



## **(Country centric capabilities and challenges): the example of Indonesia**

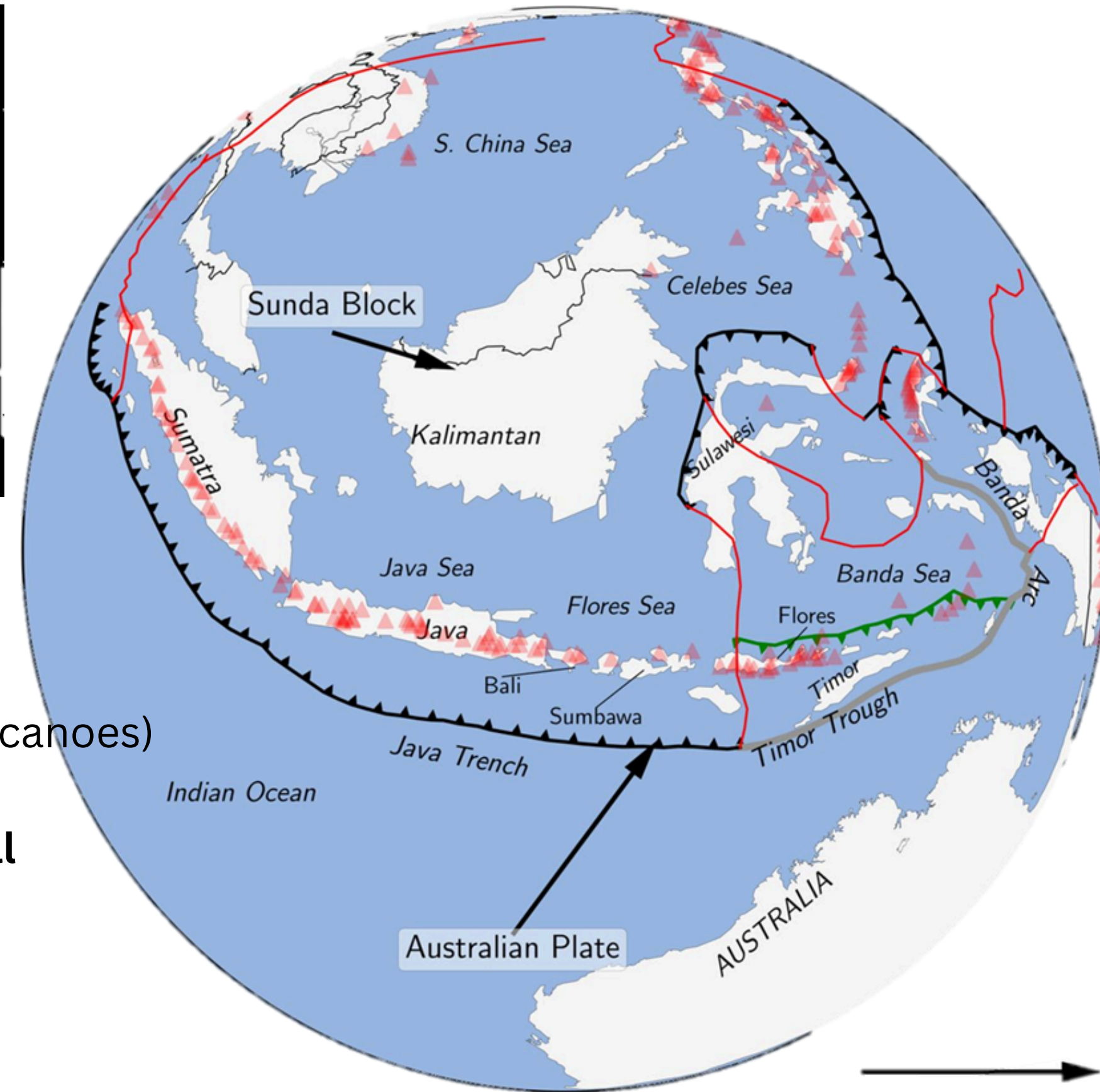


1. **Muhammed Wafid - Head of Geological Agency**
2. **Heruningtyas Desi Purnamasari - Head of Volcano monitoring Indonesia (CVGHM)**
3. **Agie Wandala Putra - Meteorology, Climatology, and Geophysical Agency of Indonesia ( BMKG)**

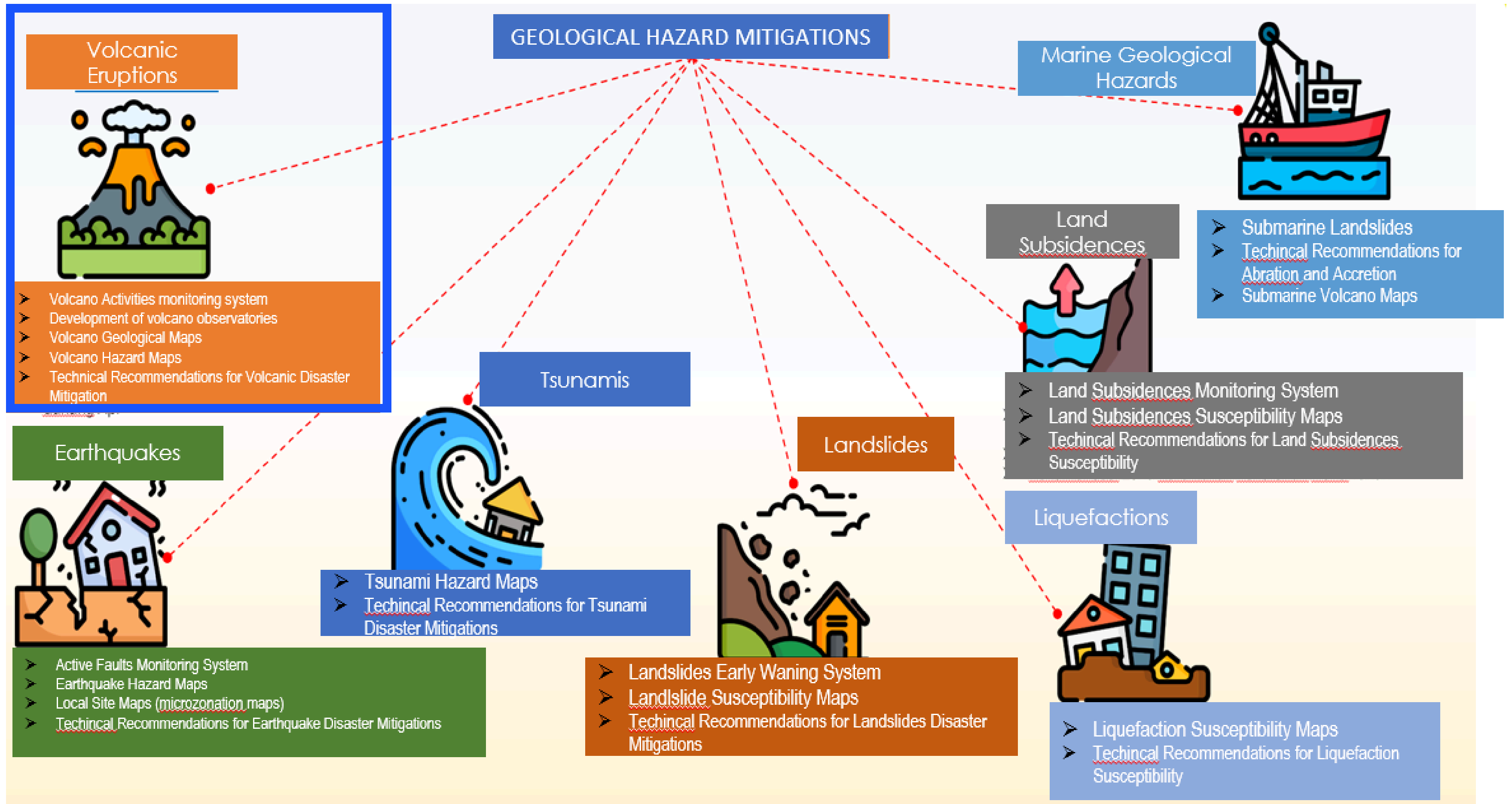
# TECTONIC OF INDONESIA



- **17.000** island (34 Provinces)
- **265 million** inhabitants
- **4** tectonic plates
- **127** active volcanoes (69 under monitoring-3 submarine volcanoes)
- **6-12** volcanic eruptions per year
- **>280 Active Faults** triggering Earthquake (**12 - 15 % of global earthquakes** occur in Indonesia and multiple destructive earthquakes per year)
- **Tsunamigenic** (Tectonic and Non-tectonic)
- **Over 800 Landslides** per year





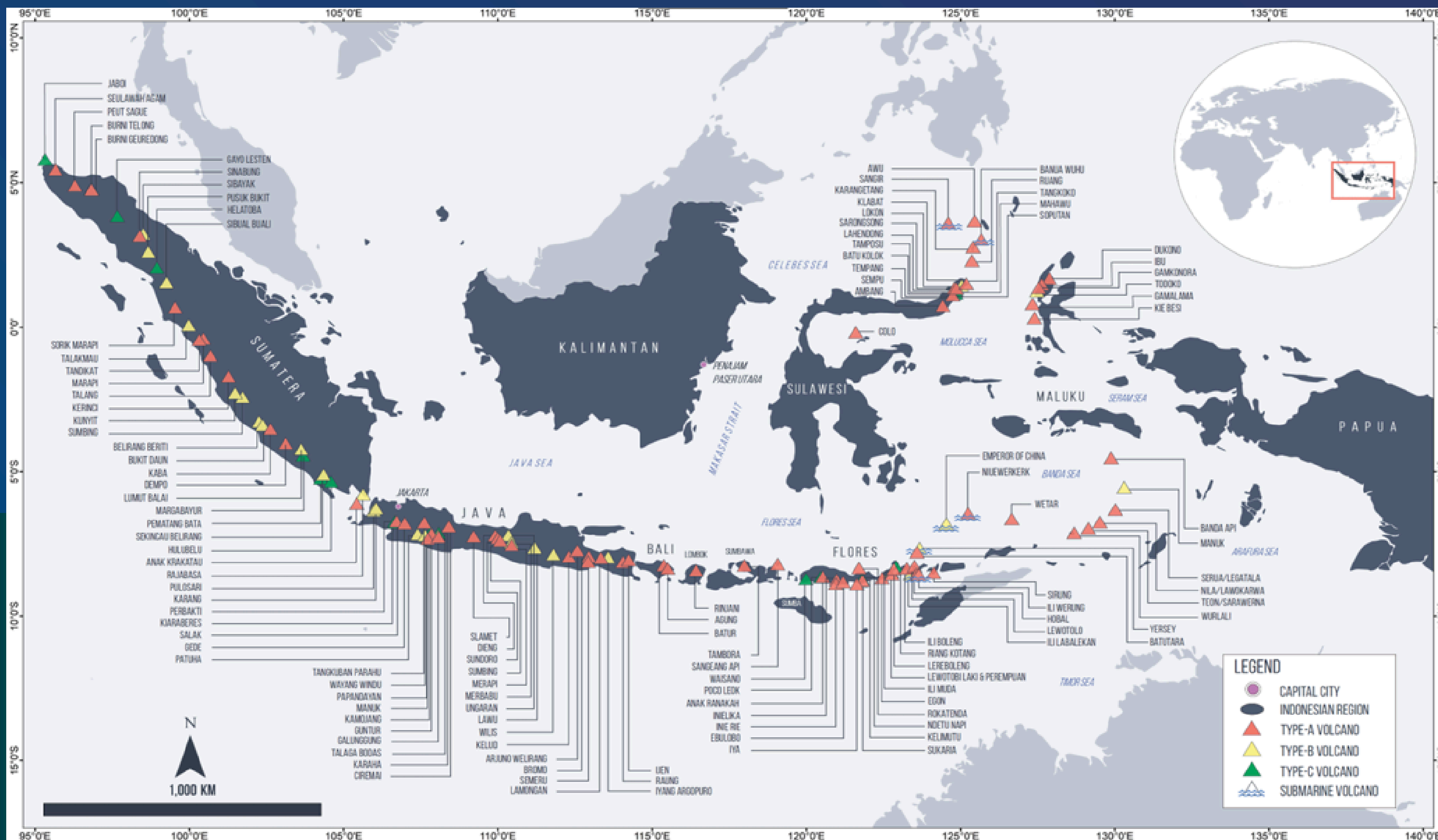




# Geological Agency

## Ministry of Energy and Mineral Resources

### 127 ACTIVE VOLCANO IN INDONESIA WITH 3 TYPES: A, B AND C



#### 127 ACTIVE VOLCANOES

**Type A** : 77 volcanoes  
with eruptive historical  
record since 1600 AD

**Type B** : 29 volcanoes  
with eruptive historical  
record before 1600 AD

**Type C** : 21 volcanoes  
with solfatara and  
fumarole but no eruptive  
historical record



# Eruptions like these shape our landscapes – and our futures



Eruption of Mount Merapi, Indonesia, September 19, 2024  
source : <https://radarjogja.jawapos.com>



