BUILDING BACK BETTER CENTRAL SULAWESI: Planning For Resilient Infrastructure Post Earthquake

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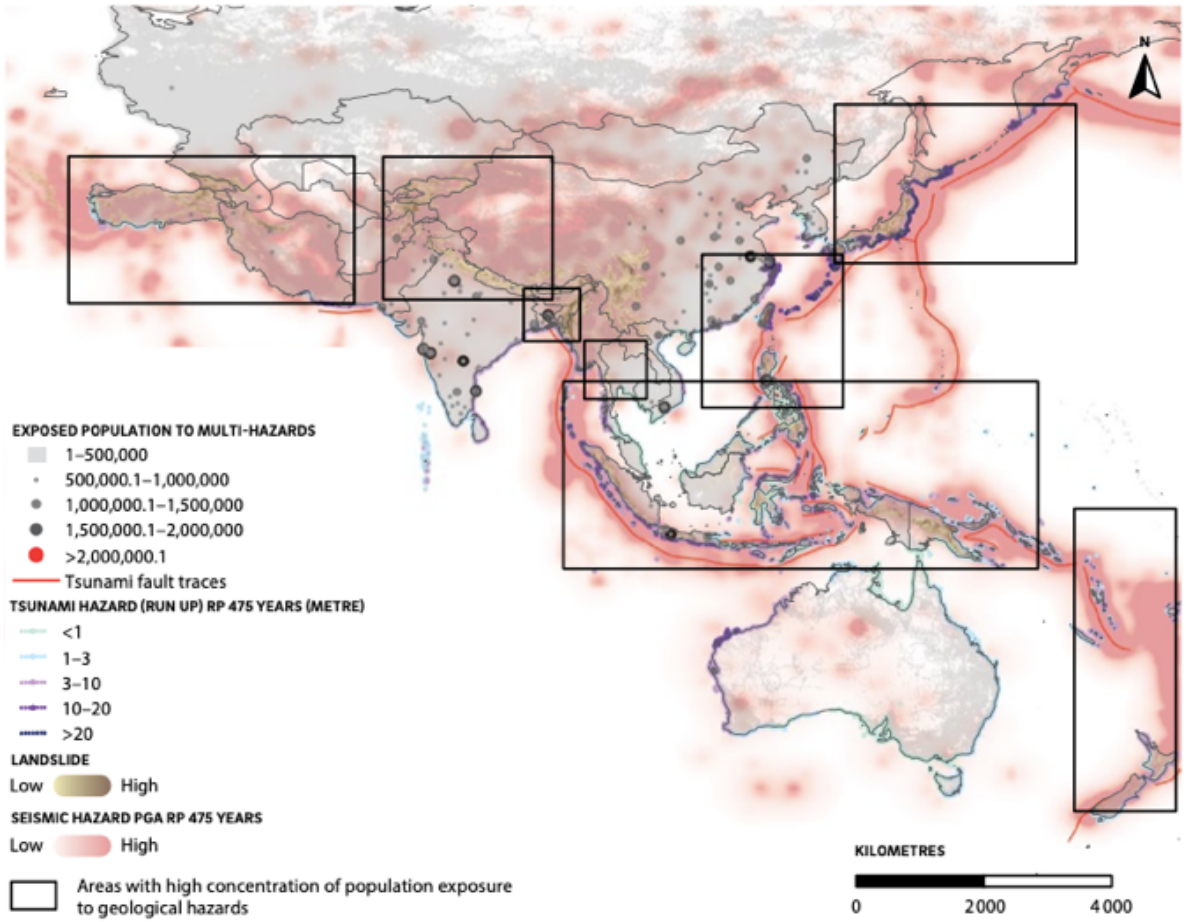
Outline:

1. Background: Understanding Risk and Central Sulawesi Earthquake
2. Planning Process for Rehabilitation and Reconstruction
3. Planning for Resilient Infrastructure
4. Enhancing Infrastructure Disaster Resilience for the Next Five Years

1. Background: Understanding risk
- *The Ring of Fire* -



Source: UNESCAP, ***Asia-Pacific Disaster Report 2019***

- Concentration of population most exposed to seismic risks (earthquakes, landslides and tsunamis) are along the Pacific Ring of Fire (UNESCAP, 2018).
- The Ring of Fire hotspots with critical infrastructure exposure : Concentration of population are in growth centers or cities with a high risk of disaster → the potential for economic losses is also large.

HOTSPOT 2	RING OF FIRE
Earthquake, landslide and tsunami, typhoon tracks, North and East Asia, South-East Asia	
Population exposure	High (disproportionate impact on poor)
Economic stock exposure	Very high
Infrastructure: energy	Very high
Infrastructure: transport	High
Infrastructure: ICT	Moderate

