



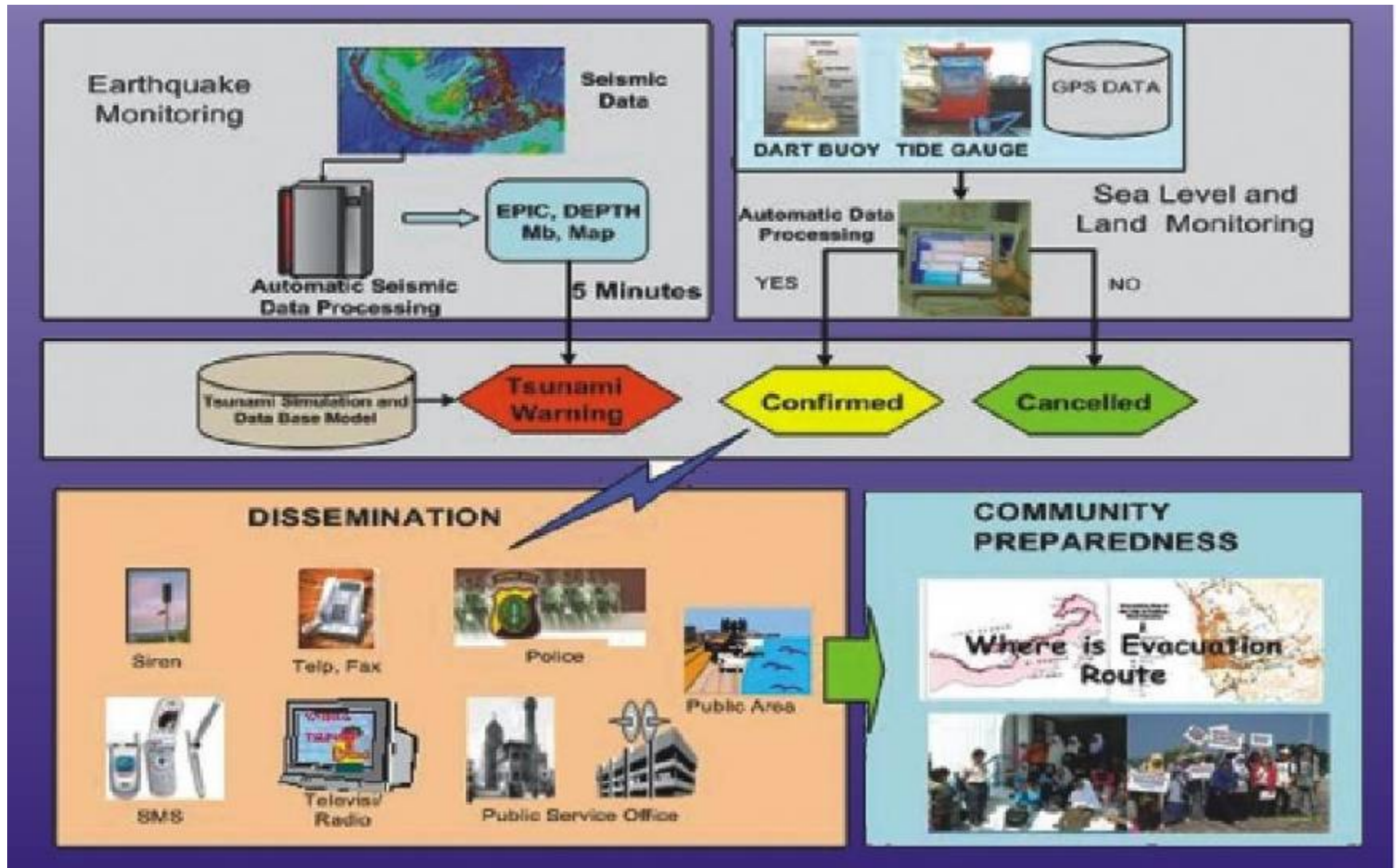
**INA-TEWS**

**INDONESIA TSUNAMY EARLY  
WARNING SYSTEM**



- **BMG** stands for (Badan Meteorologi dan Geofisika) **METEOROLOGICAL AND GEOPHYSICAL AGENCY**
- By law is the appointed official agency in Indonesia in charge for Tsunami Warning Dissemination.

