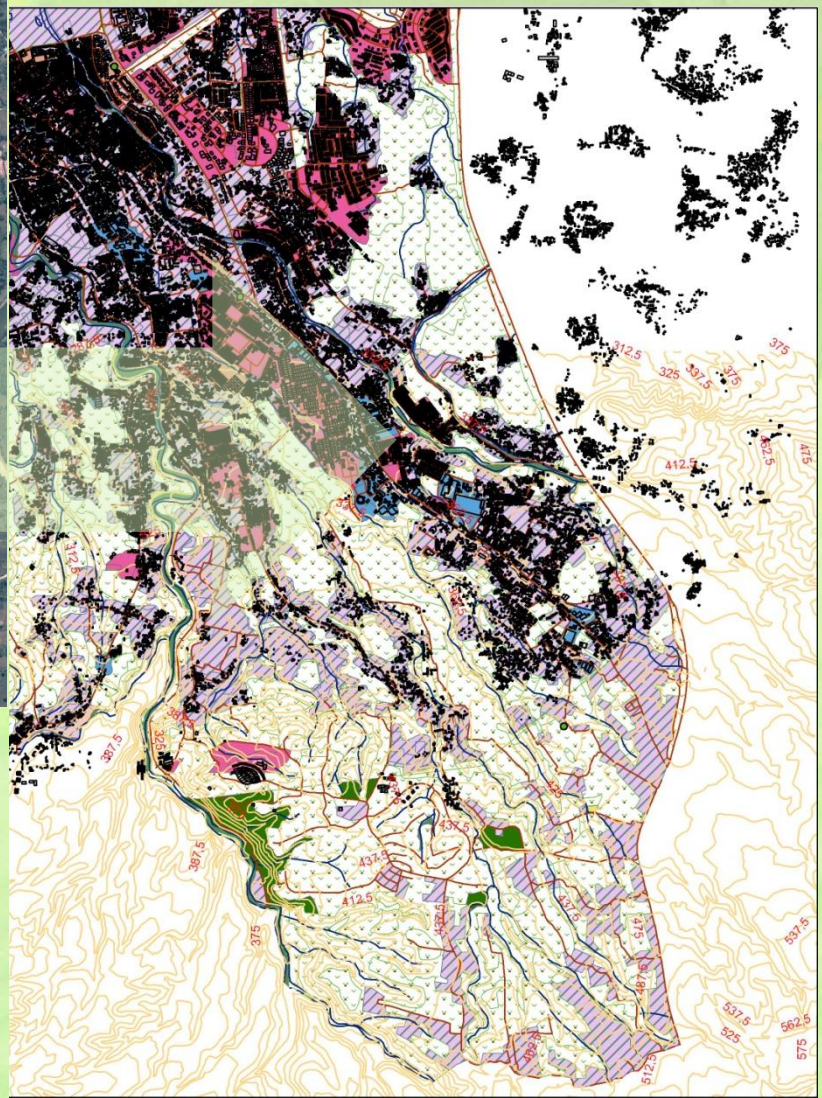


Landsat 7ETM dan 5TM

ALOS AVNIR


HL
APL
HP
PETA PENUTUPAN LAHAN
U
SKALA 1 : 50.000
LEGENDA :
Jalan Raya
Jalan Lokal
Sungai
Batas Provinsi
Batas Kabupaten
APL Areal Penggunaan Lain
HL Hutan Lindung
HP Hutan Produksi
HPT Hutan Produksi Terbatas
Batas Areal
KETERANGAN PENGGUNAAN LAHAN :
Simbol | Tutupan Lahan | ID_Landuse | Luas (Ha) | Persen Luas (%)
Awan/Bayangan Awan | Awan | 1.168,96 | 6,35
Tubuh Air | TA | 85,91 | 0,47
Rumput dan Tanah Kosong | RTK | 1.223,66 | 6,65
Pemukiman | P | 34,93 | 0,19
Hutan | H | 1.758,66 | 9,55
Hutan Belukar (sekunder) | BS | 6.135,02 | 33,33
Tegalan/Ladang | TL | 127,42 | 0,69
Semak Belukar | SB | 7.873,32 | 42,77
Sumber Data :
- Peta Kawasan Hutan dan Perairan Kalbar Skala 1:500.000 , BAPLAN-Dephut, Tahun 2003
- Peta Bakorsurtanal Skala 1:50.000 Lembar 1416-14,1416-23 dan 1416-42, Bakorsurtanal Bogor Tahun 2001
- Citra Alos Resolusi 10 x 10 meter liputan tanggal 9 Oktober 2008

