



Utilization of Remote Sensing Technology in Support of Disaster Management Efforts in Indonesia

REMOTE SENSING APPLICATION CENTER
INDONESIAN NATIONAL INSTITUTE OF AERONAUTICS AND SPACE (LAPAN)

*United Nations International Conference on Space-based Technologies for
Disaster Risk Reduction – “Understanding Disaster Risk
BEIJING, CHINA, 19-21 SEPTEMBER 2016*

Introduction: about LAPAN

- **LAPAN** is abbreviation of **LembagA Penerbangan dan Antariksa Nasional (National Institute of Aeronautics and Space)**
- LAPAN as Indonesian Space Agency was established on November 27, 1963 by Presidential Decree No.236 of 1963
- **LAPAN role reinforced by the presence of the Law No.21 of 2013 (Indonesian Space Law).**
- **LAPAN has authorities on:**
 - 1) Space science
 - 2) Remote sensing
 - 3) Space technology mastery
 - 4) Platform Launching, and
 - 5) Space commercial activities



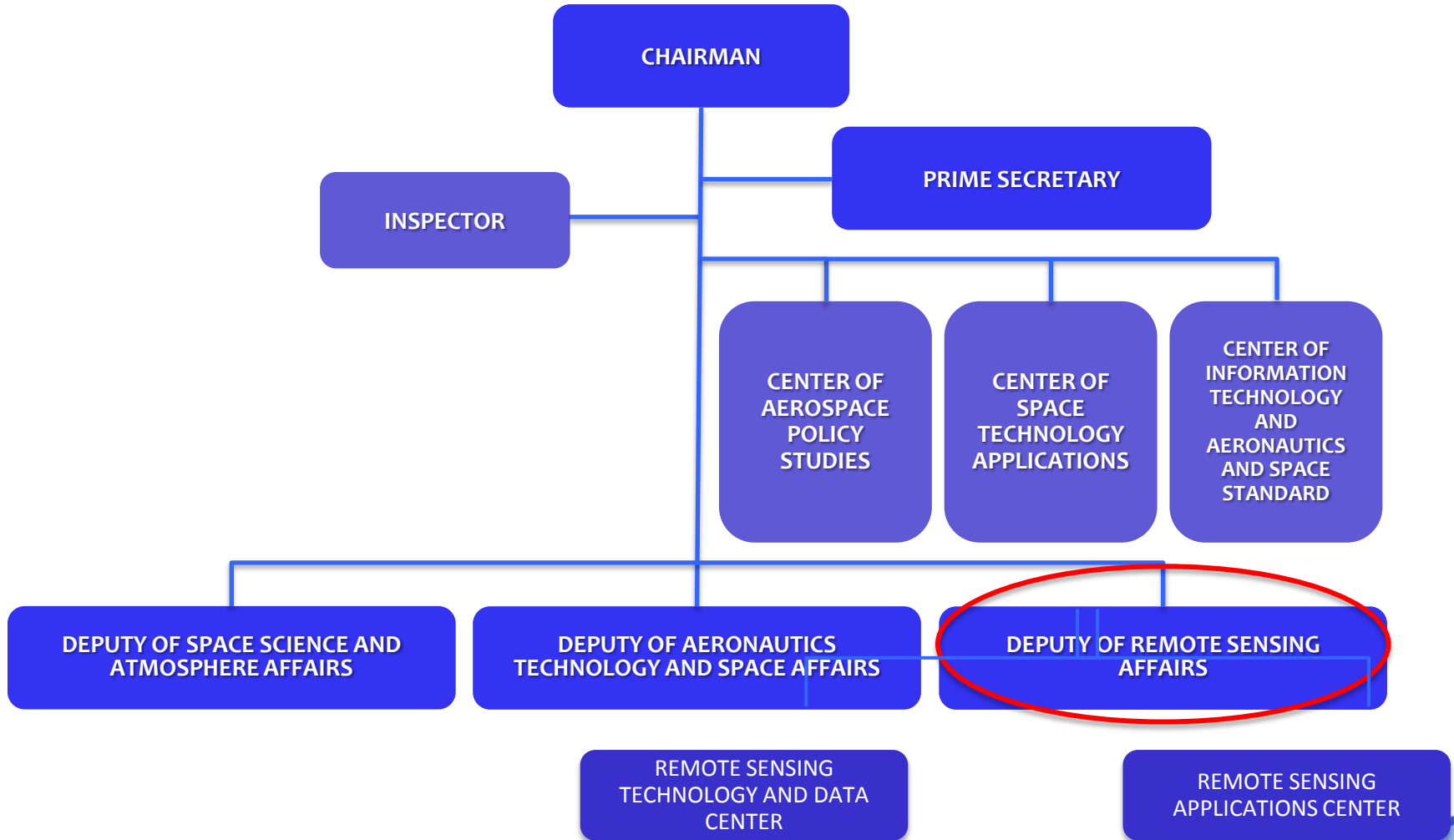
Remote Sensing Scope

- In the field of remote sensing, LAPAN responsible for:
 - 1) RS Data acquisition
 - 2) RS Data processing
 - 3) RS Data storage and distribution
 - 4) The use of RS data, and
 - 5) Dissemination of space-based information





LAPAN structure organization



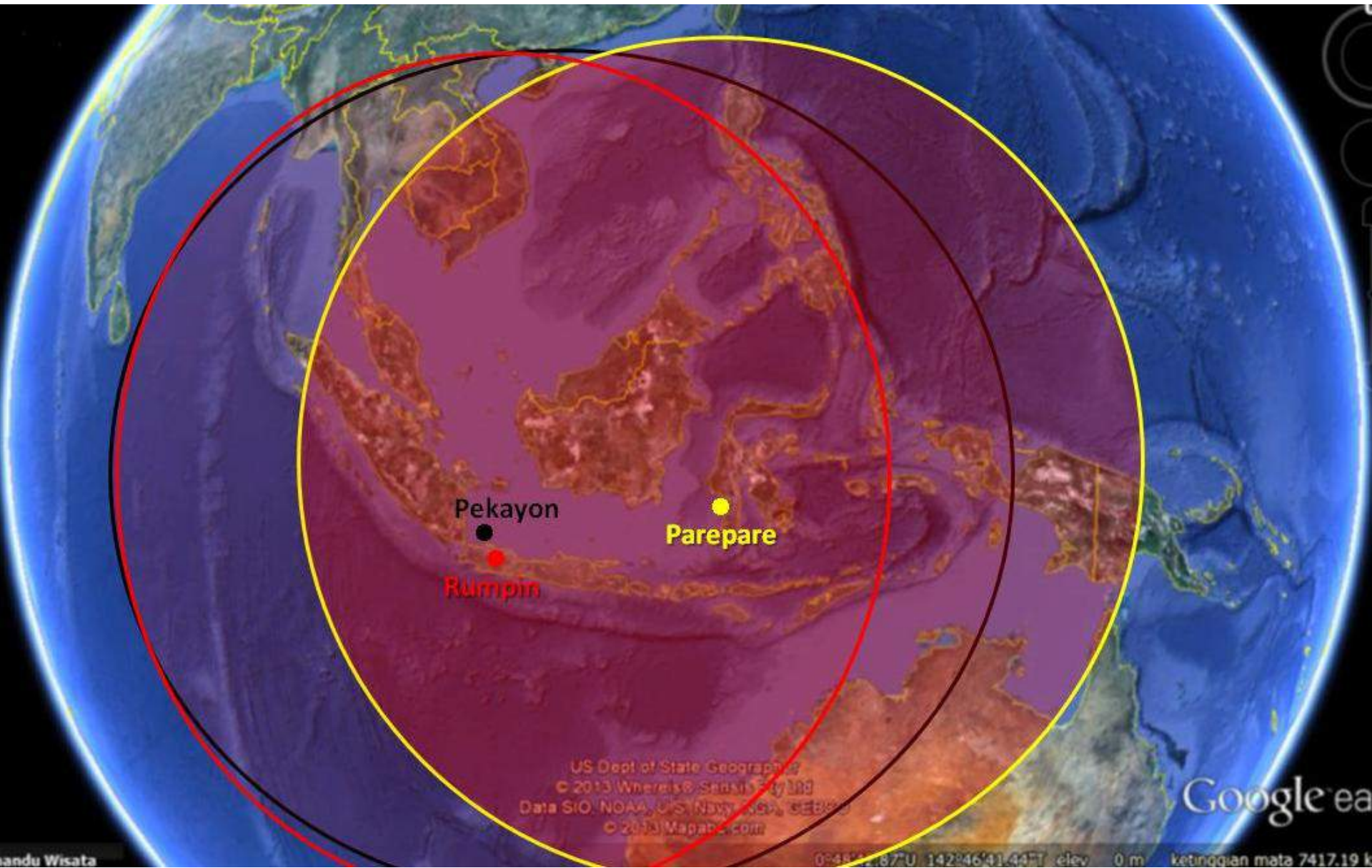


Role of LAPAN on providing remote sensing data and information

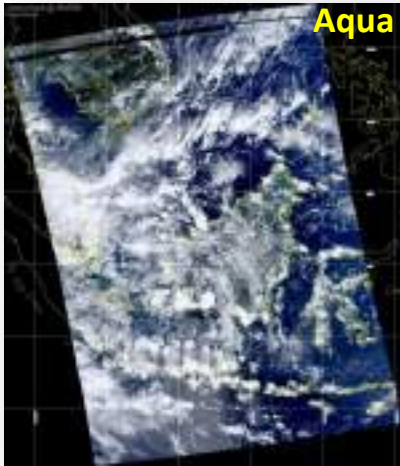
The Indonesian Space Act No.21/2013

- LAPAN requires to provide the high resolution satellite remote sensing data with the Indonesian Government license for Ministries/Government Agencies, Army, Police, and Local Governments.
- Regulation on remote sensing Satellite and Ground Station in Indonesia.
- Regulation on standard methods of remote sensing data processing.
- Regulation on guidelines of remote sensing applications and information dissemination.

Coverages of LAPAN's Ground Station



Data received in LAPAN's Ground Station



Low Resolution (≥ 250 meter)

- Terra/Aqua
- SNPP
- NOAA-18/19
- MetOp



Middle resolution (15 - 30 meter)

- Landsat-7
- Landsat-8

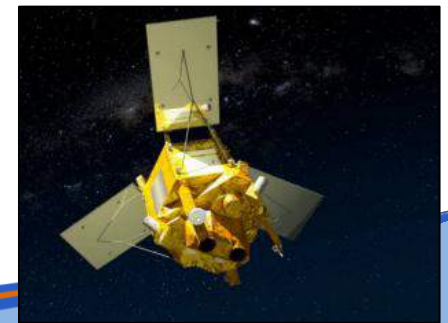


High resolution (≤ 1.5 meter)

- SPOT-6
- SPOT-7

Single Government License

- Government of Indonesia has been implementing the Single Government License of SPOT-5/SPOT-6/SPOT-7 images.
- It means, Govt. of Indonesia only buy once the images then those can be used by all Indonesian government institutions (Central Govt., Local Govt., Institutes, University, Military, Police)
- It cut cost millions USD.



RSGIS for Disaster Management

- Dealing with Disaster, LAPAN committed to provide the space-based information especially in the context of preparedness and emergency response.
- In order to support space-based disaster information, LAPAN coordinates with the Indonesian National Board for Disaster Management (BNPB) and another stakeholder agencies (both national and international)
- LAPAN have implemented several projects in the field of disaster management and emergency response such as flood, drought, fire hotspot, climate monitoring and prediction, as well as the assessment of those disasters and emergency response for other catastrophes such as landslide, tsunami, earthquake, and volcanic eruption.
- LAPAN was established as Regional Support Office of UNSPIDER since February 19, 2013.



