

# Space-based Applications for supporting SDGs in Indonesia

**Agenda 5. Space for sustainable development: technology and its applications, including the United Nations Programme on Space Applications**

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The 61<sup>th</sup> Session of the Science and Technical Subcommittee of the UNCOPOUS

Secretariat of Indonesian Space Agency Secretariat (INASA)  
National Research and Innovation Agency (INASA-BRIN)



Vienna, 29 Jan - 9 Feb 2024

# Research Themes for Supporting SDGs



**Paddy growth phase**  
**CH<sub>4</sub>-Rice & Water Management**  
**Fishing Potential Zone**



**Smoke-haze mapping from forest fires**  
**Thermal Discomfort Zone**



**Open-pit Mining Mapping**  
**CH<sub>4</sub>-Rice & Water Management**



**Slum Areas Mapping**  
**Urban Environmental Comfort**  
**Thermal Discomfort Zone**  
**Urban heat island**



**Open-pit Mining Mapping**



**CH<sub>4</sub>-Rice & Water Management,**  
**Flood Management & Coastal Protection**



**Marine Debris**  
**Oil Spill**



**Mangrove classification,**  
**Landuse changes,**  
**Open-pit Mining Mapping**

# Space Applications for Environment (SAFE) CH4Rice Project

## Project Title:

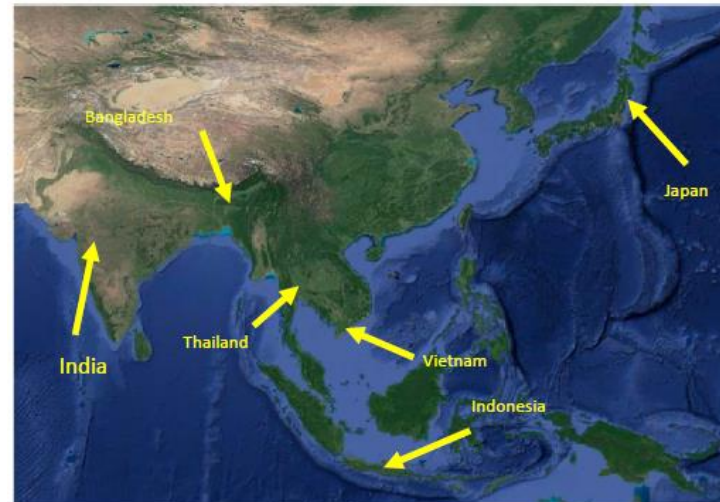
Assessment of Methane Emission from Rice Paddies and Water Management



Duration : 2023 - 2025

## Countries Involved:

- VNSC Vietnam (Project Leader)
- BRIN Indonesia
- GISTDA Thailand
- ISRO India
- JAXA Japan
- PUST Bangladesh



## Implementation in Each Country:

- Preparing in-situ water-level measurements
- Field survey and/or Installing in-situ water level measurements to study sites
- Start/continue to compare in-situ water-level with ALOS-2 PALSAR-2 Full-pol data

## Data Sharing:

- ALOS-2 PALSAR-2 (full-pol) observation for study sites and sharing the data

## Dissemination:

- APRSAF 2022, 2023
- CEOS Plenary in November 2023 by GISTDA

## Outcome:

- Climate change mitigation such as carbon credit through CH4 MRV (Monitoring, Reporting and Verification) using satellite and in-situ data
- Water management by efficient irrigation with lower CH4 emission (e.g. Alternate Wetting and Drying or water saving irrigation)
- Regional and global sustainable agriculture related initiatives/activities



Source: SAFE CH4Rice, APRSAF 2023

Contact person:  
P. Sofan (Parwati@brin.go.id)