The pyroclastic flow of Mount Semeru on December 4, 2021  
source : <https://www.tempo.co/>



The eruption of Mount Marapi on February 6, 2024  
source : <https://www.tempo.co/>



The 2024 eruption of Mount Ruang produced pyroclastic flows and incandescent lava ejections that reached up to 8 kilometers from the eruption center. (Source : CVGHM)



The eruption of Mount Lewotobi Laki-laki on June 17, 2025, produced an eruption column that reached up to 10 kilometers. (Source : CVGHM)



The eruption of Mount Ibu produced an eruption column 5,000 meters high. Source: <https://toraja.tribunnews.com/>



# The real-world impact on communities



Mount Semeru erupts in Indonesia, 2021.

Behind every eruption, there are lives disrupted



Source : <https://edition.cnn.com/>



# Impact on the aviation sector

## Bali flights cancelled after Indonesian volcano spews 10km-high ash tower

Mount Lewotobi Laki-Laki on the island of Flores, east of Bali, erupted on Tuesday afternoon, leading to several airlines cancelling flights



■ Giant ash plume rises from Indonesia's Mount Lewotobi Laki-Laki volcano – video

Travel > News & Advice

## Dozens of Bali flights cancelled after volcano erupts in Indonesia

Airlines say they are closely monitoring the situation and will inform customers of any changes

Amelia Neath • Wednesday 18 June 2025 10:23 BST • 0 Comments

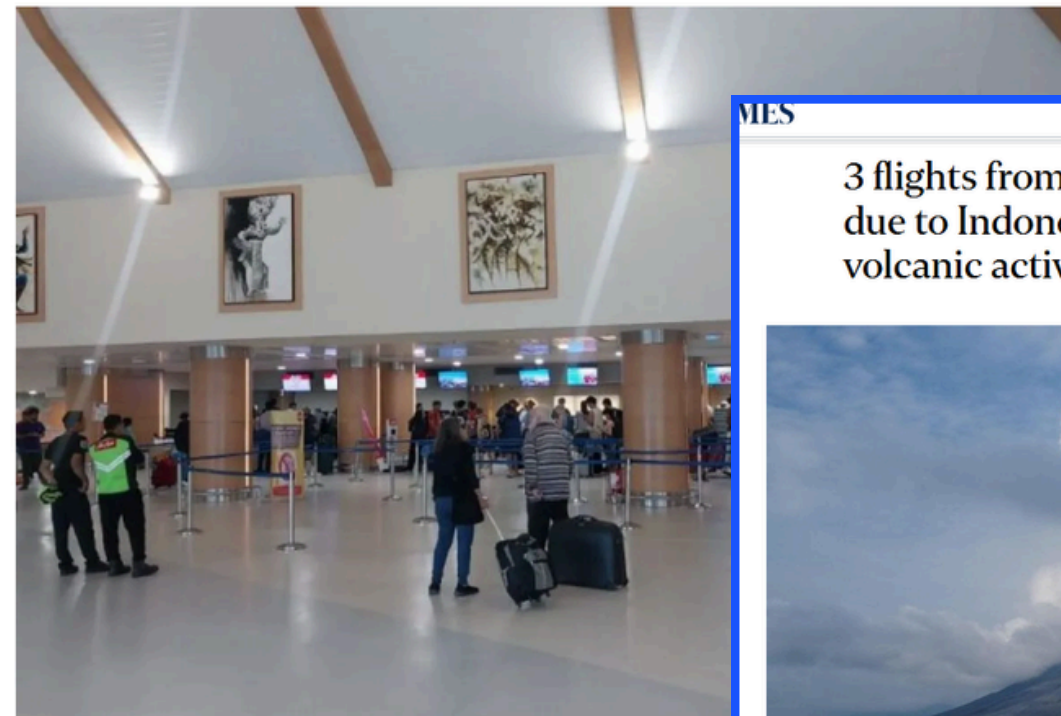


ANTARA  
INDONESIAN NEWS AGENCY

HOME CURRENT ISSUE WORLD BUSINESS & INVESTMENT EXPLORE IN

## Bali: 17 outbound flights canceled due to Lewotobi eruption

June 18, 2025 19:09 GMT+700



I Gusti Ngurah Rai Airport, Bali, said 17 outgoing flights and 15 incoming flights were canceled Wednesday (June 18, 2025) due to the eruption of Mount Lewotobi Laki-Laki.

MES

SINGAPORE

## 3 flights from Changi Airport cancelled due to Indonesia's Mount Ruang volcanic activity



A series of eruptions from Mount Ruang, beginning on April 16, has already forced thousands to evacuate. PHOTO: AFP

TEMPO  
ENGLISH

Search News

TEMPO EXCLUSIVE

< Home Popular News News Asean & Beyond Sport Environment Sci

Home > Economy & Business

## Mount Ruang Erupts Again; Airports Closed, 18 Flights Canceled

Translator

Dewi Elvia Muthiariny

Editor

Laila Afifa

April 30, 2024 | 07:24 pm



TEMPO.CO, Jakarta - Mount Ruang in Sitaro Islands Regency, North Sulawesi has erupted again today, April 30, forcing the closure of several airports in the region.



**BADAN GEOLOGI**  
Kementerian Energi dan Sumber Daya Mineral



Badan Geologi



@kabargeologi



www.geologi.esdm.go.id



Badan Geologi



kabargeologi



# Center for Volcanology and Geological Hazard Mitigation, Geological Agency, MEMR



Minister of Energy and Mineral Resources Regulation No. 13 of 2016, Article 693  
Conduct research, investigation, engineering, and services in the field of volcanology and geological disaster mitigation.

Tsunami in Poso 2018



Malang earthquake, 2021



Flood in East Nusa Tenggara, 2021



Sinabung eruption, 2020



**Volcanic hazard mitigation** is the effort to reduce risks and impacts caused by volcanic eruptions.



**Mitigate** the impact of volcanic eruptions, early warning systems are essential.



# The 4 hazards managed by Center for Volcanology and Geological Hazard Mitigation, Geological Agency



- 127 active volcanoes
- 20 volcanoes with above-normal status
- 5 million people living within the hazard-prone areas (KRB)
- **Fatalities**  
200,000 people (before 1980)  
450 people (after 1980)
- **Evacuated**  
750,000 people (after 1980)



- ✓ 7000 km subduction zone
- ✓ > 3000 km of active fault lines
- ✓ 150 million people exposed
- ✓ 5 million people exposed to tsunamis
- ✓ Over 250,000 fatalities since the year 2000