International Network

- UN-SPIDER Team
- Network of Regional Support Offices (RSOs) (13 + 4)
- National Focal Points (45)



UN-SPIDER
in Vienna



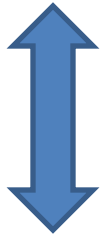
UN-SPIDER
Beijing Office



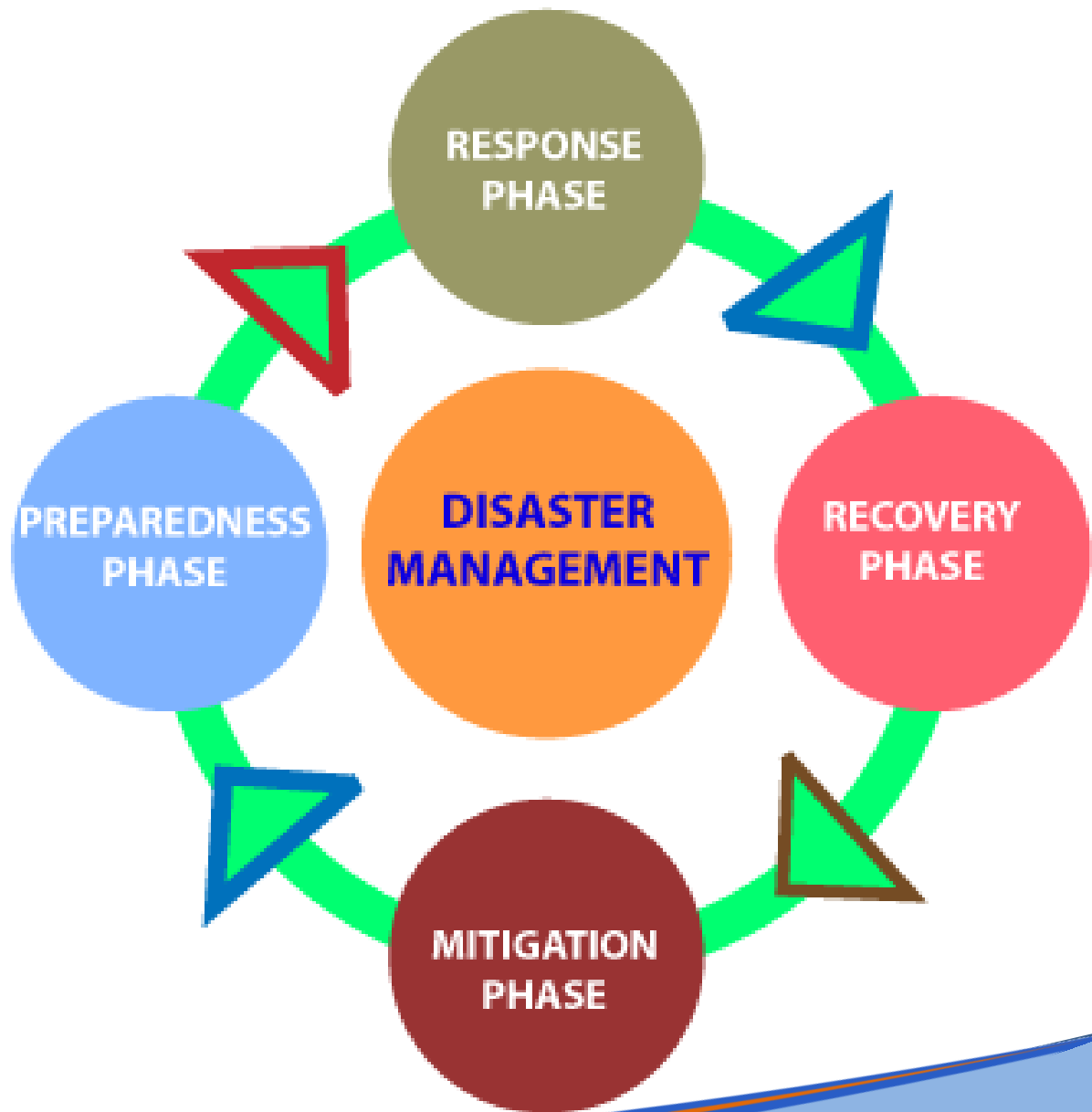
UN-SPIDER
Bonn Office



Space-based
technology



National-local
context



Types of Disaster in Indonesia



FLOOD



FOREST/LAND FIRE



DROUGHT



EPIDEMIC



LANDSLIDE



TECHNOLOGY FAILURE



EARTHQUAKE



TSUNAMI



VOLCANIC



SOCIAL CONFLICT

DAILY INFORMATION

- Cloud Coverage (TRMM, Qmorph)
- Forest Fire (Fire Hotspot and FDRS)
- Flood Prediction
- Oceanic parameter (LST and Chlorophil)

MONTHLY INFORMATION

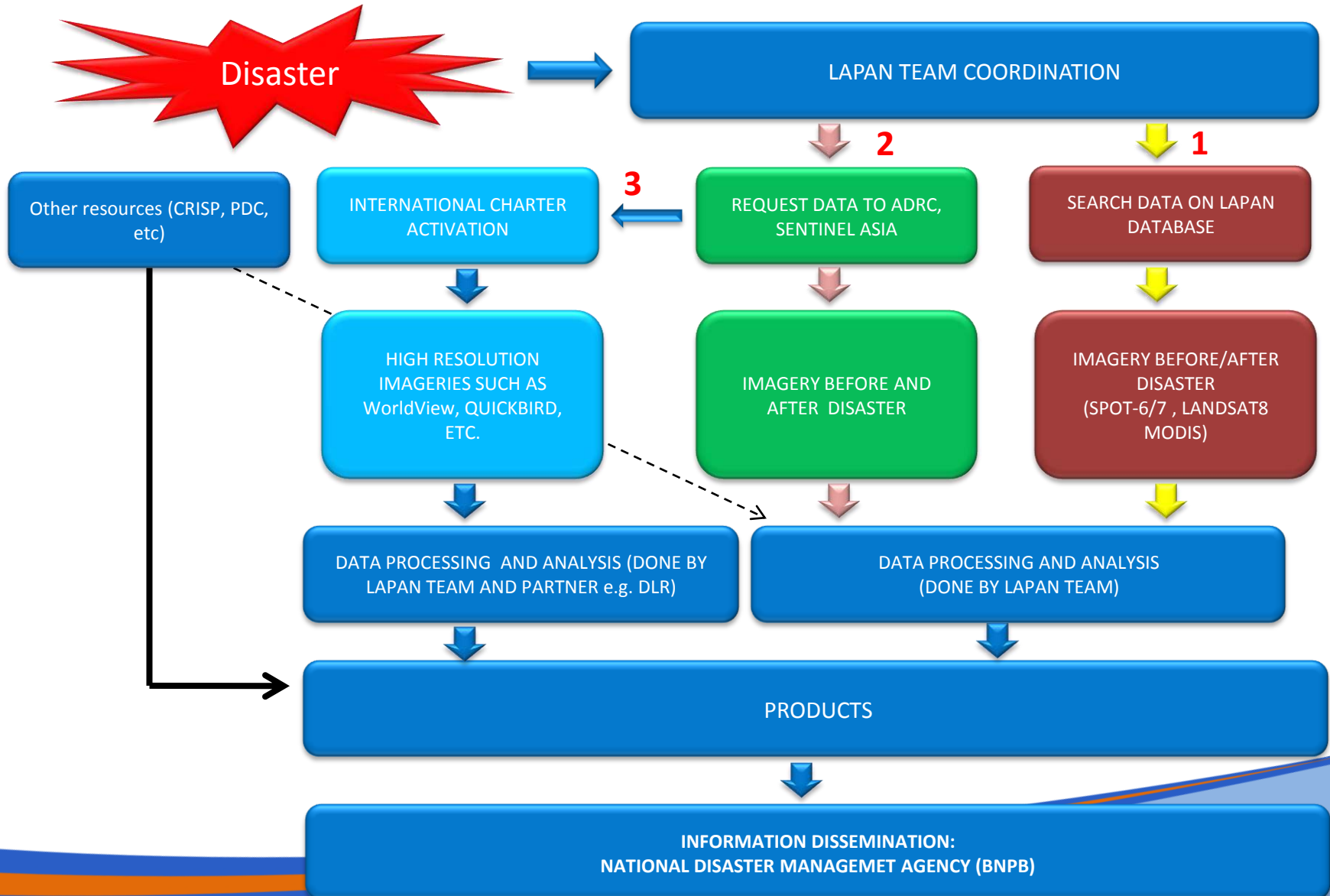
- Monthly Rainfall accumulation
- Monthly Forest Fire (Fire Hotspot and FDRS)
- Monthly Flood Prediction
- Fishing Ground
- Food Security

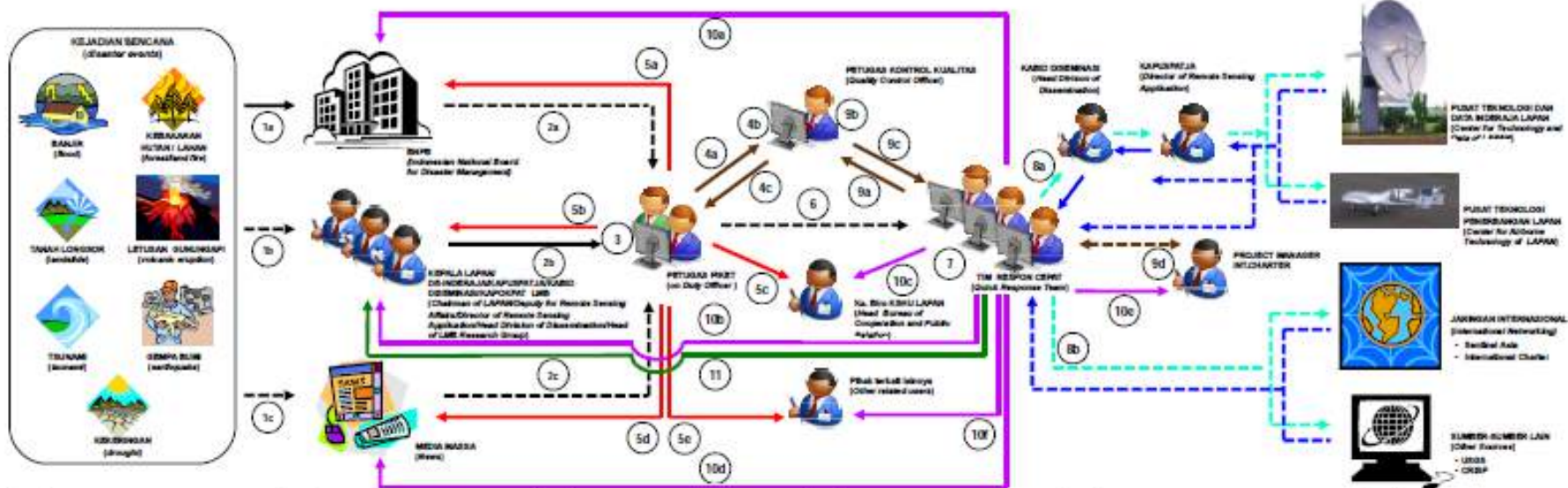
EMERGENCY RESPONSE

- VOLCANO, LANDSLIDE, FLOOD, SMOKE AND FOREST FIRE, EARTHQUAKE, TSUNAMI



Disaster Emergency Response Mechanism





1

TERJADI BENCANA
Informasi kejadian bencana sampai ke:
a. BNPB;
b. Pimpinan LAPAN;
c. Media massa (cetak/elektronik).

