Operational Fire Danger Rating System in Indonesia

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International Workshop on
"Inventory, Modelling and Climate Impacts of Greenhouse Gas Emission (GHG's) and Aerosols in the Asian Region

Tsukuba, Japan
26-28 June 2013

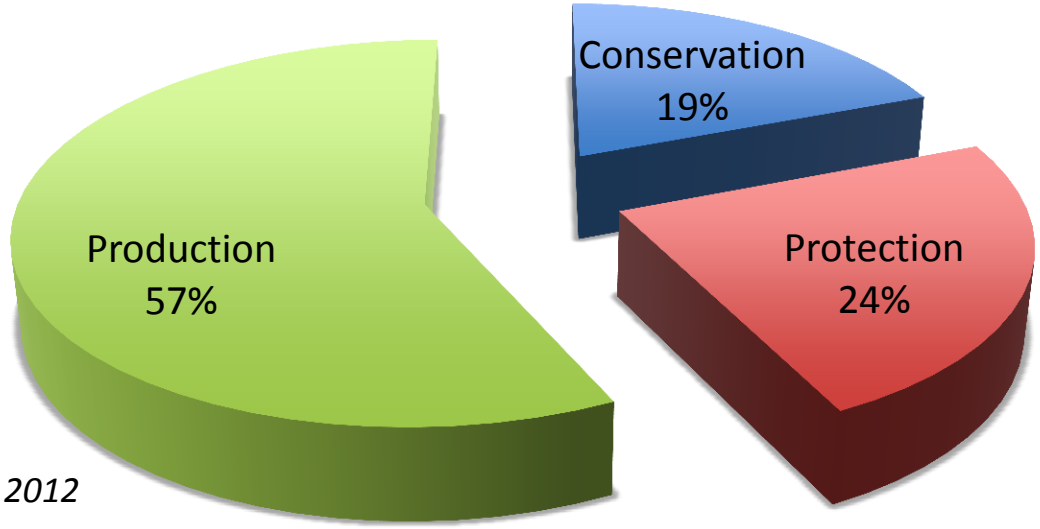
Outline

- Land and Forest Fire in Indonesia
- Hotspot Monitoring/Early Detection
- Fire Danger Rating System/Early Warning System
- Fire Information Dissemination
- Fire Controlling
- Remarks

Land and Forest Fire in Indonesia

Forest Area based on Function (ha)

Conservation	Protection	Production	Total
26,127,409	32,211,209	77,832,507	136,171,126



Ministry of Forestry, 2012

- Land and forest fires in Indonesia has become an almost repetitive annual phenomenon, especially in the long dry season with significant drought.
- Since 1997 until today, the indicators that have been used by MoFr in monitoring forest fires are hotspots as obtained by satellite NOAA-AVHRR *(National Oceanic and Atmospheric Administration-Advanced Very High Resolution Radiometer)*.
- However, since 2008, hotspots monitoring are also obtained by satellite Aqua and Terra, which have instrument called MODIS *(Moderate Resolution Imaging Spectroradiometer)*.

Loss from Land & Forest Fire in Indonesia

Year	Loss (x 1,000 ha)	Cost (US $ x Billion)
1982/1983	3,600	9.04
1987	66	NA
1991	500	0.17
1994	5,110	15,00
1997/1998	10 - 11,000	17,00
2006	8,000	NA

ADB, 2009; Saharjo, 2012

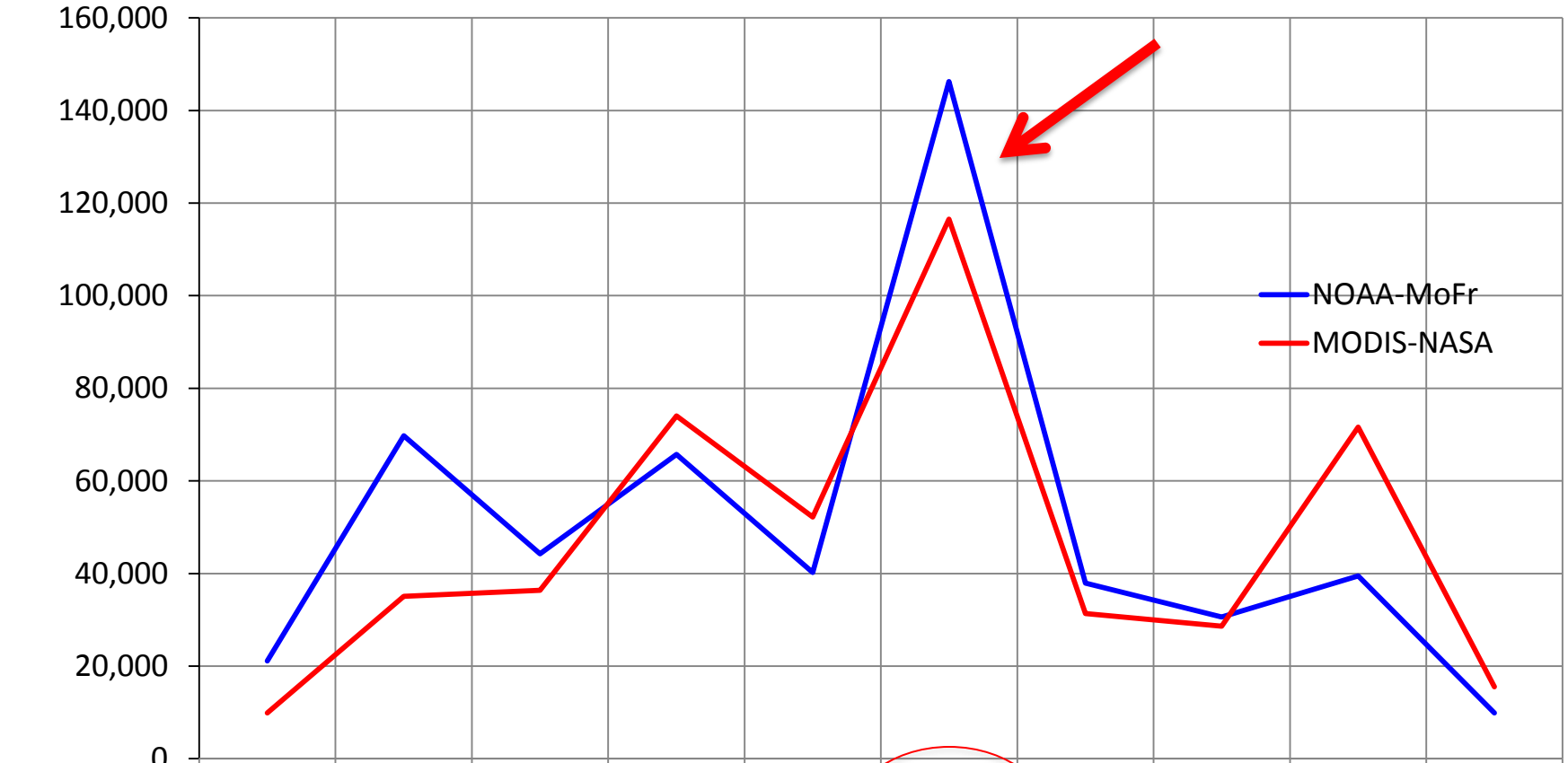
Land Fire, Riau, Sumatra, June 2013

Hotspot Monitoring/Early Detection

Indicators hotspot as well as a key indicator in determining the policy of forest fires in Indonesia are used in :

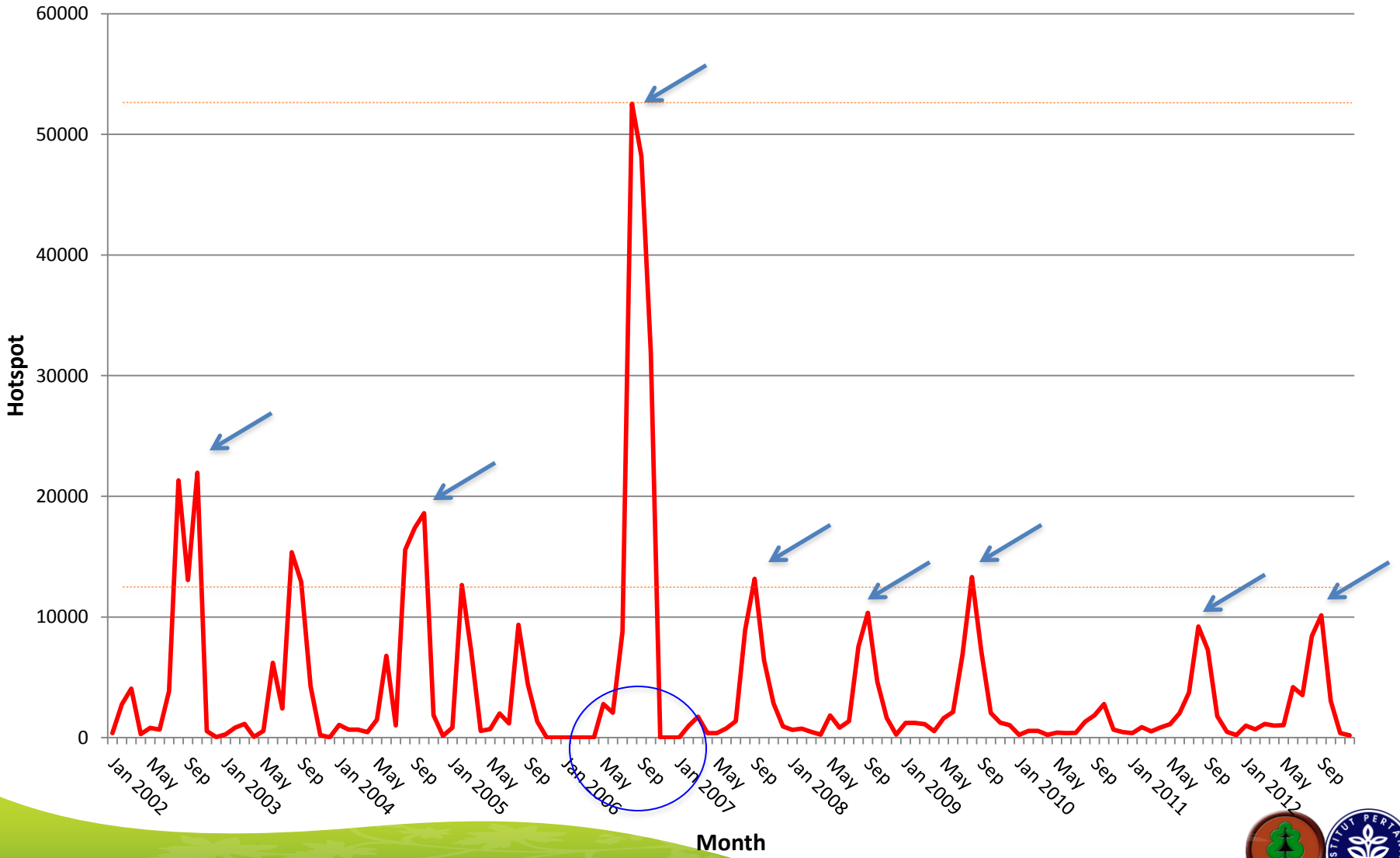
- Formulating forest fire control activities (incl: prevention, suppression and handling of impact)
- Determining areas prone to land and forest fires,
- The political determination of the budget,
- Institutional determination (national, provincial and district/city)
- Main performance indicator of Ministry of Forestry which is reported regularly to the Presidential Working Unit for Supervision and Management of Development (UKP4) for 2009-2014.