1. Background: Understanding risk

- Exposed People and Assets -

Number of lives and assets (USD) exposed to the risk of earthquake, tsunami, and landslides

earthquake

86 million
people

33,3 billion
physical assets

tsunami

3 million
people

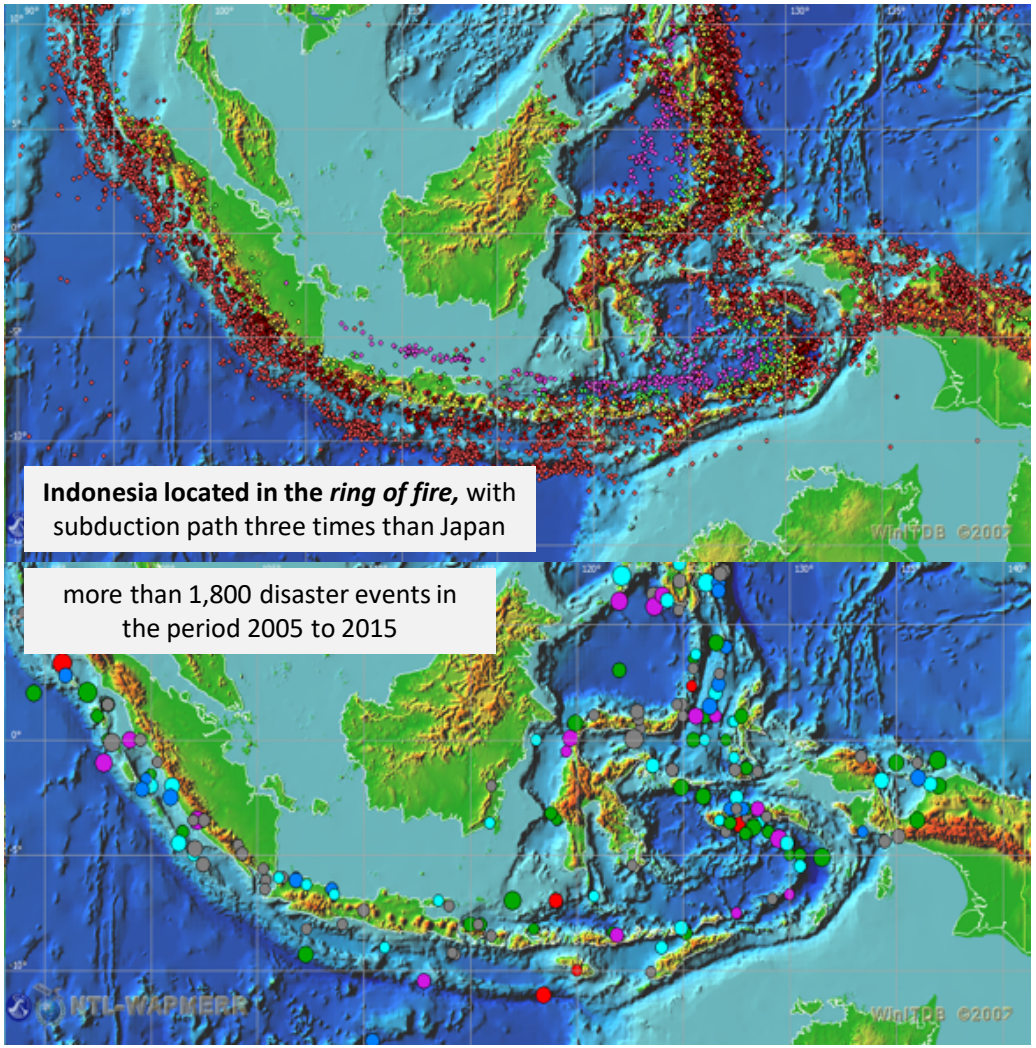
5 billion
physical assets

landslide

14 million
people

5,5 billion
physical assets

Source: BNPB, 2015



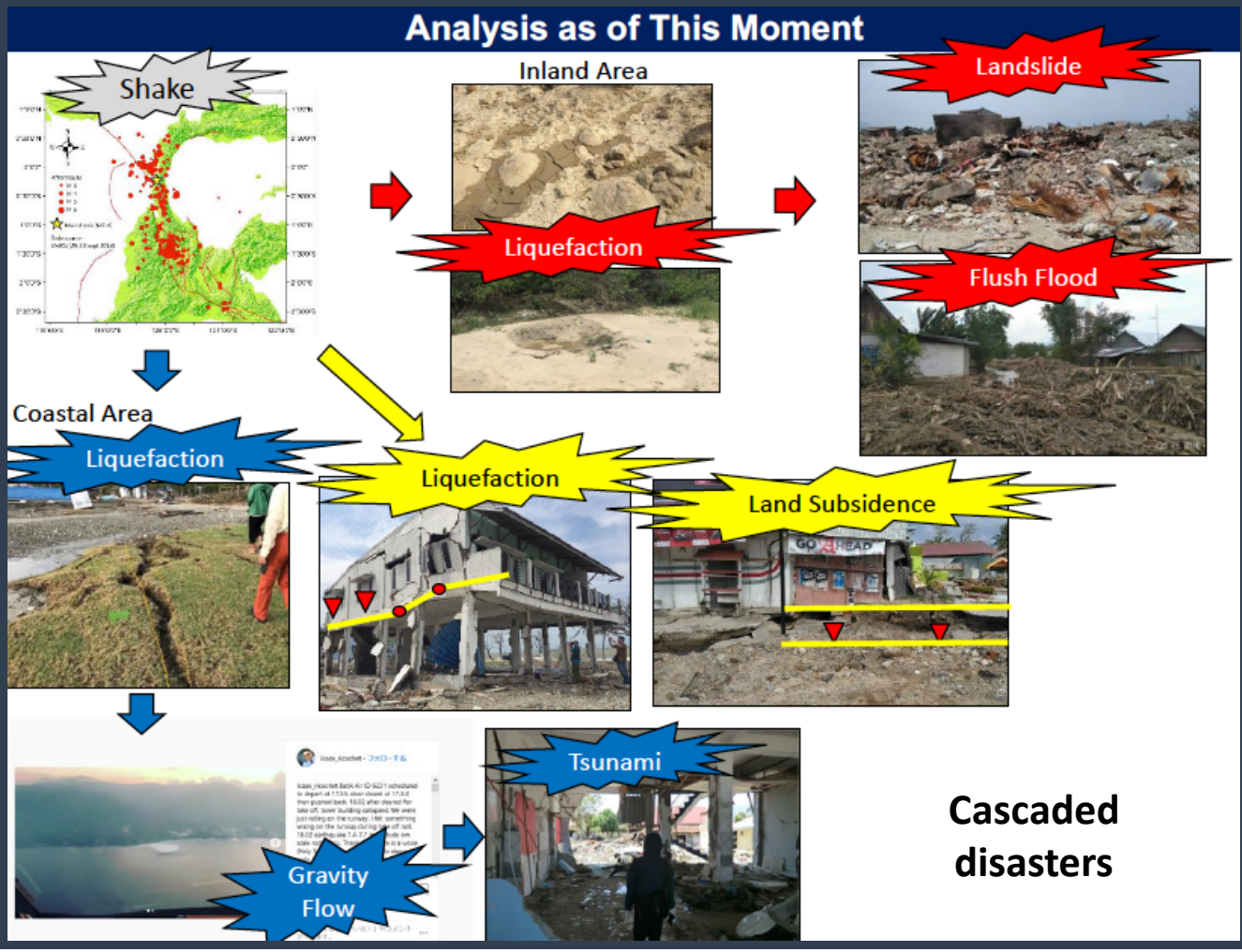
Distribution of earthquakes that occurred since 1600 (above) and tsunamis (below)
Source: Prasetya, 2019

