WATER RESOURCES MANAGEMENT INDONESIA:

From Weather and Climate Services to Disaster Management

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1. Ministry of Environment and Forestry (KLHK)
2. Agency for Meteorology Climatology and Geophysics (BMKG)
3. National Disaster Management Authority (BNPB)
4. Contributions from Min. of Public Works and Public Housing (PUPR)

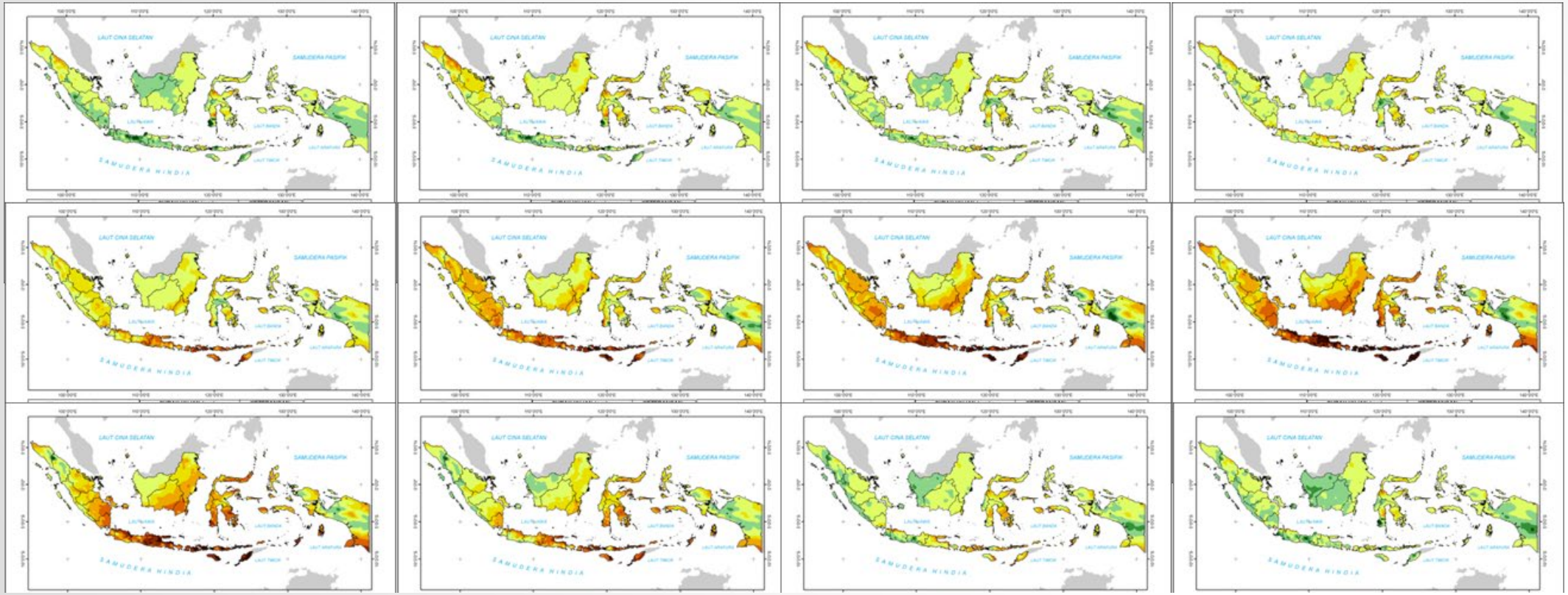
Presented at the AOGEO, 3 November 2019, Canberra - Australia

OUTLINE

- National report on the platform activity
  - Weather and climate services
  - Use of services for water management
  - Landslide early warning system
  - Disaster Management in Indonesia
- Proposals for capacity development
- [Roadmap/strategic way] Contributions for global agenda
- Conclusion

WEATHER AND CLIMATE SERVICES

RAINFALL CLIMATOLOGY



- Varies from region to region and in intensity.
- Monsoonal and equatorial type rainfall.
- Annual intensity ranges from 700mm/year to 5500 mm/year.

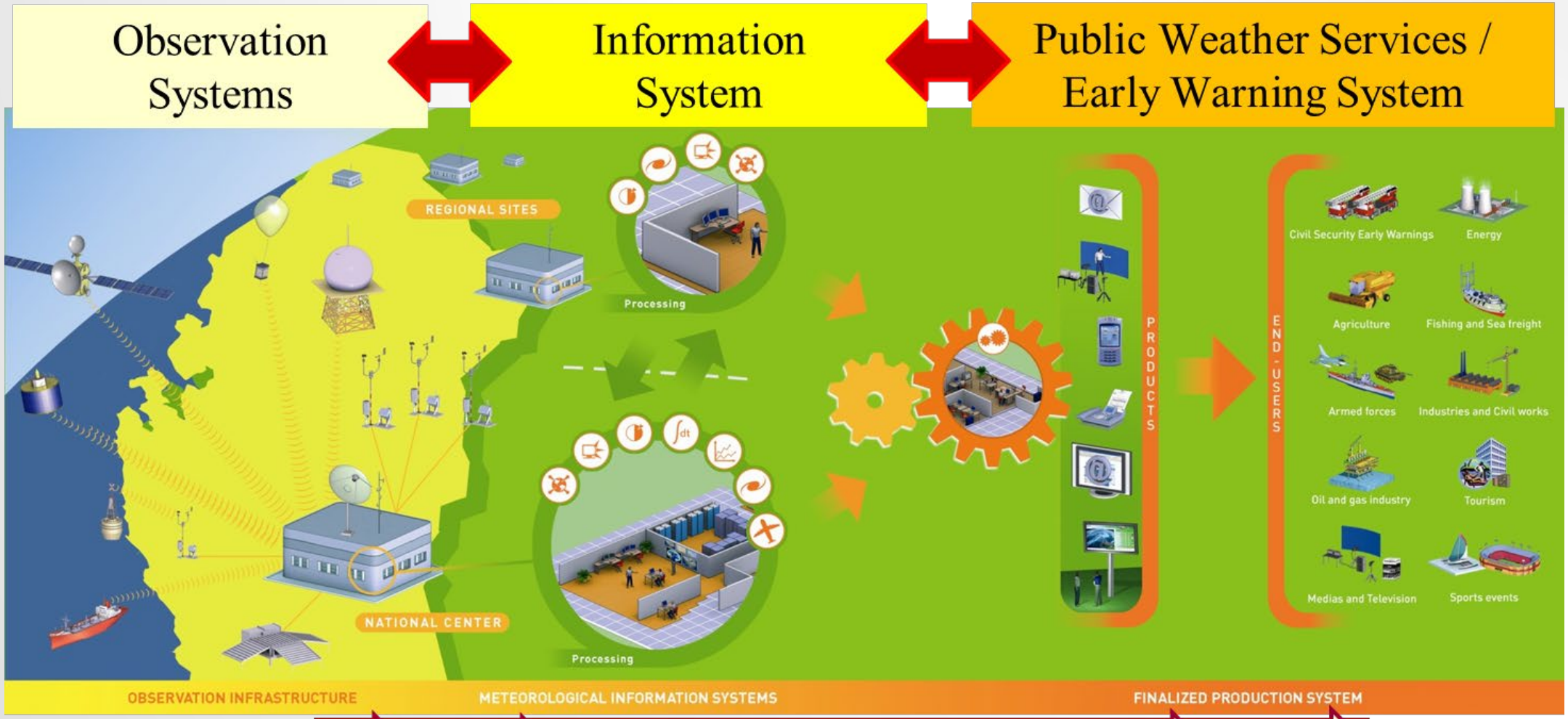
DIGITAL FORECAST

IMPLEMENTATION OF DIGITAL FORECAST AND AUTOMATIC PRODUCTION CONCEPTS

Why digital Forecast??

- Automatic production system and dissemination
- All products in digital format
- Information products nationally integrated
- Mass production
- Comply with WMO standard
- Major inputs for derived - products for public and media(TV System, Visumet, Website)

TYPICAL ORGANIZATION

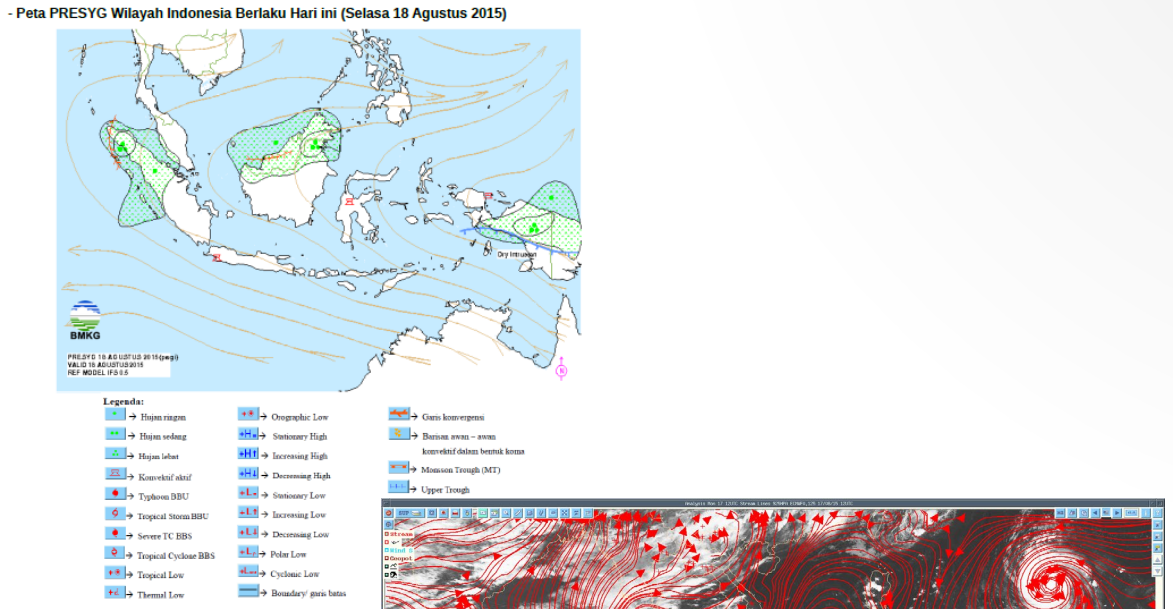


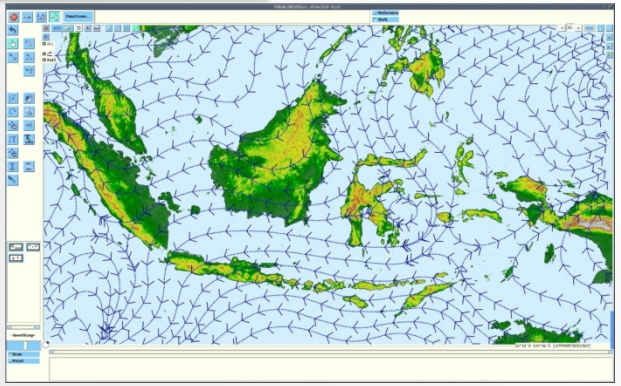
USER ORIENTED, MODULAR, INTEGRATED AND ADDED VALUE ARCHITECTURE

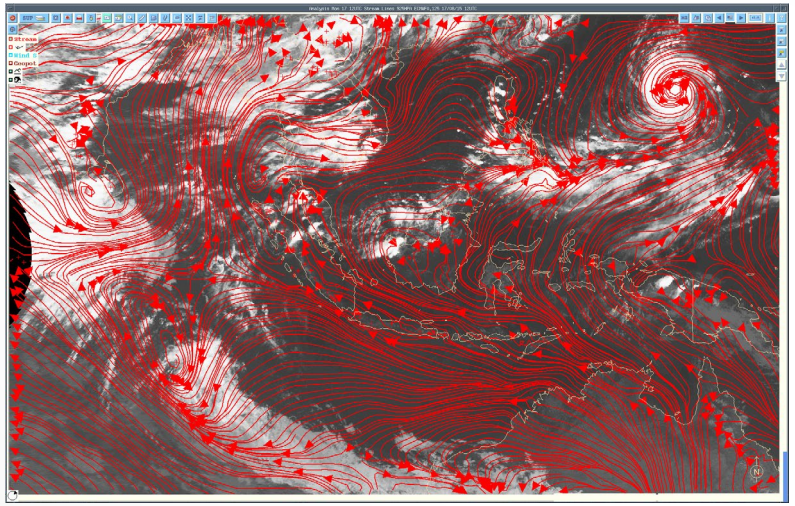
WEATHER ANALYSIS TOOLS

NWP:

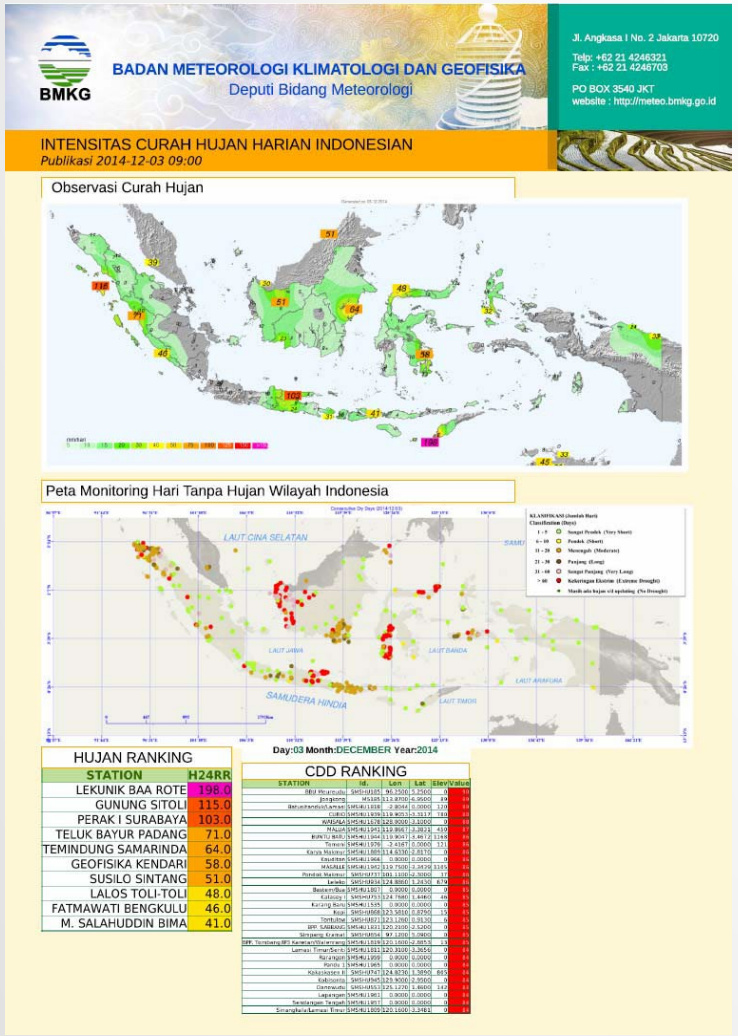
- IFS 0.5 and 0,125
- WRF DY 10 km, 3 km
- WRF DA 10 km
- GFS 0.5
- Arpege 0.5 and 1.5
- Aladin 0.1 and 0.125
- AccessR 0.1

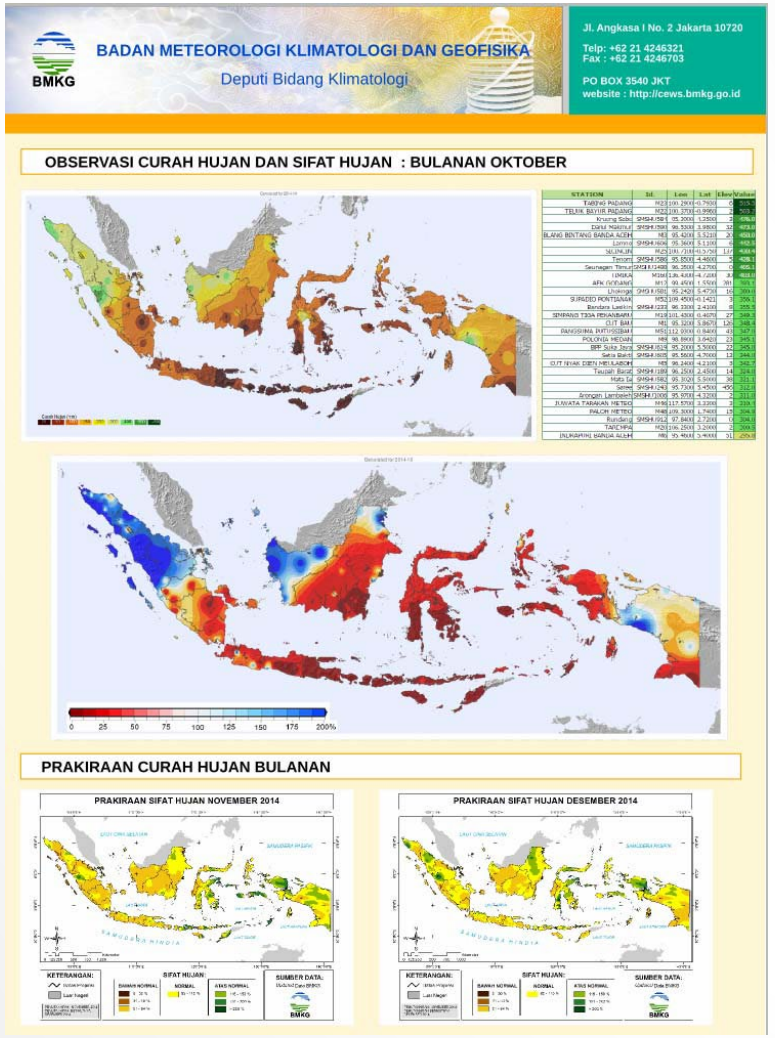






IMPROVED SERVICED THROUGH DIGITAL FORECAST
PRODUCTION OF SPECIFIC PRODUCT FOR SPECIFIC USERS





Sample for agriculture

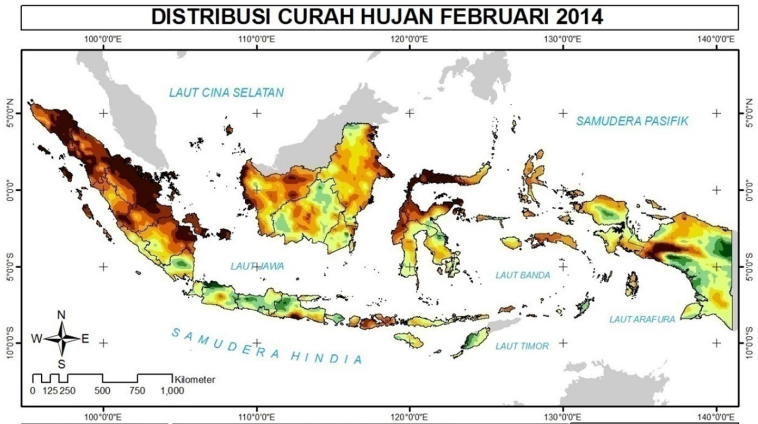
USING REMOTE SENSING DATA FOR RAINFALL MONITORING:
BLENDED INSITU – SATELLITE PRODUCT

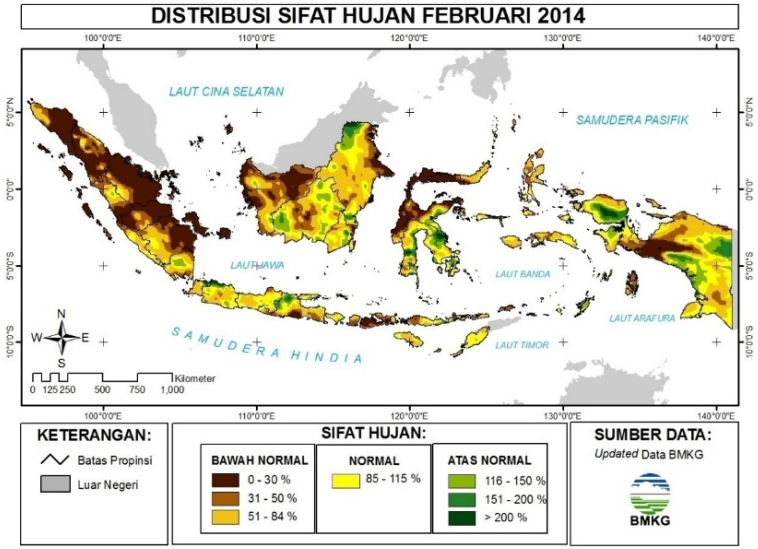
World Meteorological Organisation

SEMDP
Space-base Weather and Climate Extremes Monitoring Demonstration Project in East Asia and Western Pacific

Activity under the **WMO Space-based Weather and Climate Extremes Monitoring Demonstration Project in East Asia and Western Pacific (SEMDP):**

- Blended raingauge and satellite product now made operationally for the Indonesian region
- From 1999 – 2015 using TRMM
- From 2000 – 2019 using GSMAP