# Slum Areas Mapping

## Study Area:

Indonesia: Makassar and Bandung Cities

Project Duration : 2022 - 2023

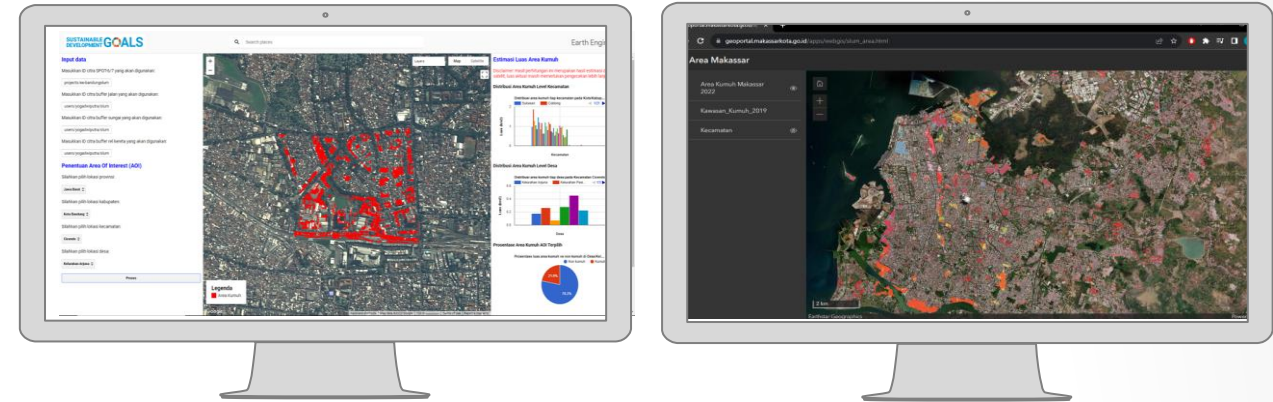
Supported by: **UNESCAP**

## Project Executer:

- BRIN (Project Leader)
- Universities (Bandung Institute Technology, Hasanuddin University)
- West Java Government
- Makassar City Government



## Results: Slum areas information system platform



## Field check in Bandung and Makassar Cities:



## Stakeholder meetings and capacity buildings:



## Data:

	Bandung City	Makassar City
Primary data	SPOT-6 imagery (17 Aug 2021)	SPOT-6 imagery (6 Jun 2021)
Supporting data	Road and river networks, railroad network, building data, population data, administrative boundary.	Night Time Light (NTL), land use, road and river networks, health facilities, population data, administrative boundary
Classification model	Machine learning-based Random Forest algorithm	Machine learning-based U-Net algorithm
References	<ul style="list-style-type: none"> <li>• Government Regulation No. 14/2016</li> <li>• Slum locations (2018) from the Department of Public Works of Bandung City.</li> </ul>	<ul style="list-style-type: none"> <li>• Government Regulation no. 14/2016</li> <li>• Decree of the Mayor of Makassar in 2018</li> </ul>

Source: Roswintiarti et al, 2023

# Flood Management and Coastal Protection in North Java

Study Area: North of Coastal Java

Project Duration : 2023

Supported by: ADB

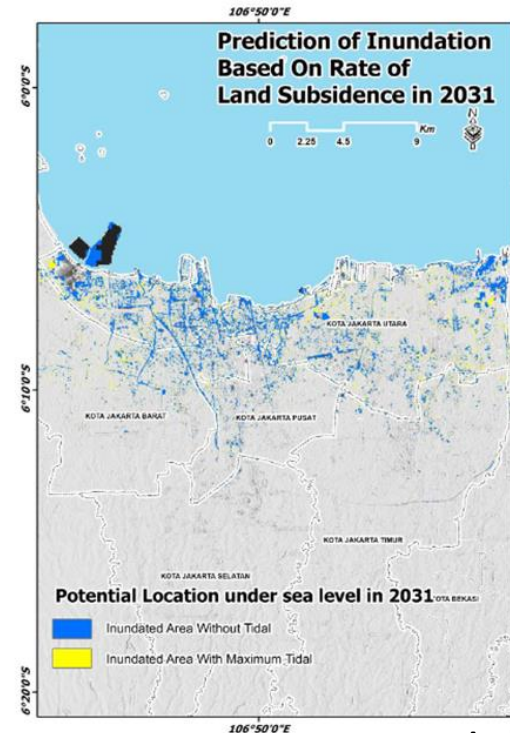
Project Executer:

- BRIN
- Ministry of Public Works and Human Settlements

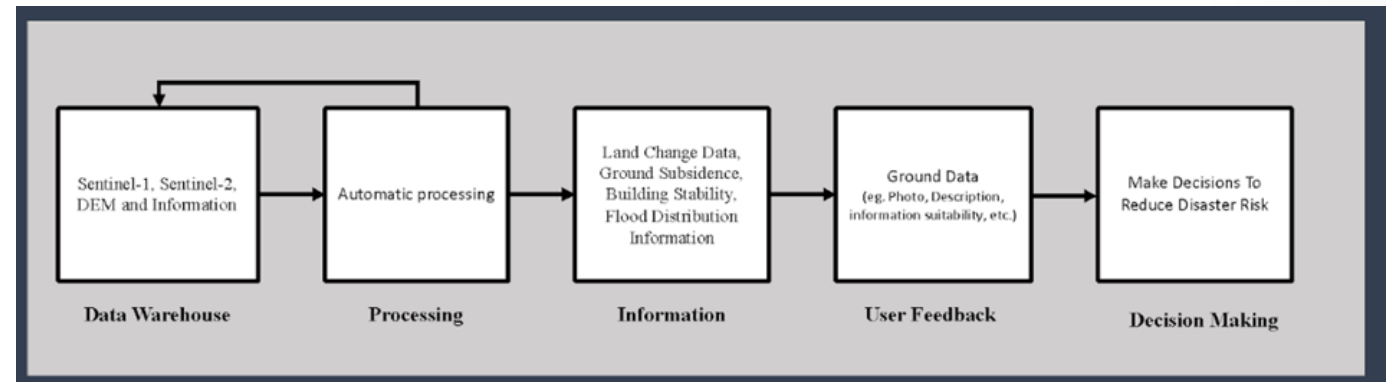
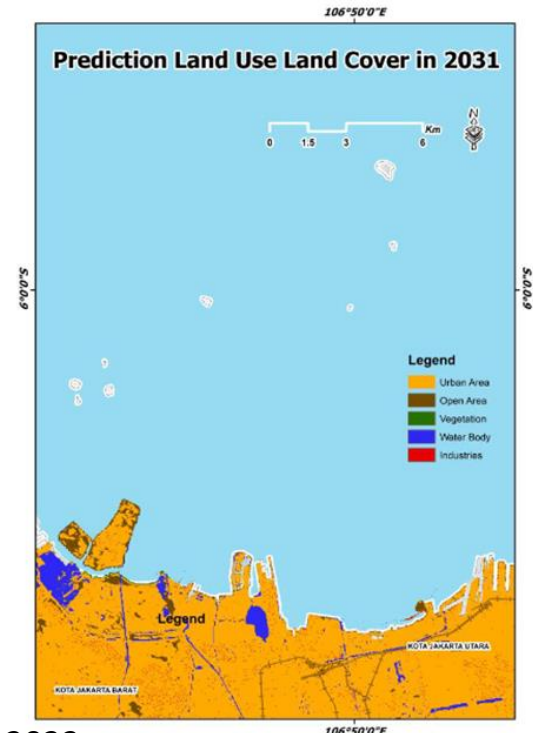


Focus study:

- ✓ Change Detection Model (land subsidence, Landuse, Infrastructure)
- ✓ Development of Early Warning System and Disaster Hazard Map (Flood & Landslide)
- ✓ Visualization of DEM and 3D in the North of Coastal Java



