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# West Sumatra and Jambi Natural Disasters: Damage, Loss and Preliminary Needs Assessment

A joint report by the BNPB, Bappenas, and the Provincial and District/City Governments of West Sumatra and Jambi and international partners, October 2009

## BADAN NASIONAL PENANGGULANGAN BENCANA

The two consecutive earthquakes that hit the provinces of West Sumatra and Jambi on 30 September and 1 October caused widespread damage across the provinces killing over 1,100 people, destroying livelihoods and disrupting economic activity and social conditions. Resulting landslides left scores of houses and villages buried, whilst disrupting power and communication for days. The first of these events was felt throughout Sumatra and Java, in Indonesia, and in neighboring Malaysia, Singapore and Thailand.

The Government of Indonesia responded immediately by declaring a one-month emergency phase, providing emergency relief funds with a promise of more to follow, and indicating that it welcomed international assistance. In addition, tents, blankets, food, medical personnel, emergency clean water facilities and toilets were provided during the immediate response. The armed forces were also engaged in search and rescue operations and delivering relief aid. National partners, including the Indonesian Red Cross, engaged immediately in emergency response efforts.

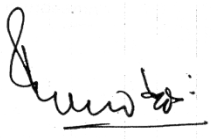
This report describes the human loss, assessment of the damage to physical assets, the subsequent losses sustained across all economic activities, and the impact of the disaster on the provincial and national economies. It also provides the baseline data against which recovery and reconstruction plans can be designed, and progress can be monitored.

The comprehensive assessment was undertaken from 9 to 17 October 2009 using the international standard methodology for measuring disasters, which has been adopted for several years now within Indonesia. Estimates were based on information collected by the assessment team during field surveys and on valuable information collected and provided by the provincial and district governments.

Indonesia's leaders have already expressed their guiding principles for recovery, reconstruction and rehabilitation which, if adhered to, should ensure that reconstruction is effective, equitable and efficient, whilst respecting the unique local cultures and traditions in the affected areas.

This report was prepared by the Government's National Disaster Management Agency (BNPB), and in close consultation with the National Development Planning Agency (Bappenas), provincial and district governments of West Sumatra and Jambi, national line ministries and international partners. The findings of the report will serve as a sound basis to make informed decisions and, more critically, help the people of West Sumatra and Jambi to rebuild their lives.

Jakarta, 30 October 2009
Primary Secretary BNPB



**Drs. Purnomo Sidik**

# Foreword

This report presents the assessment of the damage, losses and human recovery needs resulting from the earthquakes in West Sumatra and Jambi. It has been prepared by a multi-disciplinary team led by BNPB with participation from Bappenas, line ministries, and provincial and local governments with support from international partners.

The damage, loss and preliminary needs assessment was carried out using method developed by Economic Commission for Latin America and Caribbean (ECLAC) which has been adjusted to Indonesian conditions. This methodology is internationally accepted to measure the impact of disasters and comprises of assessments of the direct, indirect, and secondary impacts of the disaster. The damage, loss and preliminary needs assessment will be used as a basis to design the rehabilitation and reconstruction program. The data and input used for this assessment comes from the BNPB, the BPBD of West Sumatra and Jambi provinces, the Bappeda of West Sumatra and Jambi provinces, and other provincial and local government agencies.

The assessment of damage and losses is 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. This report will become a basis for a more detailed and comprehensive Post-Disaster Needs Assessment (PDNA) and used for calculating financing needs and budgetary requirements.

The subsequent challenge is to ensure that the rehabilitation and reconstruction process in the West Sumatra and Jambi provinces introduces disaster risk reduction measures to mitigate damage and losses from future disasters.

We would like to express our sincere appreciation to all parties that have assisted BNPB in preparing this report.

Jakarta, 30 October 2009

Deputy Chief for Rehabilitation and Reconstruction, BNPB

**Ir. Bakri Beck, MMA**

# Acknowledgments

The Government of Indonesia wishes to express its sincere appreciation to the many men and women who made this assessment possible. This report was prepared 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 as well as the governments of affected districts, without which this report would not have been possible.