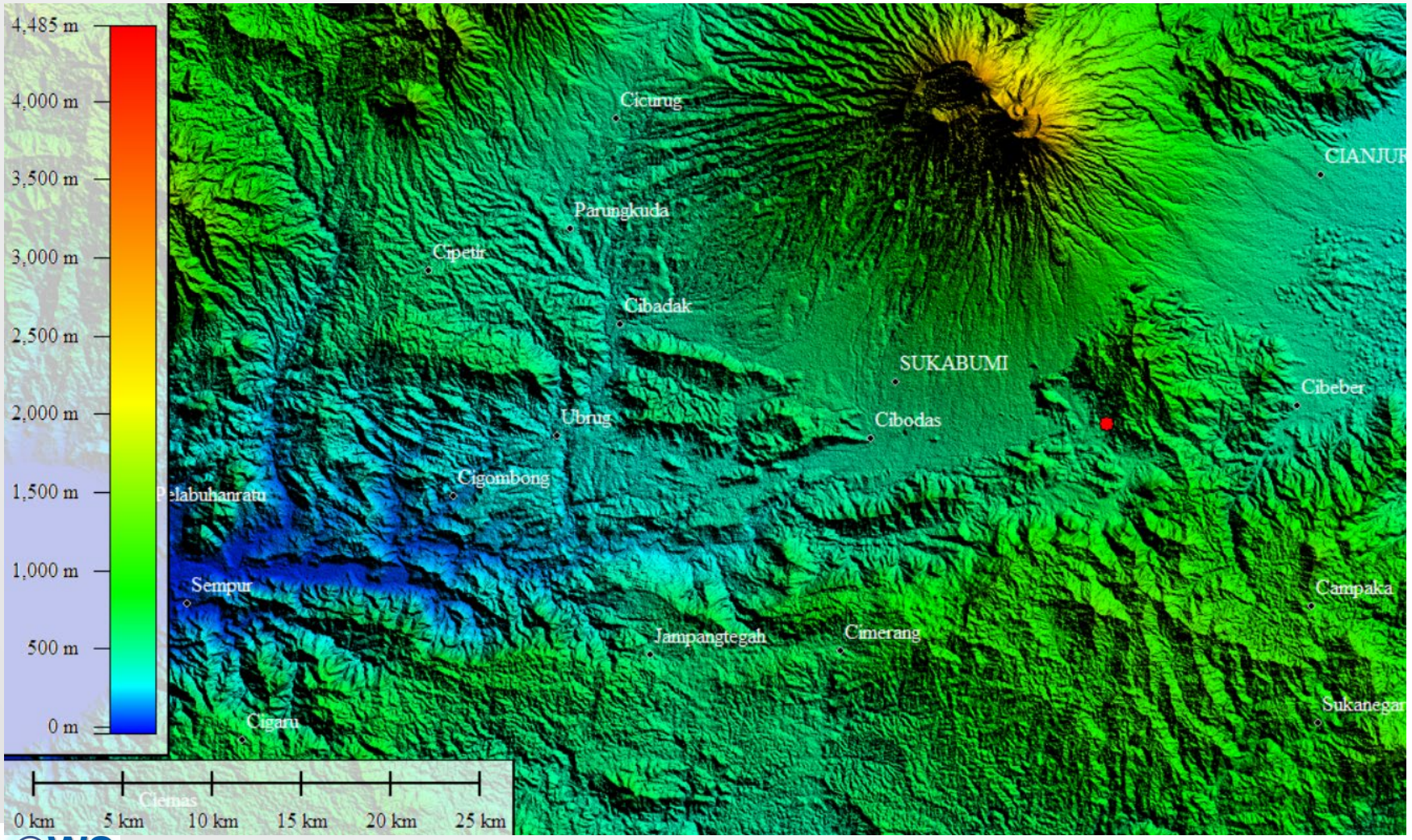




MoEF

LANDSCAPE ASSESSMENT FOR FLOOD HAZARD MITIGATION VIA FOREST AND LAND REHABILITATION PROGRAM

DIGITAL TERRAIN MODEL FOR IDENTIFYING LAND CHARACTERISTIC PRODUCING RUNOFF



MoEF

- SPATIAL DYNAMIC MODEL
- CONSIDER VARIOUS LAND ATTRIBUTES IN DRIVING RUNOFF:
  - ✓ Topographic configuration
  - ✓ Soil Properties
  - ✓ Vegetation density
  - ✓ Depression storage

AO GEO Earth Observations for Asia-Oceania

GEO GLOWS

Asian Water Cycle Initiative

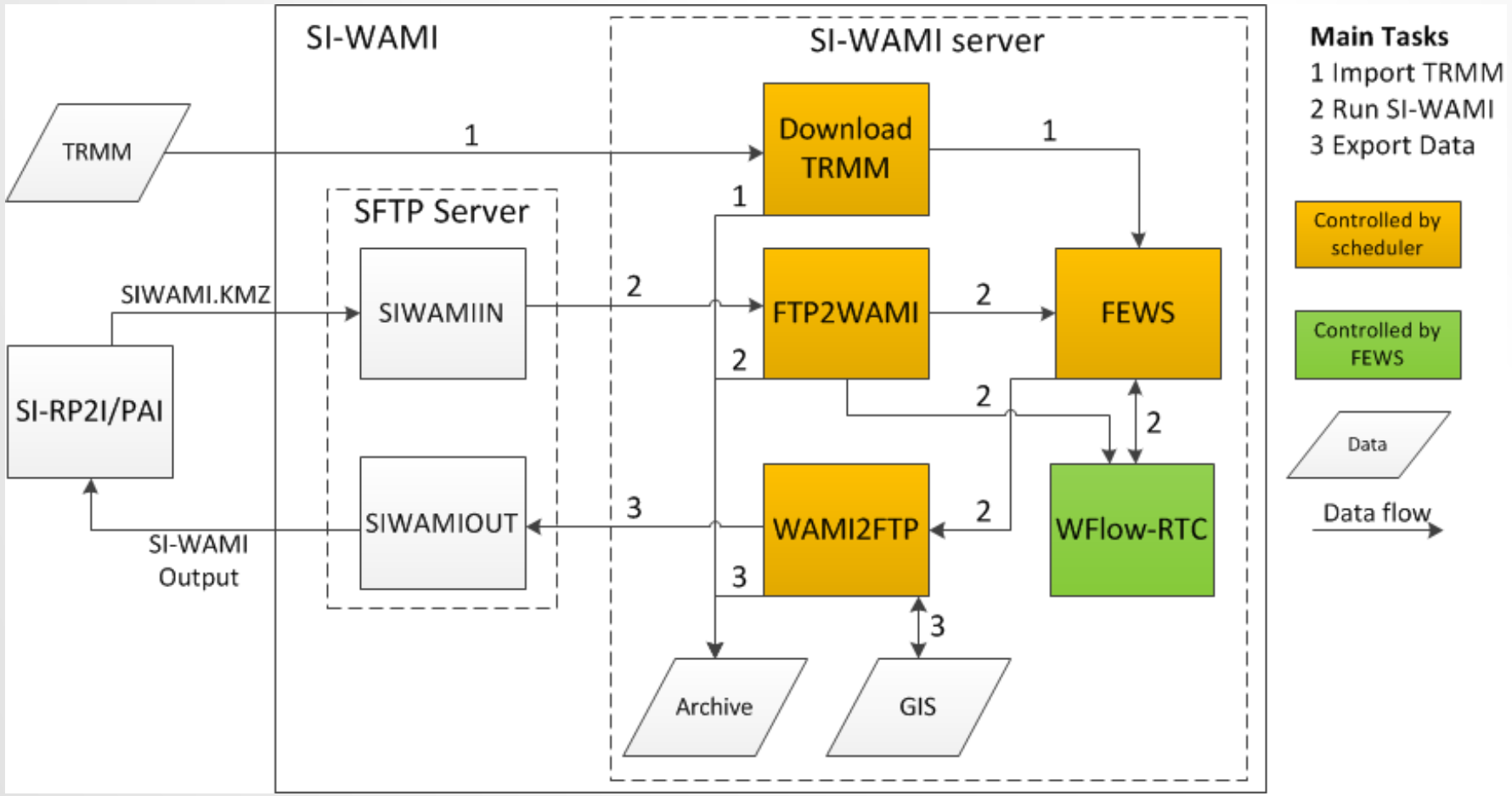
USE OF SERVICES FOR WATER MANAGEMENT:

SI-WAMI

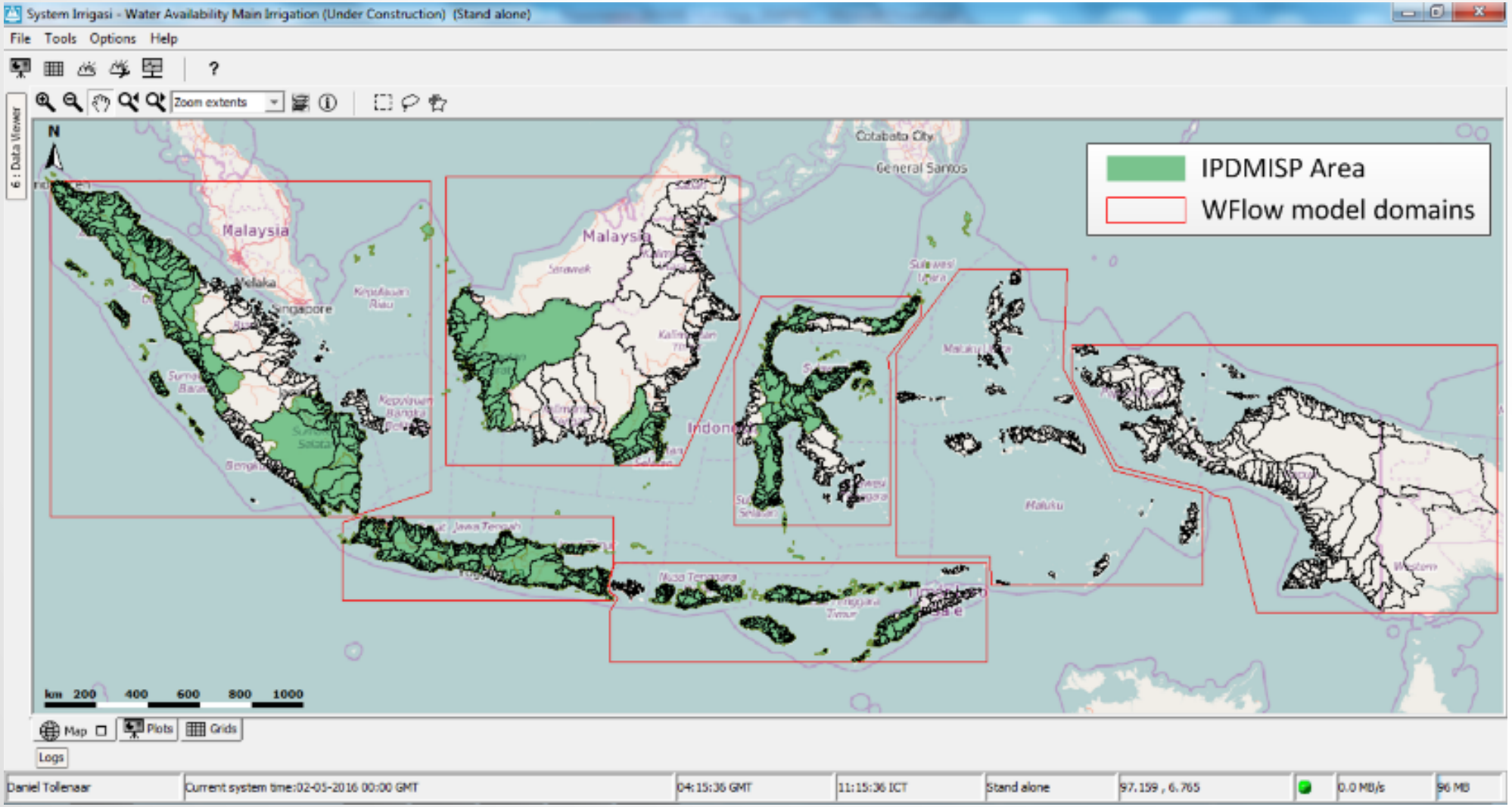
SISTEM INFORMASI WATER AVAILABILITY MAIN INTAKES

RESEARCH CENTER FOR WATER RESOURCES (PUSAIR – PUPR)

SIWAMI SETUP



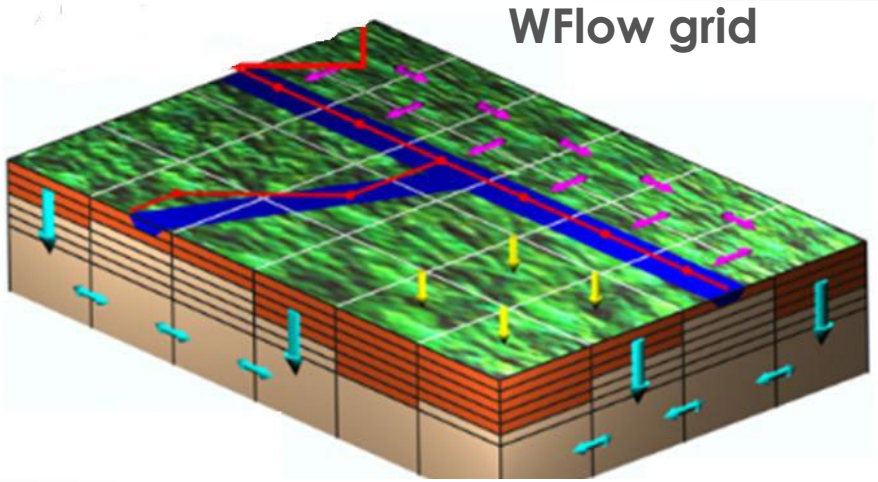
COVERED BY 7 FEWS-WFLOW MODELS



WFLOW MODELS

WFlow is a 3 Dimensional, topographically and physically based: model concepts are related to topographical features: elevation, slope, river networks, land-use and soil type.

WFlow grid



Even un-calibrated models provide realistic results as long as you respect physics.