1. Background: Understanding risk

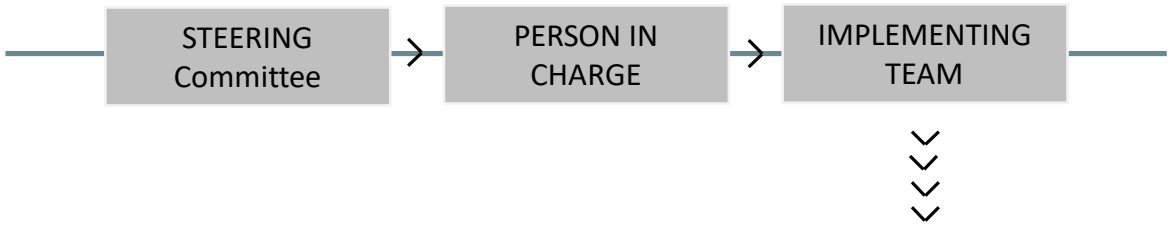
- *Central Sulawesi Earthquake* -

4.340 dead and missing
172.635 evacuated

1,32 billion USD ~ **19,27%**
damage and losses — to GRDP Central Sulawesi



2. Planning Process: Coordination and Assistance Team for Rehabilitation and Reconstruction



Working Group 1

Disaster Risk-Based Regional Development

- ✓ Oversee the process of identifying disaster-prone areas (micro zonation), land carrying capacity based on disaster-prone areas, and inventory of needs for supporting infrastructure in the post-disaster areas
- ✓ Developing recovery and development plans

Working Group 2

Regional Infrastructure Recovery

- ✓ Oversee the process of inventorying damage and recovery needs in the housing sector and basic infrastructure
- ✓ Developing recovery and development plans

Working Group 3

Regional Economic Recovery and Socio-Cultural of Community

- ✓ Oversee the process of inventorying disasters impact on the socio-culture, community economy, and regional economy
- ✓ Developing recovery and development plans

Working Group 4

Funding and Cooperation

- ✓ Oversee the process of activity budgeting and coordinate all financing collaboration activities with development partners related to post-disaster recovery and development programs

Working Group 5

Regulation and Institutional

- ✓ Supervise the regulation and institutional arrangements of regional and cross-sectoral governments in the post-disaster recovery and development process