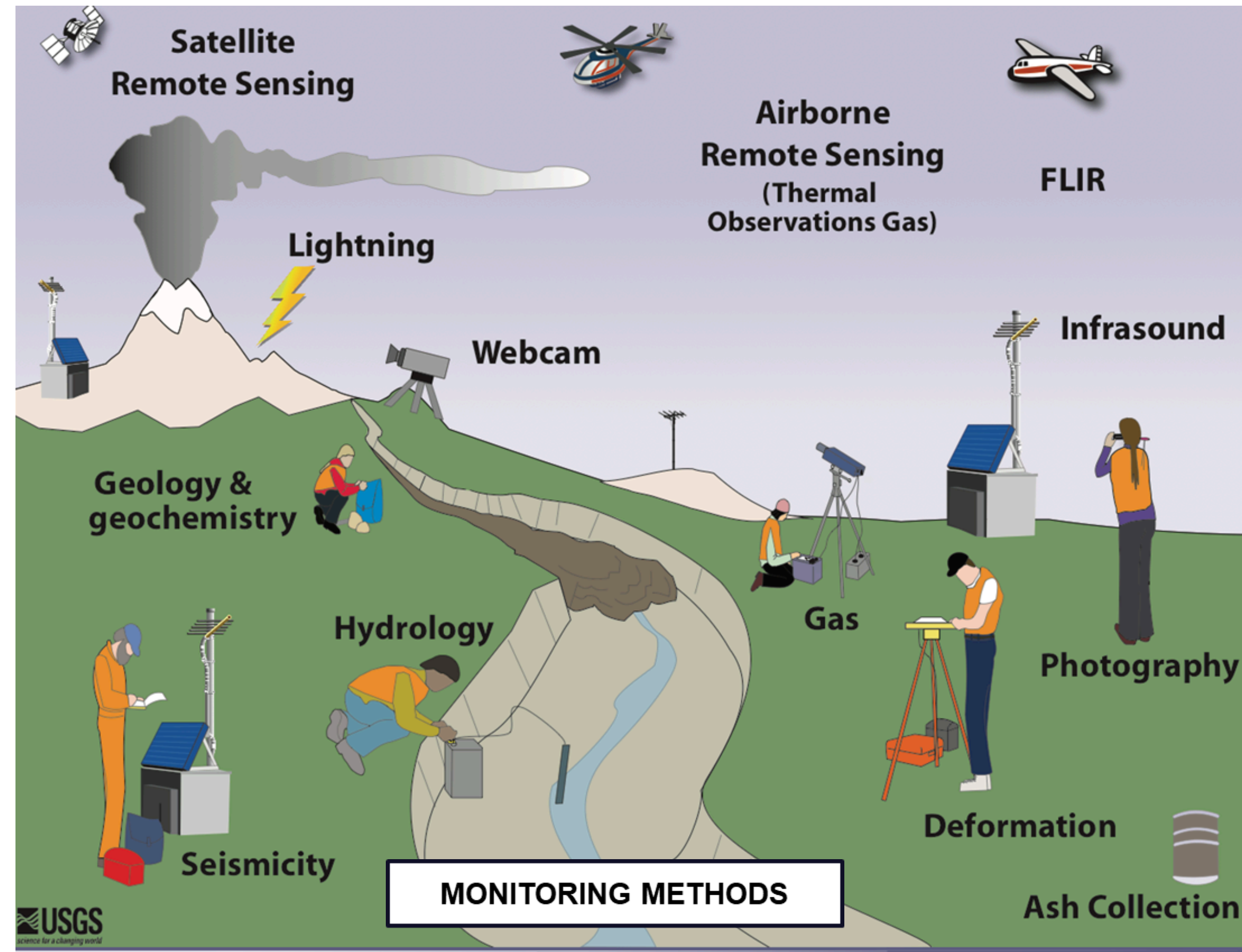


- ✓ 5 million people exposed by tsunamis



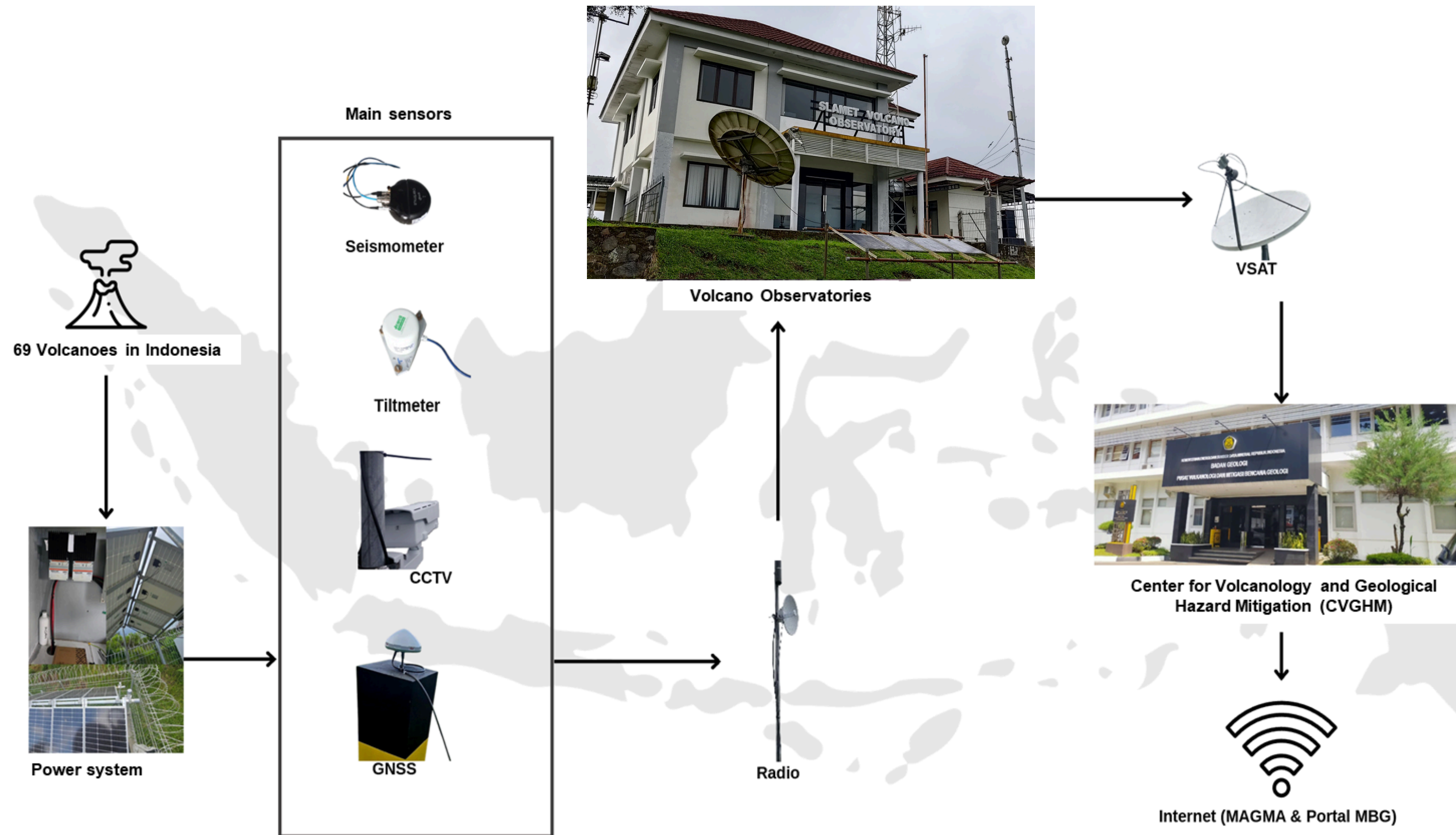
- ✓ 1,300 earthquake events in the past 5 years
- ✓ 60% prone to landslides
- ✓ 40.9 million people in hazard-prone areas
- ✓ 200 deaths per year
- ✓ 4,000 buildings damaged per year
- ✓ 400 hectares of farmland damaged per year

# Modernization and Installation of Volcano Monitoring System





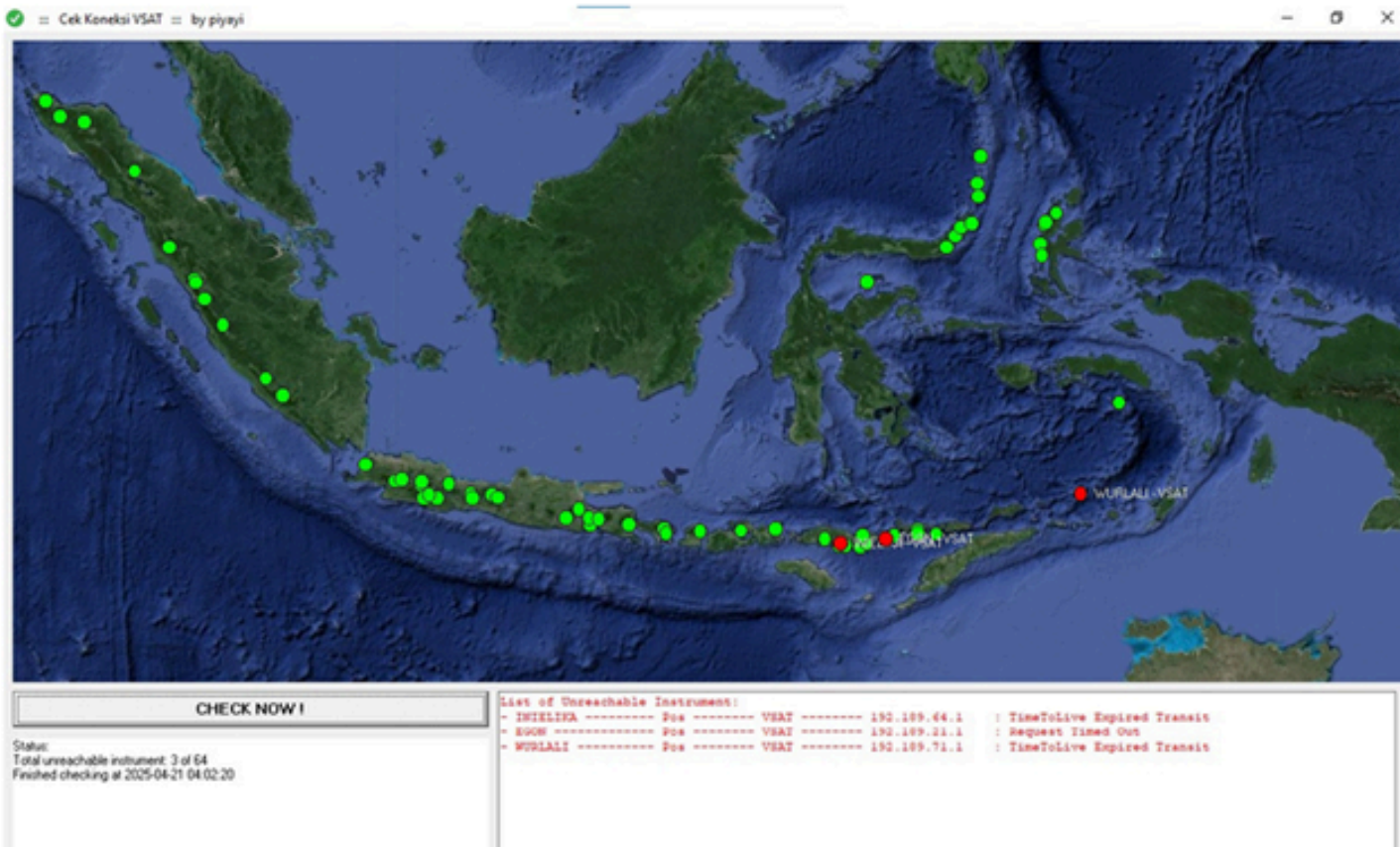
# VOLCANO MONITORING SYSTEM IN INDONESIA



- Current status of 543 volcano monitoring instruments
- 72 Observatory offices
- 243 observer who work to observe 69 volcanoes



# VOLCANO MONITORING DATA ACQUISITION SYSTEM IN INDONESIA



WebObs OVS-IPGP [172.16.3.32] WebObs-2.6.4

Indonesia / Stasiun GPS PVMBG

Views | Specifications | Location | Information | Project | Events | References | This board

