

INDONESIA IMPACT BASED FORECAST PROGRAM

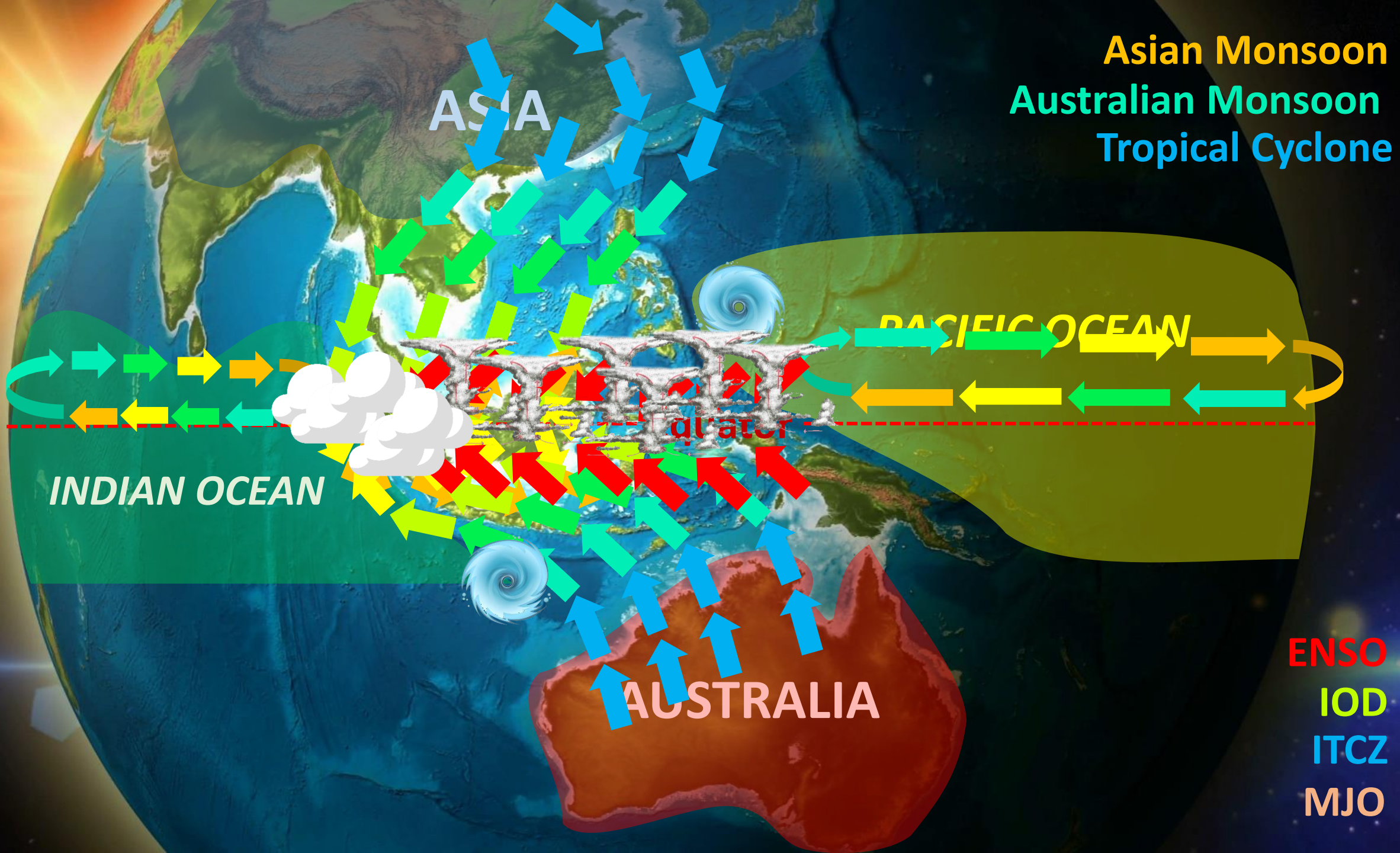
Seoul, 19 -21 November 2018

The 2nd Regional Workshop on Impact-based Forecasts in Asia



Indonesia Agency for Meteorology Climatology and
Geophysics (BMKG)

A. Fachri Radjab, M.Si
Director of PWS, BMKG



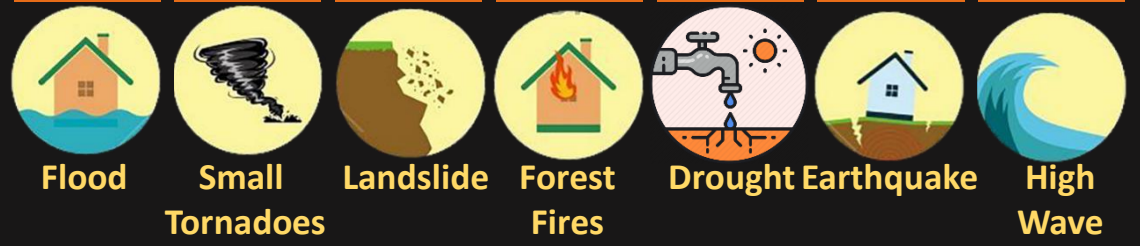
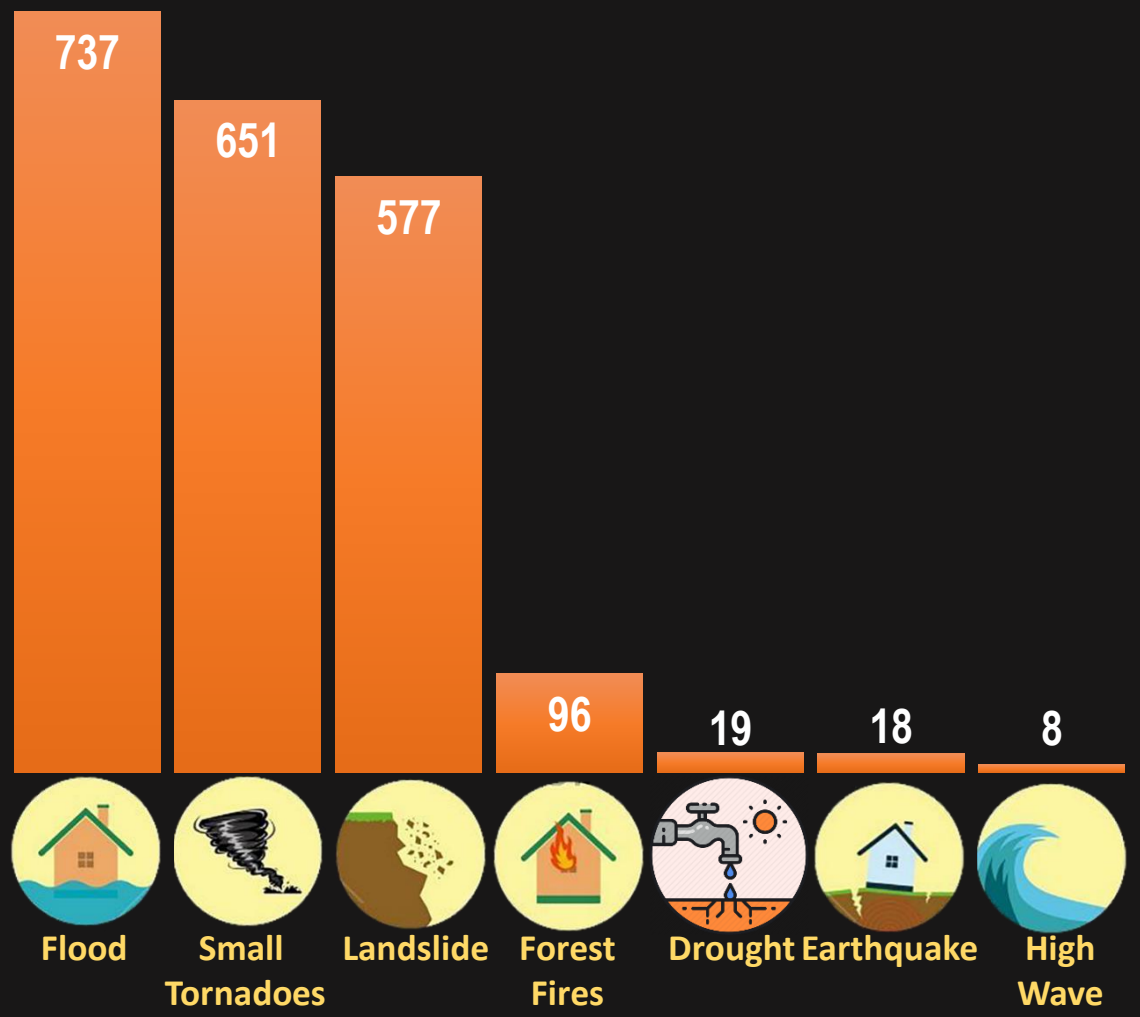