# Components of TEWS: observation, integration, dissemination & community preparedness

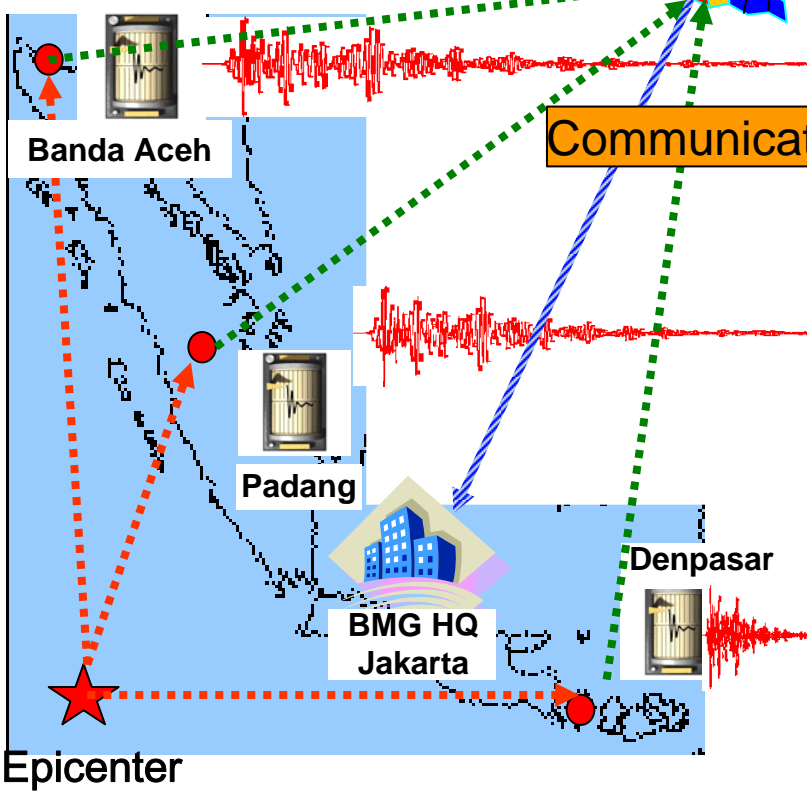




# END TO half-END CONCEPT OF Indonesian TEWS (InaTEWS)

## OBSERVATION

- Seismograph
- accelerograph



- Tide Gauge
- Buoy/OBU
- GPS LAND STATION
- Earth Observation

## PROCESSING



*Earthquake Information*

- Time
- Location
- Magnitude

1

Decision support

*Earthquake information or Tsunami Warning*

Manual Verification

2

Control System  
Of Situation Center

SMS  
5 in 1  
Phone  
Web  
Email

3

Communication

## DISSEMINATION

Evacuate  
Watch  
Advisory  
Cancellation



Siren



Speaker



Phone/fax



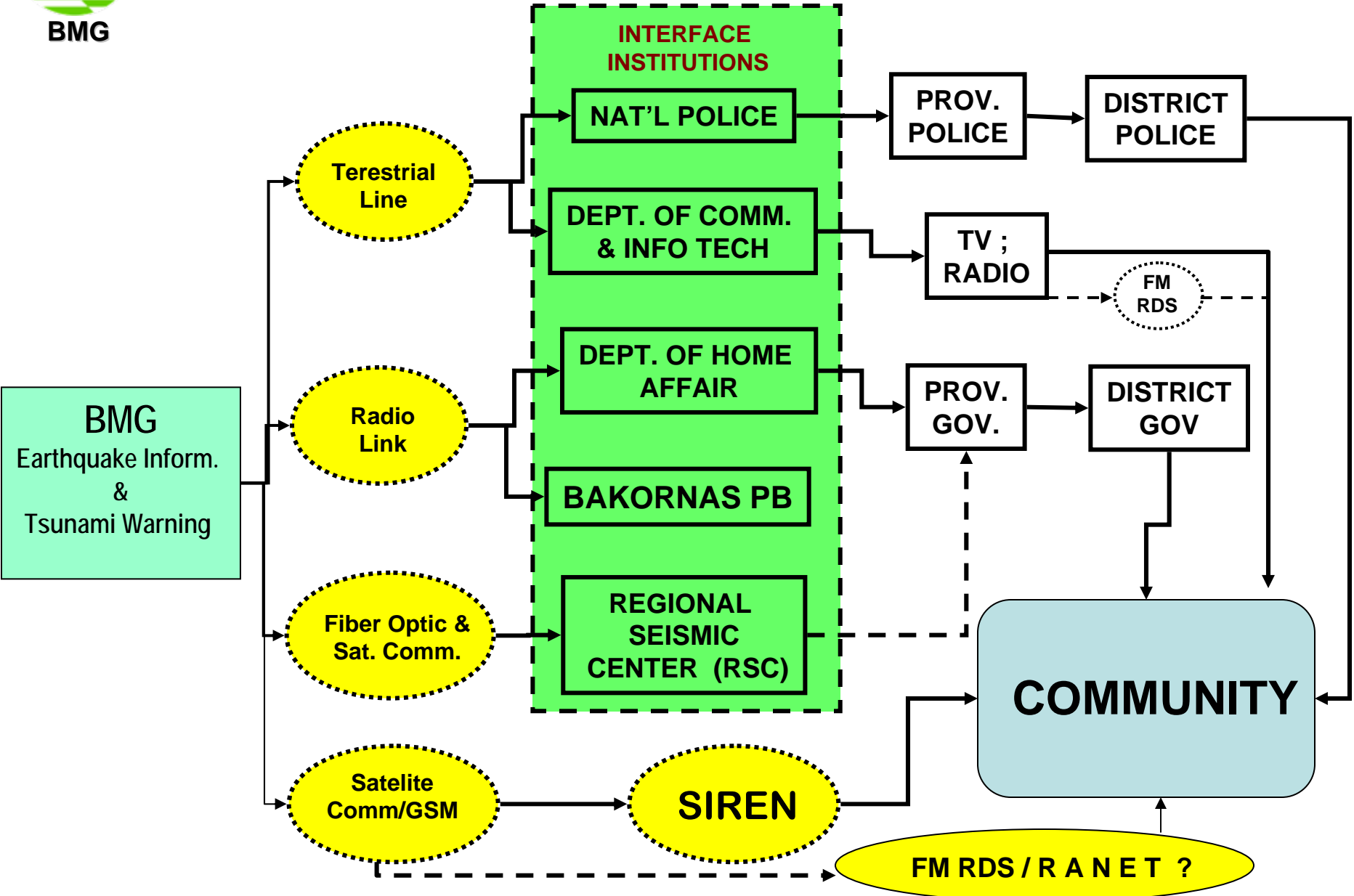
SMS



Control System  
Of Situation Center

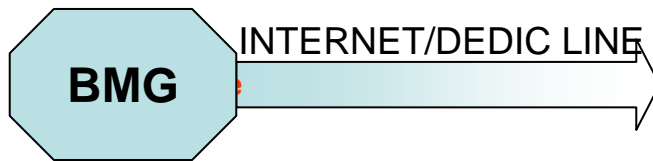


# DISSEMINATION SYSTEM

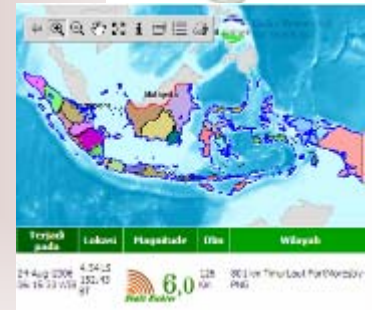




# 5in1 BMG INFO



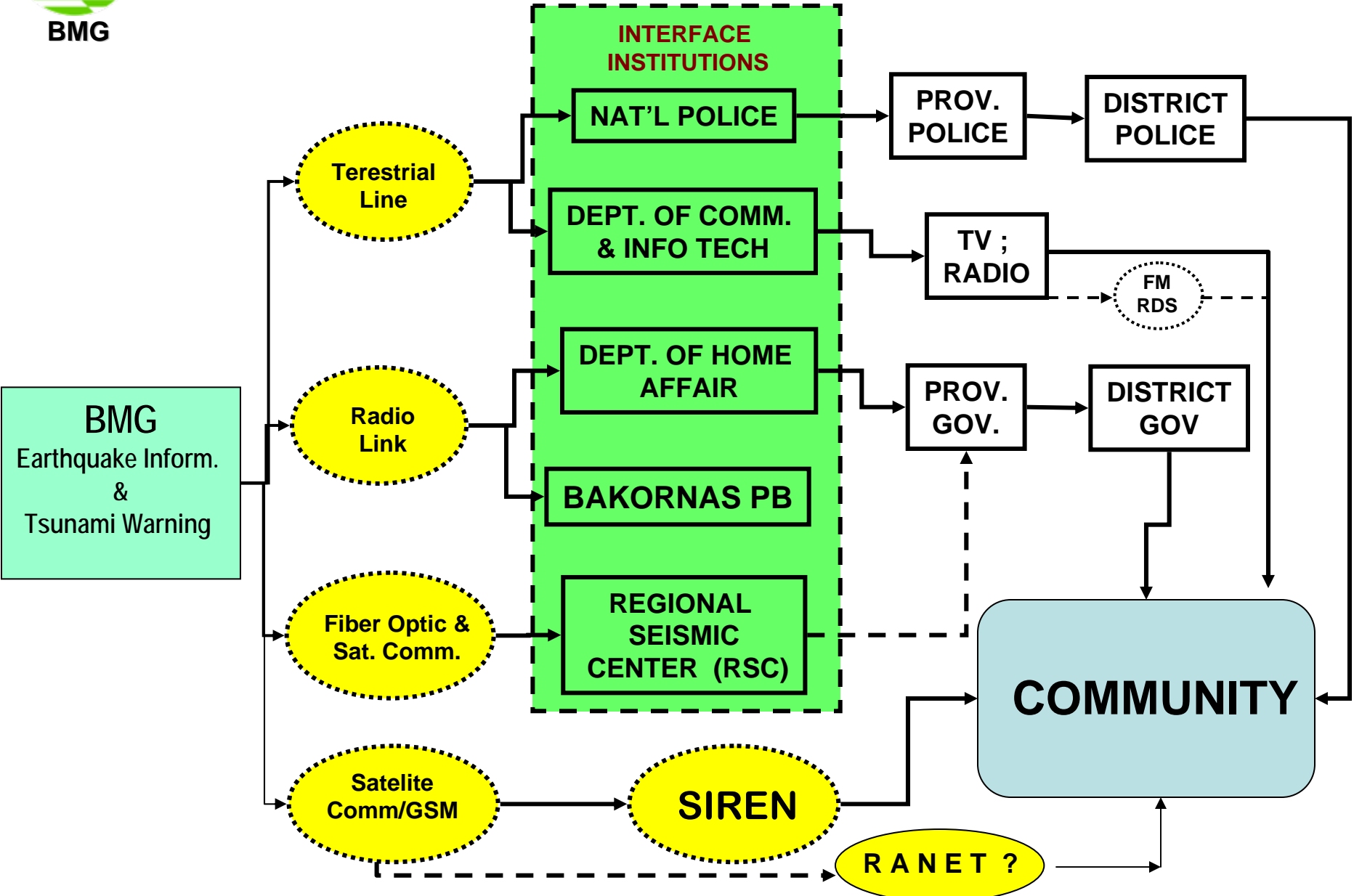
## Interface Institution



- THEORITICALLY IT LOOKS OKAY but in the reality we faced problems
  - Roles and Responsibilities of the institutions are not yet clear
  - Limited Budget and Lack of Implementing Commitment
  - Limited Human Resources and Technology
  - Unstable Network Connections
  - No guarantee the Warning System can reach the vulnarable areas



