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MRV System Integration

International Workshop on Peatland Management
- Future Aspects of Management in Tropical and Cool Temperate Peatlands Harmonious and Sustainable Relationship with Nature -

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[7]Tokyo University of Agriculture, Tokyo, Japan
[8]Hosei University, Tokyo, Japan

Hokkaido University, Sapporo, 10th October, 2013

PM Group Activity

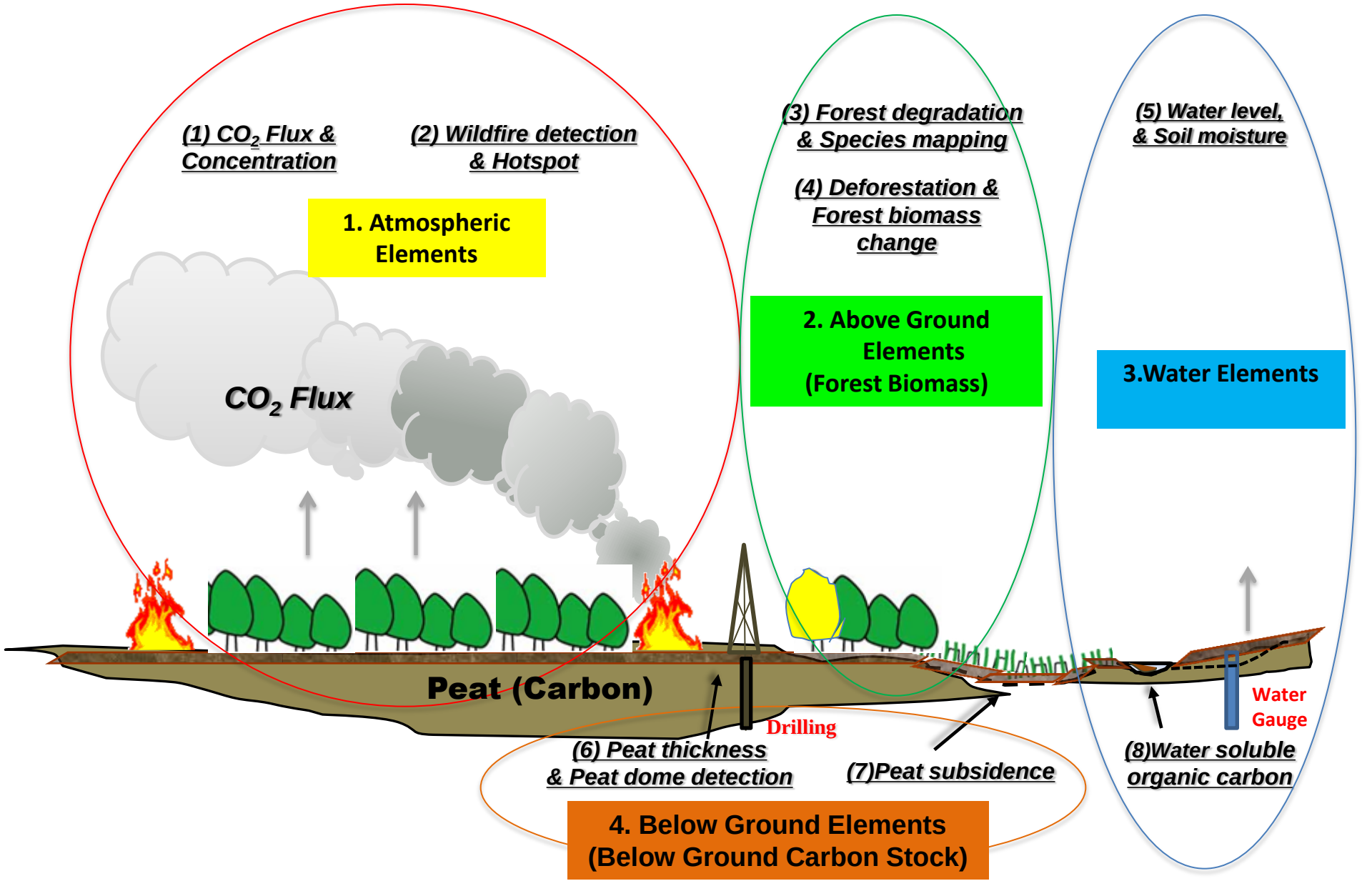
1) Collaboration & promotion our activity with Indonesian /International societies

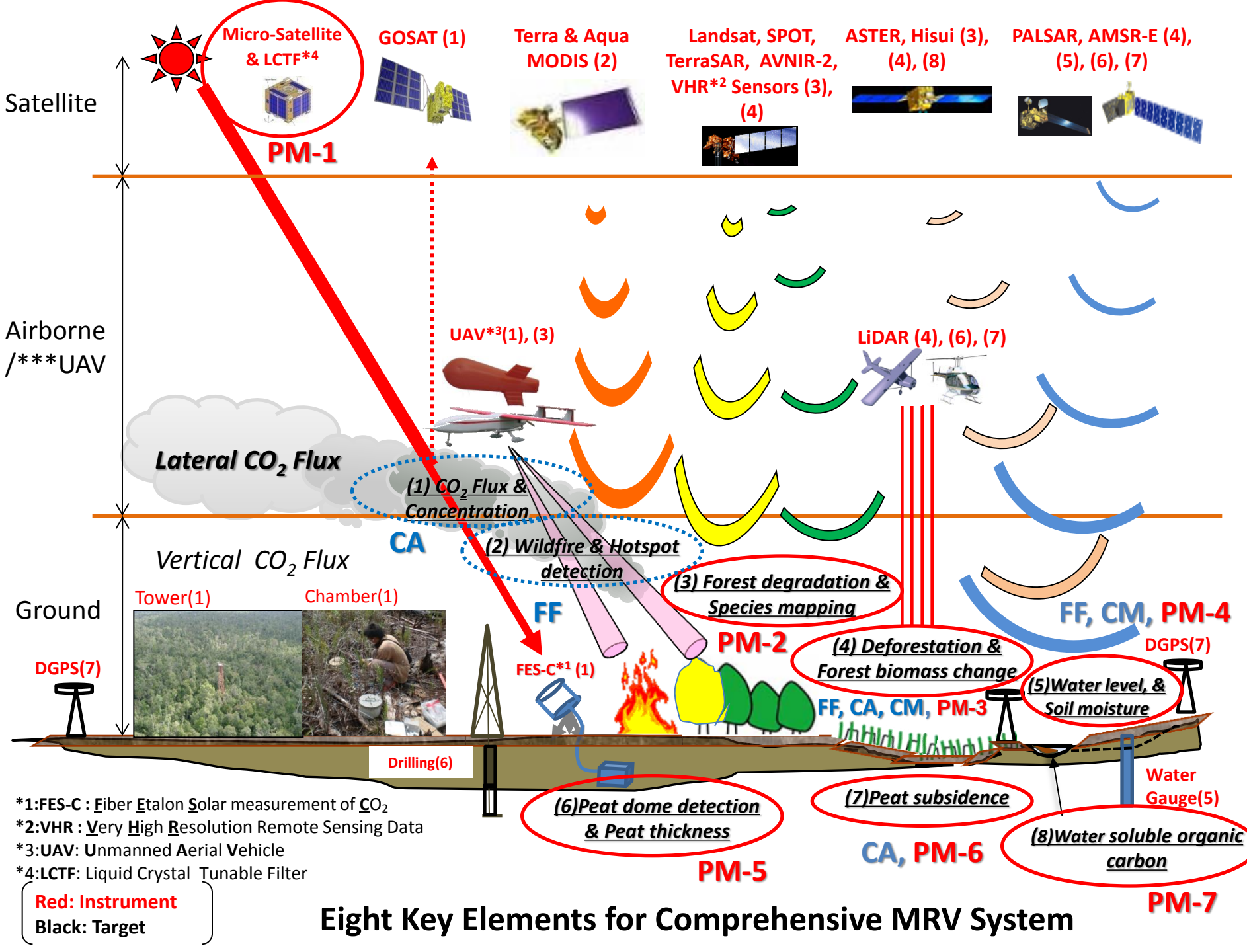
2) MRV system integration with Web-GIS

3) Carbon dynamics modeling with Ground water table prediction

4) Sub-programs to support carbon dynamics assessment
   a) Hyperspectral data application
      i) Forest biomass estimation
      ii) Ground water table estimation
      iii) Dissolved Organic Carbon (DOC) estimation
   b) Subsidence by GPS, Laser and InSAR
   c) Micro satellite observation
   d) Peat depth estimation

Key elements for integrated MRV system in peatland




Satellite
Airborne /***UAV
Ground
Micro-Satellite & LCTF*4
PM-1
GOSAT (1)
Terra & Aqua MODIS (2)
Landsat, SPOT, TerraSAR, AVNIR-2, VHR*2 Sensors (3), (4)
ASTER, Hisui (3), (4), (8)
PALSAR, AMSR-E (4), (5), (6), (7)
UAV*3(1), (3)
LiDAR (4), (6), (7)
Lateral CO2 Flux
(1) CO2 Flux & Concentration
CA
(2) Wildfire & Hotspot detection
FF
Vertical CO2 Flux
Tower(1)
Chamber(1)
DGPS(7)
FES-C*1 (1)
(3) Forest degradation & Species mapping
PM-2
FF, CM, PM-4
(4) Deforestation & Forest biomass change
FF, CA, CM, PM-3
DGPS(7)
(5)Water level, & Soil moisture
Drilling(6)
Water Gauge(5)
(6)Peat dome detection & Peat thickness
PM-5
(7)Peat subsidence
CA, PM-6
(8)Water soluble organic carbon
PM-7
*1:FES-C : Fiber Etalon Solar measurement of CO2
*2:VHR : Very High Resolution Remote Sensing Data
*3:UAV: Unmanned Aerial Vehicle
*4:LCTF: Liquid Crystal Tunable Filter
Red: Instrument
Black: Target
Eight Key Elements for Comprehensive MRV System