DISASTER IMPACT IN 2017 : **377** DEATH & MISSING **3.5million** SUFFERED & EVACUATED
 1 January 2017 - 29 December 2017

DAMAGES DUE TO DISASTER IN 2016
47,442 DAMAGED HOUSES
1,272 DAMAGED EDUCATION FACILITIES
133 DAMAGED HEALTH FACILITIES
698 DAMAGED WORSHIP FACILITIES

Indonesia Disaster 2017 **2341**

1 January - 29 December 2017



Tropical Cyclone "Cempaka"

SIKLON TROPIS CEMPAKA

Diperbaharui: 09:00 WIB, Selasa 28 November 2017



Siklon Tropis CEMPAKA posisi pada hari ini, Selasa, 28 November 2017 Jam 07:00 WIB di Perairan sebelah selatan Jawa Timur (32 km sebelah selatan-tenggara Pacitan) dengan kekuatan 65 km/jam bergerak ke Timur-Tenggara dengan kecepatan 4 km/jam.

Diprkirakan dalam 24 jam ke depan (Rabu, 29 November 2017 / 07:00 WIB) posisi siklon tropis berada di selatan Jawa Timur (124 km sebelah Tenggara Pacitan) dengan kekuatan 60 km/jam dan bergerak ke Timur-Tenggara dengan kecepatan 8 km/jam



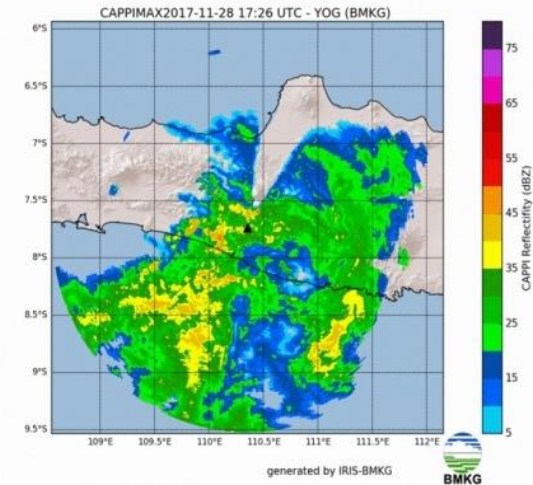
APA DAMPAKNYA ?

Terjadi hujan dengan intensitas sedang hingga lebat di Banten, DKI Jakarta, Jawa Barat, Jawa Tengah, Yogyakarta, Jawa Timur, dan Bali. Angin kencang hingga 37 km/ jam berpotensi terjadi di wilayah Selatan Jawa.

DEPUTI BIDANG METEOROLOGI BMKG

pws@bmgk.go.id | @infoBMKG | #tcempaka
Courtesy Photo

41 dead and missing victims **21** damaged education facilities
4,888 damaged houses **4** damaged worship facilities
3,212 submerged **2** health facilities.
36 damaged bridge units



BMKG issued Information

Warning 4 days before
Cempaka Tropical Cyclone
hit Yogyakarta

"The economic losses caused by the Cempaka tropical cyclone are **more than Rp. 1 trillion**. Currently it is still calculated, both in infrastructure, settlements, productive economy, social culture and across sectors.

BNPB, 5 December 2017

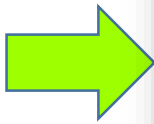


National Weather Forecast Product Transformation

Traditional process

Prakiraan Cuaca Indonesia

Kota	Cuaca Hari Ini 13 March 2015	Cuaca Esok Hari 14 March 2015
Banda Aceh	Berawan Suhu: 21-30 °C Kelembaban: 67-96 %	Berawan Suhu: 21-30 °C Kelembaban: 67-96 %
Medan	Berawan Suhu: 21-30 °C Kelembaban: 67-96 %	Berawan Suhu: 21-30 °C Kelembaban: 67-96 %
Pekanbaru	Hujan Ringan Suhu: 21-30 °C Kelembaban: 67-96 %	Hujan Ringan Suhu: 21-30 °C Kelembaban: 67-96 %
Batam	Hujan Ringan Suhu: 21-30 °C Kelembaban: 67-96 %	Hujan Ringan Suhu: 21-30 °C Kelembaban: 67-96 %
Padang	Hujan Ringan Suhu: 21-30 °C Kelembaban: 67-96 %	Hujan Ringan Suhu: 21-30 °C Kelembaban: 67-96 %
Jambi	Hujan Ringan Suhu: 21-30 °C Kelembaban: 67-96 %	Hujan Ringan Suhu: 21-30 °C Kelembaban: 67-96 %
Palembang	Hujan Ringan Suhu: 21-30 °C Kelembaban: 67-96 %	Hujan Ringan Suhu: 21-30 °C Kelembaban: 67-96 %
Pangkal Pinang	Hujan Ringan Suhu: 21-30 °C Kelembaban: 67-96 %	Hujan Ringan Suhu: 21-30 °C Kelembaban: 67-96 %
Bengkulu	Hujan Ringan Suhu: 21-30 °C Kelembaban: 67-96 %	Hujan Ringan Suhu: 21-30 °C Kelembaban: 67-96 %



