



Metode Stratifikasi Tutupan Lahan untuk Estimasi Stok Karbon Tinggi (HCS)

Tujuan

- Melakukan **analisis tutupan lahan** sebagai dasar penentuan perhitungan estimasi nilai karbon pada setiap tipe tutupan lahan
- Melakukan **pengukuran nilai karbon** pada setiap tipe/kelas tutupan lahan
- Memberikan masukan secara praktis dan ilmiah untuk penentuan kebijakan **penataan ruang (landuse planning)** terutama dalam manajemen kawasan di tingkat unit manajemen



Areal HCS?

- Areal hutan/lahan yang mengandung cadangan carbon tinggi
- Belum ada definisi khusus tentang carbon tinggi, sementara TFT, Greenpeace dan GAR menyepakati bahwa hutan yang memiliki lebih dari 35 ton/hectar dipohon hidup setinggi dada (dbh) dengan diameter lebih dari 5cm
- Dalam HCS Toolkit ver 2.0 kawasan HCS adalah kawasa yang memiliki lebih dari 35 – 75 to/ha di pohon hidup setinggi dada.
- Cadangan karbon itu tersebut tidak termasuk karbon biomassa tanah, serasah, bahan organik, kayu mati, perkebunan, perkebunan campuran, bahan organik tanah.



Informasi dan Data Awal

1. Citra Satelit / Foto Udara

2. Data Dasar

- Batas Manajemen Unit / Lanskap (IL, HGU, Batas Admin)
- Sungai
- Jalan
- Pemukiman
- Topografi

3. Data Tematik

- Historis Tutupan Lahan
- Peta Areal Penetapan HCV
- Tataruang kawasan
- Infrastruktur Manajemen Unit (Pemukiman, Kantor dll)
- Jenis Tanah
- Areal Gambut
- Areal Perkebunan / Budidaya (Sawit, Karet, HTI dll)

