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Harnessing Geospatial Knowledge for Global Disaster Awareness: Addressing Challenges and Strategies in Indonesia

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Overview of the Sendai Framework for Disaster Risk Reduction



Earthquake and Tsunami at Palu, Indonesia, 2018

It emphasizes the **importance of international cooperation and partnerships**, encouraging countries to share knowledge, resources, and best practices to effectively address disaster risks and improve preparedness.

The Sendai Framework aims to significantly **reduce disaster risk** and **enhance resilience** by promoting a **comprehensive approach** to disaster risk management at local, national, and global levels.





Disaster Risk Reduction

The primary objective is to substantially reduce disaster risk by enhancing resilience through proactive measures, ensuring communities are better prepared for potential hazards.



Strengthening Governance

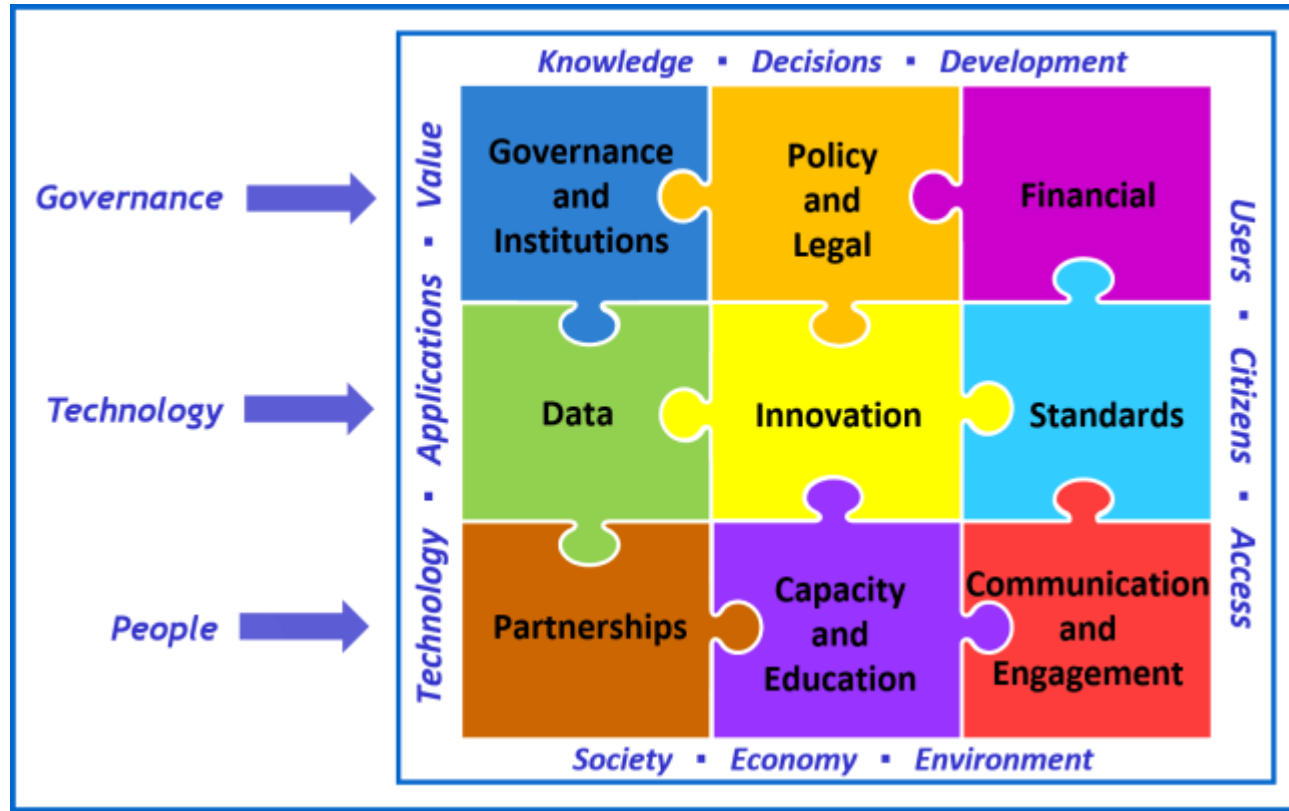
A key goal is to strengthen disaster risk governance at all levels, promoting accountability and collaboration among stakeholders to effectively manage disaster risks.



Enhancing Awareness

The framework aims to increase global awareness of disaster risks, fostering a culture of preparedness and encouraging public participation in disaster risk reduction initiatives.

