

# Operational Fire Danger Rating System in Indonesia

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Ministry of Forestry, Jakarta, Indonesia

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

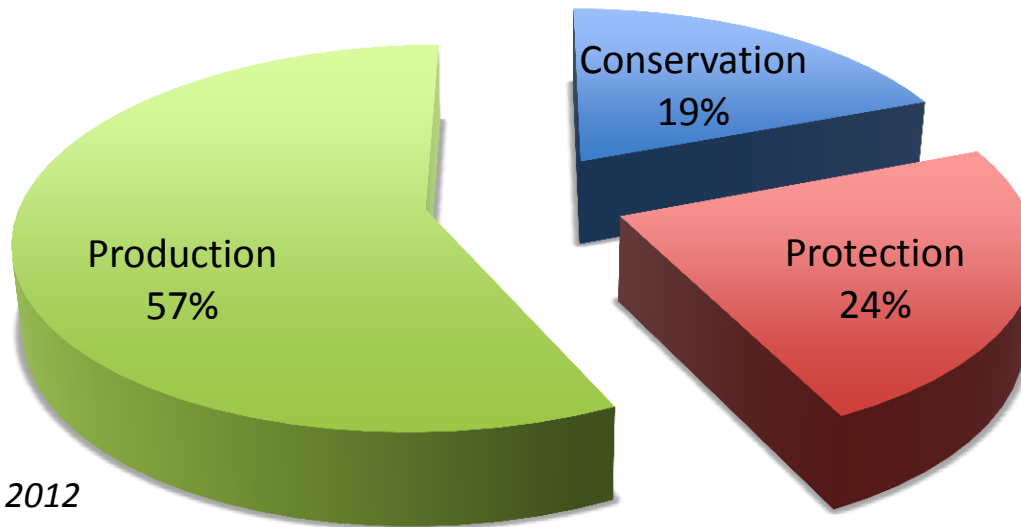
- Land and Forest Fire in Indonesia
- Hotspot Monitoring/Early Detection
- Fire Danger Rating System/Early Warning System
- Fire Information Dissemination
- Fire Controlling
- Remarks



# 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

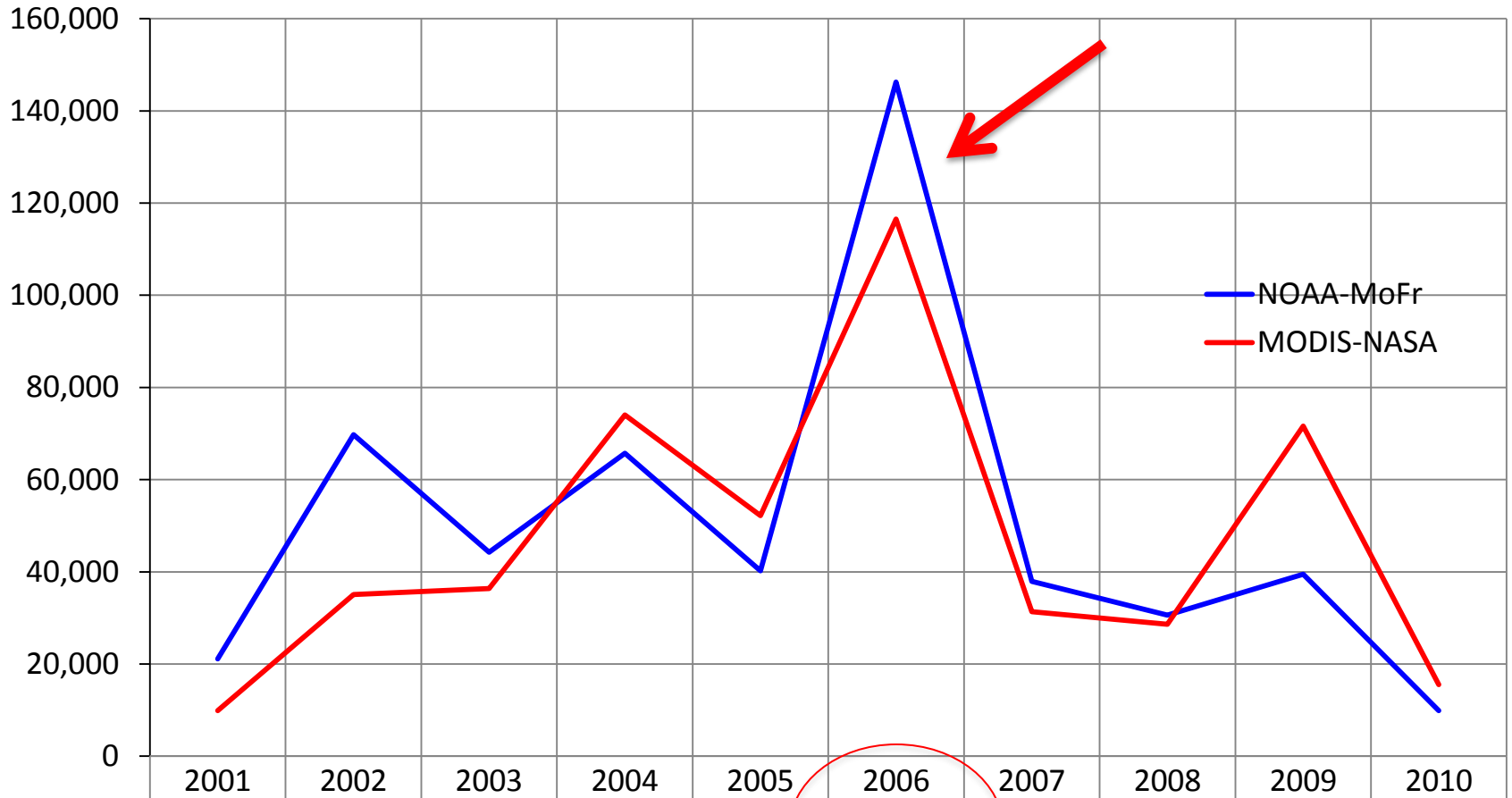
Indicators hotspot as well as a key indicator in determining the policy of forest fires in Indonesia are used in :

- 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)

Hotspot

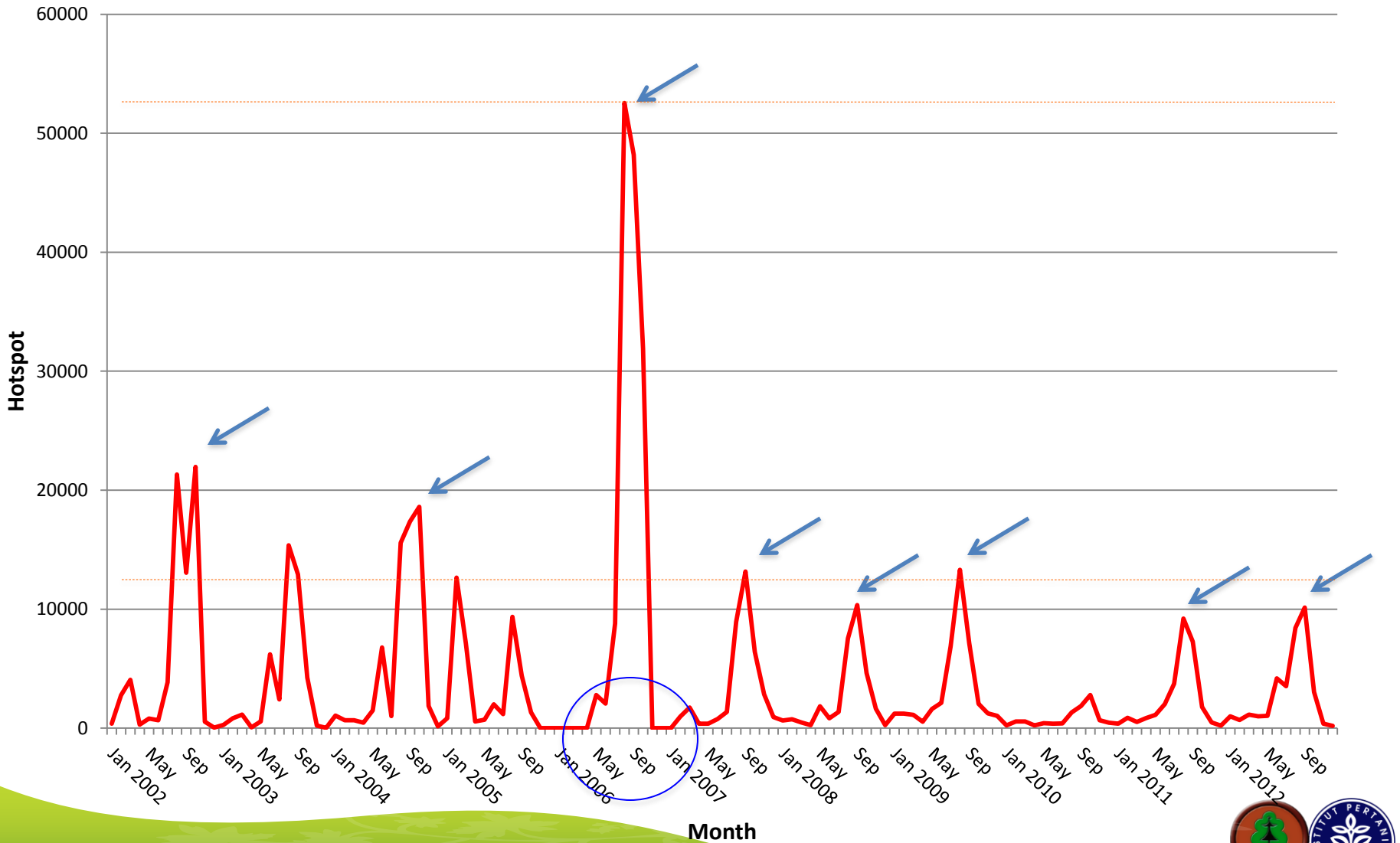


	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
NOAA-MoFr	21137	69765	44262	65693	40197	146264	37909	30616	39463	9880
MODIS-NASA	9882	35087	36375	74039	52201	116545	31340	28640	71589	15525