The assessment team was guided and led by a cross-agency group, comprising Ir. Bakri Beck MMA, (Deputy Head, Rehabilitation and Reconstruction, BNPB), Drs.Bambang Sulistianto, MM, (Director for Physical Recovery and Improvement, BNPB), Drg. Maria Sidang Doky, (Director for Economic Recovery and Improvement, BNPB), Drs. R. Sugiharto, MM, (Director for Refugee Management, BNPB), Ir. Adhy Duriat Soemono, Dipl HE (Director of Damage Assessment, BNPB), Ir. Medi Herlianto, CES (Head of Sub Directorate for Damage Inventory BNPB), Dr. Ir. Suprayoga Hadi (Director for Special Area and Disadvantaged Region, Bappenas), Governor Gamawan Fauzi (West Sumatra), and Dr. Ir. Bambang Istijono, ME (Head of the West Sumatra Planning and Development Board (Bappeda)).

Support for the assessment was provided by a team of technical experts from several multilateral and bilateral agencies, including the Asian Development Bank (ADB), the Australian Agency for International Development (AusAID), the International Finance Corporation (IFC), the United Nations Development Programme, which coordinated efforts from other UN agencies, and the World Bank.

Financial support for this assessment was provided by the Global Facility for Disaster Reduction and Recovery (GFDRR). The Government of Indonesia, the United Nations and World Bank would like to thank Government of the Commonwealth of Australia and the European Commission for their generous support to the GFDRR in carrying out the damage, loss and preliminary needs assessment in West Sumatra and Jambi provinces. Since its establishment in September 2006, GFDRR has evolved into a partnership of 25 countries, regional and international organizations that are committed to helping developing countries reduce their vulnerability to natural hazards and adapt to climate change.

GFDRR works to protect livelihoods and improve lives, and special thank and appreciation are also extended to the Secretariat of the African, Caribbean and Pacific Group of States (ACP), Australia, Belgium, Brazil, Canada, Denmark, European Commission, Finland, France, Germany, India, Ireland, Italy, Japan, Luxembourg, The Netherlands, Norway, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States, UN International Strategy for Disaster Reduction, and The World Bank.

Photographs used in this publication were taken by the assessment team unless otherwise indicated. To all of these contributors the team would like to express their deepest thanks and appreciation. Any follow-up questions, or request for additional information should be directed Adhy Duriat (adhy_drt@bnpb.go.id), Suprayoga Hadi (suprayoga@bappenas.go.id) or Enrique Blanco Armas (eblancoarmas@worldbank.org).