2. Planning Process: Joint Commitment to Post-Disaster Rehabilitation and Reconstruction

Provincial Master Plan

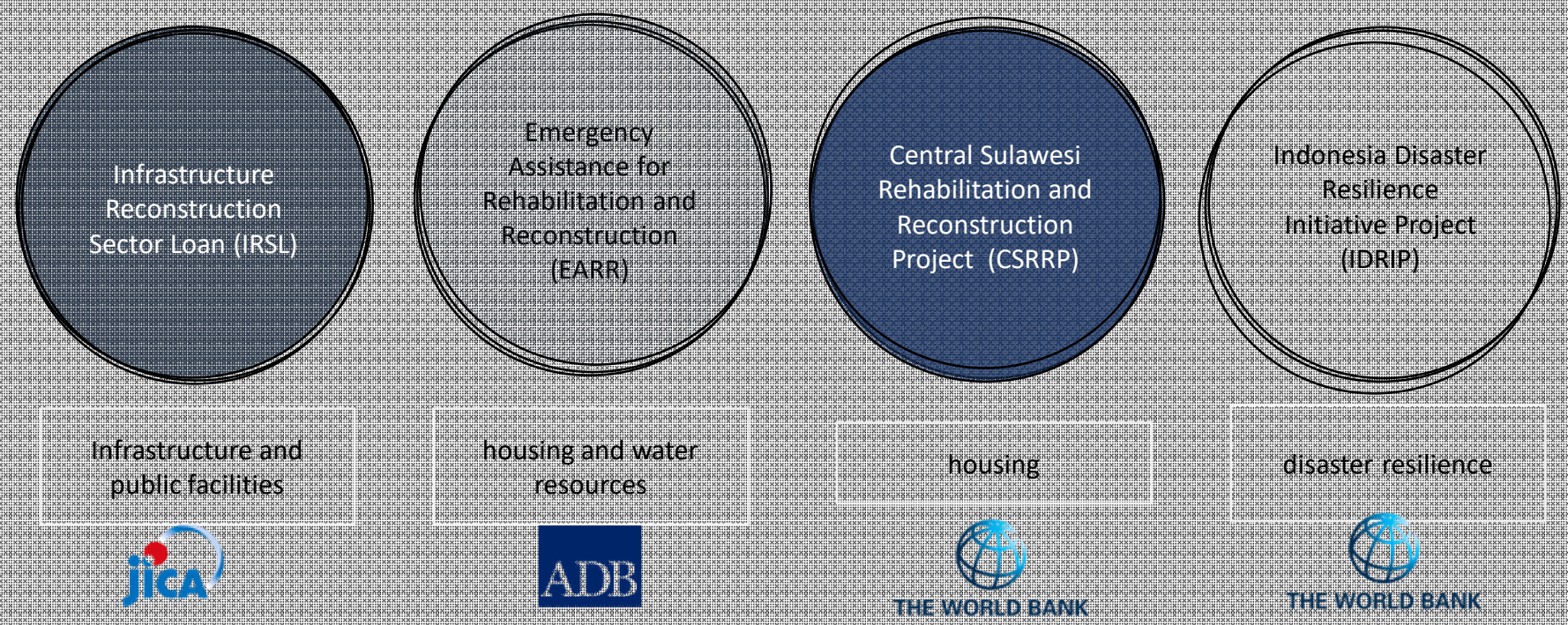
Central Sulawesi Governor Regulation No. 10, 2019
April 12, 2019

Rehabilitation and Reconstruction Plan for Each District/City

Palu City	Sigi District	Donggala District	Parigi Moutong District
No. 360/294.a/BPBD/2019 (March 25, 2019)	No. 3/2019 (February 28, 2019)	No. 8/2019 (January 31, 2019)	No. 2/2019 (March 6, 2019)

Source: Rehabilitation and reconstruction plan/action plans for each district/city affected by the disaster, Bappenas 2019

2. Planning Process: Development Partner Support and Works Division



3. Resilient Infrastructure: The Strategy

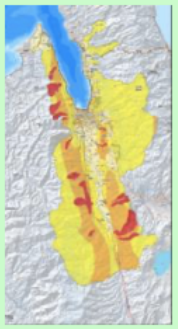
Infrastructure Strategy "Build Back Better"

From 3 points of view

1. Recovery Needs from each Infrastructure
2. Constraints (Cost, Time, Social acceptance)
3. DRR (Disaster Risk Reduction) with all infrastructure

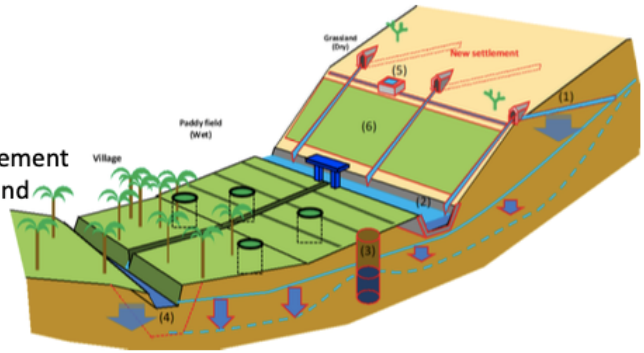
Hazard Analysis

- Tsunami
- Nalodo
- Seismic shake
- Sediment disaster
- Flood



Liquefaction To decrease groundwater level

(1) Horizontal boring
(2) Concrete lining of irrigation channel
(3) Deep wells
(4) Palu River Improvement
(5) Utilization of ground water for new settlement



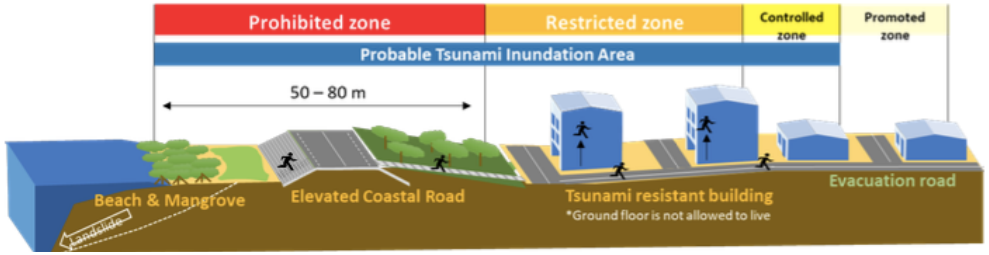
Seismic Shake

Building Inspection Board:

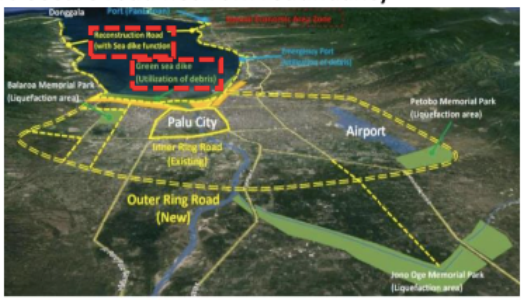
- ✓ Design check
- ✓ Inspection during construction
- ✓ Inspection after construction