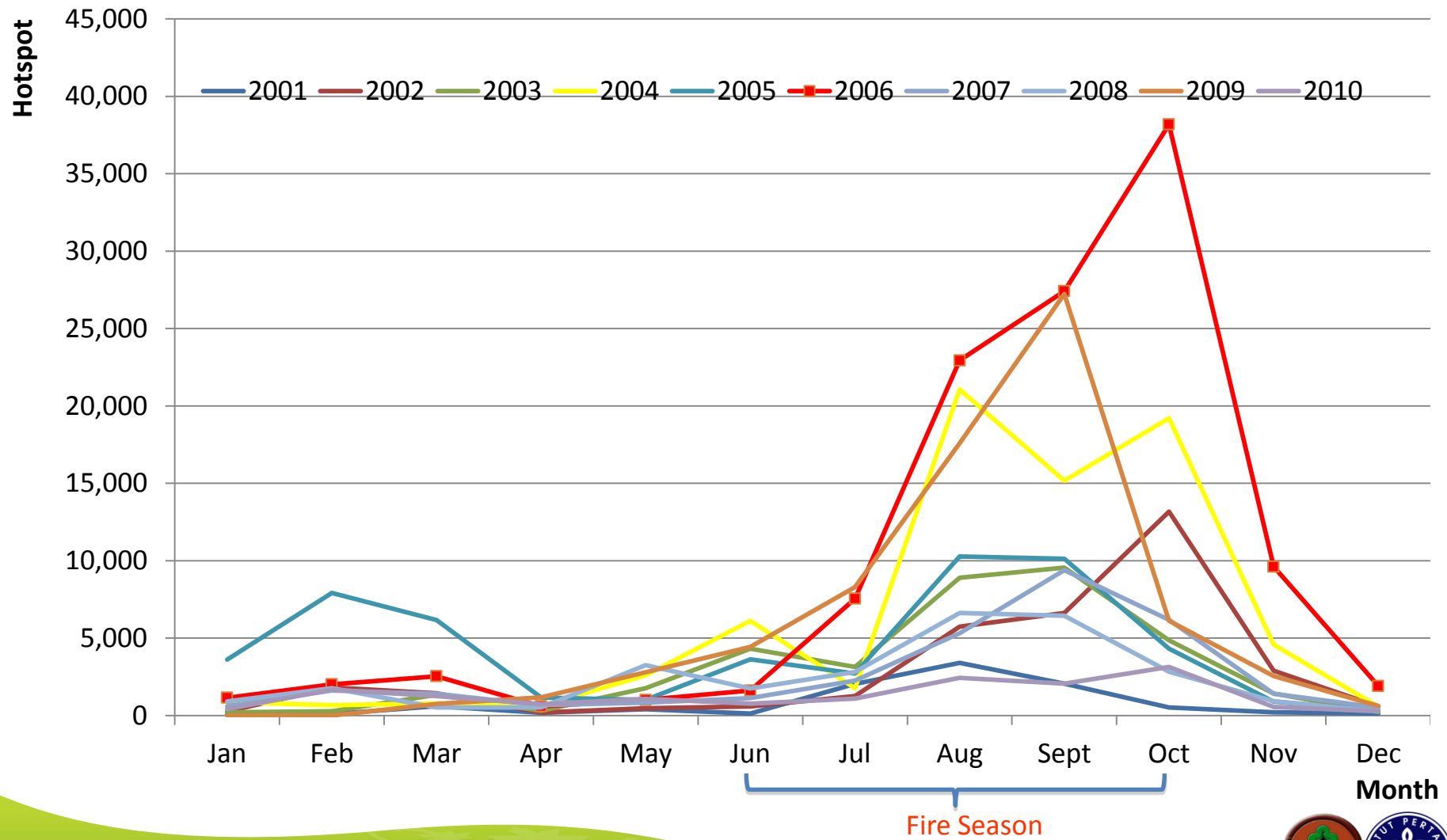




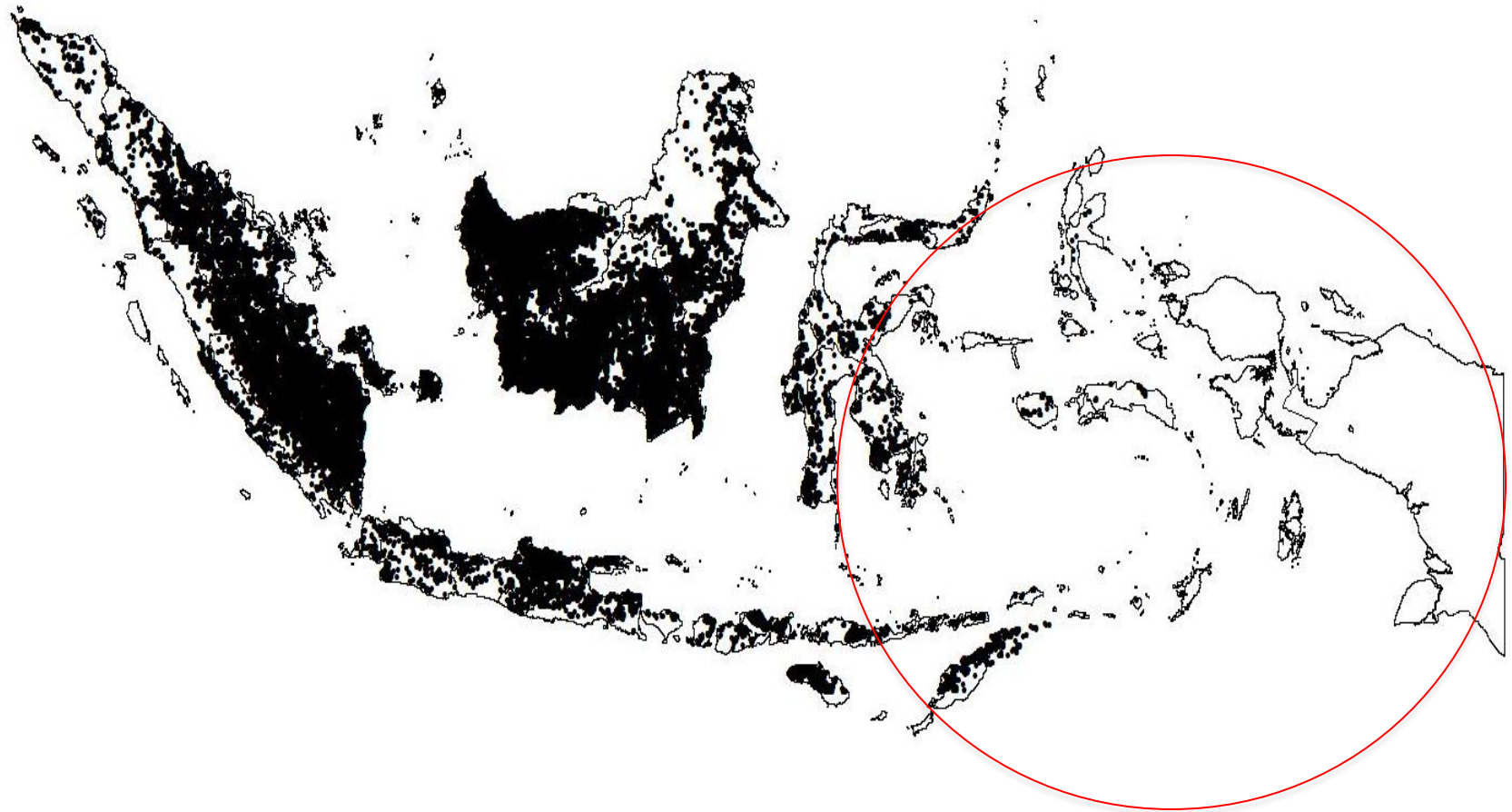
# Hotspot Pattern in Indonesia year of 2002-2012