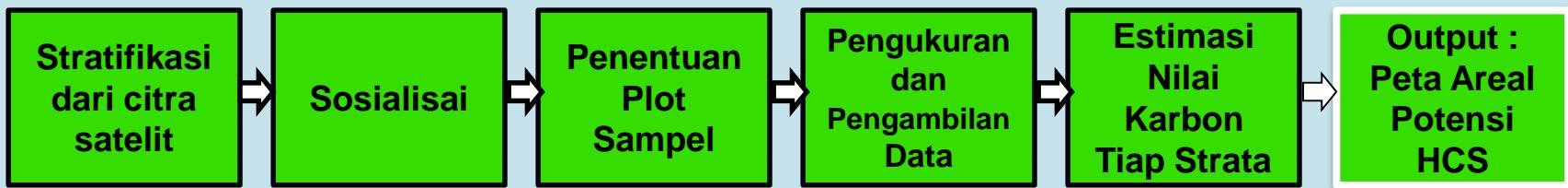
4. Dokumen penunjang lain

- Biodiversity Assesment Report
- Sosial Assesment
- AMDAL Assesment



Identifikasi HCS

Fase-1 : Stratifikasi Vegetasi/Tutupan Lahan

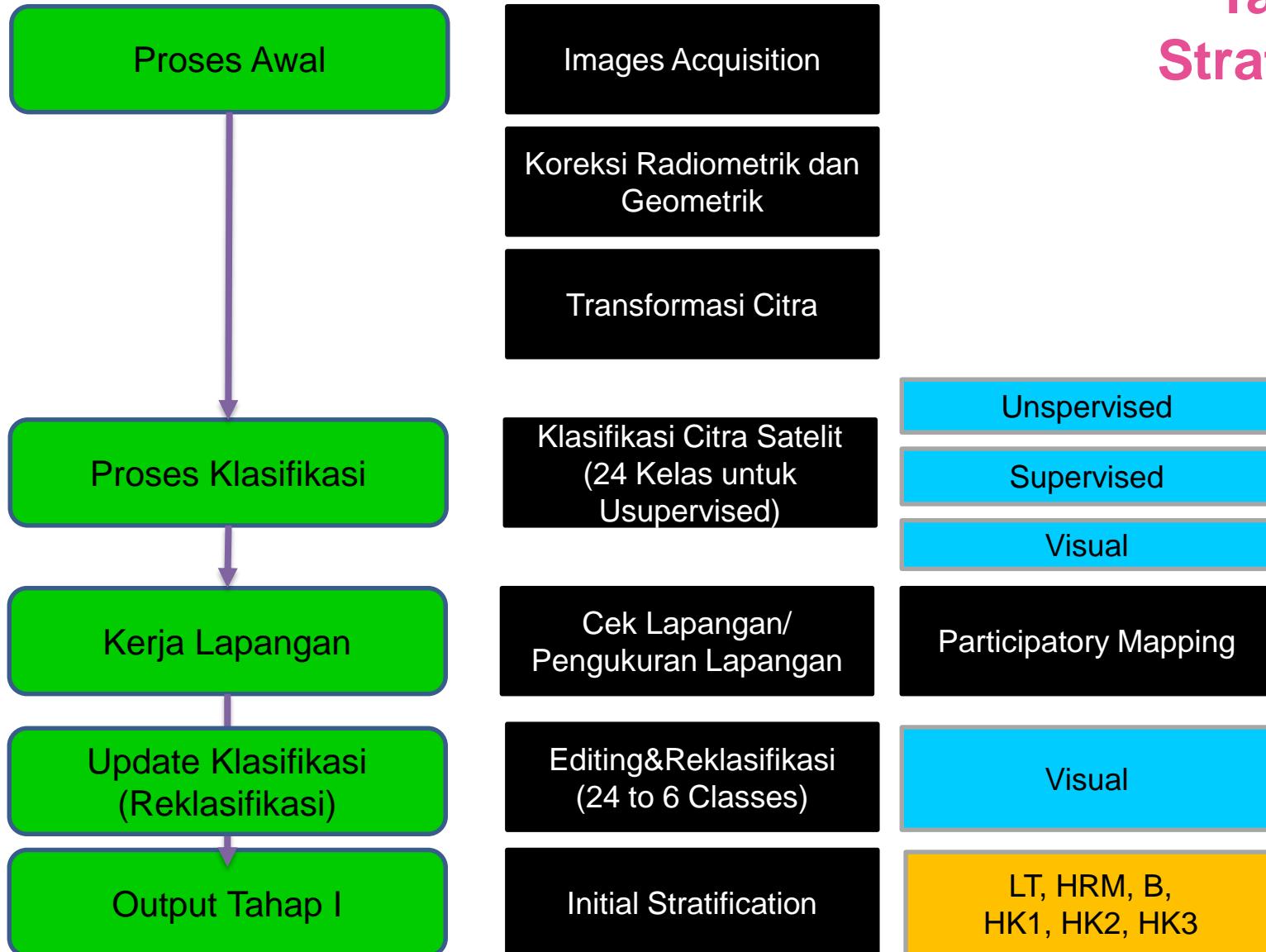


Fase-2: Analisis Patch

HCS patch
Identification



Tahapan Stratifikasi



Stratifikasi

Enam Strata HCS

HK3	Sisa hutan alam atau hutan sekunder yang mendekati hutan primer.
HK2	Sisa hutan alam atau hutan sekunder dengan kondisi lebih terganggu dibanding HK3.
HK1	Nampak seperti sisa hutan alam tapi kondisinya sangat terganggu dan sedang dalam pemulihan (didalamnya dapat diketemukan kebun campuran).
HRM/ BT	Didominasi hutan muda yang sedang dalam tumbuh kembali, namun masih ditemukan sisa hutan yang lebih tua
B/BM	Area yang baru dibuka, beberapa tanaman kayu baru tumbuh kembali dengan rerumputan yang mulai menutupi tanah
LT	Area yang baru saja dibuka, didominasi rerumputan atau tanaman pangan serta beberapa tanaman berkayu