Elements vs. Instruments of MRV in Peatland

Monitoring Layer	Spaceborne (Satellite)										Airborne			Ground												
Type of Sensor	Optical Sensor					Radar				DEM	Hyper	LiDAR	Unmanned Arial Vehicles (UAV)	Flux Tower	Chamber	Fiber Etalon Solar measurement of CO2	Thermometer	Spectrometer	Tree allometry	Water Gauge	Moisture meter	Leveling	Peat Drilling	DGPS	TOC Analyzer	CDOM Analyzer
	GHGs Measurement	Coarse Resolution	Medium Resolution	Very High Resolution	Hyper	L-Band	C-Band	X-Band	Other																	
Typical Sensor *Red circle: Japanese Sensor	GOSAT	MODIS	LANDSAT SPOT ASTER AVNIR-2	Quickbird IKONOS GeoEye	HISUI	PALSAR	ERS RADARSAT	TerraSAR-X	AMSR-E	SRTM ASTER	HyMap ALI															
(1) CO_2 Concentration CO_2 Flux	+++												+	+	+	+										
(2) Hotspot detection		+	+	+	+								+				+									
(3) Forest degradation Species mapping			+	+	+						++		+					+								
(4) Deforestation Forest biomass change			+	+	+	+	+	+			+	++	+						+							
(5) Water level Soil moisture						+	+	+	+											+	+					
(6) Peat dome detection Peat thickness						+	+			++		+										+	+			
(7) Peat subsidence						++						+												+		
(8) Water soluble organic carbon					++						++							+							+	+

MRV System Integration

Outputs from
FF Group
CA Group
CM Group
PM Group

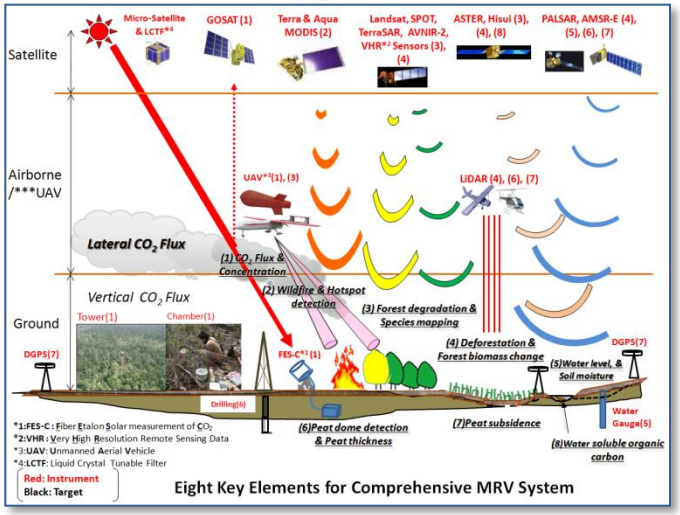
Integration into one platform

Comprehensive MRV System

- Kalimantan University Consortium
- Government
- Community
- Private sector
- NGO, etc.

Capacity Development

Implement



Eight Key Elements for Comprehensive MRV System

User tools

- Outputs from Groups on **WebGIS**
- Free software (QGIS, Google, etc)
- SMS, Mobile phone
- Data transfer networks

Feedback

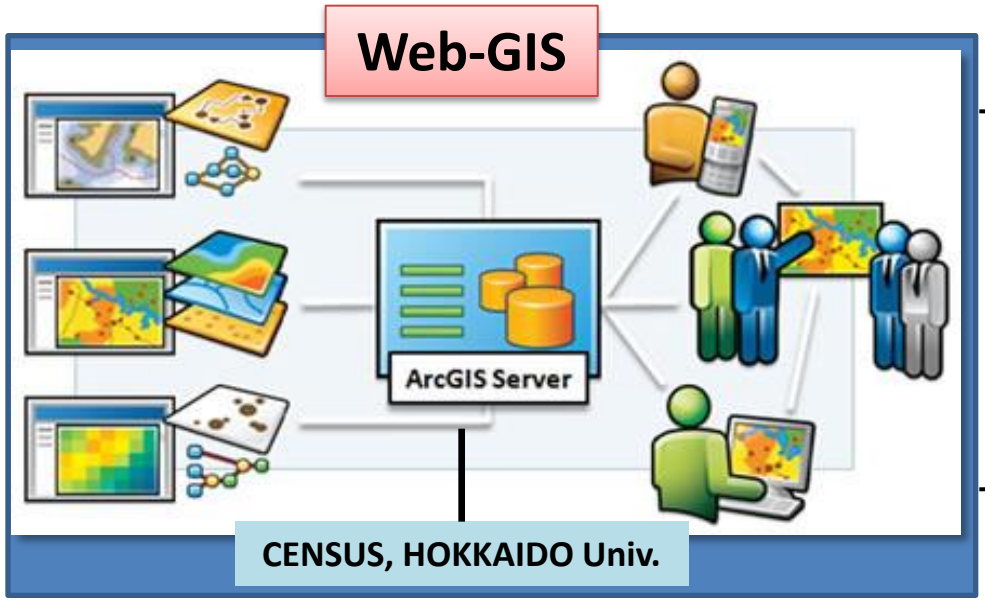
Practical Peatland Carbon Assessment

MRV System Integration

Outputs from
FF Group
CA Group
CM Group
PM Group

Vector data
(point, line, polygon)

Raster data
(maps, satellite images, etc.)



Users

Ex.) Thematic Maps
- Landsat, PALSAR, ASTER, SPOT, Orth-photo
- SRTM-DEM(90m grid), ASTER－GDEM (30m grid)
- PIPIB map, Wetlands International Map, etc..

Contribution

FF Group's output
1) MODIS Hotspot map
2) Ground Water Table map (at LAPAN)

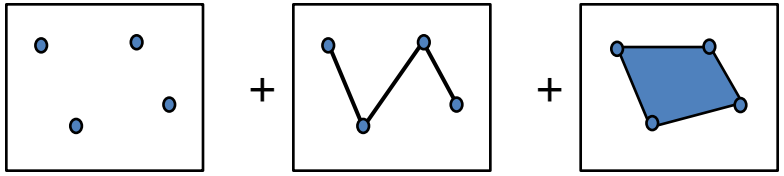
http://jica-jst.lapanrs.com/

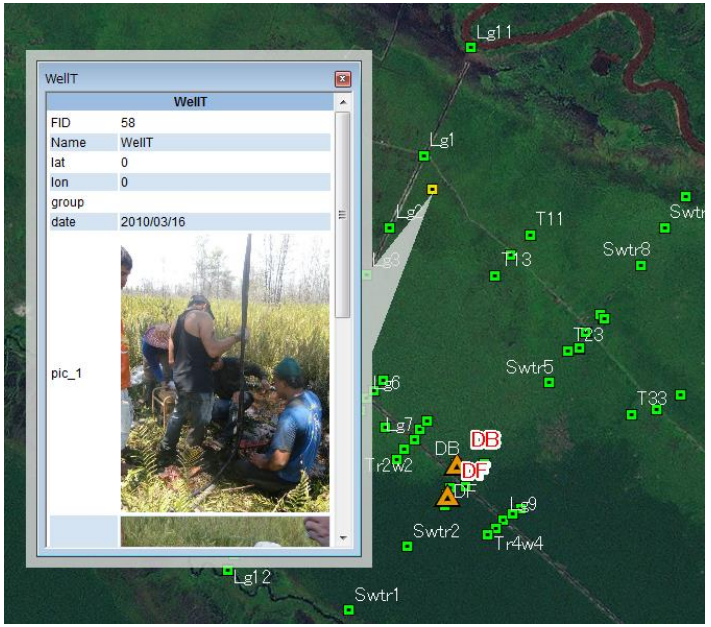
- Sustainable Peatland Management
- Regional Carbon & Ecosystem Modeling
- REDD+ Mechanism, Local community activation
- Government Strategy (ex. **RAN/RAD-GRK**)

Examples of Data Set for Web GIS

Web GIS System

- Software
  - ESRI ArcGIS for Server
- Data Set
  - Base map of Indonesia
  - Archive of Rater data with Search Index
    - Satellite images
    - LiDAR DSM or DTM
    - DEM (SRTM & ASTER GDEM)
    - Geological maps
  - Research site Location & Information
    - Ground water Level Gauge
    - River water Level Gauge
    - Flux tower
  - Annual Summary of MODIS Active fire Products (MOD14)
  - Etc….