# DISSEMINATION SYSTEM

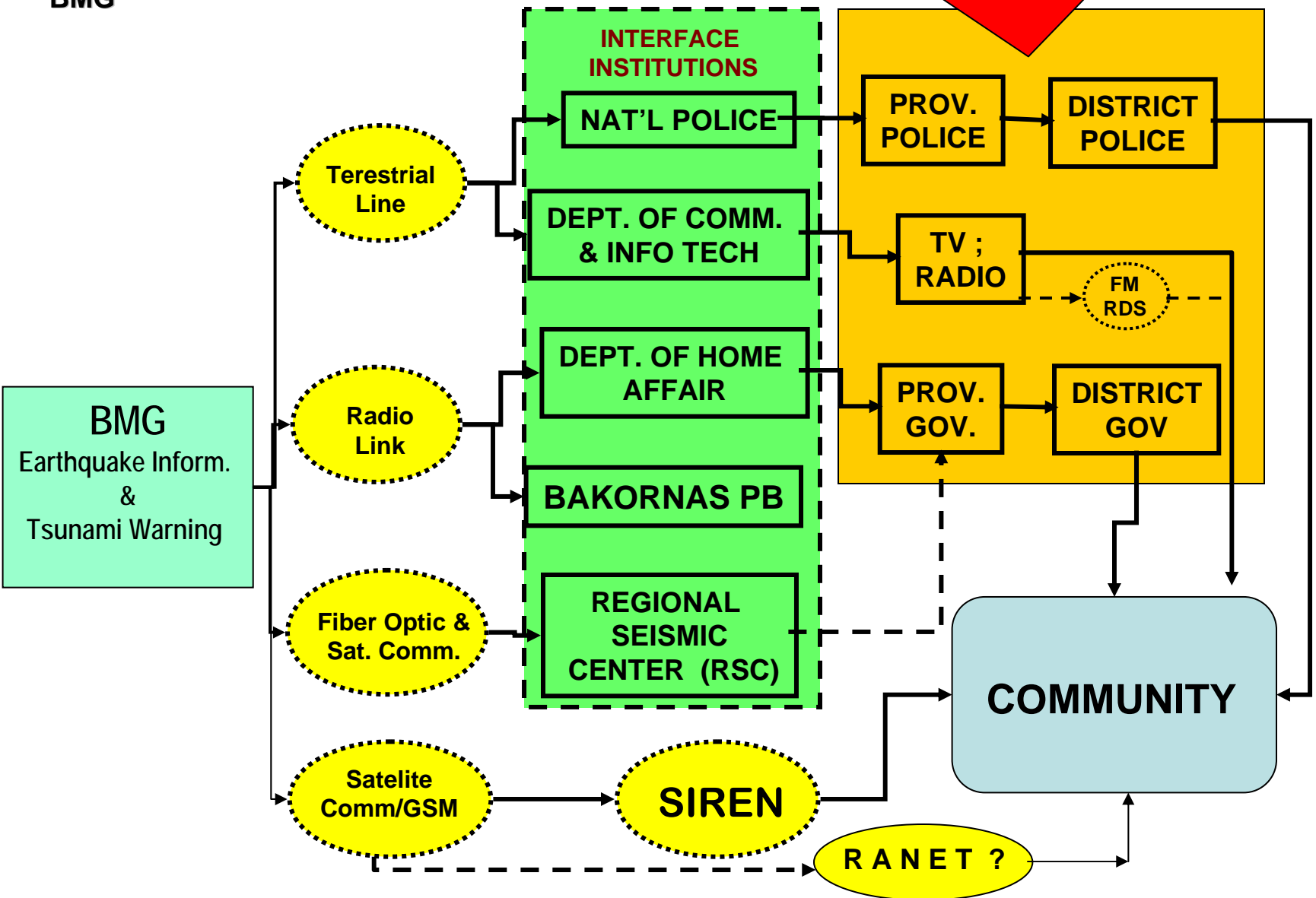






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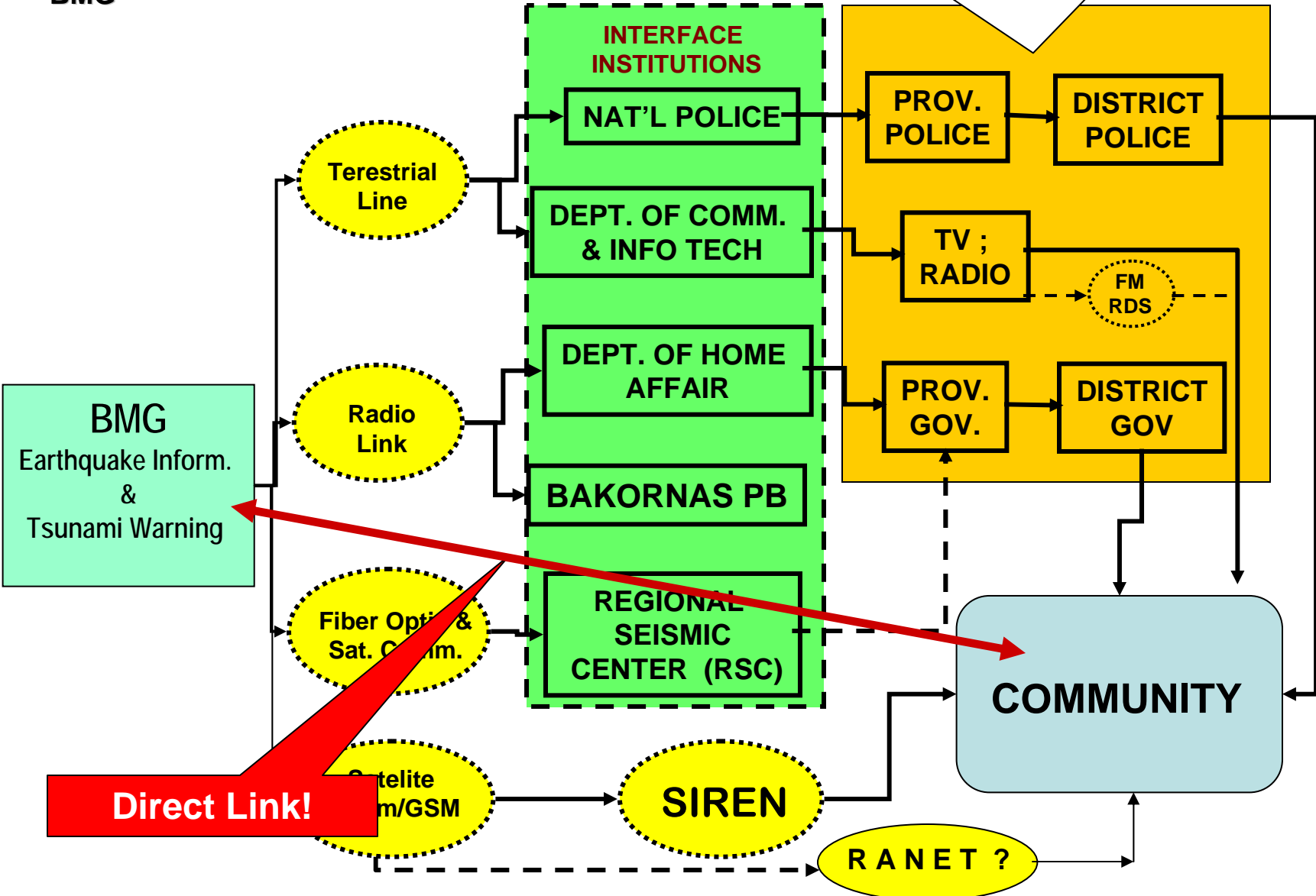
Who is responsible for Coordination?