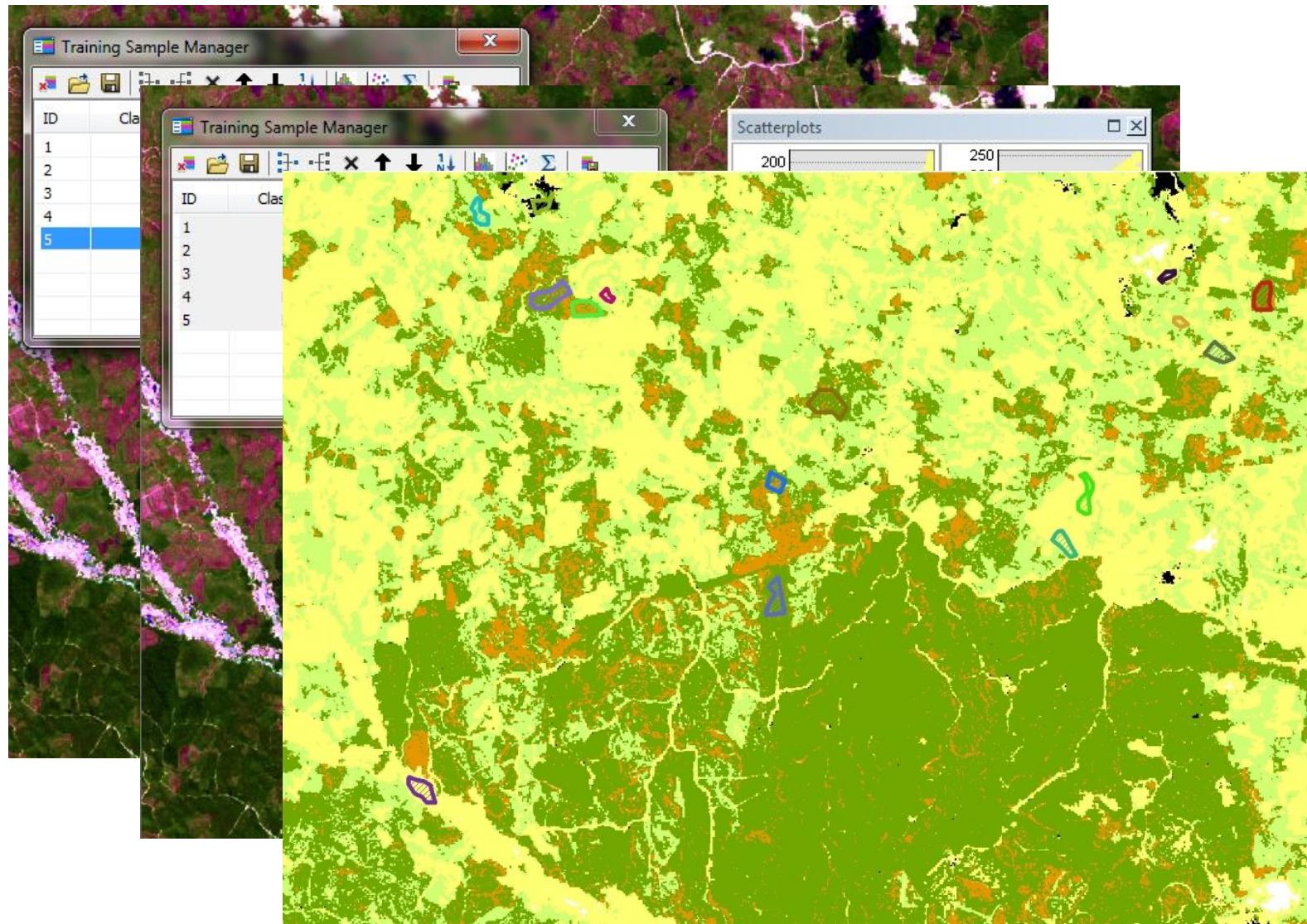


Jenis Citra Satelit

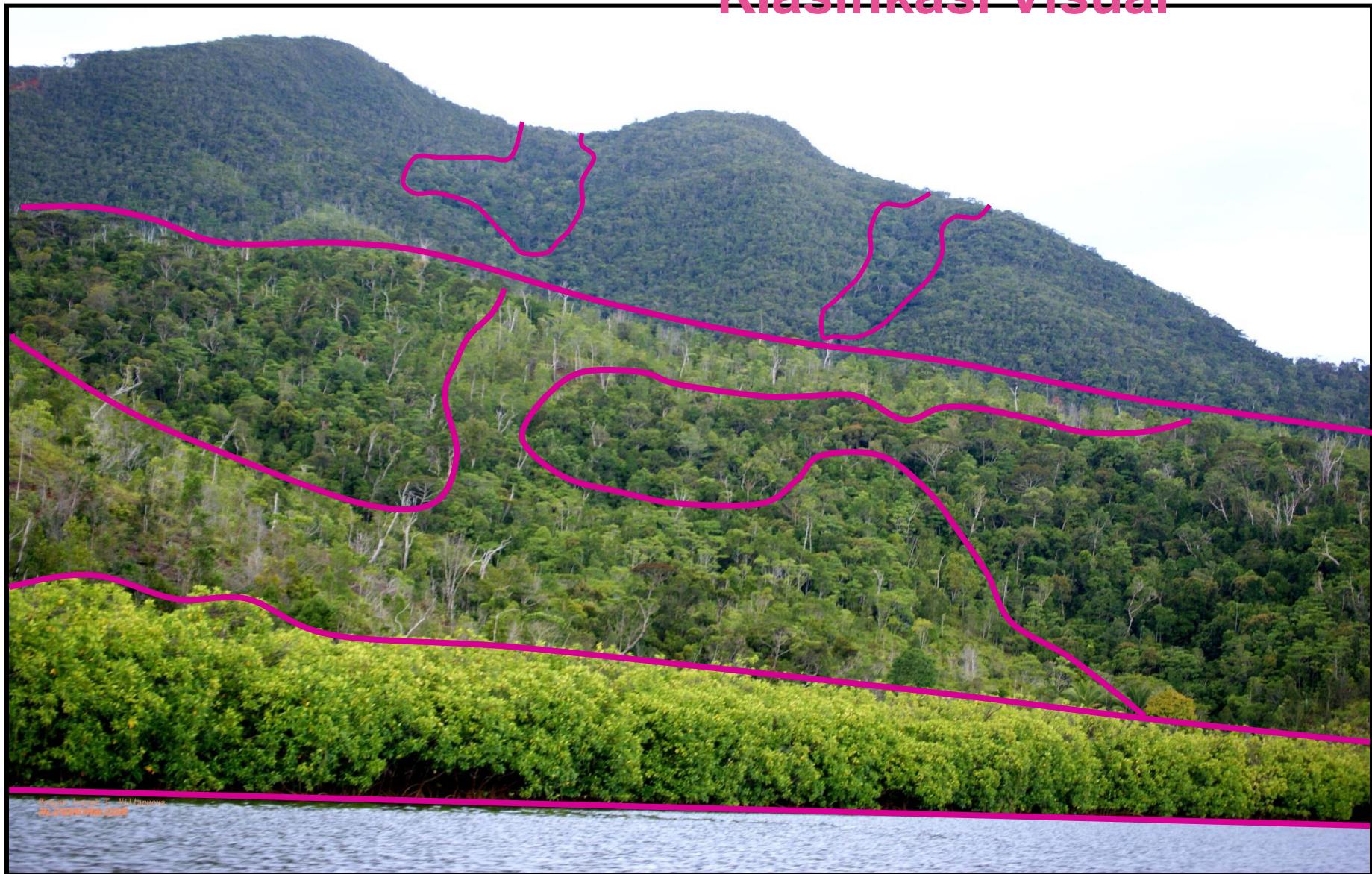
	IKONOS High-Resolution (1m) Satellite Imagery	Digital Globe High-Resolution (60cm) Satellite Imagery	Land Sat 7 ETM 15m Satellite Imagery	Land Sat 5 TM 30m Satellite Imagery	SPOT (pan and xs) 10/20m Satellite Imagery	RadarSat-1 (fine beam) 8m Radar Imagery
Image Resolution (cell size in m)	1m	60cm (2ft)	14.25m panchromatic 28.5m multispectral 60m thermal	~30m multispectral 60m thermal	10m panchromatic 20m multispectral	8m radar
Image Size or Minimum Order Size	Custom acquisition: 1) Minimum order is 100 km ² for newly acquired imagery. 2) Minimum order of 50 km ² for archived images (Area ordered can be a polygon of any shape, but must have sides of no less than 5 km)	Custom acquisition: 1) Minimum order is 64 km ² for newly acquired imagery. 2) Minimum order of 24 km ² for archived images	Fixed image size: 185 km x 170 km (31,450 km ²)	Fixed image size: 185 km x 170 km (31,450 km ²)	Fixed image size: 60 km x 80 km (4,800 km ²)	Fixed image size: 50 km x 50 km (2,500 km ²)
Available Spectral Bands	3 natural color 1 infrared 1 panchromatic Bands can be purchased in any combination.	3 natural color 1 infrared 1 panchromatic Bands can be purchased in any combination.	