Jenis bencana alam meliputi:
• Banjir
• Kebakaran hutan/lahan
• Tanah longsor
• Letusan gunungapi
• Tsunami
• Gempa bumi
• Kekeringan

2

AKTIVASI QUICK RESPONSE (QR)
Petugas piket (On Duty Officer / ODO) melakukan aktivasi QR setelah:
a. Berkoordinasi dengan BNPB, atau
b. Mendapat instruksi dari Pimpinan LAPAN (Ka LAPAN/De-Indenja/Kapustelja/Kabid Daeminas) atau Kapustelja/Kapostel LMS a.n. Kapustelja; atau
c. Mendapat berita dari media massa (cetak/elektronik).

ODO membuat Laporan Kejadian Bencana (LKB) dalam Form LKB.
• Diambilnya Poin C sebagai dasar aktivasi QR harus memenuhi persyaratan S.1.

3

PENGOLAHAN DATA UNTUK INFORMASI RILIS SISTEM
ODO melakukan pengolahan data untuk menghasilkan informasi rilis pertama.
Teknis pengolahan data untuk tap-tap jenis bencana mengacu pada Petunjuk Teknis:

- Banjir (Juknis QR BU-1)
- Kebakaran hutan/lahan (Juknis QR KH-1)
- Tanah longsor (Juknis QR TL-1)
- Letusan gunungapi (Juknis QR GA-1)
- Tsunami (Juknis QR TS-1)
- Gempa bumi (Juknis QR GB-1)
- Kekeringan (Juknis QR KL-1)

4

KONTROL KUALITAS INFORMASI RILIS PERTAMA
ODO menyampaikan Draft Informasi Rilis Pertama (DQR-1) ke petugas kontrol kualitas (Quality Control Officer/ QCO).

- a. ODO menyampaikan DQR-1 ke QCO;
- b. QCO melakukan kontrol kualitas;
- c. ODO menerima dan menyunting DQR-1 sesuai dengan arahan QCO.

5

DISEMINASI INFORMASI RILIS PERTAMA
ODO mengirimkan informasi rilis pertama (QR-1) kepada pihak-pihak:
a) BNPB; b) Pimpinan LAPAN langsung (Ka LAPAN/De-Indenja/Kapustelja/Kabid Daeminas); c) Ka. Biro Kerjasama Humas dan Umum (KSHU) LAPAN; d) Media Massa (melalui Web LAPAN); e) Pihak-pihak terkait lainnya sesuai arahan Kabid Daeminas.

- ODO membuat laporan pengolahan informasi QR-1 yang mengacu pada Form LQR-1.
- Proses quick response dapat selesai sampai langkah ini atau berlanjut dengan langkah berikutnya apabila memenuhi Pernyataan S-2. Apabila dinyatakan selesai maka LQR-1 sekaligus merupakan Laporan Advikal QR.

6

PENBENTUKAN TIM RESPON CEPAT (QUICK RESPONSE TEAM / QRT)

- QRT dibentuk berdasarkan instruksi pimpinan LAPAN.
- QRT dipimpin oleh seorang Project Manager (PM).
- ODO mengalokasikan tugas pengolahan lebih lanjut kepada QRT.

7

PENGOLAHAN DATA UNTUK INFORMASI RILIS KEDUA
QRT melakukan pengolahan data untuk menghasilkan informasi rilis kedua.
Teknis pengolahan data untuk tap-tap jenis bencana mengacu pada Petunjuk Teknis:

- Banjir (Juknis QR BU-2)
- Kebakaran Hutan/Lahan (Juknis QR KH-2)
- Tanah Longsor (Juknis QR TL-2)
- Letusan Gunungapi (Juknis QR GA-2)
- Tsunami (Juknis QR TS-2)
- Gempa Bumi (Juknis QR GB-2)
- Kekeringan (Juknis QR KL-2)

Langkah ke-7 ini dapat dilidit dengan langkah ke-6 dalam rangka untuk memperoleh data dengan resolusi lebih baik / data pendukung lainnya.

8a

PENCARIAN DATA KE SUMBER-SUMBER INTERNAL LAPAN
QRT melakukan pencarian data ke sumber-sumber internal LAPAN:

- a. Ke Kapustelja, dengan urutan permintaan: PM → Kabid Daeminas → Kapustelja → Kapusteldata (Form DCI-TD)
- b. Ke Kapustelbang, dengan urutan permintaan: PM → Kabid Daeminas → Kapustelja → Kapustelbang (Form DCI-TB)

8b

PENCARIAN DATA KE SUMBER-SUMBER EKSTERNAL LAPAN

- a. Melalui kontak kerjasama dengan jaringan internasional yang sudah terjalin, seperti: Sentinel Asia, International Charter, dll. Dalam melaksanakan ini, PM perlu mengajukan permohonan akses ke International Charter apabila terlebih dahulu memenuhi persyaratan S-3.
- b. Melalui sumber-sumber yang tersedia di internet seperti USGS, CRISP, dll.

• Jenis data yang diperlukan untuk dilakukan pencarian dicatat dalam Form LKDC.

9

KONTROL KUALITAS INFORMASI RILIS KEDUA
QRT menyampaikan Draft Informasi Rilis Kedua (DQR-2) ke QCO.

- a. QRT menyampaikan DQR-2 ke QCO;
- b. QCO melakukan kontrol kualitas terhadap DQR-2;
- c. QRT menerima dan menyunting DQR-2 sesuai dengan arahan QCO;
- d. Dalam hal proses QR melibatkan International Charter, maka PM QR harus berkoordinasi dengan PM International Charter.

10

DISEMINASI INFORMASI RILIS KEDUA
QRT mengirimkan informasi rilis kedua yang sudah disetujui QCO (QR-2) kepada pihak-pihak:
a. BNPB;
b. Pimpinan LAPAN langsung (Ka LAPAN/De-Indenja/Kapustelja/Kabid Daeminas);
c. Ka. Biro KSHU LAPAN;
d. Media Massa (melalui Web LAPAN);
e. International Charter (apabila melibatkan);
f. Pihak-pihak terkait lainnya sesuai arahan Kabid Daeminas.

11

PENUTUPAN QR (CLOSING)

- a. PM melaksanakan penutupan QR apabila memenuhi pernyataan S-4;
- b. QRT membuat Laporan Advikal QR yang mengacu pada Form LQR-2;
- c. LQR-2 disampaikan kepada Kapustelja.

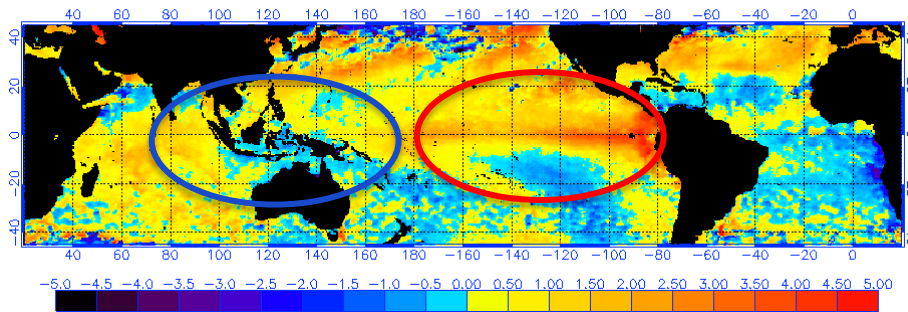


Examples of space-based information products

Climate Forecast as the global alert

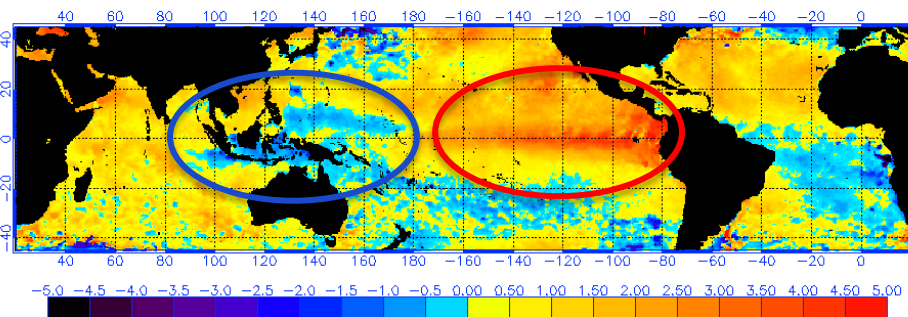
June, 2015

NOAA/NESDIS SST Anomaly (degrees C), 6/29/2015



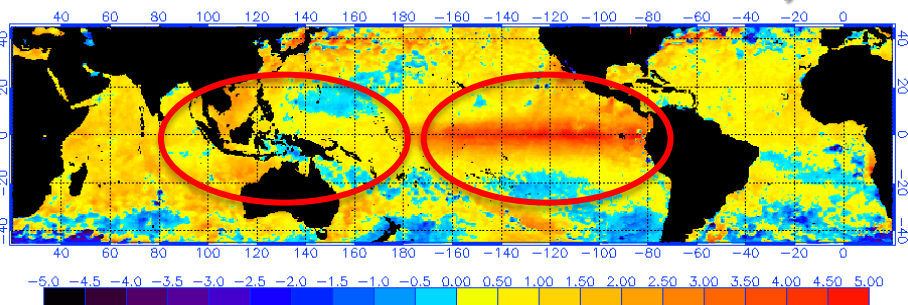
Sep, 2015

NOAA/NESDIS SST Anomaly (degrees C), 9/28/2015

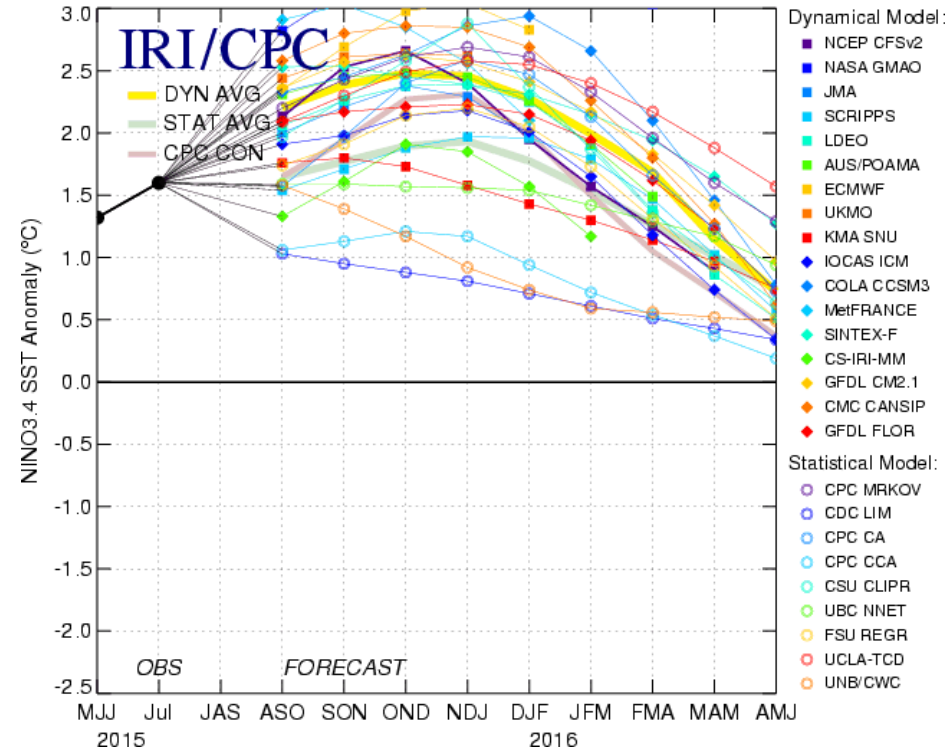


Nov, 2015

NOAA/NESDIS SST Anomaly (degrees C), 11/26/2015



Mid-Aug 2015 Plume of Model ENSO Predictions



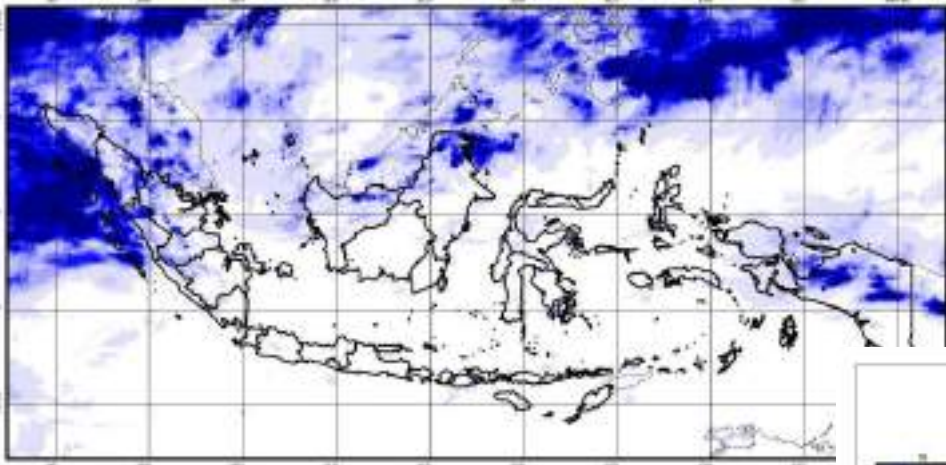
Source:

- International Research Institute (IRI)
- NOAA/NESDIS

Rainfall accumulation

AKUMULASI CURAH HUJAN DI INDONESIA

17 - 23 September 2015



LEGENDA :



Pengolahan data oleh :

RISAT PEMANFAATAN PENGEKSAAN
LEMBAGA PENYIANGKIAN ANTARSI
Email : sribudi@lapan.go.id
http://portal.lapan.go.id/MSBA

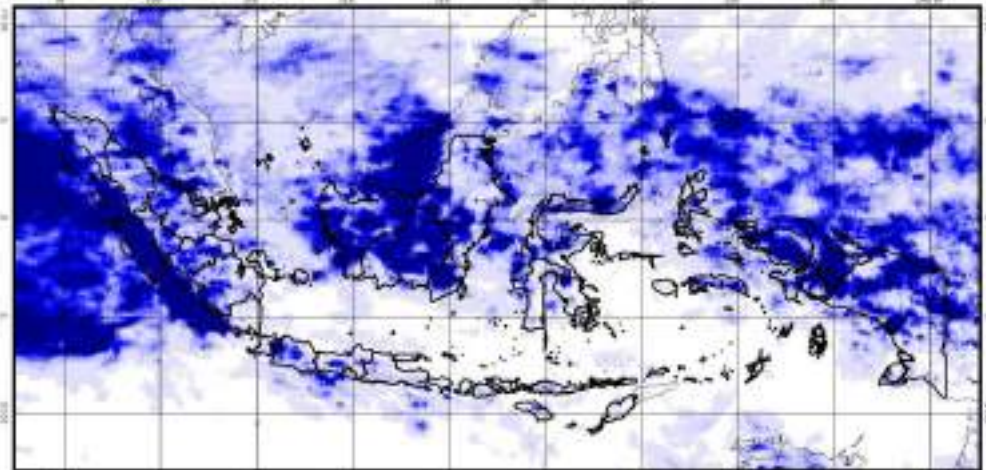
SUMBER :

1. Data Qmorph
2. Peta Administrasi Indonesia

Proyeksi : UTM
Sistem Grid : Grid Geografis
Datum : MEAD

AKUMULASI CURAH HUJAN DI INDONESIA

09 November 2015 (07.00 WIB) - 15 November 2015 (06.00 WIB)



LEGENDA :



Pengolahan data oleh :

PUSAT PEMANFAATAN PENGEKSAAN JALAN
LEMBAGA PENYIANGKIAN ANTARSI MASYARAKAT (LAPAN)
Email : sribudi@lapan.go.id
http://portal.lapan.go.id/MSBA

SUMBER :

1. Data Qmorph
2. Peta Administrasi Indonesia

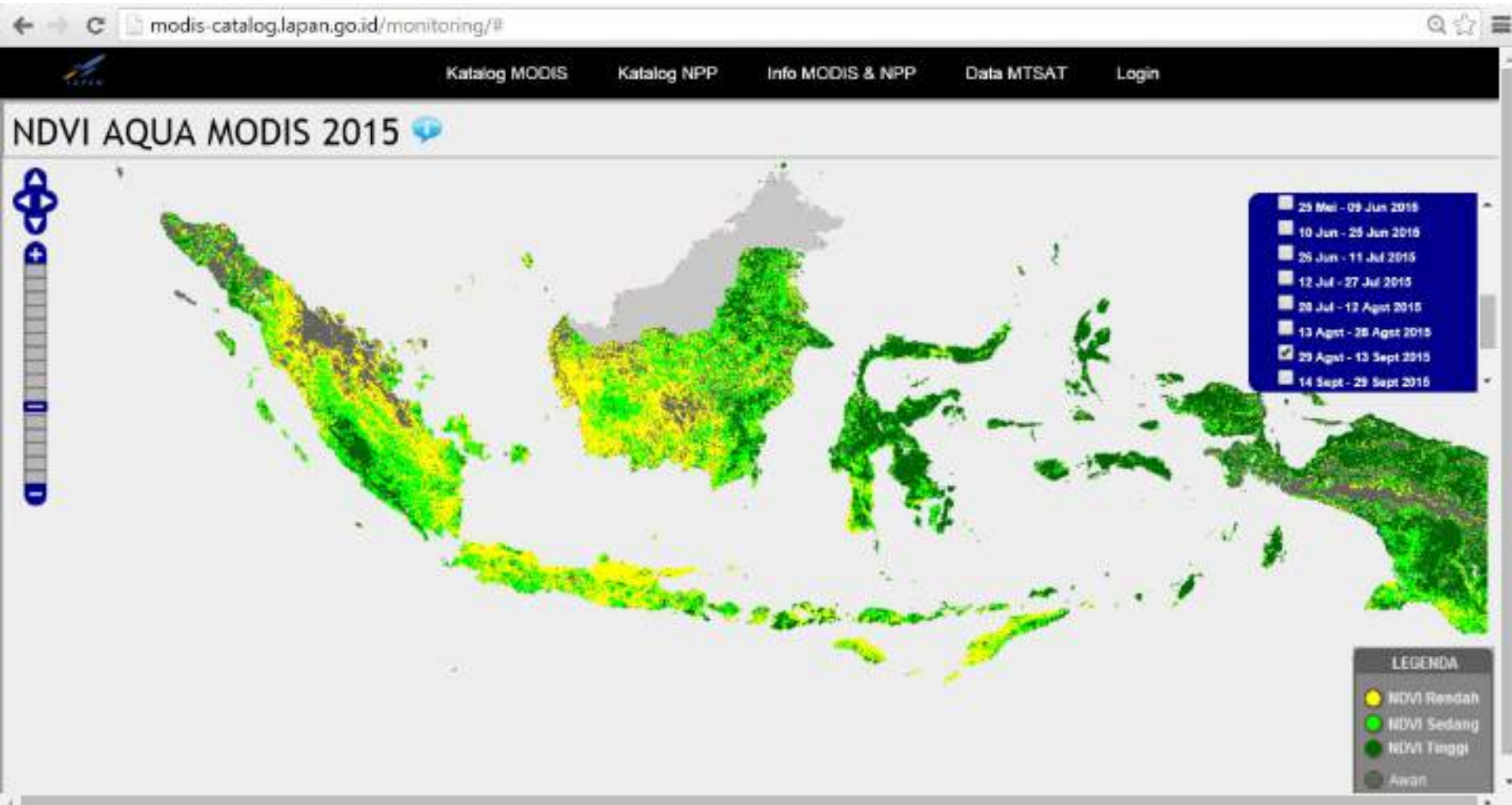
Proyeksi : Geodetik
Sistem Grid : Grid Geografis
Datum : WGS84

Data source:
Qmorph Data
Spatial res: 8 km

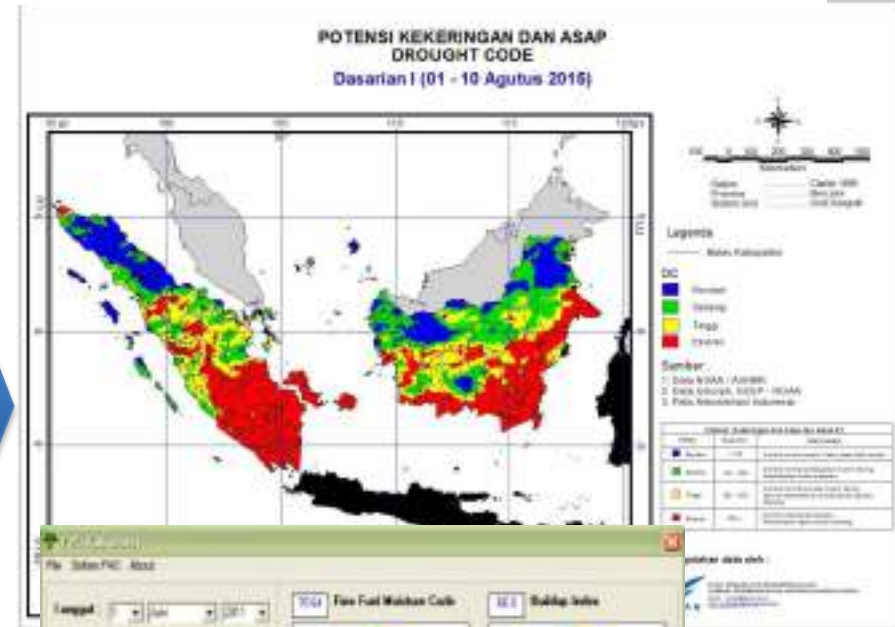
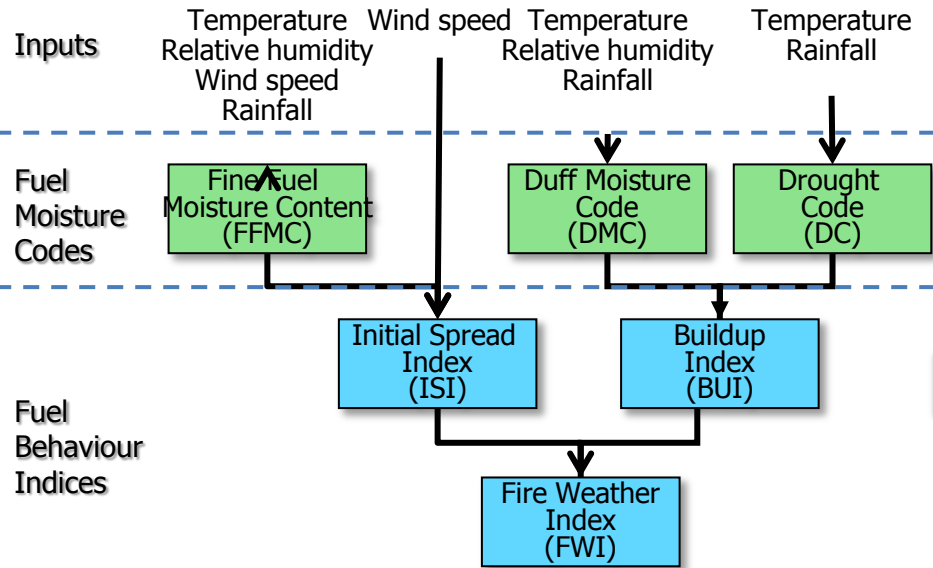
Vegetation Index (13 Ags – 28 Ags 2015)



