# PDNA AT A GLANCE

## Republic of Indonesia

## Earthquake, September & October 2009

### Disaster Risk Profile of Indonesia

Indonesia is located in Southeastern Asia and is an archipelago of 17,508 islands (6,000 inhabited). With a population of around 238 million, it is the world's fourth most populous country. It has a GDP per capita of about US $4,000, with service sector, industries and agriculture as largest contributor to the national economy. The country is prone to a number of natural hazards such as floods, severe droughts, tsunamis, earthquakes, volcanoes and forest fires. There are some 76 active volcanoes in the country. The Indonesian archipelago is located at the convergence zone of four major tectonic plates: Eurasian, Indian-Australian, Pacific and the Philippines, and is prone to high seismic activities in Sumatra, Java, Bali and the islands of Nusa Tenggara. The area of West Sumatra is among the most frequent earthquake stricken zones in Indonesia.

### The Disaster

On 30th September 2009, a powerful magnitude 7.6 earthquake struck West Sumatra province. The earthquake affected 13 out of 19 districts, killing over 1,100 people and injuring another 3,000. The death toll was intensified by landslides in at least three villages in the district of Padang Pariaman, burying a significant proportion of the inhabitants. The earthquake caused major destruction to concrete buildings in Kota Padang and many one-storey houses in the surrounding districts. The cities of Padang and Pariaman (Kota Padang and Kota Pariaman), as well as the district of Padang Pariaman (Kabupaten Padang Pariaman) were the worst affected areas. West Sumatra province is at a high risk of earthquakes due to its location at the convergence zone of four major tectonic plates and densely populated settlements.

One day after the earthquake hit West Sumatra, another large earthquake occurred in the province of Jambi on 1st October, affecting 43 villages in the district of Kerinci (Kab. Kerinci). Three people were reported dead. Most damage was sustained in the housing sector, where a total of 2,035 houses were damaged. Education, health, religious and irrigation facilities were also damaged as well as a small number of offices.

**Figure 1: Estimated ground acceleration in west Sumatra**

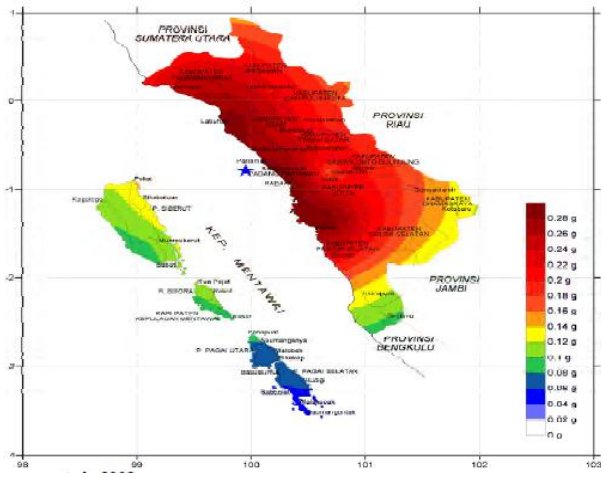
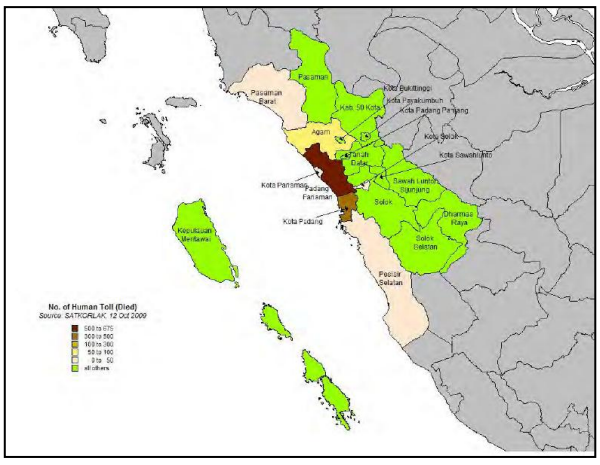



**Figure 2: Density of people killed in west Sumatra**



## Immediate Response – Damage, Loss and Preliminary Needs Assessment (DLNA)

The Government of Indonesia immediately responded by declaring a one-month emergency phase and welcoming international assistance under close national coordination. A comprehensive assessment was rapidly undertaken from 9th to 17th October 2009 with the financial support of the Global Facility for Disaster Reduction and Recovery (GFDRR). The assessment was led by the Government of Indonesia's National Disaster Management Agency (BNPB), with vital input from the National Development Planning Agency (Bappenas), the provincial governments of West Sumatra and Jambi, local district governments as well as by a team of technical experts from several multilateral and bilateral agencies including the World Bank, the Asian Development Bank (ADB), the Australian Agency for International Development (AusAID), the International Finance Corporation (IFC), and the United Nations Development Programme.