Cumulative Hotspot in Indonesia (2001-2012)

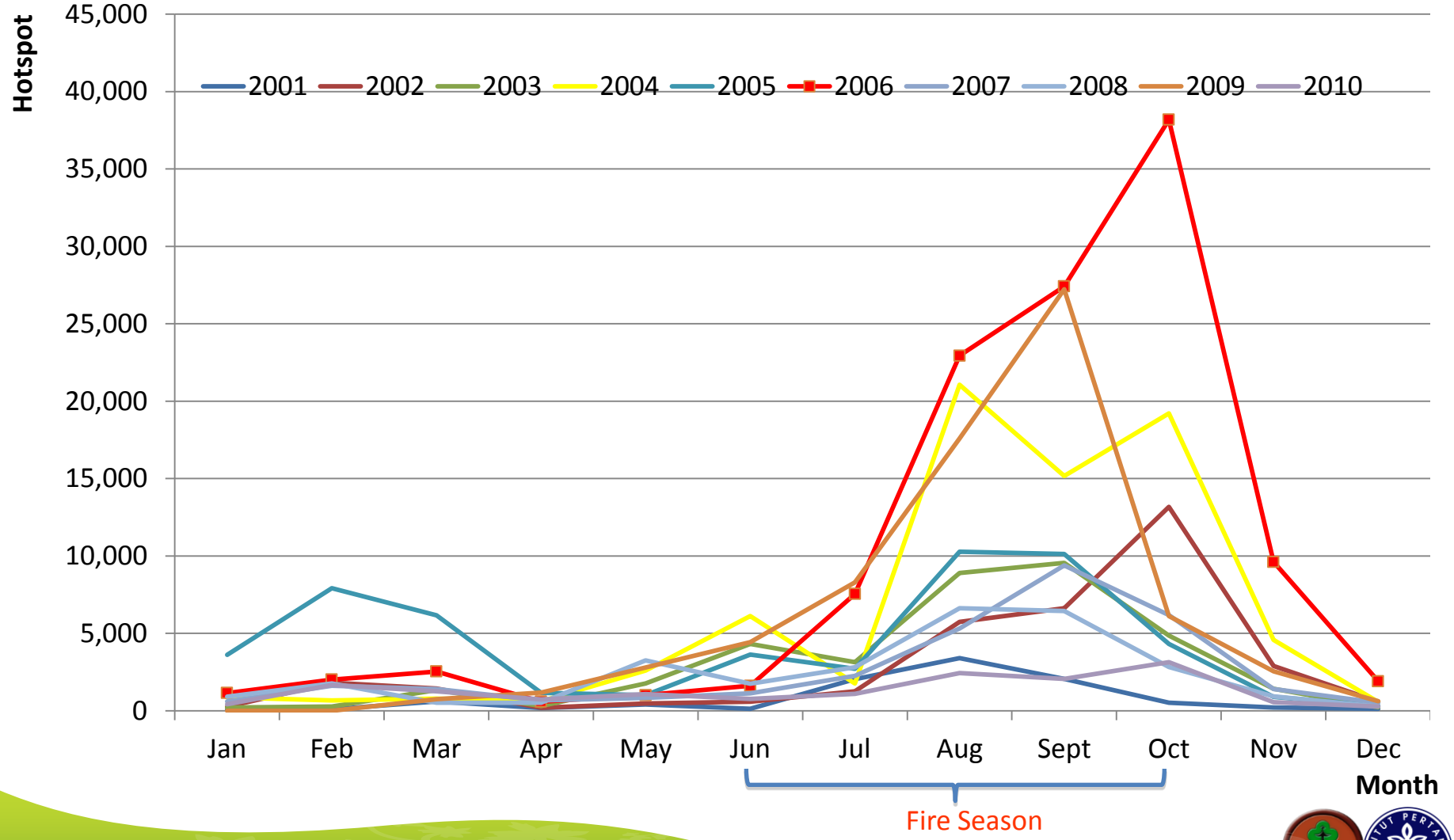


	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
NOAA-MoFr	21137	69765	44262	65693	40197	146264	37909	30616	39463	9880
MODIS-NASA	9882	35087	36375	74039	52201	116545	31340	28640	71589	15525

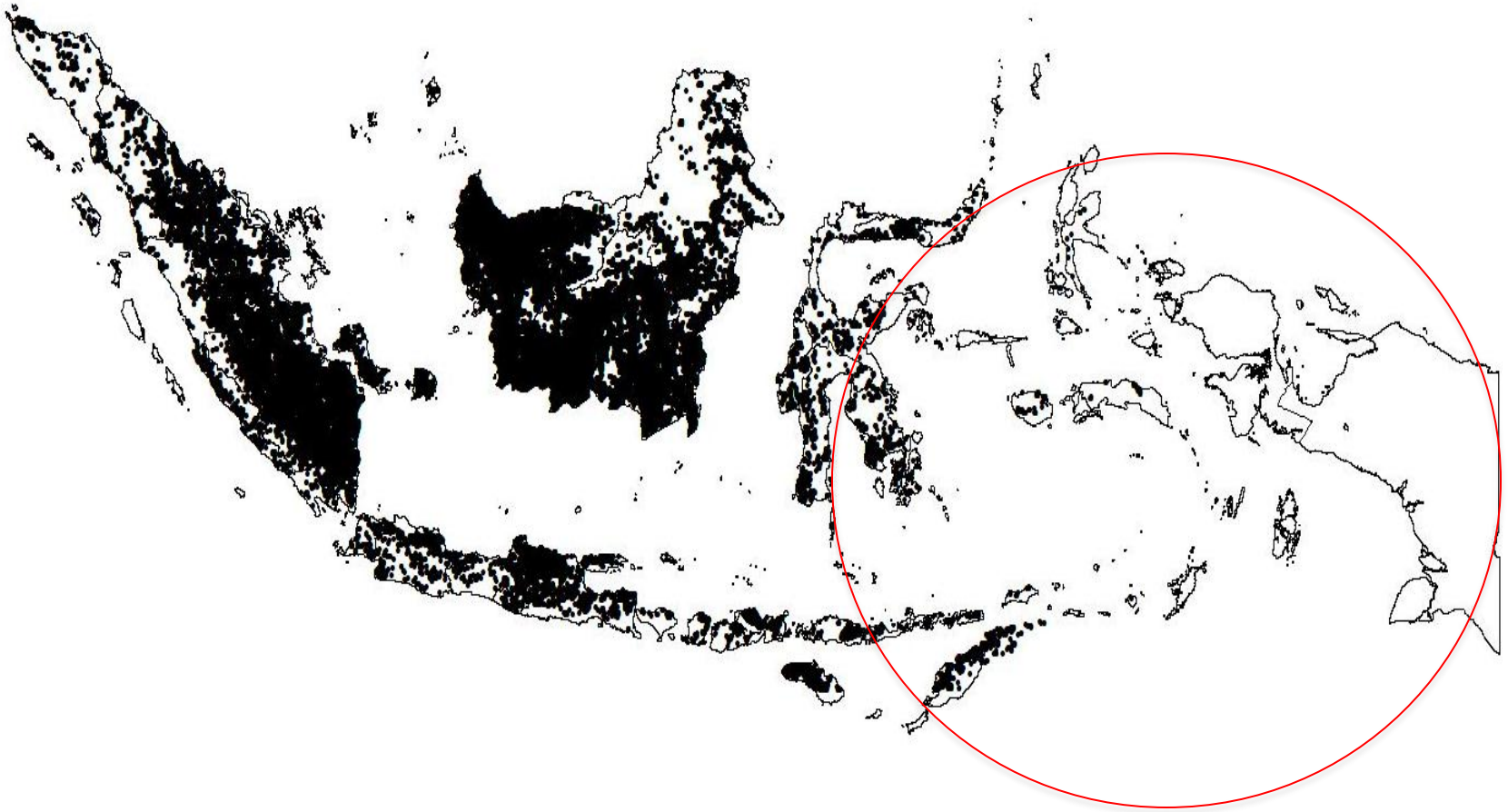
Hotspot Pattern in Indonesia year of 2002-2012