Quickbird



PETA PENGGUNAAN LAHAN

PROVINSI PAPUA dan PAPUA BARAT

U

SKALA 1 : 4.500.000

PETA INDEKS

SKALA 1 : 27.500.000

Proyeksi	:	Universal Transverse Mercator (WGS84)
Sistem grid	:	Grid Geografi & Universal Transverse Mercator
Datum horisontal	:	Datum Indonesia 1995 (DGN - 1995)
Datum vertikal	:	
Satuan tinggi	:	Meter
Selang kontur	:	100 Meter

KETERANGAN :

BATAS ADMINISTRASI
- Batas Negara
- Batas Propinsi
- Batas Kabupaten/Kotamadya

GEDUNG DAN BANGUNAN LAINNYA
- Jalan arteri : Satu jalur, Dua jalur
- Jalan Kolektor
- Jalan lokal
- Jalan lain
- Jalan Setapak
- Danau
- Sungai
- Sungai Musiman
- Garis Pantai

KETERANGAN PENGGUNAAN LAHAN :

- Hutan
- Hutan Rawa
- Hutan Mangrove
- Rawa-rawa
- Semak Belukar
- Rumput dan Tanah kosong
- Sawah
- Ladang
- Pemukiman
- Kebun/Perkebunan
- Tambak
- Tubuh Air

Sumber Data :
- **Digital Elevation Model Daerah Papua Resolusi 30 x 30 meter**
- **Peta Digital Rupa Bumi Indonesia Bakorsurtanal Skala 1 : 250.000 tahun 2001**
- **Citra Landsat TM 5 dan ETM 7+ Tahun 2006 dan 2007 Daerah Papua dan Papua Barat**