OBJECTIVES AND GOALS



UNDRR 2017

The implementation of UN-IGIF for disaster risk reduction to enhance national efforts towards global awareness and collaboration in support of the Sendai Framework related to Climate Action and achieving SDGs

Governance and Institution

- Geospatial Information Unit: BIG, BNPB, Ministries & Agencies
- Role Definitions: Clearly define roles and responsibilities among stakeholders.

Policy and Legal

- Analysis of existing policies that support geospatial knowledge in disaster management.

Financial

- National's Funds supporting the Disaster Risk Management

Data

- Geospatial Data Collection: Data gathered from multiple sources and custodians (satellite imagery, ground surveys, statistics).
- Data Sharing Protocols: Indonesian One Map and One Data Create environment for sharing data among agencies and stakeholders.

Partnership

- Development of Partnership between Sub-National and National Institutions.



Capacity and Education

- Enhancing local capacities in utilizing geospatial tools for disaster awareness.
- Develop of training programs for stakeholders at various levels, including local communities.

Standard

- Standardization: Standards are established for data formats to ensure compatibility

Communication and Enggement

- Awareness Campaigns: Develop strategies to educate communities about disaster risks and preparedness.
- Early Warning Systems: Implement systems that provide timely alerts based on geospatial data analysis.
- Evaluate the reach and impact of awareness campaigns through surveys and feedback.

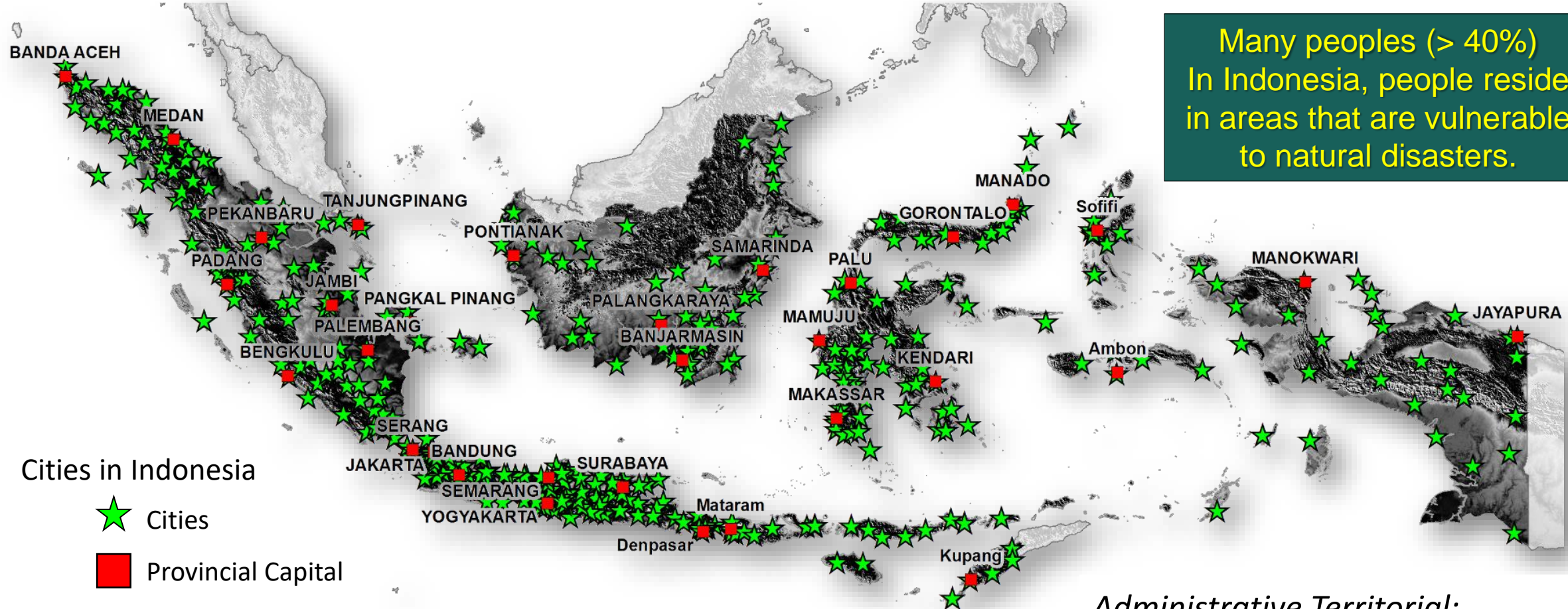
Innovation

- Geospatial Knowledge Development for Disaster Mitigation and Risk Reductions
- Data Alliances develop collaborative commitments between national and regional levels.