# DISSEMINATION SYSTEM

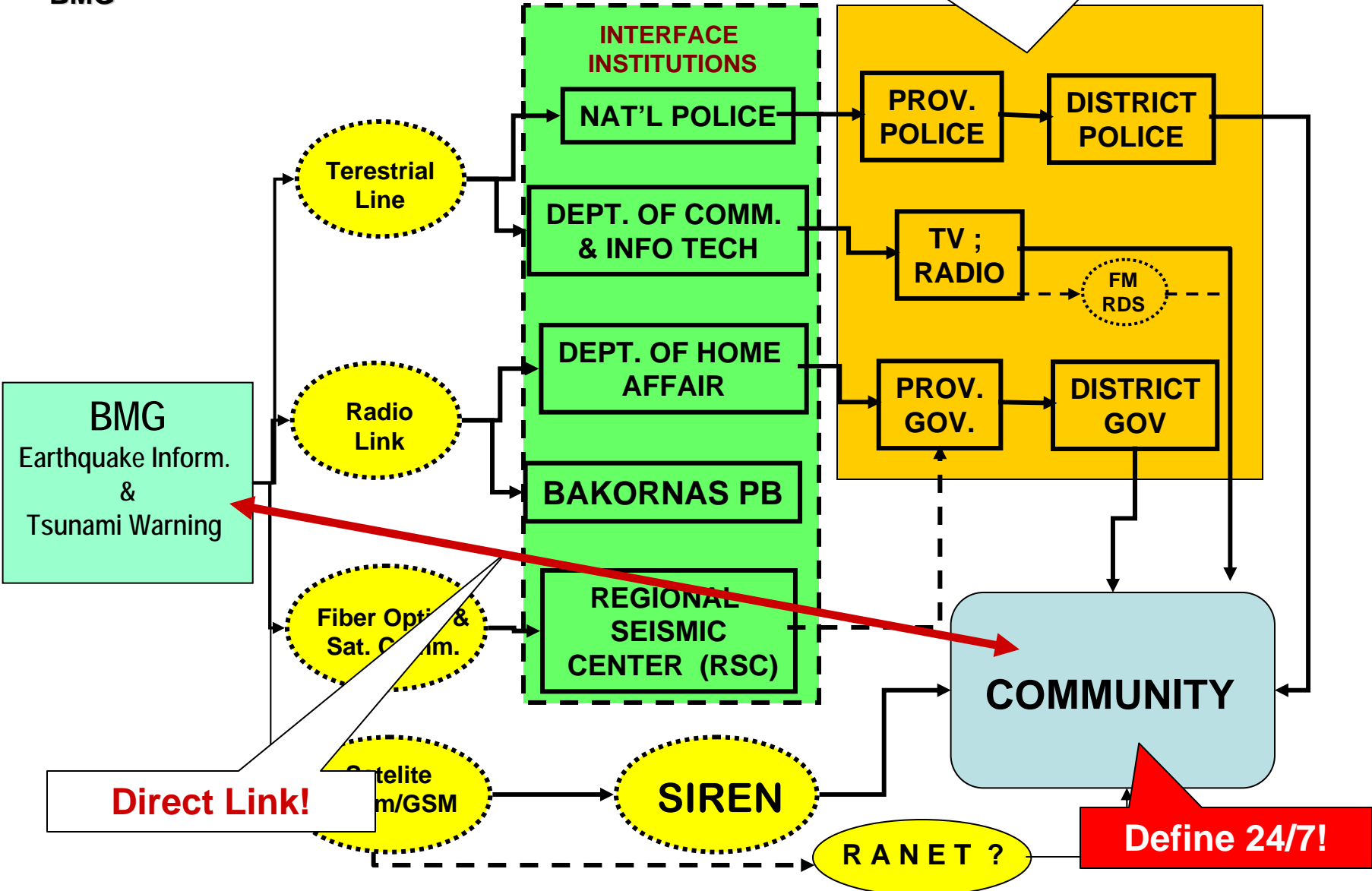
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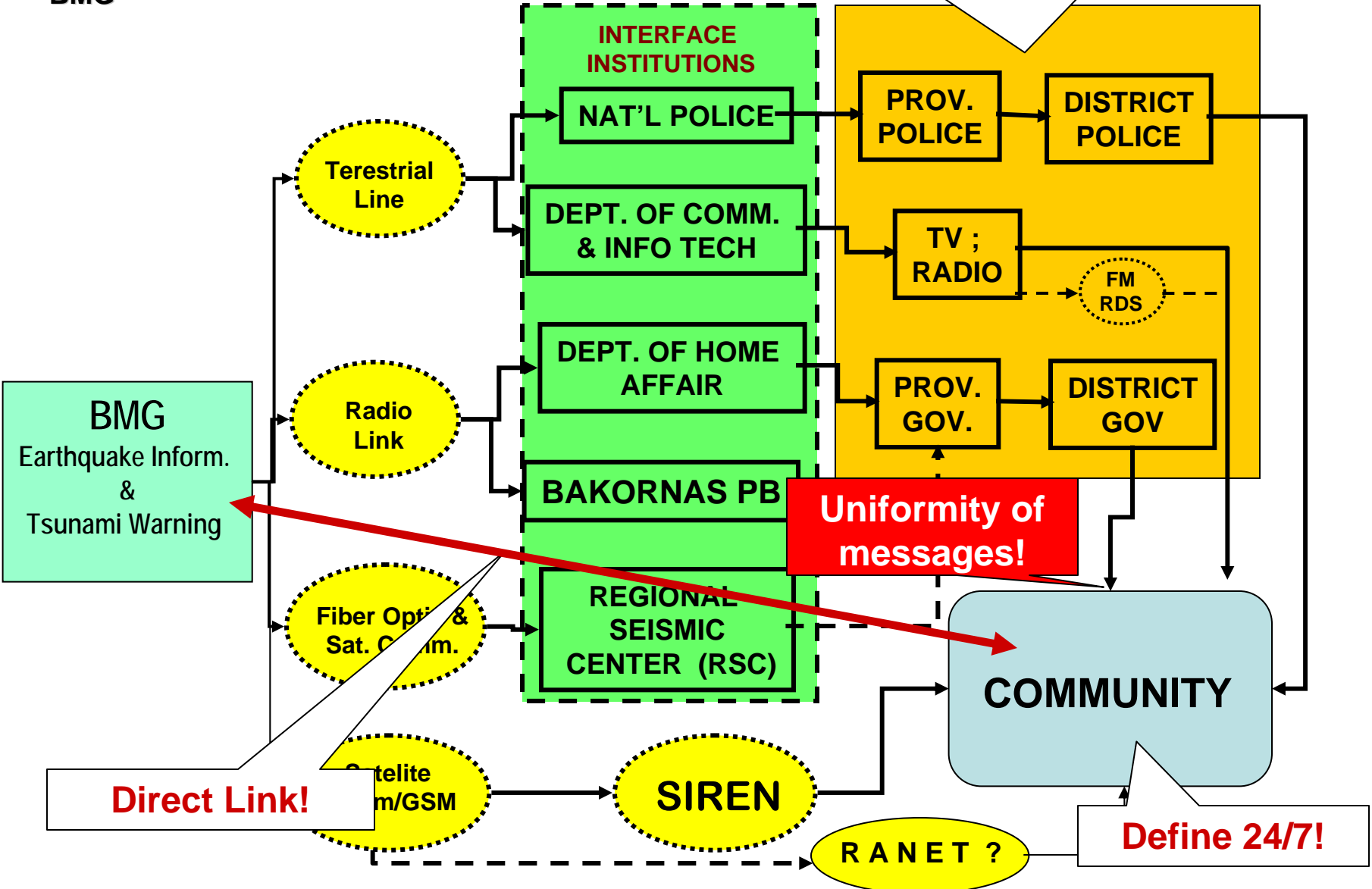
Who is responsible for Coordination?





# DISSEMINATION SYSTEM

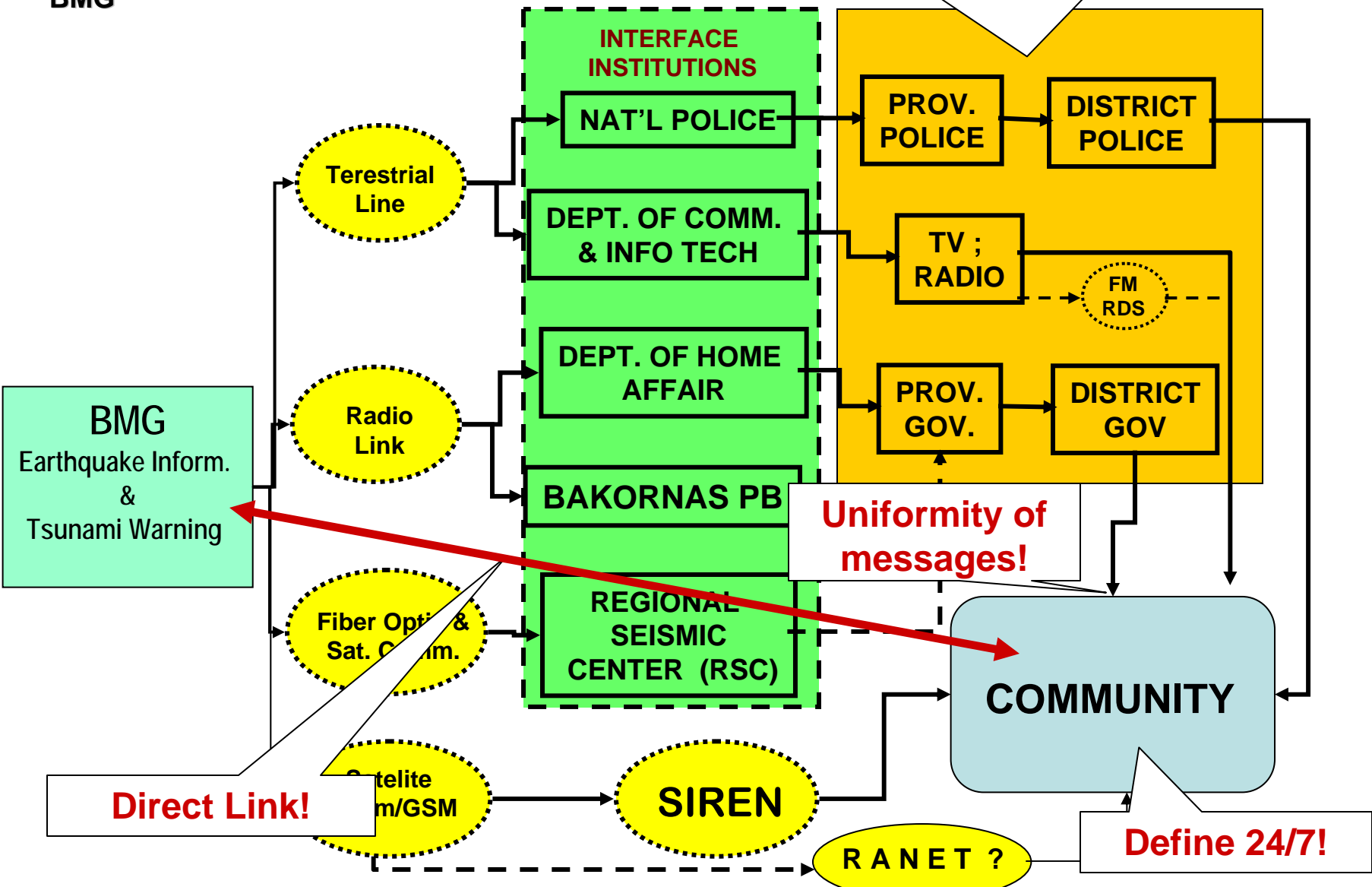
Who is responsible for Coordination?