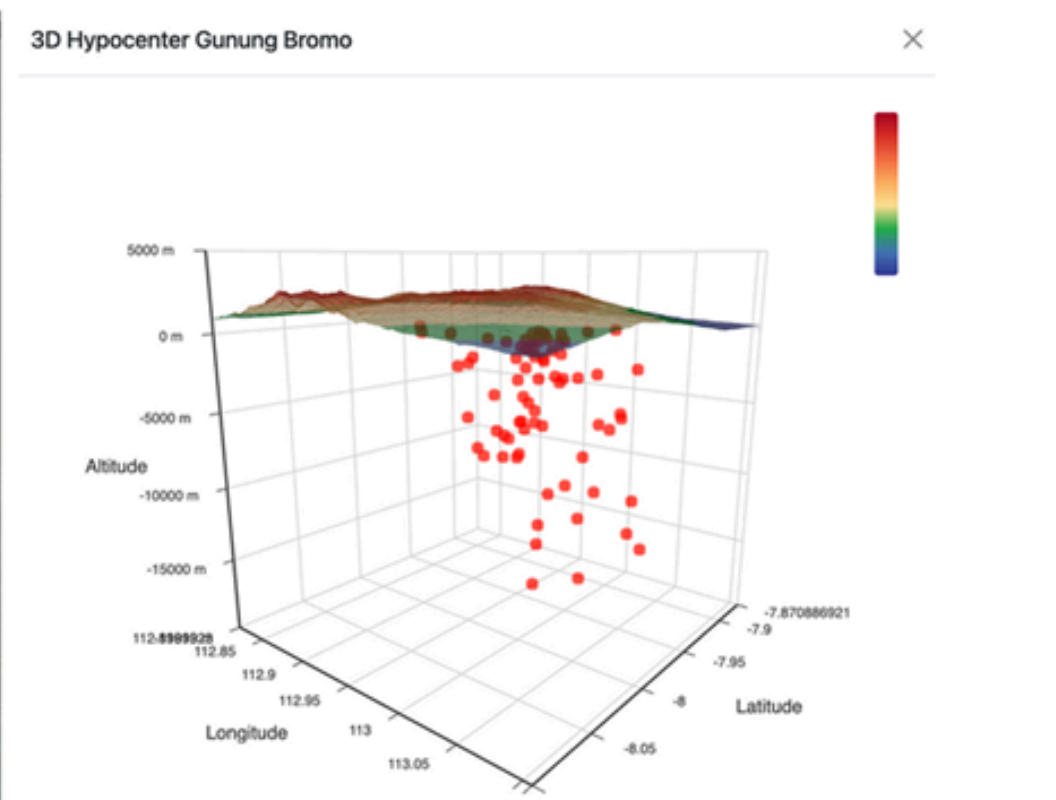
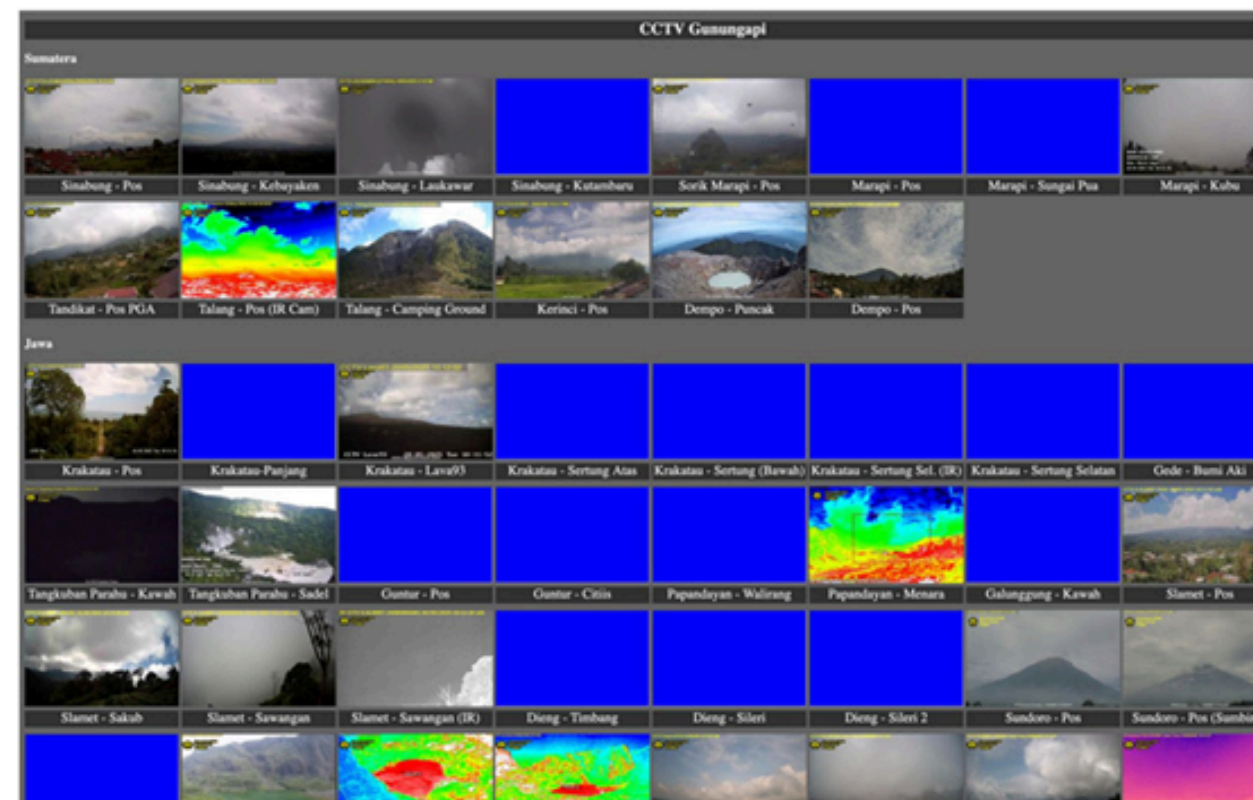
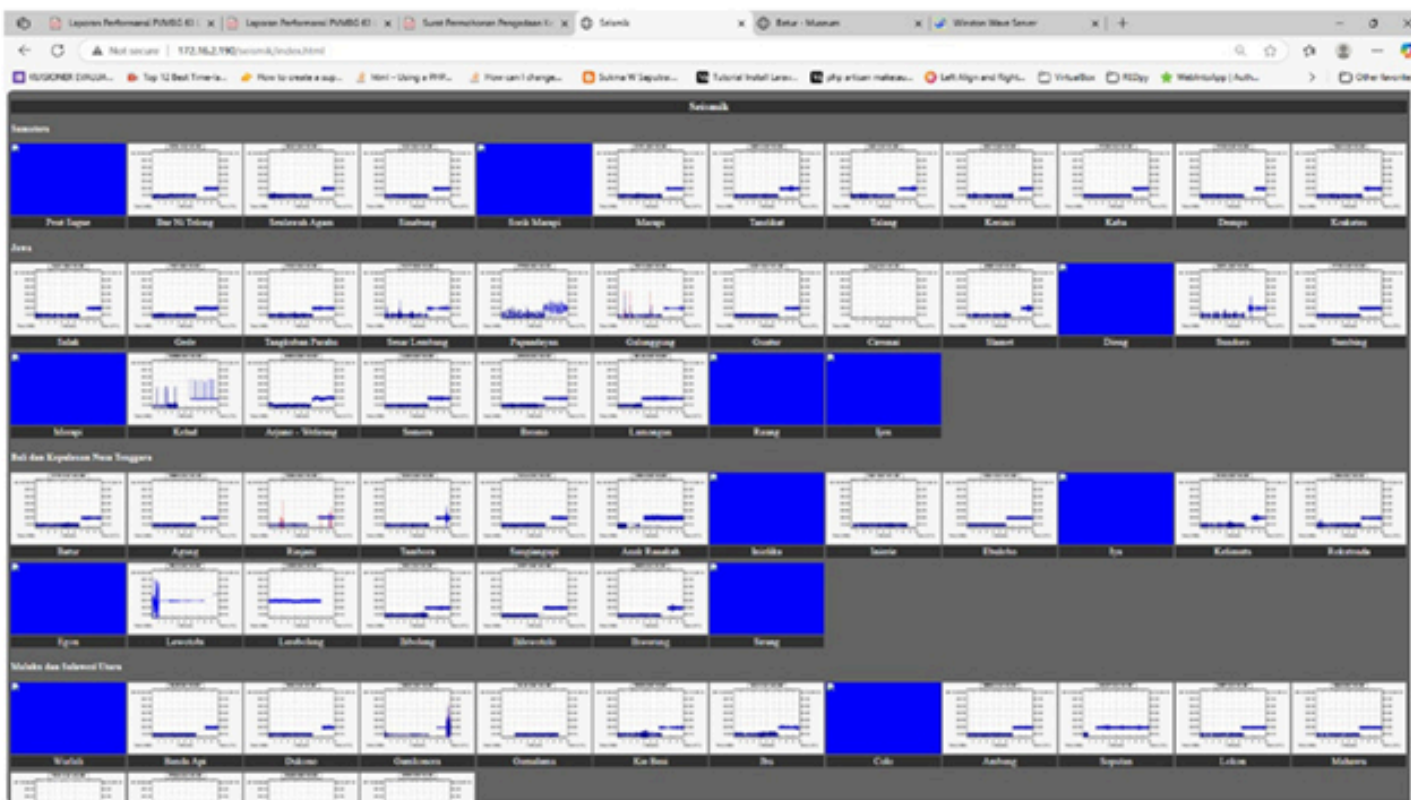
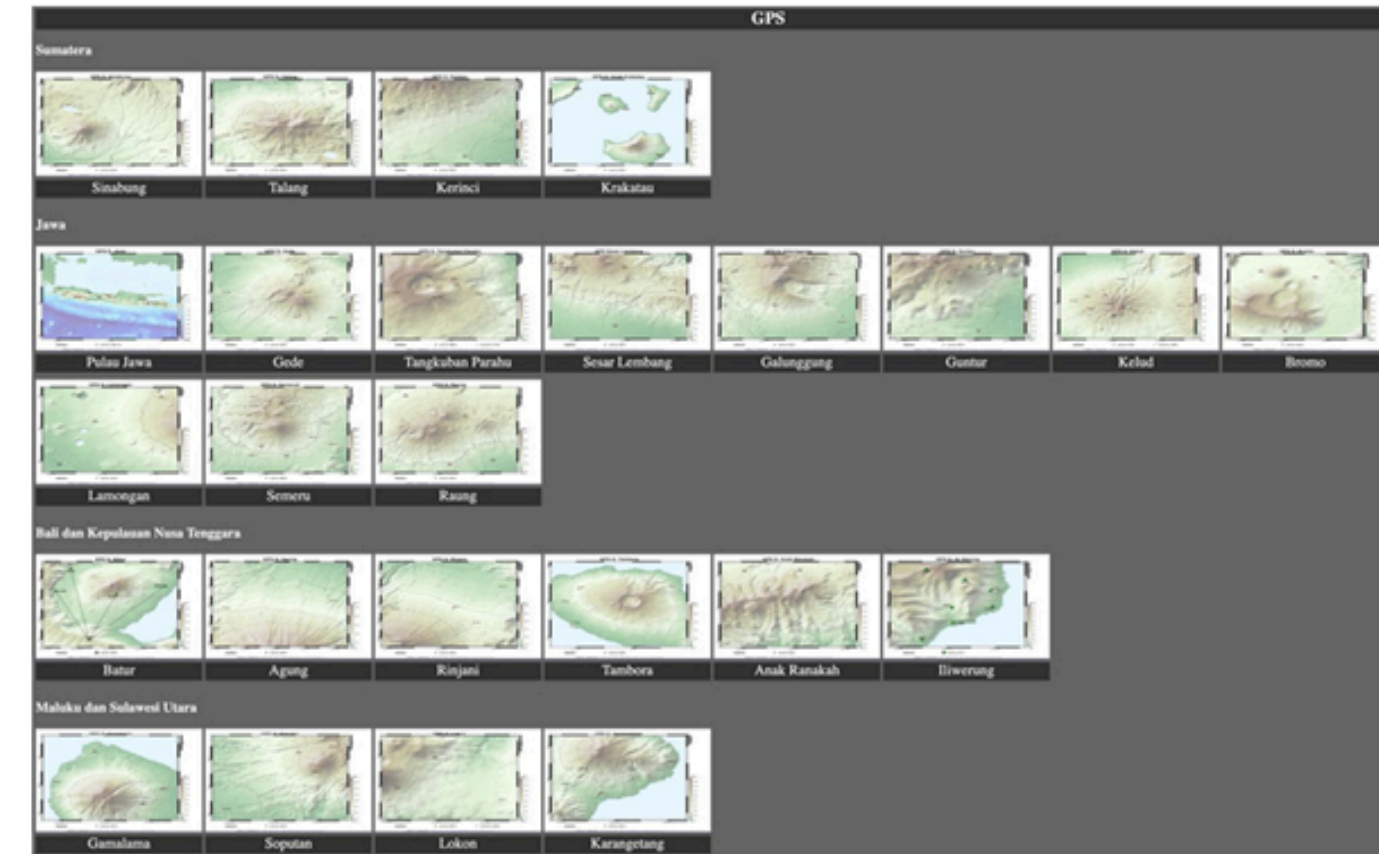
**Purpose**

**Specifications**

- Domain: Indonesia
- Grid code: VIEWJO\_GPS
- Operator: PVMBG
- External link: <http://myview.org>

