

Innovation on Fire Danger Rating System (FDRS) Based on Integration of Internet of Things (IoT) Remote Sensing, and Machine Learning

Badan Pengkajian dan Penerapan Teknologi

(Rapid – Deployable - Network)

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The Need for Warning / Mitigation

Forest Fire

- Direct damage approach in 221T/US\$20B (1.5% PDB) [World Bank, 2015]
- Indirect : Health, Quality of Life, Relationship with neighboring counties
- Fire Danger Warning is the only way to reduce damage by managing before the fire get big

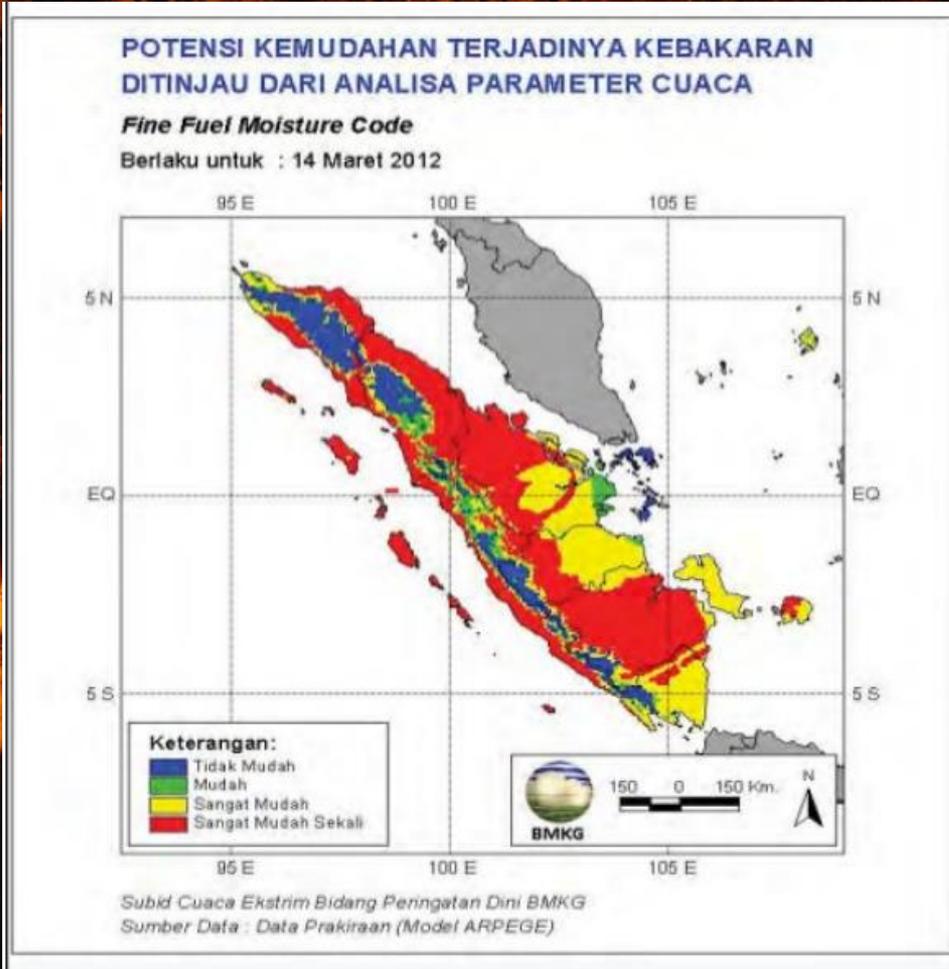
FIRE DANGER RATING SYSTEM

Forest Fire

- A system to provide warnings on impending forest / land fires
- Adopted from Canada in 2003, By BPPT, LAPAN, and BMKG

Current FDRS

- Regional Scale
- Samples at 12 - Daily updates (16:00)
- Mostly based on weather



NEEDS

- Hi-resolution (spatial and temporal) warning system
- Based on Weather and Fuel Information
- Small sensors, Many sensors
- Learn from past information

- Provincial, Daily
- Weather Only
- Large (stolen, immobile), Few
- Fixed algorithm