# Hotspot Distribution in Indonesia year of 2001-2010

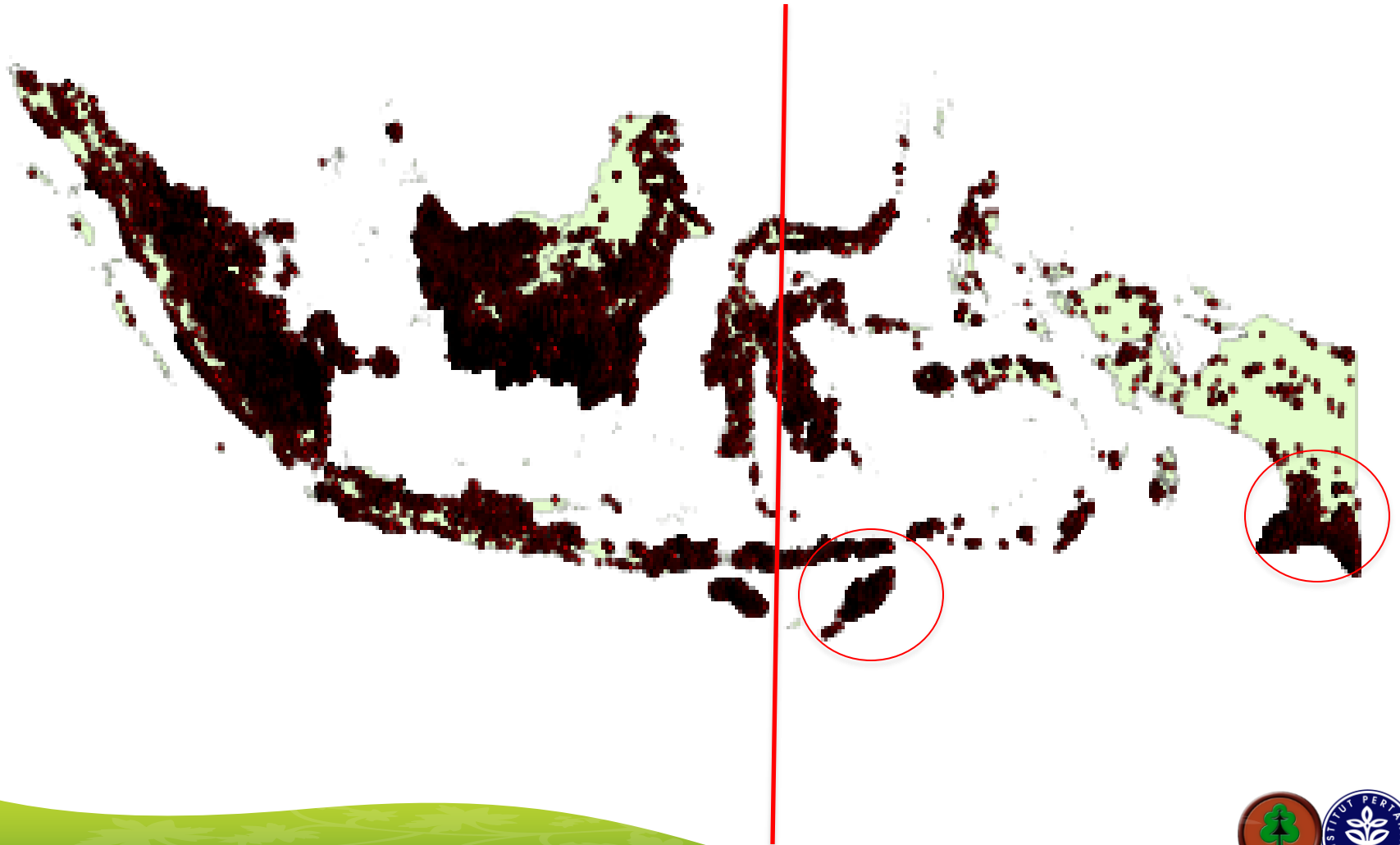


# NOAA-FHS year of 2006 in Indonesia

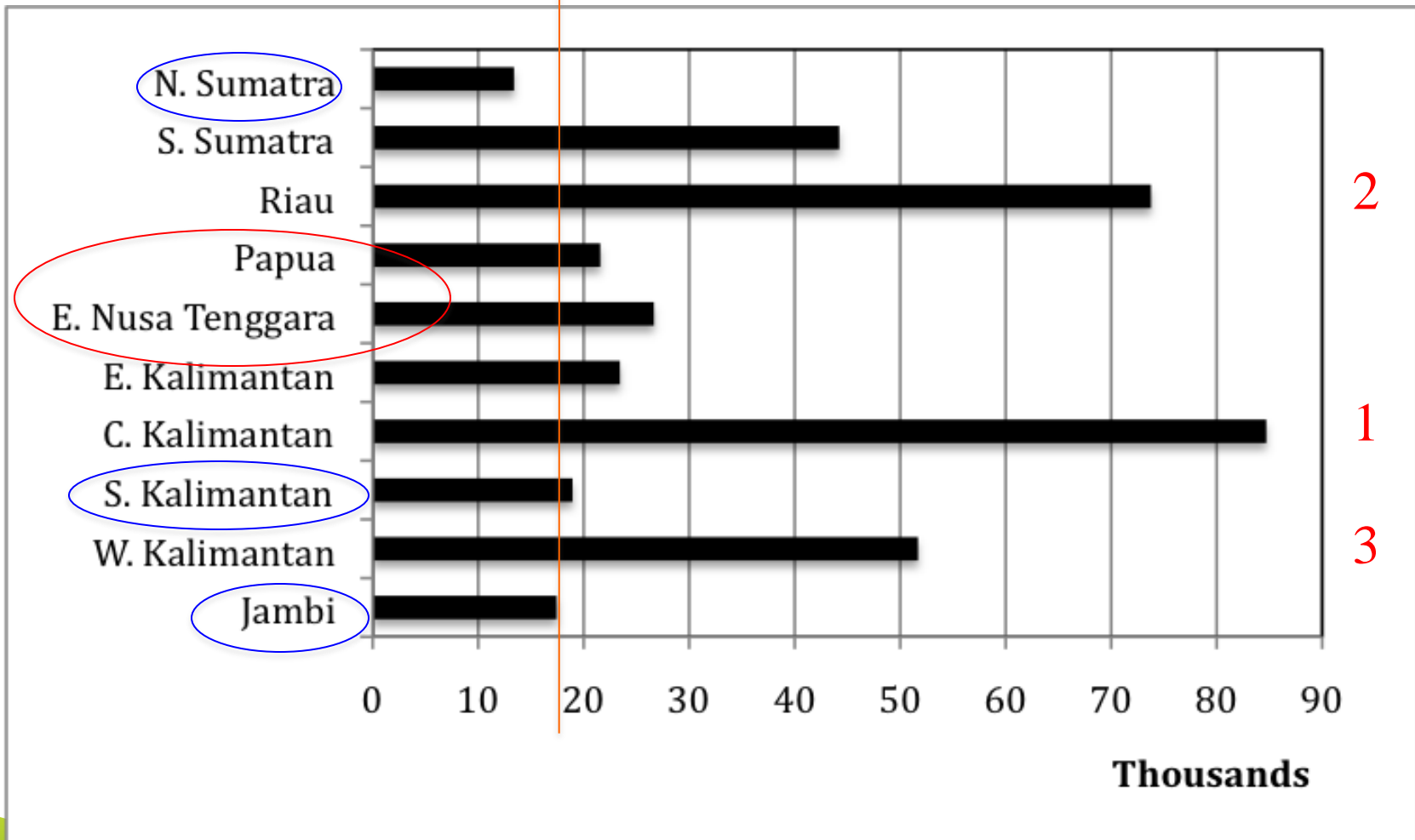


No coverage

# MODIS-FHS year of 2006 in Indonesia



# FHS MODIS year of 2001 – 2010 at fire prone province

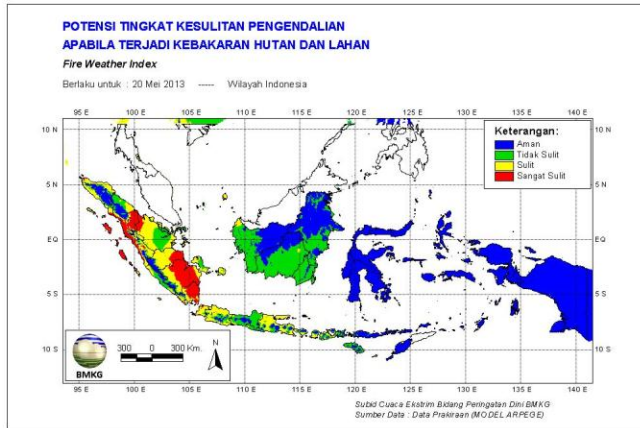


# Fire Danger Rating/Early Warning System

- 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

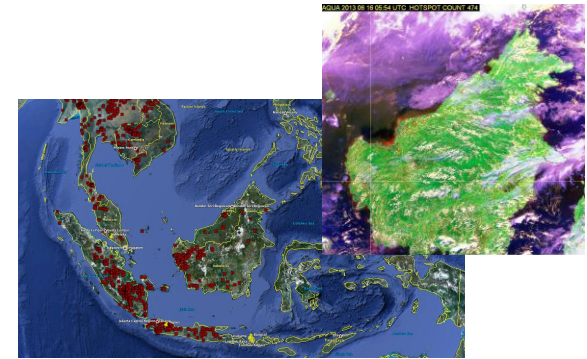


# Early Warning



**Complementary**

# Early Detection



**Concept:**

1. Daily weather data to estimate physical 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.

**Concept:**

Satellite surveillance based on surface temperature.

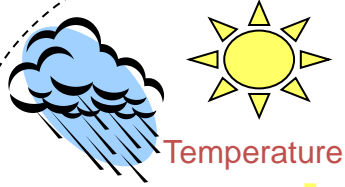
**Usage:**

To identify burnt area for suppression purpose.