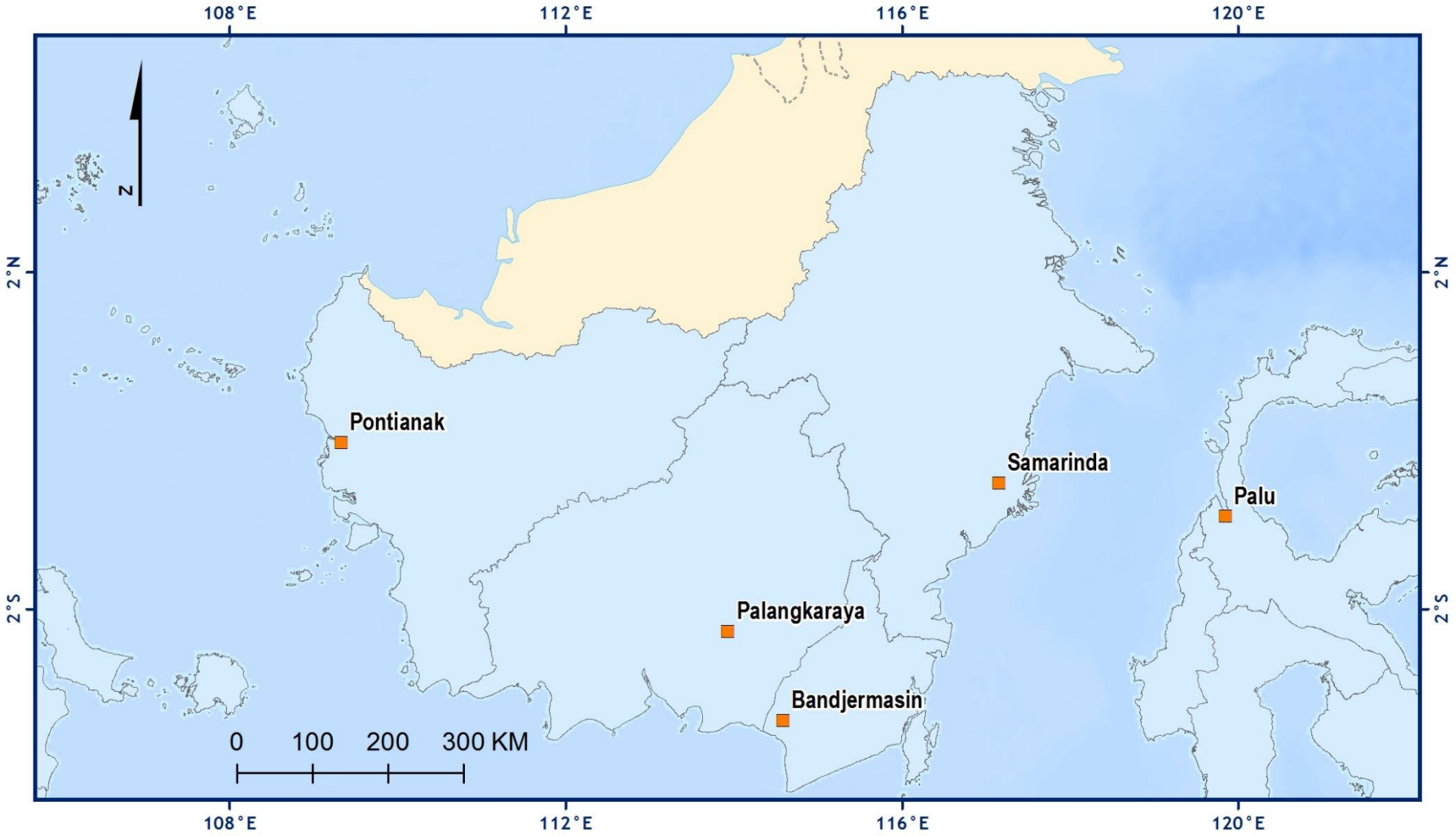




Base map of Indonesia

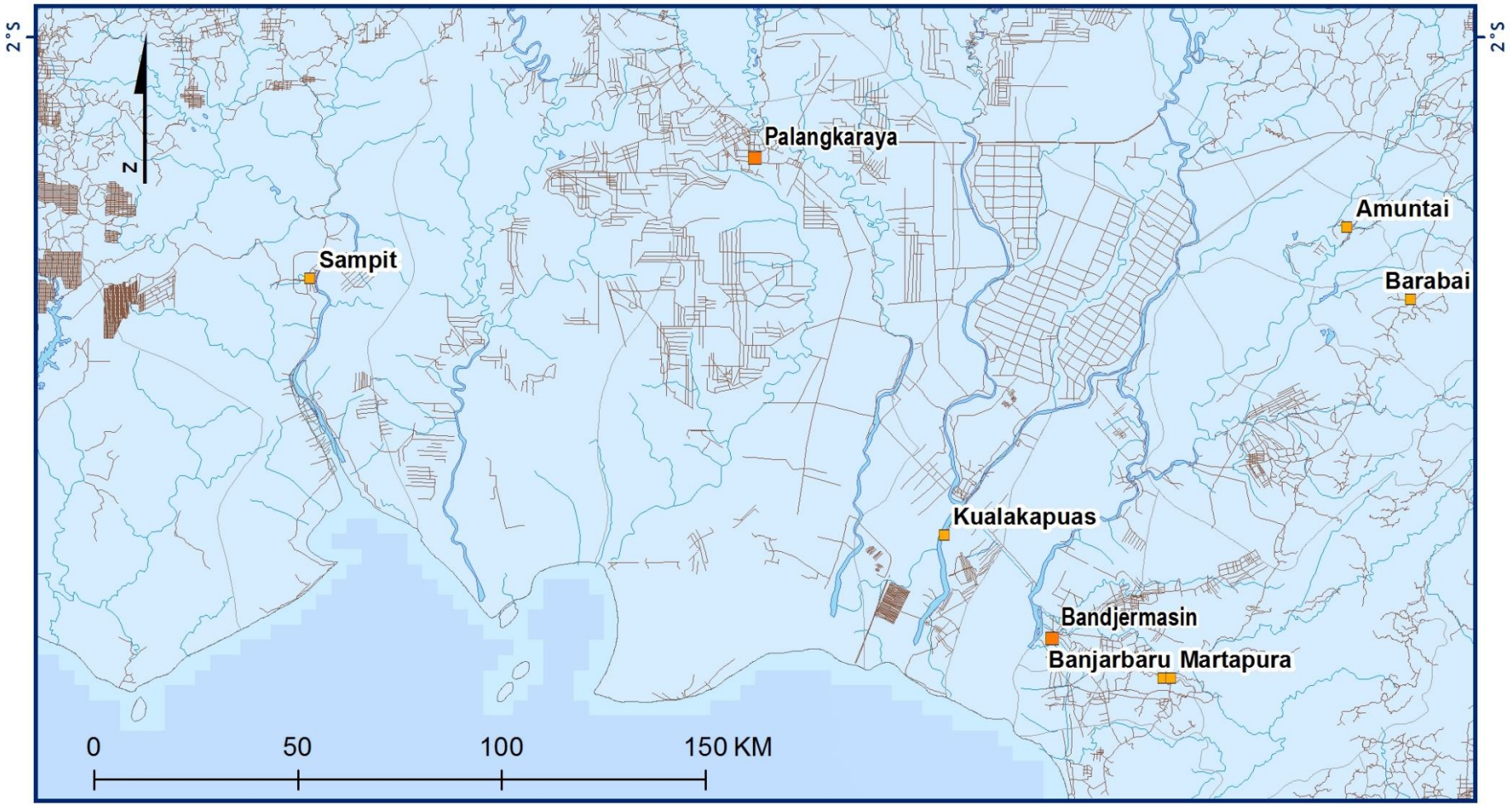
Integrated MRV Systems

- Zoom level 1 (border & capital city)



Integrated MRV Systems

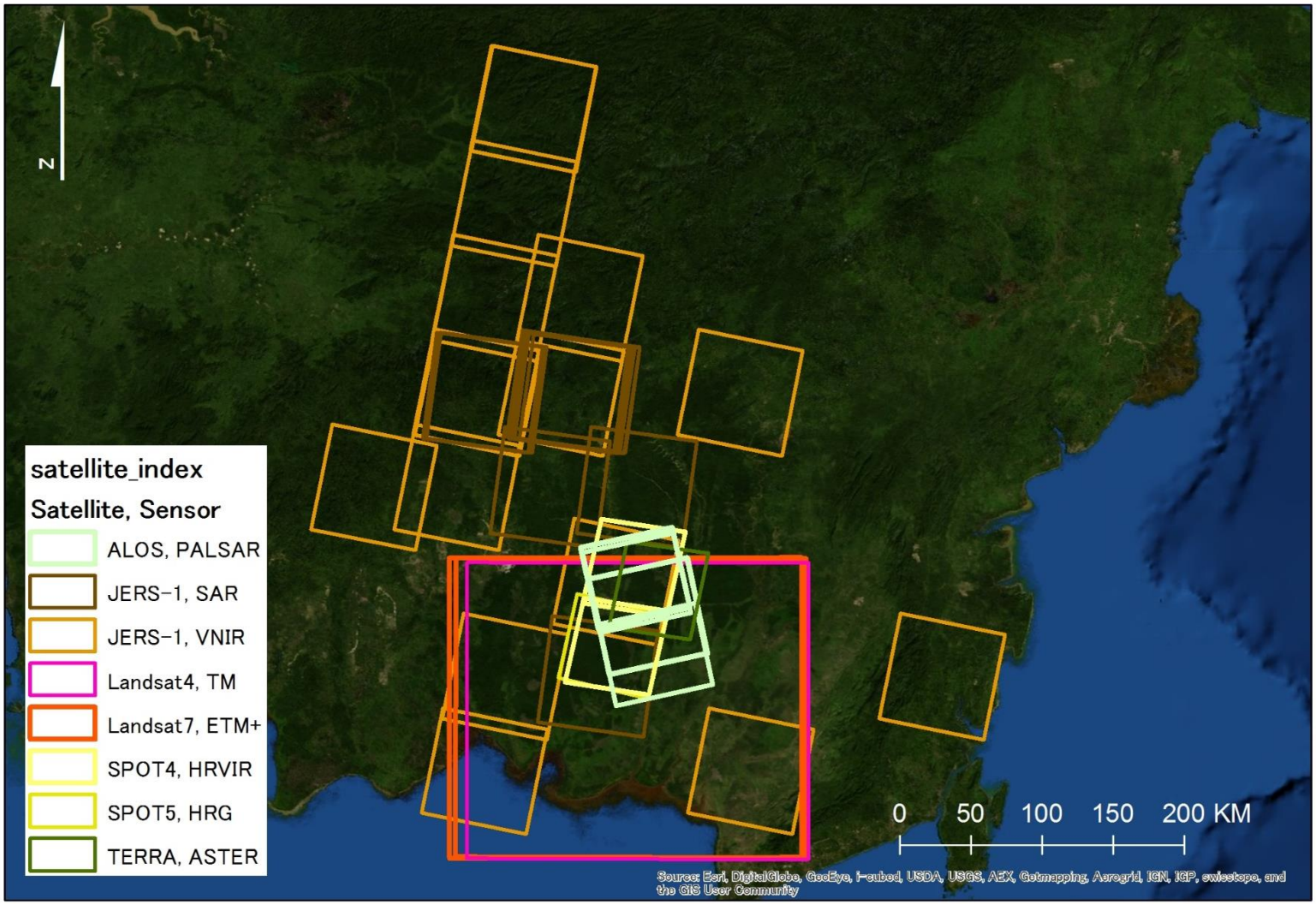
- Zoom level 2 (river & road & logging road)