3 natural color 3 infrared 2 thermal 1 panchromatic (All bands included in purchase price)	3 natural color 3 infrared 1 thermal (All bands included in purchase price)	SPOT xs: package includes 2 natural color and 1 infrared SPOT pan: 1 panchromatic band only Stereo paired images available	Single side-scanning radar image
Applications	<ul style="list-style-type: none"> ▪ High-resolution mapping of individual facilities. ▪ Siting of well pads/other facilities. ▪ Audits of producing/refining facilities. ▪ Emergency response and damage assessment. ▪ Environmental monitoring of construction activities. ▪ Hazard identification: landslides, encroaching erosion, etc. 	<ul style="list-style-type: none"> ▪ High-resolution mapping of individual facilities. ▪ Siting of well pads/ other facilities. ▪ Audits of producing/refining facilities. ▪ Emergency response and damage assessment. ▪ Environmental monitoring of construction activities. ▪ Hazard identification: landslides, encroaching erosion, etc. 	<ul style="list-style-type: none"> ▪ Mapping of large areas. ▪ Natural resource mapping¹. ▪ Pipeline routing and facility siting. ▪ Land use mapping. 	<ul style="list-style-type: none"> ▪ Mapping of large areas. ▪ Natural resource mapping¹. ▪ Pipeline routing and plant siting. ▪ Historical land use analyses. ▪ Historical impact assessment. 	