Digital process

DKI JAKARTA 3 HARIAN

PRAKIRAAN CUACA DKI JAKARTA

Diperbaharui : 2018-04-13 10:00 WIB

BMKG

	JUMAT 13 APRIL 2018				SABTU 14 APRIL 2018				MINGGU 15 APRIL 2018			
	PAGI	SIANG	MALAM	DINI HARI	PAGI	SIANG	MALAM	DINI HARI	PAGI	SIANG	MALAM	DINI HARI
JAKARTA UTARA	Cerah berawan	Cerah berawan	Berawan	Cerah berawan	Cerah berawan	Cerah berawan	Berawan	Berawan	Cerah berawan	Hujan Lokal	Berawan	Berawan
JAKARTA PUSAT	Cerah berawan	Cerah berawan	Berawan	Cerah berawan	Cerah berawan	Cerah berawan	Berawan	Berawan	Cerah berawan	Hujan Lokal	Berawan	Berawan
JAKARTA BARAT	Cerah berawan	Hujan Lokal	Berawan	Berawan	Cerah berawan	Hujan Lokal	Cerah berawan	Berawan	Cerah berawan	Hujan Lokal	Berawan	Cerah berawan
JAKARTA TIMUR	Cerah berawan	Hujan Ringan	Berawan lokal	Berawan	Cerah berawan	Hujan Ringan	Cerah berawan	Berawan	Cerah berawan	Hujan Ringan	Berawan	Cerah berawan
JAKARTA SELATAN	Cerah berawan	Hujan Lokal	Berawan lokal	Berawan	Cerah berawan	Hujan Ringan	Cerah berawan	Berawan	Cerah berawan	Hujan Ringan	Berawan	Cerah berawan
KEPULAUAN SERIBU	Cerah berawan	Cerah berawan	Cerah berawan	Cerah berawan	Cerah berawan	Cerah berawan	Berawan	Berawan lokal	Cerah berawan	Berawan	Berawan	Hujan Lokal

KEDEPUTIAN BIDANG METEOROLOGI BMKG



BADAN METEOROLOGI KLIMATOLOGI DAN GEOFISIKA
BMKG

Prakiraan Cuaca Indonesia
Berlaku Mulai Sabtu 14 April 2018 07:00 WIB
Hingga Minggu 15 April 2018 07:00 WIB

LOKASI	PROG	SAMPAI	SIANG	MALAM	S	BUNY	SI	AMUN	T1	PERSEBARAN
Banda Aceh			23-33	23	20	10	10	10	10	60-95
Medan			24-32	23	20	10	10	10	10	65-95
Pekanbaru			23-29	23	10	10	10	10	10	80-100
Batam			25-32	23	10	10	10	10	10	60-90
Jambi			24-29	23	10	10	10	10	10	80-100
Padang			24-30	23	10	10	10	10	10	65-95
Palembang			24-33	23	10	10	10	10	10	70-100
Pangkal Pinang			24-31	23	10	10	10	10	10	65-95
Bengkulu			24-32	23	10	10	10	10	10	60-95
Bandar Lampung			23-32	23	10	10	10	10	10	65-95
Pontianak			24-34	23	10	10	10	10	10	60-95
Samarinda			23-31	23	10	10	10	10	10	60-100
Pangkalpinang			23-33	23	10	10	10	10	10	55-100
Berastagi			23-32	23	10	10	10	10	10	70-90
Manado			23-32	23	10	10	10	10	10	65-95
Gorontalo			24-34	23	10	10	10	10	10	60-95
Pala			22-33	23	10	10	10	10	10	70-95
Kendari			23-33	23	10	10	10	10	10	65-95
Maluku			24-32	23	10	10	10	10	10	60-90



Shift Paradigms in BMKG-PWS



❑ Based on user needs

❑ High Impact forecast

❑ Risk based warning

Moving from:

What the weather will *be*:
(Meteorological thresholds)
- 50mm in 24 hours
- 35 knot winds

To:

What the weather will do:
(Impact Warnings)
- Roads flooded
- Communities cut off



Meteorologist and Disaster Manager Connection



BMKG and BNPB collaborate to build capacity to do hydrological and meteorological **impact based forecasts** and **risk-assessment operations**;

- Identify specific **points of contact** between the two agencies.
- BNPB provides crucial **geospatial, economic** and **population** data.
- BNPB and BMKG **identify critical areas** of vulnerability.

Improving service delivery to the BNPB through **improved real-time warnings**

- lead time,
- message content,
- forecast and impact information,
- dissemination,
- enhancement of severe weather disaster awareness,
- preparedness and response;
- strengthening coordination
- collaboration mechanisms



Meteorologist and Disaster Manager Connection



BMKG and BNPB collaborate to develop:

- **Hazard matrices.**
- **Response matrices**, including agreements on specific SOPs for addressing specific severe weather.
- **Common communications strategy**, between the two partners.

Work with BMKG and BNPB,
engaging partners on local to national levels to act as **'change agents'** in relevant communities to help serve the public by strengthening their **resilience against extreme weather events;**



How does it work?



Minimal	Minor	Significant	Severe
Business as usual	Business as usual	Short term strain on emergency personnel	Prolonged strain on emergency personnel
<ul style="list-style-type: none"> Some Pooling of water on roads Day to day activities not disturbed Wet roads Minimal traffic congestion 	<ul style="list-style-type: none"> Localised flooding of susceptible roads, low-lying areas and bridges Localised and short term disruption to municipal services (water, electricity) Major roads affected but can be used, increased travel times Minor motor vehicle accidents due to slippery roads Closure of roads crossing low water bridges 	<ul style="list-style-type: none"> Flooding of roads and settlements (<i>formal and informal</i>) Disruption to municipal services (water, electricity) Major disruption of traffic flow due to major roads being flooded or closed Possible damage to roads and bridges Danger to life (fast flowing streams / deep water) Some communities temporarily not accessible/cut-off Displacement of affected communities Damage to property, infrastructure and loss of livelihood 	<ul style="list-style-type: none"> Widespread

Warning Risk Level (Green, Yellow, Orange, Red)

LIKELIHOOD	IMPACT			
	Minimal	Minor	Significant	Severe
High >80%	2	7	10	
Medium 60-79%	1	6	9	
Low 30-59%		4	8	
Very Low <29%		3	5	

- BMKG and BNPB have met the **risk** and **response** matrix according to the predicted phenomena
- **Response** from BNPB from each warning level was **compiled** based on the agreed likelihood (BMKG) and impact (BNPB).
- In the future BMKG will provide forecasts and warnings with **impact levels** that can be responded directly by BNPB and BPBD



Weather Ready Nations in Indonesia

	Phase One:	Phase Two:	Phase Three:	Phase Four:	Phase Five:	Phase Six:
WRN (supported by NOAA & WRN) 	Collect Data and Develop Hazard, Response and Risk Matrices	Expand Stakeholder Participation	Forecaster and Disaster Management Interface	Standard Operating Procedures (SOP)	Demonstration Test	Public Awareness and Outreach
	2018	2019	2019	2020	2020	2020
		Workshop one: Initial development of sector specific matrices (e.g. health, public works, transportation and other key partners) Workshop two: Finalize sector specific matrices (eg. health, public works, transportation and other key partners)	Workshop one: Develop web-based display system to share information between forecasters and disaster managers	Workshop one: Draft the Standard Operating Procedures (SOPs) Workshop two: Finalize the Standard Operating Procedures (SOPs)	Workshop one: Train the Trainer and Train Forecast and Civil Protection Staff Workshop two: Train the media and NGOs Workshop three: Simulation test in conjunction with Civil protection and NMHSs	Workshop one: Development of outreach material and public awareness to encourage people and organizations to volunteer to assist with communication and mitigation efforts.