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# Glossary of Terms

| | |
|---|---|
| 3G | 3rd generation telecommunications |
| *Adat* | Traditional customs |
| ADB | Asian Development Bank |
| APBD | Provincial and District Budget (Anggaran Pendapatan dan Belanja Daerah) |
| APBD-P | Revised Provincial and District Budget (Perubahan Anggaran Pendapatan dan Belanja Daerah) |
| ATM | Automated Teller Machine |
| AusAID | Australian Agency for International Development |
| Balai | Hall |
| Bapedalda | District Environment Impact Management Agency (Badan Pengendalian Dampak Lingkungan Daerah) |
| Bappeda | Development Planning Agency at Sub-National Level (Badan Perencanaan Pembangunan Daerah) |
| Bappenas | National Development Planning Agency (Badan Perencanaan Pembangunan Nasional) |
| BI | Bank Indonesia |
| BKSDA | Forestry's Forest Conservation Unit (Balai Konservasi Sumber Daya Alam) |
| BMKG | Indonesian Meterological, Climotological and Geophysical Agency |
| BNPB | National Disaster Management Agency (Badan Nasional Penanggulangan Bencana) |
| BOP | Balance of payments |
| BPBP | Aquaculture Development Center (Balai Pengembangan Budidaya Perikanan) |
| BPD | Regional Development Bank (Bank Pembangunan Daerah) |
| BPN | National Land Agency (Badan Pertanahan Nasional) |
| BPR | Rural Credit Bank (Bank Pembangunan Rural) |
| BPS | National Statistics Bureau (Badan Pusat Statistik) |
| *Bunda kandung* | Birth Mother |
| *Bupati* | Regent, district head |
| CDMA | Radio channel access method (Code Division Multiple Access) |
| CEO | Chief Executive Officer |
| CGI | Consultative Group on Indonesia |
| DAK | Special Allocation Fund (*dana alokasi khusus)* |
| DALA | Damage and Loss Assessment |
| DAU | General Allocation Grant (*dana alokasi umum*) |
| DfID | UK Department for International Development |
| DiBI | Indonesian Disaster Information and Data (Data dan Informasi Bencana Indonesia) |
| Dinas | Provincial or District Government Office |
| DPKAD | Department of Finance and Asset Management (Dinas Pengelolaan Keuangan dan Asset Daerah) |
| DPRD | Provincial Representatives Council (Dewan Perwakilan Rakyat Daerah) |
| DRM | Disaster Risk Management |
| DRR | Disaster Risk Reduction |
| *Dusun* | Hamlet |
| ECLAC | United Nations Economic Commission for Latin America and the Caribbean |

| | |
|---|---|
| EIA | Environment Impact Assessment |
| FAO | Food and Agriculture Organization |
| FGD | Focus Group Discussions |
| FY | Financial Year |
| GDP | Gross Domestic Product |
| GFDRR | Global Facility for Disaster Risk Reduction |
| GWh | Gigawatt hours |
| GIS | Geographic Information Systems (Sistem Informasi Geografis) |
| *Gotong royong* | Mutual cooperation |
| GRDP | Gross Regional Domestic Product |
| GSM | Global System for Mobile communications |
| ha | hectare |
| *Hajj* | Haj |
| HRNA | Human Recovery Needs Assessment |
| IDP | Internally Displaced Persons |
| INGO | International Non-Government Organization |
| IFC | International Finance Corporation |
| IMR | Infant Mortality Rate |
| IPP | Independent Power Producer |
| ITB | Bandung Institute of Technology |
| Kab. | *Kabupaten* |
| *Kabupaten* | District |
| KAN | Village Customary Deliberation Councils (Kerapatan Adat Nagari) |
| *Kelurahan* | Administrative Urban Sub-District (lower level of government administrative unit in a *kota*) |
| *Kecamatan* | Sub-District |
| KII | Key Informant Interviews |
| km | kilometer |
| *Korong* | Sub-village |
| *Kota* | Urban District |
| kV | kilovolt |
| kW | kilowatt |
| kWh | kilowatt hour |
| *Langgar* | Prayer room |
| *Losmen* | Guest house |
| *Madrasah* | Islamic School |
| MoHA | Ministry of Home Affairs |
| MoNE | Ministry of National Education |
| MoRA | Ministry of Religious Affairs |
| MPW | Ministry of Public Works |
| MSE | Micro and small enterprises |
| MSME | Micro, small and medium enterprises |
| MW | Megawatt |
| *Nagari* | Traditional Menang Administrative Unit (comprising several villages) |
| NAP-DRR | National action plan for disaster risk reduction |
| NBFI | Non-Bank Financial Institution |
| NBFS | Non-Bank Financial Sector |
| NEIC | US National Earthquake Information Center |