Importance of Disaster Risk Reduction Management in Indonesia



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Many peoples (> 40%)
In Indonesia, people reside
in areas that are vulnerable
to natural disasters.

Natural disasters are latent hazards in Indonesia, and therefore its mitigation and adaptation must be handled properly by sustainable disaster risk reduction management.

Administrative Territorial:

- 38 Provinces
- 514 Cities
- 7094 Districts
- 83.447 Villages



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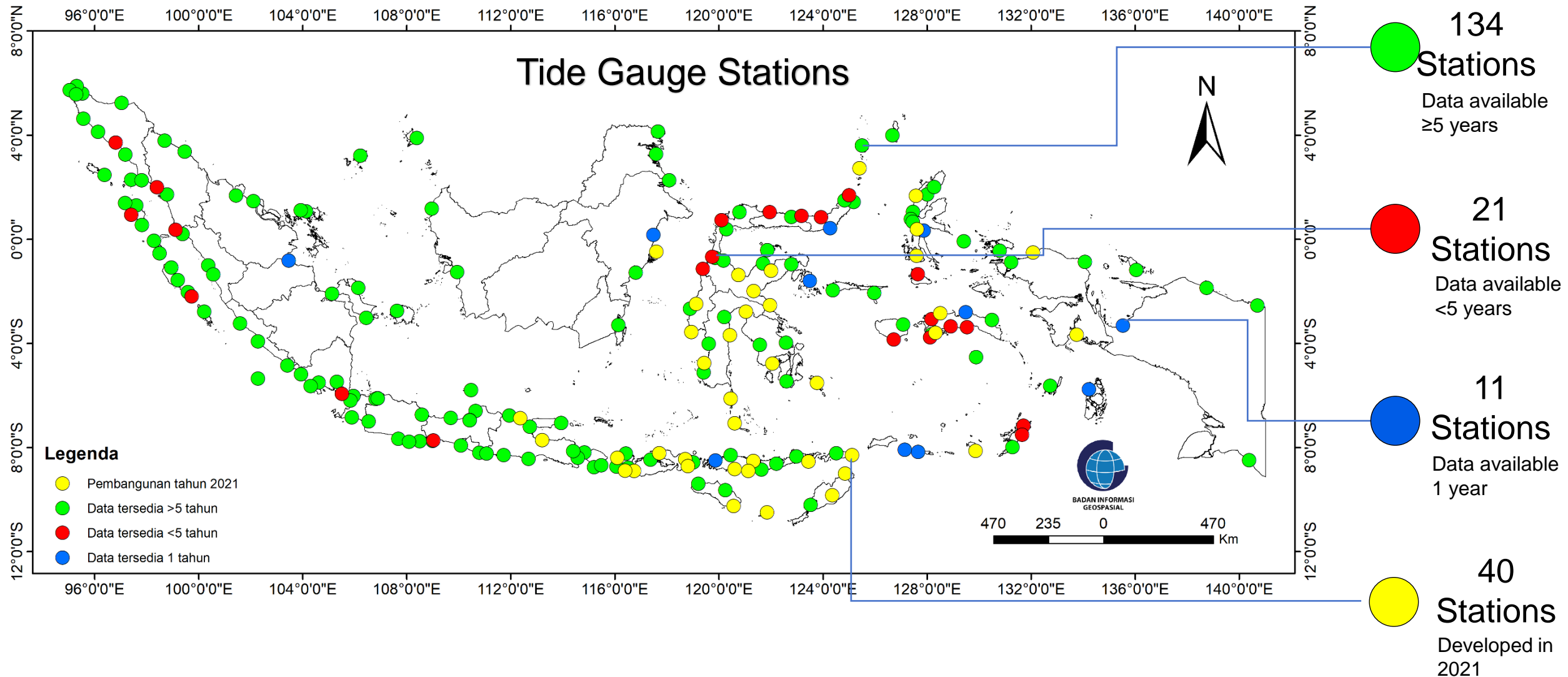