Hotspot Distribution in Indonesia year of 2001-2010

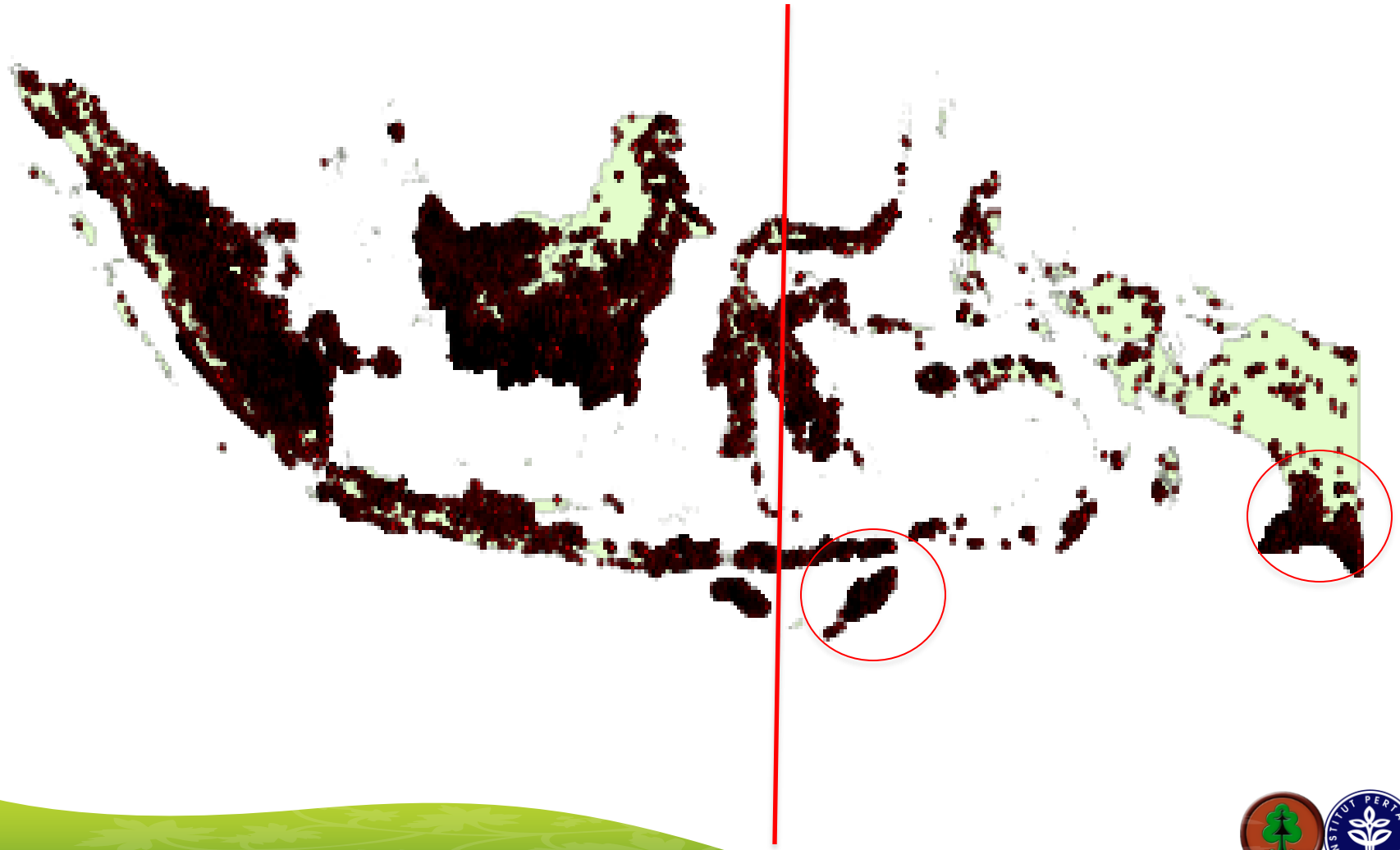


NOAA-FHS year of 2006 in Indonesia

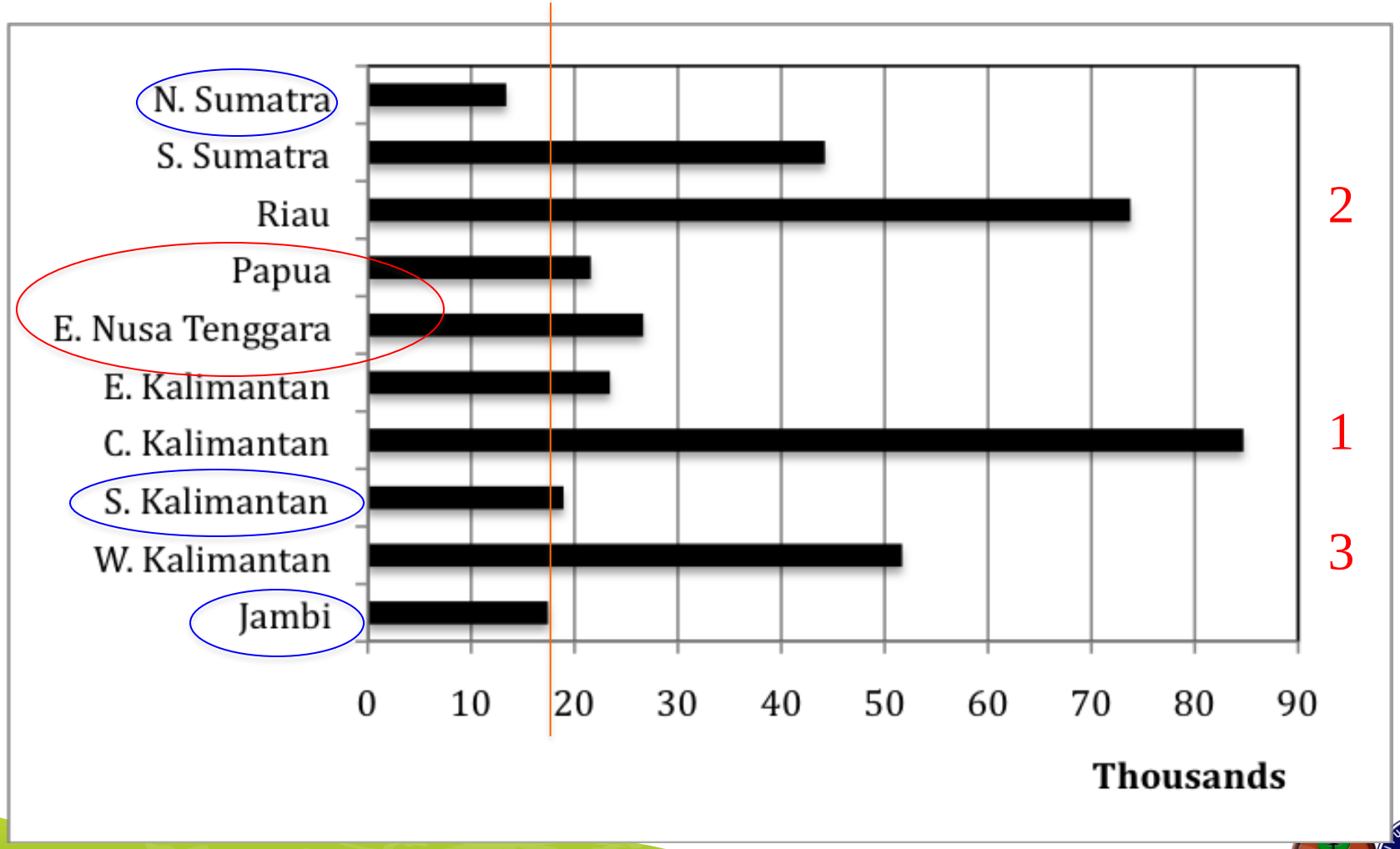


No coverage

MODIS-FHS year of 2006 in Indonesia



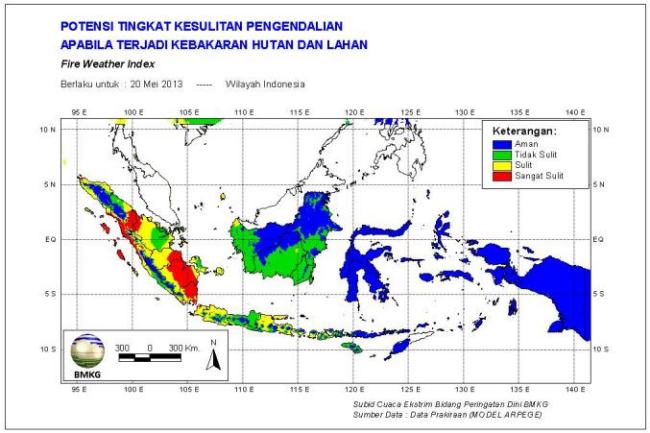
FHS MODIS year of 2001 – 2010 at fire prone province



Fire Danger Rating/Early Warning System

- Evaluation of (meteorological) factors that influence fire danger
- A system for fire danger rating to evaluate the fire environment on regular intervals and in objective way.
- Provides information and guidelines for fire management

Early Warning



Concept:

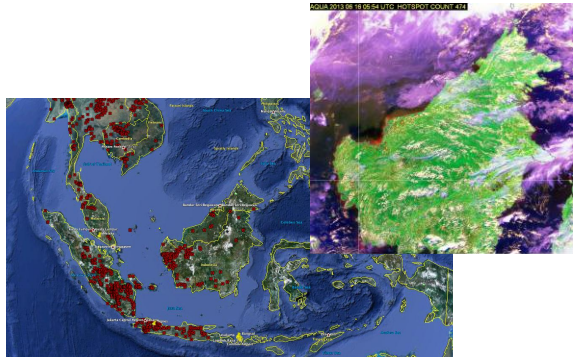
1. Daily weather data to estimate phisycal condition (water content of fuel).
2. Fuel information – land cover
3. A correlation model of weather and field condition.

Usage:

To identify potential area to control activities.

Complementary

Early Detection



Concept:

Satellite surveillance based on surface temperature.

Usage:

To identify burnt area for suppression purpose.