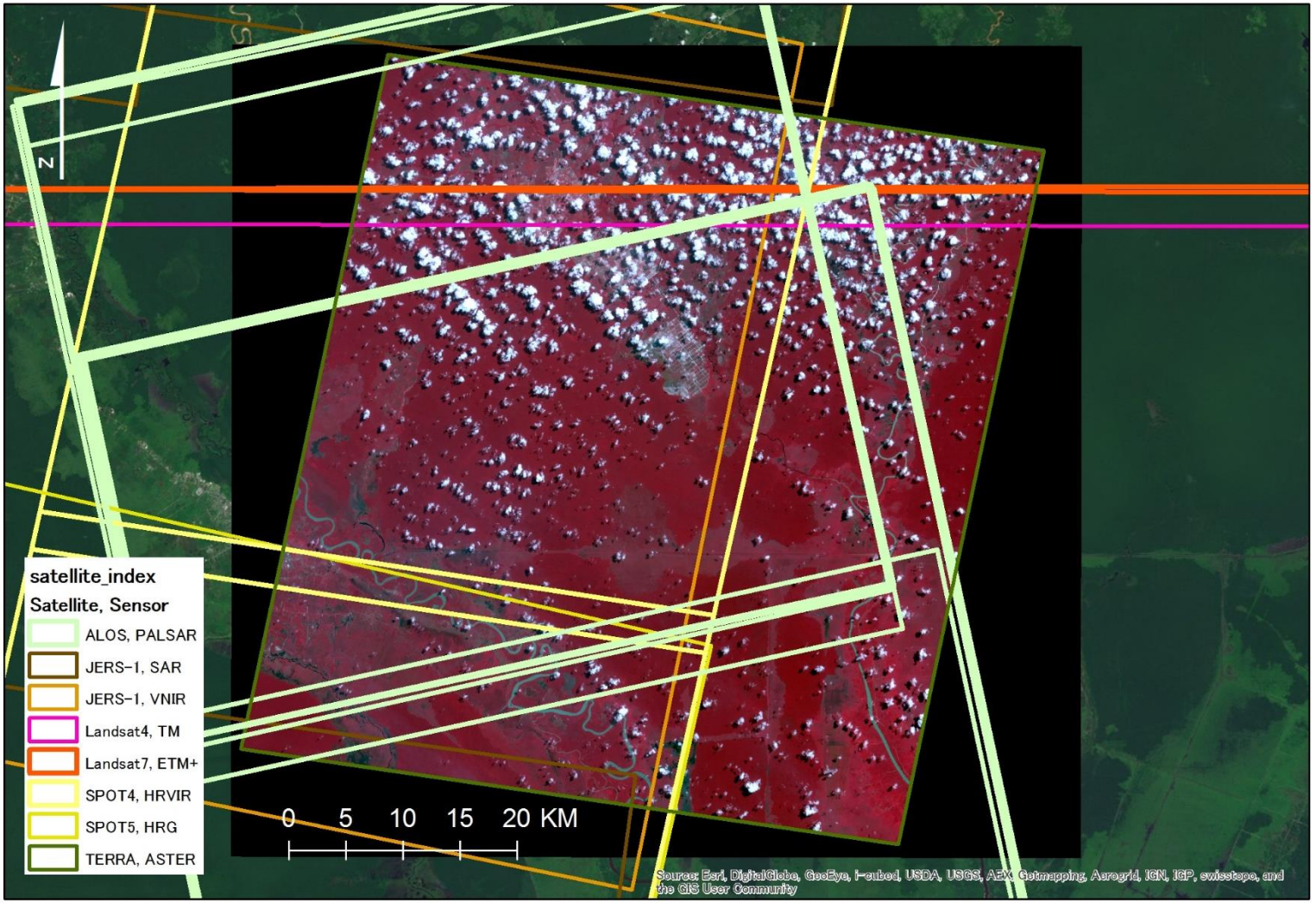
Archived GIS Data Set (RASTER)

Satellite image
&
DSM / DTM (LiDAR)
&
Geological map

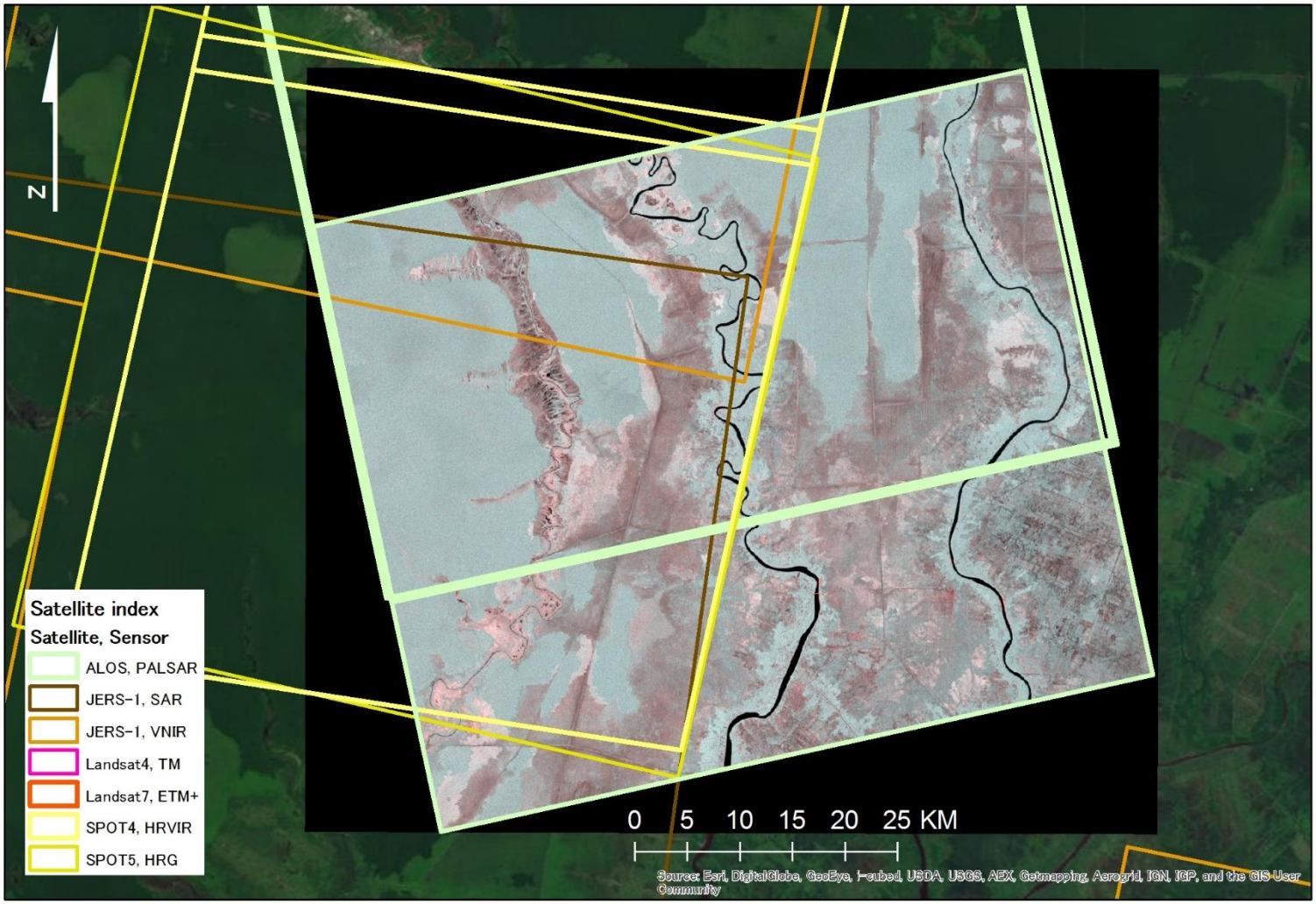
Satellite image index



Index with image (Terra ASTER)

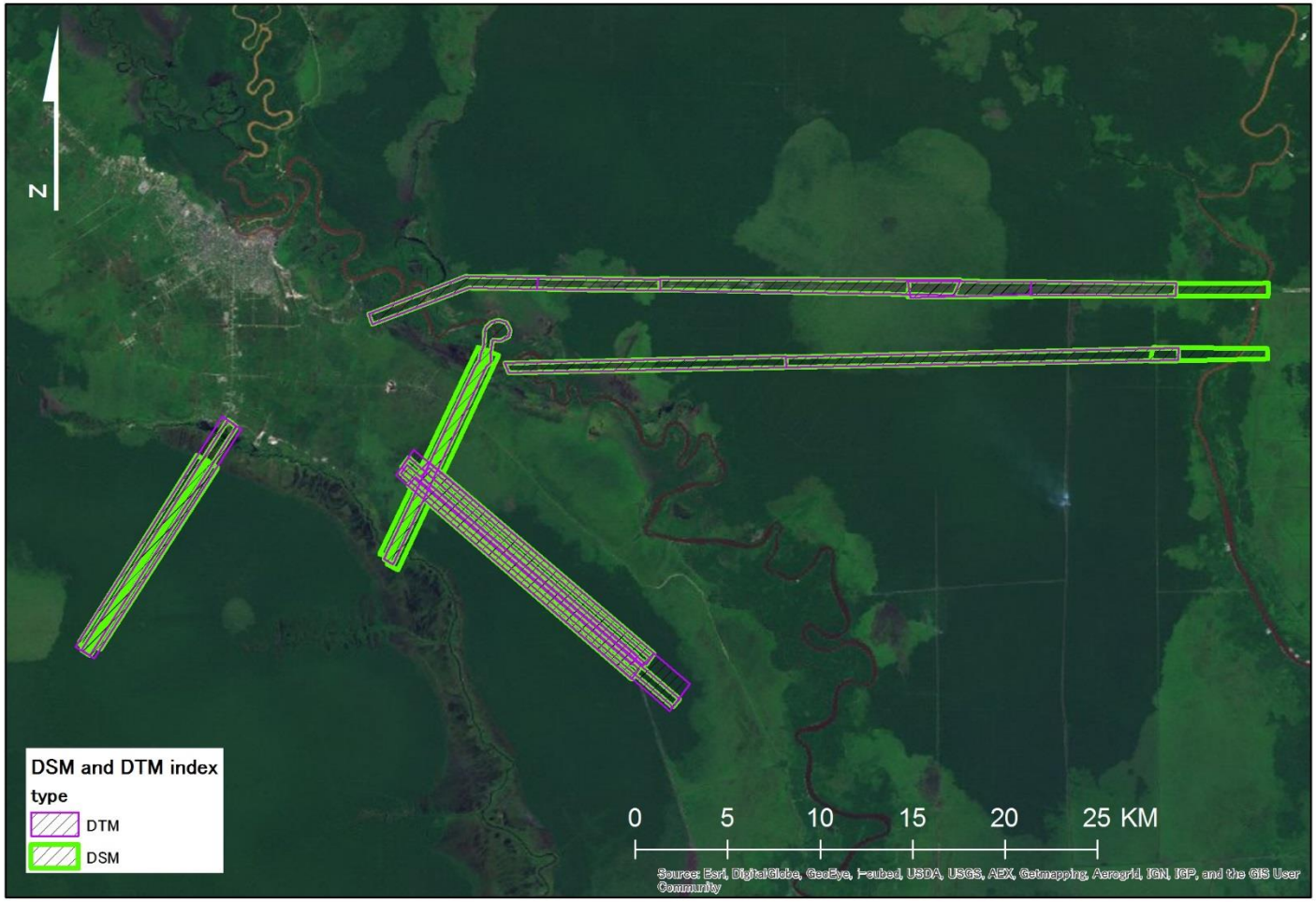


Index with image (ALOS PALSAR)