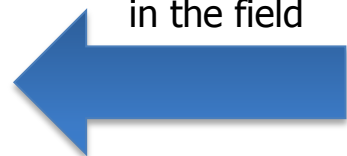
Vegetation Index (29 Ags – 13 Sep 2015)



Fire Danger Rating System



Dashboard of FDRS in the field

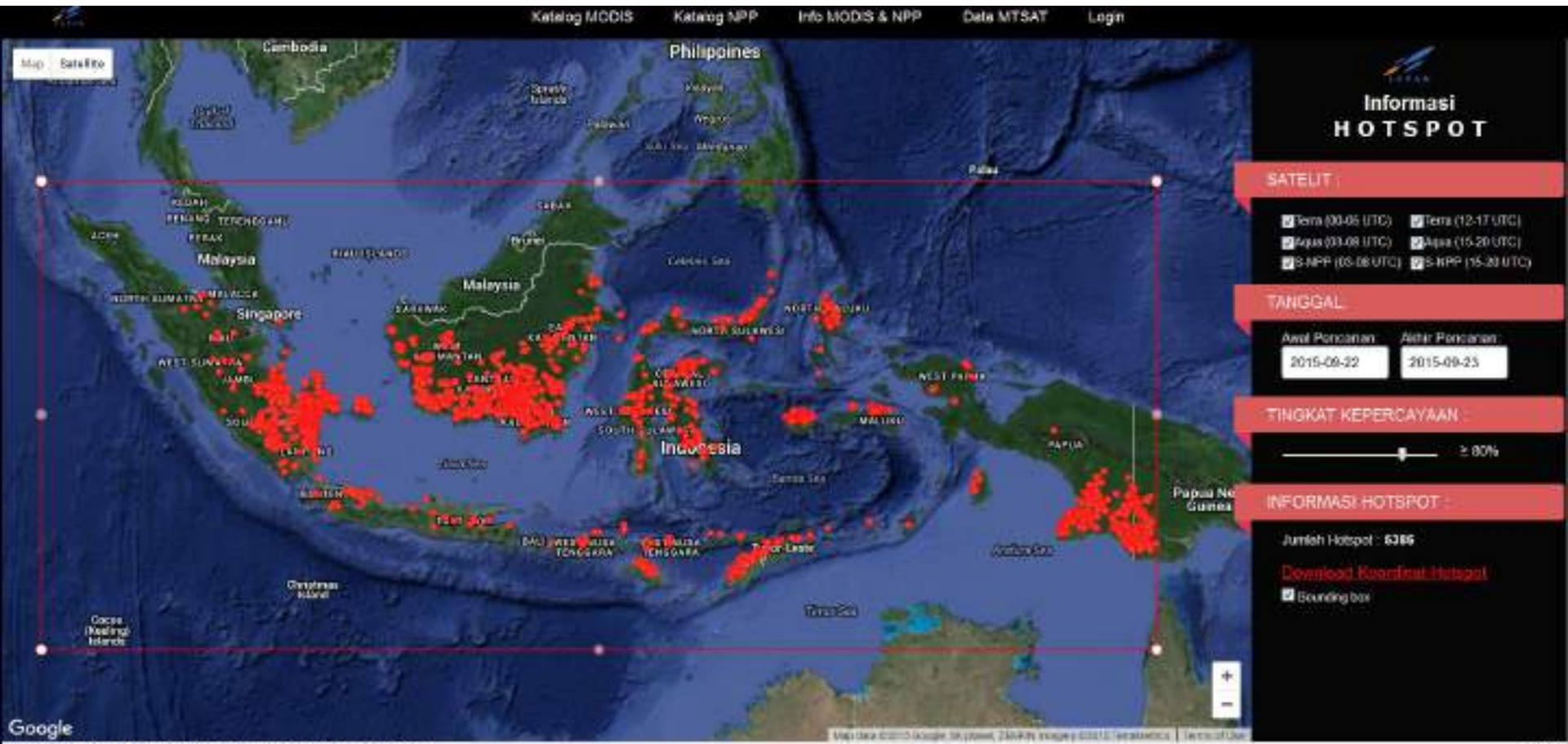


FIRE WEATHER INDEX CALCULATOR

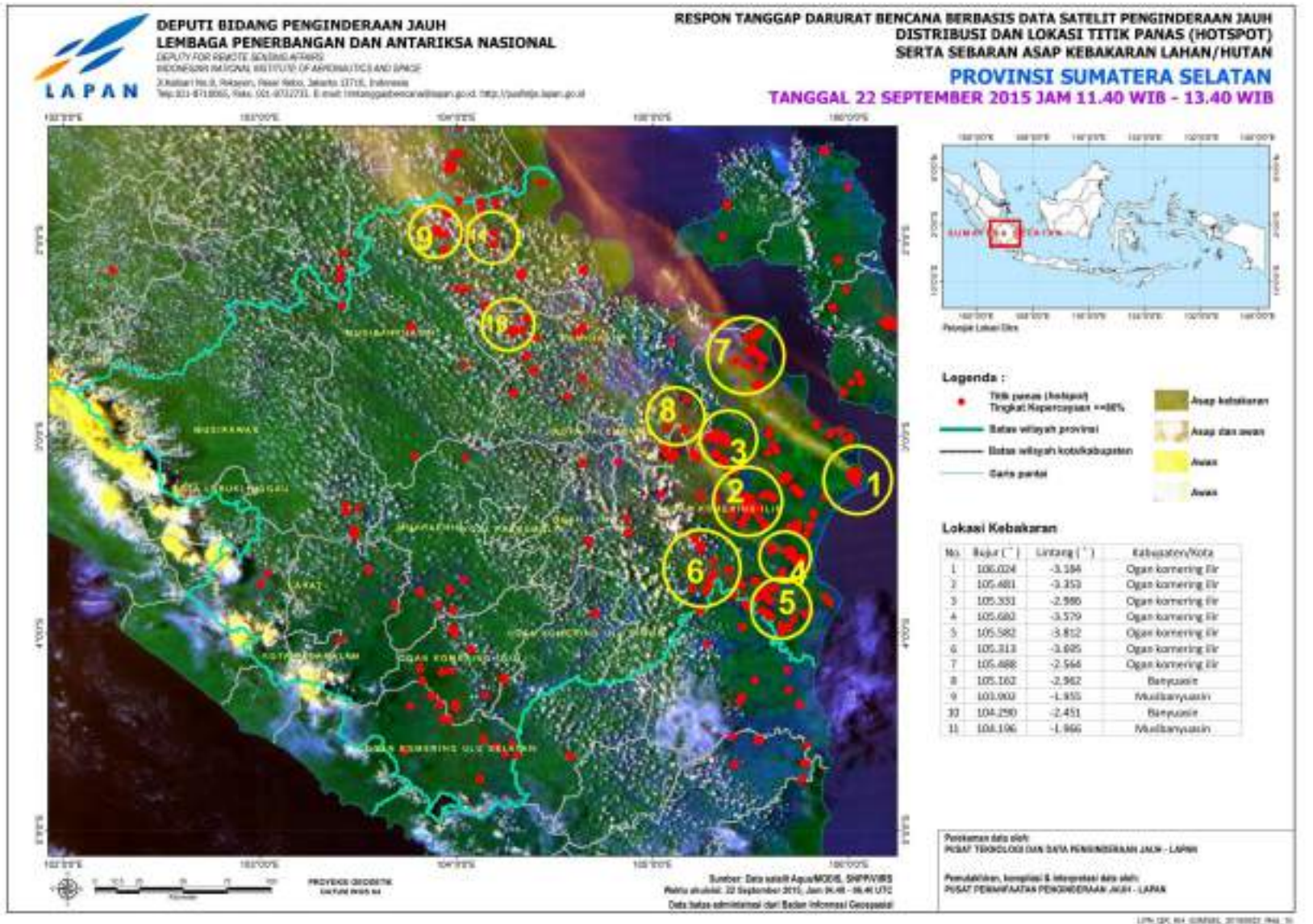


Fire Hotspot Monitoring (Terra-Aqua MODIS, SNPP VIIRS)

