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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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

2. Zero Hunger
- Paddy growth phase
- CH4-Rice & Water Management
- Fishing Potential Zone

3. Good Health and Well-Being
- Smoke-haze mapping from forest fires
- Thermal Discomfort Zone

6. Clean Water and Sanitation
- Open-pit Mining Mapping
- CH4-Rice & Water Management

11. Sustainable Cities and Communities
- Slum Areas Mapping
- Urban Environmental Comfort
- Thermal Discomfort Zone
- Urban heat island

12. Responsible Consumption and Production
- Open-pit Mining Mapping
- CH4-Rice & Water Management

13. Climate Action
- Flood Management & Coastal Protection

14. Life Below Water
- Marine Debris
- Oil Spill

15. Life on Land
- 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

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

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

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Source: SAFE CH4Rice, APRSAF 2023
Slum Areas Mapping

Study Area:
Indonesia: Makasar and Bandung Cities

Project Duration: 2022 - 2023

Supported by: UNESCAP

Project Executer:
• BRIN (Project Leader)
• Universities (Bandung Institute Technology, Hasanuddin University)
• West Java Government
• Makasar City Government

Data:

<table>
<thead>
<tr>
<th>Bandung City</th>
<th>Makasar City</th>
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</thead>
<tbody>
<tr>
<td>Primary data</td>
<td>SPOT-6 imagery (17 Aug 2021)</td>
</tr>
<tr>
<td>Supporting data</td>
<td>Road and river networks, railroad network, building data, population data, administrative boundary.</td>
</tr>
<tr>
<td>Classification model</td>
<td>Machine learning-based Random Forest algorithm</td>
</tr>
</tbody>
</table>
| References | • Government Regulation No. 14/2016  
• Slum locations (2018) from the Department of Public Works of Bandung City. | • Government Regulation no. 14/2016  
• Decree of the Mayor of Makasar in 2018 |

Results: Slum areas information system platform

Field check in Bandung and Makasar Cities:

Stakeholder meetings and capacity buildings:

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 Executor:
- 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
Agriculture and Fishery Applications

Paddy rice monitoring
Novresiandi et al, 2023

SAR-supported RS-based Application for Monitoring Rice Transplanting Periods

(a). CART
(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

**Opit pit mining mapping**

 machine learning classification process using Random Forest algorithm

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

- Avicennia officinalis
- Acrostichum aureum
- Avicennia alba
- Avicennia marina
- Avicennia officinalis
- Bruguiera gymnorrhiza
- Bruguiera parviflora
- Bruguiera sexangularis
- Ceriops tagal
- Ceriops trippia
- Exocoetia agallocha
- Nypoideae
- Rhizophora apiculata
- Rhizophora mucronata
- Rhizophora stylosa
- Sonneratia alba
- Sonneratia ovata
- Xylocarpus granatum

**Oil spill**

Hartuti et al, 2023

**Marine Debris**

Meliani et al, 2023

Mapping plastic debris in coastal area
Disaster Applications

**Probability of lava flow**

Santoso et al, 2023

**Smoke fires mapping**

Khalifah et al, 2023

All bands (16 bands) classification

**Burned areas segmentation**

Agusto et al, 2023

**Smoldering peatlands**

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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