Hydrological concepts in WFlow

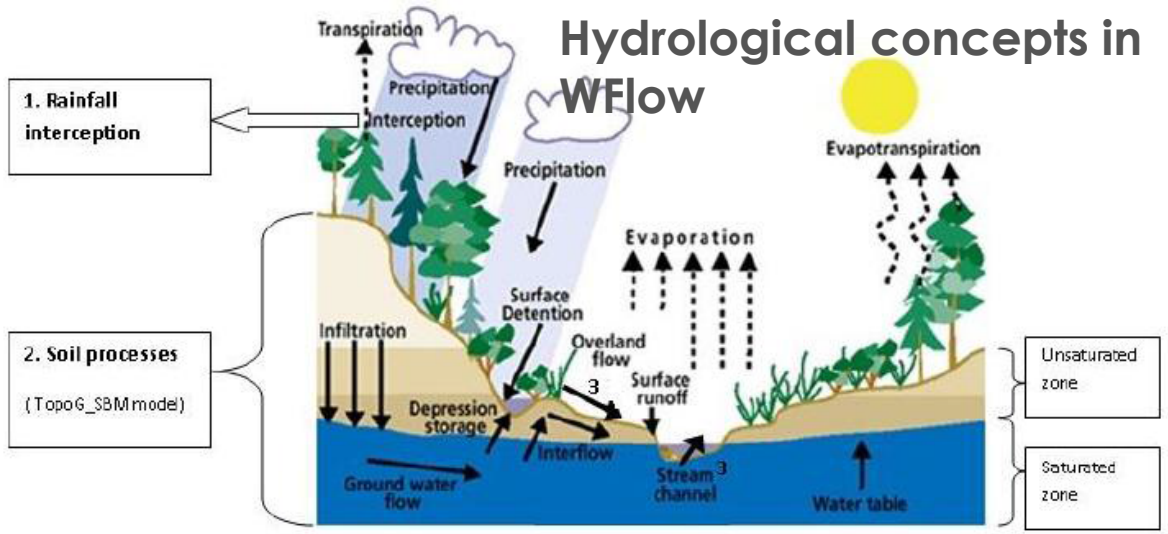
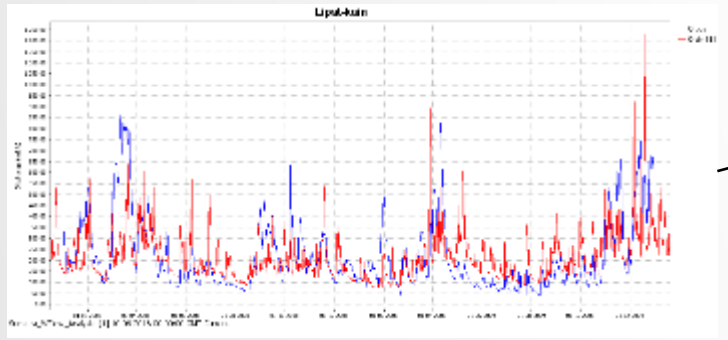
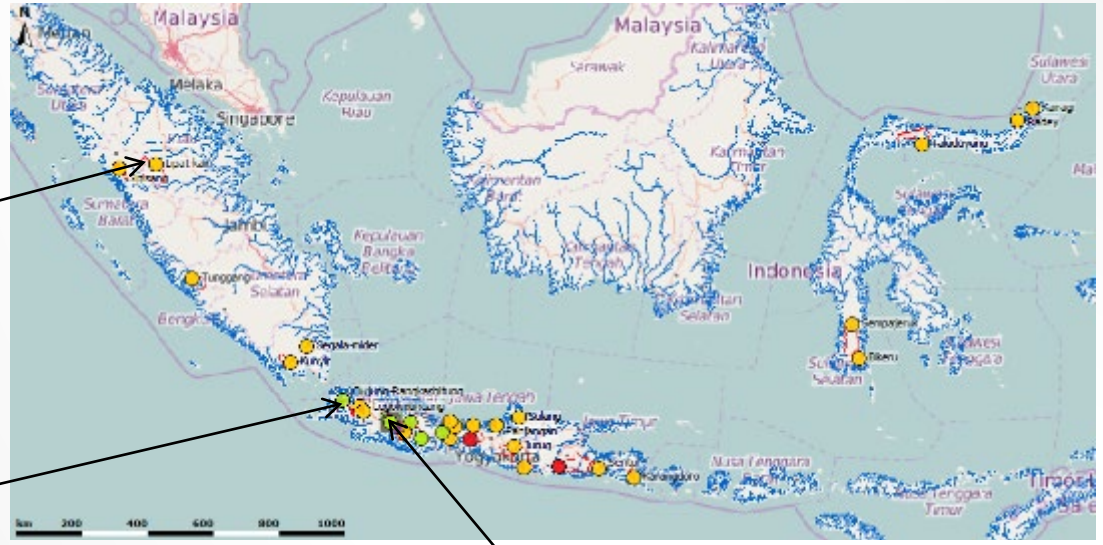
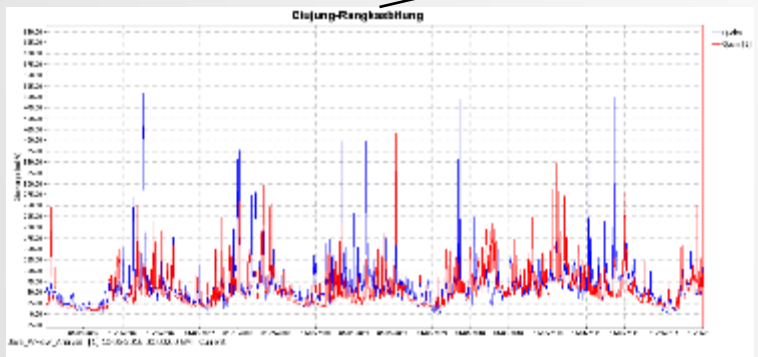


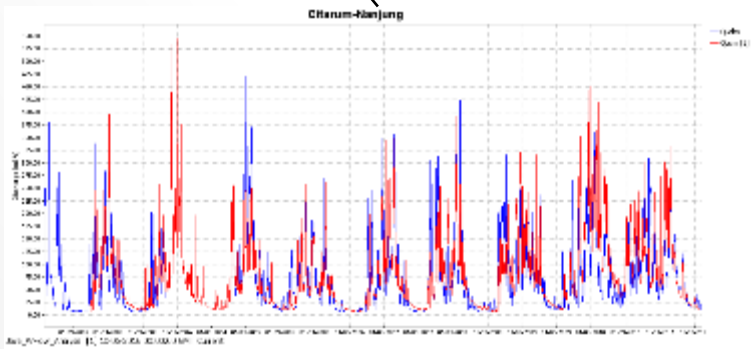
Figure 8.13 Processes in the hydrological cycle