<ul style="list-style-type: none"> ▪ Mapping of large areas with medium resolution. ▪ Natural resource mapping¹. ▪ Pipeline routing and plant siting. ▪ Geologic mapping using stereo images. ▪ Historical land use analyses 	<ul style="list-style-type: none"> ▪ Detection of oil spills and seeps. ▪ Mapping of geologic structures and geomorphology. ▪ Natural resource mapping¹. ▪ Ability to penetrate clouds and can be used at night or in low lighting conditions.
Lead time ²	Archived: 10 days New: 30 - 120 days ³	Archived: 14 days New: 30 - 120 days	Archived: 10 days New: as available ⁴	Archived: 10 days New: as available	Archived: 10 days New: as available	Archived: 14 days New: 90 days
Archived dates available	2000 to present	5/2002 to present	1999 to present	1984 to present	1986 to present	1996 to present
Cost for Archived Images	\$7 - \$24/ km ² for natural color or infrared Minimum order = \$350 - \$1,200	\$23/ km ² for natural color or infrared Minimum order = \$552	\$750	\$425	\$1,800 pan \$2,400 xs	> \$3,500
Cost for New Images	\$20 - 36/ km ² for natural color or infrared Minimum order = \$2,000 - \$3,600	\$23/ km ² for natural color or infrared Minimum order = \$1,500	\$750	\$425	~\$1,800-\$2,400	> \$3,500
Cost Notes	Price varies according to reprocessing desired ⁵ Price varies according to location in the world	Price varies according to reprocessing desired ⁵				