## Methodology Used for DLNA

The assessment team followed the UN Economic Commission for Latin America and the Caribbean (ECLAC) methodology for measuring the impacts of the disasters, adapted to Indonesian conditions. This methodology is internationally accepted to measure the impacts of disasters and comprises of assessments of the direct, indirect, and secondary impacts of the disaster. The assessment analyzed: (a) "Damage" (direct impact) referring to the impact on assets, stock, and property valued at agreed replacement (not reconstruction) unit prices; (b) "Loss" (indirect impact) referring to flows that will be affected over the time period until the economy and assets have recovered; and (c) "Economic and social effects" (secondary impacts) including macro-economic and fiscal impacts; livelihood, employment, and income impacts; and social impacts. The assessment of damage and losses was derived from the number of damaged units, as reported by various agencies, and an estimation of the cost to replace or repair those units, as determined by experts based on experiences from other assessments in Indonesia and other regions. The assessment of damage and loss provided a basis for determining recovery and reconstruction needs. Estimates were based on information collected by the assessment team during field surveys and those provided by the provincial and district governments.

## Assessed Damages and Losses

Damage and losses in West Sumatra are estimated at Rp 21.6 trillion or US$2.3 billion. Given that West Sumatra accounts for less than 2 percent of national GDP, it was estimated that the earthquake would not have a major impact on the national economy. Impacts to the regional economy was thought to be little bit more pronounced with the estimated reduction in regional growth rate by 0.3 percentage points in 2009 and 1.0 percentage in 2010.

**Table 1: Summary of Damages and Losses in West Sumatra in Rp billion**

| | Disaster effects | | | Ownership | |
|---|---|---|---|---|---|
| | Damage | Losses | Total | Private | Public |
| **Infrastructure** | **16,393.8** | **412.0** | **16,805.8** | **16,326.0** | **479.8** |
| Housing | 15,649.4 | 297.6 | 15,947.0 | 15,947.0 | 0.0 |
| Transport & communications | 327.6 | 28.8 | 356.4 | 61.4 | 295.0 |
| Roads & Bridges | 294.0 | 9.1 | 303.1 | 9.1 | 294.0 |
| Communications | 33.6 | 19.7 | 53.3 | 52.3 | 1.0 |
| Energy | 46.3 | 6.0 | 52.3 | 0.0 | 52.3 |
| Water & sanitation | 370.5 | 79.6 | 450.1 | 317.6 | 132.5 |
| Water supply | 159.9 | 79.6 | 239.5 | 107.0 | 132.5 |
| Sanitation | 210.6 | 0.0 | 210.6 | 210.6 | 0.0 |
| **Social services** | **1,484.1** | **205.0** | **1,689.2** | **1,125.9** | **563.2** |
| Education | 593.8 | 25.0 | 618.8 | 510.0 | 108.8 |
| Health | 569.1 | 175.2 | 744.3 | 308.5 | 435.6 |
| Culture & religion | 304.2 | 3.1 | 307.2 | 300.5 | 6.7 |
| Facilities for the poor | 17.1 | 1.8 | 18.9 | 6.9 | 12.0 |
| **Productive sectors** | **879.7** | **1,565.7** | **2,445.4** | **2,074.1** | **371.3** |
| Agriculture | 56.1 | 223.0 | 279.1 | 207.3 | 71.8 |
| Crops | 5.1 | 146.0 | 151.1 | 151.1 | 0.0 |
| Livestock | 5.2 | 2.0 | 7.2 | 4.4 | 2.8 |
| Fisheries | 6.8 | 49.0 | 55.8 | 51.8 | 4.0 |
| Irrigation | 39.0 | 26.0 | 65.0 | 0.0 | 65.0 |
| Trade | 673.7 | 621.5 | 1,295.2 | 1,246.9 | 48.2 |
| Industry | 10.9 | 114.8 | 125.6 | 125.6 | 0.0 |
| Business & finance | 68.0 | 230.2 | 298.2 | 64.4 | 233.8 |
| Bank | 63.6 | 152.2 | 215.9 | 61.1 | 154.8 |
| Non-bank financial | 4.4 | 78.0 | 82.4 | 3.4 | 79.0 |
| Tourism | 71.0 | 376.3 | 447.3 | 429.8 | 17.4 |
| **Cross-sectoral** | **611.4** | **15.9** | **627.3** | **0.0** | **627.3** |
| Government | 610.8 | 14.8 | 625.6 | 0.0 | 625.6 |
| Environment | 0.6 | 1.1 | 1.7 | 0.0 | 1.7 |
| **Total** | **19,369.0** | **2,198.7** | **21,567.7** | **19,526.0** | **2,041.5** |
| **Total (US$)** | 2,060.5 | 233.9 | 2,294.4 | 2,077.2 | 217.2 |

Damages and losses in Jambi are estimated at Rp 101.2 billion (US$10.6 million) based on early estimates by the district government of Kerinci. Almost 80 percent of all damages and losses in the Western Sumatra were recorded in the infrastructure sectors (including housing), followed by the productive sectors:

- Infrastructure suffered damage and losses estimated at Rp 16.8 trillion or US$ 1.8 billion, primarily the result of damage to housing (over Rp 15 trillion or US$ 1.6 billion), in line with the extent of damage observed in other similar disasters.
- Many government buildings collapsed in Kota Padang and in the other districts causing total damage and losses estimated at Rp 0.6 trillion or US$ 63 million.
- Damage and losses in the productive sectors were estimated at Rp 2.4 trillion or US$ 0.25 million. Among these sectors, the trade and industry sector were the most severely affected.
- Damage and losses in the social sectors were relatively limited, at about Rp 1.7 trillion or US$0.2 billion.