# FDRS BASIC CONCEPT

Weather



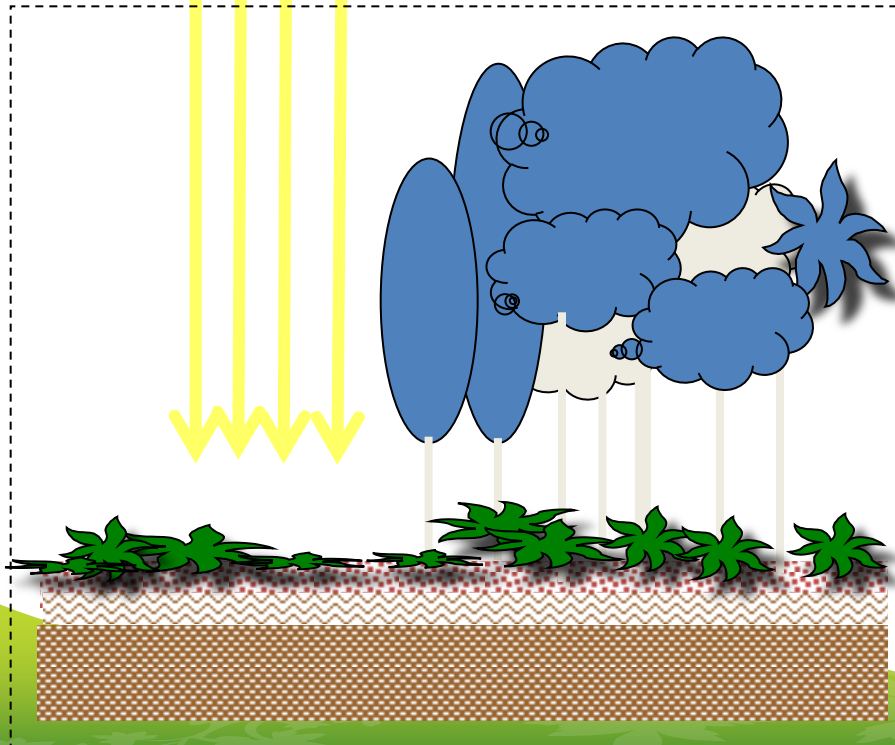
Temperature

Humidity

Wind Speed

Rain Fall

Fuel

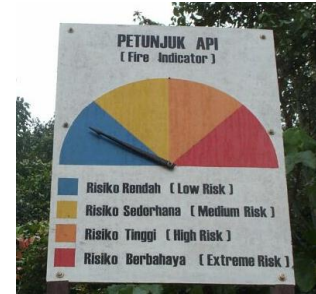
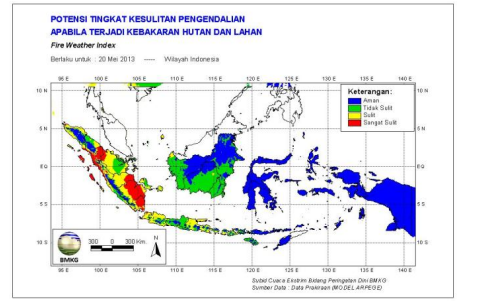


## FIRE DANGER

- Low
- Moderate
- High
- Extreme

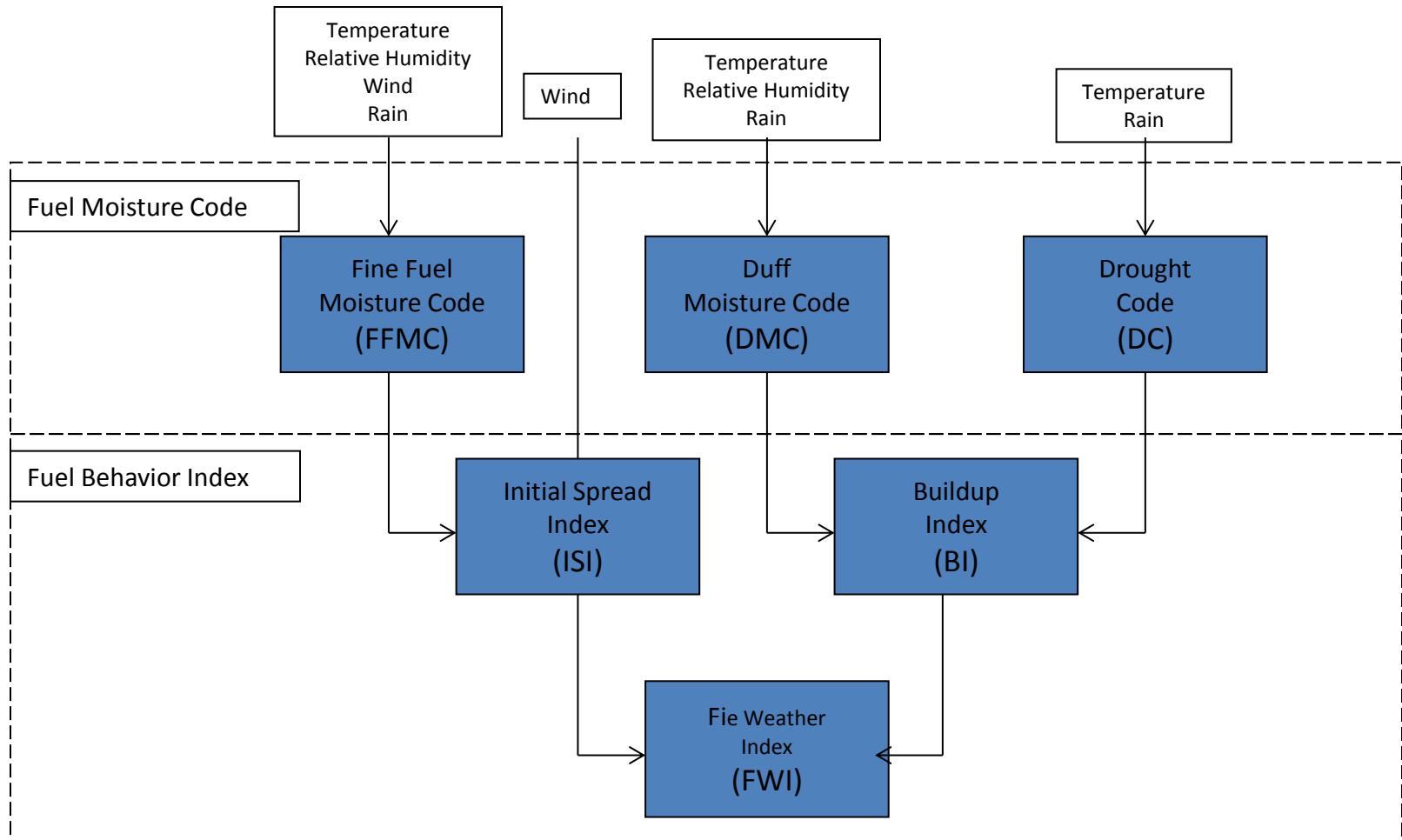
Fire Behaviour Prediction/ FBP

Fire Weather Index/FWI

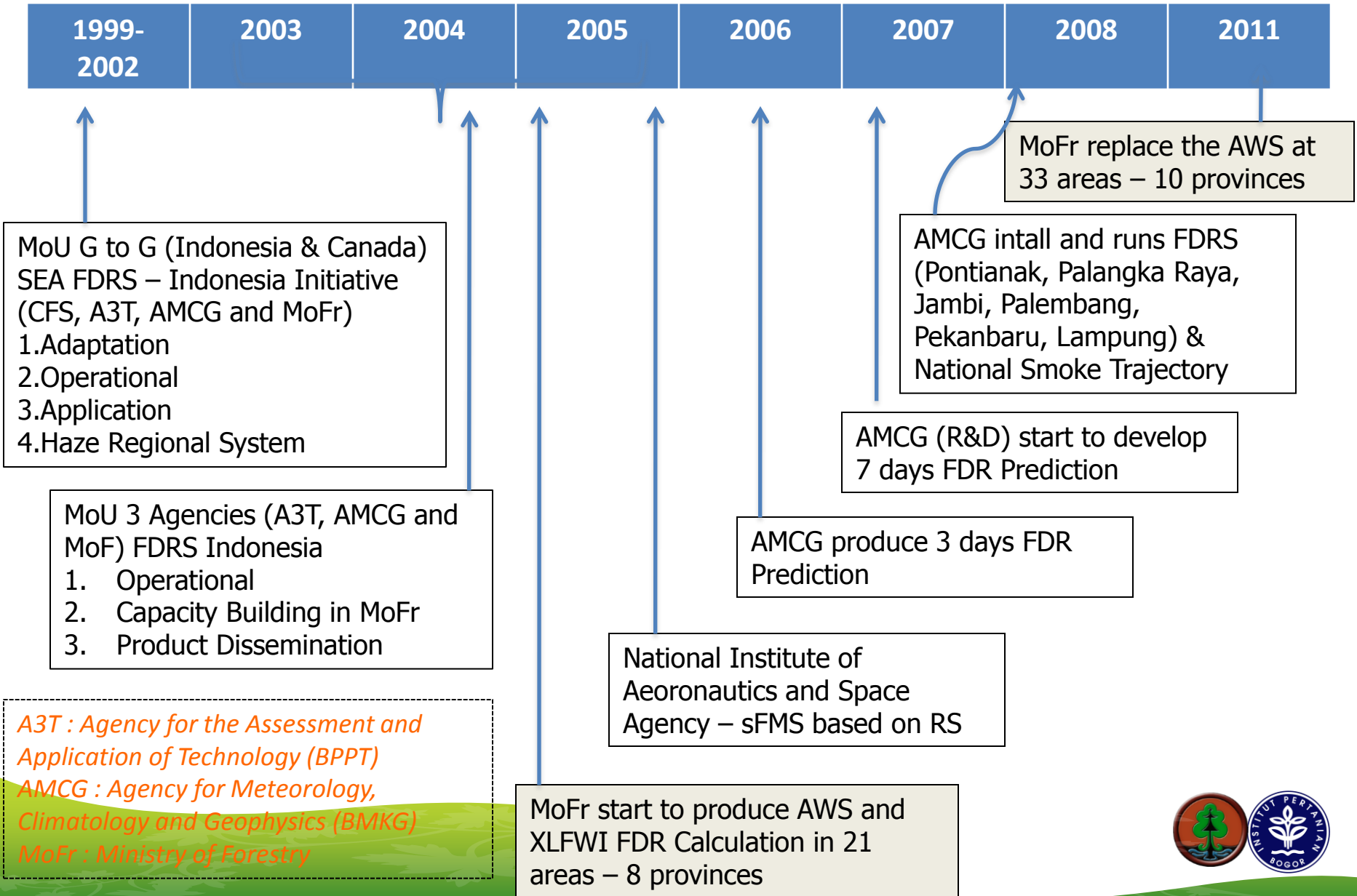




# Fire Danger Rating System Structure



# Implementation



*A3T : Agency for the Assessment and Application of Technology (BPPT)*  
*AMCG : Agency for Meteorology, Climatology and Geophysics (BMKG)*  
*MoFr : Ministry of Forestry*