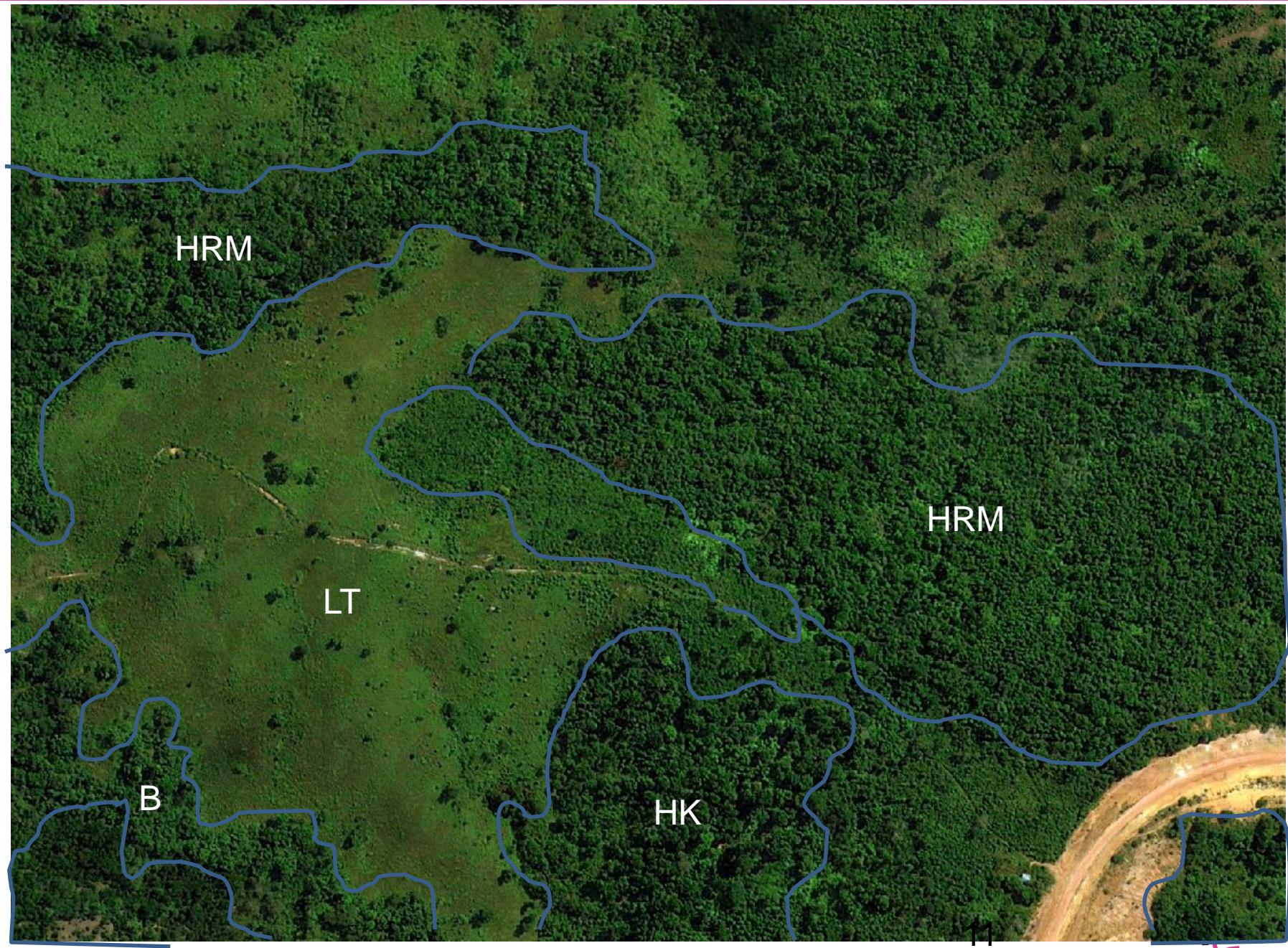