POWERED BY esri

DSM / DTM (LiDAR) Index

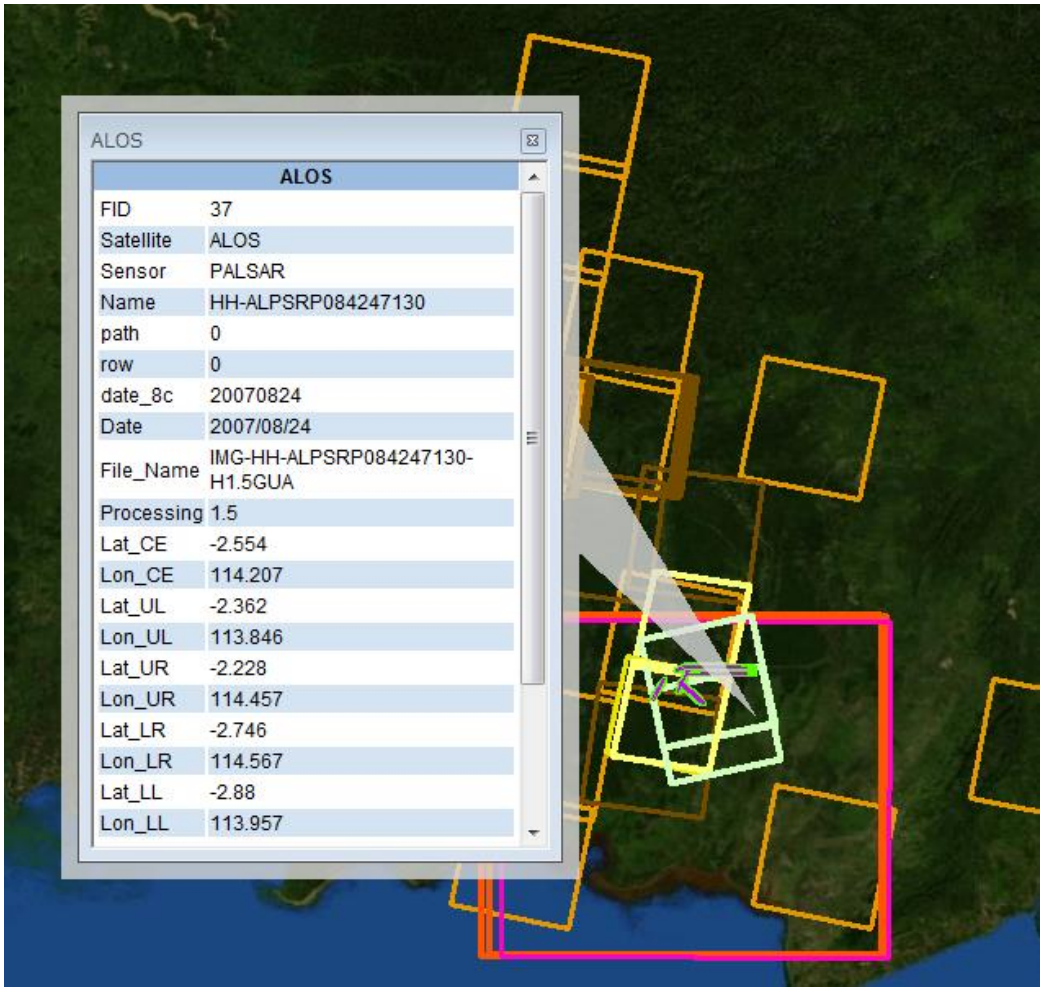


Index with DTM

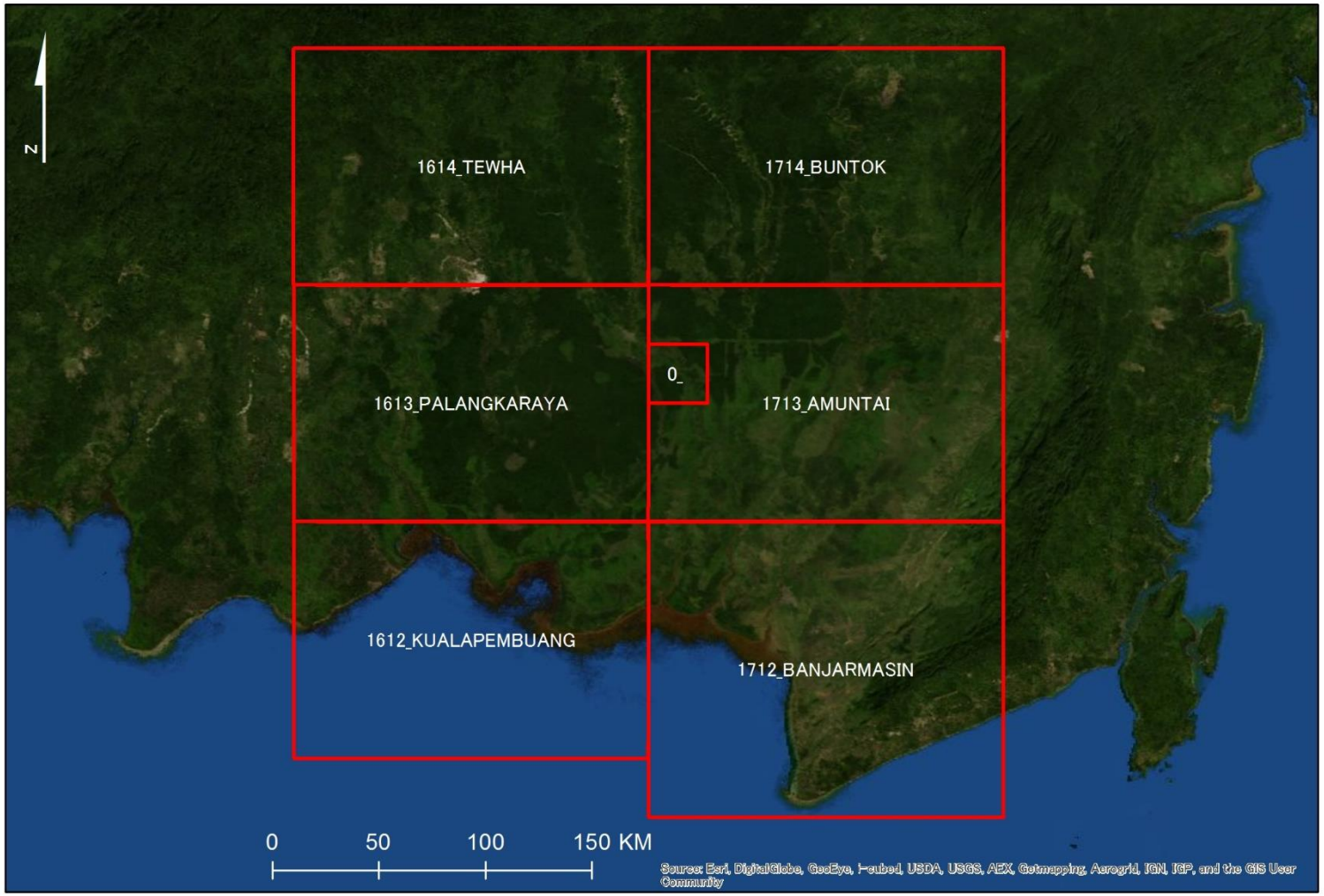


Pop-up Information

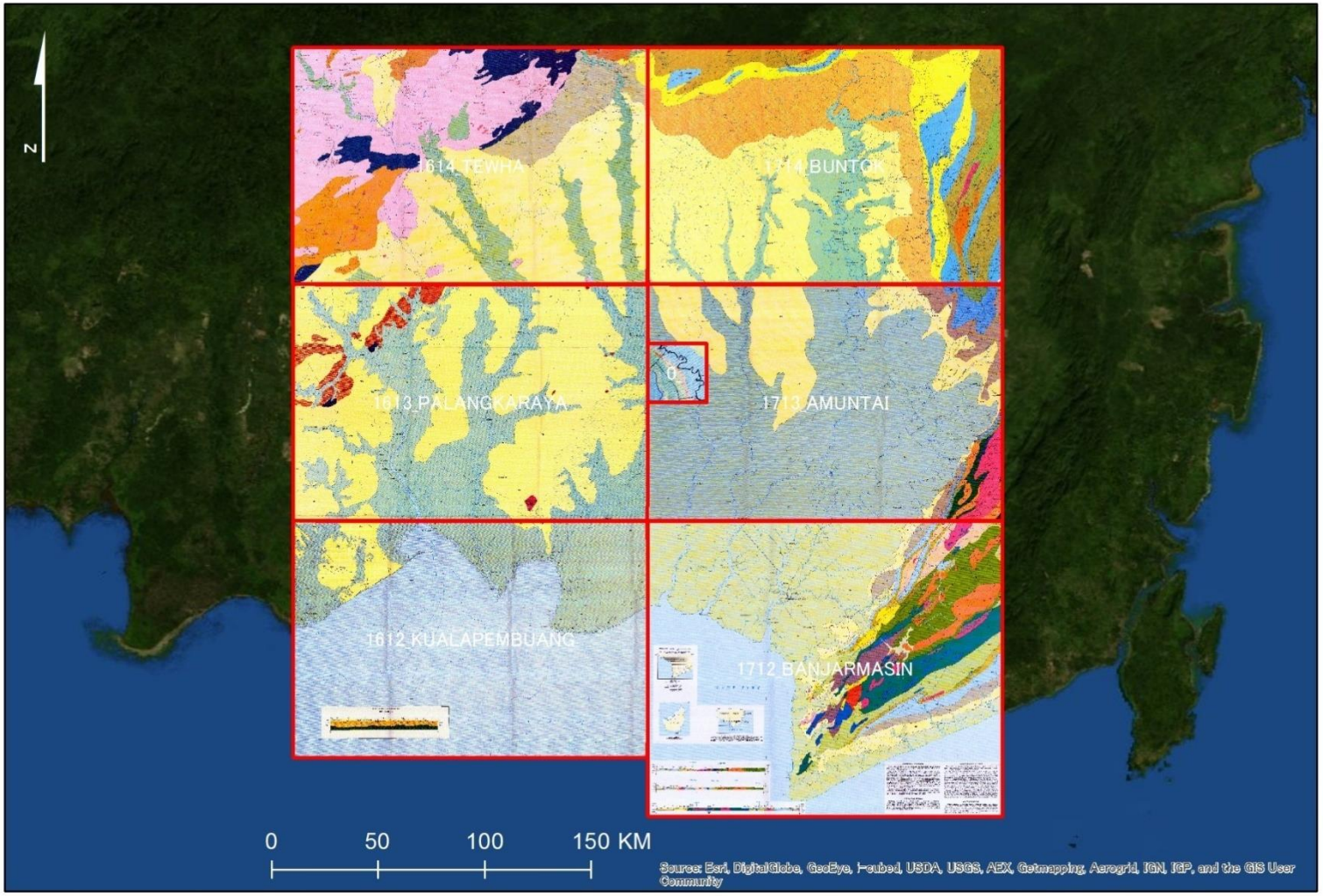
- Satellite
- Sensor
- Product ID
- Acquisition date
- Path / Row
- Processing level