Ardha et al 2023



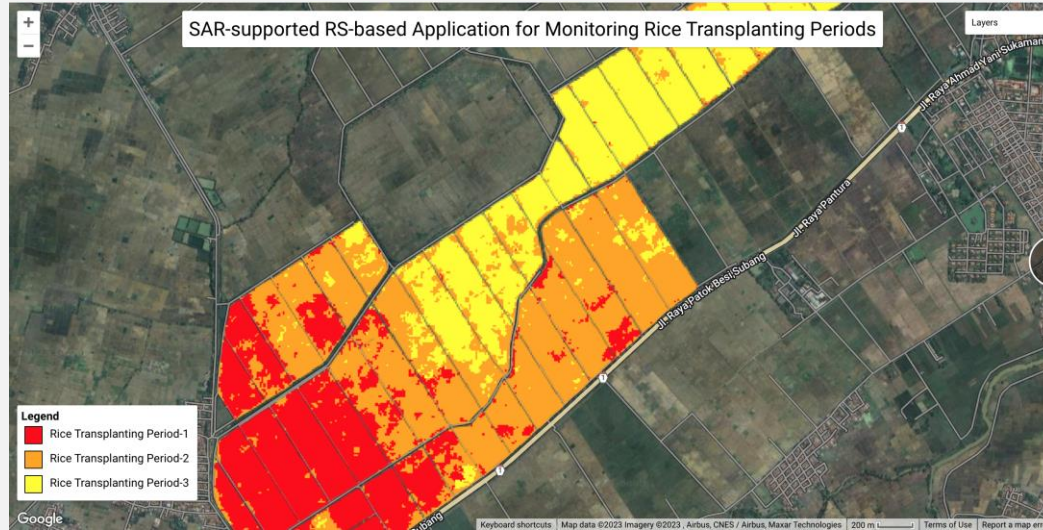
Khomarudin et al, 2023



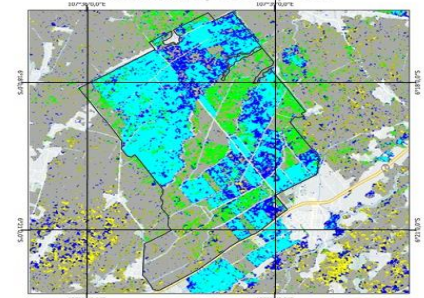
# Agriculture and Fishery Applications

## Paddy rice monitoring

Novresiandi et al, 2023

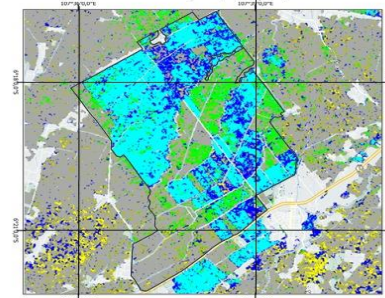


GROWTH PHASE OF RICE CLASSIFICATION AND REGRESSION TREE, PT SANG HYANG SERI AND SURROUNDING, SUBANG DISTRICT, WEST JAVA PROVINCE, 01 - 15 September 2022



(a). CART

GROWTH PHASE OF RICE CLASSIFICATION USING RANDOM FOREST METHOD, PT SANG HYANG SERI AND SURROUNDING, SUBANG DISTRICT, WEST JAVA PROVINCE, 01 - 15 September 2022

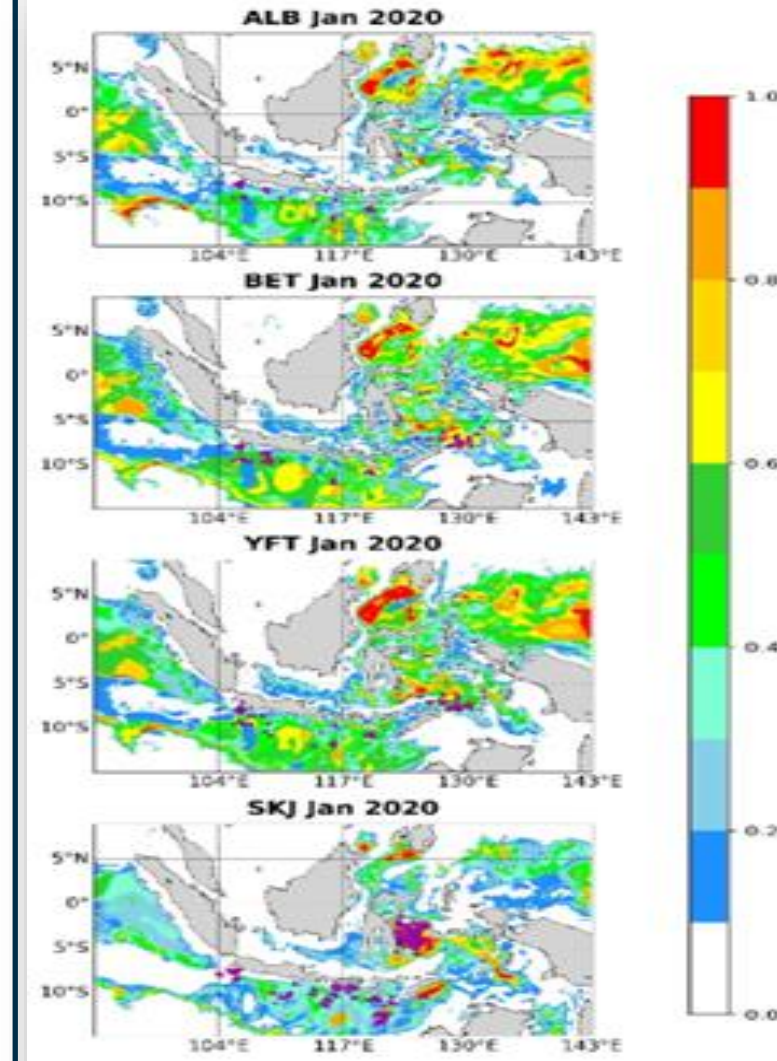


(b). Random Forest Muradi et al, 2023

## Commercial Pelagic Fishing Potential Zone

Albacore (ALB) ;  
Big Eye Tuna (BET);  
Skipjack (SKJ) ;  
Yellow Fin Tuna (YFT)