Over 88 percent of all damage and losses are estimated to be private in nature. This is primarily the result of large damage and losses in the housing sector, which is primarily privately owned, and by the fact that many of the productive sectors (trade and industry, tourism, and the financial sector) suffered large losses.

### *Recovery and Reconstruction Needs*

The overall needs to recover and rebuild is estimated at Rp 23 trillion (approximately US$ 2.4 billion). Financial requirements for early to medium term (over 18 months period) are estimated at Rp 3,230 billion (US$343.6 million), while total reconstruction needs are Rp 19,674 billion (US$2,092.9 million) over an estimated period of 24 months.

**Table 2: Total estimated recovery and reconstruction needs**

*Rp billion*

| Sector | Recovery Needs (Rp billion) Description | | Reconstruction Needs (Rp billion) Description | |
|---|---|---|---|---|
| **Public Sector** | | | | |
| Agriculture | Assistance for agricultural recovery | 21.4 | Irrigation systems | 45.4 |
| | Assistance for fisheries recovery | 2.9 | Docks and ponds | 3.0 |
| Industry and Trade | | | Public markets | 500.0 |
| Housing | Contribution of Govt for housing rehabilitation | 2,975.2 | | |
| Health | Treatment cost of injured (physical and psychological) | 7.5 | Health Facilities | 416.6 |
| Education | Provision of temporary schools | 25 | Education Facilities | 1,273.4 |
| Transport and Communications | Re-opening of road traffic | 5 | Roads and Bridges | 417.5 |
| | | | Telecommunications Systems | 1.3 |
| Water and Sanitation sector | | | Water and sanitation systems | |
| Electricity sector | | | Electrical sector | 64.1 |
| Government Administration | Demolition and debris removal in buildings | 14.8 | Government buildings | 729.9 |
| Religion and Culture | | | Religious sites | 7.5 |
| Facilities for the poor | | | Facilities for the poor | 13.4 |
| Environment | | | Rehabilitation of environmental services | 11.6 |
| **Total Public Sector** | | **3,051.8** | | **4,034.5** |
| **Private Contributions** | | | | |
| Industry and Trade | Credit lines for medium industries capitalization | 17.2 | Reconstruction shops and small industry | 117.0 |
| | Grants for capitalization of micro-trade enterprises | 79.1 | | |
| | Credit lines for SMEs in trade sector | 82.2 | | |
| Housing | | | Housing reconstruction | 14,900.0 |
| Health | | | Health Facilities | 277.8 |
| Religion and Culture | | | Religious sites | 336.6 |
| Facilities for the poor | | | Facilities for the poor | 7.7 |
| **Total Private Sector** | | **178.5** | | **15,639.1** |
| **TOTAL** | | **3,230.3** | | **19,673.6** |

Based on the survey, and government's past experiences of handing reconstruction programs, the assessment recommended the use of community-driven approaches to rebuild housing, community infrastructure, irrigation systems, schools and health centers where appropriate, bearing in mind that some badly affected communities may not have the capacity to carry out such activities and a different approach may be necessary. Following principles were also adopted:

- Wherever possible, existing channels and programs should be utilized.
- Ensure that policy responses and programs respect the local cultures.
- Wherever possible, common standards and approaches should be adopted.

**Figure 3: Debris removal after the earthquake**

In the housing sector, which accounts for around 78 percent of all needs, the Government adopted a policy of assistance for the rebuilding of housing (providing Rp 15 million or US$ 1,597 for destroyed or badly damaged housing, Rp 10 million or US$ 1,064 for medium-damaged housing and a maximum of Rp 1 million or US$ 106 for lightly damaged housing). Recovery and reconstruction program covered public and social buildings and facilities including schools, health centers, and places of worship as well as Infrastructure and environment programs (such as roads, energy, and irrigation). Detailed technical assessment of all education facilities was also suggested to ensure safety in future earthquakes, followed by a rehabilitation and reconstruction program based on community-based school construction.

### *Disaster Risk Reduction Priorities*

The assessment stressed the need to integrate disaster mitigation and preparedness into the relief, rehabilitation and development process to reduce vulnerabilities in the community. A Disaster Risk Reduction (DRR) strategy was recommended that reduces risks through rebuilding of livelihood and by promoting and implementing risk reduction measures. Following measures were suggested:

- Promote hazard-resilient construction for new buildings, especially schools and health centers, and the enforcement of strict building standards, especially for critical infrastructure.
- Address the existing issue of hazardous buildings, starting first with seismic retro-fitting of school buildings, health centers and key government buildings.
- Allocate resources and use risk and vulnerability assessments in spatial planning and the planning of new infrastructure and facilities.
- Strengthen the capacity of local government institutions to protect ecosystems that can serve towards reducing disaster risks and combating environmental degradation.
- Develop an effective tsunami warning and evacuation plan, including public education regarding evacuation routes.

**Figure 4: Earthquake resistant building construction is required to reduce future damages**