Geological Map index (1:250000)

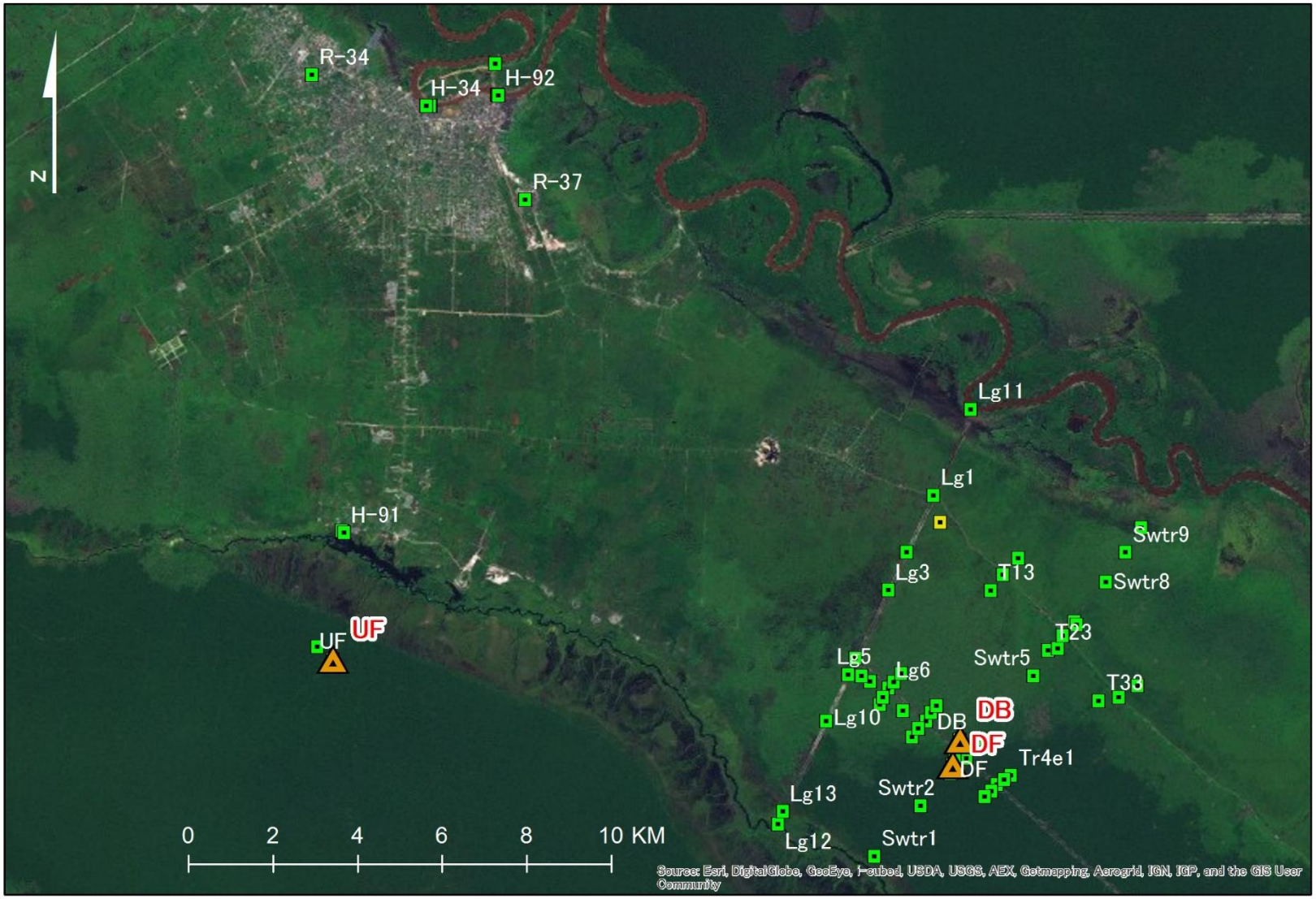


Geological Map (1:250000)