# DISSEMINATION SYSTEM

Who is responsible for Coordination?



# SUMMARY

- Set up a direct link from Sources to the closest institution to the local communities and public
- Setup a 24x7 “Watchdog” Warning Center
- Find the fastest way to reach the community
  - Mosques, Radio, Sirene
- Produce an SOP for Warning Dissemination (valid for everyone)
- Produce a LAW to make sure that the SOP is followed and to have the Uniformity.

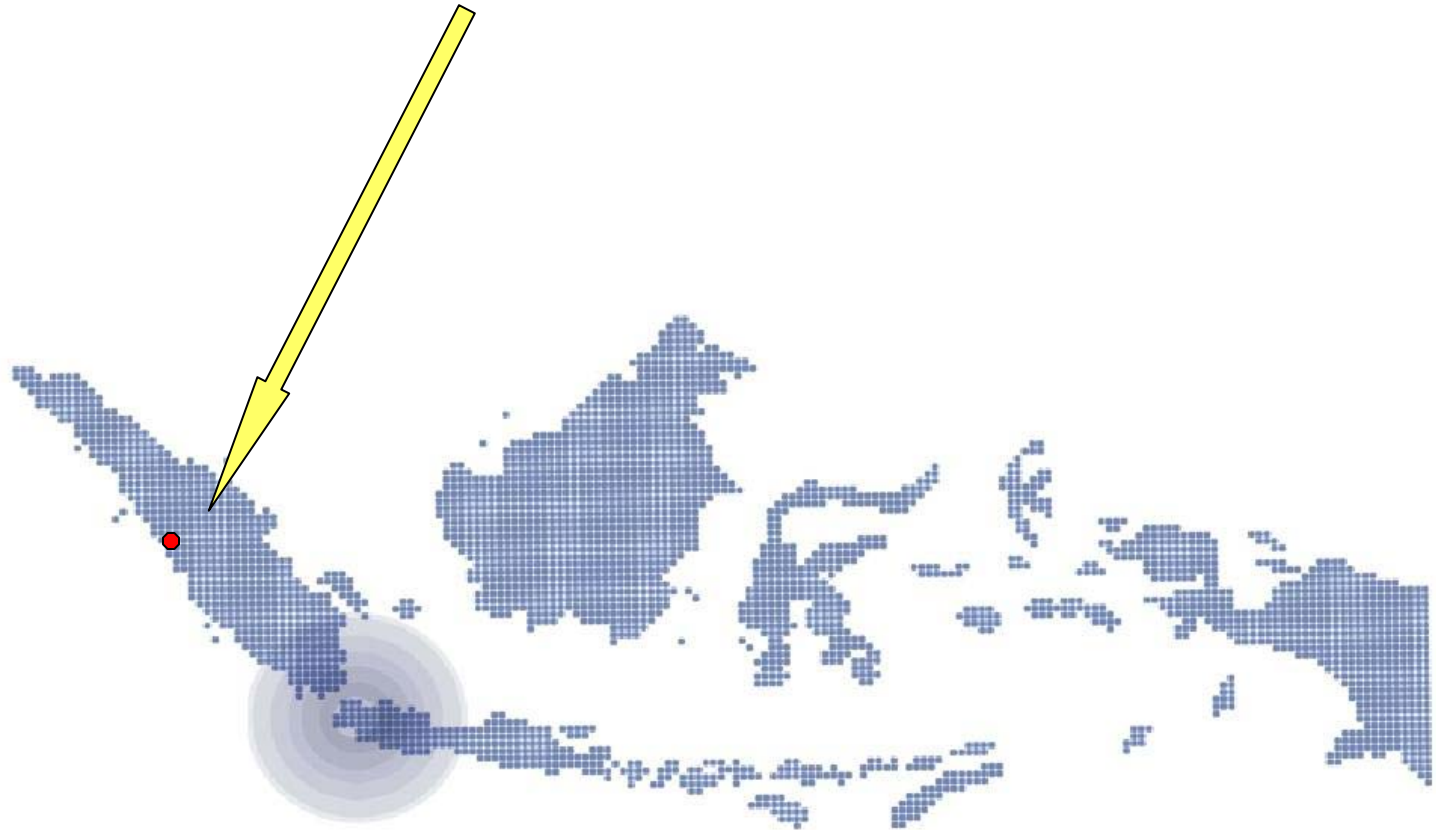
# ESTABLISHMENT OF TSUNAMI WARNING SYSTEM IN PADANG CITY