**188 node(s)**

Alias	Name	Coordinates	Lifetime and Validity	Type	Mo	Project
		Lat. (WGS84) Lon. (WGS84) Elev. (m)	Start / Installation End / Stop		Event	
DULR	"Si Werung Dulur"	-8.58969 123.55827 0	2024-02-20	LEICA GX1250GG	0	
LERK	"Si Werung Lerak"	-8.52139 123.55969 0	2024-12-18	LEICA GX1250GG	0	
CBTR	"Batur Kawah-2"	-8.24587 115.37899 1327	2020-10-06	GR30	0	
CSGN	"Batur Sengen"	-8.23907 115.40460 1050	2020-10-07	GR30	0	
CEGI	"Agung Cegi GPS"	-8.30232 115.47160 998	2012	GPS Javad	0	
CKAR	"GPS G. Agung Batulompeh"	-8.20881 115.49942 81	2024-02-22	Leica GR30	0	
DKUH	"Agung DKUH GPS"	-8.29601 115.53434 676	2012	GPS Javad	0	
GARD	"GPS G. Agung Rendang"	-8.42476 115.43170 571	2024-02-27	LEICA GR30	0	
CARU	"GPS Aaru Pos PGA"	3.60672 125.48011 97	2022-07-17	GPS LEICA GR30	0	
CBBR	"GPS Aaru Baha Baru"	3.63639 125.43679 117	2022-07-17	GPS LEICA GR30	0	
CBBA	"GPS Aaru Baha"	3.68374 125.51730 127	2022-07-17	GPS LEICA GR30	0	
CKDH	"GPS Aaru Kendaha"	3.68408 125.39974 99	2022-07-17	GPS LEICA GR30	0	
CKLG	"GPS Aaru Kolongan"	3.65951 125.46244 681	2022-07-17	GPS LEICA GR30	0	
CKSG	"GPS Aaru Kalsavage"	3.72730 125.43278 152	2022-07-17	GPS LEICA GR30	0	
CPTM	"Batur Pura Tukad Melik"	-8.22505 115.35517 1100	2020-10-03	GR30	0	
DB02	"DB02 GPS Tampora"	-8.21810 115.35580 1381	2020-10-01		0	
DB02B	"Batur GPS baru"	-8.22860 115.36047 1100	2020-09-15		0	
CMSM	"Batur Museum Geopark"	-8.28346 115.36485 1350	2020-10-01	GR30	0	
CYMP	"Batur Yeh Mampoh"	-8.24317 115.34732 1085	2020-10-01	GR30	0	





# Conduct gas measurements at the volcanic crater, collect crater lake water samples, and perform photogrammetry surveys using drones





# Dissemination of disaster-prone area maps to tourists, stakeholders, and the public



Kecamatan Simpang Empat, Sumatera Utara, Indonesia  
4FR7+8M7, Ndokum Siroga, Kec. Simpang Empat, Kabupaten Karo, Sumatera Utara, Indonesia  
Lat 3.141035°  
Long 98.464346°  
26/08/24 03:39 PM GMT +07:00



29/10/2024  
Tue  
Mahera, Gam Ici, Kec. Ibu, Kabupaten Mahera Barat, Maluku



Gunung Tujuh, Jambi, Indonesia  
68V6+H68, Bengkolan Dua, Gunung Tujuh, Kerinci Regency, Jambi 37122, Indonesia  
Lat -1.756428°  
Long 101.310749°  
28/08/24 10:18 AM GMT +07:00



November 2024  
Nama, Kec. Una-Una, Kabupaten Una-Una, Sulawesi Tengah

MN073, Timemark Diverifikasi

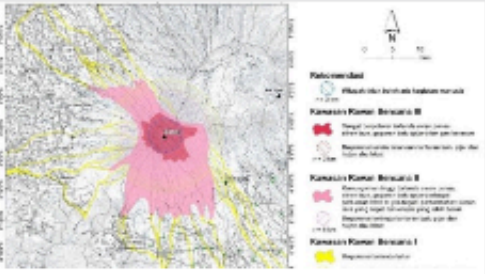


# Information dissemination through mass media, WhatsApp groups with stakeholders, and SMS (Short Message Service) blast.

## Press Release Gunung Api

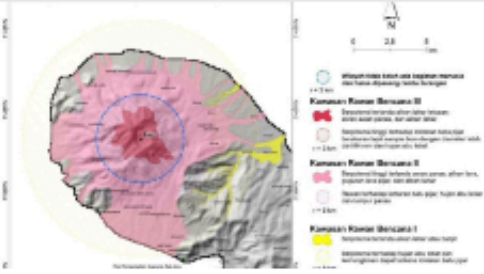
home | Gunung Api | Press Release Gunung Api

show 15 entries




AKTIVITAS GUNUNGAPI RAUNG, JAWA TIMI

Selengkapnya




PENINGKATAN KEGEMPAAN GUNUNGAPI A

Selengkapnya




LAPORAN KHUSUS

Sele



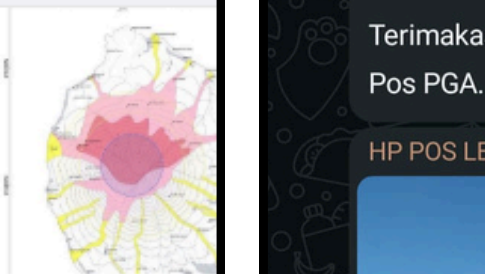
PENINGKATAN GEMPA VULKANIK G. LEWOT

Selengkapnya



PERUBAHAN TINGKAT AKTIVITAS G. LEWOT

Selengkapnya



Aktivitas G. Gamala

Sele

19.27

Info Publik G.A Lewotobi  
AMA PAUL KABELN TRIBUN POS KUPAN...

Selamat siang Bapa Ibu, ijin menyampaikan update aktivitas terkini G. Lewotobi Laki-laki 17/6/25 sbb:

1. Secara visual, Gunung tampak jelas, asap kawah teramati putih sedang hingga tebal, bertekanan lemah dengan tinggi lebih kurang 50 - 200 meter di atas puncak.

2. Pengamatan Seismik sampai saat ini menunjukkan adanya peningkatan gempa Vulkanik Dalam


3. Gempa Vulkanik ini mengindikasikan adanya suplai magma dari kedalaman.

Saat ini tingkat aktivitas Gunung api Lewotobi Laki-Laki berada di level III SIAGA; Dengan rekomendasi zona bahaya berada di radius 6 Km. dari pusat aktivitas Gunung api Lewotobi Laki-Laki. Masyarakat agar tetap tenang, namun tetap meningkatkan kewaspadaan jika sewaktu waktu terjadi peningkatan yang signifikan.

Kami akan terus mengupdate aktivitas Gunung api Lewotobi Laki-Laki.

Terimakasih, salam tangggguh 🙌🏻  
Pos PGA. Lewotobi Laki-laki.

HP POS LEWOTOB LAKI LAKI



23.23

PB LUMAJANG  
+62 813-3411-2320, +62 813-5884-616...

Gunung jelas hingga kabut 0-II. Asap kawah tidak teramati.

**KEGEMPAAN**

**Tektonik Lokal**  
(Jumlah : 63, Amplitudo : 7-45 mm, S-P : 0-5 detik, Durasi : 16-33 detik)

**Tektonik Jauh**  
(Jumlah : 15, Amplitudo : 5-45 mm, S-P : 0-49 detik, Durasi : 65-157 detik)

**KETERANGAN LAIN**

Terjadi peningkatan jumlah gempa gempa tektonik lokal sejak tanggal 1 November 2024 mulai pukul 00:00 WIB.

**TINGKAT AKTIVITAS**

G. Lamongan Level I (Normal)

**REKOMENDASI**

1. Dalam Tingkat Aktivitas Level I (Normal), maka direkomendasikan agar masyarakat dan pengunjung/wisatawan/pendaki tidak turun dan mendekati dasar kawah di puncak G. Lamongan, serta tidak menginap di dalam kawasan puncak G. Lamongan.

2. BPBD Kab. Lumajang, Pemerintah Provinsi Jawa Timur agar selalu berkoordinasi dengan Pusat Vulkanologi dan Mitigasi Bencana Geologi atau melalui Pos Pengamatan Gunungapi Lamongan di Desa Tegal Randu, Kecamatan Klakah, Lumajang, tentang aktifitas Gunungapi Lamongan.

**PENYUSUN LAPORAN**

Nur Hidayat

**SUMBER DATA**

KESDM, Badan Geologi, PVMBG  
Pos Pengamatan Gunungapi Lamongan  
<https://magma.esdm.go.id/v1/gunung-api/laporan>

**Media Sosial PVMBG**

<https://linktr.ee/PVMBG>

23.17

TELKOM

Sat, 7 Dec at 05:32

Terjadi Letusan G. Dukono 07 Desember 2024 pkl 06:15;Kolom abu 4800m dari puncak,Hindari Radius 3km dari puncak::BGKOMDIGI

Tue, 24 Dec at 11.03

Terjadi Letusan G. Raung 24 Desember 2024 pkl 10:35;Hindari Radius 3km dari puncak:BGKOMDIGI

Sun, 12 Jan at 14.02

Terjadi Letusan G. Lewotobi Laki-laki 12 Januari 2025 pkl 14:51;Kolom abu 1500m dari puncakhindari radius 5km dan sektoral baratdaya-timurlaut 6km

Tue, 21 Jan at 11.06

Terjadi Letusan G. Ili Lewotolok 21 Januari 2025 pkl 11:50;Kolom abu 400m ,hindari radius 2km dari puncak;;BGKOMDIGI;;

Thu, 20 Mar at 22.52

Terjadi Letusan G. Lewotobi Laki-laki 20 Maret 2025 pkl 22:56;Hindari Radius 7km dan 8km Sektoral Baratdaya-Timurlaut::BGKOMDIGI