- ✓ Soil strength
- ✓ Foundation type
- ✓ Structural Design
- ✓ Programming

Tsunami



To secure road network redundancy

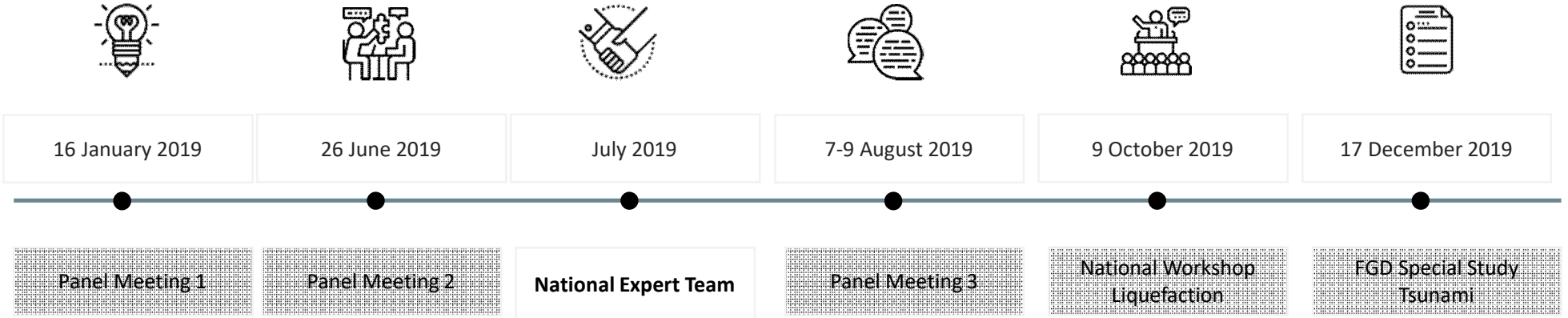


Source: JICA, 2019

3. Resilient Infrastructure: Considering all Hazards

Infrastructure facilities	Points to consider				
	Earthquake	Tsunami	Liquefaction	Sediment	Flood
Road	✔	Coastal area only	Avoidance	Disaster Risk	Disaster Risk
Bridge	✔	Coastal area only	Avoidance	Disaster Risk	Disaster Risk
Harbor	✔	✔	✔	–	–
Sea Dike	✔	✔	✔	Disaster Risk	Disaster Risk
River Dike	✔	Coastal area only	✔	Disaster Risk	Disaster Risk
Irrigation	✔	Coastal area only	✔	–	Disaster Risk
Water Supply/Sewerage system	✔	Coastal area only	✔	–	Disaster Risk
Architecture	✔	Coastal area only	Avoidance	Disaster Risk	Disaster Risk
Public facility	✔	Avoidance	Avoidance	Disaster Risk	Disaster Risk
Communications · Broadcasting	✔	Avoidance	Avoidance	Disaster Risk	Disaster Risk

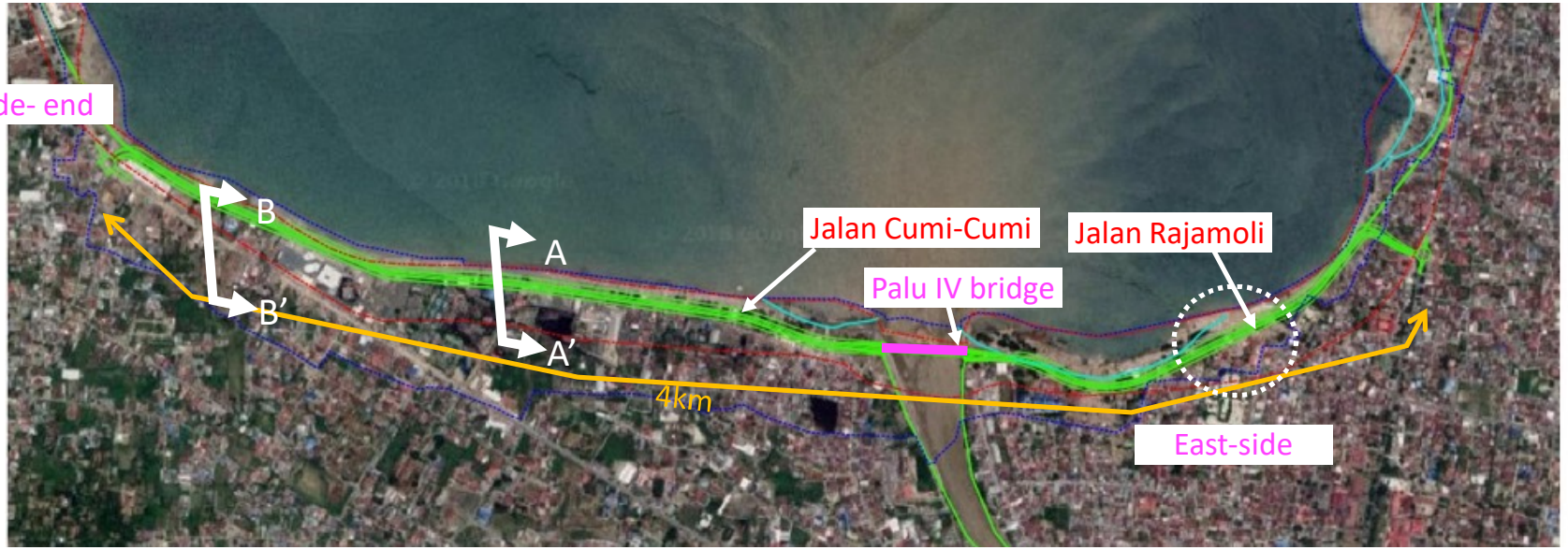
3. Resilient Infrastructure: National and International Panel Experts Involvement