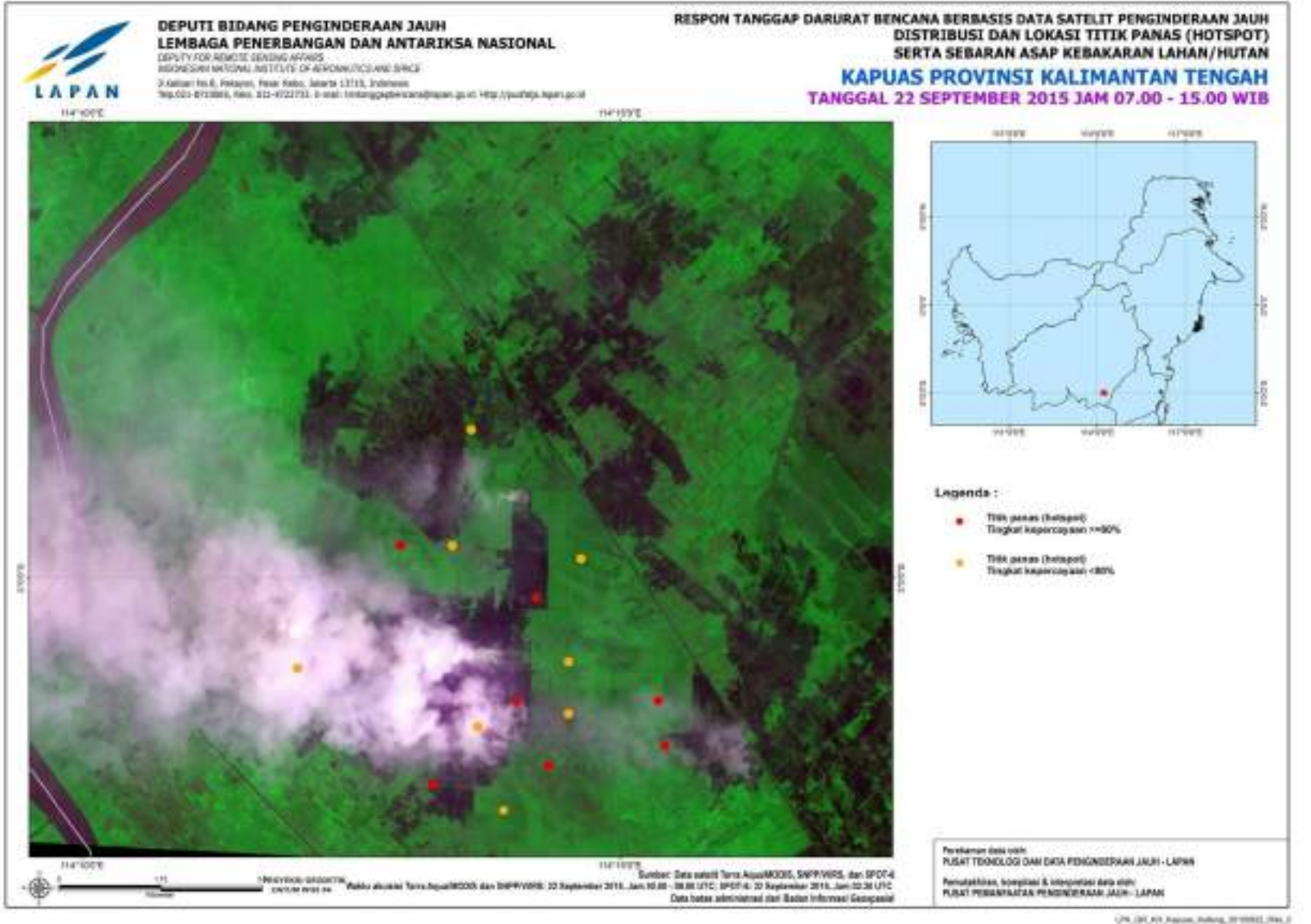
22 - 23 September 2015



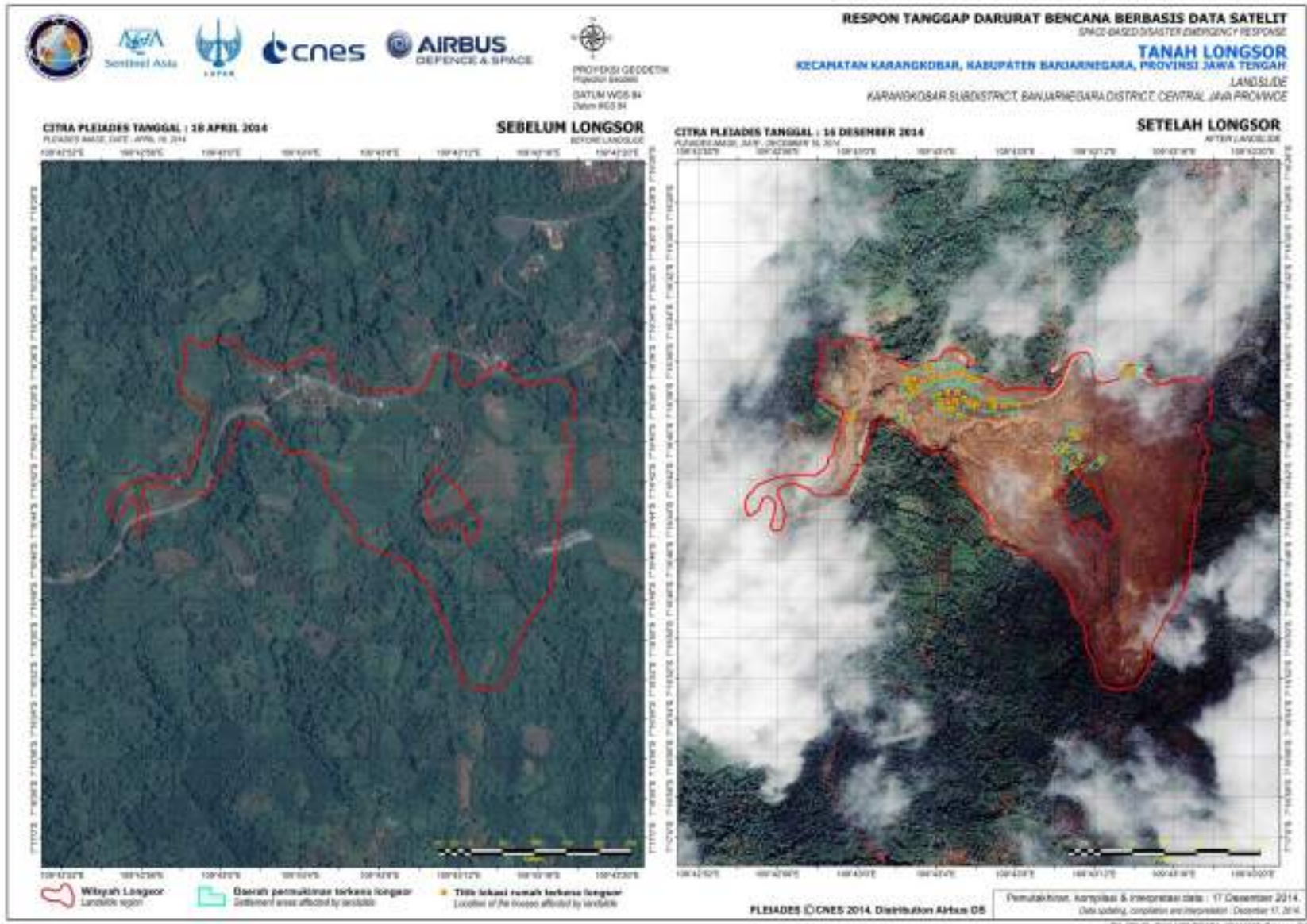
Fire Hotspot and Smoke/Haze Monitoring (South Sumatera, MODIS, 23 Sep 2015 - 06.40 UTC)



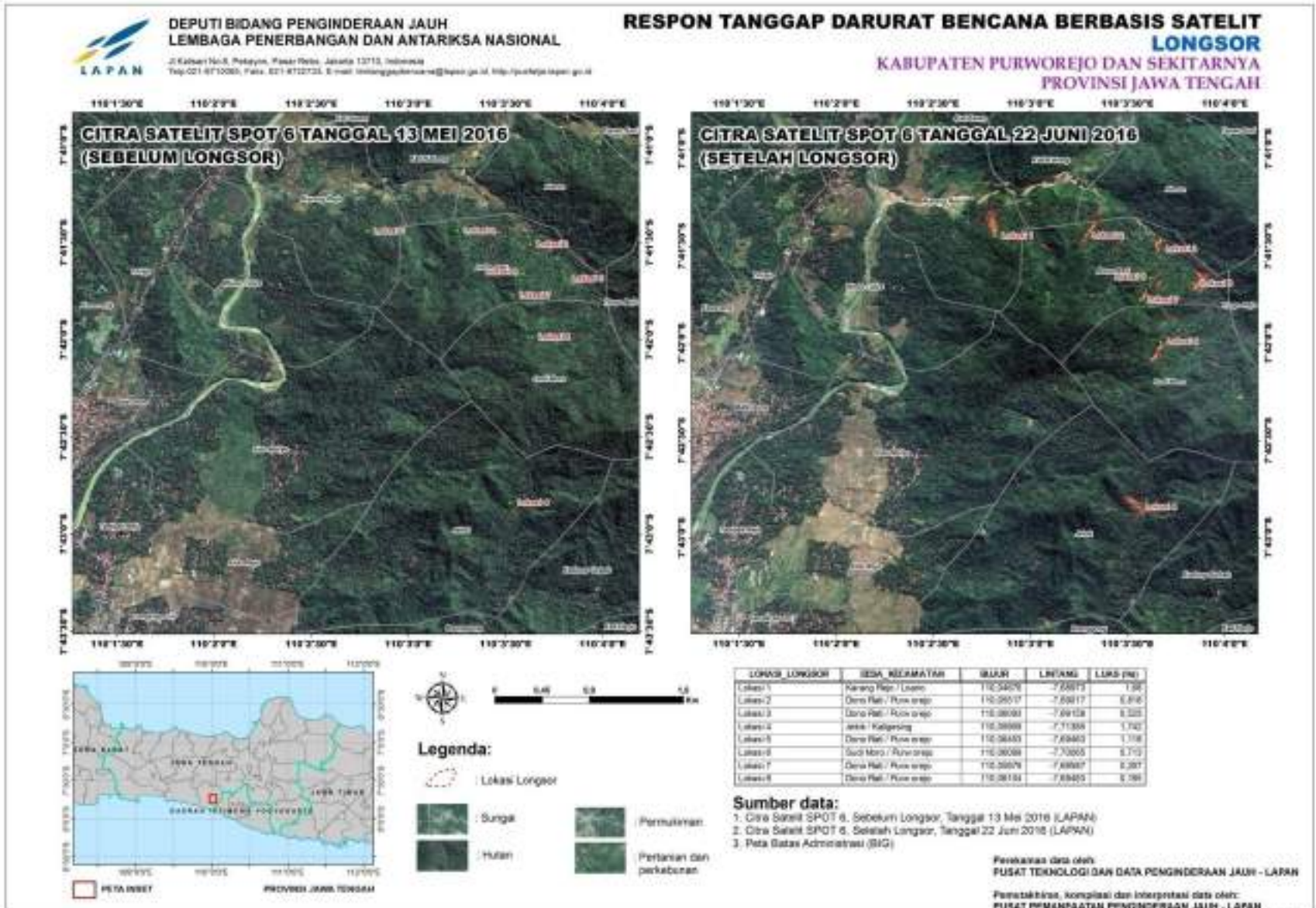
Smoke and burned area (Central Kalimantan, SPOT-6, 22 Sep 2015)



Landslide in Banjarnegara (Pleiades, Dec 2014)



Landslide in Purworejo (SPOT-6, June 2016)



Landslide in Purworejo (SPOT-6, June 2016)



DEPUTI BIDANG PENGINDERAAN JAUH
LEMBAGA PENERBANGAN DAN ANTARIKSA NASIONAL

Jl. Sekeloa No. 8, Pajajaran, Pasar Rebo, Jakarta 13718, Indonesia
Telp. 021-6730689; Fax. 021-6732230; E-mail: lambagapenginderaanjauh@lapan.go.id; <http://satelit.lapan.go.id>

**RESPON TANGGAP DARURAT BENCANA BERBASIS SATELIT
LONGSOR (DESA DONO RATI, KECAMATAN PURWOREJO)
KABUPATEN PURWOREJO DAN SEKITARNYA
PROVINSI JAWA TENGAH**



Legenda:

-  Runtuhan Terdampak Longsor
-  Lokasi Longsor
-  Sungai
-  Peremukisan
-  Hutan
-  Pertanian dan perkebunan