WRN Workshop 2018

First WRN JAKARTA Workshop: Analyze available data and tools for use in developing matrices Februari 2018



Workshop three SEMARANG: Finalize Hazard and Response Matrices for country selected extreme weather impacts Semarang, Juli 2018

Workshop two YOGYAKARTA : Initial development of Hazard and Response Matrices for country selected extreme weather impacts Februari 2018

High Level Meeting BMKG-BNPB on Impact based forecast and risk based warning shift paradigms. Jakarta, Juli 2018. *(Draft Recommendation)*



2018

Rain Impact Matrices

Thunderstorm Impact Matrices

Wind Impact Matrices

Response Matrices BMKG-BNPB



Impact Based Simulation in BIMA



MATRIKS DAMPAK DAN MATRIKS RESPON AKIBAT CURAH HUJAN TINGGI DI WILAYAH BIMA



TABEL MATRIKS DAMPAK DAN MATRIKS RESPON

WARNING RISK	DESKRIPSI DAMPAK CUACA	RESPON DISASTER MANAGEMENT BPBD		LEVEL
		DESKRIPSI RESPON	KETERANGAN	
1	Terdapat hujan lebat tidak menimbulkan dampak	Melakukan Monitoring Informasi Cuaca BMKG Bima serta Koordinasi Internal antara BPBD Bima	Monitoring melalui Sistem Bimda Info BMKG Bima dan Koordinasi melalui Tim Peng. Handphone, HT dan WAZ Group BPBD BIMA	MINIMAL
	Air sungai deras, debit air tinggi dan sudah mengalir ke berbagai arah sungai			MINOR
	Dronawa vertikal berubah menjadi permukaan waduk			MINOR
	Area perawahan tergenang air			MINOR
	Jalan rusak dan terdapat reruntuhan kerendahan sisi lereng			MINOR
	AKtivitas sehari-hari tidak terganggu			MINOR
	Adanya Luapan air sungai disertai arus yang deras disertai ledakan sungai			MINOR
	Adanya Luapan air ditinjau selokan di pemukiman warga			MINOR
	Jalan raya tergenang air dan licin			MINOR
	Area perawahan / Perawahan tergenang air			MINOR
2	Terdapat gemangan air di jalan umum dan licin	Koordinasi dengan Tim TSBK / TSBG, TRC dan P-PRB yang ada di lokasi	Laporan Tim TSBK / TSBG dan P-PRB yang berada di lokasi	MINOR
	Terdapat banjir lokal di dataran rendah			MINOR
	Terdapat gemangan dalam jangka pendek (jar dan tidak padam)			MINOR
	Jalan raya tergenang namun tetap dapat dilalui			MINOR
	Terdapat kecakapan ringan pada Kendaran bermotor akibat jalan licin			MINOR
	Jalan tertutup karena ada luapan air dari jembatan			MINOR
	Terdapat banjir air di sekitar benturan sungai			MINOR
	Air masuk ke pemukiman warga			MINOR
	Jalan raya tergenang air sehingga tidak bisa dilalui			MINOR
	Area dataran rendah dan perawahan tergenang air dan berpotensi tidak bisa dilalui			MINOR
3	Terdapat banjir di jalan dan pemukiman warga	Koordinasi dengan Tim TSBK / TSBG, TRC dan P-PRB yang ada di lokasi. Koordinasi dengan BPBD Bima	Laporan kepada Atasan dan Pengawasan Teknis Survei ke lokasi terdampak kepada Pimpinan Daerah	MINOR
	AKtivitas masyarakat terganggu			MINOR
	Pusat Kode dan Jalan Utama terendam banjir			MINOR
	Terdapat kerusakan pada jalan dan jembatan			MINOR
	Berkahaya untuk keselamatan (air dan deras/lebat air tinggi)			MINOR
	Sarana komunikasi tidak dapat diakses / putus			MINOR
	Terdapat Kerusakan property bangunan			MINOR
	Bangir / disialar benturan sungai			MINOR
	Air masuk pemukiman warga			MINOR
	Masyarakat panik karena sudah mendengar bunyi petir			MINOR
4	Jalan raya tergenang air, berlutimur dan aspal berlubang sehingga tidak bisa dilalui	Melakukan Evaluasi oleh Tim TSBK / TSBG / TRC dan Kaj Cepak BPBD Bima	Tim Kaj Cepak melaporkan perkembangan ke Kepala BPBD	MINOR
	Area dataran rendah dan perawahan terendam banjir dan memuncak kerendahan			MINOR
	Bangir meluap ke jalan dan pemukiman			MINOR
	Kerawakan yang menyebabkan Fasilitas utama mati (tan dan listrik padam)			MINOR
	Rukn transportasi dan pelayanan perjalanan mengalami dampak yang parah			MINOR
	Sampul jalan utama dan jembatan terendam air			MINOR
	Berkahaya untuk keselamatan seluruh masyarakat (air dan deras dan debit air tinggi)			MINOR
	Selagian busur komunikasi tidak dapat diakses kerendahan datar jangka waktu yang lama			MINOR
	Proses evakuasi wilayah yang terdampak menjadi sulit			MINOR
	Terdapat Kerusakan property bangunan dan infrastruktur wilayah			MINOR
5	Area banjir cukup luas dan sehingga menyebabkan aktivitas rumah total	Koordinasi Internal BPBD Bima dengan BPBD dan Pemimpin BPBD Bima serta Proses Evaluasi Bencana Bangir	Proses analisa wilayah terdampak untuk merencanakan SK Siga Bencana	MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
6		Koordinasi dengan Tim TSBK / TSBG, TRC dan P-PRB yang ada di lokasi. Koordinasi dengan BPBD Bima	Kekawat BPBD meninjau Tim Kaj Cepak (Analisa Kerawakan dan Lokasi Dampak)	MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
7		Melakukan Survey ke lokasi oleh Tim Kaj Cepak BPBD dan melaporkan kembali kepada Kepala BPBD Bima	Tim Kaj Cepak melaporkan perkembangan ke Kepala BPBD	MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
8		Koordinasi dengan Tim TSBK / TSBG, TRC dan P-PRB yang ada di lokasi. Koordinasi dengan BPBD Bima	Kekawat BPBD meninjau Tim Kaj Cepak (Analisa Kerawakan dan Lokasi Dampak)	MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
9		Koordinasi dengan Tim TSBK / TSBG, TRC dan P-PRB yang ada di lokasi. Koordinasi dengan BPBD Bima	Kekawat BPBD meninjau Tim Kaj Cepak (Analisa Kerawakan dan Lokasi Dampak)	MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
10		Koordinasi dengan Tim TSBK / TSBG, TRC dan P-PRB yang ada di lokasi. Koordinasi dengan BPBD Bima	Kekawat BPBD meninjau Tim Kaj Cepak (Analisa Kerawakan dan Lokasi Dampak)	MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR
				MINOR