Sulma et al, 2023



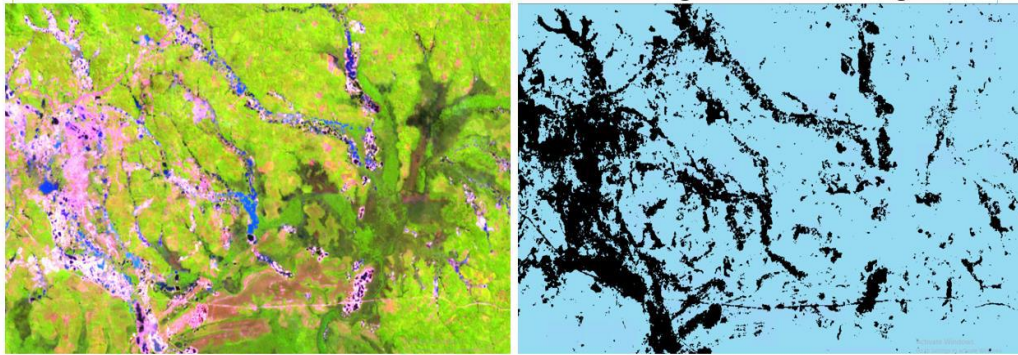


# Environmental Applications

## Opet pit mining mapping

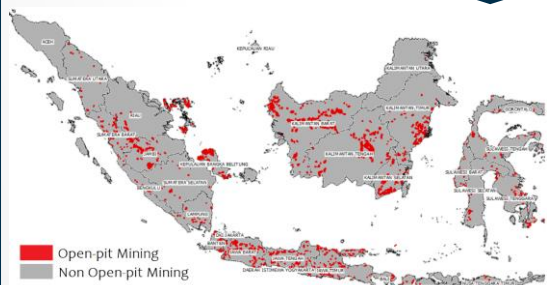


machine learning classification process using Random Forest algorithm

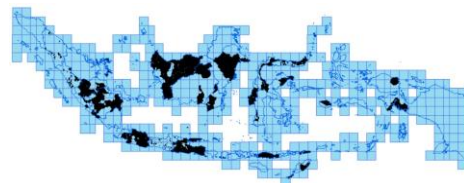


■ Open-pit Mining   
 ■ ■ ■ Non Open-pit Mining   
 ■ Open-pit Mining   
 ■ Non Open-pit Mining

Yulianto et al, 2022,  
Nugroho et al, 2023

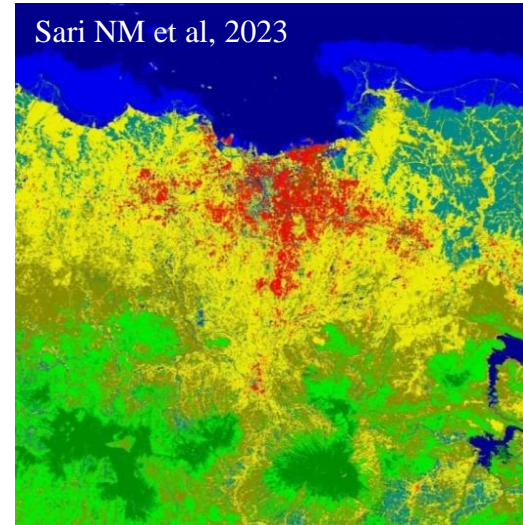


## Monitoring of illegal mining



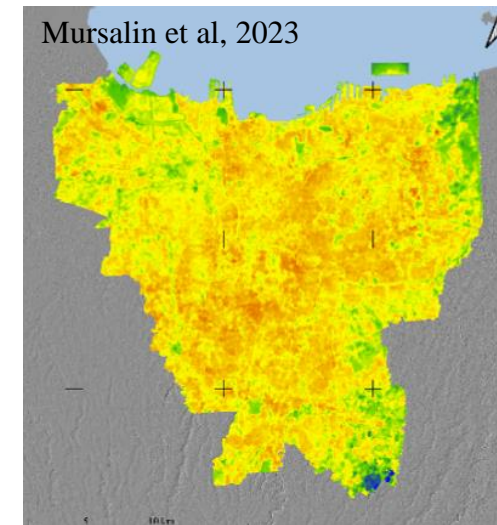
Minerba Online Reporting System for Illegal Mining