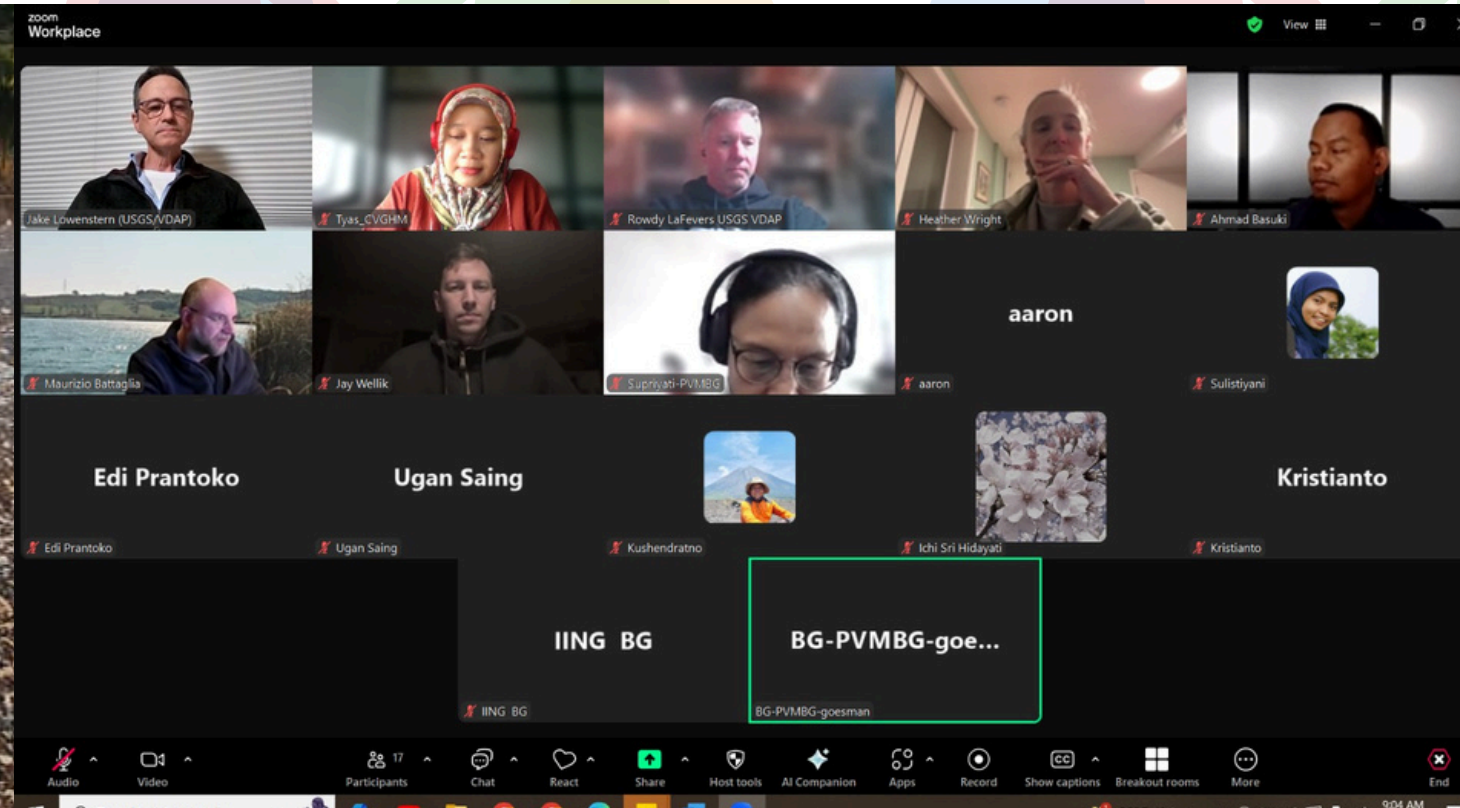
Tue, 22 Apr at 14.18

Terjadi Erupsi Menerus G. Lewotobi Laki-laki 22 April 2025, Hindari Radius 6 km dari Puncak, BG-KOMDIGI

Text Message • SMS



# Partnerships that strengthen preparedness (VDAP/USGS, EOS, IRD, DPRI JAPAN, etc)





# MAGMA Indonesia



## MAGMA Indonesia

"Bridging the Will of Nature to Society"



[magma.vsi.esdm.go.id](http://magma.vsi.esdm.go.id)



GET IT ON  
**Google Play**



**MAGMA (Multiplatform Application for Geohazard Mitigation and Assessment)** is the world's first multi-platform application (web & mobile) that provides integrated and real-time information and recommendations on geological disasters (Volcanoes, Earthquakes, Tsunamis, and Landslides) for the public, both nationally and internationally.

It was developed by civil servants at the **Center for Volcanology and Geological Hazard Mitigation (CVGHM)**, Geological Agency, Ministry of Energy and Mineral Resources.

- 1 Real-time Volcanic Activity**  
Visuals, seismicity, and recommendations
- 2 Volcanic Ash Information**  
MAGMA-VONA Report
- 3 Volcanic Eruption Report**  
MAGMA-VEN Report
- 4 Disaster-Prone Area Map**
- 5 Earthquake Information**  
MAGMA-ROQ
- 6 Landslide Information**  
MAGMA-SIGERTAN
- 7 Public Reporting System**  
MAGMA-CRS



**BADAN GEOLOGI**  
Kementerian Energi dan Sumber Daya Mineral



Badan Geologi



@kabargeologi



[www.geologi.esdm.go.id](http://www.geologi.esdm.go.id)

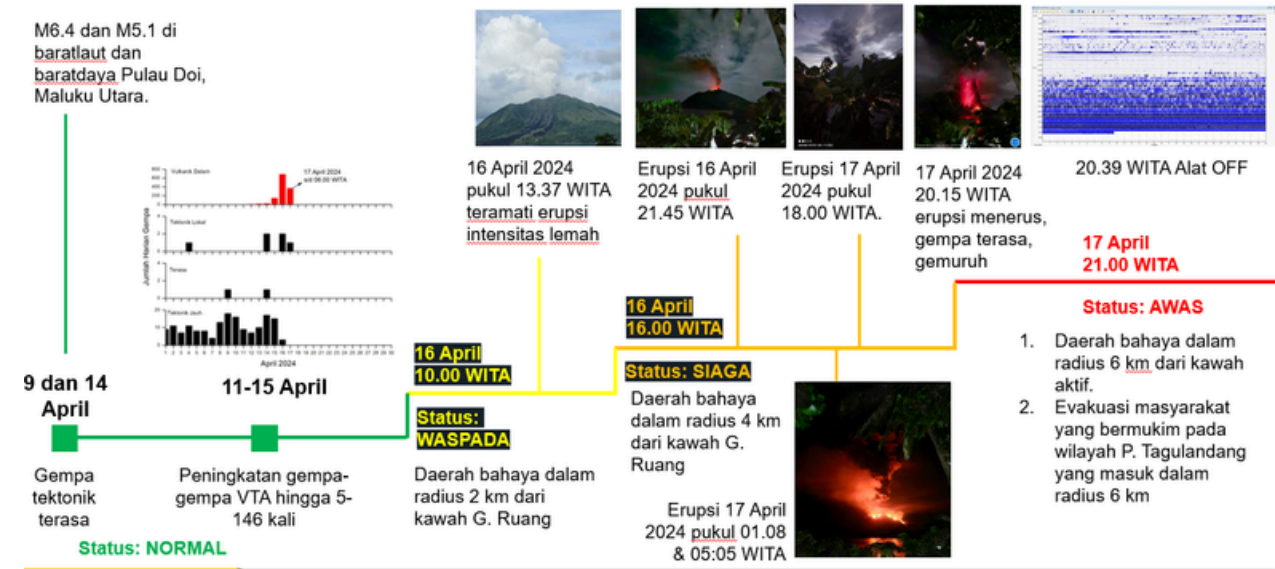
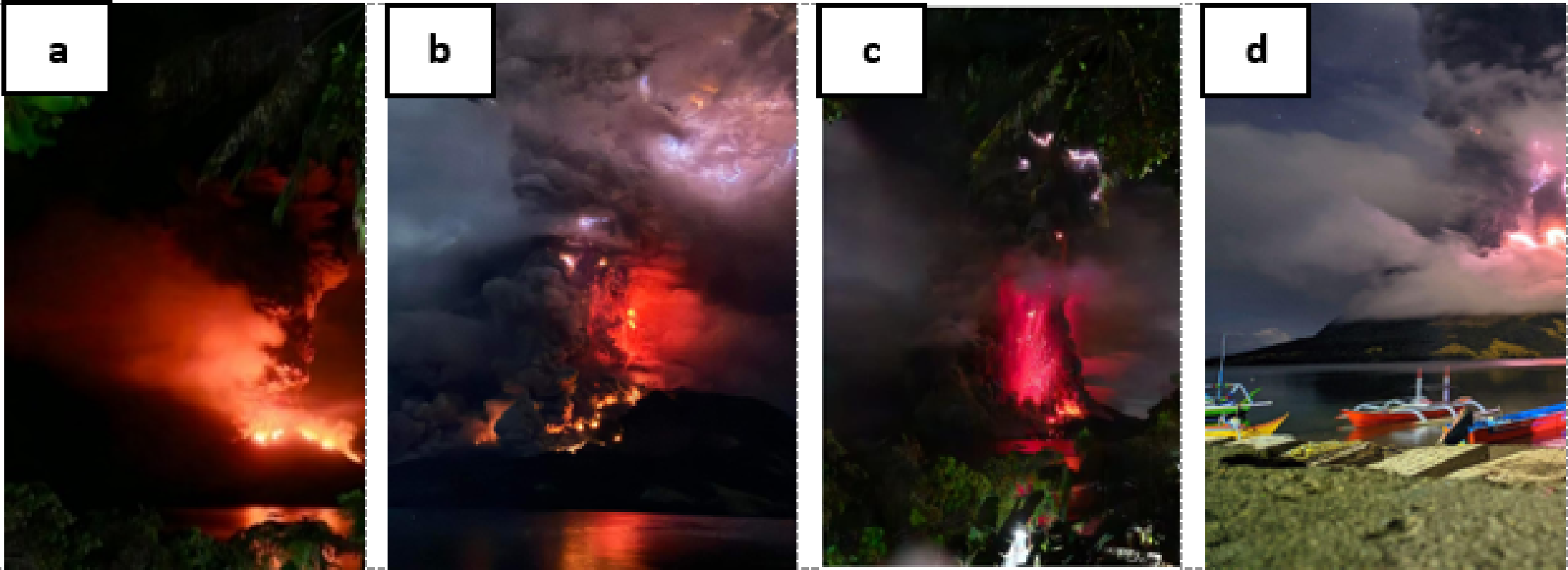
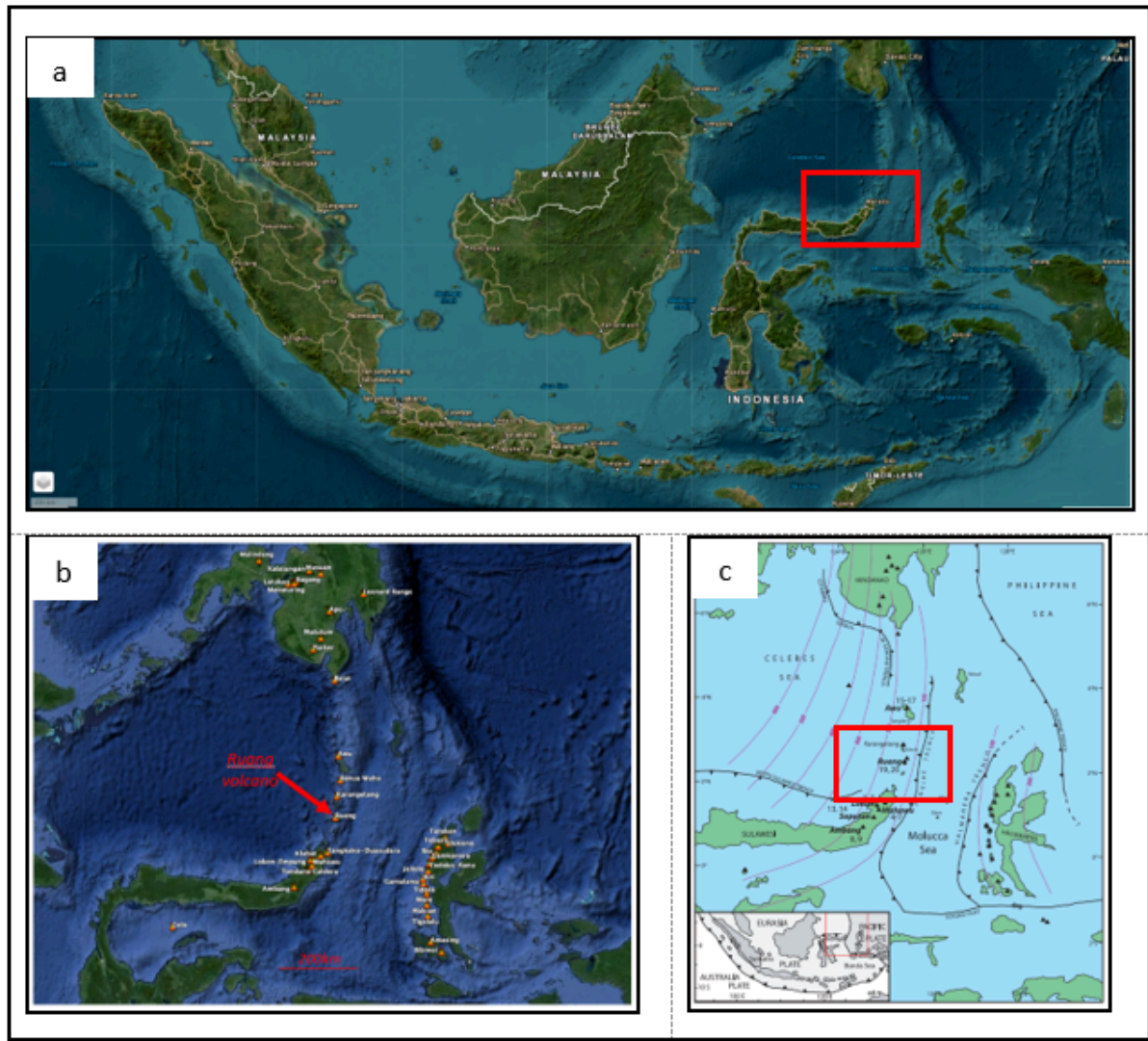