# 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:

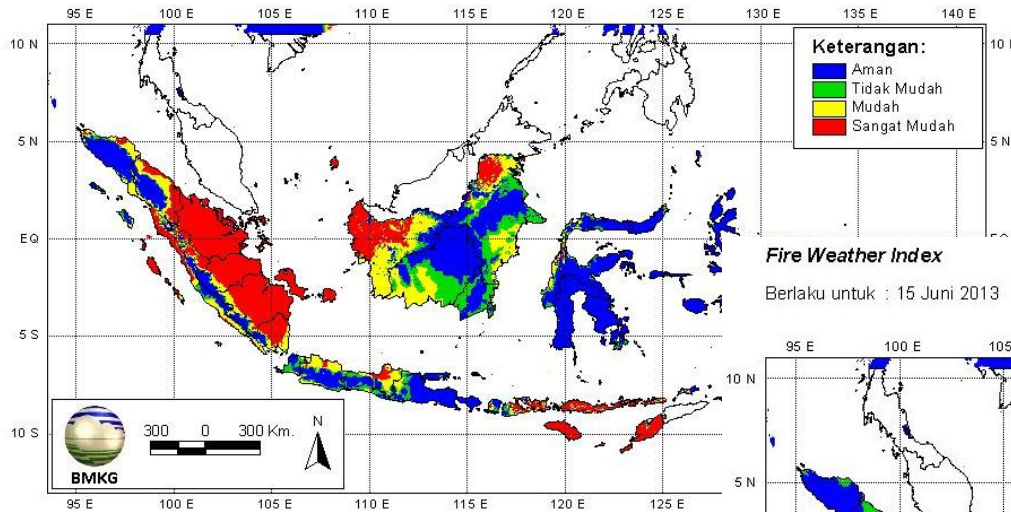
- Ministry of Forestry
- Ministry of Environment
- Disaster Management Agency
- ASEAN Secretariat
- NGOs
- Universities



# National FDRS – operated by BMKG

## Fine Fuel Moisture Code

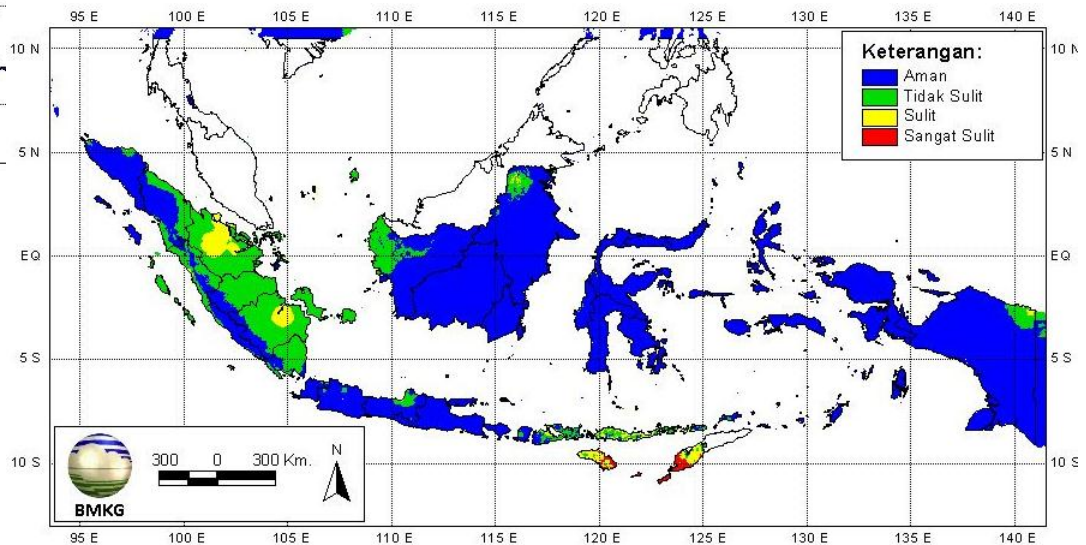
Berlaku untuk : 15 Juni 2013 ----- Wilayah Indonesia



FFMC - Indonesia

## Fire Weather Index

Berlaku untuk : 15 Juni 2013 ----- Wilayah Indonesia

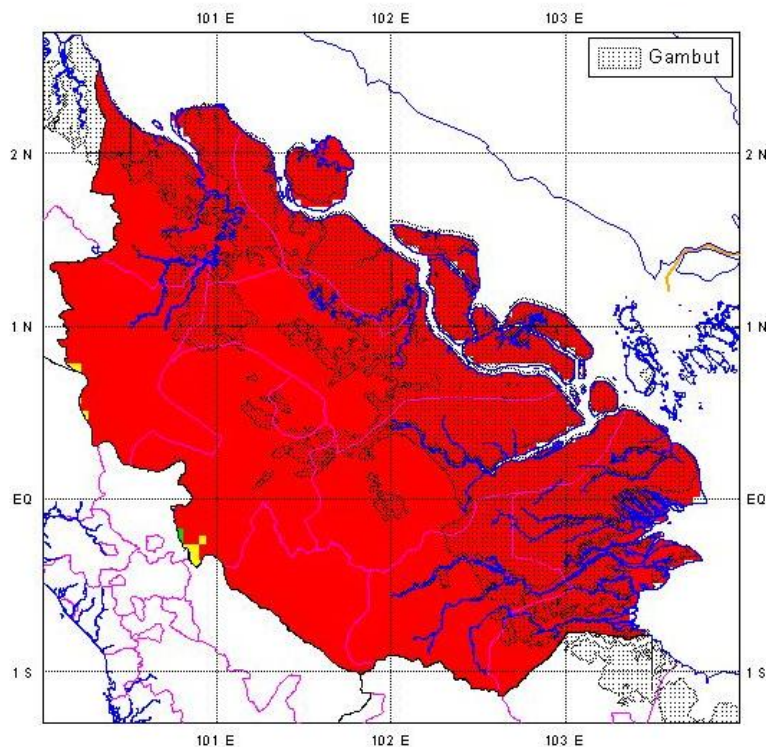


FWI - Indonesia



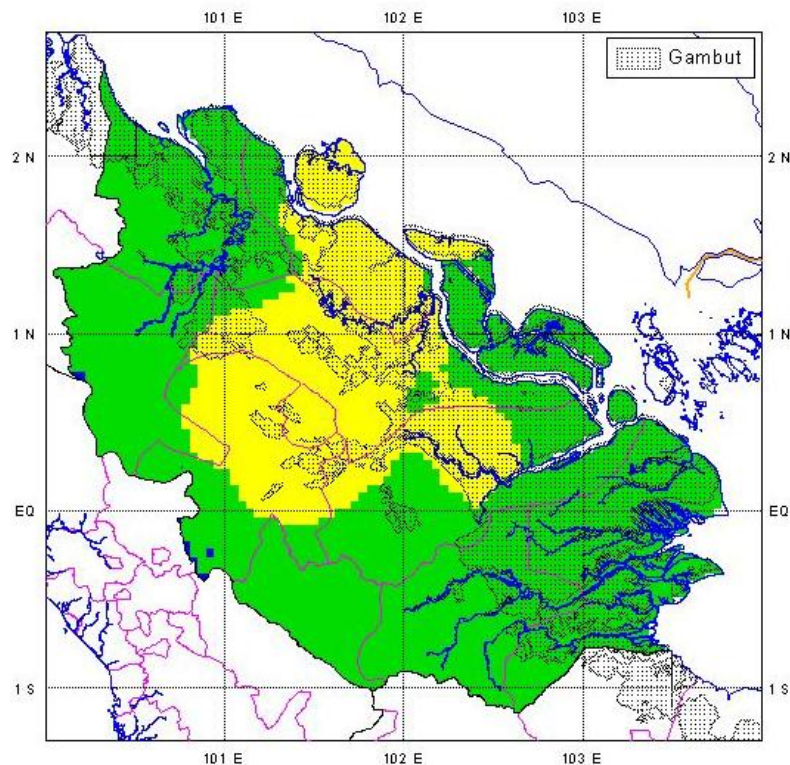
# Provincial FDRS – operated by BMKG

Berlaku untuk : 15 Juni 2013 ----- Wilayah Riau



FFMC – Riau, Sumatera (15 June 2013)

Berlaku untuk : 15 Juni 2013 ----- Wilayah Riau



FWI Riau, Sumatera (15 June 2013)





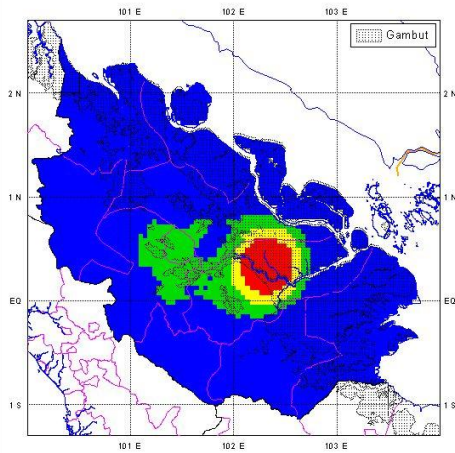
# 3 days FDRS

## FFMC - 26 June 2013

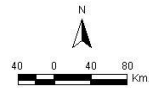
### POTENSI KEMUDAHAN TERJADINYA KEBAKARAN DITINJAU DARI ANALISA PARAMETER CUACA

#### Fine Fuel Moisture Code

Berlaku untuk : 26 Juni 2013 ----- Wilayah Riau



Subid Cuaca Ekstrim Bidang Peringatan Dini BMKG  
Sumber Data : Data Realtime Pengamatan Sinoptik BMKG