## Urban Environmental Comfort



Sari NM et al, 2023

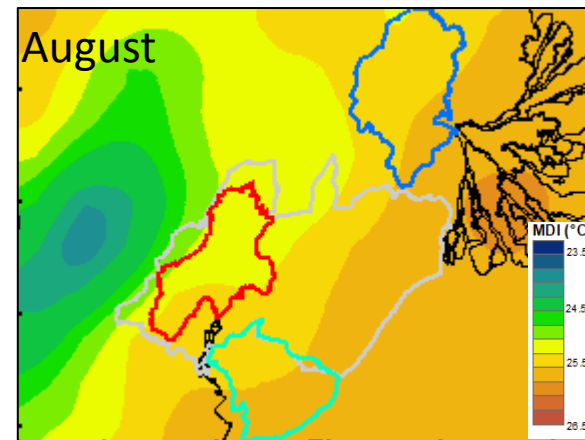
## Urban Heat Island



Mursalin et al, 2023



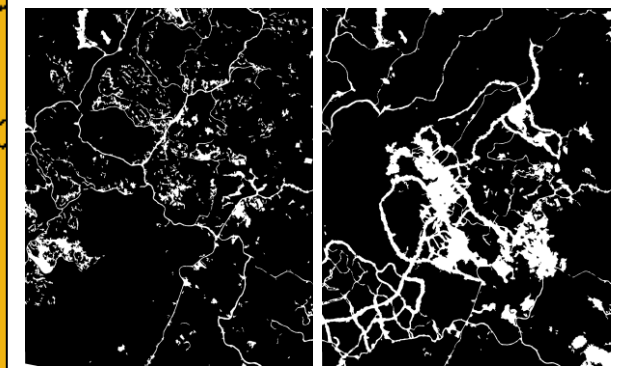
## Discomfort Index in IKN



August

Sofan et al, 2024

## Landuse changes in IKN



Chulafak et al, 2023

March 2021

Jun 2023

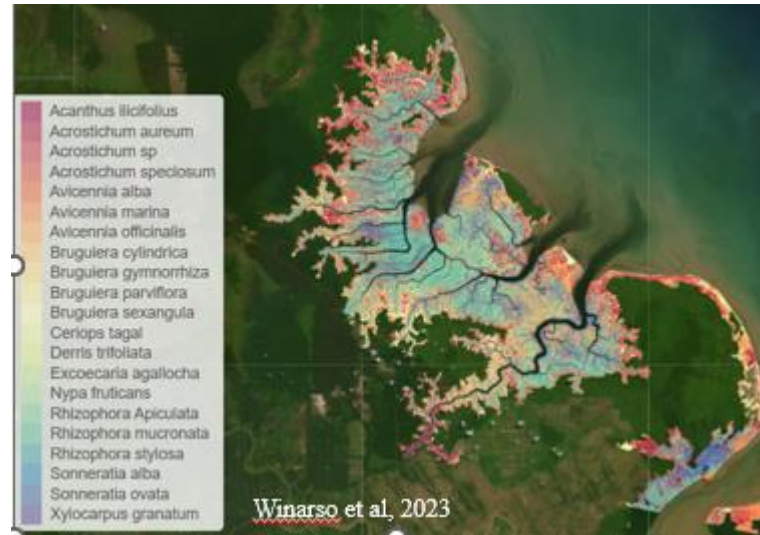


# Environmental Applications



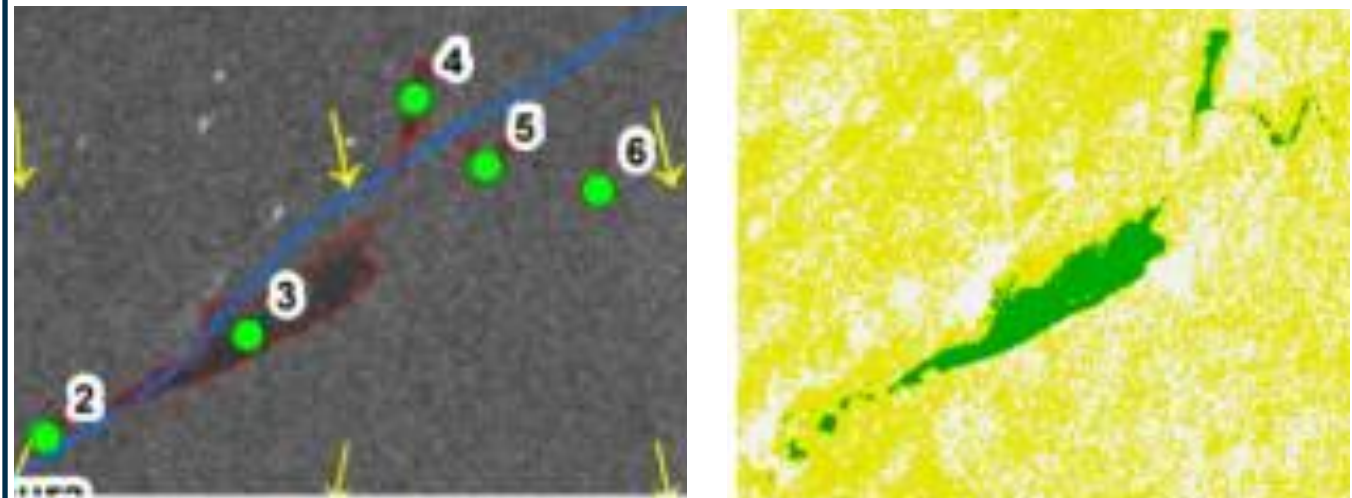
## Mangrove types

Winarso et al, 2023



## Oil spill

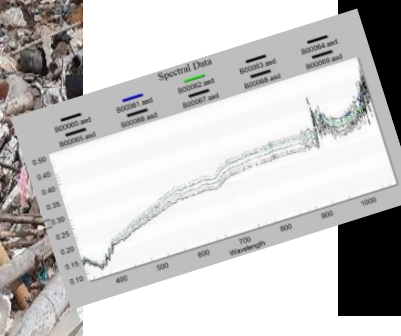
Hartuti et al, 2023



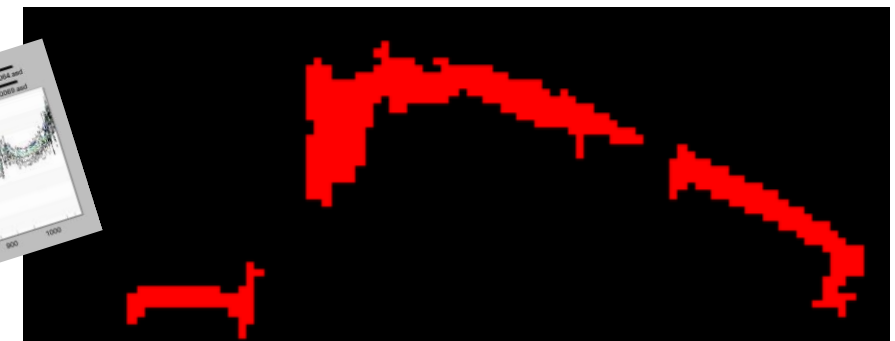