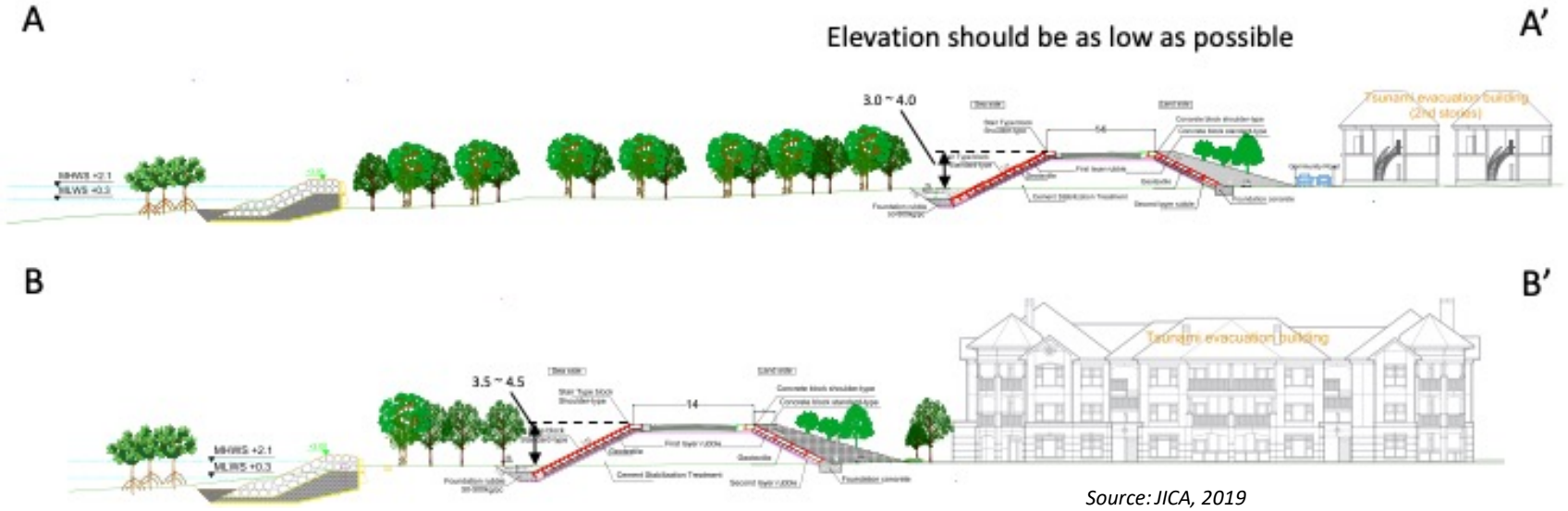


Recommendations

1. The construction of elevated roads as the main logistics route in Central Sulawesi Province
2. Reducing the risk of tsunami hazard in the Palu coastal area needs to be to be combined with green infrastructure (coastal vegetation)
3. Tsunami disaster risk reduction process should consider the possibility of future threats → Do further research to understand the previous events and to anticipate the future events.

3. Resilient Infrastructure: Elevated Logistic Road with Tsunami Mitigation Measures Function





Source: JICA, 2019

3. Resilient Infrastructure: Joint Research for Tsunami Mitigation Measures

Model Test for Tsunami Measures

Purpose:

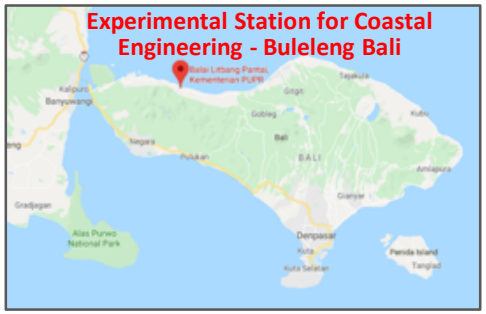
- Validity check for elevated road height as a tsunami countermeasure.
- Confirmation of tsunami mitigation effect by mangrove and inland trees.

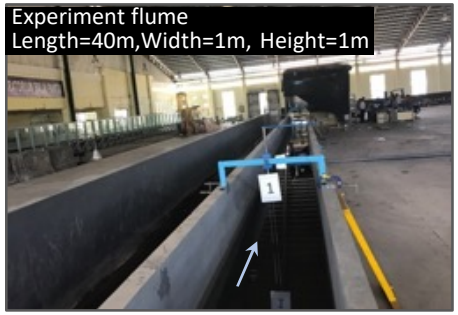
Experimental Series and Model

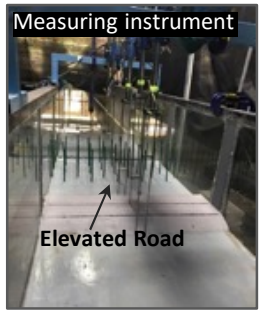
Parameter	Scenario
Slope	1:100
Wave Target	3.5m, 4.5m, 5.5m
Mangrove Zone	Without, With (35m)
Costal Protection	With
Inland Trees	Without, With (25m)
Elevated Road	Without, With (MSL+5.0, 6.5m)