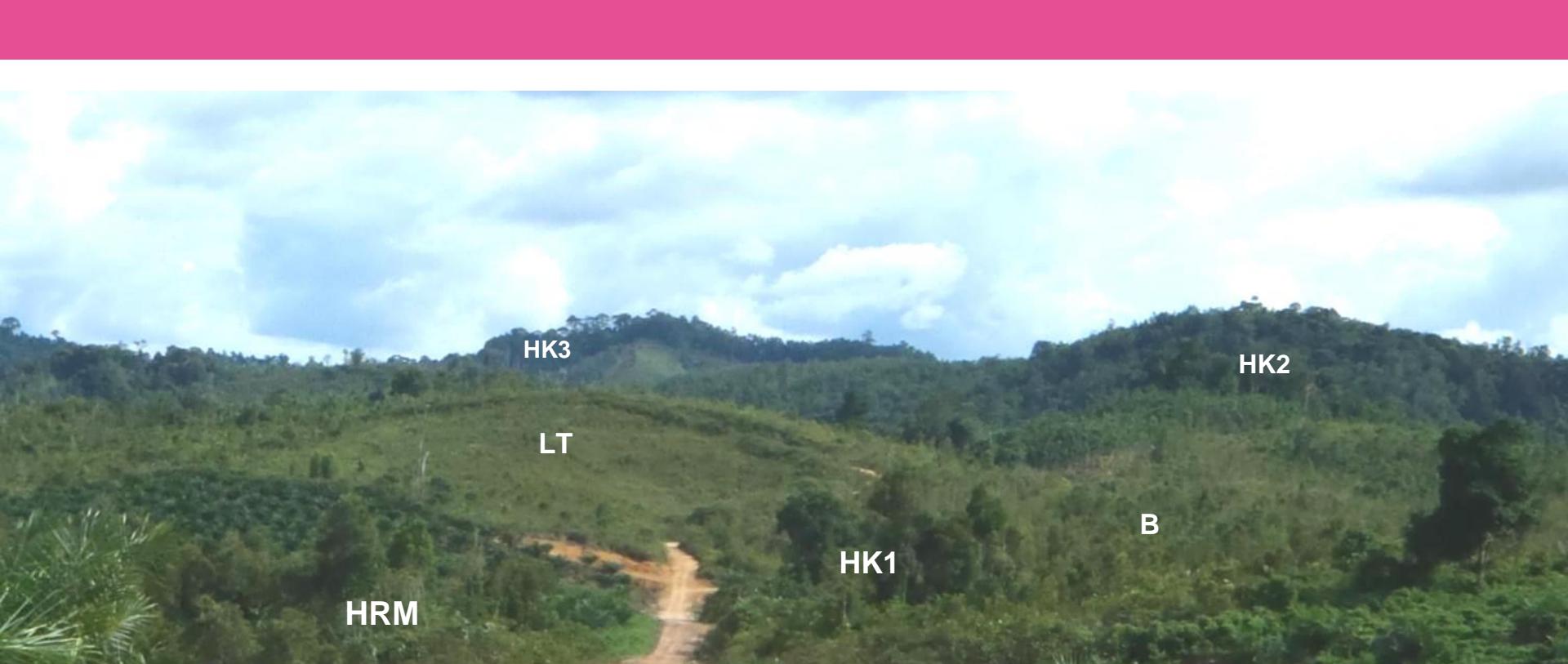
Ilustrasi Stratifikasi (Supervised)