TABEL WARNING RISK LEVEL

L I K E H O O D	HIGH > 80 %	2	7	10	
	MEDIUM 60-70 %	1	6	9	
	LOW 30-59 %		4	8	
	VERY LOW < 29 %		3	5	
		Minimal	Minor	Significant	Severe

IMPACT



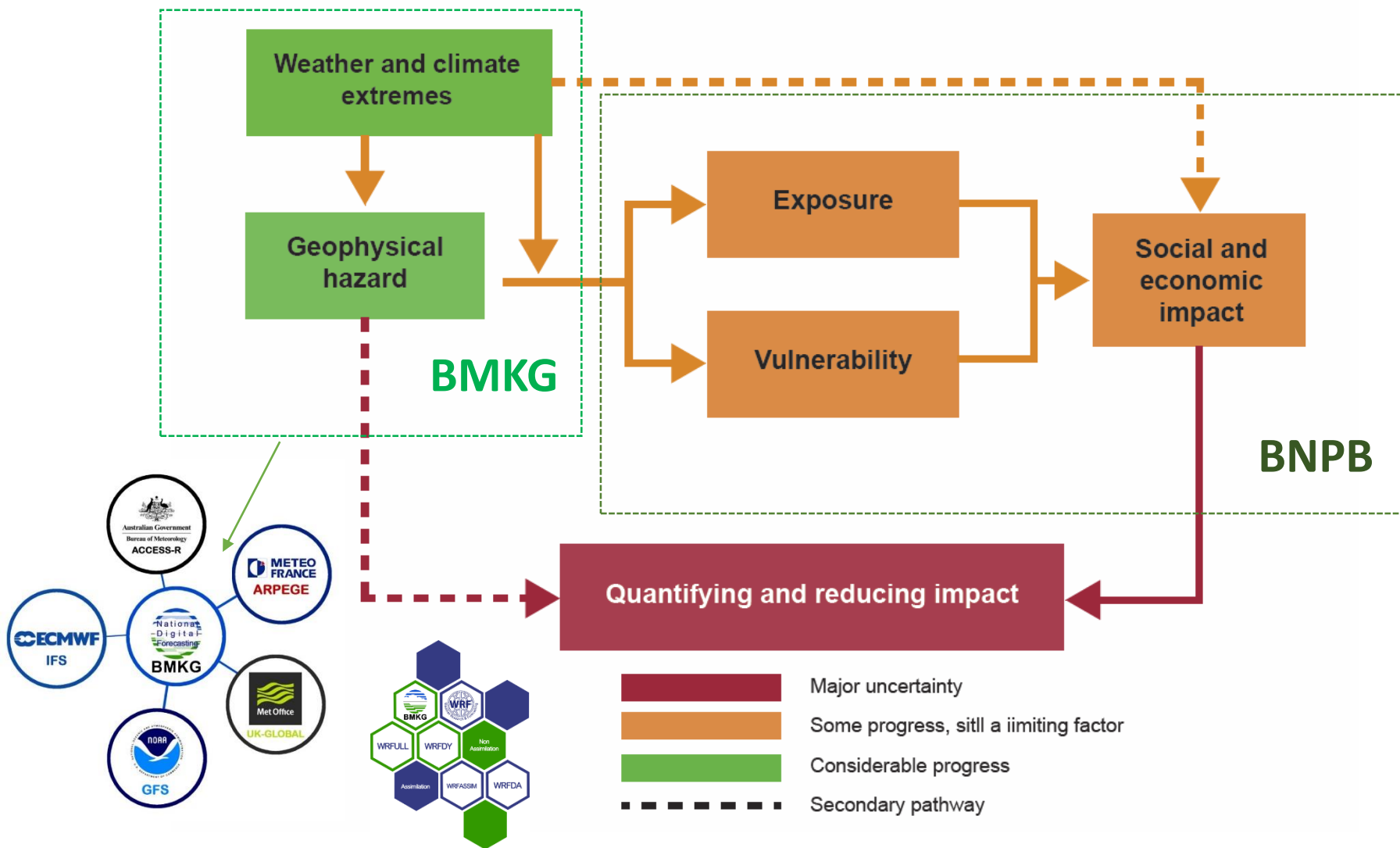
NOTIFIKASI PERINGATAN DINI CUACA EKSTRIM

BADAN METEOROLOGI, KLIMATOLOGI, DAN GEOSIPSA
 STASIUN METEOROLOGI SULTAN MUHAMMAD SALAHUDDIN BIMA
 Jl. Sultan Muhammad Salahuddin Bima 84173, NTB Telp: (0374) 43215 Fax: (0374) 43123
 Website: www.bmkgbima.net Email: stamet_bmu@yahoo.co.id

UPDATE telah terjadi hujan sedang - lebat disertai Kilat/Petr pada tanggal 18 Maret 2018 mulai pukul 11.40 WITA hingga saat ini (17.30 WITA) di wilayah kecamatan Wawo, Woho, KotaBima, Ambalangi, Wera, Soromandi yang dapat menyebabkan meluapnya air sungai, gemangan air, dan jalan licin.

INDEKS KERENTANAN BANJIR WILAYAH KAB. BIMA, KOTA BIMA DAN KAB. DOMPU
INDEKS BAHAYA BANJIR WILAYAH KAB. BIMA, KOTA BIMA DAN KAB. DOMPU
INDEKS RISIKO BANJIR WILAYAH KAB. BIMA, KOTA BIMA DAN KAB. DOMPU