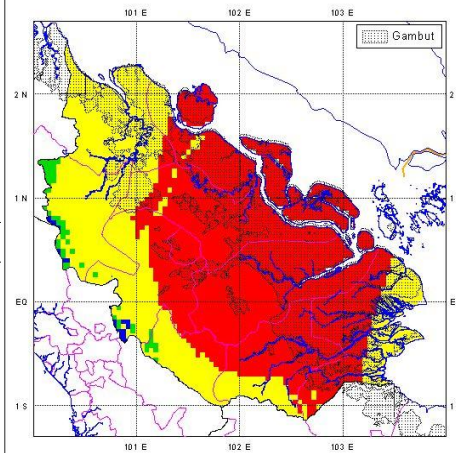


## FFMC - 27 June 2013

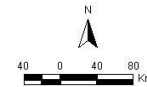
### POTENSI KEMUDAHAN TERJADINYA KEBAKARAN DITINJAU DARI ANALISA PARAMETER CUACA

#### Fine Fuel Moisture Code

Berlaku untuk : 27 Juni 2013 ----- Wilayah Riau



Subid Cuaca Ekstrim Bidang Peringatan Dini BMKG  
Sumber Data : Data Prakiraan (MODEL ARPEGE)

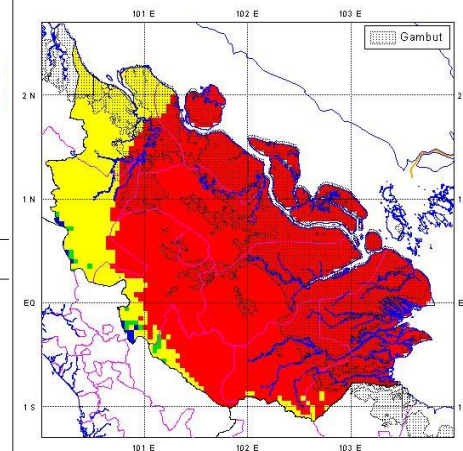


## FFMC - 28 June 2013

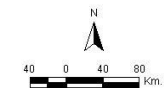
### POTENSI KEMUDAHAN TERJADINYA KEBAKARAN DITINJAU DARI ANALISA PARAMETER CUACA

#### Fine Fuel Moisture Code

Berlaku untuk : 28 Juni 2013 ----- Wilayah Riau



Subid Cuaca Ekstrim Bidang Peringatan Dini BMKG  
Sumber Data : Data Prakiraan (MODEL ARPEGE)



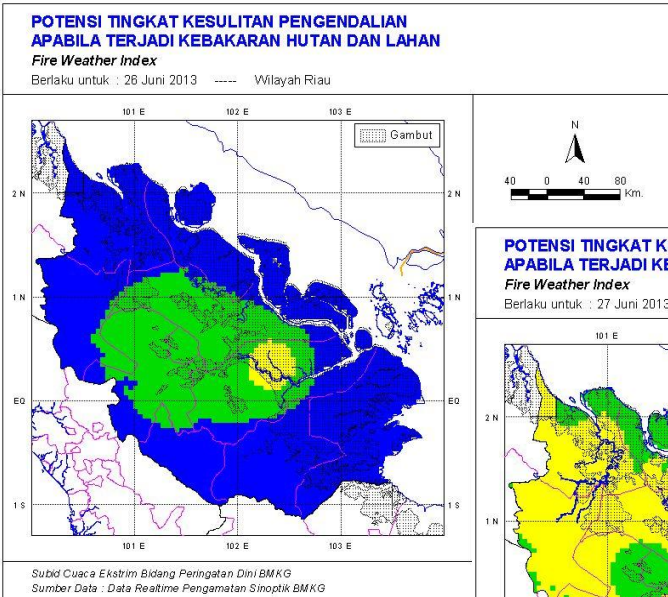
LEGENDA :  
----- Batas Provinsi  
----- Batas Kabupaten/Kota  
----- Batas Kecamatan  
----- Batas Pantai

Keterangan:  
Aman  
Tidak Mudah  
Mudah  
Sangat Mudah

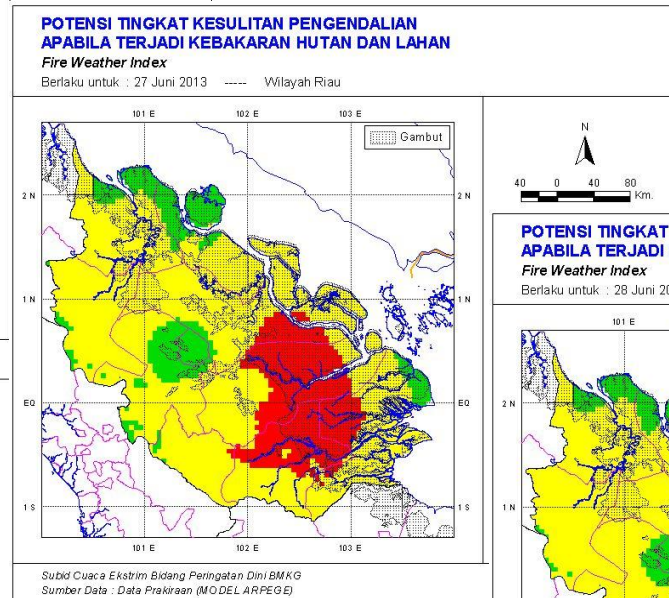


# 3 days FDRS

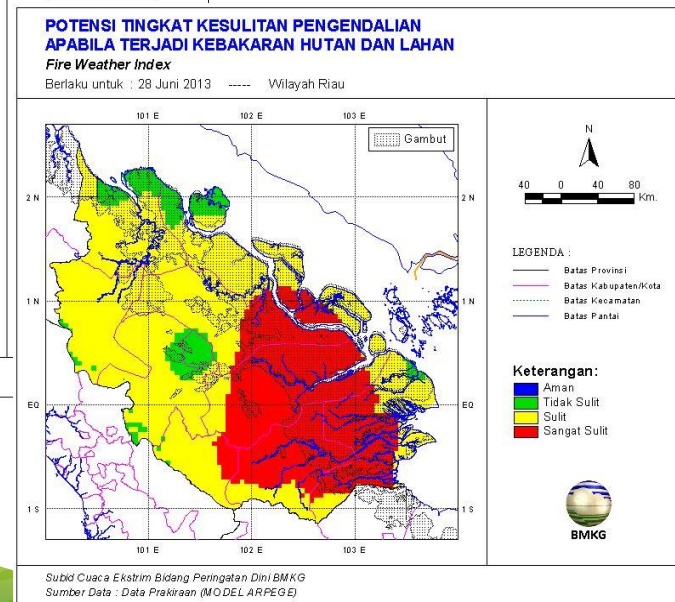
## FWI - 26 June 2013



## FWI - 27 June 2013



## FWI - 28 June 2013





# District/Sub-District FDRS – operated by MoFr



Microsoft Excel - FWI Examples\_G\_Result\_CLASS\_FD

10 Feb 2002 - 26 Jan 2003 FWI data calculated for Pekanbaru - Riau

Data source: CMSS realtime data - BMG

Station Information

Name: Peka

WMO Number

Latitude

Longitude

Estimated startup values

DATE	Input Weather Data					Calculated FWI Data					FFMC CLASS	DC
	TEMP	RH	WIND	RAIN	FFMC	DMC	DC	ISI	BUI	FWI		
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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