FDRS BASIC CONCEPT

Weather

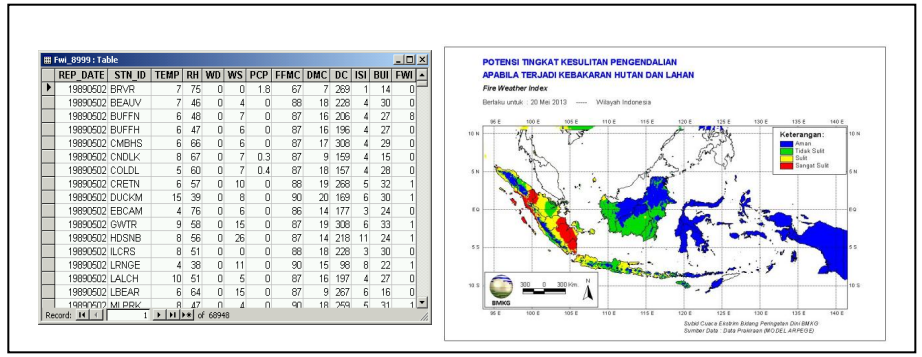
Temperature

Humidity

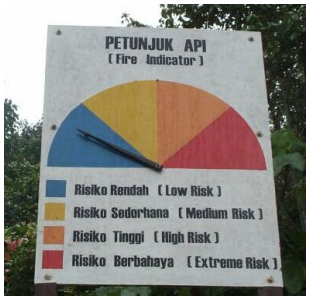
Wind Speed

Rain Fall

Fuel



FIRE DANGER

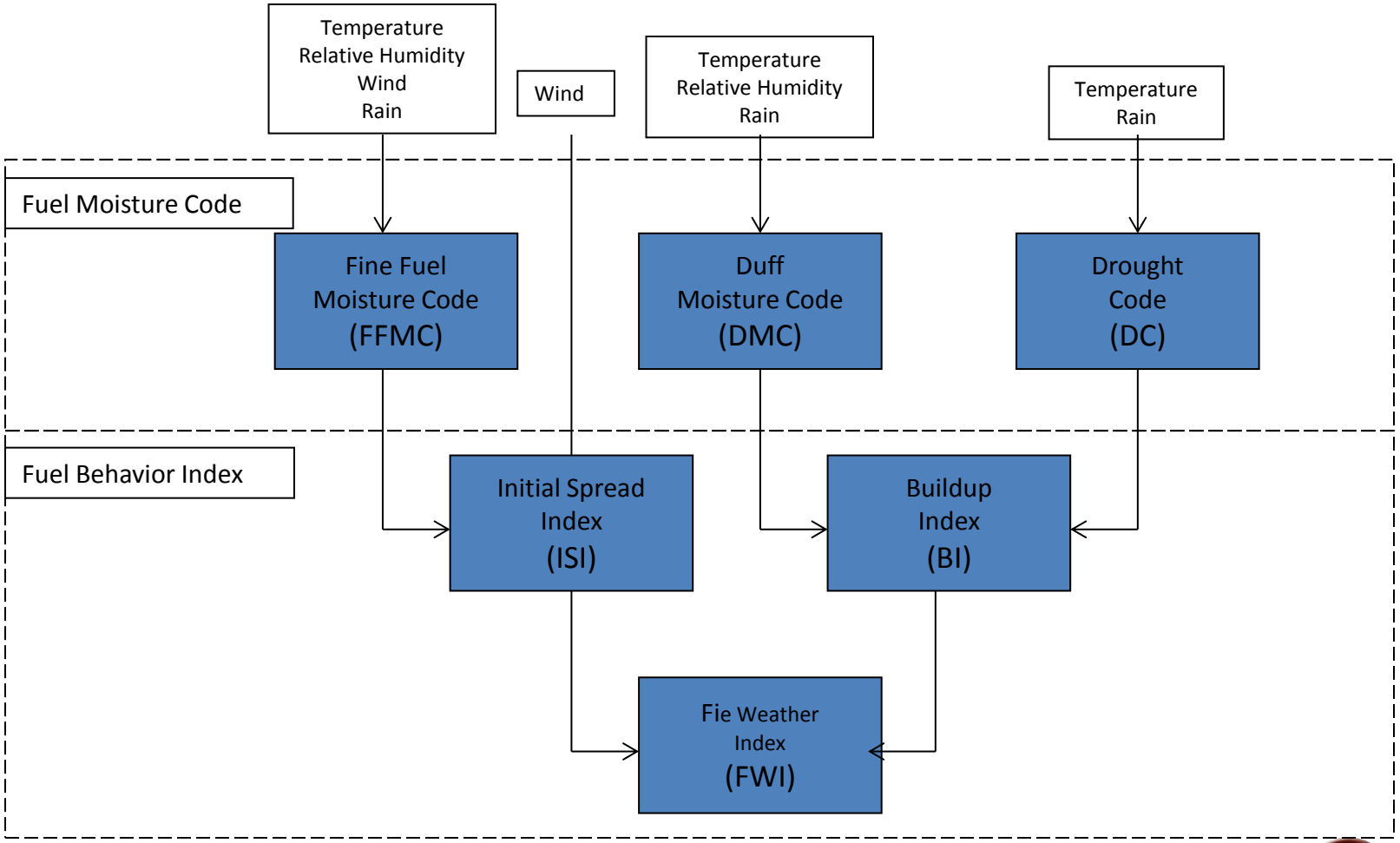


- Low
- Moderate
- High
- Extreme

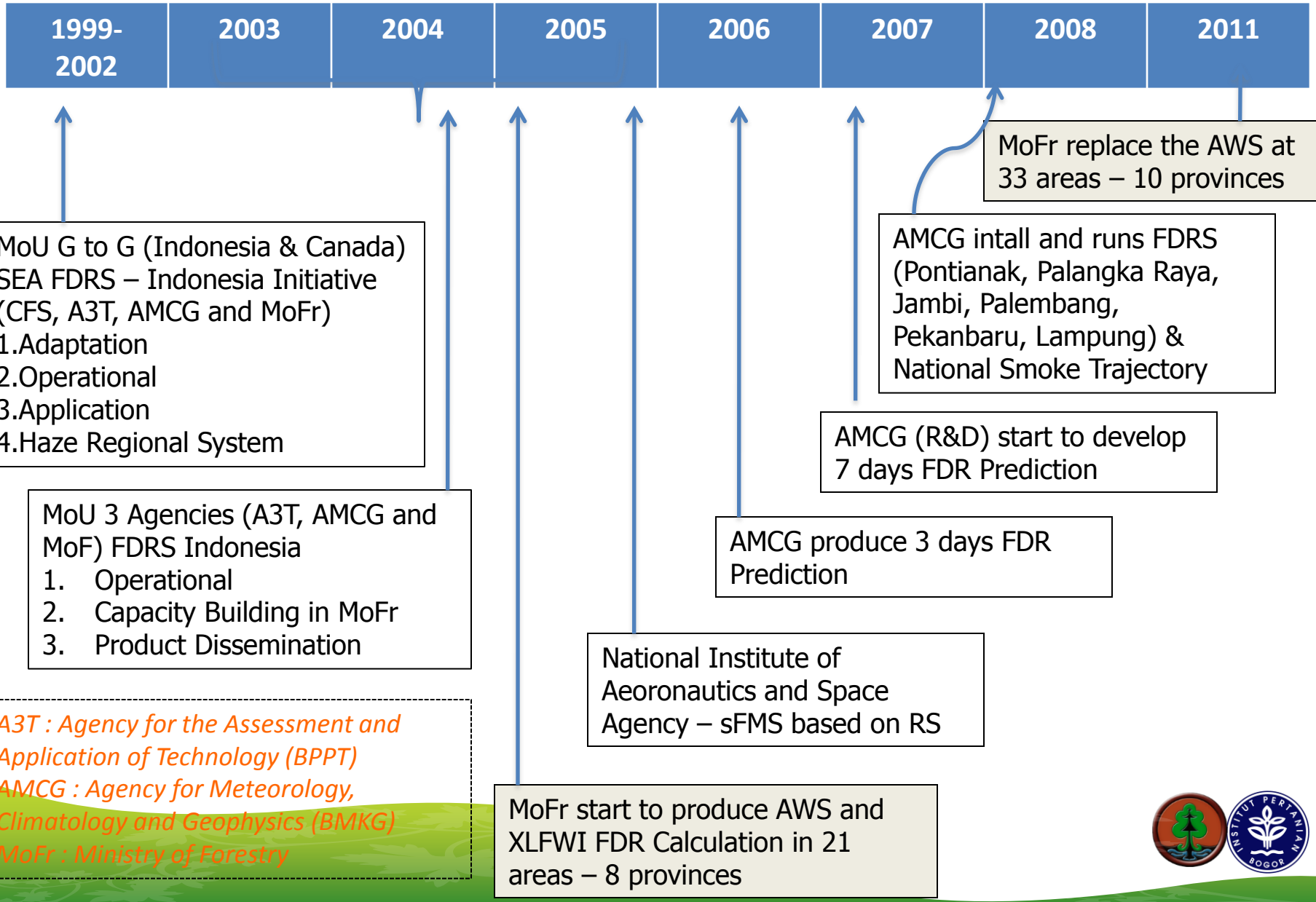
Fire Behaviour Prediction/ FBP

Fire Weather Index/FWI

Fire Danger Rating System Structure



Implementation



Development

Institutions:

– Agency for Meteorology Climatology and Geophysics (BMKG)

– National Institute of Aeronautics and Space (LAPAN)

– Ministry of Forestry (MoFr)

– Agency for Assessment and Application of Technology (BPPT)

– Canadian Forest Service (CFS)

Pilot project areas:

– Riau Province

– West Kalimantan Province

FDRS Operation

Information providers:

– BMKG (since February 2002) → weather station based, spatial information

– LAPAN (since 2005) → satellite remote sensing-based, spatial information

– Ministry of Forestry (since 2005) → Single weather station based- ExcelFWI Calculation (33 Operation areas for 10 Provinces)

Users:

– Ministry of Forestry

– Ministry of Environment

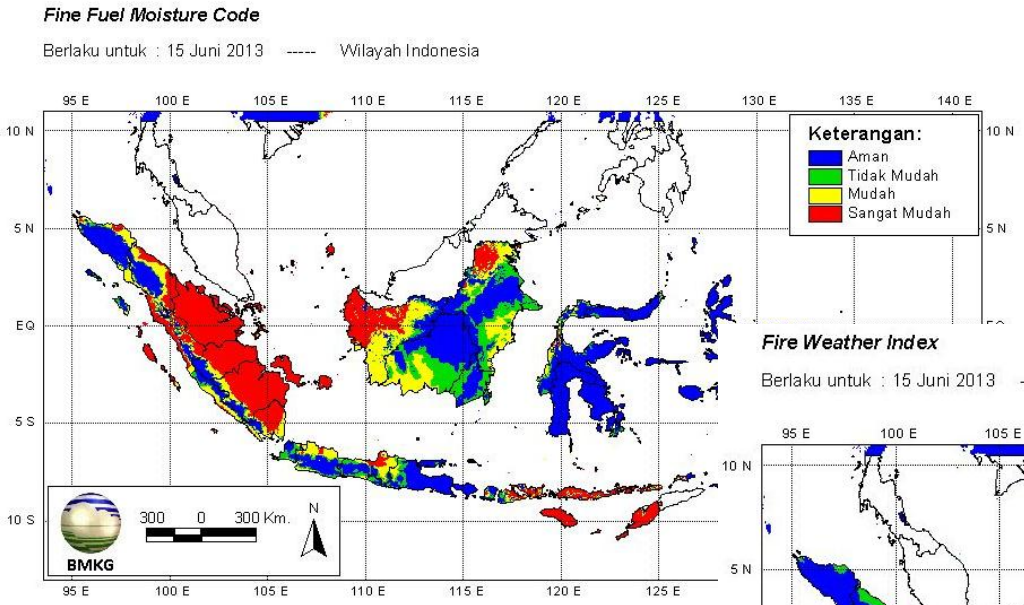
– Disaster Management Agency

– ASEAN Secretariat

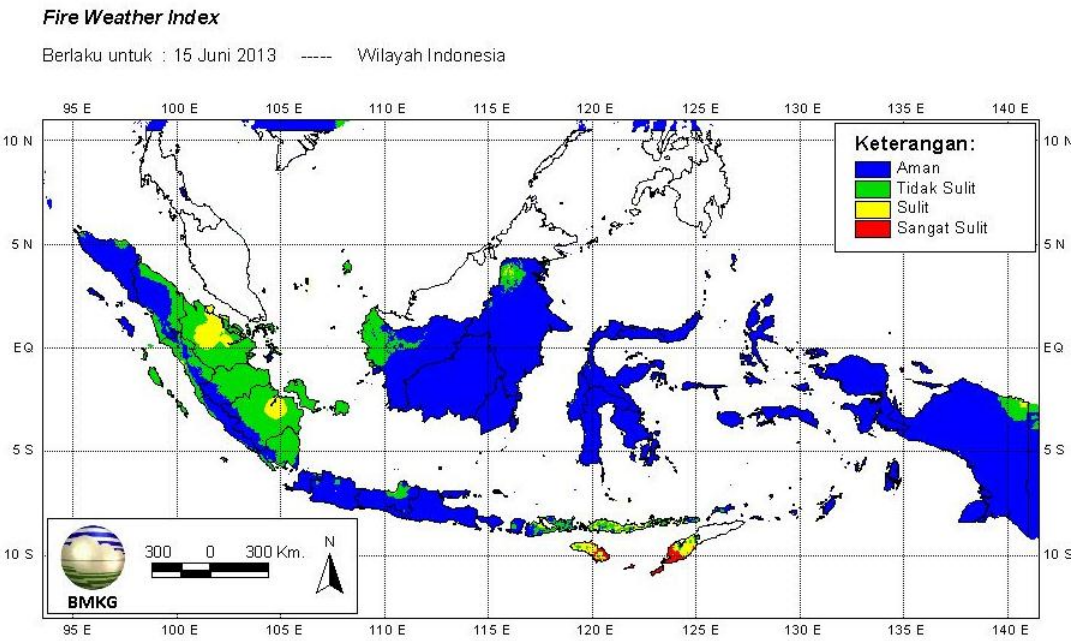
– NGOs

– Universities

National FDRS – operated by BMKG

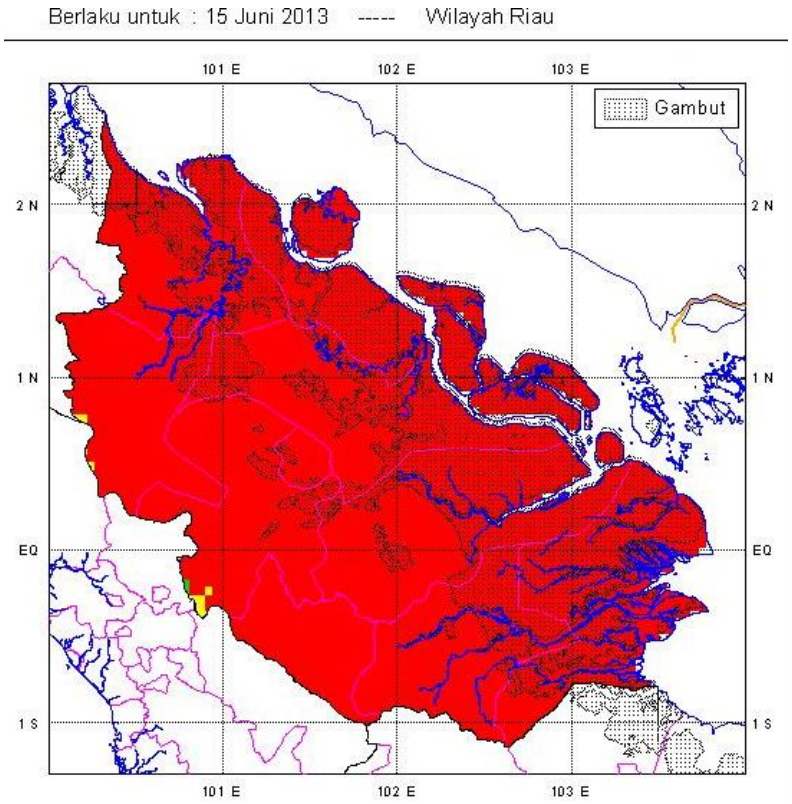


FFMC - Indonesia

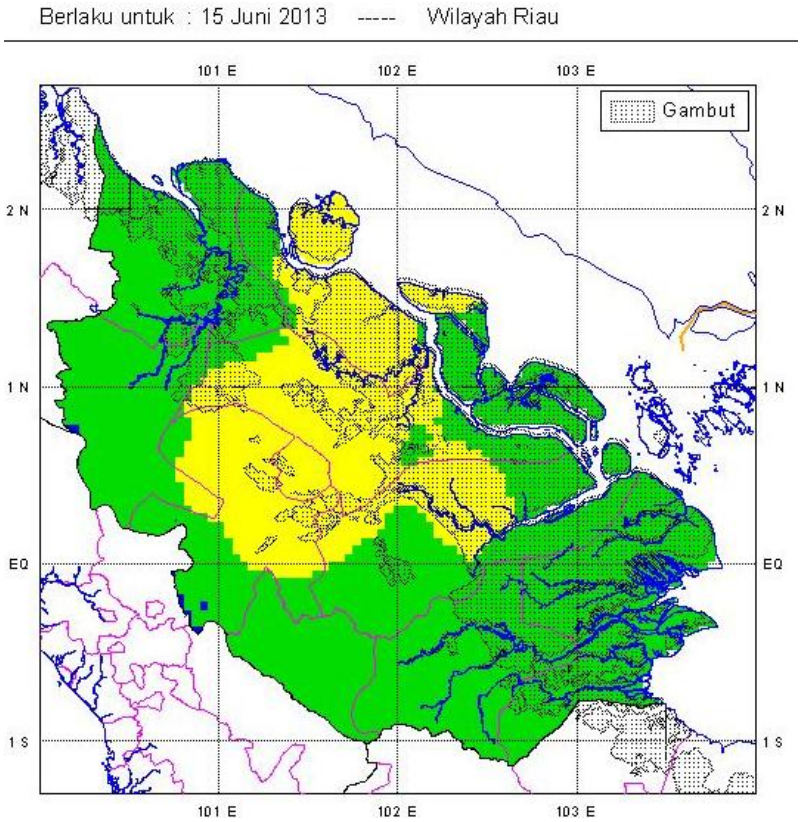


FWI - Indonesia

Provincial FDRS – operated by BMKG



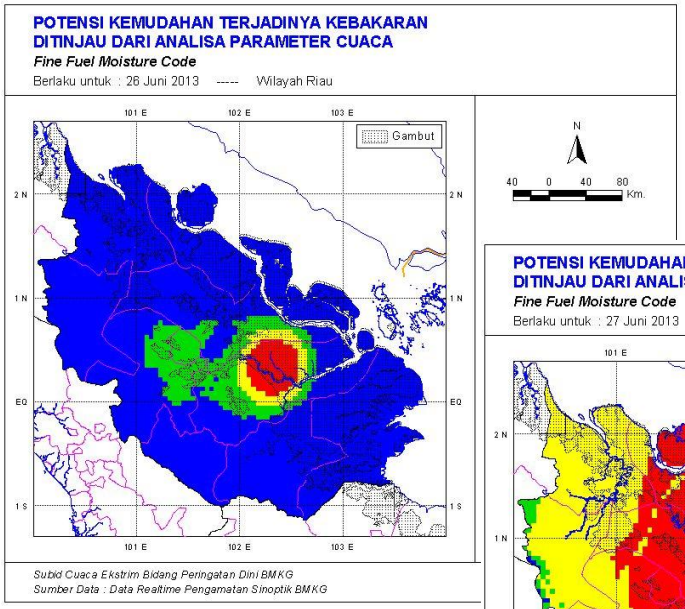
FFMC – Riau, Sumatera (15 June 2013)



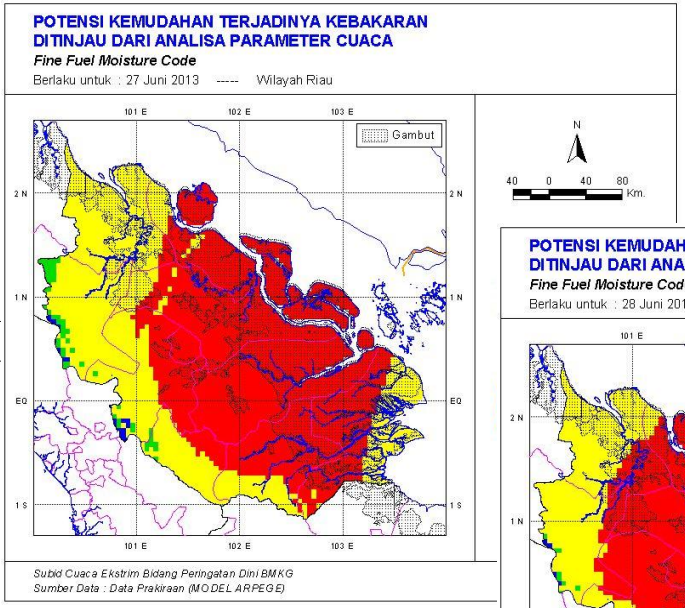
FWI Riau, Sumatera (15 June 2013)