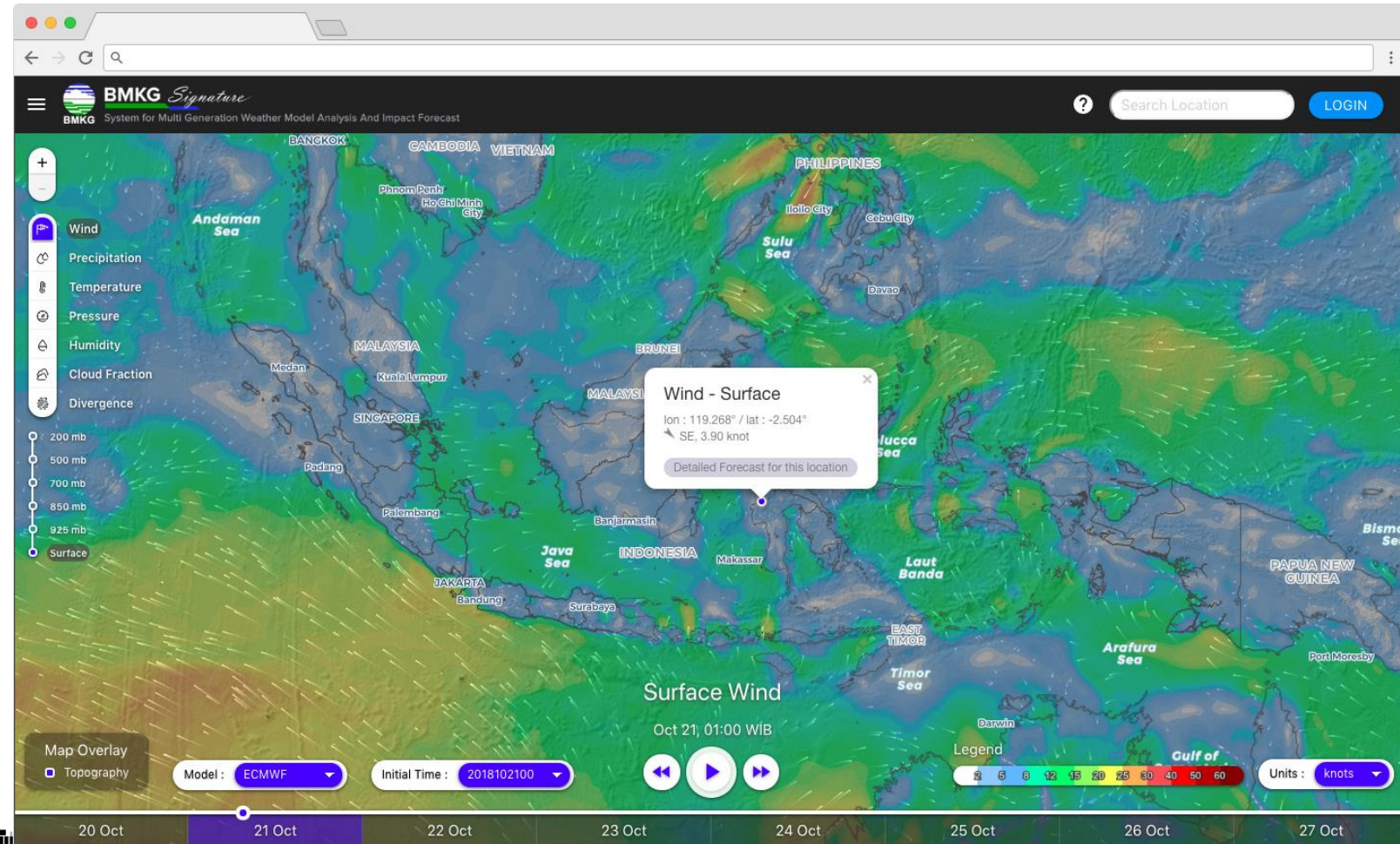




Weather Forecast

- Multi-Model (WRF, ECMWF, GFS, ARPEGE, IFS, AccessR) for Next 7 Days with 3 Hours Interval
- Global, Regional (Asia Pacific), and Indonesia
- Interactive Maps with Dynamic Weather Visualization
- Meteogram
- Model Comparison
- Geolocation
- Probabilistic