GEOSPATIAL DATA UTILIZATION

GEOSPATIAL DATA UTILIZATION – DISASTER COASTAL MITIGATION

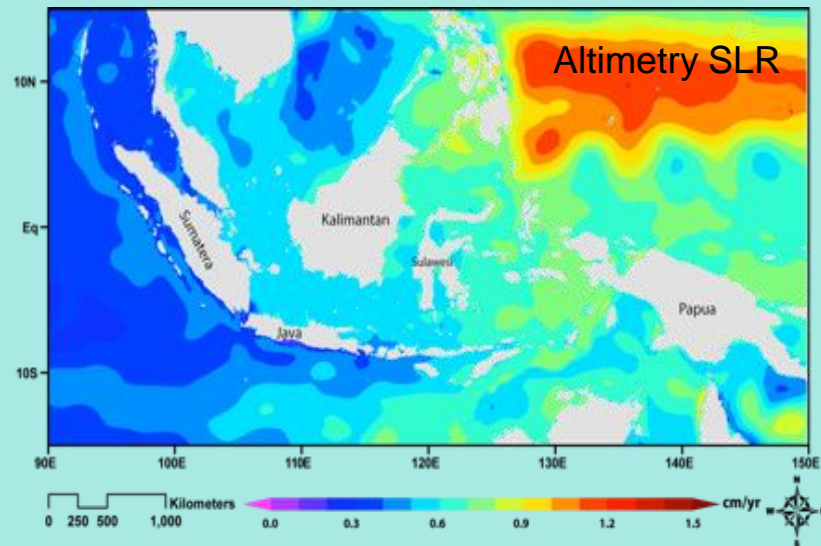
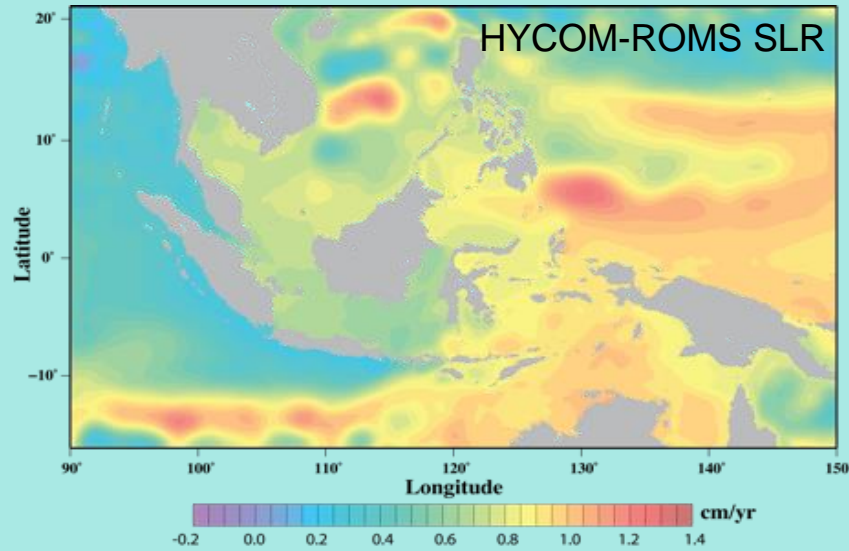


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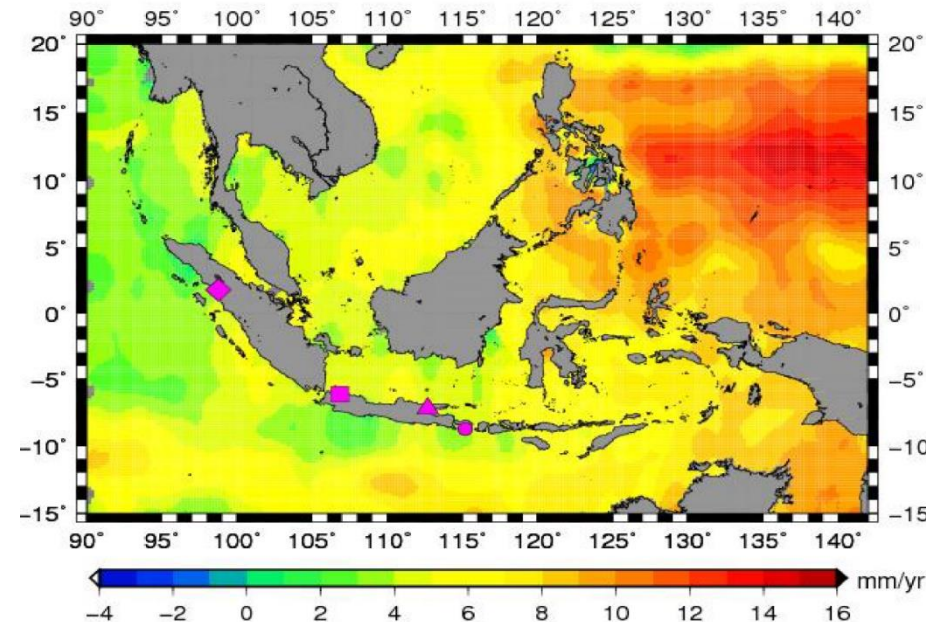
Sea Level Rise (SLR) in Indonesian Region