3 days FDRS

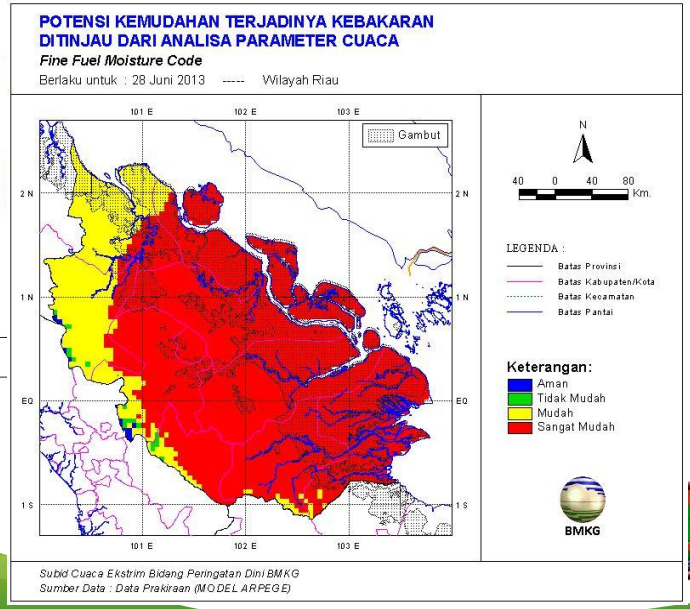
FFMC - 26 June 2013



FFMC - 27 June 2013

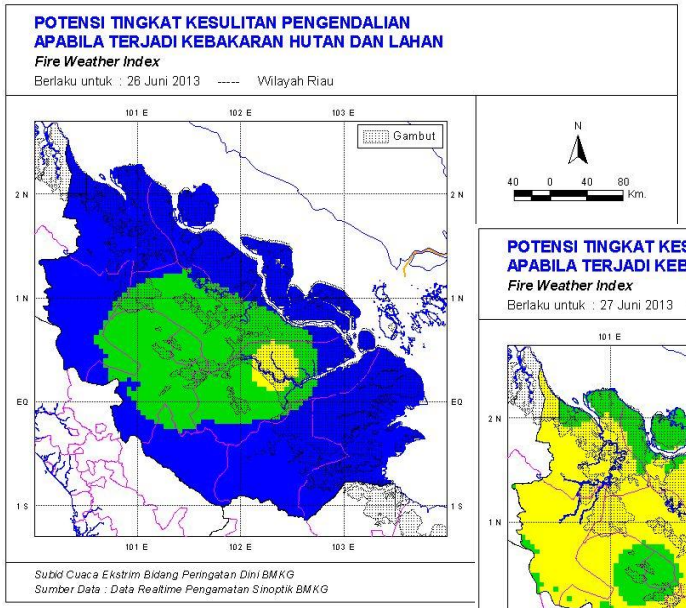


FFMC - 28 June 2013

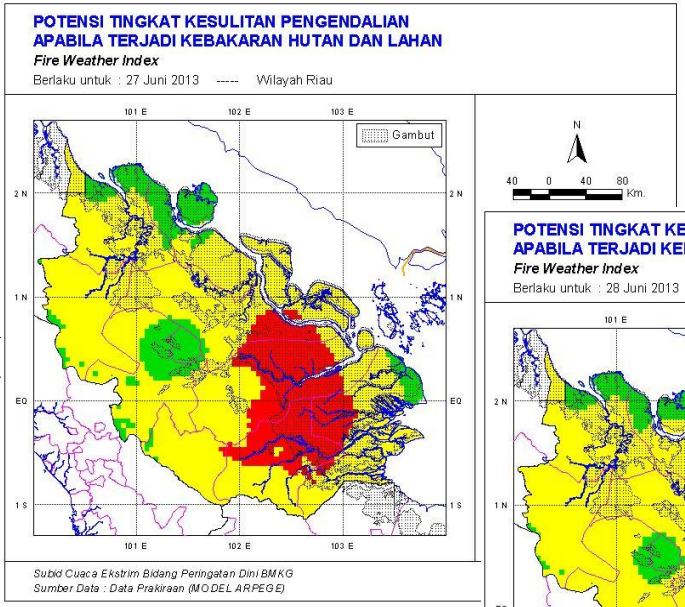


3 days FDRS

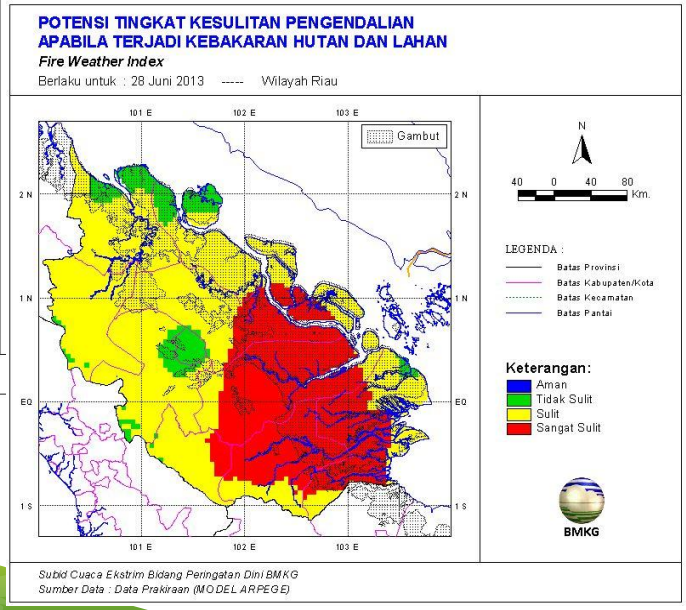
FWI - 26 June 2013



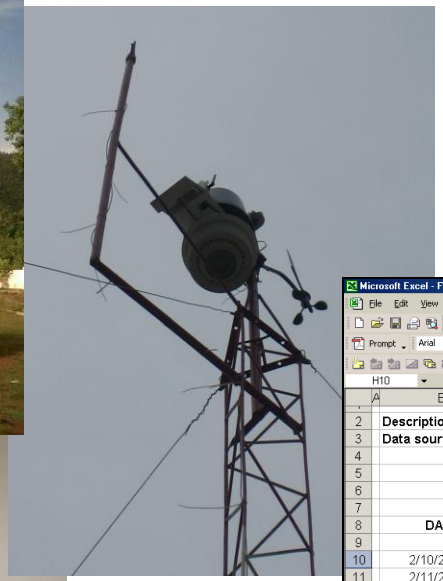
FWI - 27 June 2013



FWI - 28 June 2013



District/Sub-District FDRS – operated by MoFr



Microsoft Excel - FWI Examples_G_Result_CLASS_FD

=FFMC(C10,D10,E10,F10,H9)

2	Description:	10 Feb 2002 - 26 Jan 2003 FWI data calculated for Pekanbaru - Riau										Station Information	
3	Data source:	CMSS realtime data - BMG										Name	Peka
4												WMO Number	
5												Latitude	
6									Estimated startup values			Longitude	
7		Input Weather Data				Calculated FWI Data							
8	DATE	TEMP	RH	WIND	RAIN	FFMC	DMC	DC	ISI	BUI	FWI	FFMC CLASS	DC
9						85.0	6.0	15.0					
10	2/10/2002 12:00	28.2	70.8	0.5	0.0	85.0	7.4	19.8	2.2	7.6	1.5	EKSTRIM	RE
11	2/11/2002 12:00	31.0	60.9	10.9	0.0	87.0	9.4	25.1	4.8	9.7	5.1	EKSTRIM	RE
12	2/12/2002 12:00	31.0	62.2	7.7	0.0	87.1	11.3	30.3	4.1	11.7	4.9	EKSTRIM	RE
13	2/13/2002 12:00	29.5	68.9	5.3	0.3	87.1	12.8	35.3	3.7	13.4	4.7	EKSTRIM	RE
14	2/14/2002 12:00	29.5	68.9	5.3	0.3	87.2	14.3	40.3	3.7	15.2	5.1	EKSTRIM	RE
15	2/15/2002 12:00	26.8	68.9	0.0	0.0	86.9	15.7	44.9	2.7	16.7	3.9	EKSTRIM	RE
16	2/16/2002 12:00	30.6	65.4	8.5	0.0	86.9	17.4	50.1	4.2	18.6	6.5	EKSTRIM	RE
17	2/17/2002 12:00	26.8	65.9	0.0	0.0	87.0	18.9	54.6	2.8	20.3	4.6	EKSTRIM	RE
18	2/18/2002 12:00	30.4	64.3	2.8	0.3	87.0	20.7	59.8	3.2	22.2	5.6	EKSTRIM	RE
19	2/19/2002 12:00	30.4	65.9	6.0	0.0	87.1	22.4	64.9	3.8	24.1	6.9	EKSTRIM	RE
20	2/20/2002 12:00	28.3	72.1	3.4	0.6	84.7	23.7	69.7	2.4	25.7	4.6	EKSTRIM	RE
21	2/21/2002 12:00	29.1	74.2	3.0	17.0	49.0	11.2	45.7	0.2	13.9	0.1	SEDANG	RE
22	2/22/2002 12:00	29.8	70.6	0.0	0.1	65.6	12.6	50.7	0.5	15.6	0.4	SEDANG	RE
23	2/23/2002 12:00	26.8	85.5	1.8	0.2	72.1	13.3	55.3	0.7	16.6	0.6	TINGGI	RE
24	2/24/2002 12:00	30.0	64.0	0.0	3.0	62.0	11.4	57.6	0.5	15.3	0.4	SEDANG	RE

PNFI Validation FWI Data | PEKANBARU 2002-2003 FWI Data | PEKANBARU FWI BULANAN | PEKANBARU 2002-2003 Analysi