WFLOW HAS BEEN CALIBRATED AT 30 STATIONS IN JAVA, SUMATRA, KALIMANTAN AND SULAWESI

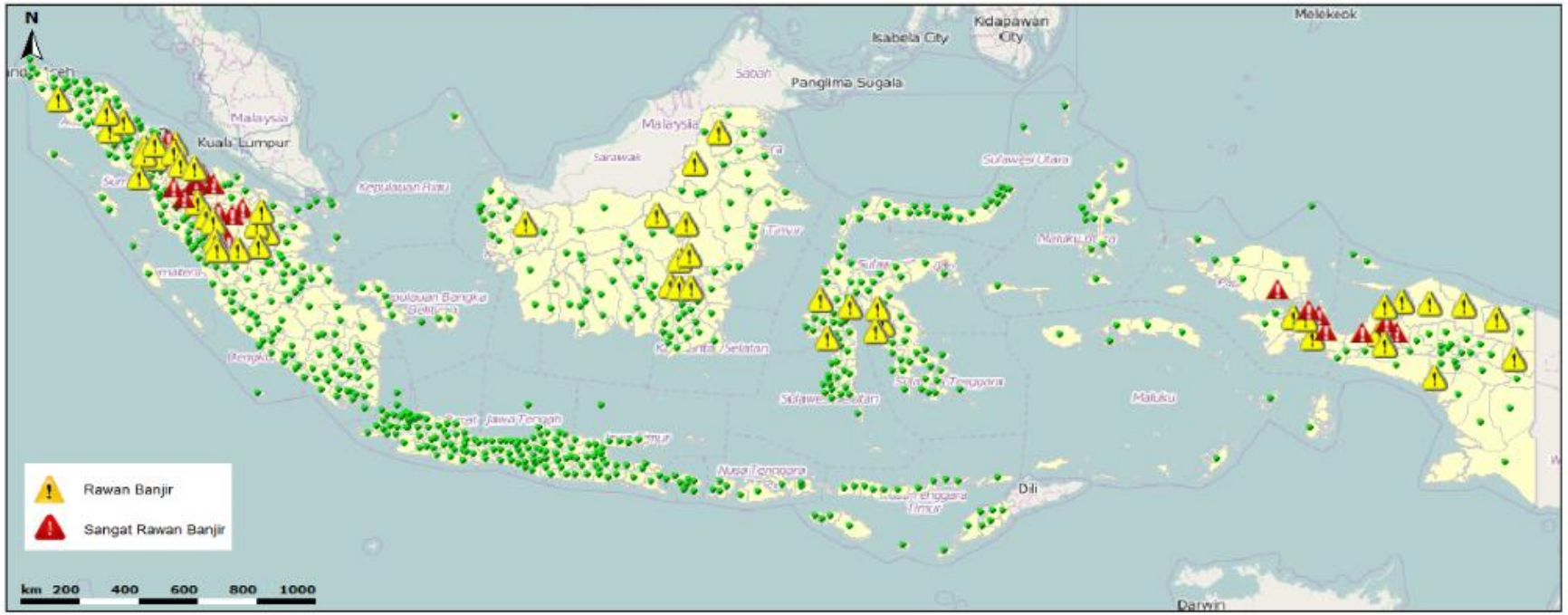








FLOOD EARLY WARNINGS



VI.Tabel Peringatan Dini Banjir tiap Kabupaten dalam Wilayah Sungai 01-11-2019

No	Kewenangan Balai	Wilayah Sungai	Kabupaten	Status Hari Ini	Status Besok	Status Besok Lusa
27	BBWS Citarum	WS CITARUM	BANDUNG			Sangat Rawan Banjir
30	BBWS Citarum	WS CITARUM	CIANJUR			Rawan Banjir
		WS CITARUM	KOTA BANDUNG			Rawan Banjir
		WS CITARUM	PURWAKARTA			Rawan Banjir
		WS CITARUM	SUBANG			Rawan Banjir
		WS CITARUM	SUMEDANG			Rawan Banjir
		WS CIMANUK-CISANGGARUNG	GARUT			Sangat Rawan Banjir
		WS POMPENGAN-LARONA	KAB KOLAKA UTARA	Rawan Banjir		
		WS POMPENGAN-LARONA	KAB LUWU TIMUR	Rawan Banjir		
		WS POMPENGAN-LARONA	KAB LUWU UTARA	Rawan Banjir		
		WS SADDANG	KAB PINRANG	Rawan Banjir		
		WS WOYLA-BATEUE	KAB ACEH BARAT	Rawan Banjir	Rawan Banjir	
		WS WOYLA-BATEUE	KAB ACEH BARAT DAYA		Rawan Banjir	
		WS WOYLA-BATEUE	KAB NAGANRAYA		Rawan Banjir	
		WS WOYLA-BATEUE	KAB PIDIE		Rawan Banjir	
		WS ALAS-SINGKIL	KAB ACEH SINGKIL		Rawan Banjir	
		WS ALAS-SINGKIL	KAB ACEH TENGGARA	Rawan Banjir		
		WS TOBA-ASAHAN	KAB ASAHAN	Sangat Rawan Banjir		
		WS TOBA-ASAHAN	KAB SIMALUNGUN	Rawan Banjir		
		WS TOBA-ASAHAN	KAB TOBASAMOSIR	Rawan Banjir		
		WS TOBA-ASAHAN	KABUPATEN SAMOSIR	Rawan Banjir		
		WS TOBA-ASAHAN	KOTA TANJUNGBALAI	Rawan Banjir		
		WS ROKAN	KAB LABUHANBATU	Sangat Rawan Banjir		
		WS ROKAN	KAB ROKAN HILIR	Sangat Rawan Banjir		
		WS ROKAN	KAB ROKAN HULU	Rawan Banjir		
		WS ROKAN	KAB TAPANULI SELATAN	Sangat Rawan Banjir		
		WS SIAK	KAB KAMPAR	Sangat Rawan Banjir		
		WS SIAK	KAB ROKAN HULU	Rawan Banjir		
		WS SIAK	KAB SIAK	Sangat Rawan Banjir		
		WS SIAK	KOTA PEKANBARU	Sangat Rawan Banjir		
		WS KAMPAR	KAB INDRASIRI HULU	Rawan Banjir		
		WS KAMPAR	KAB KAMPAR	Sangat Rawan Banjir		
		WS KAMPAR	KAB KUANTAN SINGINGI	Sangat Rawan Banjir		
		WS KAMPAR	KAB PELALAWAN	Rawan Banjir		
		WS KAMPAR	KAB ROKAN HULU	Rawan Banjir		
		WS KAMPAR	KAB SAWAHLUNTO / SINJUNJUNG	Rawan Banjir		
		WS KAMPAR	KAB SIAK	Rawan Banjir		
		WS INDRASIRI	KAB INDRASIRI HULU	Rawan Banjir		
		WS INDRASIRI	KAB KUANTAN SINGINGI	Rawan Banjir		
		WS INDRASIRI	KAB SAWAHLUNTO / SINJUNJUNG	Rawan Banjir		
		WS BARITO-KAPUAS	BARITO SELATAN	Rawan Banjir		
		WS BARITO-KAPUAS	BARITO TIMUR	Rawan Banjir		
		WS BARITO-KAPUAS	BARITO UTARA	Rawan Banjir		
		WS BARITO-KAPUAS	KUTAI BARAT	Rawan Banjir		
		WS BARITO-KAPUAS	TABALONG	Rawan Banjir		
		WS SESAYAP	MALINAU	Rawan Banjir	Rawan Banjir	
		WS SESAYAP	NUNUKAN		Rawan Banjir	
		WS MAHAKAM	BARITO UTARA	Rawan Banjir		
		WS MAHAKAM	KUTAI BARAT	Rawan Banjir		
		WS KALUKKU-KARAMA	KAB MAMUJU	Rawan Banjir		
		WS KAPUAS	SANGGAU	Rawan Banjir		
		WS KAPUAS	SEKADAU		Rawan Banjir	
		WS KAPUAS	SINTANG		Rawan Banjir	
		WS TOMARI-LASUSUA	KAB KOLAKA UTARA	Rawan Banjir		
		WS MAMBERAMO-TAMI-APAUVAR	KAB INTAN JAYA	Sangat Rawan Banjir		
		WS MAMBERAMO-TAMI-APAUVAR	KAB JAYAPURA	Rawan Banjir		
		WS MAMBERAMO-TAMI-APAUVAR	KAB MEMBERAM RAYA	Rawan Banjir		
		WS MAMBERAMO-TAMI-APAUVAR	KAB PANIAI	Rawan Banjir		
		WS MAMBERAMO-TAMI-APAUVAR	KAB PEGUNUNGAN BINTANG	Rawan Banjir	Rawan Banjir	Sangat Rawan Banjir
		WS MAMBERAMO-TAMI-APAUVAR	KAB SARMI	Rawan Banjir		
		WS MAMBERAMO-TAMI-APAUVAR	KAB YAHUKIMO		Rawan Banjir	Sangat Rawan Banjir
		WS SINLANDEN-DIGUL-BIKUMA	KAB BOUVEN DIGOEL			Rawan Banjir
		WS SINLANDEN-DIGUL-BIKUMA	KAB MAPPI			Rawan Banjir
		WS SINLANDEN-DIGUL-BIKUMA	KAB PEGUNUNGAN BINTANG		Rawan Banjir	Sangat Rawan Banjir
		WS SINLANDEN-DIGUL-BIKUMA	KAB YAHUKIMO			Sangat Rawan Banjir
		WS OMBA	KAB KAIMANA	Rawan Banjir		
		WS OMBA	KAB NABIRE	Sangat Rawan Banjir		
468	BWS Papua Barat	WS OMBA	KAB TELUKBINTUNI	Rawan Banjir		
469	BWS Papua Barat	WS OMBA	KAB TELUKWONDAMA	Sangat Rawan Banjir		
501	Kewenangan provinsi dan kabupaten	WS WAPOGA-MIMIKA	KAB ASMAT	Rawan Banjir		
505	Kewenangan provinsi dan kabupaten	WS WAPOGA-MIMIKA	KAB INTAN JAYA	Sangat Rawan Banjir		
508	Kewenangan provinsi dan kabupaten	WS WAPOGA-MIMIKA	KAB MEMBERAM RAYA	Rawan Banjir		
510	Kewenangan provinsi dan kabupaten	WS WAPOGA-MIMIKA	KAB NABIRE	Sangat Rawan Banjir		
512	Kewenangan provinsi dan kabupaten	WS WAPOGA-MIMIKA	KAB PANIAI	Rawan Banjir		
515	Kewenangan provinsi dan kabupaten	WS WAPOGA-MIMIKA	KAB WAROPEN	Rawan Banjir		
517	Kewenangan provinsi dan kabupaten	WS KAMUNDAN-SEBYAR	KAB KAIMANA	Rawan Banjir		
523	Kewenangan provinsi dan kabupaten	WS KAMUNDAN-SEBYAR	KAB TELUKBINTUNI	Sangat Rawan Banjir		
524	Kewenangan provinsi dan kabupaten	WS KAMUNDAN-SEBYAR	KAB TELUKWONDAMA	Sangat Rawan Banjir		
563	Kewenangan provinsi dan kabupaten	WS KAYAN	MALINAU	Rawan Banjir		
569	Kewenangan provinsi dan kabupaten	WS CIWULAN-CILAKI	BANDUNG			Sangat Rawan Banjir
585	Kewenangan provinsi dan kabupaten	WS CISADEA-CIBARENO	BANDUNG			Rawan Banjir
586	Kewenangan provinsi dan kabupaten	WS CISADEA-CIBARENO	CIANJUR			Rawan Banjir
615	Kewenangan provinsi dan kabupaten	WS SIBUNDONG-BATANG TORU	KAB TAPANULI TENGAH	Rawan Banjir	Rawan Banjir	
617	Kewenangan provinsi dan kabupaten	WS BAH BOLON	KAB ASAHAN	Sangat Rawan Banjir		
618	Kewenangan provinsi dan kabupaten	WS BAH BOLON	KAB SIMALUNGUN	Rawan Banjir		
620	Kewenangan provinsi dan kabupaten	WS WAMPU-BESITANG	KAB LANGKAT	Rawan Banjir	Rawan Banjir	Rawan Banjir
622	Kewenangan provinsi dan kabupaten	WS SIMEULUE	KAB SIMEULUE		Rawan Banjir	
649	Kewenangan provinsi dan kabupaten	WS TEUNOM-LAMBEUSO	KAB ACEH JAYA		Rawan Banjir	
650	Kewenangan provinsi dan kabupaten	WS TEUNOM-LAMBEUSO	KAB PIDIE		Rawan Banjir	
652	Kewenangan provinsi dan kabupaten	WS BARUHULET	KAB ACEH SELATAN		Rawan Banjir	
656	Kewenangan provinsi dan kabupaten	WS TAMIANG-LANGSA	KAB ACEH TAMIANG		Rawan Banjir	Rawan Banjir
658	Kewenangan provinsi dan kabupaten	WS TAMIANG-LANGSA	KAB GAYOLUES	Rawan Banjir	Rawan Banjir	Rawan Banjir
664	Kewenangan provinsi dan kabupaten	WS KUBU	KAB LABUHANBATU	Sangat Rawan Banjir		
665	Kewenangan provinsi dan kabupaten	WS KUBU	KAB ROKAN HILIR	Sangat Rawan Banjir		
669	Kewenangan provinsi dan kabupaten	WS BARUMUN-KUALUH	KAB ASAHAN	Rawan Banjir		
670	Kewenangan provinsi dan kabupaten	WS BARUMUN-KUALUH	KAB LABUHANBATU	Rawan Banjir		
671	Kewenangan provinsi dan kabupaten	WS BARUMUN-KUALUH	KAB ROKAN HILIR	Rawan Banjir		
672	Kewenangan provinsi dan kabupaten	WS BARUMUN-KUALUH	KAB TAPANULI SELATAN	Sangat Rawan Banjir		

AO GEO Earth Observations for Asia-Oceania

GEO GLOWS

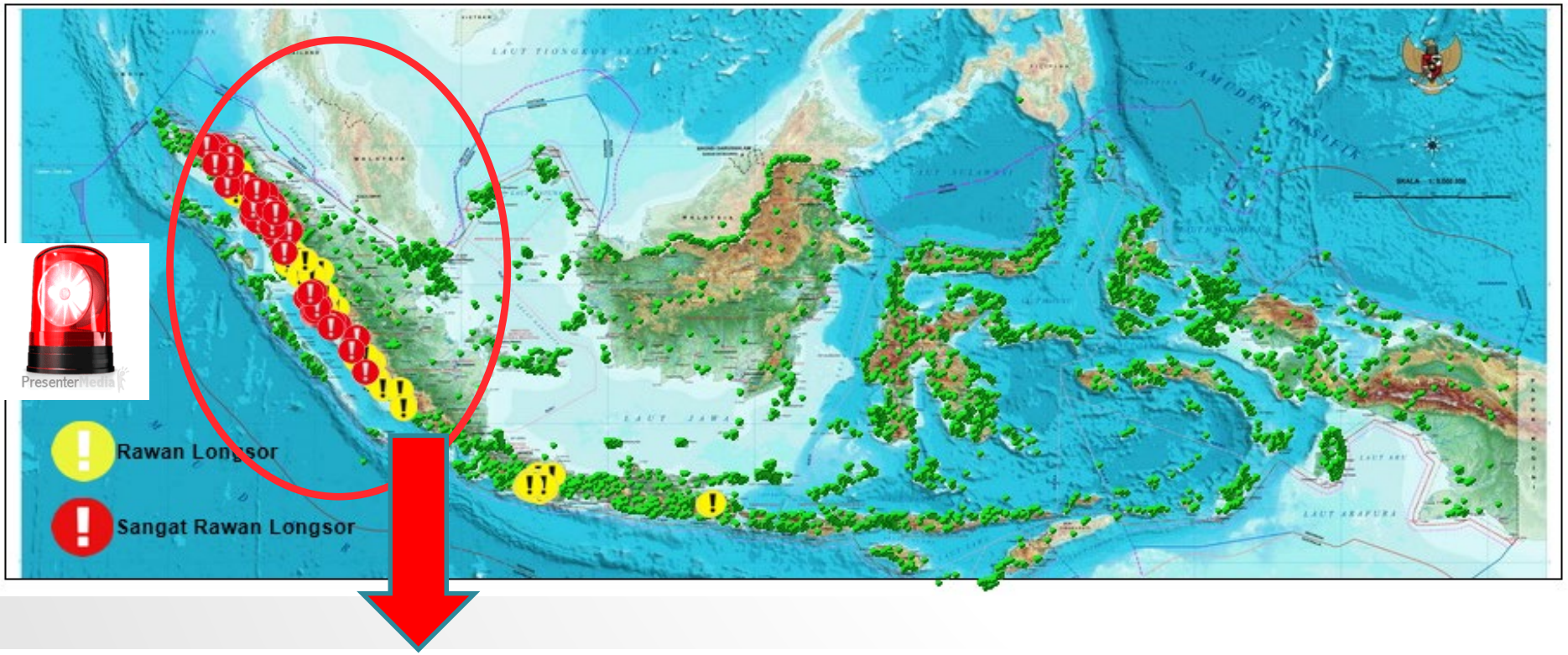
Asian Water Cycle Initiative

LAND SLIDE EARLY WARNING SYSTEM:

BALAI LITBANG SABO - PUPR

LAND SLIDE EWS

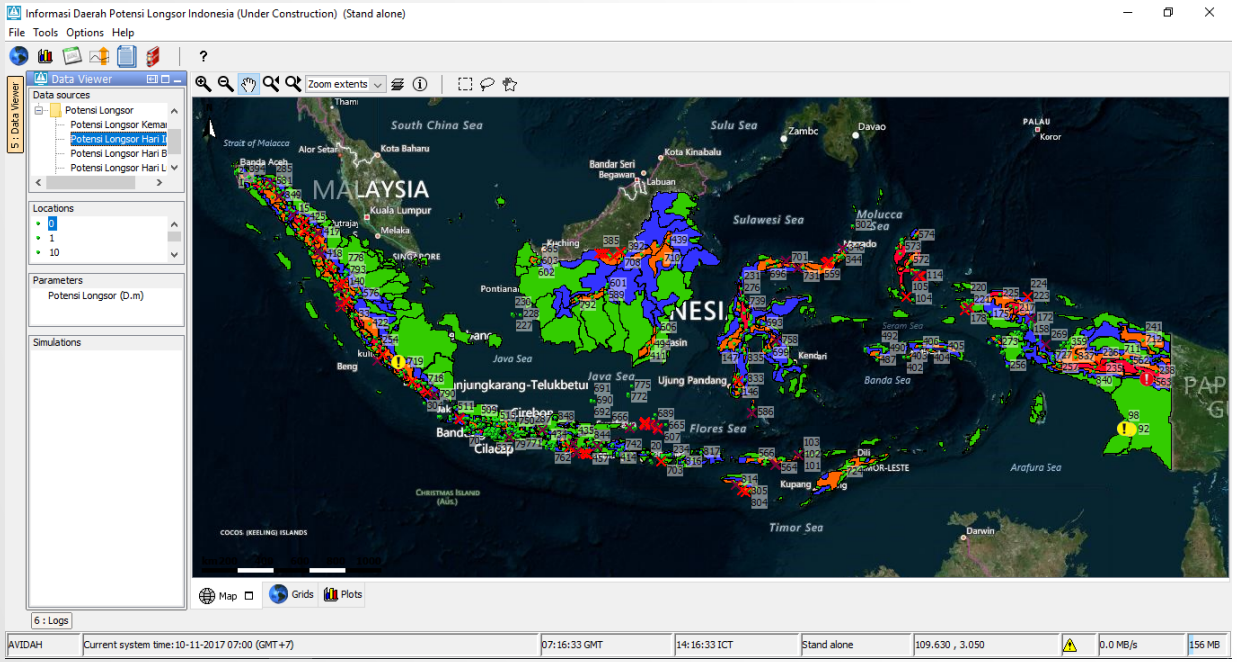
II. Peta Peringatan Dini Longsor 10-11-2017



V. Tabel Peringatan Dini Longsor Wilayah Sungai 09-11-2017 s.d. 12-11-2017

Wilayah Sungai	Status Hari Ini	Status Besok	Status Lusa	Status Hari Ini +3	Hujan Harian Hari Ini	Hujan 3 Harian Hari Ini	Hujan Harian Besok	Hujan 3 Harian Besok	Hujan Harian Lusa	Hujan 3 Harian Lusa	Hujan Harian Hari Ini +3	Hujan 3 Harian Hari Ini +3
WS AKUAMAN		Sangat Rawan Longsor	Rawan Longsor	Rawan Longsor	0.00	32.67	116.78	147.66		151.12		156.84
WS AKUAMAN		Sangat Rawan Longsor	Rawan Longsor	Rawan Longsor	0.00	32.67	116.78	147.66		151.12		156.84
WS AKUAMAN		Sangat Rawan Longsor	Rawan Longsor	Rawan Longsor	0.00	70.83	116.78	183.30		153.78		156.84
WS AKUAMAN		Sangat Rawan Longsor	Rawan Longsor	Rawan Longsor	0.00	25.47	116.78	140.23		150.05		156.84
WS AKUAMAN		Sangat Rawan Longsor	Rawan Longsor	Rawan Longsor	0.00	25.47	116.78	140.23		150.05		156.84
WS AKUAMAN		Sangat Rawan Longsor	Rawan Longsor	Rawan Longsor	0.00	25.47	116.78	140.23		150.05		156.84
WS AKUAMAN		Sangat Rawan Longsor	Rawan Longsor	Rawan Longsor	0.00	38.46	116.78	140.23		150.05		156.84
WS ALAS-SINGKIL		Sangat Rawan Longsor		Rawan Longsor	7.53	47.82	107.59	156.22		130.63		146.01
WS ALAS-SINGKIL		Sangat Rawan Longsor		Rawan Longsor	2.76	75.60	100.66	147.91		117.46		139.38
WS BARUMUN-KUALUH		Rawan Longsor	Rawan Longsor	Rawan Longsor	1.11	53.01	104.85	138.84		147.70		154.42
WS BARUMUN-KUALUH		Sangat Rawan Longsor	Rawan Longsor	Rawan Longsor	4.98	50.19	153.86	172.92		167.92		179.02
WS BATANG ANGKOLA-BATANG GADIS		Rawan Longsor	Rawan Longsor	Rawan Longsor	5.43	53.01	104.85	138.84		147.70		154.42
WS BATANG ANGKOLA-BATANG GADIS		Sangat Rawan Longsor	Rawan Longsor	Rawan Longsor	8.22	57.96	153.86	185.91		167.92		179.02
WS BATANGHARI		Rawan Longsor			2.31	46.56	86.37	133.17		109.33		115.58
WS BATANGHARI		Sangat Rawan Longsor	Rawan Longsor	Rawan Longsor	30.00	118.23	130.38	185.11		175.72		181.99
WS BENGKULU-ALAS-TALO		Rawan Longsor		Rawan Longsor	18.24	50.16	84.14	119.96		119.46		139.65

LAND SLIDE EWS



Interactive view based on FEWS Desktop

Sample of dissemination through WA group

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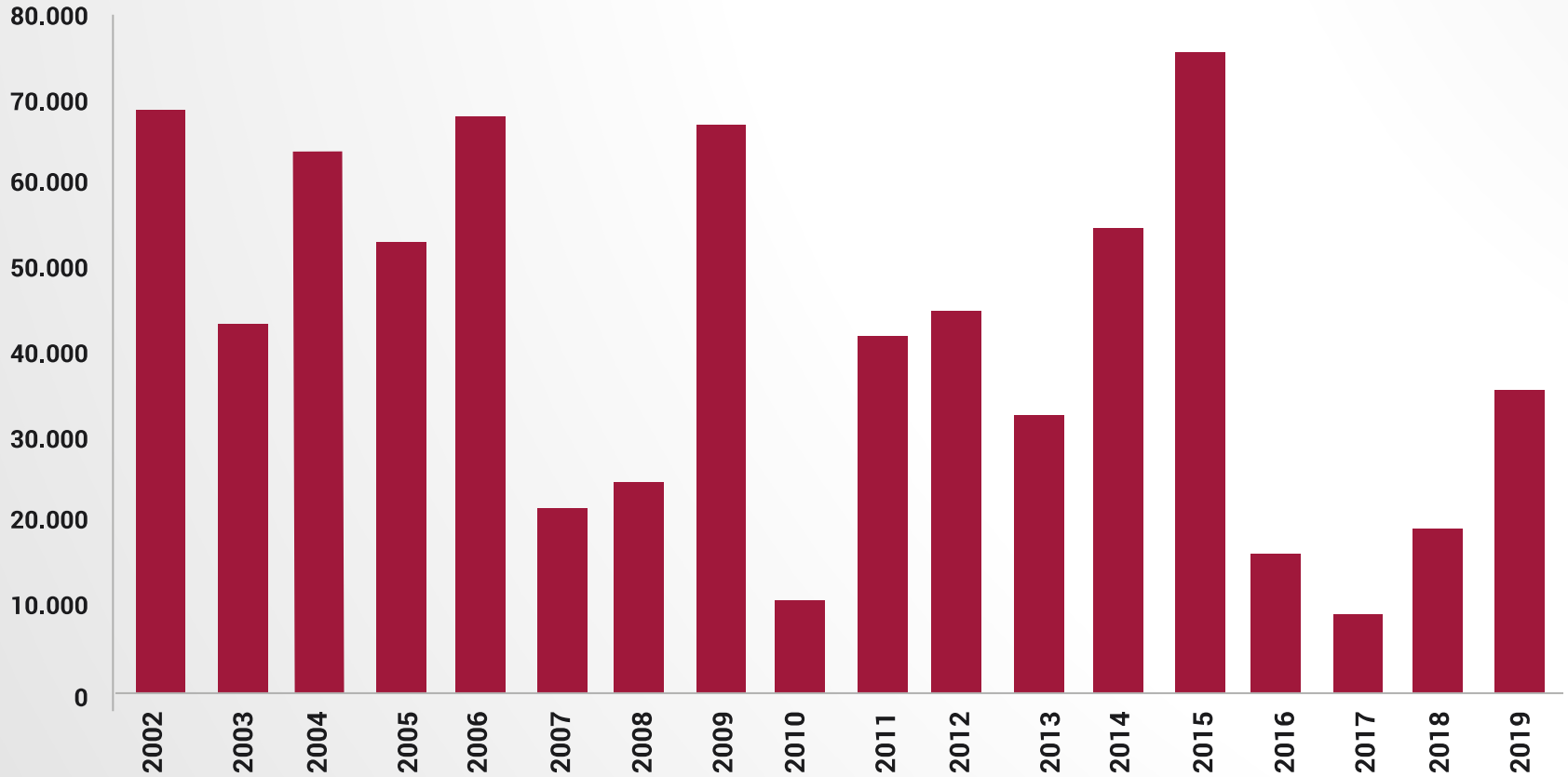
DISASTER MANAGEMENT IN INDONESIA

HOTSPOTS FOR 17 YEARS IN INDONESIA

Fires in Indonesia
(Data covers 1 Jan – 19 September for all years)



Source: University of Maryland and distributed by Nasa Fire Information for Resource Management System (FIRMS)