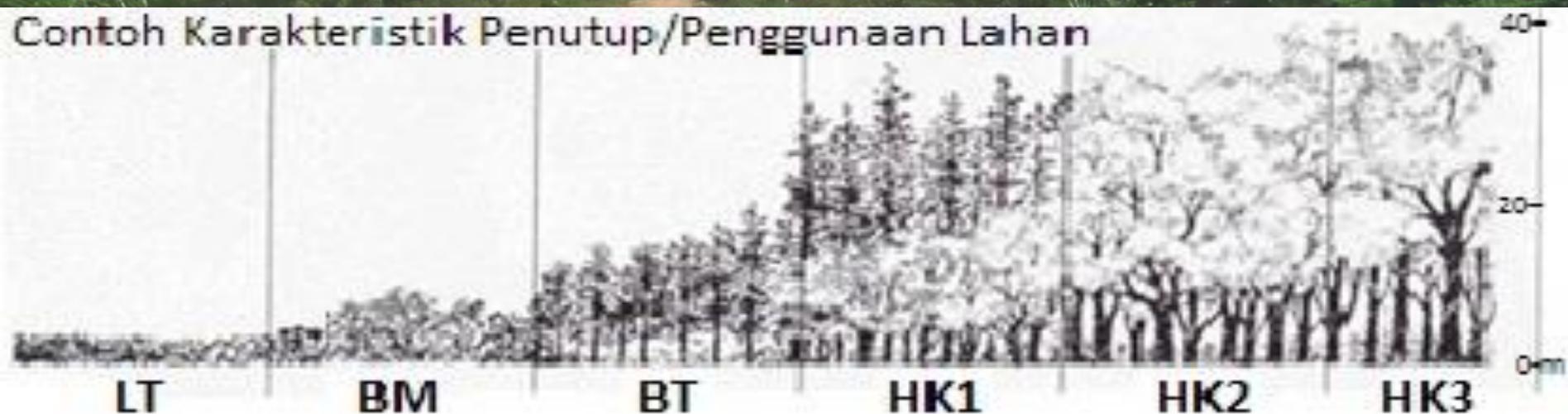
Klasifikasi Visual







Contoh Karakteristik Penutup/Penggunaan Lahan



Kriteria Penutup Lahan

Klasifikasi (Classification)				Prediksi Penilaian (Scoring prediction)					
Tutupan Vegetasi (Vegetation cover)	No	Penutup/Penggunaan Lahan (Landcover)	Kode	Kelas pohon (tree strata)	Diameter (cm)	SPH ø > 50cm	Tajuk (canopy coverage %)	Volume (m³)	Carbon (ton/ha)
Hutan (Forest)	1	Hutan Kerapatan Tinggi (High density forest)	HK3	Pohon Besar	> 50	> 35	> 70	> 400	> 250
	2	Hutan Kerapatan Sedang (Moderate density forest)	HK2	Pohon Sedang	35 - 50	16 - 35	40 - 70	200 - 400	150 - 250
	3	Hutan Kerapatan Rendah (Low density forest)	HK1	Pohon kecil	20 - 35	5 - 15	< 40	50 - 200	75 - 150
Non Hutan (Non-forest)	4	Hutan regenerasi Muda (Young Regenerating Forest)	HRM	Tiang	10 - 20	-	-		35 - 75
	5	Belukar -Semak (Young shrub/bushes)	B	Pancang	2 - 10	-	-		15 - 35
	6	Lahan Terbuka-Rumput (Bareland/grassland)	LT	Semai	< 2	-	-		< 15
	7	Kebun Sawit (Planted Oil palm)	KS						



Pembelajaran setelah proses stratifikasi

1. Citra Resolusi Medium

- Sumber : Landsat ETM 7 & 8
- Keterbatasan pada liputan areal berawan/kabut
- Kemudahan untuk monitoring secara reguler

2. Metode Interpretasi Citra Satelit

- Unsupervised 24 kelas menjadi 16 kelas
- Digitasi Visual berdasarkan pengalaman interpreter menjadi 6 strata
- Keterbatasan pemisahan stratifikasi BT dan HK1 dan Tanaman Karet
- Batas masing2 strata bisa tidak jelas (*scatter*) sehingga ada penyederhanaan
- Skala yang dapt dihasilkan terbatas (optimal 1:25.000 - 50.000)
- Luas area yang dapat diidentifikasi, 10 - 25 ha atau lebih

1. Citra Resolusi Tinggi

- Sumber : Ikonos, SPOT dan QuickBird,etc
- Keterbatasan pada liputan areal berawan/kabut
- Keterbatasan pemilihan citra (relatif mahal)

2. Interpretasi Citra Satelit

- Visual Interpretasi lebih mudah dilakukan
- Skala yang dihasilkan cukup detil (optimal 1:5.000-10.000)
- Luas area yang dapat diidentifikasi, 1 - 2,5 ha atau lebih

Rekomendasi :

- ✓ Menggunakan citra resolusi tinggi atau apabila terbatas dengan citra resolusi medium gunakan metode stratifikasi lebih *advance* (contoh: Object based Oriented)
- ✓ Memperbanyak informasi lapangan untuk referensi dalam interpretasi



Terima Kasih...