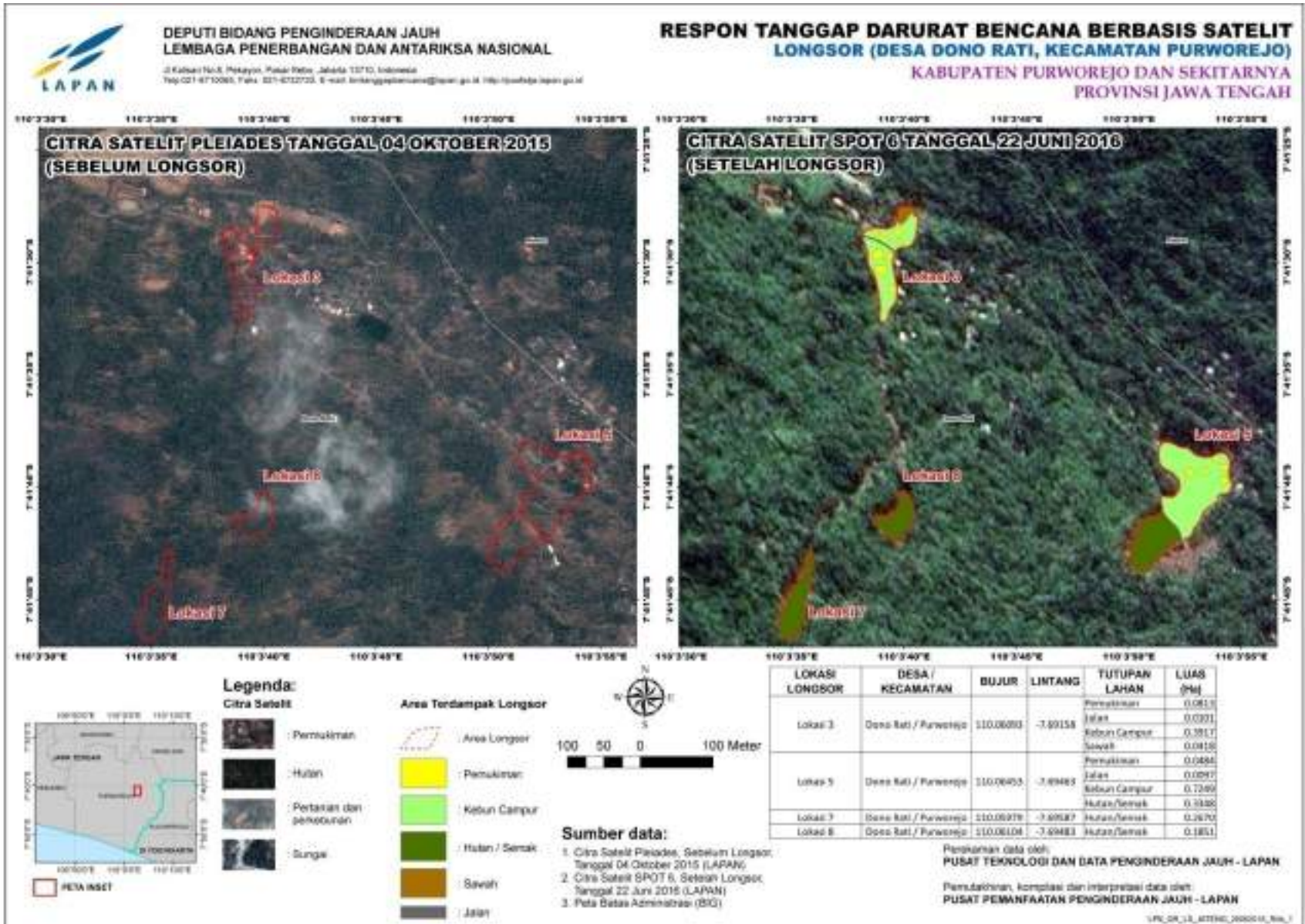
LOKASI RUNTUHAN	DESA / KECAMATAN	BELUR	LEBARING
1	Dono Rati / Purwoarjo	110.35875	-7.85120
2	Dono Rati / Purwoarjo	110.35805	-7.85130
3	Dono Rati / Purwoarjo	110.35807	-7.85131
4	Dono Rati / Purwoarjo	110.35907	-7.85114
5	Dono Rati / Purwoarjo	110.35878	-7.85134
6	Dono Rati / Purwoarjo	110.35808	-7.85127
7	Dono Rati / Purwoarjo	110.35809	-7.85176
8	Dono Rati / Purwoarjo	110.35808	-7.85174
9	Dono Rati / Purwoarjo	110.35887	-7.852
10	Dono Rati / Purwoarjo	110.35858	-7.85435
11	Dono Rati / Purwoarjo	110.35813	-7.85424
12	Dono Rati / Purwoarjo	110.35485	-7.85425
13	Dono Rati / Purwoarjo	110.35608	-7.85421
14	Dono Rati / Purwoarjo	110.35469	-7.85425
15	Dono Rati / Purwoarjo	110.35287	-7.85425
16	Dono Rati / Purwoarjo	110.35259	-7.85460

Sumber data:

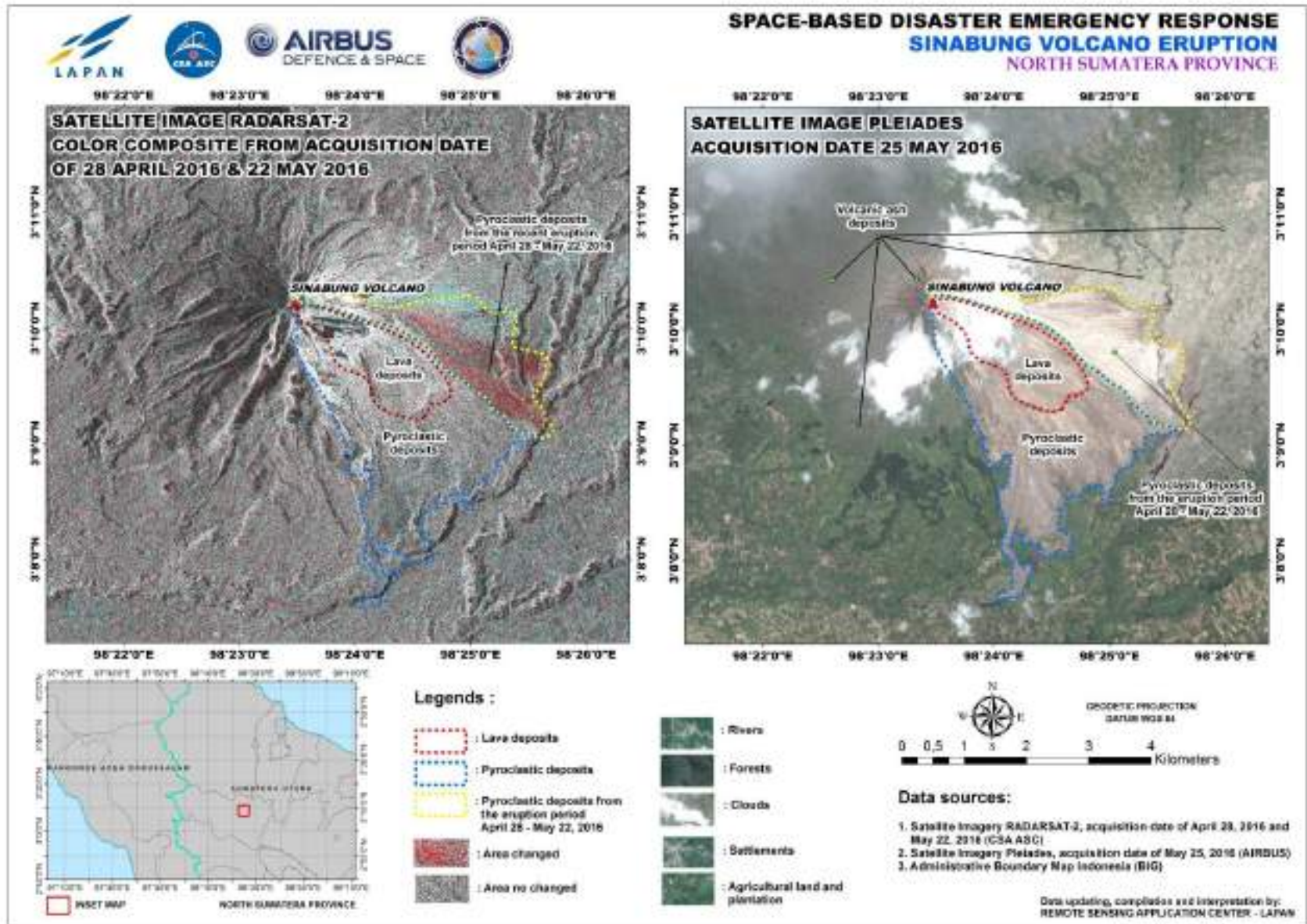
1. Citra Satelit Pleiades, Sebelum Longsor, Tanggal 04 Oktober 2015 (LAPAN)
2. Citra Satelit SPOT 6, Setelah Longsor, Tanggal 22 Juni 2016 (LAPAN)
3. Peta Balas Administrasi (BIB)

Penyusunan data oleh:
PUSAT REANALISIS DAN DATA PENGINDERAAN JAUH - LAPAN
Penyusunan, pengolahan dan interpretasi data oleh:
PUSAT PERAMPAATAN PENGINDERAAN JAUH - LAPAN

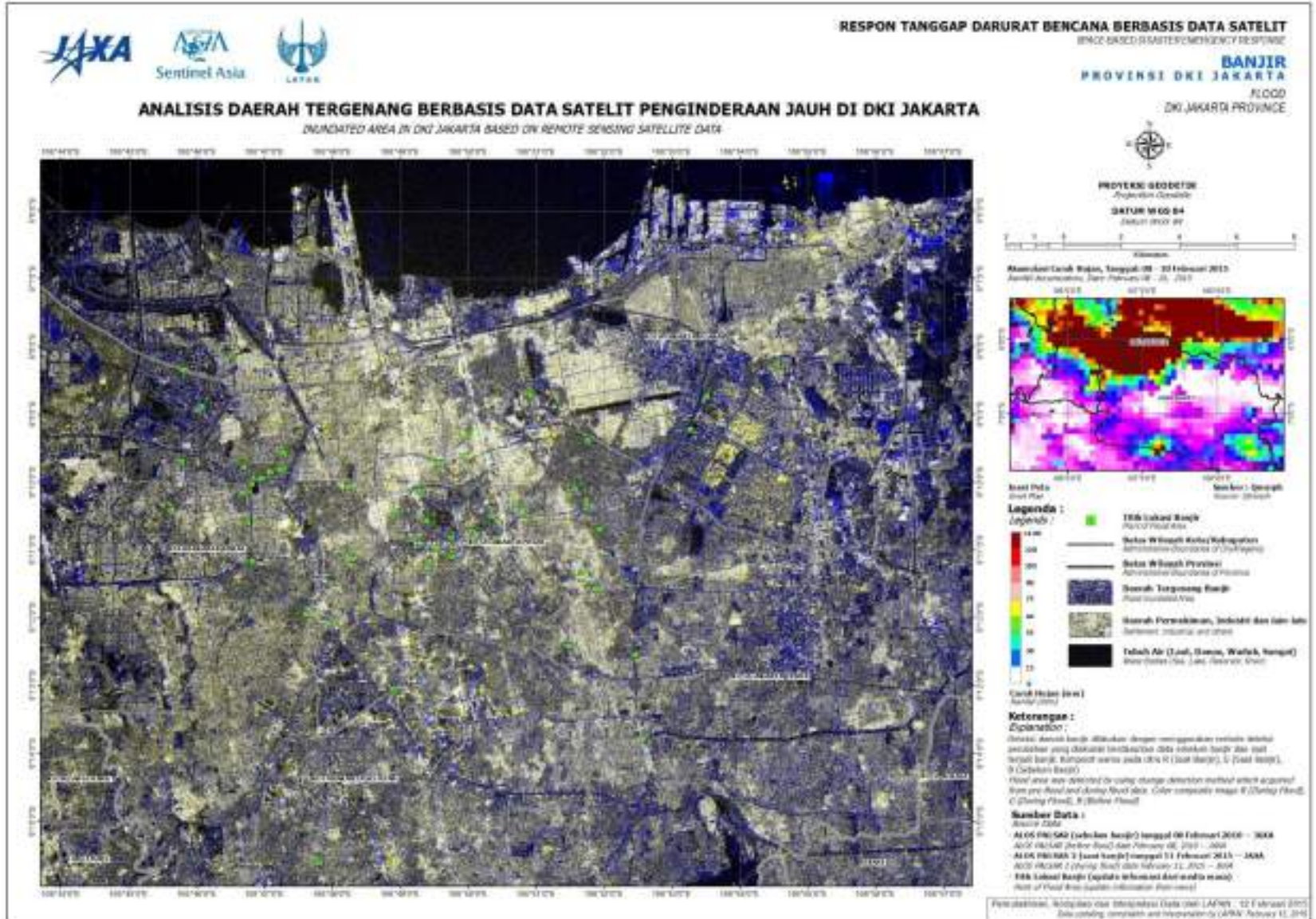
Landslide in Purworejo (SPOT-6, June 2016)



Sinabung Eruption (May 2016)