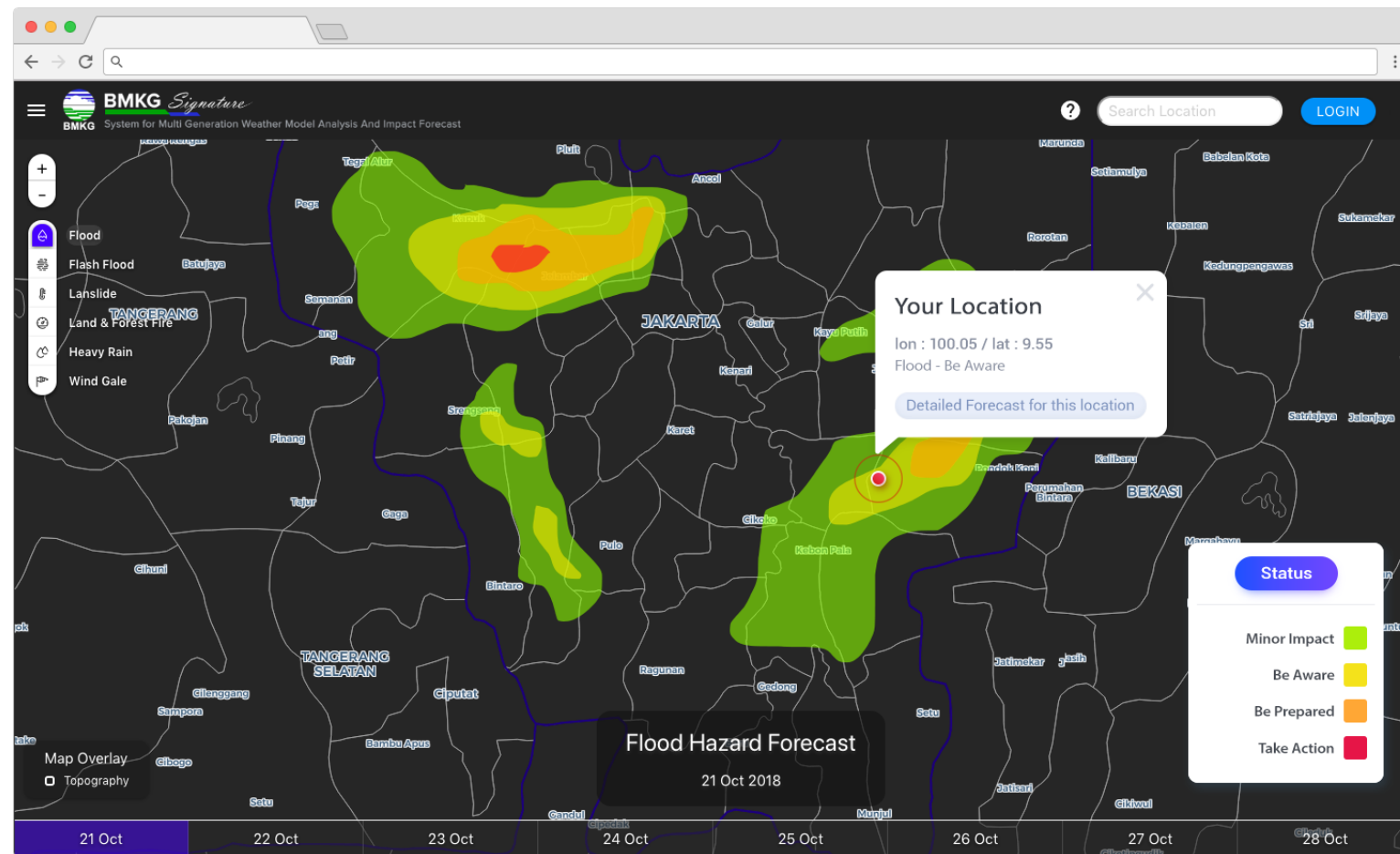
Interactive Weather Forecast



Impact Based Forecasting

Public Access Interactive Maps for Impact Based Forecasting

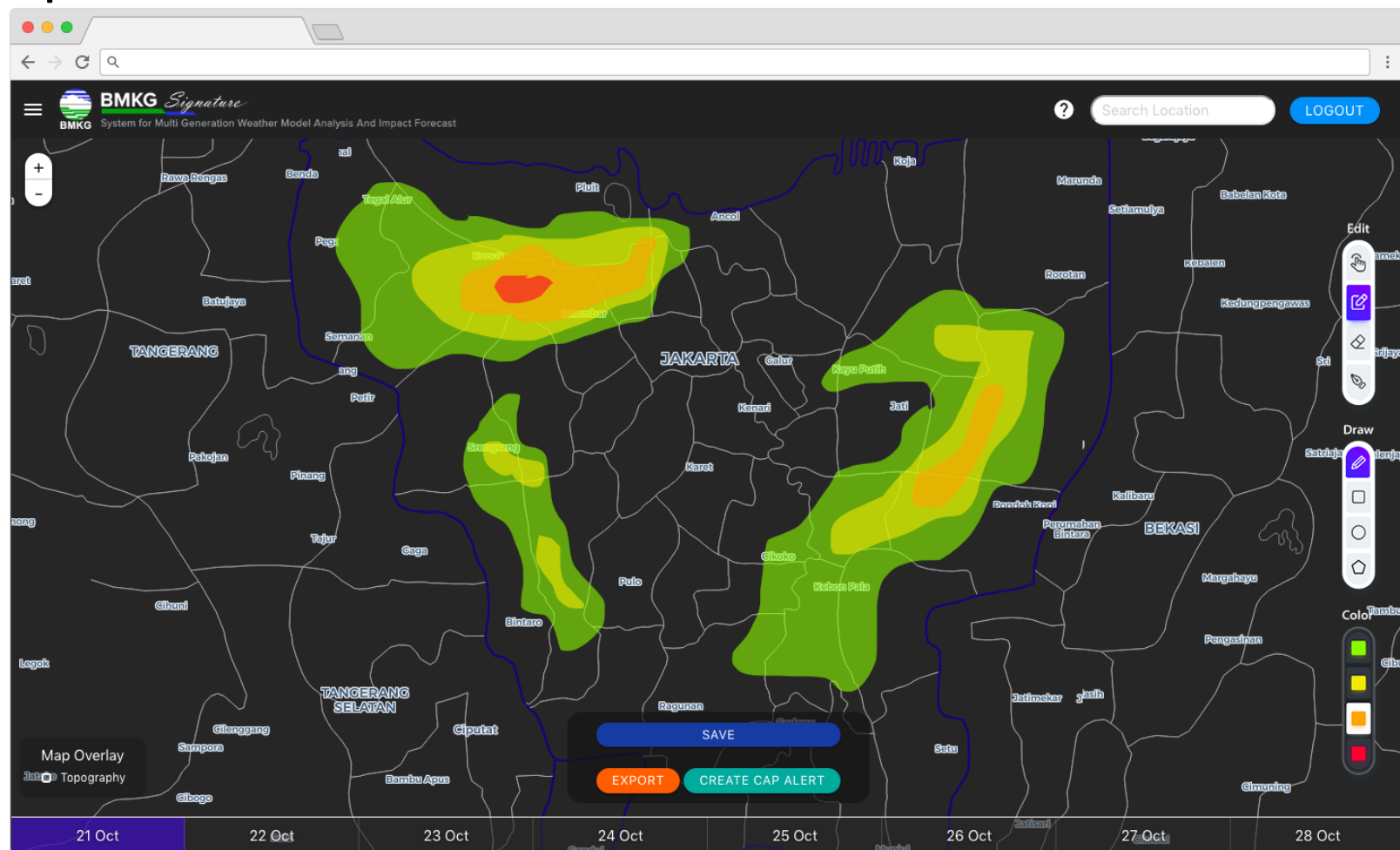
- Auto generated forecast with Admin supervise
- Impact Forecast : Flood, Flash Flood, Landslide, Land & Forest Fire
- Severe Weather : Heavy Rain and Wind Gale
- 4 Warning Levels (Minor Impact, Be Aware, Be Prepared, Take Action)
- 7 Days Forecast, once a day
- Geolocation & Warning System



Impact Based Forecasting

Admin Panel for Supervising Impact Forecast

- Edit System-Generated Impact Forecast
- Draw (Freedraw, Square, Circle, Polygon) with 4 Coloring Warning Levels
- Export Result to GIS File (SHP, GeoTiff, GeoJSON)
- Integrated with CAP (Common Alerting Protocol)



MASYARAKAT INDONESIA SADAR IKLIM DAN CUACA (MOSAIC)

A PROGRAMS TO MAKE INDONESIAN COMMUNITIES UNDERSTAND ABOUT CLIMATE AND WEATHER





MOSAIC

A program that has main purpose to reduce disaster potential by learning about how to get weather information, how to interpret weather information, and how to response weather information.