PUSDALOPS  
*your safety is our concern*

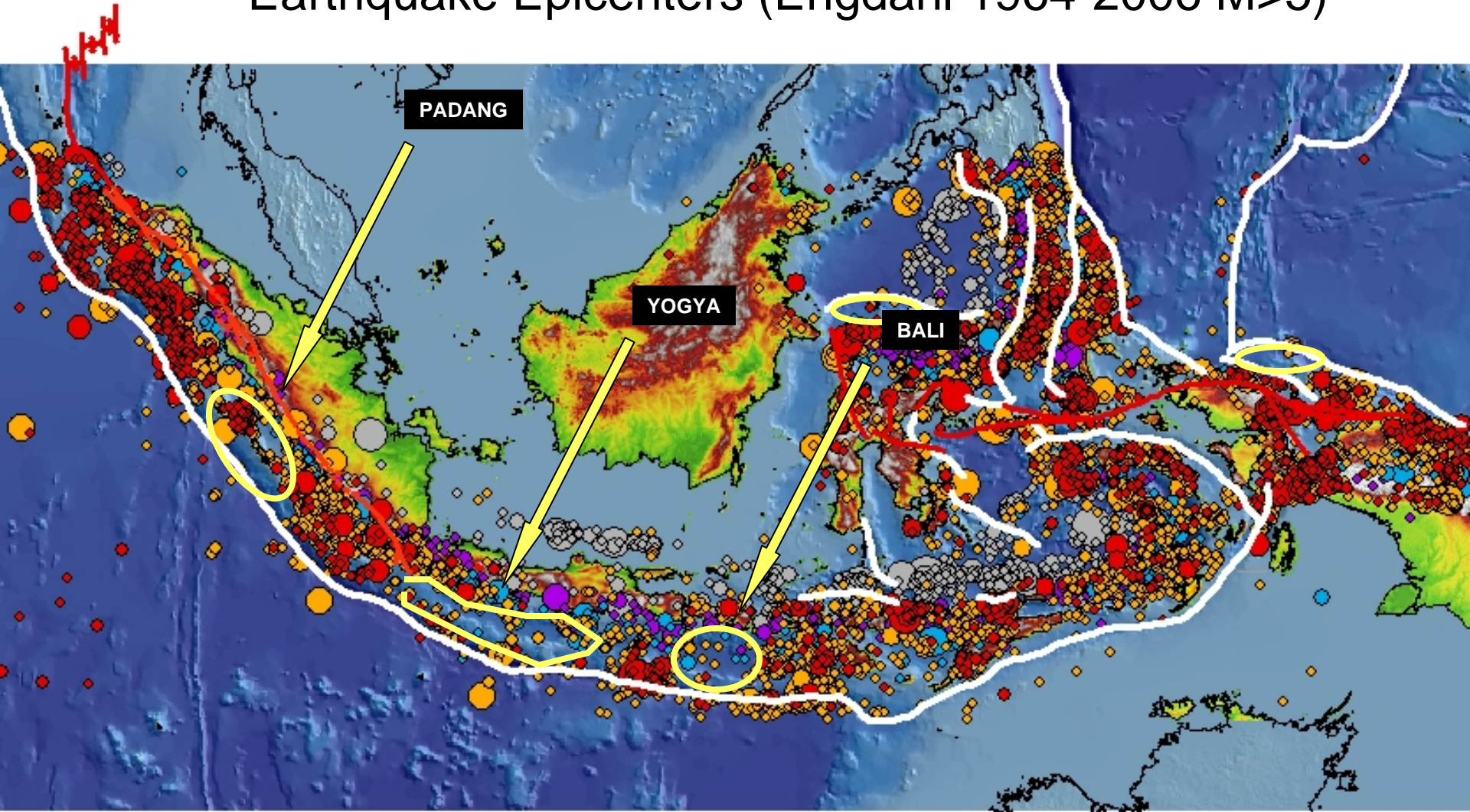
WARNING CENTER

# WHY PADANG ?

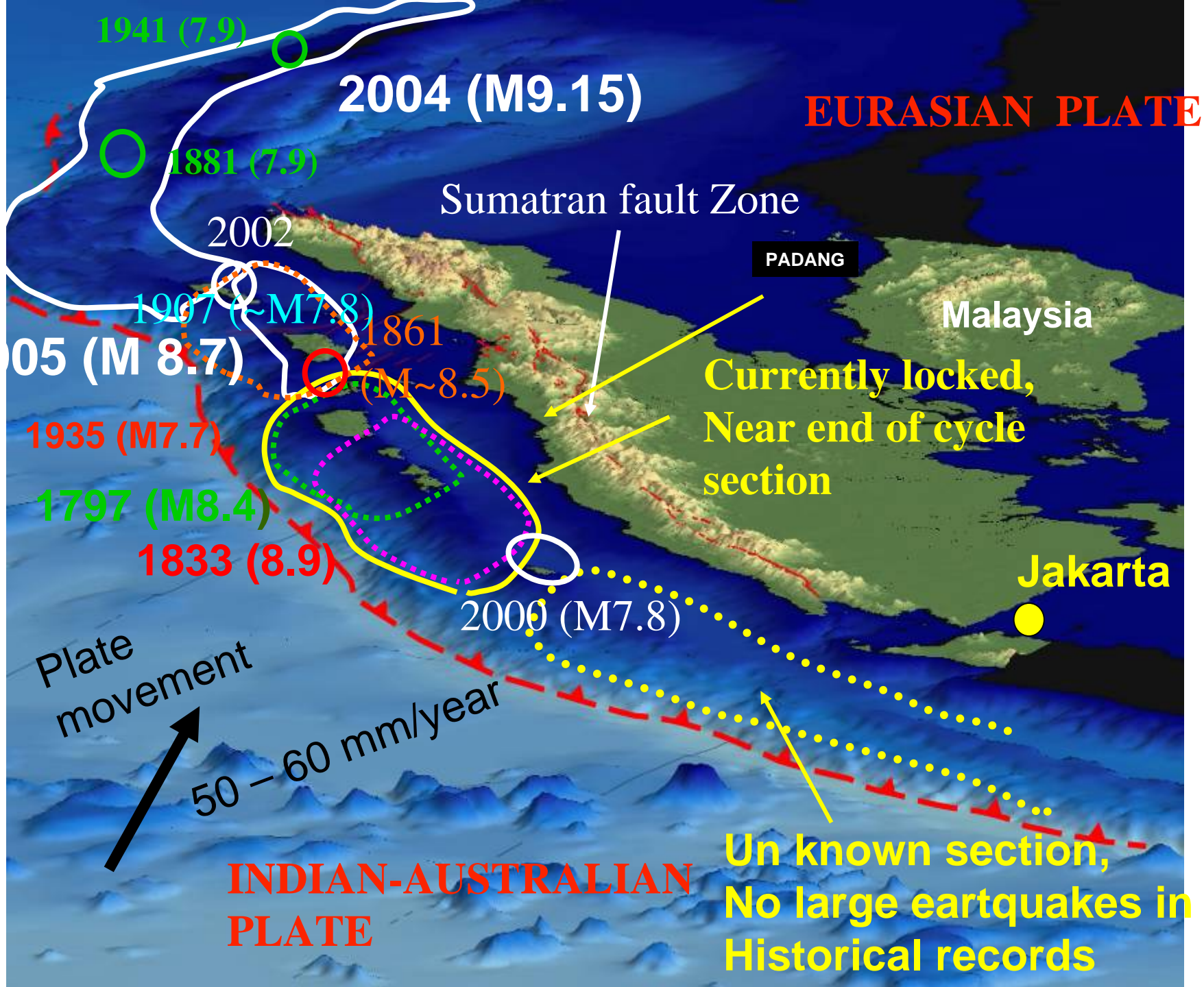




# Earthquake Epicenters (Engdahl 1964-2006 M>5)



Seismic gaps



# Vertical Displacement of the Rupture






~10 m


## March Edition - 2005

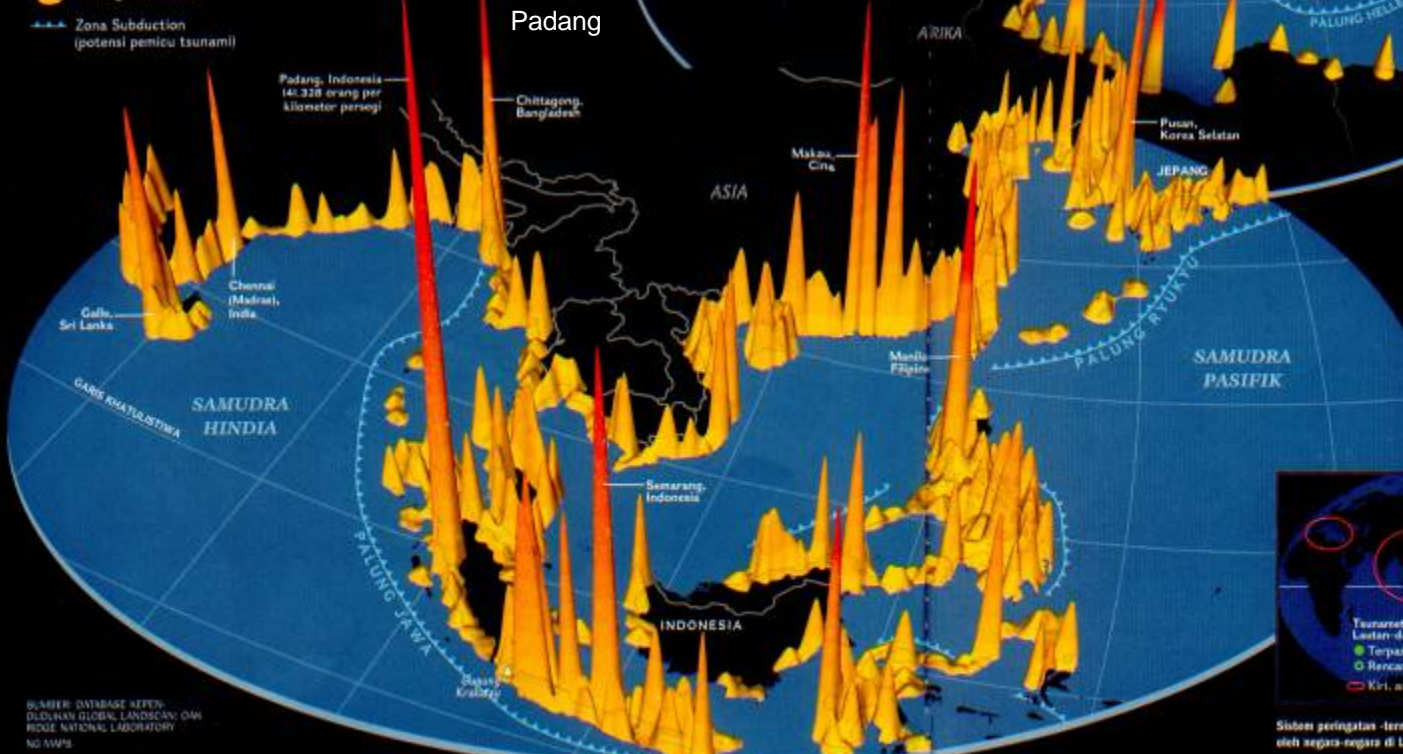
### Pantai Padat dan Rawan

Tsunami Samudra Hindia diakibatkan oleh gempa bumi yang luar biasa kuatnya. Ia mengingatkan bahwa setiap garis pantai dalam zona aktif tektonik mempunyai risiko. Korban jiwa besar mengancam daerah-daerah pesisir berpenduduk padat di dataran rendah. Samudra Pasifik paling rawan terhadap tsunami. Pada abad lalu saja, ia telah mengalami tsunami sebanyak 800 kali.

Kepadatan penduduk sejauh 2 kilometer dari garis pantai dan di ketinggian kurang dari 10 meter

-  Lebih dari 75.000 orang per kilometer persegi
-  30.000 sampai 75.000
-  Kurang dari 30.000

 Zona Subduction (potensi pemicu tsunami)



**Barat Laut Pasifik-Alaska**  
Gempa bumi berkekuatan tinggi di kawasan Alaska merupakan salah satu sebab utama tsunami selama abad ini. Gempa juga memunculkan besar Cascadia, kawasan Barat Laut Pasifik. Bila terkapit, dalam 15 menit gelombang menulikan akan menghantam penduduk pesisir.