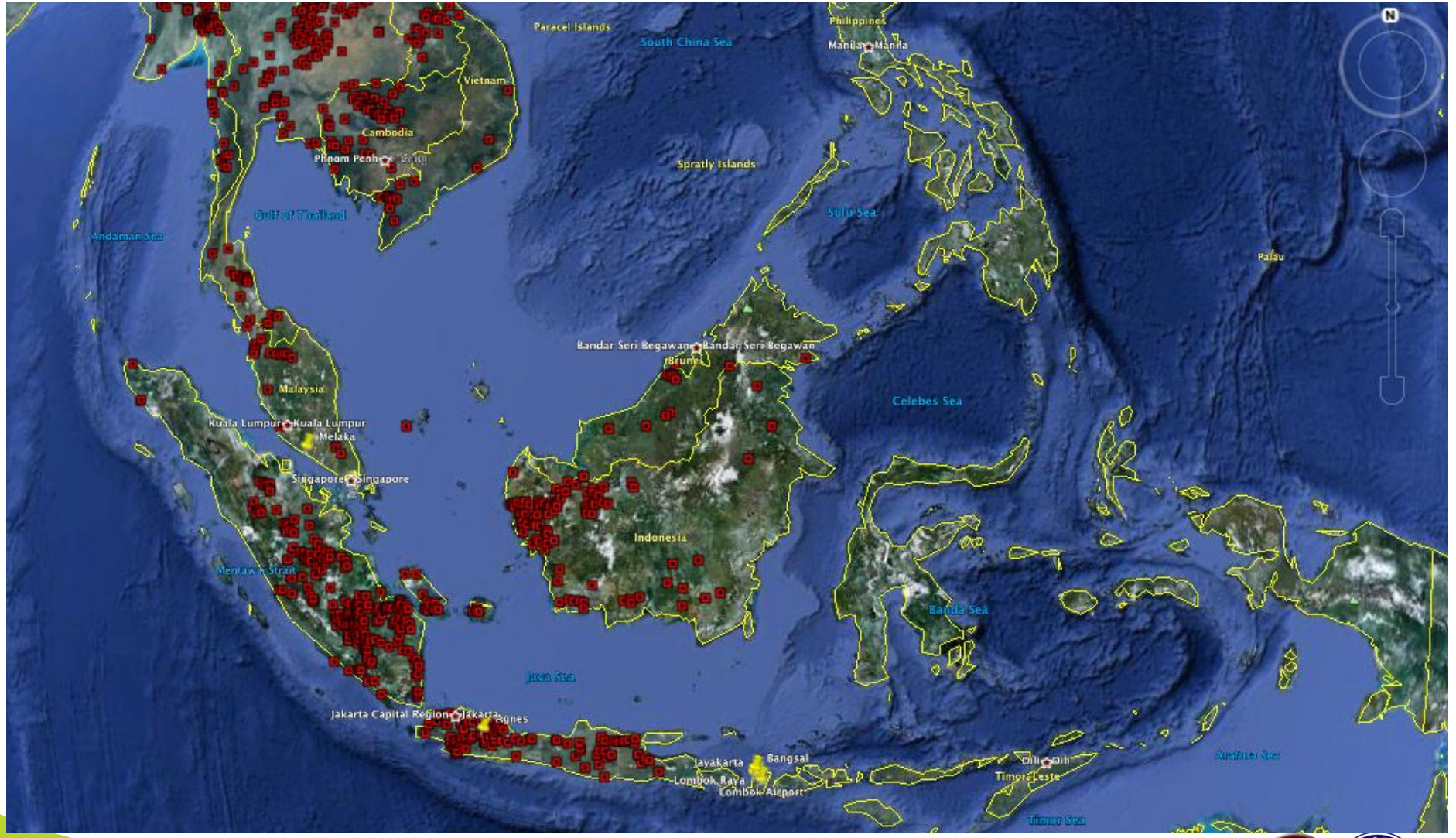
Ready Sum=123.5 NUM

Fire Information Dissemination

Mailing list sipongi
Founded Sept 4, 2001

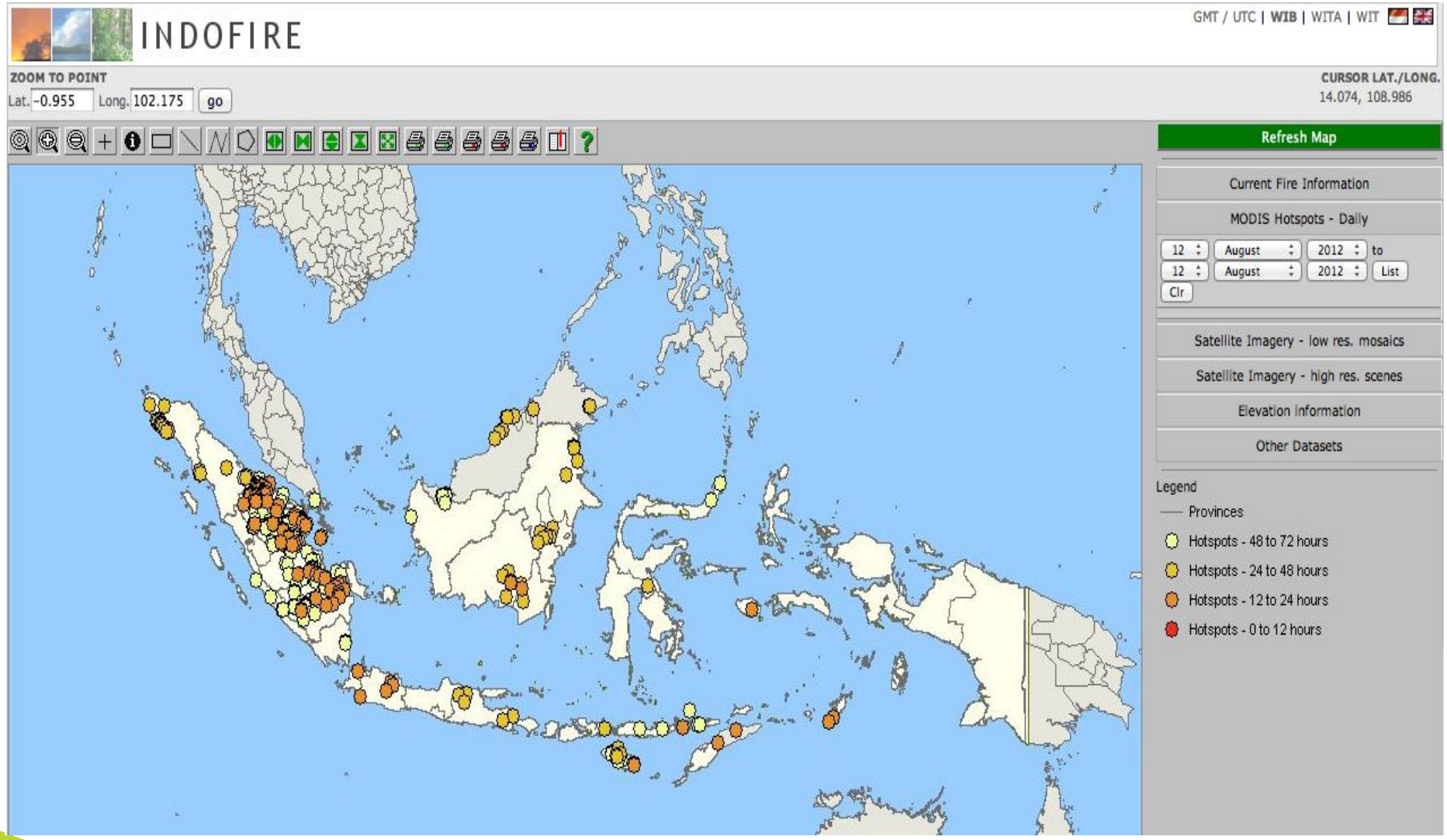
Member as of June 2013 : 1,005 subscribers.
Incl. fire fighters, policy maker district & provincial agency, ministry of environment, agriculture, internal affair, local & int'l NGOs, universities, etc.

NOAA-FHS Dissemination



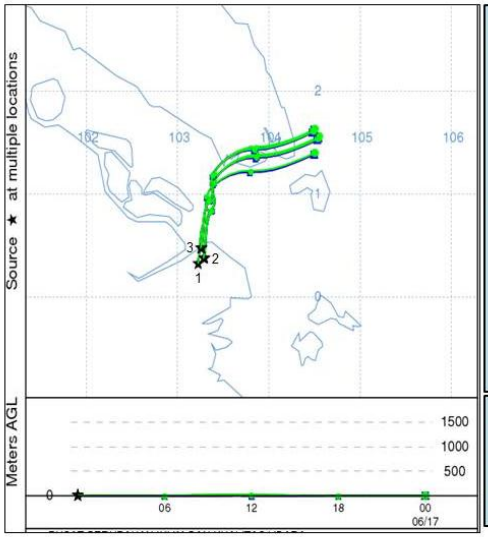
www.indofire.org/www.dephut.go.id

MODIS-FHS Dissemination



http://indofire.landgate.wa.gov.au/indofire.asp.

Haze Trajectory in Riau, Sumatra (18-19 June 2013)

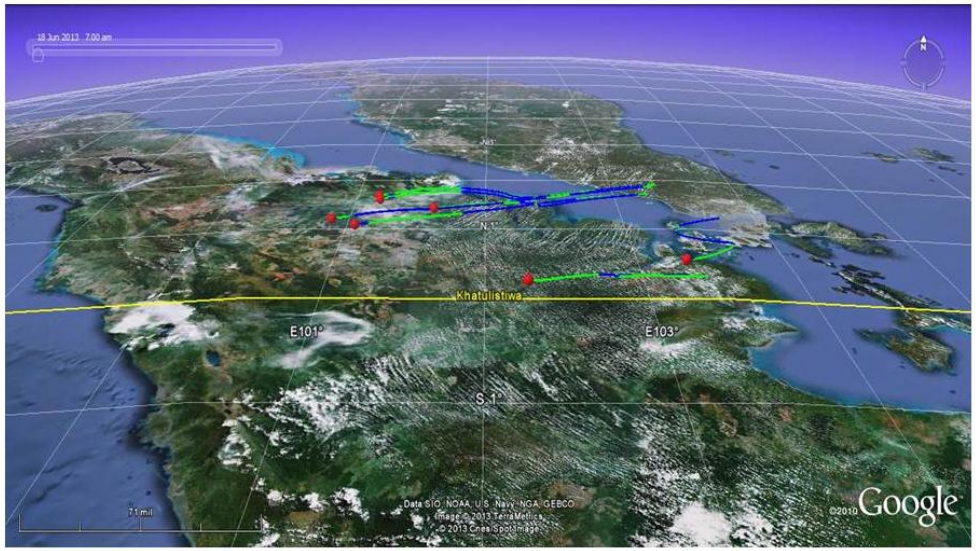


Keterangan:

- **Trajectory Asap Kebakaran Hutan Pada Ketinggian:**
  - ➢ = 10 m (Pepohonan)
  - ➢ = 1 m (Semak belukar)
  - ➢ = 0 m (Permukaan tanah/ Gambut)
- **Lokasi Kebakaran :**
  1. **Kec. Kuala Kampar**
  2. **Kec. Teluk Baleng**
  3. **Kec. Pulau Burung**

Pada Level Ketinggian tersebut:
Trajectory massa Kebakaran Hutan bergerak ke arah Timur Laut.

Sumber: BMKG-NOAA Hysplit Model



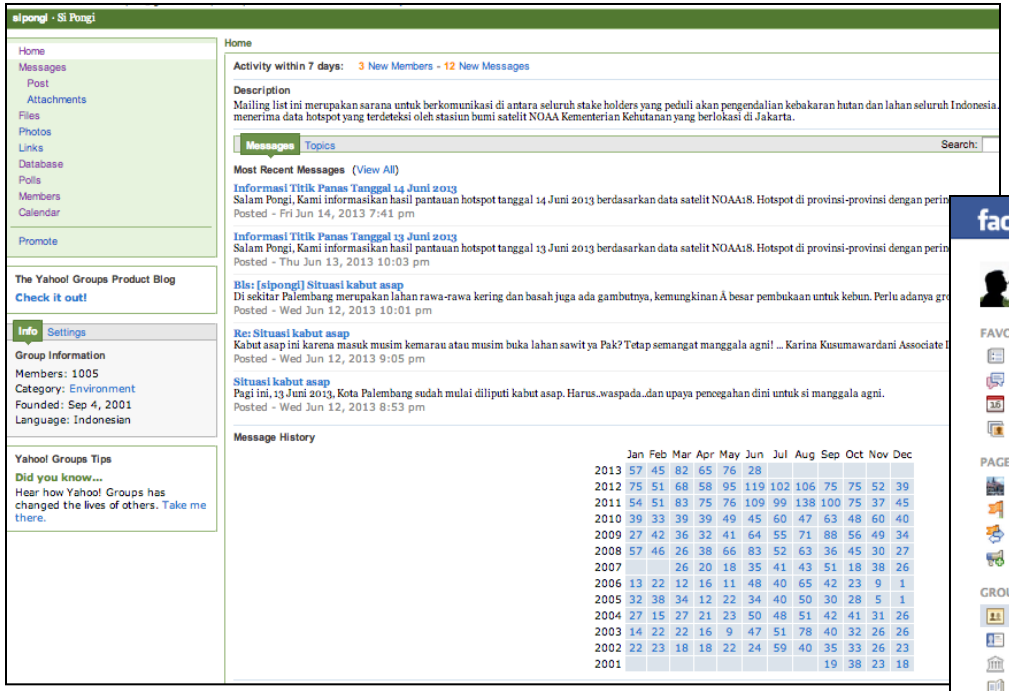
Sumber: BMKG-NOAA Hysplit Model 10 m 1 m 0 m (Permukaan tanah/ Gambut)