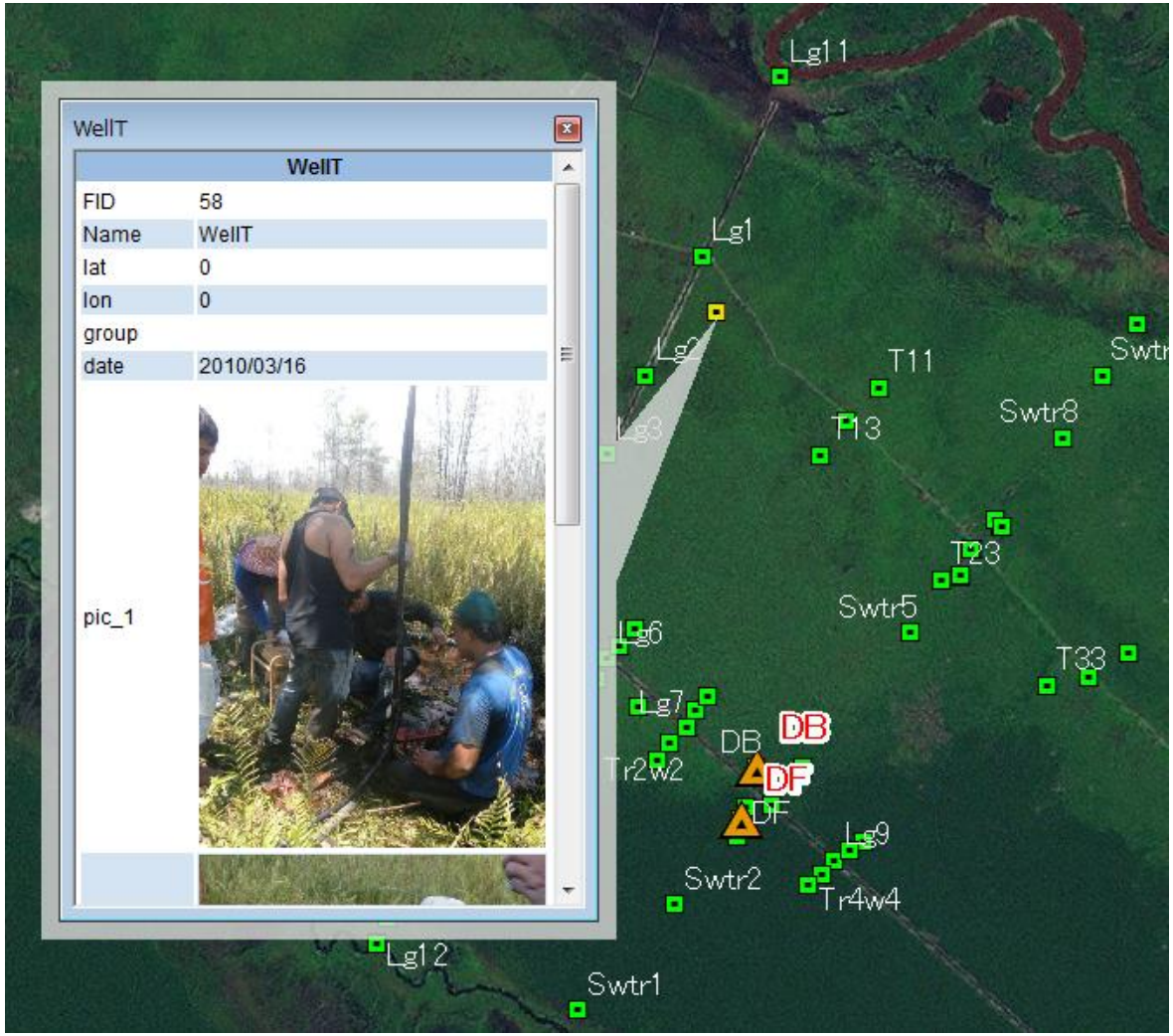
Location of Research Station

Location of Research station



Pop-up Information

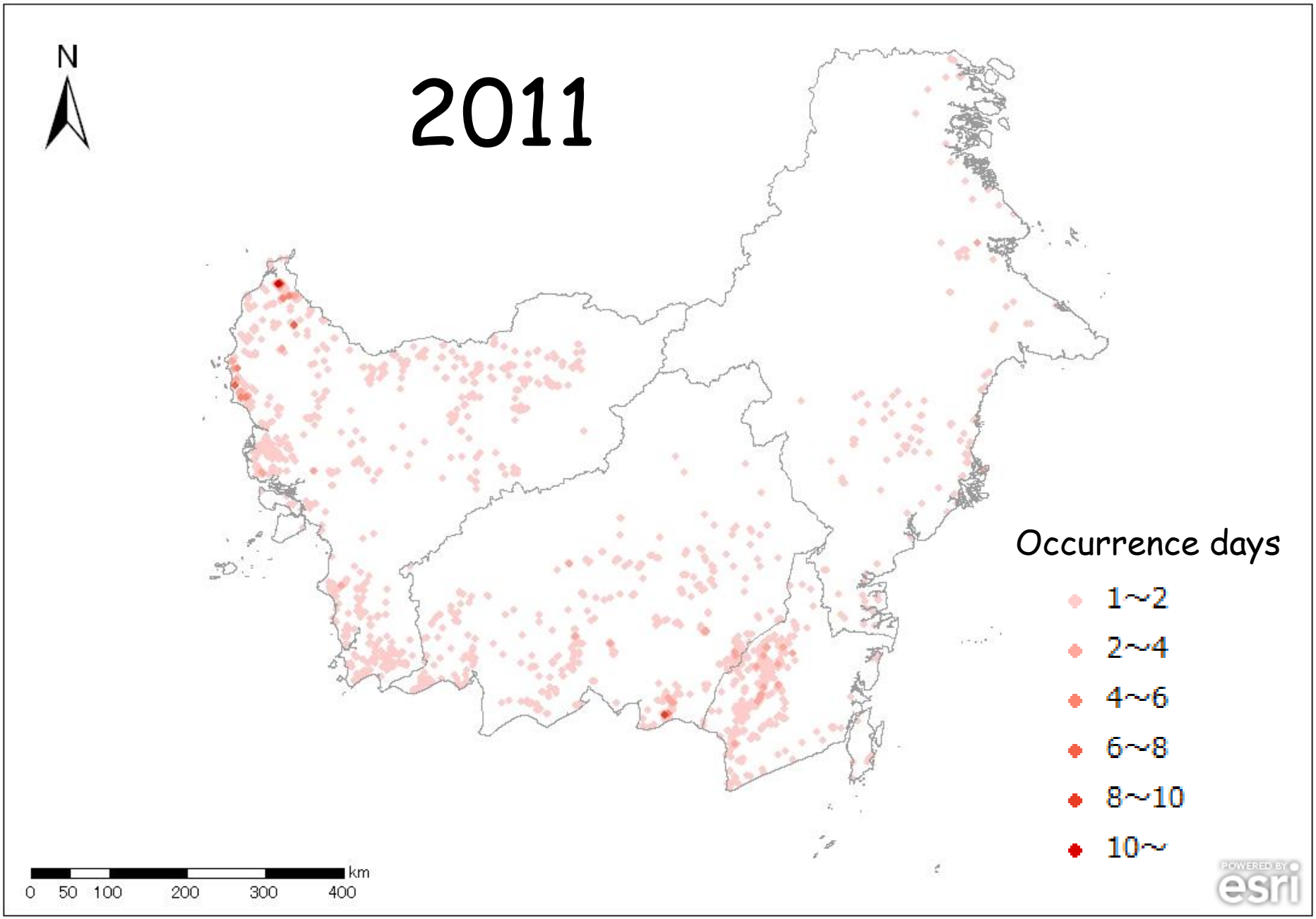
- Site Name
- Research Date
- Picture (if available)
- Name of Researcher



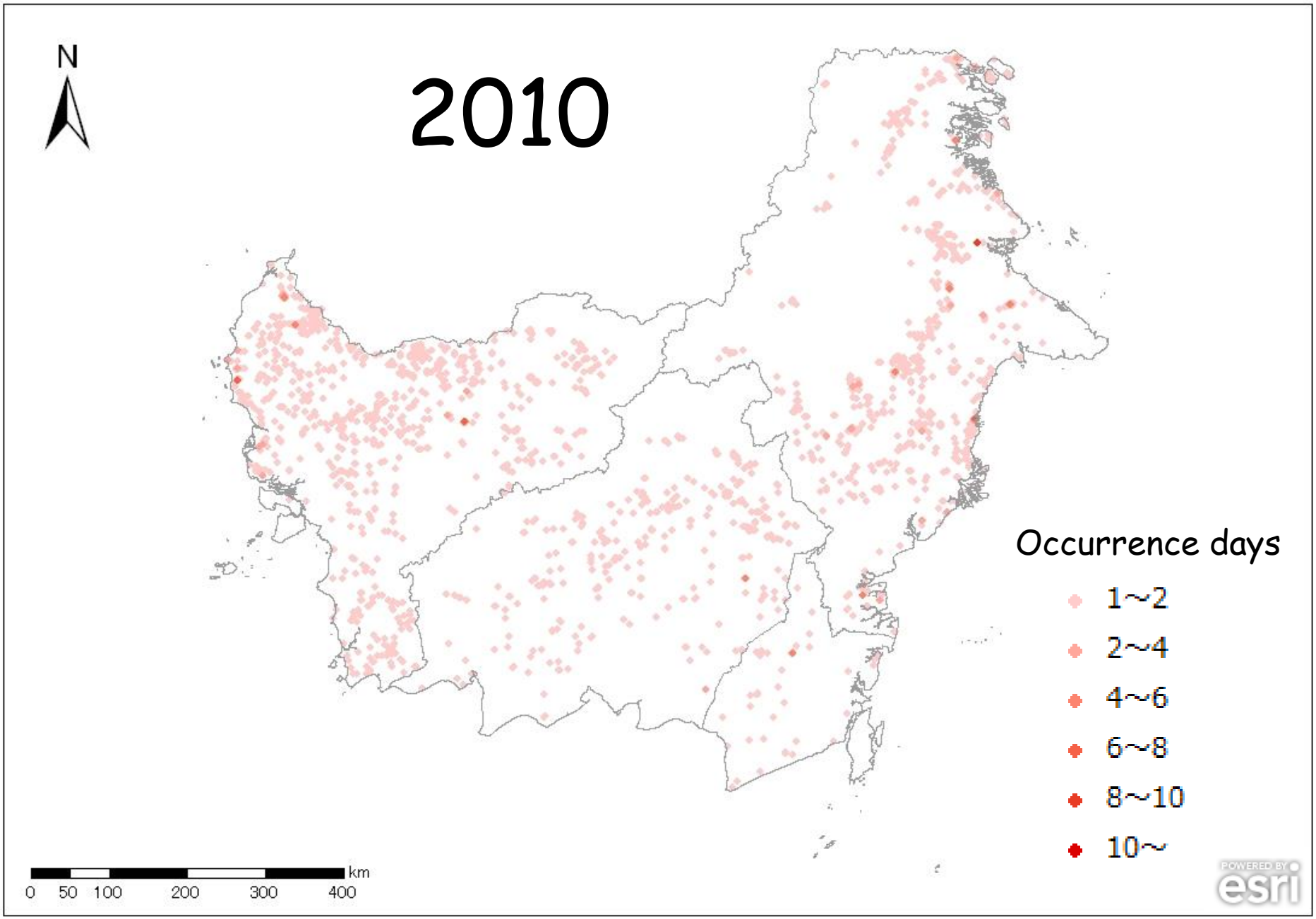
Annual Summary of Active Fire Products

(MODIS MOD14)