Hidrometeorology Hazard

**December, January,
February**

Flood, Landslide, High
Wave, Flasd Flood, Storm

March, April, May

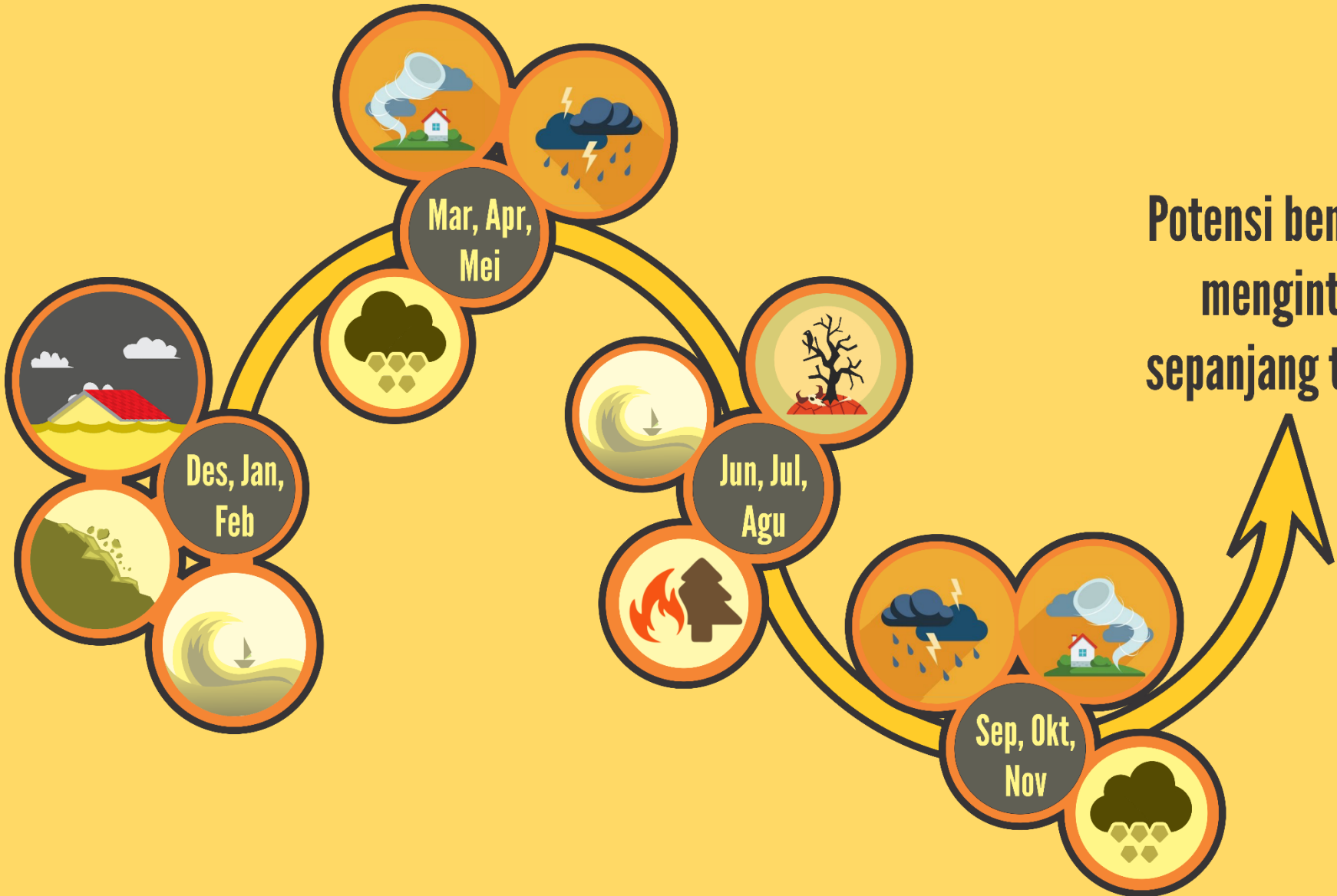
Small Tornadoes,
Thunderstorm, Hail

June, July, August

Drought, Forest Fire, High
Wave

Sept, Oct, Nove

Small Tornadoes,
Thunderstorm, Hail



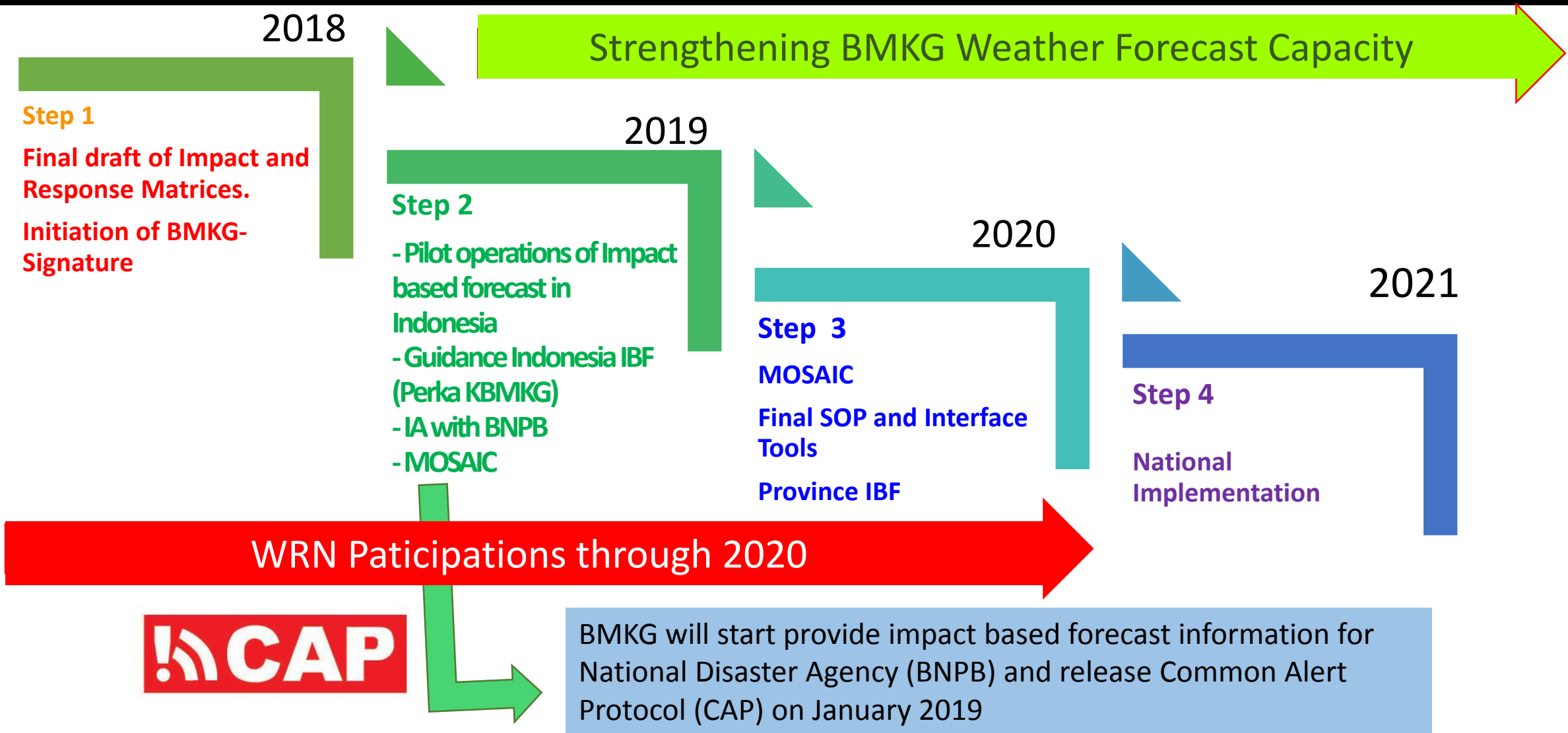
Potensi bencana
mengintai
sepanjang tahun



MOSAIC Platform

	Phase 1	Phase 2	Phase 3	
Participant	Disaster volunteers	Volunteers on Specifics Sectors	Traning for Trainers	
Subjects	Introduction on Weather and Climate	Introduction on Weather and Climate	Skilled modeling of adult learning principles and delivery techniques, including how to help adults learn and remember, processing and facilitation techniques, classroom set-up and management, and handling difficult participant situations	
	Understanding the impact of extreme weather	Understanding the impact of extreme weather on specific sectors	Researched, up-to-date and well-designed program and materials related weather and climate impact to their specific community	
	Weather and Climate simulation (practice)	Weather and Climate simulation (practice)	The application of a client’s own content throughout the program and for any final skill demonstration project.	
	How to understand weather forecast and warning from BMKG	How to understand weather forecast and warning from BMKG	The opportunity to receive both facilitator and peer feedback and coaching.	
	Know the action from response matrices of impact forecast and risk alert	Know the action from response matrices of impact forecast and risk alert to their sectors	Connecting with the regional hub of BMKG and Disaster Manegement offices	
	How to use BMKG alert information to the community	How to use BMKG alert information to the specific community		
	Tabletop exercise	Tabletop exercise		
	Partners	BNPB, BPBD, Tagana (Volunteers from Ministry Social), Public Volunteers group, Public Radion networks, University disaster group.	Agriculture, Health, Industry, Forestry, Humanitarian, School/Education, Military, Social, Businees/Finance.	
	Duration	3 days	3 days	2 days

Road Map Indonesia Impact Based Forecast





THANK YOU