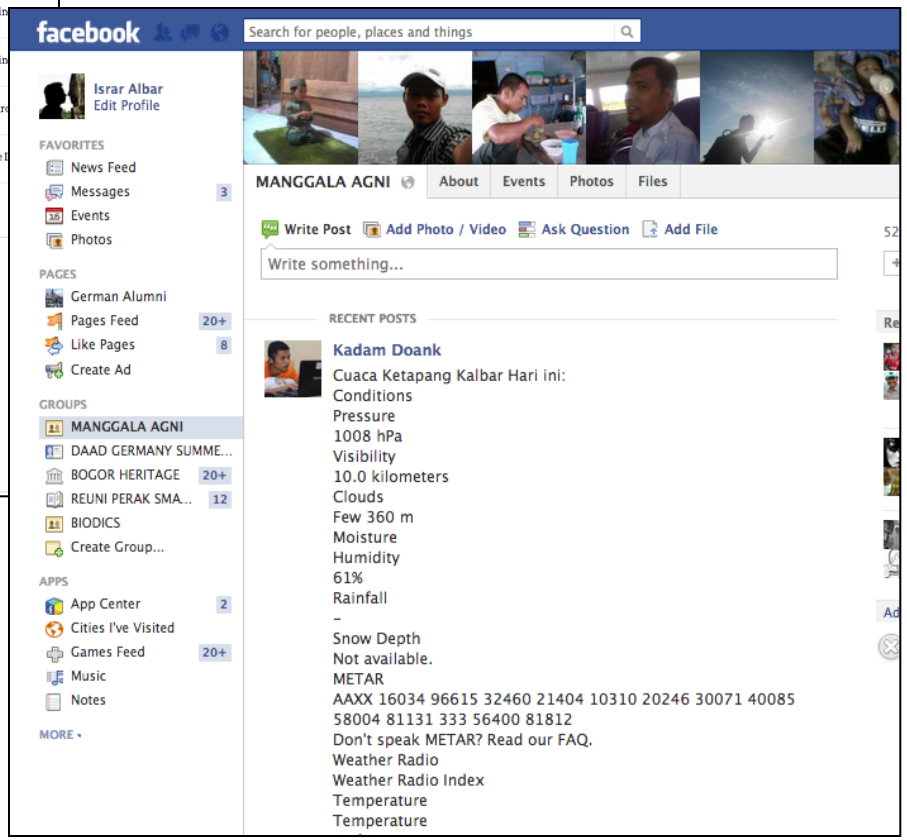
Social Media

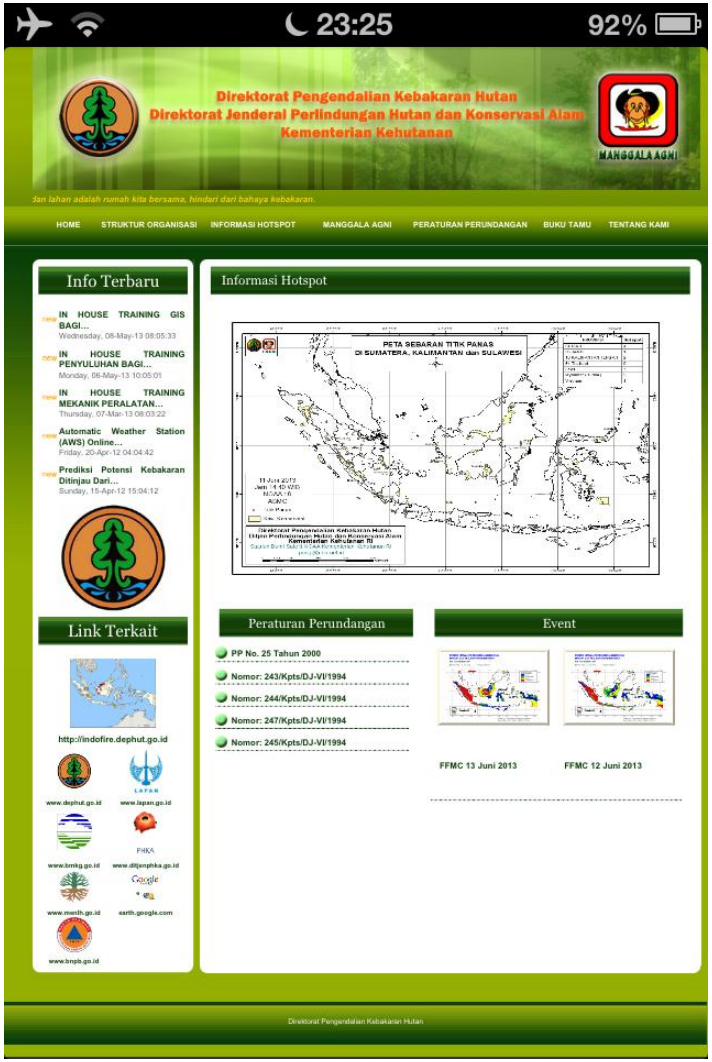
Facebook, twitter, BBGroup, WhatsAppGroup, WeChat, Line, etc.

Advantage : Smartphone/tablet (iOS, Android, Blackberry) supported by 3G operator (Telkomsel, Indosat, XL) become familiar with low cost charge in local/sub-district.

Mailing List & Social Media



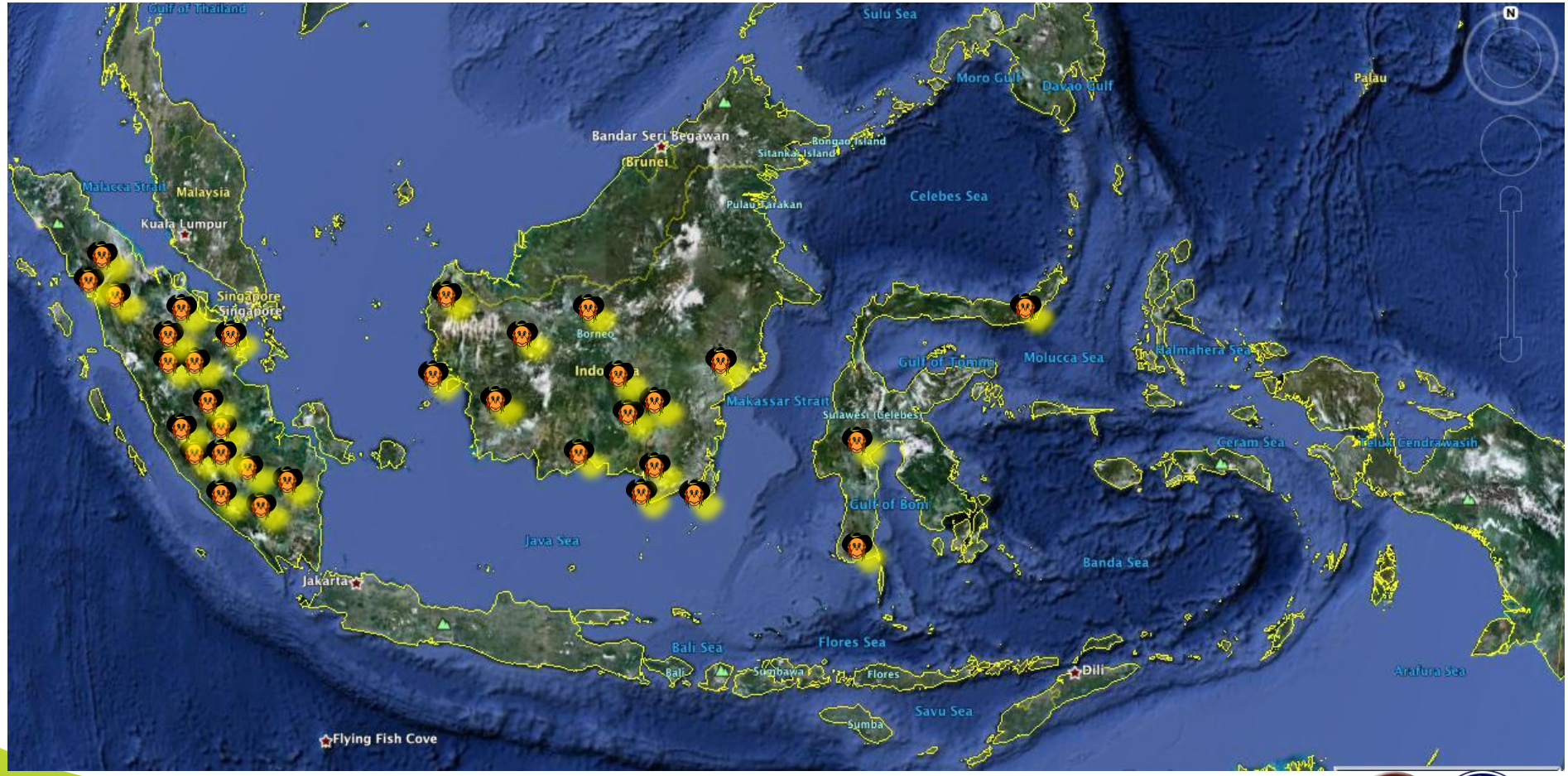




Hotspot access from Smartphone

FDRS access from Tablet

Fire Controlling



- Offices of Fire Brigades: Manggala Agni

Fire Controlling

- Prevention
- Suppression
- Handling of Impact

Manggala Agni : 1.845 (as of June 2013)

Community Care Fire : 7.308 (as of June 2013)

Fire in Rengat, Riau, Feb 2013

Nozzle-stick with holes for Peat fire

Remarks

- Weather stations distributed uniformly across the fire prone area could support land/forest fire monitoring.
- Difficulty in keeping inputs for FDRS consistent → technical problems such as weather data communication, data format, weather observation instrument, AWS sensors problem, etc.
- Need adjustment for fuel type - FBP
- Public are more familiar with FDRS information

Thank you

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NIES JAPAN

財団法人 地球・人間環境フォーラム
GLOBAL ENVIRONMENTAL FORUM

UNIVERSITY OF MARYLAND

START
global change SysTem for Analysis, Research & Training