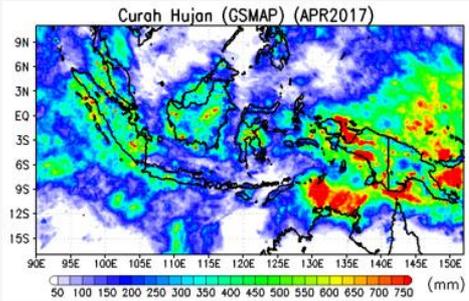


DESIGN



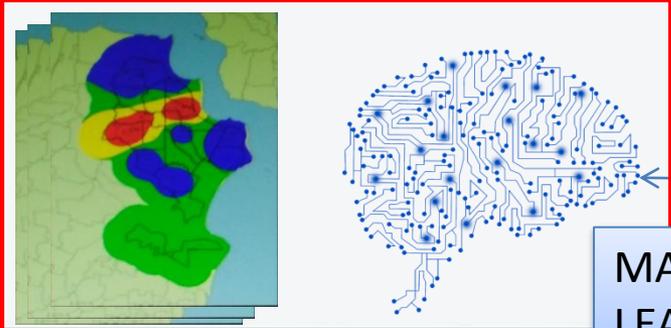
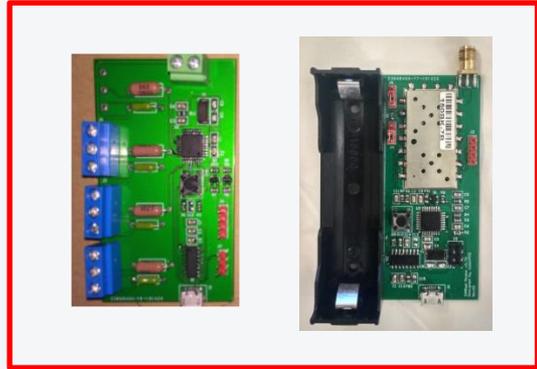
- Based on IoT network and remote sensing images
 - As regulated in Indonesia (no ISM yet)
 - Miniaturization using MEMS (Micro Electro-Mechanical Sensors)
- Distributable, as needed (during fire season)
- Integrate **Fire Weather Index (FWI)** Algorithm – Weather Based/Sensors with **Fire Behavior Prediction (FBP)** Algorithm
 - Fuel Based/Remote Sensing
- Use machine learning for updating the algorithm

SYSTEM DESIGN

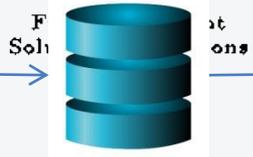
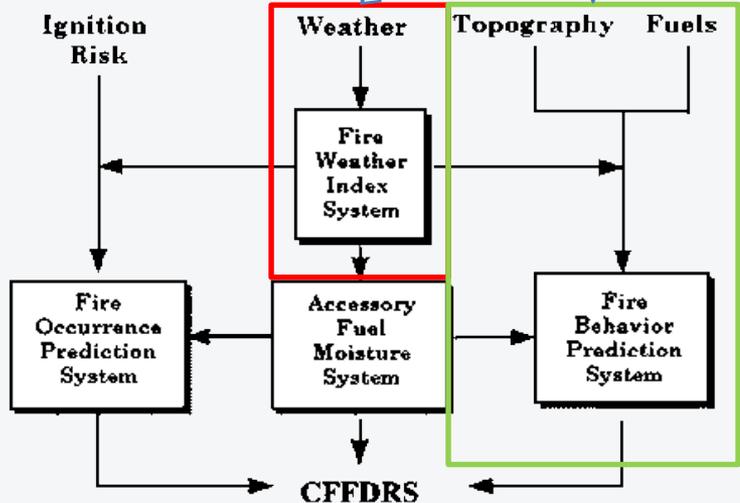


WEATHER

FUEL



MACHINE LEARNING



COLLABORATION



- Remote Sensing
 - Himawari, GSDMap, ASTER (Japan)
 - MODIS, Landsat (USA)
- Forestry
 - Burn rate, land cover
- IoT Development
 - Radio, Protocols, Embedded System, Energy Harvesting
- Big Data Hardware/Software Processing
 - Architecture, Software
- Machine Learning System
 - Algorithm Development
 - RealTime Processing

MEMBERS

NEOnet

Nusantara Earth Observation Network

BMKG

Agency for Meteorology Climatology and Geophysics

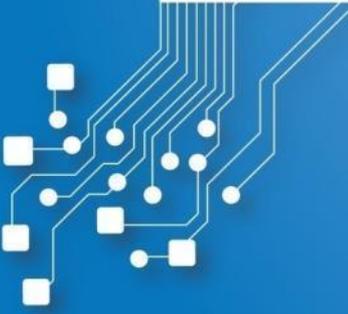
LAPAN

National Institute for Aeronautics and Aviation

PTPSW

Center of Technology for Regional Resources Development

THANK YOU



Badan Pengkajian dan Penerapan Teknologi

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