In general, during the period of 1961 to 2015, SLR rates in Indonesian region is around 0.1 – 0.6 cm/year



SLR from from 1961 to 2015

Ibnu Sofian (BIG), 2019



Linear-term of SLR for 1993-2009 from Satellite Altimetry

Nurmaulia et al.(ITB), 2010

GEOSPATIAL DATA UTILIZATION – DISASTER COASTAL MITIGATION



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Sea Level Rise:
0.1 – 0.5 cm/year (IPCC)

Coastal Subsidence:
3 - 10 cm/year



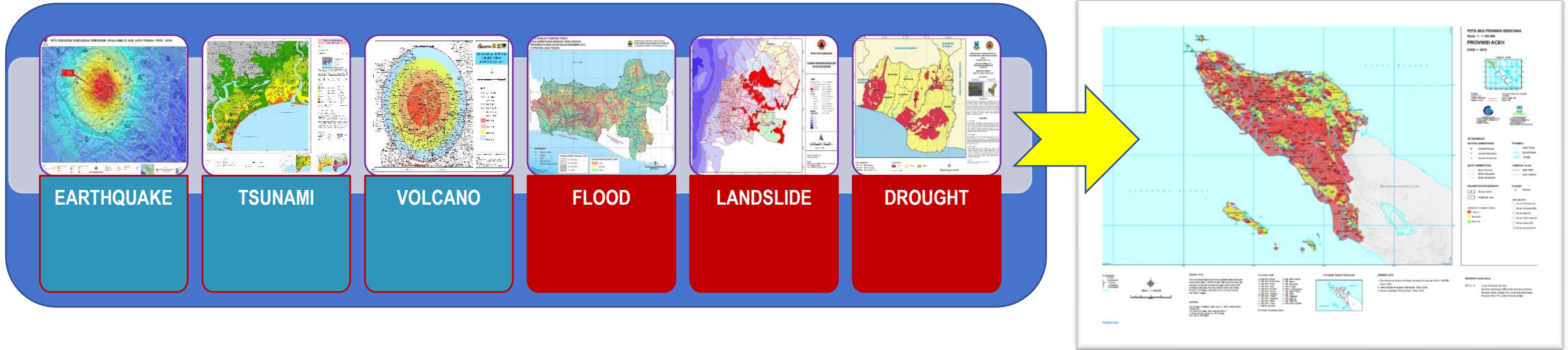
- *Tidal Flooding and Inundation.*
- *Surface water degradation.*
- *Infrastructure damages (housing, building, road etc).*
- *Environmental degradation.*
- *Deterioration in livelihood quality.*



Land Subsidence can be derived from GPS CORS, GPS Surveys, InSAR, Leveling

Watch out land subsidence along the coastal areas

Ref: Andreas et al. (2018),
Abidin et al. (2016), Estelle
et.al (2012), Amelung et al.
(2010)



- ❑ Six (6) types of disaster : Earthquake, Tsunami, Volcano Eruption, Flood, Landslide, And Drought.
- ❑ Based on geographic assessment and landscape analysis to evaluate the susceptibility of any areas.
- ❑ Using Analytical Hierarchy Process

The Multi-Hazard map is produced by cooperation of several relevant Ministries and Agencies



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CAPACITY BUILDING ON IMPLEMENTATION OF DISASTER RISK REDUCTION AWARENESS



1. Training and Education

- a) **Community Workshops:** Organizing workshops to educate local communities about disaster risks, preparedness strategies, and response plans.
- b) **Professional Development:** Providing training for government officials, disaster response teams, and volunteers to enhance their skills in risk assessment, emergency management, and crisis communication.

2. Strengthening Institutional Frameworks

- a) **Policy Development:** Formulating and implementing policies that promote disaster risk reduction at local, regional, and national levels.
- b) **Inter-agency Collaboration:** Encouraging cooperation among government agencies, non-governmental organizations (NGOs), and community groups to ensure a unified approach to disaster management.