Playas de Tijuana  
26.609 orang per kilometer persegi

**Laut Tengah**  
Permasalahan tsunami ada sejak 3.000 tahun lalu di Laut Tengah. Wilayah ini 10 kali lebih rawan terhadap gelombang pasang dikibanding Atlantik. Gempa sekitar Yunani, Italia, Turki, memicu tsunami.

**Asia-Pasifik**  
Jepang dan Indonesia, garis pantai keduanya padat penduduk, merupakan bangsa paling terancam tsunami di dunia. Sekitar 22 persen tsunami Pasifik yang terlewat berasal dari dekat Jepang. Mereka mempunyai sistem peringatan yang canggih.



Sistem peringatan -termasuk tsunami- di laut yang dalam- dipasang oleh negara-negara di Lembah Pasifik pada pertengahan abad 20.

SUMBER: DATABASE APTED; DUNYAN DIGITAL LANDSCAPE; OHI; RIDGE NATIONAL LABORATORY; NG SMP

## GENERAL INFORMATION

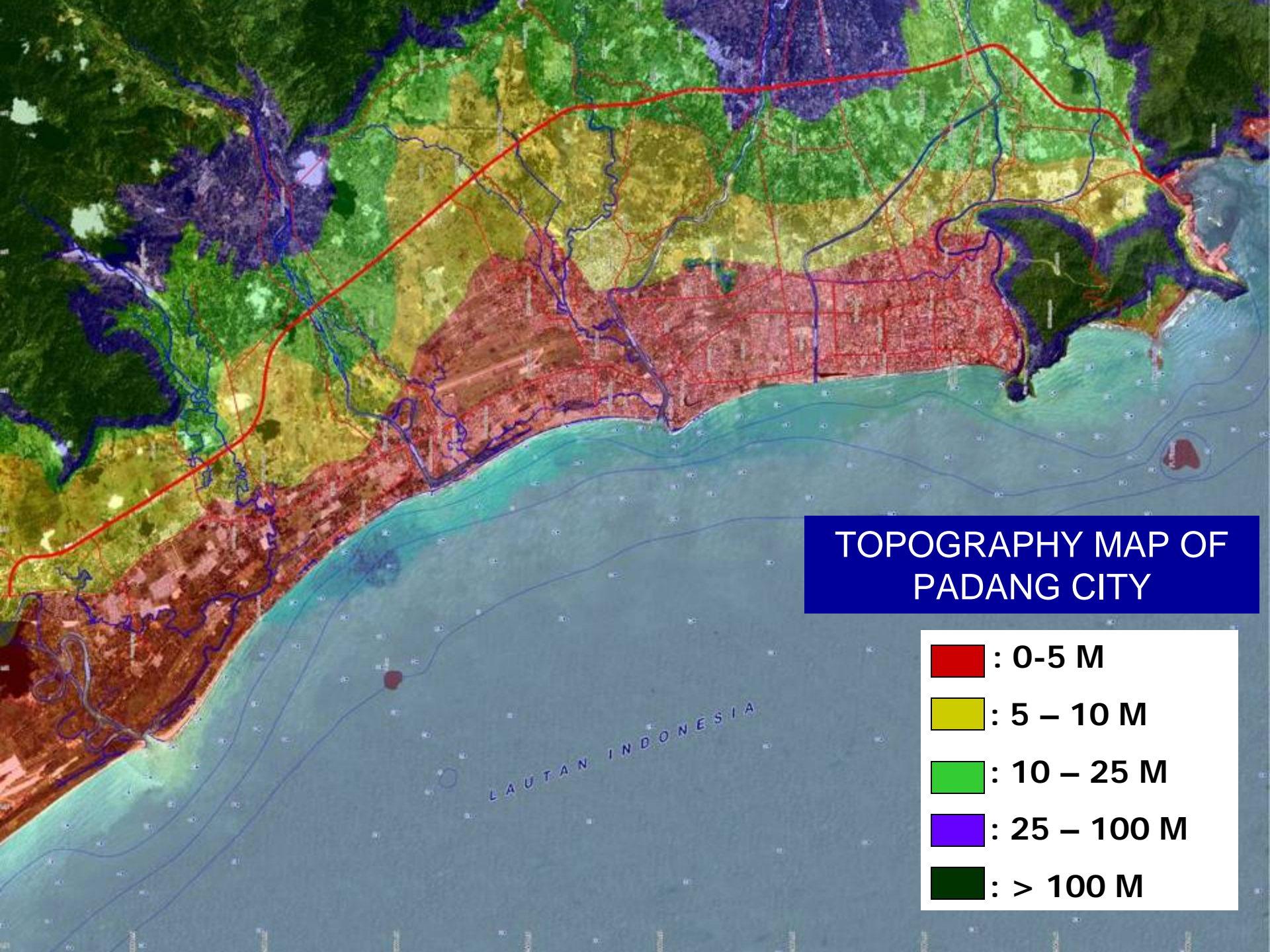
Padang is a capital of West Sumatera Province. Almost 1 million people live in the City. Geographically, it lays on the west coast of Sumatra Island and has a direct border with the open sea (Indian Ocean)



# BACKGROUND

The Tsunami incidents in Aceh, Nias and series of Earthquakes in Sumatra Islands has woken up the Local Authorities and the People of Padang. They are starting to realize that they live in vulnarable area.





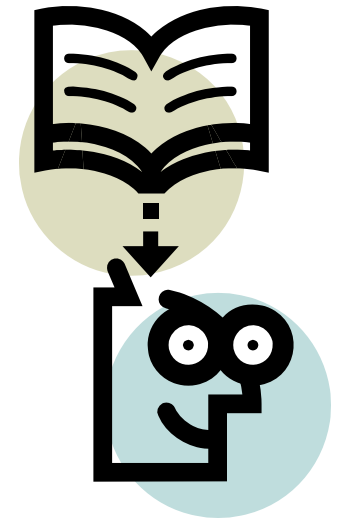
# TOPOGRAPHY MAP OF PADANG CITY

- Red** : 0-5 M
- Yellow** : 5 – 10 M
- Green** : 10 – 25 M
- Purple** : 25 – 100 M
- Dark Green** : > 100 M

# Something has to be done !

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- What ?
- Who ?
- How ?
- Where to start ?
- .....???????