Validasi data

Metode Validasi Data

1. Sumber, harga dan Penyedia

2. Metadata (Akuisisi dan ID Data)

3. Resolusi dan format data

1. Sumber, harga dan Penyedia

Sumber Data

- Landsat = USGS, TRFIC
- Ikonos = Space Imaging
- SPOT = SPOT ASIA

Harga

- ? USD/Scene x Rp
- ? Yen/Scene x Rp

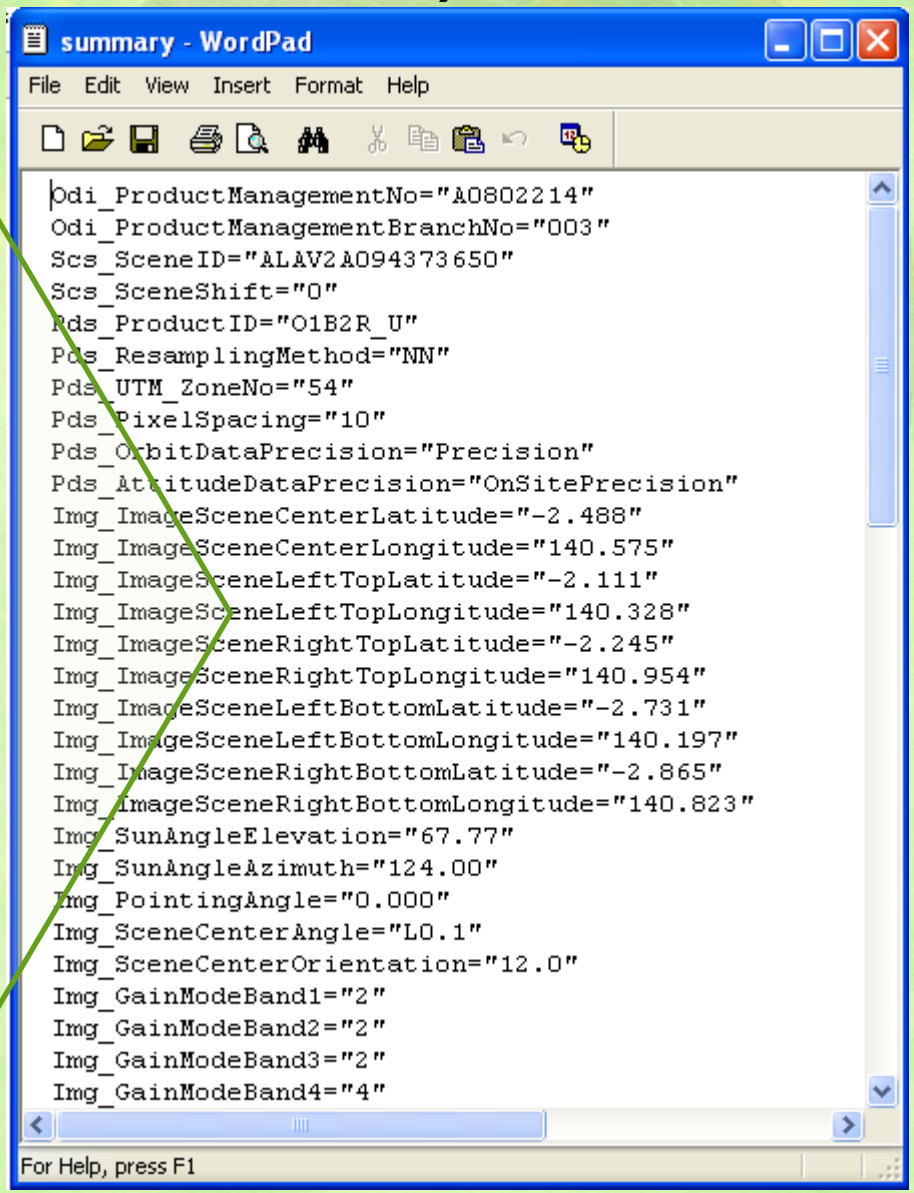
Penyedia

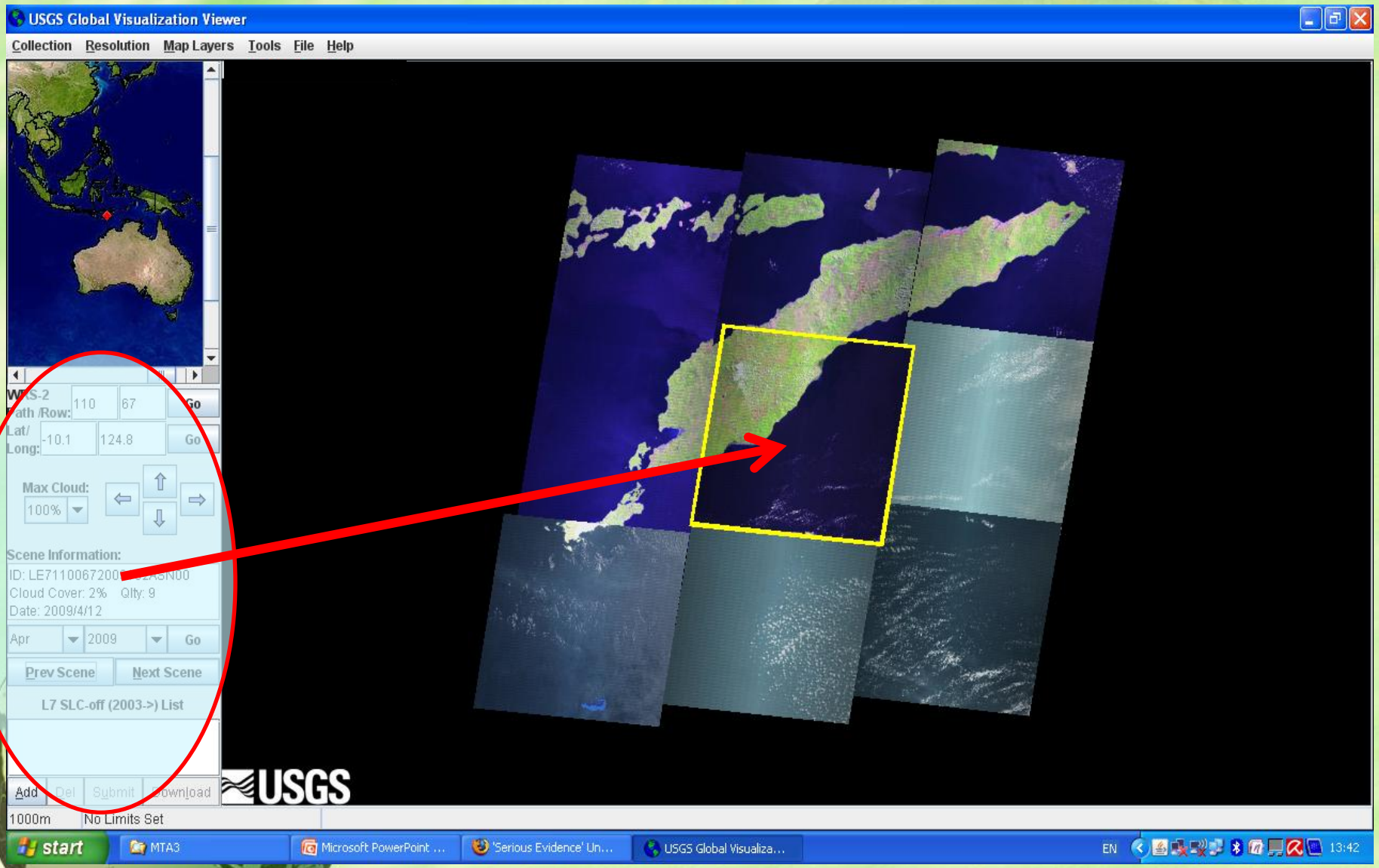
- Distributor Resmi
- Reseller

2. Metadata (Akuisisi dan ID Data)

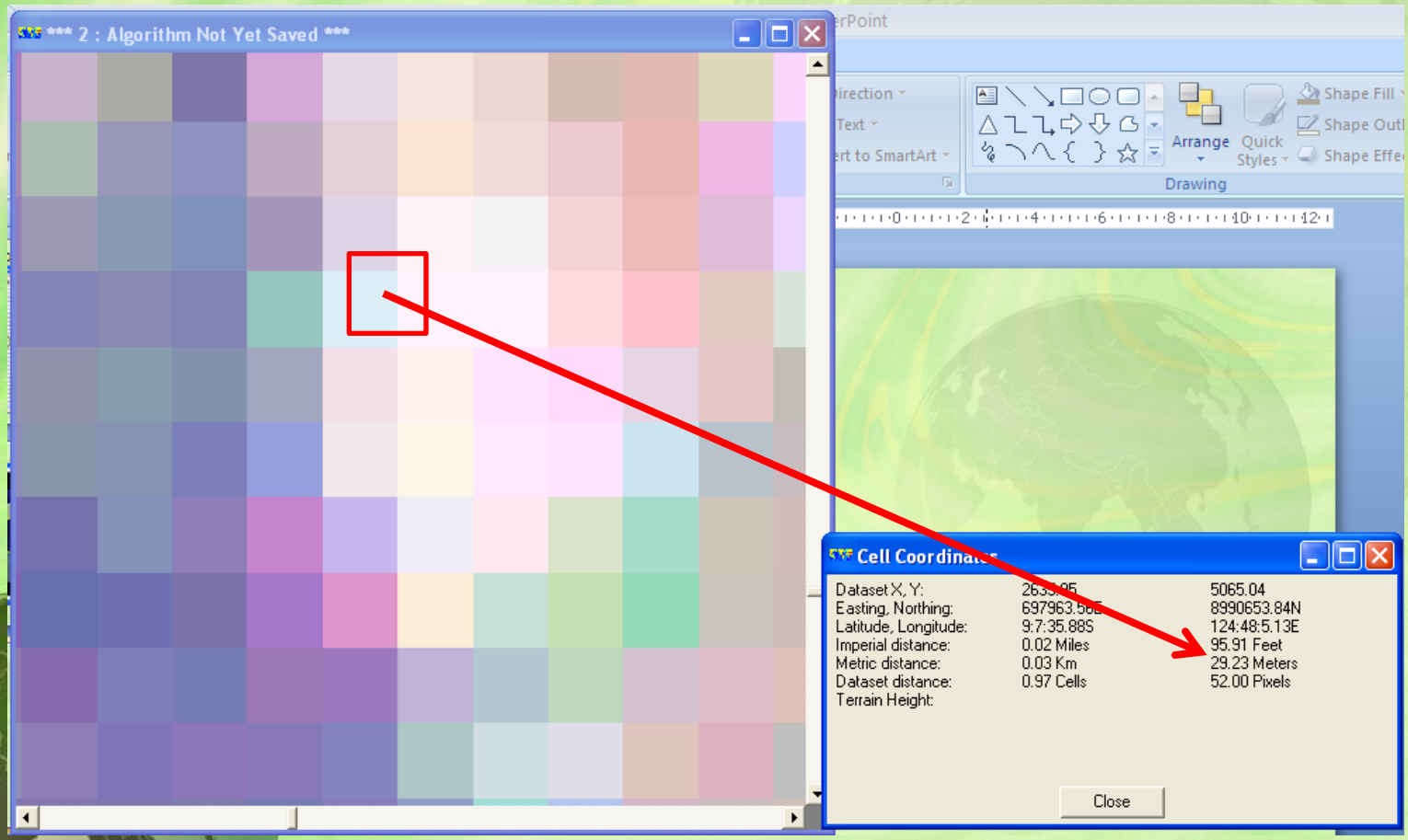
File MTL

- Tanggal Akuisisi
- Koordinat
- Proyeksi
- Path/Raw
- Scene Id
- dll




USGS Global Visualization Viewer
Collection
Resolution
Map Layers
Tools
File
Help
Go
Lat/ Long:
-10.1
124.8
Go
Max Cloud:
100%
Scene Information:
Cloud Cover: 2%
Qlty: 9
Date: 2009/4/12
Apr
2009
Go
Prev Scene
Next Scene
L7 SLC-off (2003->) List
Add
Del
Submit
Download
USGS
1000m
No Limits Set
start
MTA3
Microsoft PowerPoint ...
'Serious Evidence' Un...
USGS Global Visualiza...
EN
13:42

3. Resolusi


*** 2 : Algorithm Not Yet Saved ***
Cell Coordinates
Dataset X, Y: 5065.04
Easting, Northing: 8990653.84N
Latitude, Longitude: 124:48:5.13E
Imperial distance: 95.91 Feet
Metric distance: 29.23 Meters
Dataset distance: 52.00 Pixels
Terrain Height:
Close
Arrange
Quick Styles
Drawing

TERIMA KASIH