DISASTER RISK ASSESMENT
FOREST FIRE

http://inarisk.bnpb.go.id

BNPB

FOREST FIRE

AFFECTED LOCATION
PROVINCE 34
REGION/CITY 479

PEOPLE AFFECTED
0

ECONOMIC LOSS (RP.MILYAR)
59.036.830

AREA OF RISK (HA)
86.457.259

PHYSICAL LOSS (RP.MILYAR)
0

ENVIRONMENTAL LOSS (HA)
41.856.289

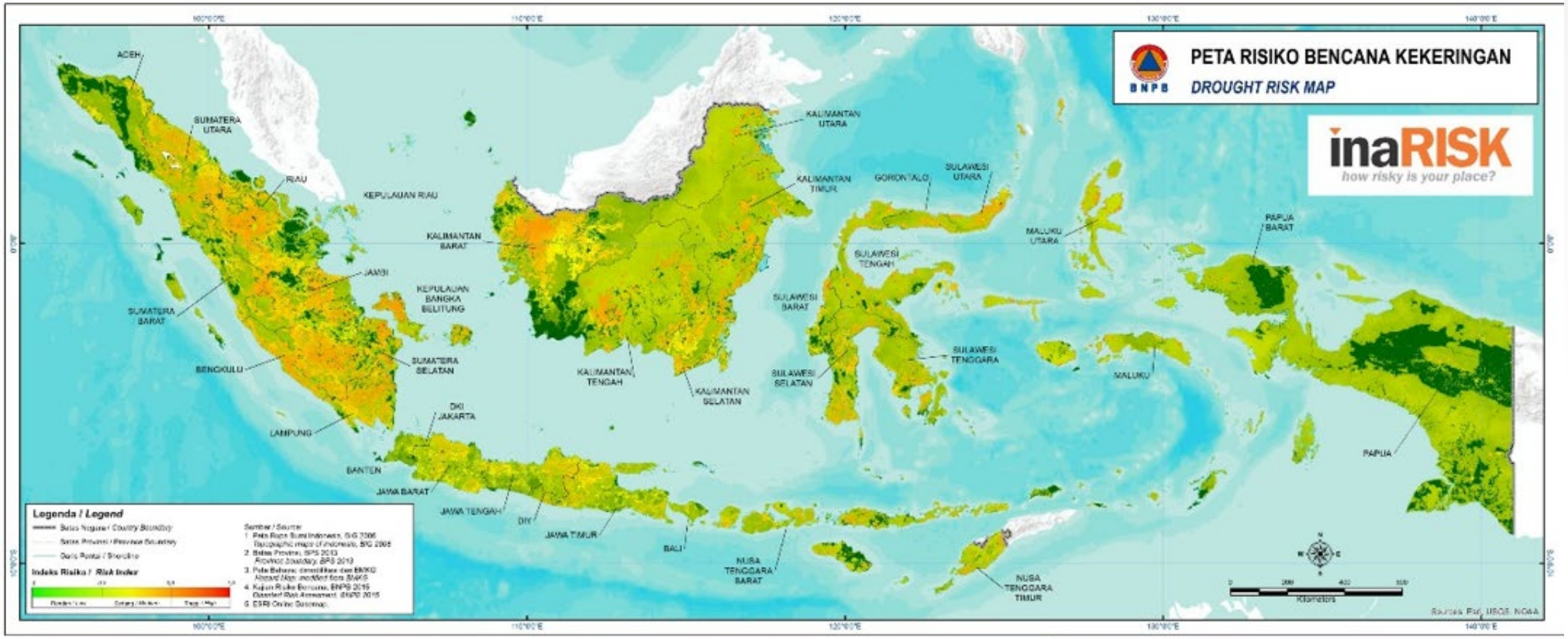
Vulnaralibility Parameter:
- Total Population (BPS)
- Total Housess, public facilities, critical facilities (GPS, BIG, Loc.Gov)
- PDRB Data (Loc.Gov)
- Land Cover Data (KLHK and BIG

AO GEO Earth Observations for Asia-Oceania

Asian Water Cycle Initiative

DISASTER RISK ASSESMENT
DROUGHT

http://inarisk.bnpb.go.id



DROUGHT

AFFECTED LOCATION
PROVINCE 34 REGION/CITY 489

PEOPLE AFFECTED
48.491.666

ECONOMIC LOSS (RP.MILYAR)
192.737.143

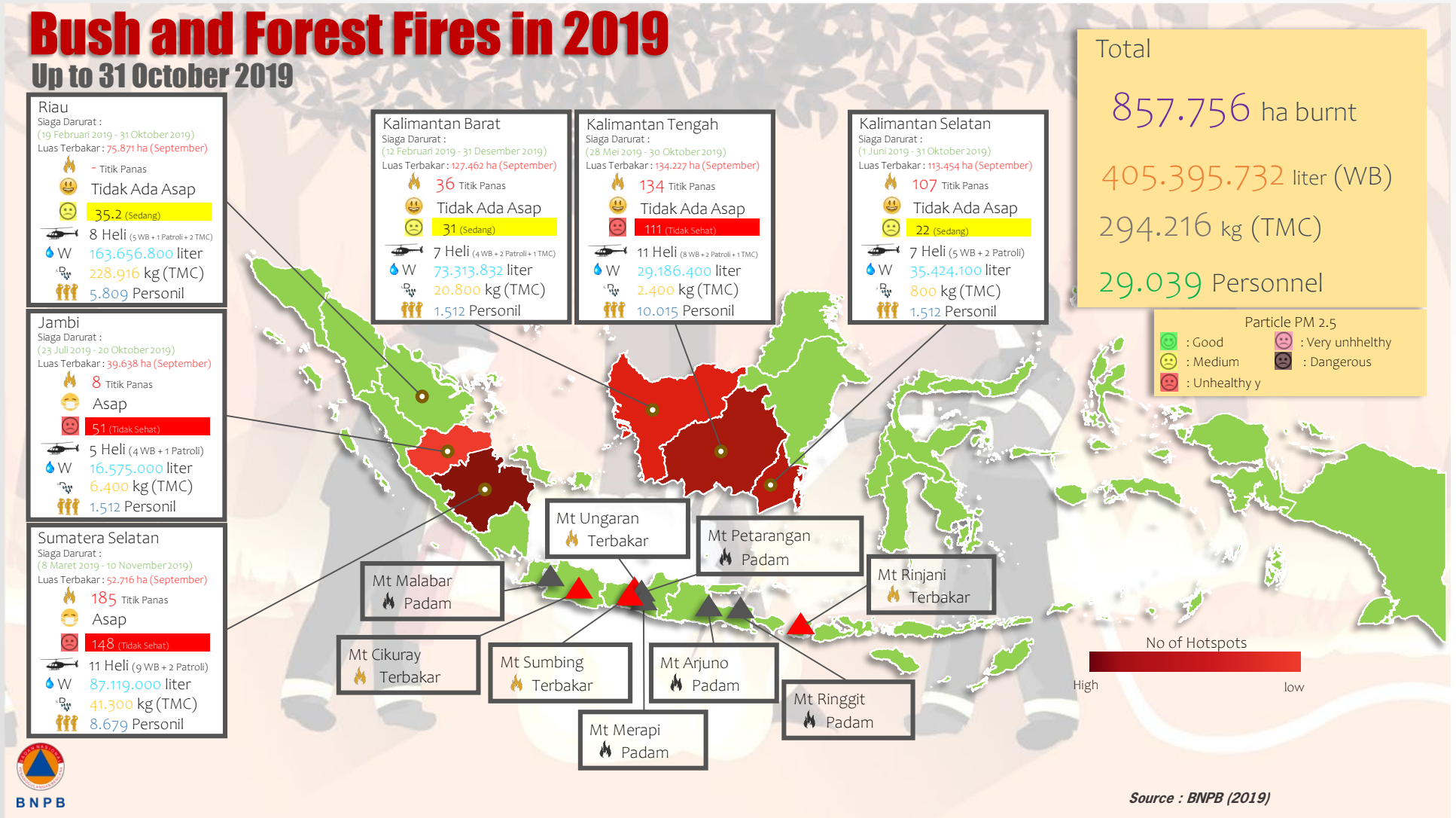
AREA OF RISK (HA)
46.735.107

PHYSICAL LOSS (RP.MILYAR)
0

ENVIRONMENTAL LOSS (HA)
29.820.457

Vulnaralibility Parameter:

- Total Population (BPS)
- Total Housess, public facilities, critical facilities (GPS, BIG, Loc.Gov)
- PDRB Data (Loc.Gov)
- Land Cover Data (KLHK and BIG


Bush and Forest Fires in 2019
Up to 31 October 2019
Riau
Siaga Darurat :
(19 Februari 2019 - 31 Oktober 2019)
Luas Terbakar : 75.871 ha (September)
- Titik Panas
Tidak Ada Asap
35.2 (Sedang)
8 Heli (5 WB + 1 Patroli + 2 TMC)
W 163.656.800 liter
228.916 kg (TMC)
5.809 Personil
Jambi
Siaga Darurat :
(23 Juli 2019 - 20 Oktober 2019)
Luas Terbakar : 39.638 ha (September)
8 Titik Panas
Asap
51 (Tidak Sehat)
5 Heli (4 WB + 1 Patroli)
W 16.575.000 liter
6.400 kg (TMC)
1.512 Personil
Sumatera Selatan
Siaga Darurat :
(8 Maret 2019 - 10 November 2019)
Luas Terbakar : 52.716 ha (September)
185 Titik Panas
Asap
148 (Tidak Sehat)
11 Heli (9 WB + 2 Patroli)
W 87.119.000 liter
41.300 kg (TMC)
8.679 Personil
Kalimantan Barat
Siaga Darurat :
(12 Februari 2019 - 31 Desember 2019)
Luas Terbakar : 127.462 ha (September)
36 Titik Panas
Tidak Ada Asap
31 (Sedang)
7 Heli (4 WB + 2 Patroli + 1 TMC)
W 73.313.832 liter
20.800 kg (TMC)
1.512 Personil
Kalimantan Tengah
Siaga Darurat :
(28 Mei 2019 - 30 Oktober 2019)
Luas Terbakar : 134.227 ha (September)
134 Titik Panas
Tidak Ada Asap
111 (Tidak Sehat)
11 Heli (8 WB + 2 Patroli + 1 TMC)
W 29.186.400 liter
2.400 kg (TMC)
10.015 Personil
Kalimantan Selatan
Siaga Darurat :
(1 Juni 2019 - 31 Oktober 2019)
Luas Terbakar : 113.454 ha (September)
107 Titik Panas
Tidak Ada Asap
22 (Sedang)
7 Heli (5 WB + 2 Patroli)
W 35.424.100 liter
800 kg (TMC)
1.512 Personil
Total
857.756 ha burnt
405.395.732 liter (WB)
294.216 kg (TMC)
29.039 Personnel
Particle PM 2.5
: Good
: Medium
: Unhealthy y
: Very unhhelthy
: Dangerous
Mt Ungaran Terbakar
Mt Petarangan Padam
Mt Malabar Padam
Mt Rinjani Terbakar
Mt Cikuray Terbakar
Mt Sumbing Terbakar
Mt Arjuno Padam
Mt Ringgit Padam
Mt Merapi Padam
No of Hotspots
High
low
BNPB
Source : BNPB (2019)

PREVENTION FRAMEWORK FOR BUSH AND FOREST FIRES

- **Involving national and provincial governments in monitoring hotspots**
- **Implementing claster based actions from coorporates and communities**
- **Focusing early detection and ffire cease and community empowerement**
- **Involving coorpotates in empowering the communities about ≤ 3 KM from the concession**
- **Obligateing the local governments to cease the fire on the open access more ≥ 3 KM from the concession**
- **Monitoring ground water level on the Peatland Hydrological Units**

EMPOWERING THE VILAGERS

- Fire Desa Sadar Api (socialization, training and monitoring)
- Desa Tangguh Api (joint patrol, outreach and incentives)
- Desa Makmur Peduli Api, (land use management, livelihood)

EARLY DETECTIONS AND EARLY FIRE FIGHTINGS

- Routine checks on *hotspots/firespots*
- Outreaching the communities traditionally burn
- Early warning system by using remote sensing tools

- Early detection and early fire fightings with maximum 0.2 ha.
- *Fire fighter deployed one hour after detaction*
- First earlly fire fighting responded at the laltes 8 hours after detection

CHALLENGES RELATED WITH BUSH AND FOREST FIRE

1. No comprehensive and high level of regulation related to management water and peatland

2. Less data accuracy of existing, using peatlands

3. Not easy to implement peatland concession with Peatland Hydrological Unit concepts

4. Limited roles of district government

5. The peatland restoration programs are sustainable

PROPOSAL OF CAPACITY DEVELOPMENT

- Developing capacity for assessment of renewable energy from earth observation (solar, wind, ⋯).
- Support for earth observation data sharing capabilities with relevant sectors and agencies (such as data cube).
- Detection of greenhouse gases and pollutants/aerosols from space, from urban and volcanic sources

CONTRIBUTIONS TO GLOBAL AGENDAS

CONTRIBUTIONS TO GLOBAL AGENDA:
TRACKING LOSSES AND DAMAGES

- **The United Nations Sustainable Development Goals,**
- **The Sendai Framework for Disaster Risk Reduction,**
- **The United Nations Framework Convention on Climate Change Paris Agreement,**
- **The Warsaw International Mechanism on Loss and Damage,**

The United Nations Sustainable Development Goals SDG No.11 and No.13:

Significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations

Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

AO GEO Earth Observations for Asia-Oceania

GEO GLOWS

Asian Water Cycle Initiative

CONTRIBUTIONS TO GLOBAL AGENDA:
TRACKING LOSSES AND DAMAGES

Sendai Framework for Disaster Risk Reduction

The Sendai Framework aims to guide the multi-hazard management of disaster risk in development at all levels as well as within and across all sectors. The Sendai Framework set several targets to be achieved by 2030, including a substantial reduction of global disaster mortality, the number of affected people and direct disaster economic loss through, inter alia, the increase in the availability of and access to multi-hazard early warning systems and disaster risk information and assessments.