3. Public Awareness and Community Engagement

- a) **Awareness Campaigns:** Utilizing various media platforms to disseminate information about disaster risks, safety measures, and preparedness actions.
- b) **Community Involvement:** Engaging community members in the planning and execution of disaster risk reduction initiatives to foster a sense of ownership and accountability.



4. Infrastructure Resilience

- a) **Resilient Building Practices:** Promoting the adoption of building codes and construction practices that enhance infrastructure resilience against natural disasters.
- b) **Early Warning Systems:** Establishing and maintaining effective early warning systems to alert communities of impending disasters, thereby enabling timely evacuations and preparedness actions.

5. Research and Data Management

- a) **Risk Assessment and Mapping:** Conducting studies to identify high-risk areas and vulnerable populations and creating risk maps to inform planning and response strategies.
- b) **Monitoring and Evaluation:** Implementing systems to assess the effectiveness of disaster risk reduction strategies and adapting them based on lessons learned.



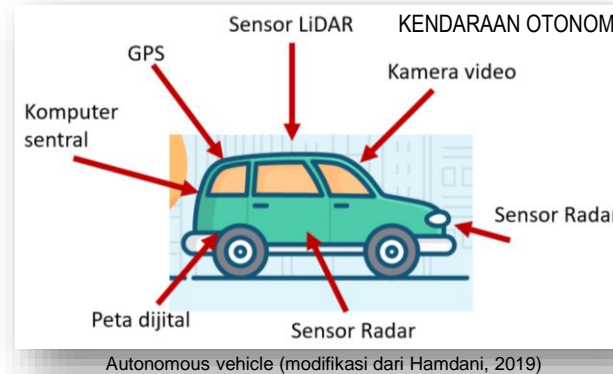
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FUTURE RECOMMENDATIONS

THE EMERGENCE OF NEW DATA SOURCES AND ANALYSIS METHODS

- New opportunities for data collection for example using autonomous vehicles
- *Crowd sourcing* and VGI
- High spatial resolution satellite imagery
- Big data



TECHNOLOGY ADVANCES

- Interconnection of transportation modes through smart mobility
- *Digital twins for spatial modeling, simulation and prediction*
- *Machine learning, deep learning and AI for geospatial production*
- *Quantum computing enables intensive processing*

FUTURE TRENDS OF GEOSPATIAL TECHNOLOGY BASED ON THE DRIVERS OF CHANGE



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CHANGING USER REQUIREMENTS

- The emergence of products and services specifically designed for urban environments.
- Requests for the provision of real-time information.
- Integrated smart city solutions are increasingly being spread

INDUSTRY STRUCTURE SHIFT

- Increased workplace diversity in technology, science and innovation
- Consumer talent and shift, changing values and attitudes
- New cooperation agreements with industries beyond geospatial emerge

LEGISLATIVE ENVIRONMENT

- Digital ethics and privacy are addressed by national and international initiatives
- Cybersecurity conversations increase as digital devices increase
- Pressure on government institutions to become more technological and digital savvy



GEOSPATIAL INFORMATION CHALLENGES FOR DISASTER RISK REDUCTION



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Delivering **the right information to the right people** at the right place and time in a useful form.



"Useful form" in this context refers to **the scale, accuracy, and detail of the information** presented.



Build data sharing and interoperability systems to address data sharing issues in emergency response situations.



The need for detailed scale GI also requires large data and super computers for processing.





THERE IS NEED FOR REGIONAL COOPERATION IN ASPECTS:



HILIRISATION OF GEOSPATIAL INFORMATION TECHNOLOGY:

- **Leveraging technologies** such as artificial intelligence, Internet of Things, cloud computing, and Big Data;
- **Engaging end users** in various fields, such as youth or the private sector;
- **Manage information more effectively** through the creation of regional or national cloud-based metadata platforms; and
- **Strengthen implementation** through enhanced partnerships with global and regional stakeholders.

- That is how to utilize geospatial technology directed at strategic sectors.
- Three main sectors that need special attention are industry, community service, and participatory.





Geospatial Positioning of Indonesia:

"Indonesia, as an archipelagic nation, is characterized by similar terrestrial disaster hazards prevalent in the Asian sub-region, as well as coastal disaster hazards observed in the Pacific-Oceania sub-region."

International Collaboration:

"International collaboration within the Asia-Pacific region is crucial for enhancing disaster risk reduction efforts and increasing awareness of disaster management practices."

Importance of Geospatial Position:

"The geospatial positioning of nations plays a significant role in facilitating data sharing and technological exchange among neighboring countries, thereby strengthening regional disaster preparedness and response capabilities."



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THANK YOU