## Marine Debris



Meliani et al, 2023



Mapping plastic debris in coastal area

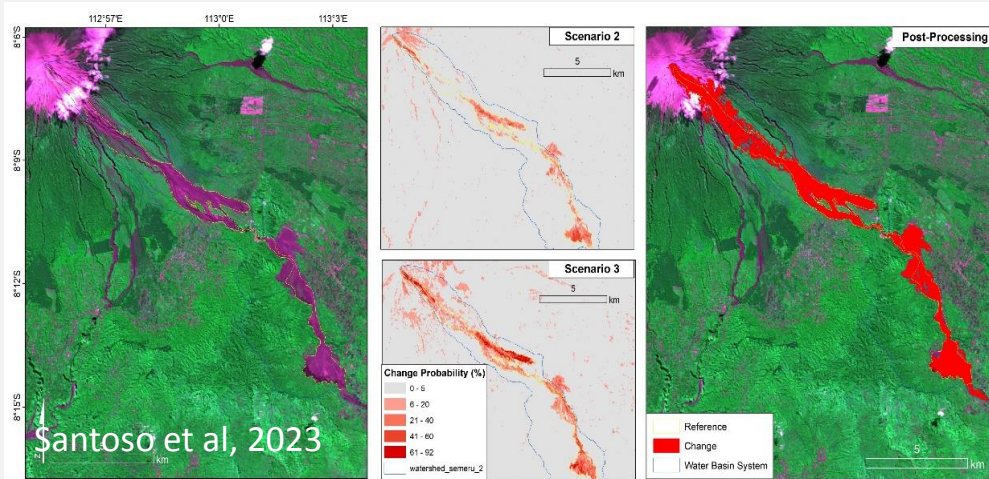




# Disaster Applications



## Probability of lava flow



## Smoke fires mapping

Khalifah et al, 2023

All bands (16 bands) classification

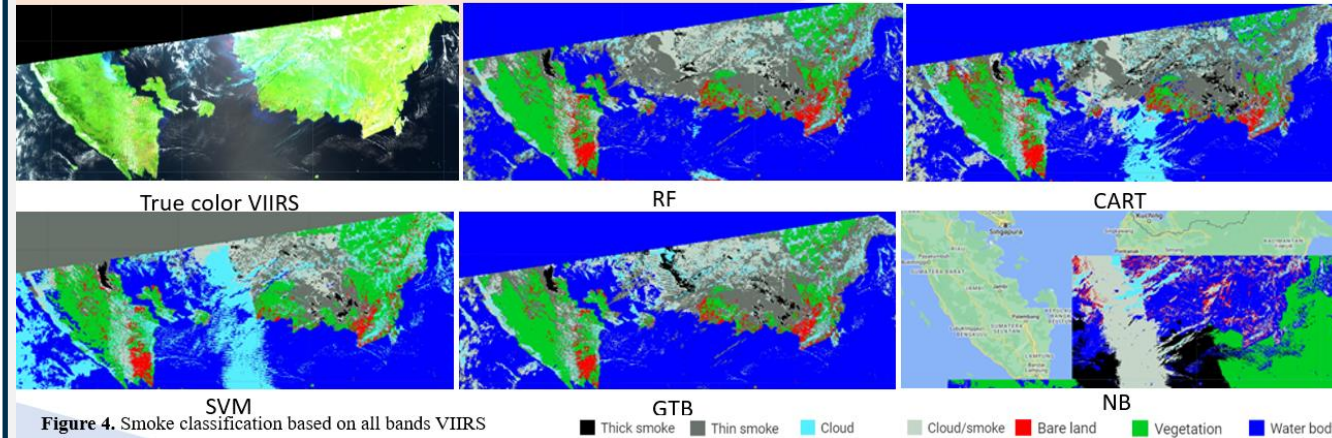
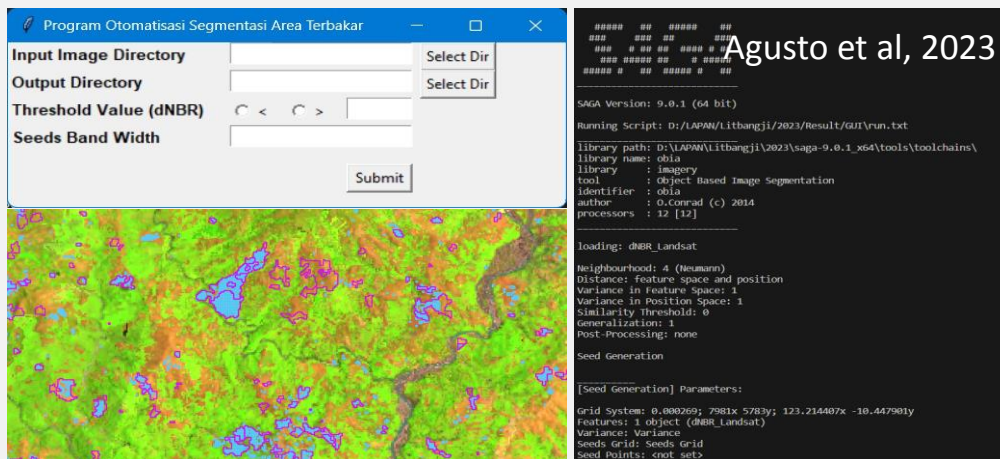
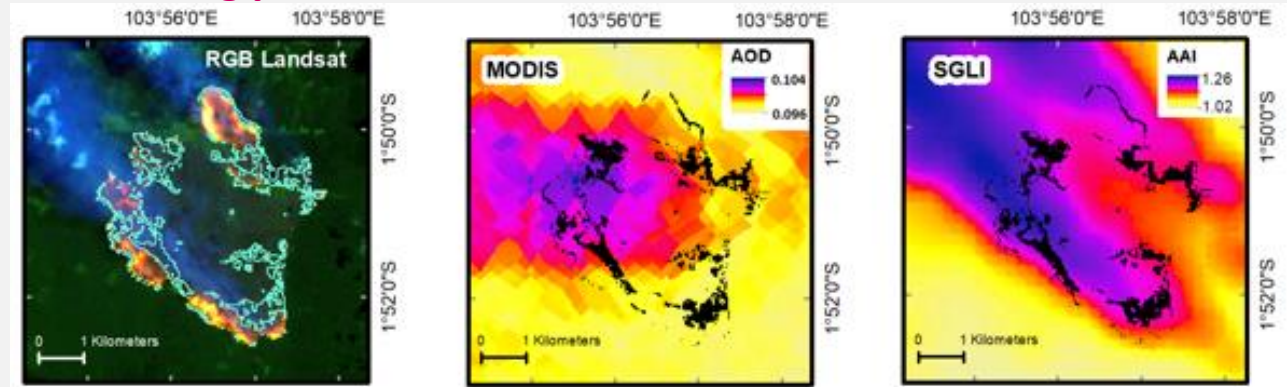


Figure 4. Smoke classification based on all bands VIIRS

## Burned areas segmentation



## Smoldering peatlands



Smoldering pixels passed test-1

Sofan et al, 2023

# Concluding Remarks

- Indonesia remains committed to leveraging space technology and applications to support SDG's
- Indonesia welcomes research collaboration with other countries to improve the quality of research and skills to utilizing space data and its technology to support SDG's
- BRIN has several programs in researcher mobility such as visiting researchers, postdoctoral fellowships, research degrees and research assistantships through Indonesian Research and Innovation Fund (<https://irif.brin.go.id/>)



# Thank you for your attention

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