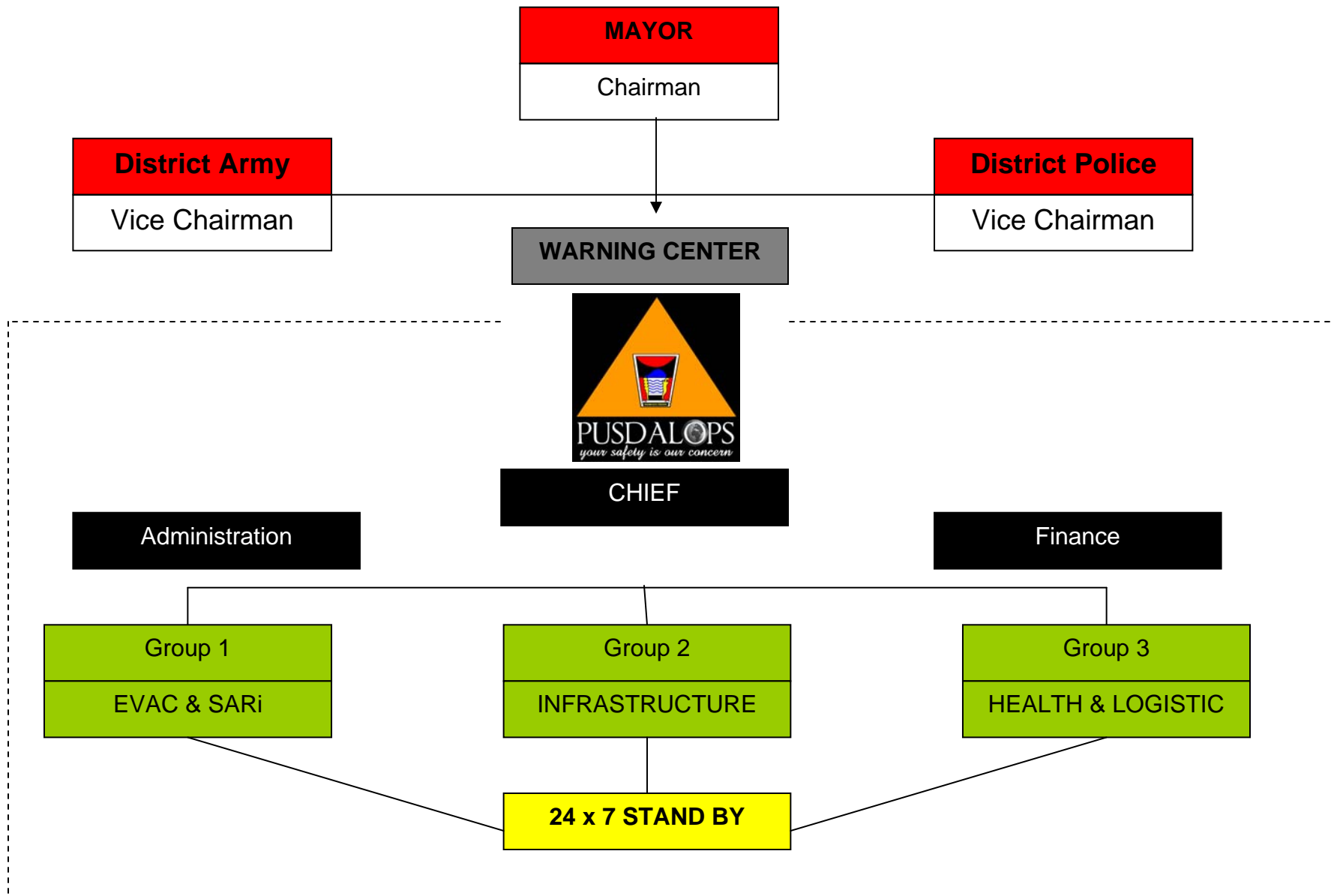




PUSDALOPS

*your safety is our concern*

# ORGANISATION STRUCTURE OF PUSDALOPS SATLAK / WARNING CENTER



# Pusdalops as the Coordinator of Dissaster Management and Warning Dissemination

## CHIEF

### GROUP 1

#### Evac & SAR

- Police
- Military
- Red Cross
- SAR Team
- Fire Brigade
- Tsunami Comm.
- Scouts
- Radio & TV
- Amateur Radio
- NGOs
- Medic Teams

### GROUP 2

#### Infrastructure

- Electricity Company
- Public Water Works
- Dept. Of Infrastructure
- Military & Police
- Telecommunication
- Local Government
- NGOs

### GROUP 3

#### Health & Logistics

- Health Dept.
- Read Cross
- Hospitals
- Dolog
- Social Dept
- NGO's

The Chief of Pusdalops have authority by law to call or to activate the group

# Existing Condition of Pusdalops Padang City

- Pusdalops Office has already established at Fire Brigade Department
- Personal Computers
- Speedy Internet Connection
- Radio Communication System
  - VHF Repeater System – Motorola
  - 1 HF Radio Vertec System
  - 1 VHF Radio
  - 24 x 7 Stand By Personnel

# Alerting the Public – How?

- The key is to **educate and communicate a warning message** to people on the coast to move inland to higher ground to escape the destructive waves. Also consider vertical evacuation in reinforced concrete buildings.
- All organizations need to develop **Standard Operating Procedures and multiple communication methods** for alerting the public, using high and low technology such from satellite broadcasts to mosques loudspeakers to communicate the alert.
- Special Case: **Local Tsunami. First Line of Defense - Public awareness and education will save people near earthquake epicenter.**

# Local dissemination: what's the best?

There is no dissemination system that is best for all communities: **Different communities have distinct characteristics and needs.**



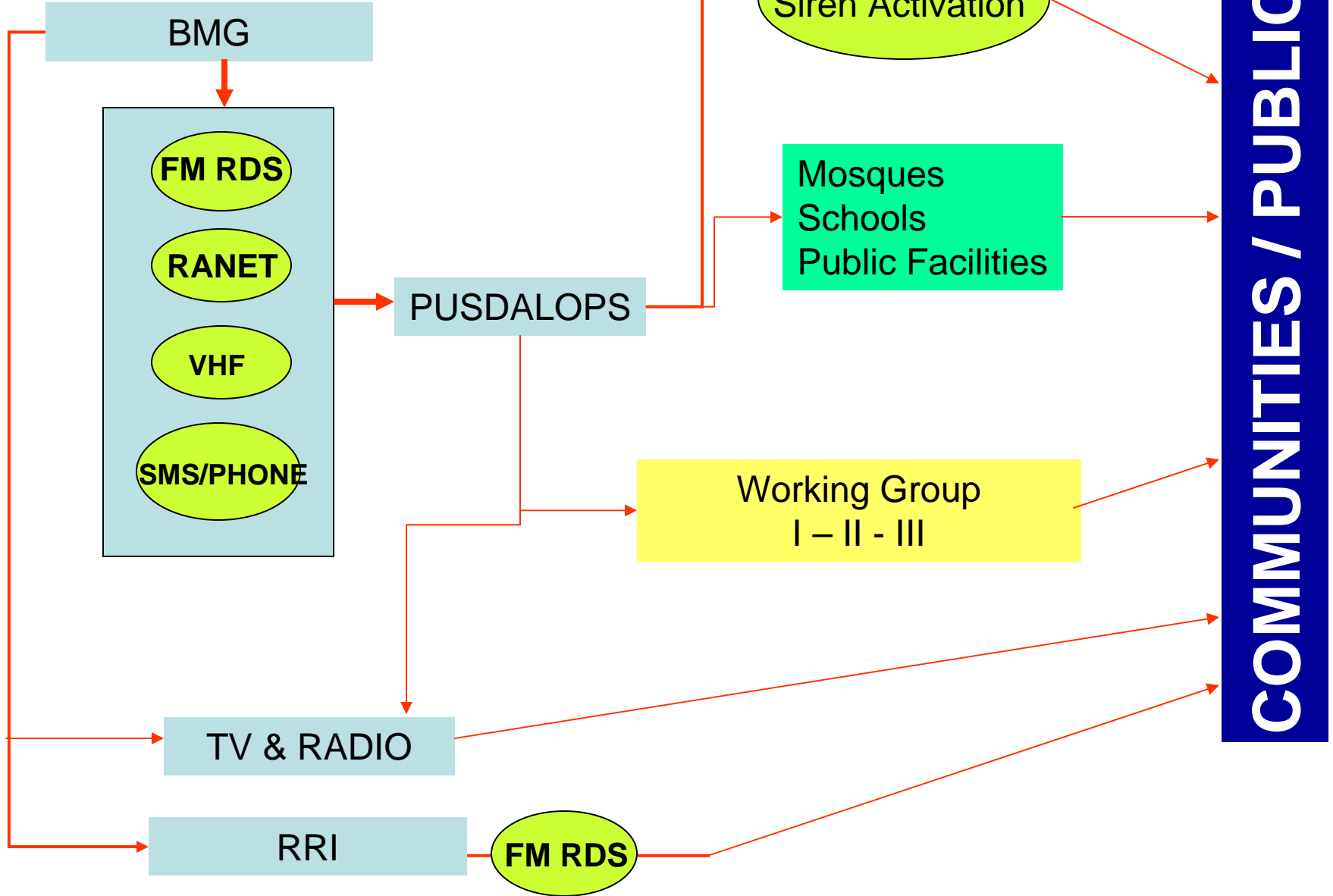
## **Factors to consider:**

- Size and layout of the area
- Composition and activities of the population
- Financial resources of the community
- Existing notification systems

# Examples of Notification Systems

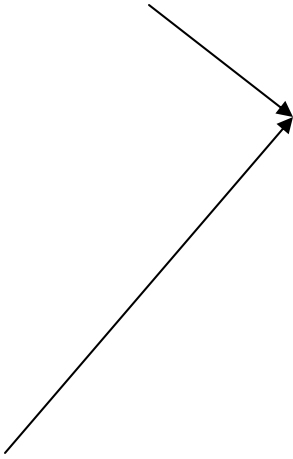
- Use of Mass Media (Radio, Television)
- Siren Towers
- First Responders (i.e. Police, Fire, Lifeguards)
- Public Loudspeakers (Mosques)
- SMS Text Messaging – Telephone Companies
- Emergency Telephone Call Lists (public and private sectors)
- RAPI (Indonesian Citizen Band)
- Police & Military Resources
- RANET
- FM RDS

# WARNING CHAIN IN PADANG





# Existing Agendas of Local Govt. of Padang

- Finalization of *Peraturan Daerah (Perda)*
  - Finalization of SOP (Protap)
  - Establishment of PUSDALOP
  - Local Curriculum
  - Evacuation Routes and Signs
- 
- On Progress
- Zoning dan building Regulation.
  - Socialization, Dissemination and Drills
  - Connection to the National and Provincial Programs
  - Readiness
  - Supports and Backup from other parties

# THANK YOU!

Thailand, 5-8 Februari 2007 – Chonlapreuk Resortr, Nakorn Nayok



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