Total 27 Series

Tsunami Experiment Facility





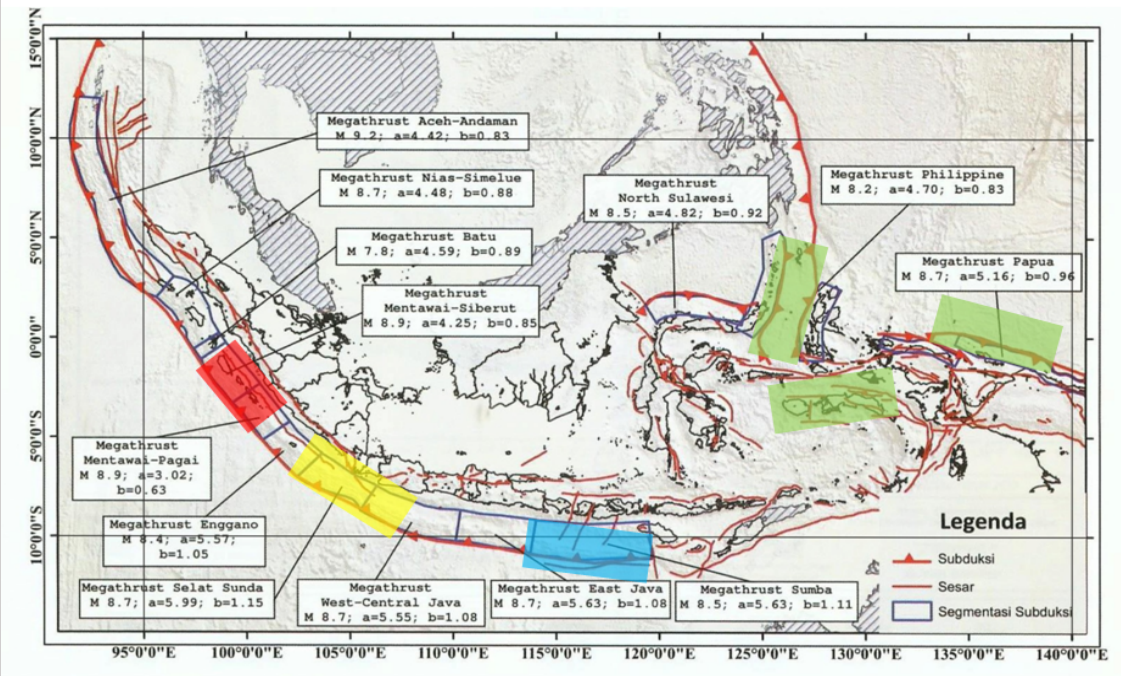


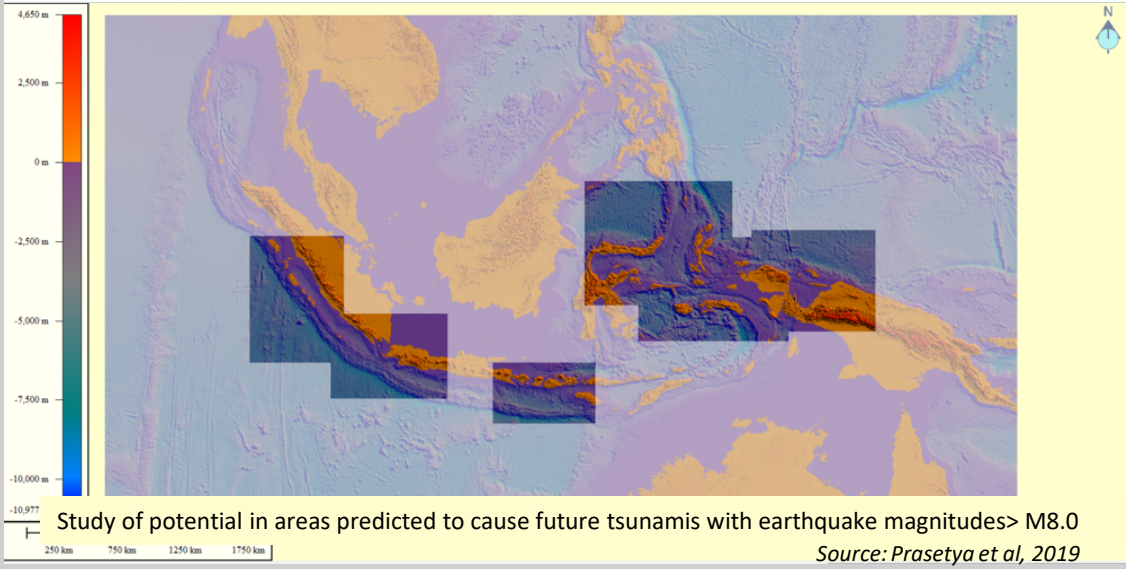
Participation of Japanese Experts

3. Resilient Infrastructure: Preparing for Potential Future Events

Based on the megathrust potential data from the results of the 2017 National Earthquake Center (PusGeN) study, Priority areas for tsunami disaster risk mitigation are:

- The southern coast of the Indonesian Archipelago with priority for the city of Padang and its surroundings: **Megathrust Mentawai-Pagai with potential M8.9**
- South Coast of Bengkulu-West Java including the Sunda Strait region: **Megathrust Enggano-Sunda Strait-West Java (Sunda Gap)** with the potential of each M8.8 or can be simultaneous with M> 9
- South Coast of East Java - Nusa Tenggara: **Megathrust Central Java - East Java and Bali** with potential M8,9
- North Coast of North Sulawesi: **Megathrust Northern Sulawesi Trench** with potential M8.5
- Coastal Area of **Buru-Seram Island, Halmahera and Papua** with potential M8.0