Badan Geologi

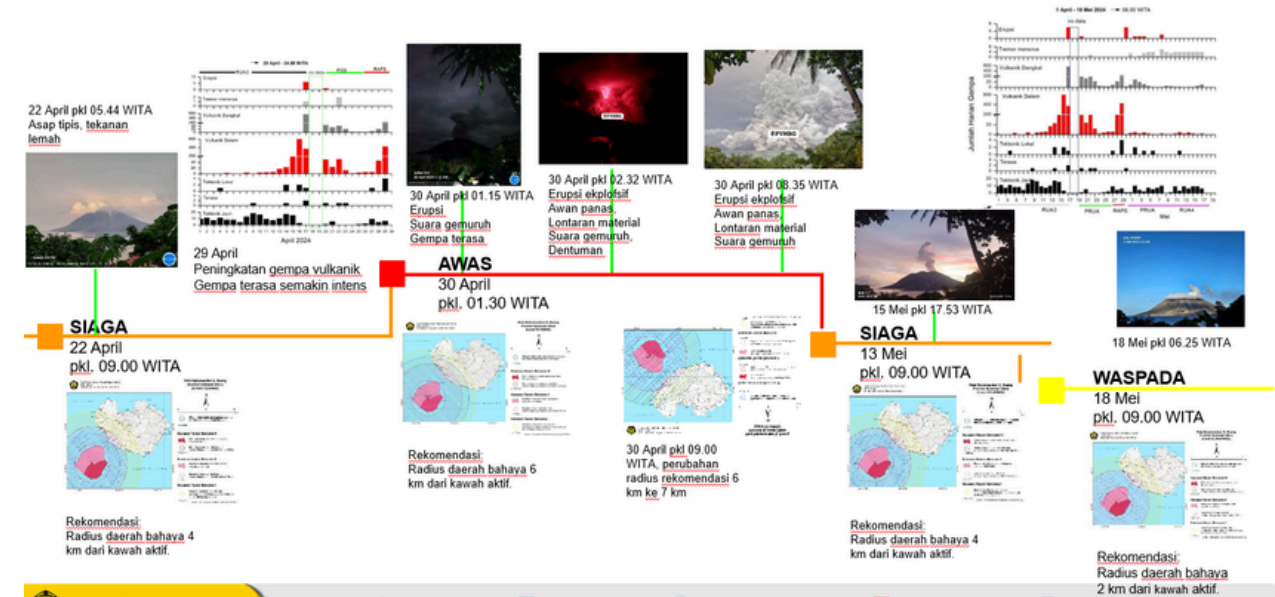


kabargeologi





# RUANG ERUPTION 2024





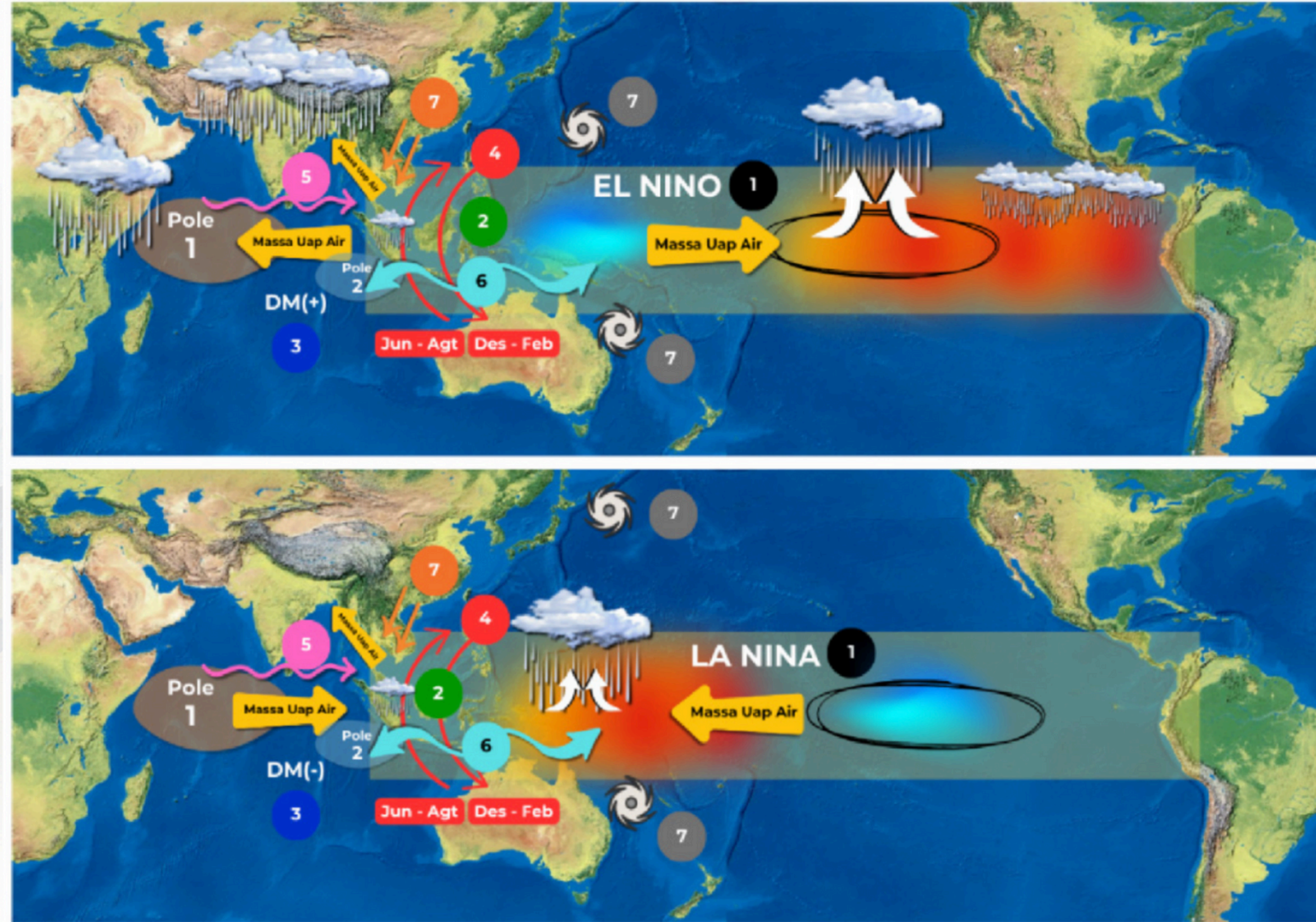
# Indonesia's Weather and Climate Forcing

Indonesia's weather and climate are influenced by key drivers:

El Niño/La Niña, Madden-Julian Oscillation (MJO), Indian Ocean Dipole (IOD), Cold Surge, Equatorial Waves, Sea Surface Temperature (SST), and Tropical Cyclones.

These factors **shape** not only seasonal rainfall patterns but also **short-term heavy rain events** that can **trigger secondary hazards**, including:

- Landslides in mountainous areas
- Flash floods in river valleys
- **Lahar floods on volcanic slopes**



WORLD  
METEOROLOGICAL  
ORGANIZATION

Early  
Warnings  
to All





# EW4ALL Pillars Implementation in Indonesia

1

## Disaster Risk Knowledge



**inaRISK**  
how risky is your place?



**sim▲mpu**

**Katalog Digital  
Kesiapsiagaan**

**GEOPORTAL**



2

## Detection, Observations, Monitoring, Analysis and Forecasting



**BMKG Signature**



**InaTEWS**



**Portal MBG**

**SIHKA  
SITABA**



**NDF & Nowcasting**



4

## Preparedness and Response Capabilities



**Katalog Digital  
Kesiapsiagaan**



**sim▲mpu**



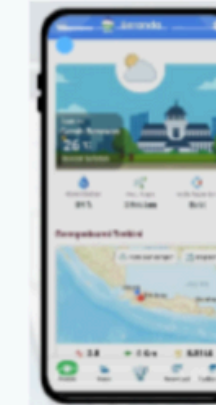
3

## Warning Dissemination and Communication



**sim▲mpu**

**mhews**



**KOMDIGI**  
Kementerian Komunikasi dan Digital  
Republik Indonesia

**Aplikasi  
Info BMKG**

The BMKG plays a significant role in EW4ALL chain and is also **applied in volcanic hazard** by:

- ❑ Providing **weather forecasts and early warnings**.
- ❑ Raising **public awareness** of disaster risks.
- ❑ **Facilitating coordination and collaboration** among disaster management stakeholders.



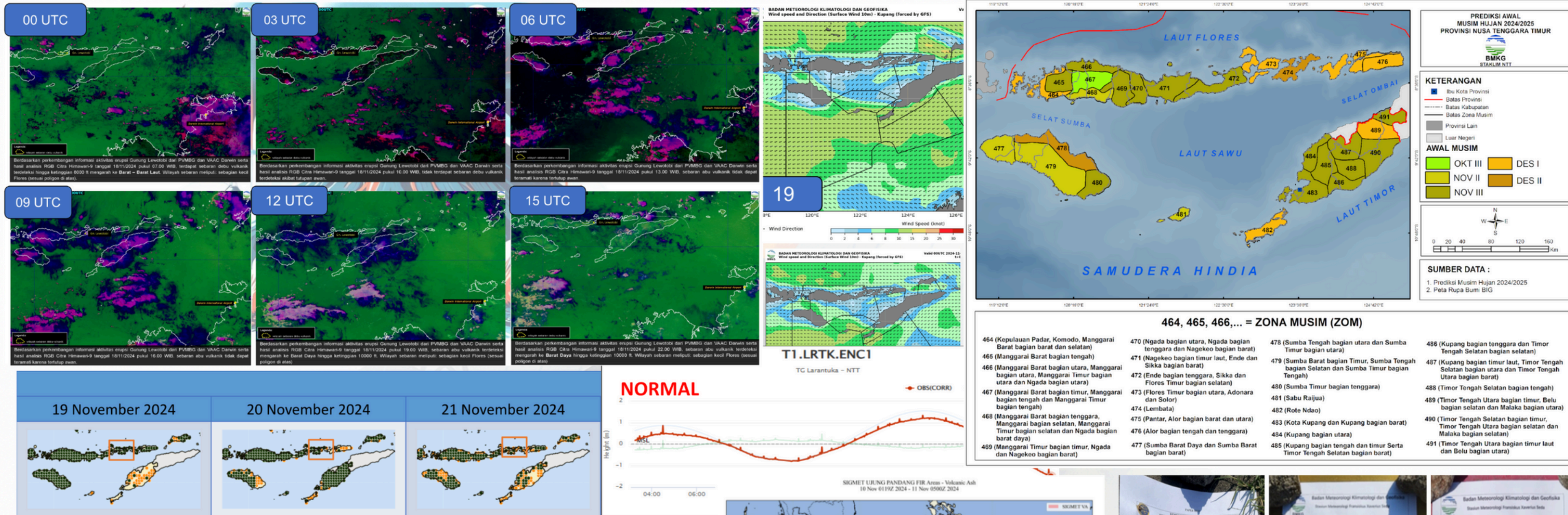
**WORLD  
METEOROLOGICAL  
ORGANIZATION**