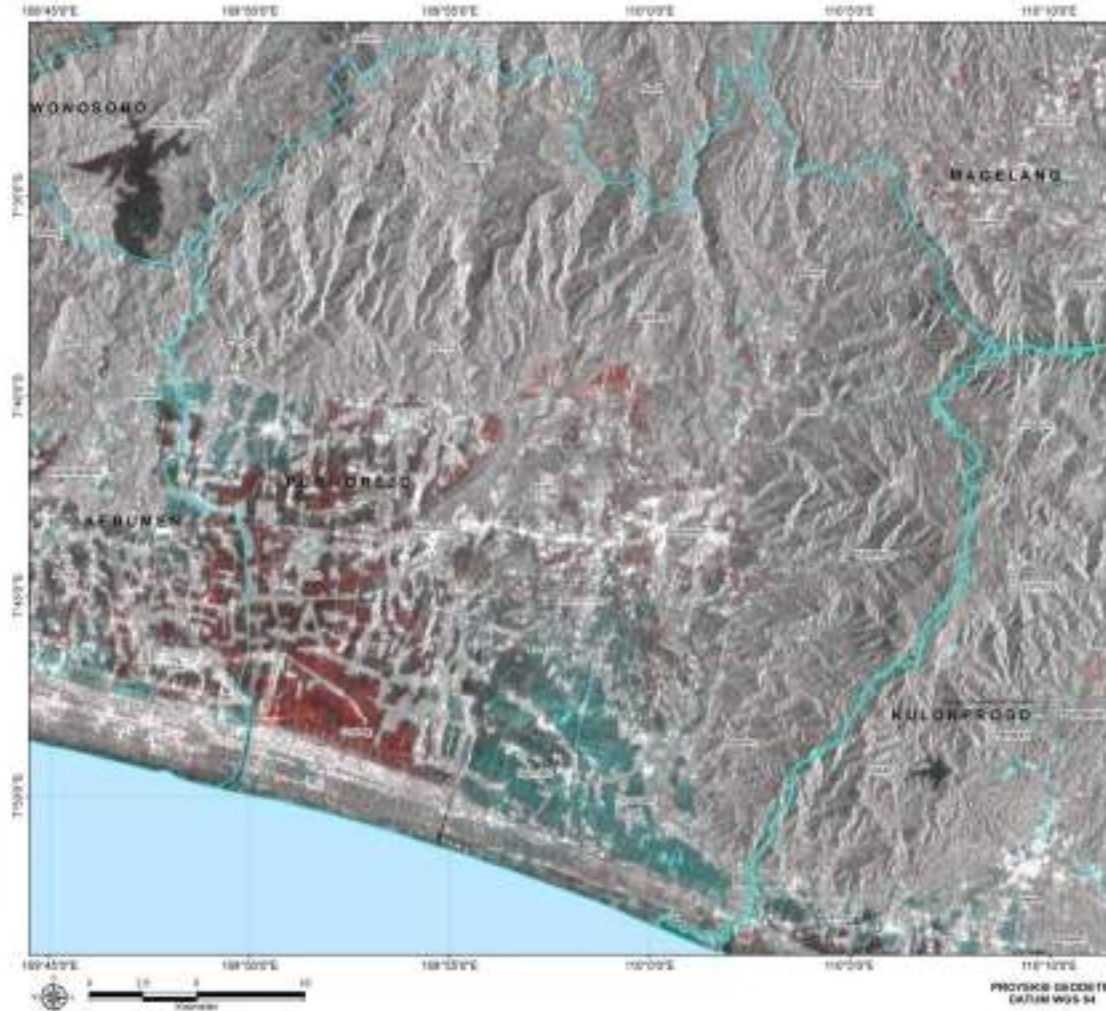
Flood in Jakarta ALOS PALSAR, 9 Feb 2015



Flood in Central Java ALOS PALSAR, May 2016



RESPON TANGGAP DARURAT BENCANA BERBASIS SATELIT DAERAH TERGENANG BANJIR KABUPATEN PURWOREJO DAN SEKITARNYA PROVINSI JAWA TENGAH



Legenda :

- : Batas wilayah kota/kabupaten
- : Batas wilayah provinsi
- : Garis pantai

-  Daerah Tergenang Banjir
-  Tidak Air
-  Daerah Tidak Tergenang Banjir

Sumber data:

1. Data Citra ALOS-2 (JAXA)
 - Tanggal 9 Mei 2016 (Sebelum Banjir)
 - Tanggal 20 Mei 2016 (Sesudah Banjir)
2. Peta Batas Administrasi Indonesia (BIG)

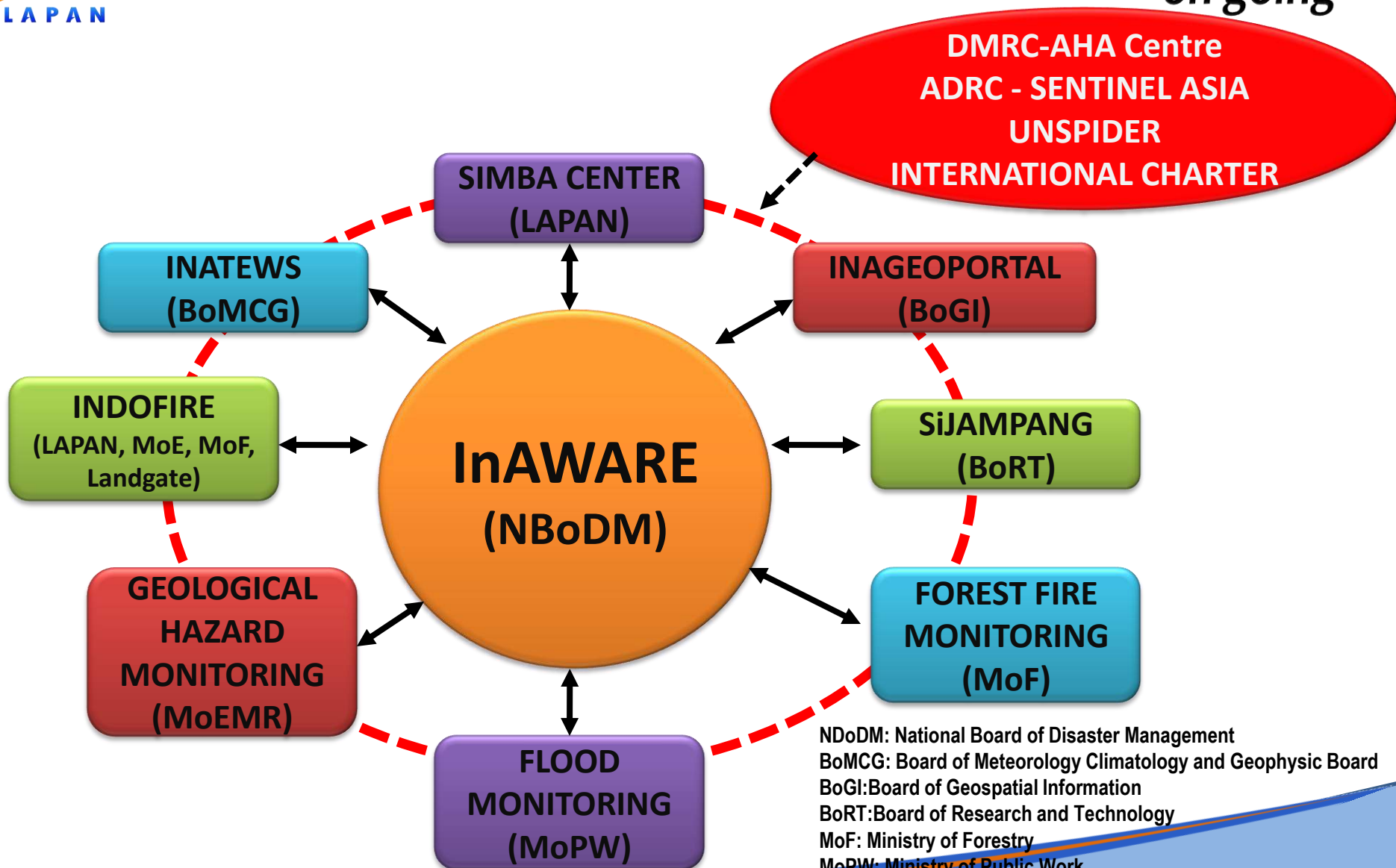


Data and Informations Dissemination



Integrated Disaster Information System in Indonesia

- on going



NBoDM: National Board of Disaster Management
BoMCG: Board of Meteorology Climatology and Geophysic Board
BoGI: Board of Geospatial Information
BoRT: Board of Research and Technology
MoF: Ministry of Forestry
MoPW: Ministry of Public Work
MoEMR: Ministry of Energy and Mineral Resources
AHA Centre: ASEAN Humanitarian Assistance

Website of Remote Sensing Technology and Data Center

<http://www.pustekdata.lapan.go.id>



The screenshot displays the website interface for the Remote Sensing Technology and Data Center (Pustekdata). The page features a dark blue background with a starry space pattern. At the top, the LAPAN logo and name are visible. The main content area is titled "PUSAT TEKNOLOGI DAN DATA PENUNJANG MURNI" and includes a navigation menu with items like "Beranda", "Tentang Kami", "Layanan", "Produk", "Publikasi", "Tugas", and "Kontak". A central banner image shows a satellite view of a city, identified as "KOTA PEKALANG - JAWA TONGGA (OLEHADES, 19-07-2010)". Below this, there are three columns of featured items under the heading "Layanan Terbaru". The first column lists "Perencanaan Citra dan Data", the second "Citra dan Data", and the third "Perencanaan Sistem". Each item includes a brief description and a date.

Website of Remote Sensing Application Center

<http://www.pusfatja.lapan.go.id>



The screenshot displays the website interface for Pusat Pemanfaatan Penginderaan Jauh (PPPJ) LAPAN. The page features a dark blue header with the LAPAN logo and navigation menu items: Home, Litbangsari, PPTB, UMS, M&A, Publikasi, Aplikasi, Layanan, and Contact. A search bar is located in the top right corner. The main content area is titled 'Sistem Informasi Sumber Daya Alam dan Lingkungan (ISDAL)' and includes a 'Dokumentasi' section with a news article dated 04/11/2013 titled 'History Lecture of The 22nd Lecture of the Asia-Pacific Regional Space Agency Forum (APRSAF), Bali, 3-4 Desember 2013'. The article text describes the event and mentions the presence of LAPAN representatives. On the right side, there are three sidebar sections: 'Seeds Data Hasil Litbang', 'Publikasi Hasil Populer', and 'Tanggap Darurat Bencana'. The bottom of the page contains three columns for 'Litbangsari', 'EVSYS', and 'Himpun Video'.



Local Government

- Group A { BPBD
- Group B { LAPAN
- Group C { BMKG
- Group D { Manggala Agni
- Police/Army
- Transportation
- Health, etc

Central Government

- Group A { Coordinating Minister for Political, Justice, and Security Affairs
- Group B { BNPB
- Ministry of Environmental and Forestry
- LAPAN
- BMKG
- Ministry of Health
- Ministry of People Welfare etc



Daily Dissemination



Technical training for LAPAN



JAXA-AIT MINI PROJECT
RS Applications for Flood Risk Assessment
LAPAN-BIG (Sep 2014 – Jan 2015)



JAXA-AIT MINI PROJECT
RS Applications for Landslide Risk Assessment
LAPAN-BNPB (Sep 2015 – Jan 2016)



UNSPIDER TRAINING
RS for earthquake damage and assesment
(Sep 2015)



PROJECT MANAGER TRAINING FOR
INTERNATTIONAL CHARTER
JAXA
(Sep 2014)

Technical Assistant Support for Users



National Coordination



Ministerial meeting



MoU between LAPAN and local government

ASEAN cooperation

Mechanism of Space-based data and information data sharing during emergency response

Bogor-Indonesia, 19-21 April 2016



How can the process of identification, analysis, interpretation and delivery of disaster information can be done in an effective, efficient, accurate and fast, so that people in the danger zone of disaster can anticipate the disasters?

- Discrepancies in maps and data from various organisations.
- Data sharing mechanism.
- Timely availability of data.
- Huge data size that make difficult to process and transfer via internet.
- Difficulty in getting high resolution satellite images during emergencies.
- Lack of trained manpower at local level.

How do the results of the process of high tech remote sensing can be easily understood by the various levels of society?

The need for proper education process and comprehensively to various walks of life.

Thanks for



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