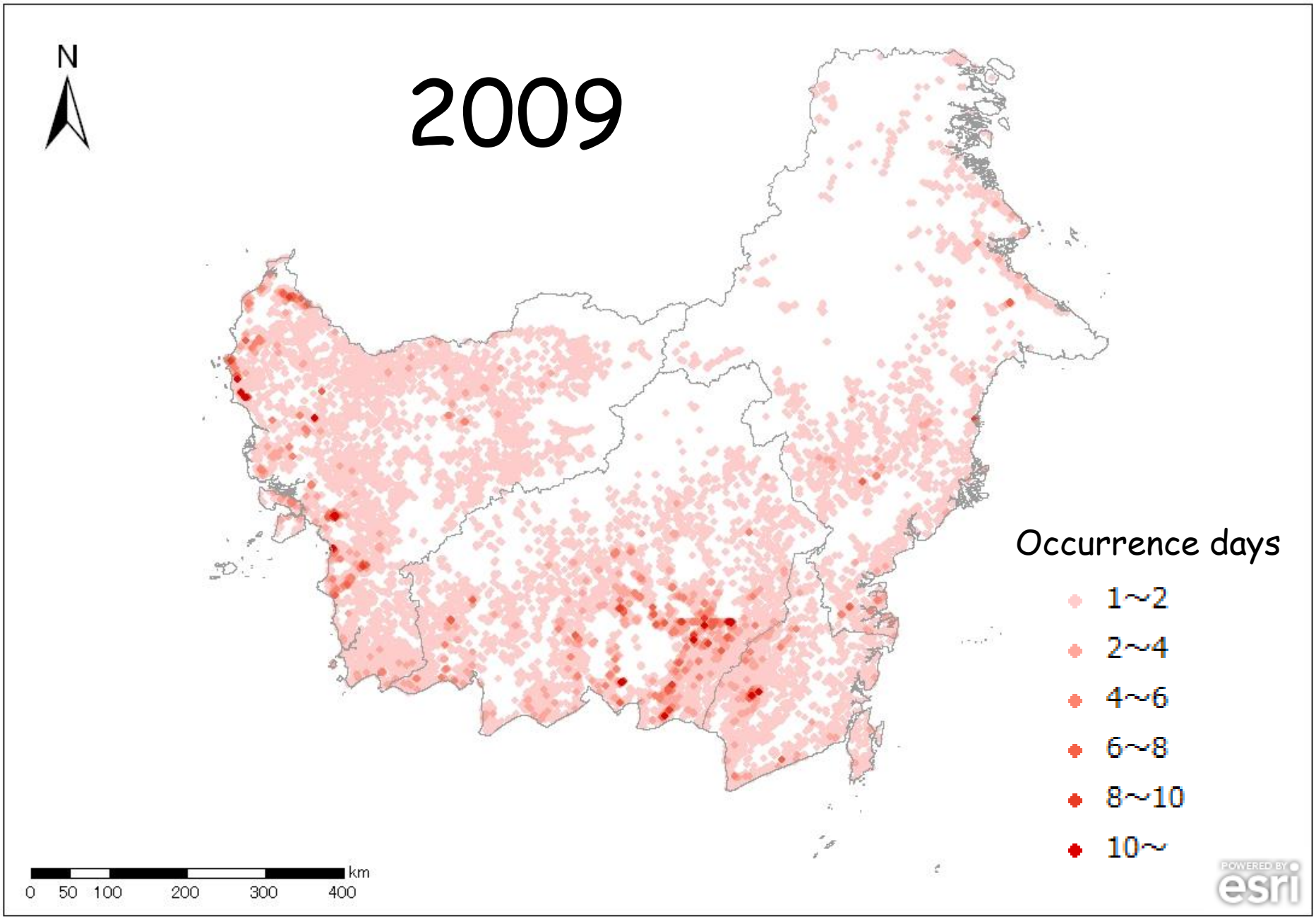
Integrated MRV Systems



Integrated MRV Systems



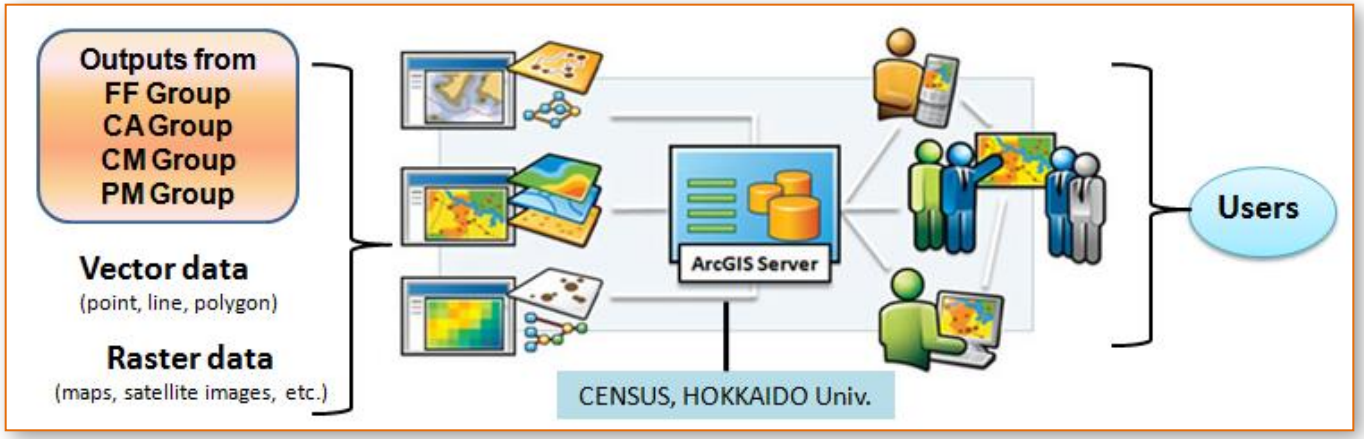
Integrated MRV Systems



National Action for GHG Emission Reduction (RAN-GRK)

- ✓ **Government of Indonesia** has committed to reduce GHG emissions by 2020 by 26% to **Business as Usual (BAU) baseline** with national support and by 41% to BAU with international support.
- ✓ Accordingly, the enactment of the National/Local Action Plan for Greenhouse Gas Emission Reduction (RAN/RAD-GRK) are made as a follow-up to this commitment.

(http://www.sekretariat-rangrk.org/english/)

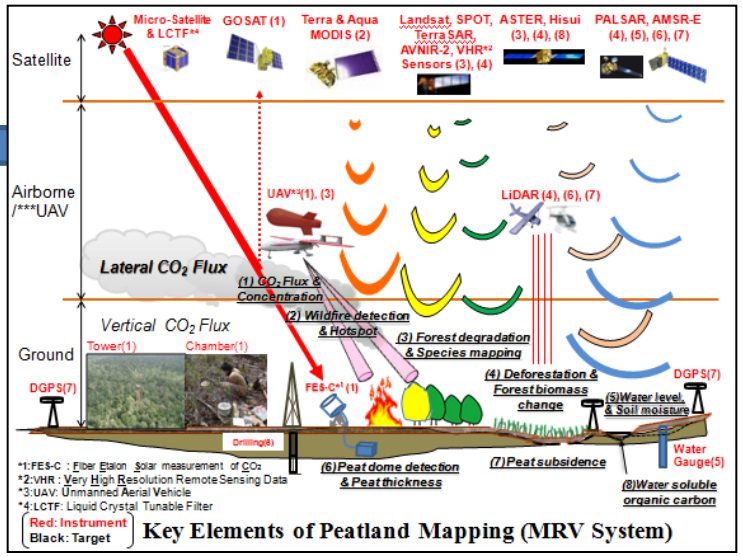




Contribution by integrated MRV system through the Web-GIS system of SATREPS

Contribution to RAD-GRK

Key Substances of RAD-GRK



3. Proposed Mitigation Action Plan

2. BAU Baseline of GHG Emission

4. Priority Scale of Proposed Mitigation Actions

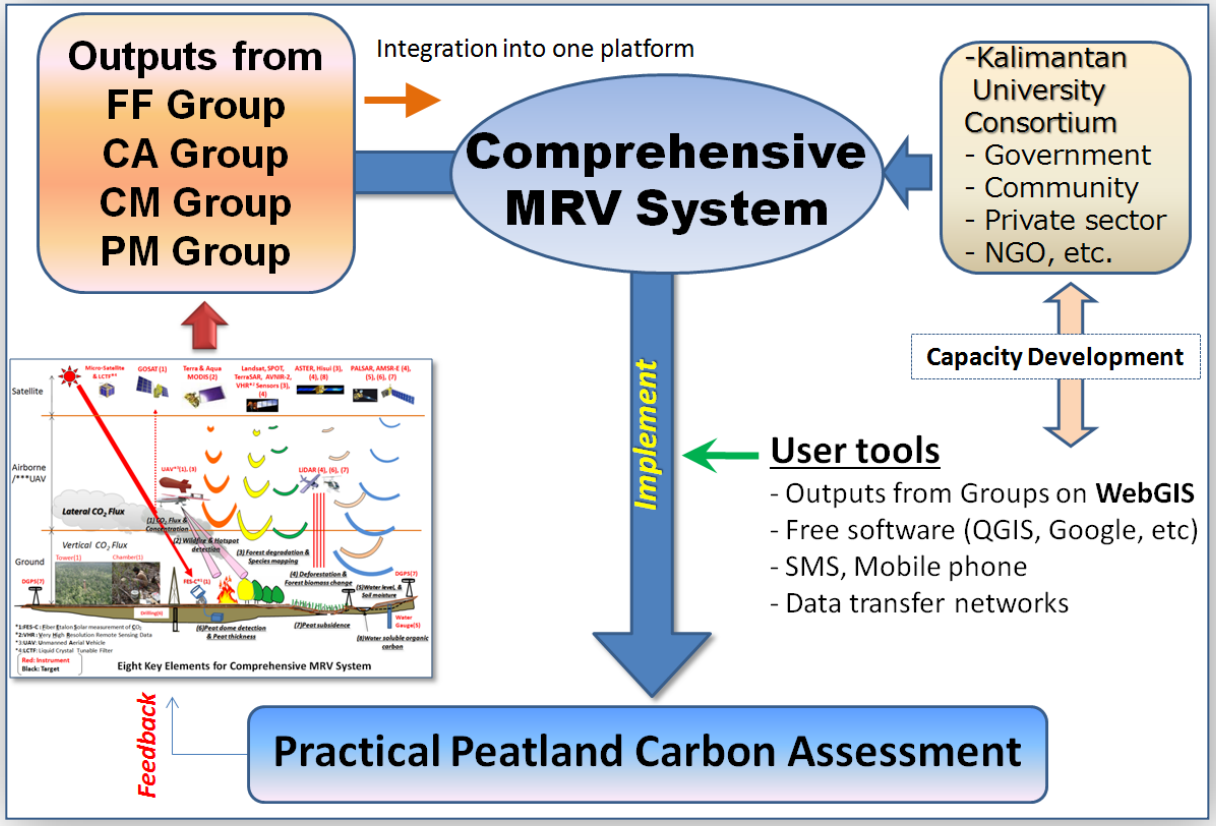
1. Sources, Potentials and Characteristics of GHG Emissions

RAD-GRK

5. Institutional Affairs and Funding

Conclusion

- Remarkable progress has been made from each group
- Integrated MRV system has been made with Web-GIS
- **Practical peatland carbon assessment will be achieved**



Collaborations:

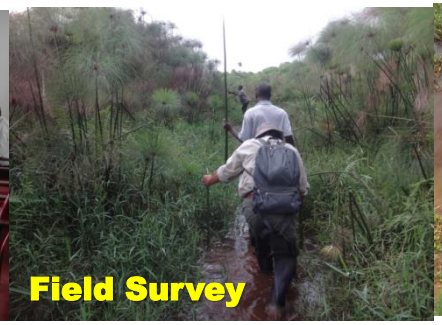
Indonesian Stakeholders
&
International Stakeholders

International Collaboration by MRV system











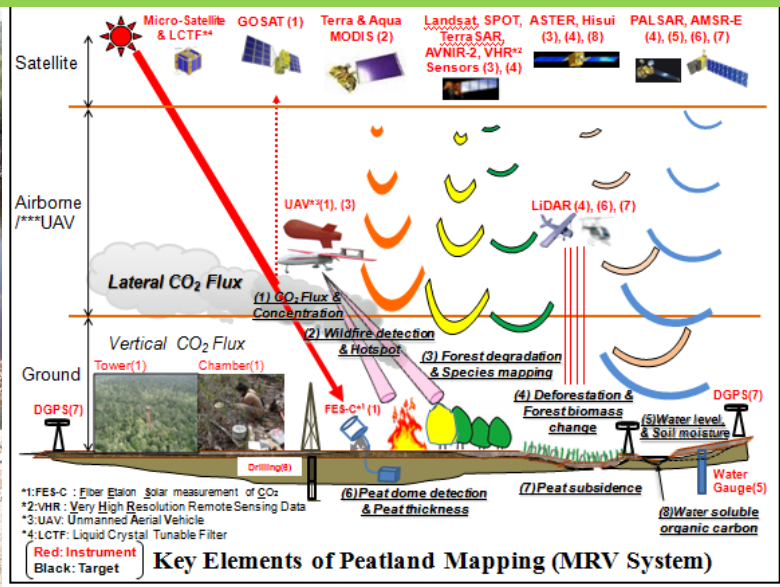


International Collaboration by MRV system



2011/ Dec. (COP17)







2012/ Dec. (COP18)



Memorial Photo on COP18, Doha, Qatar, 4th Dec. 2012