**Early  
Warnings  
to All**





# BMKG's Role in Volcanic Activities Warning: Mt. Lewotobi Laki-laki



## BMKG provides the following services:

- Detection of volcanic ash dispersion using satellite imagery (direction and trajectory) and Sulfur Dioxide (SO<sub>2</sub>)
- Early prediction of the rainy season onset in East Nusa Tenggara
- Forecast of volcanic ash dispersion
- Forecast of convective cloud development in East Nusa Tenggara
- Forecast of wind direction and speed
- Prediction of sea level height from tide gauges and maritime AWS
- Observation of local air quality using paper tests



WORLD  
METEOROLOGICAL  
ORGANIZATION

Early  
Warnings  
to All





# Building Operational Rainfall-Lahar Early Warning System: **Framework**



## PVMBG (Geological Agency) provides:

- volcano status (Level 1 to 4)
- volcano activity report
- volume of volcanic material on the summit
- lahar flow pathways



## BNPB/BPBD/local government provides:

- identify hazard-prone areas (Kawasan Rawan Bencana/KRB)
- raising public awareness and mitigation for residents in KRB
- EWS with rain gauge station, CCTV and Automatic Water Level Recorder
- population distribution data, critical infrastructure, housing, and other exposure elements in risk zones



## BASARNAS (National Search and Rescue Agency) provides:

- high-risk locations
- potential evacuation



## Ministry of Public Works provides:

- survey of watershed and river characteristics
- flow rate modeling based on rainfall intensity and duration

## Retrieved Information:

Rain/Heavy Rain + Active Volcano (Level 2 or higher) + Eruption Phase and Material Loading + Local Observations + Reports from field

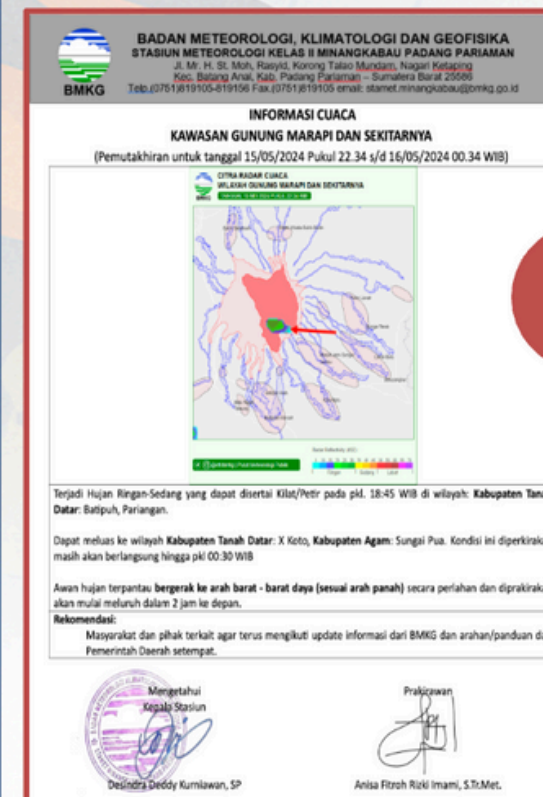
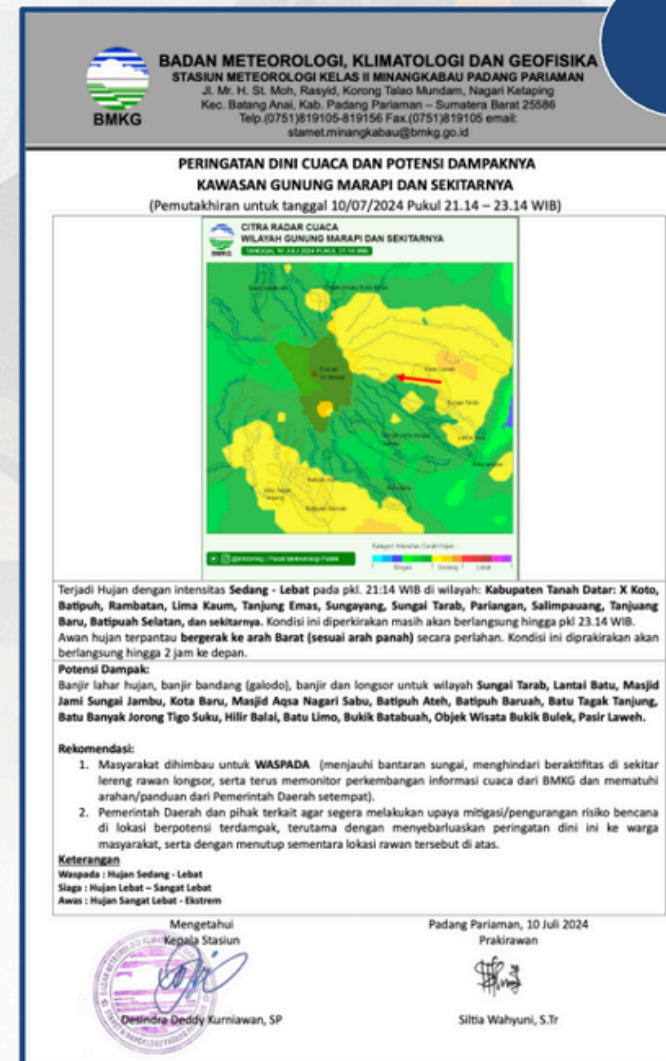


## BMKG provides:

meteorological information on potential weather patterns (particularly heavy rainfall) that may trigger natural hazards in volcanic areas, and act as advisory

## BMKG released two type of products:

1. **Early Warning Bulletin (EWB)**
2. **Weather Information Bulletin (WIB)**



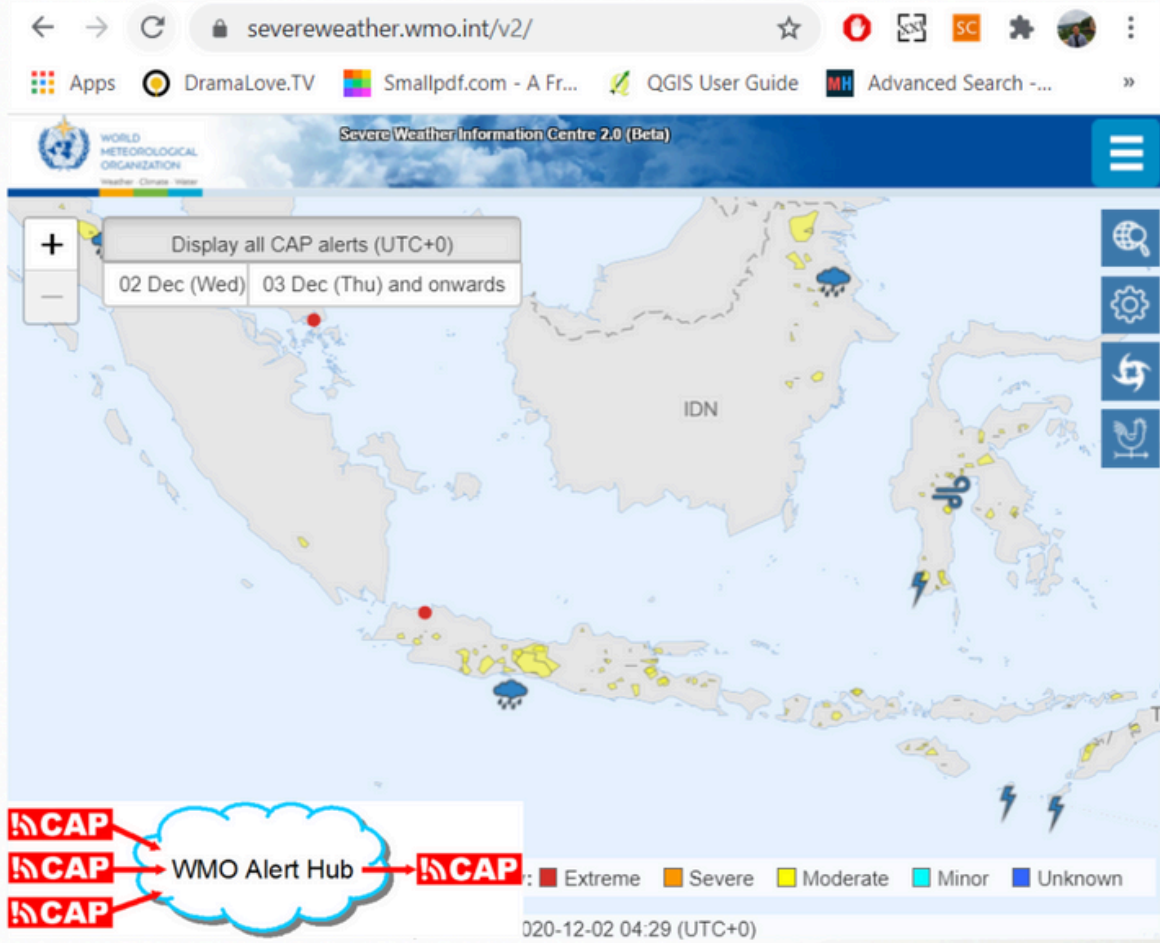
WORLD  
METEOROLOGICAL  
ORGANIZATION

Early  
Warnings  
to All





# BMKG's End-to-End Capacity



The **Common Alerting Protocol (CAP)** is a standardized message format designed to deliver warnings for **All-Media**, **All-Hazards**, and **Everyone**.

- ❑ **All-Media:** TV, radio, phone, signage, e-mail, social media, and websites;
- ❑ **All-Hazards:** weather, fires, earthquakes, and volcanic events; and
- ❑ **Everyone:** general public, specific users/communities, and/or designated authorities.

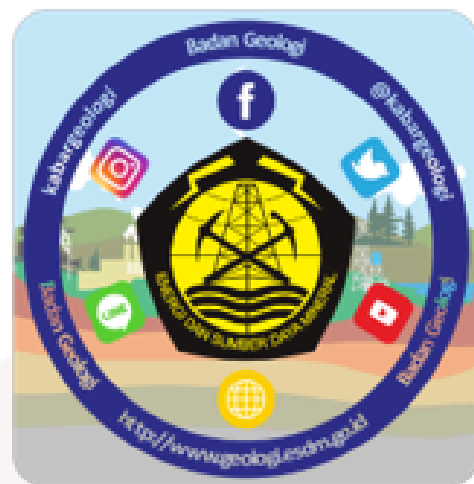


Leveraging over **10 million active users** on the **infoBMKG app** and a **wide range of dissemination channels**, such as: websites, public displays, SMS, radio, television, and more, **Indonesians are increasingly familiar with risk-based early warnings, including** those related to **volcanic hazards** integrated into **Impact-Based Forecast platform**.





**GEOLOGICAL AGENCY**  
MINISTRY OF ENERGY AND MINERAL RESOURCES



# THANK YOU...

***“Driven by Service  
Guided by Excellence”***



Realistic



Achievable



Measurable

#EnergyTransitions