The Paris Agreement

Parties recognize the importance of averting, minimizing and addressing loss and damage associated with the adverse effects of climate change, including extreme weather events and slow onset events, and the role of sustainable development in reducing the risk of loss and damage.

The Warsaw International Mechanism on Loss and Damage

The Warsaw international mechanism on loss and damage associated with impacts of climate change, including extreme events and slow onset events facilitates and promotes, inter-alia, understanding of and expertise in approaches to address loss and damage associated with the adverse effects of climate change, and the collection, sharing, management and use of relevant data and information

CONTRIBUTIONS TO GLOBAL AGENDA:
TRACKING LOSSES AND DAMAGES

- United Nations office for Disaster Risk Reduction,
- United Nations Convention to Combat Desertification.

The United Nations Sustainable Development Goals SDG No.15:

By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world

CONTRIBUTIONS TO GLOBAL AGENDA:
CHALLENGES IN LOSS AND DAMAGE REPORTING

- Standards - National and global statistics significantly suffer from the lack of internationally agreed upon definitions and accounting practices for aggregation (downstream, such as data duplication and wrong attribution) and analysis of loss data which can lead to under/overestimating the total losses
- Authoritative and quality assured hydrometeorological event information - When impacts from a hydrometeorological hazard occur in a country, loss and damage information is recorded and aggregated based on a generally accepted or standardized national typology of events
- Context - In many cases the context of the recorded loss is not accurately associated in the event/impact attribution analysis (e.g. flood damage could be linked to a number of underlying factors such as heavy rain, tropical storm, riverine flooding from upstream heavy rains)

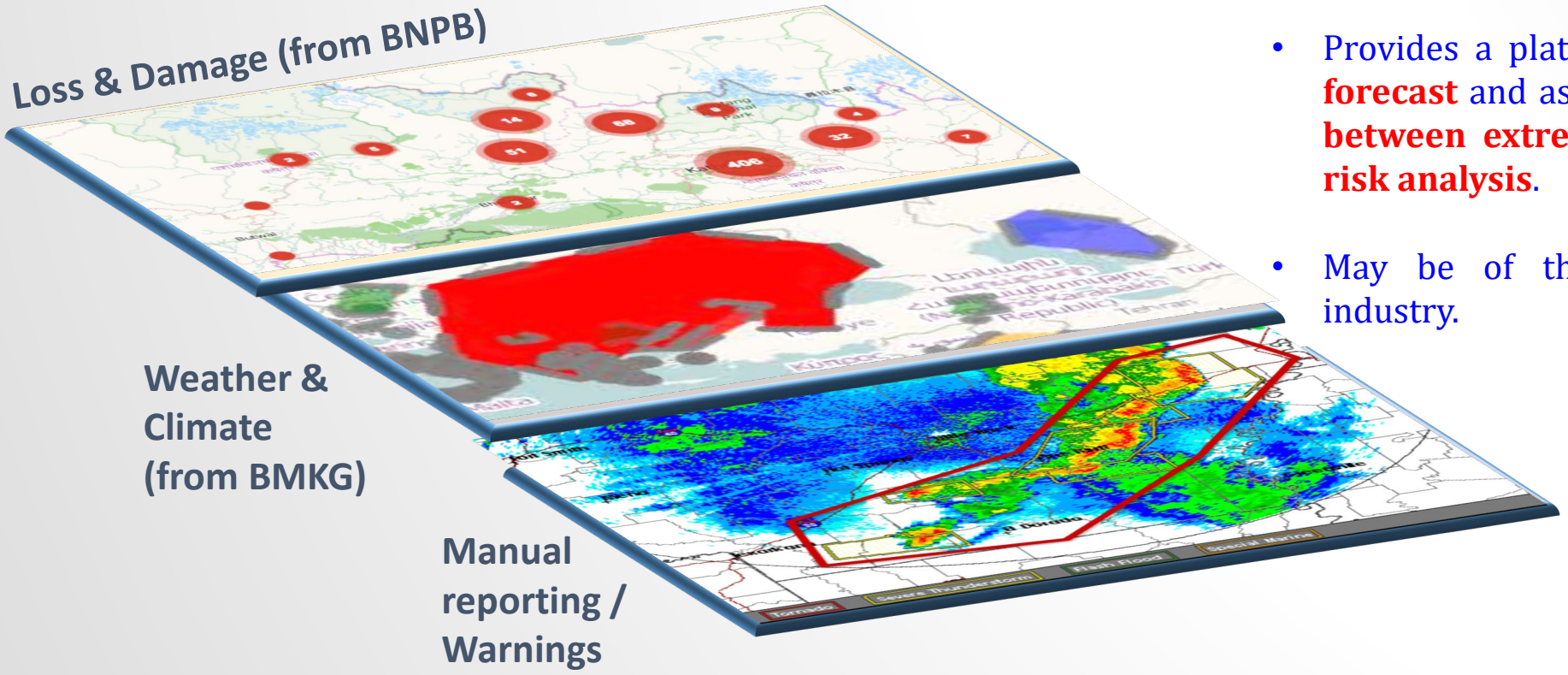
WMO COMMUNITY CONTRIBUTION:
CATALOGUING HAZARDOUS EVENT

Resolution 9 World Meteorological Congress-17 (2015)

Decides to standardize weather, water, climate, space weather and other related environmental hazard and risk information and develop identifiers for cataloguing weather, water and climate extreme events;

South-West Pacific (RA-V)
WMO Cataloguing of Hazards Events Test Phase

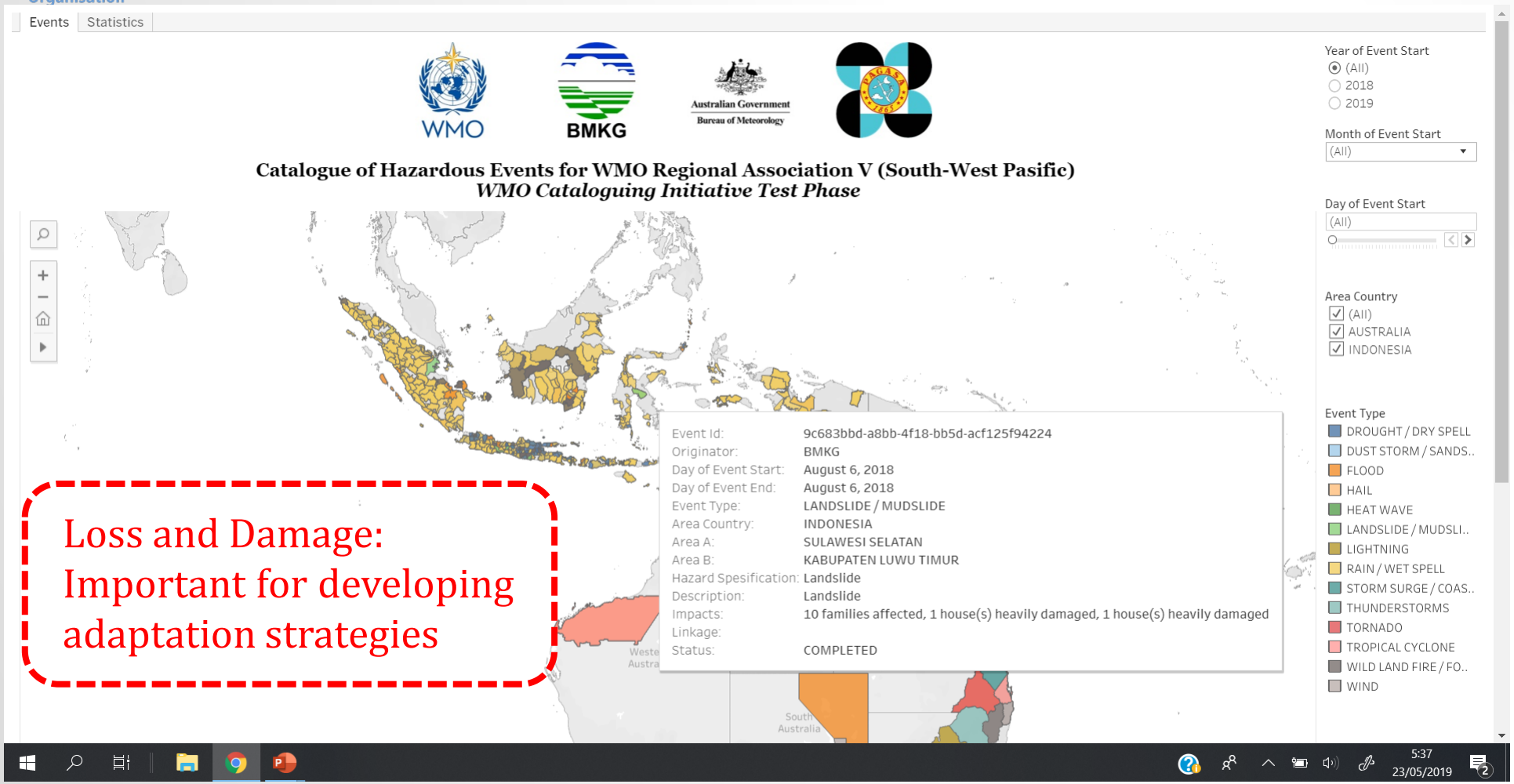
WMO COMMUNITY CONTRIBUTION:
CATALOGUING HAZARDOUS EVENT



- Layering of extreme event information and loss and damage information will enable new possibilities for analysis and application.
- Provides a platform **for building impact forecast** and as well as historical **relation between extreme events – impacts for risk analysis**.
- May be of the interest for insurance industry.

WMO COMMUNITY CONTRIBUTION:
CATALOGUING HAZARDOUS EVENT

http://puslitbang.bmkg.go.id/extreme-catalogue.html



Loss and Damage:
Important for developing adaptation strategies

- In 2018 only: registered more than 1300 rainfall events with ‘extreme category (in Indonesia).

CONCLUSIONS

CONCLUSIONS

1. Extended hydrometeorological services exist to support the activities of sectors sensitive to weather and climate. Earth observation data are used quite heavily in providing the services.
2. Challenges exist to increase the information from standard hydrometeorological services into impact based information which are tailored to the sector's information.
3. Indonesia has experienced bush and forest fires these recent years, and the Government has framed some prevention measures that are involved the local communities and corporations.
4. …