# Fire Information Dissemination

*Mailing list sipongi*

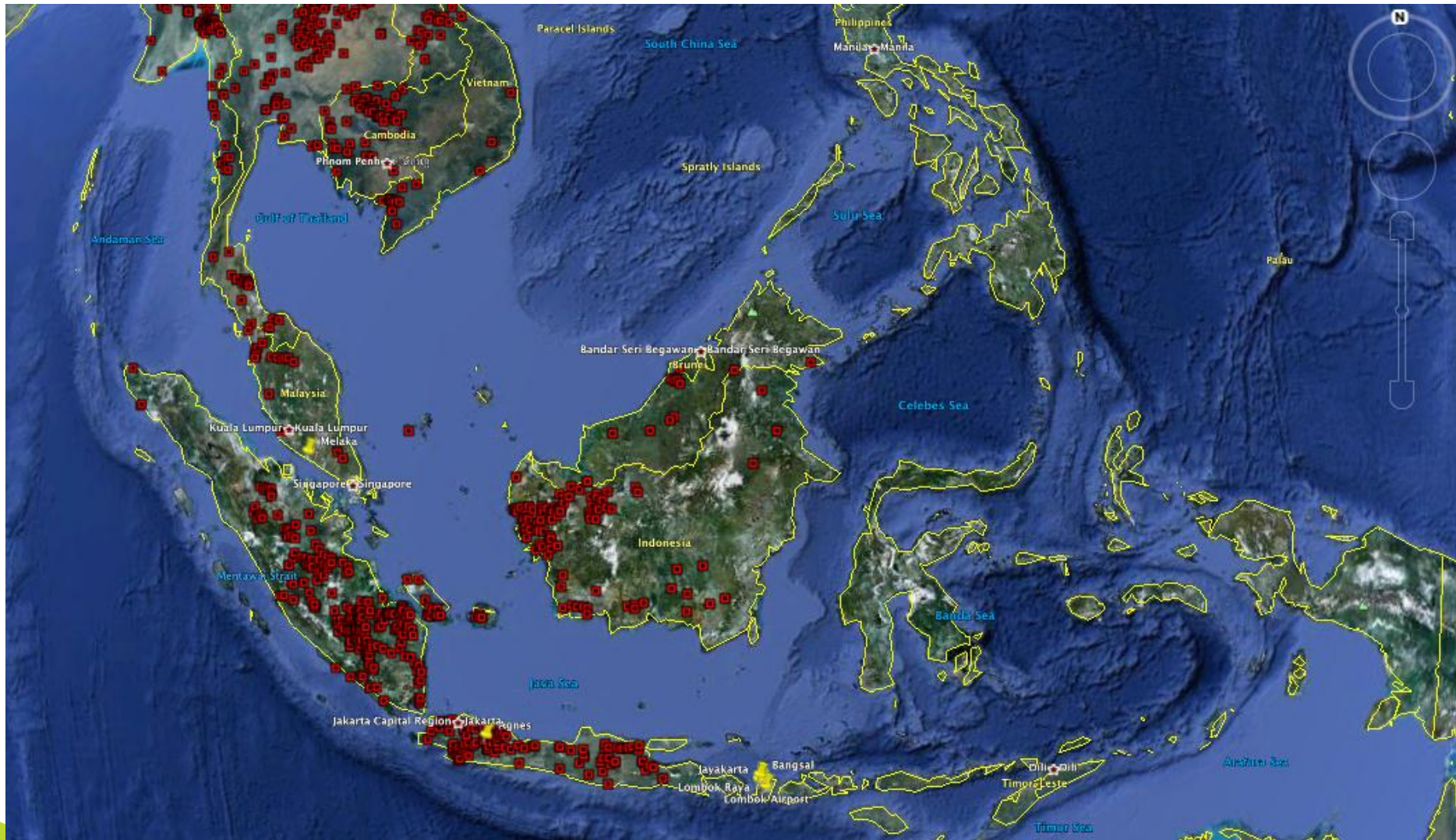
Founded Sept 4, 2001

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

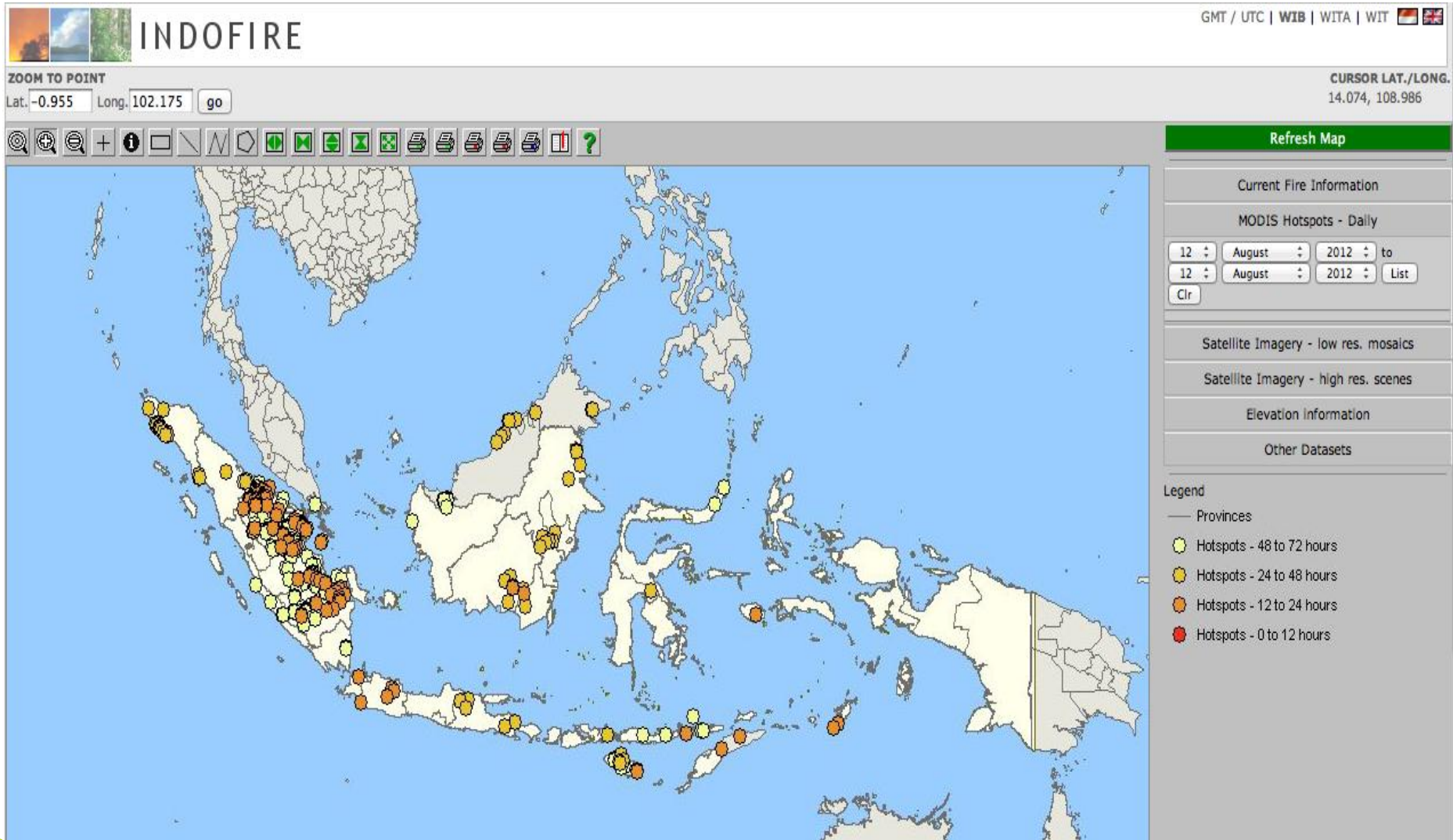


[www.indofire.org](http://www.indofire.org)/[www.dephut.go.id](http://www.dephut.go.id)





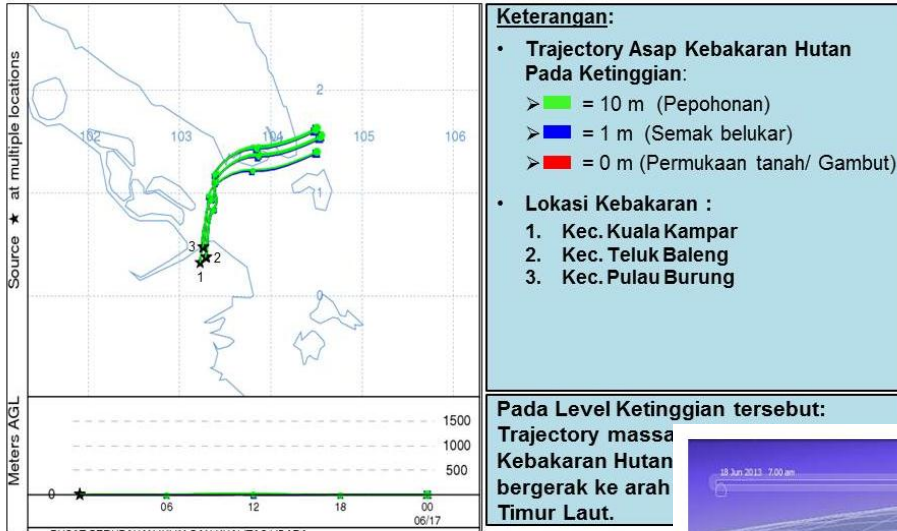
# MODIS-FHS Dissemination



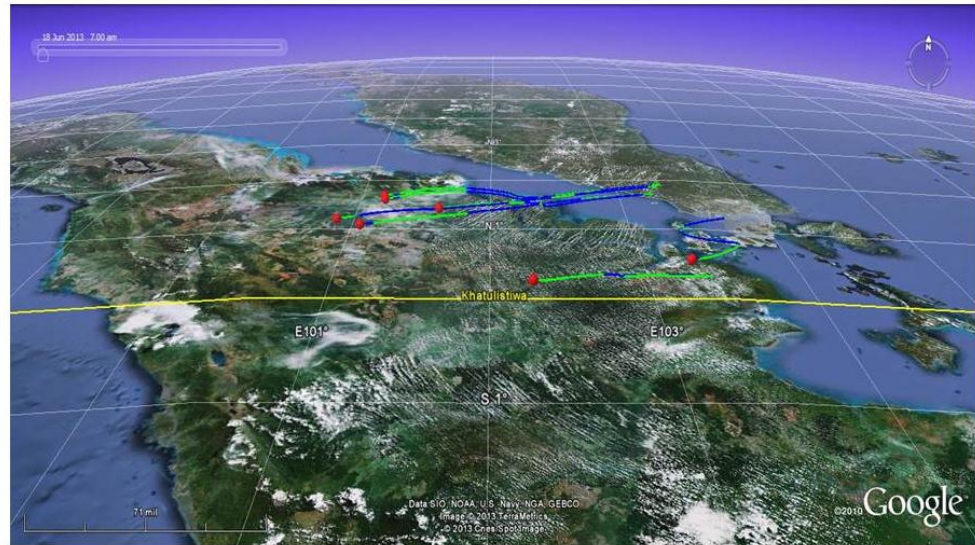
<http://indofire.landgate.wa.gov.au/indofire.asp>.



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



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

**[spong] - Si Pong!**

Home  
Messages  
Post  
Attachments  
Files  
Photos  
Links  
Database  
Polls  
Members  
Calendar  
Promote

The Yahoo! Groups Product Blog  
[Check it out!](#)

Info Settings  
Group Information  
Members: 1005  
Category: Environment  
Founded: Sep 4, 2001  
Language: Indonesian

Yahoo! Groups Tips  
Did you know...  
Hear how Yahoo! Groups has changed the lives of others. [Take me there.](#)

Home  
Activity within 7 days: **3 New Members - 12 New Messages**

Description  
Mailing list ini merupakan sarana untuk berkomunikasi di antara seluruh stake holders yang peduli akan pengendalian kebakaran hutan dan lahan seluruh Indonesia menerima data hotspot yang terdeteksi oleh stasiun bumi satelit NOAA Kementerian Kehutanan yang berlokasi di Jakarta.