Study of potential in areas predicted to cause future tsunamis with earthquake magnitudes> M8.0

Source: Prasetya et al, 2019

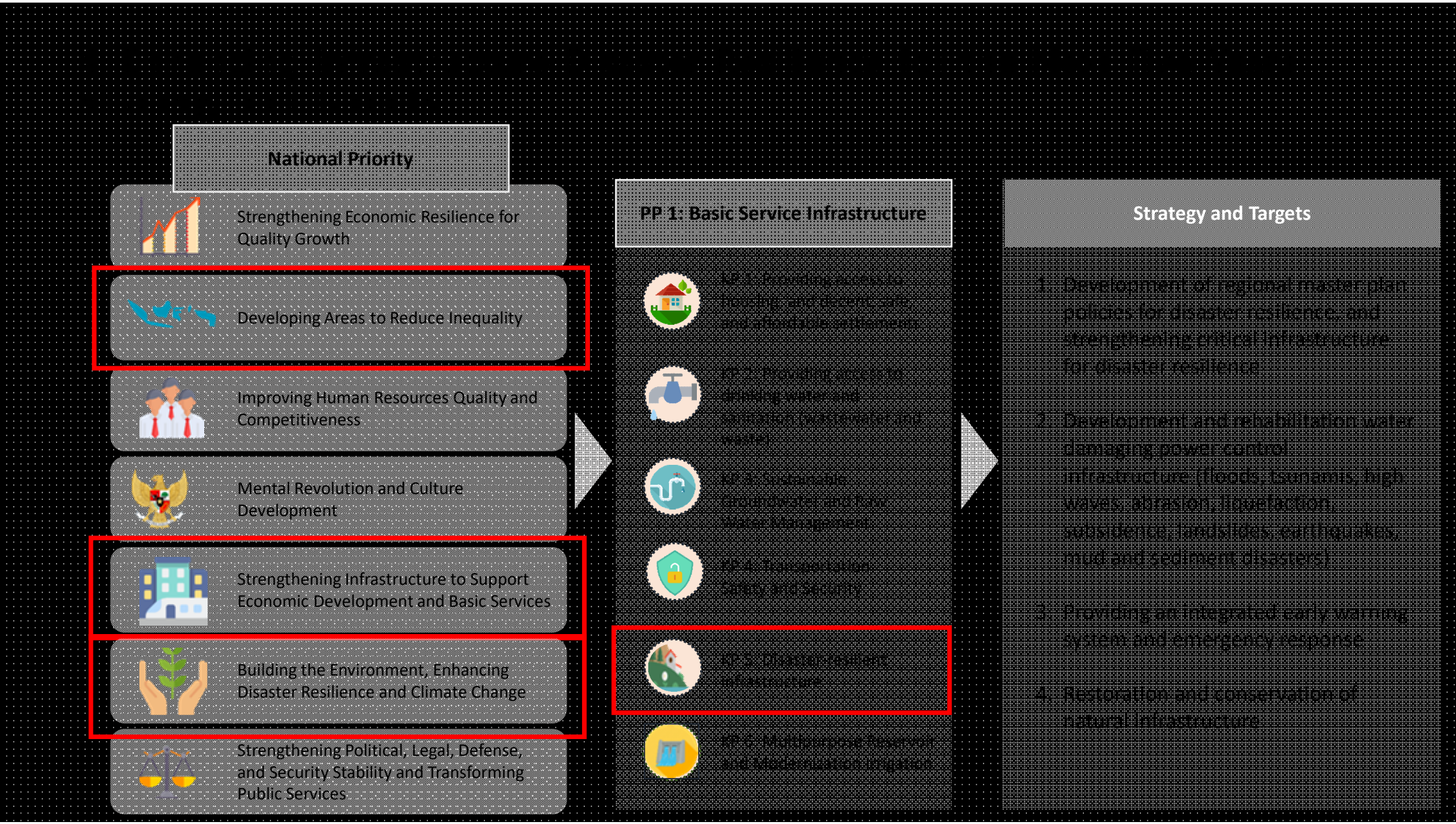
4. Enhancing Infrastructure Disaster Resilience for the Next Five Years: Mainstreaming the Issue

Disaster Management has become mainstream in the 2020-2024 RPJMN

Disaster Management Activities are included in the Development Agenda (PN) 2, Development Agenda (PN) 5, and Development Agenda (PN) 6 in the 2020-2024 RPJMN Document

Major Projects (MPs) related to Disaster Management:

- Post-Disaster Rehabilitation and Reconstruction in Central Sulawesi, Banten and West Nusa Tenggara Provinces → Part of PN 2
- Coastal Protection for 5 Urban North Coast of Java → Part of PN 5
- Strengthening the Integrated Multi Hazards Mitigation System → Part of PN 6


National Priority
Strengthening Economic Resilience for Quality Growth
Developing Areas to Reduce Inequality
Improving Human Resources Quality and Competitiveness
Mental Revolution and Culture Development
Strengthening Infrastructure to Support Economic Development and Basic Services
Building the Environment, Enhancing Disaster Resilience and Climate Change
Strengthening Political, Legal, Defense, and Security Stability and Transforming Public Services
PP 1: Basic Service Infrastructure
Strategy and Targets

Terima kasih