Messages Topics Search:

Most Recent Messages (View All)

**Informasi Titik Panas Tanggal 14 Juni 2013**  
Salam Pong!, Kami informasikan hasil pantauan hotspot tanggal 14 Juni 2013 berdasarkan data satelit NOAA18. Hotspot di provinsi-provinsi dengan perincian: Posted - Fri Jun 14, 2013 7:41 pm

**Informasi Titik Panas Tanggal 13 Juni 2013**  
Salam Pong!, Kami informasikan hasil pantauan hotspot tanggal 13 Juni 2013 berdasarkan data satelit NOAA18. Hotspot di provinsi-provinsi dengan perincian: Posted - Thu Jun 13, 2013 10:03 pm

**Bla: [spong] Situasi kabut asap**  
Di sekitar Palembang merupakan lahan rawa-rawa kering dan basah juga ada gambutnya, kemungkinan A besar pembukaan untuk kebun. Perlu adanya gr... Posted - Wed Jun 12, 2013 10:01 pm

**Re: Situasi kabut asap**  
Kabut asap ini karena masuk musim kemarau atau musim buka lahan sawit ya Pak? Tetap semangat manggala agni! ... Karina Kusumawardani Associate... Posted - Wed Jun 12, 2013 9:05 pm

**Situasi kabut asap**  
Pagi ini, 13 Juni 2013, Kota Palembang sudah mulai diliputi kabut asap. Harus..waspada..dan upaya pencegahan dini untuk si manggala agni.  
Posted - Wed Jun 12, 2013 8:53 pm

Message History

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	57	45	82	65	76	28						
2012	75	51	68	58	95	119	102	106	75	75	52	39
2011	54	51	83	75	76	109	99	138	100	75	37	45
2010	39	33	39	39	49	45	60	47	63	48	60	40
2009	27	42	36	32	41	64	55	71	88	56	49	34
2008	57	46	26	38	66	83	52	63	36	45	30	27
2007			26	20	18	35	41	43	51	18	38	26
2006	13	22	12	16	11	48	40	65	42	23	9	1
2005	32	38	34	12	22	34	40	50	30	28	5	1
2004	27	15	27	21	23	50	48	51	42	41	31	26
2003	14	22	22	16	9	47	51	78	40	32	26	26
2002	22	23	18	18	22	24	59	40	35	33	26	23
2001									19	38	23	18

facebook Search for people, places and things

Israr Albar Edit Profile

MANGGALA AGNI About Events Photos Files

Write Post Add Photo / Video Ask Question Add File

Write something...

RECENT POSTS

**Kadam Doank**  
Cuaca Ketapang Kalbar Hari ini:  
Conditions  
Pressure  
1008 hPa  
Visibility  
10.0 kilometers  
Clouds  
Few 360 m  
Moisture  
Humidity  
61%  
Rainfall  
-  
Snow Depth  
Not available.  
METAR  
AAXX 16034 96615 32460 21404 10310 20246 30071 40085  
58004 81131 333 56400 81812  
Don't speak METAR? Read our FAQ.  
Weather Radio  
Weather Radio Index  
Temperature  
Temperature

FAVORITES  
News Feed  
Messages 3  
Events  
Photos

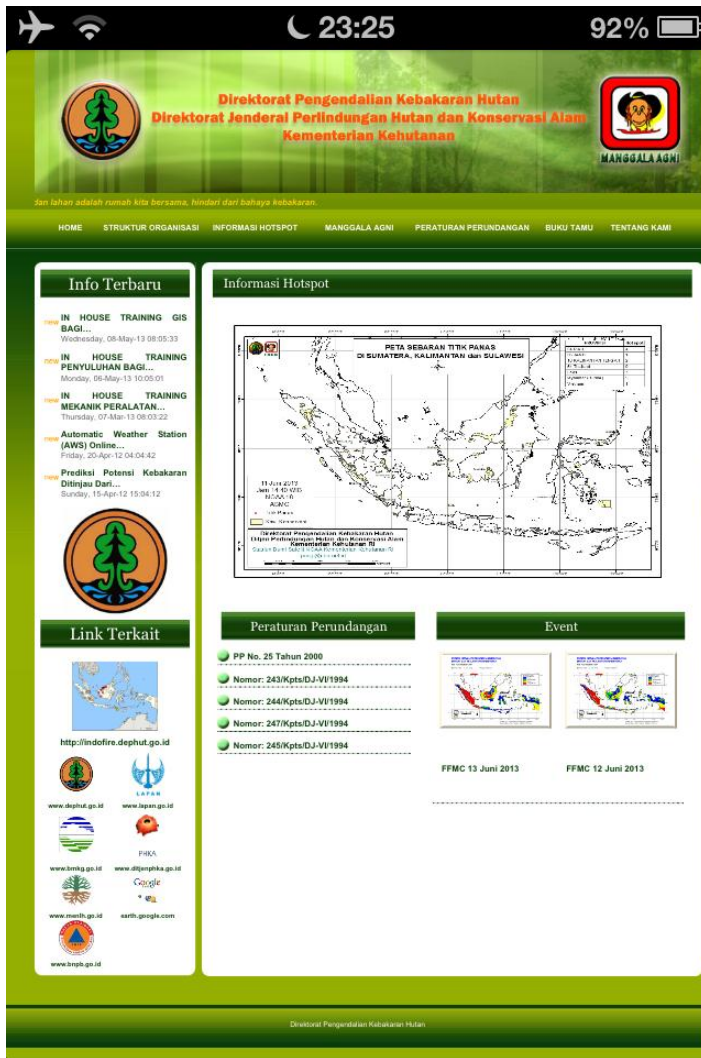
PAGES  
German Alumni  
Pages Feed 20+  
Like Pages 8  
Create Ad

GROUPS  
MANGGALA AGNI  
DAAD GERMANY SUMME...  
BOGOR HERITAGE 20+  
REUNI PERAK SMA... 12  
BIODICS  
Create Group...

APPS  
App Center 2  
Cities I've Visited  
Games Feed 20+  
Music  
Notes







Hotspot access from Smartphone

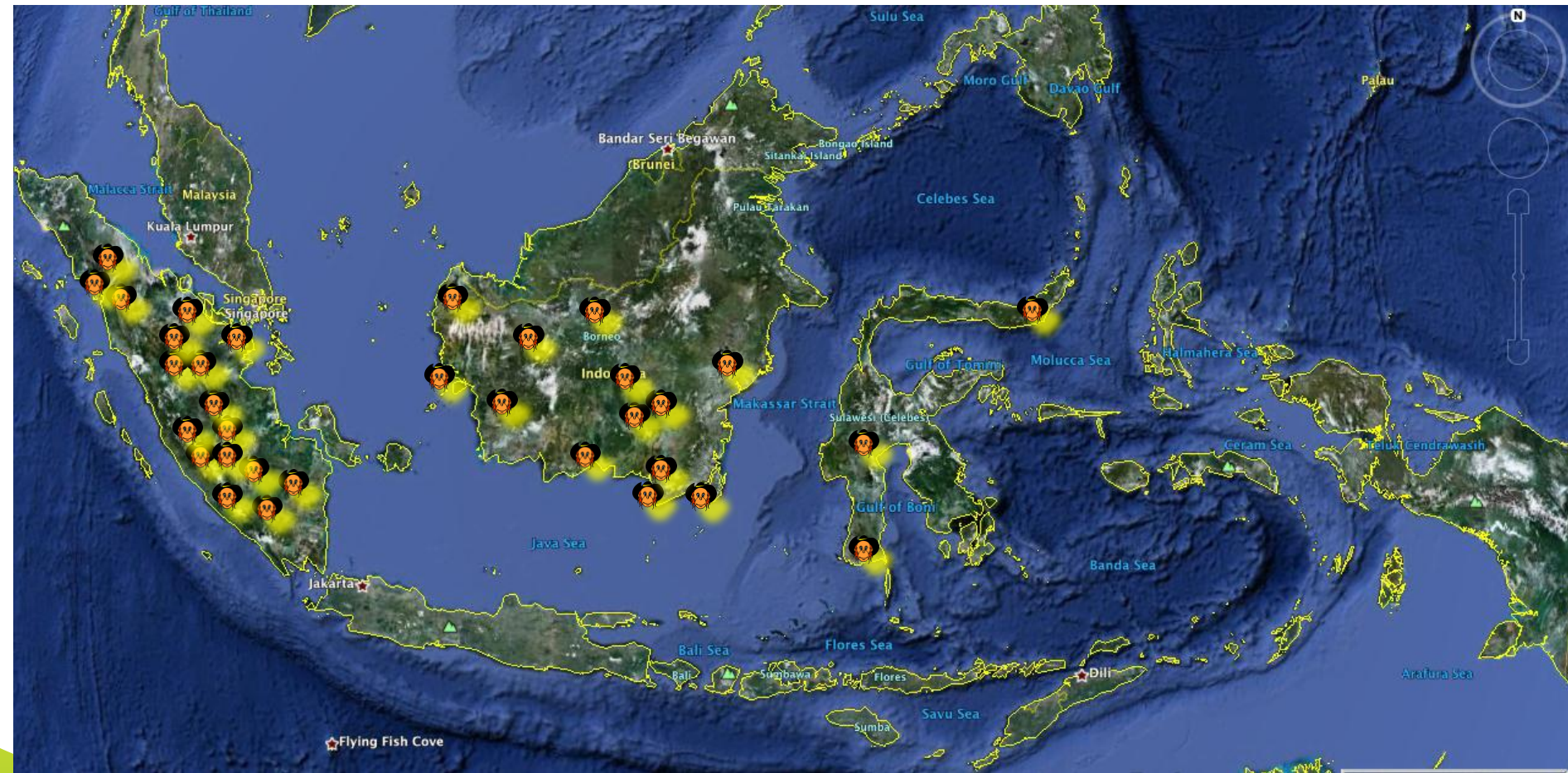


FDRS access from Tablet





# 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

israralbar@gmail.com