| | |
|---|---|
| NGO | Non-government organization |
| *Ninik mamak* | Female Elder |
| NPL | Non-Performing Loan |
| NPV | Net present value |
| OCHA | United Nations Office for the Coordination of Humanitarian Affairs |
| PBI | Bank Indonesia Regulation (Peraturan Bank Indonesia) |
| PDAM | State-owned water enterprises (Perusahaan Daerah Air) |
| Perda | Government regulations on disasters () |
| PLN | State-owned electricity company (Perusahaan Listrik Negara) |
| PNPM Mandiri | National Program for Community Empowerment (Program Nasional Pemberdayaan Masyarakat Mandiri) |
| Polindes | Village polyclinics |
| Polri | Indonesian Police Force (Kepolisian Negara Republik Indonesia) |
| *Pondok pesantren* | Boarding school |
| PPN | Value Added Tax (Pajak Pertambahan Nilai) |
| PSDA | Water Resources Management Agency (Pengelolaan Sumber Daya Air) |
| PT | Limited liability company (Perseroan Terbatas) |
| *Pura* | Hindi temple |
| Puskesmas | Health Center at Sub-District Level (Pusat Kesehatan Masyarakat) |
| RC/HC | United Nations Resident Coordinator / Humanitarian Coordinator |
| Rp | Indonesian Rupiah |
| RPJM | Central Government's Medium-Term Development Plan (Rencana Pembangunan Jangka Menengah) |
| RPJMD | Medium-Term Development Plan at Sub-National Level (Rencana Pembangunan Jangka Menengah Daerah) |
| *Rumah gadang* | Traditional house |
| Sakernas | National Labour Force Survey (Survai Tenaga Kerja Nasional) |
| SAR | Search and Rescue |
| Satlak | Response Agency (Satuan Pelaksana) |
| Satkorlak | Disaster Response Agency at Sub-National Level (Satuan Koordinasi Pelaksana) |
| SDKI | Demographic Health Survey of Indonesia (Survei Demografi Kesehatan Indonesia) |
| SIM | Subscriber Identity Module - memory chip used in handphones |
| SME | Small- and medium-sized enterprises |
| SMS | Short Messaging Service |
| *Surau* | Prayer room |
| Susenas | National household expenditure survey |
| TA | Technical assistance |
| *Tanah ulayat* | Traditional Communal Land |
| Telkom | State-Owned Telecommunications Company |
| TNI | Indonesian Armed Forces (Tentara Nasional Indonesia) |
| *Tunganai / tungganai* | Male Elder |
| UN | United Nations |
| UNDAC | United Nations Disaster Assessment and Coordination Team |
| UNDP | United Nations Development Programme |
| Unesco | United Nations |
| UNFPA | United Nations Population Fund |

| | |
|---|---|
| Unicef | United Nations Children's Fund |
| UPTD | Dinas Technical Implementation Unit (Unit Pelaksana Teknis Dinas) |
| US$ | United States dollars |
| USGS | United States Geological Survey |
| *Vihara* | Buddhist temple |
| VSAT | Ground satellite station (Very Small Aperture Terminal) |
| VSI | Volcanological Survey of Indonesia |
| *Warung* | Food stall |
| WHO | World Health Organization |
| *Wisma* | Homestead |
| XL | Telecommunications operator |
| YoY | Year-on-Year |

# Executive Summary

# Executive Summary

**On 30 September 2009, a powerful magnitude 7.6 earthquake struck West Sumatra province.** Damage was widespread, affecting 13 out of 19 districts and killing over 1,100 people. The worst affected districts are the cities of Padang and Pariaman (Kota Padang and Kota Pariaman), as well as the district of Padang Pariaman (Kabupaten Padang Pariaman). Historical data on seismic activity over the past 200 years show that West Sumatra is particularly prone to earthquakes, due to its location at the convergence zone of four major tectonic plates. The geology of the region combined with densely populated settlements in zones of higher ground amplification help to explain the vast destruction of the earthquake, both in terms of lives lost and material damage and losses.

**Damage and losses in West Sumatra are estimated at Rp 21.6 trillion, equivalent to about US$2.3 billion.** Almost 80 percent of all damage and losses are recorded in the infrastructure sectors (including housing), followed by the productive sectors with 11 percent. In line with similar disasters, housing is the worst affected sector, with damage and losses estimated at over Rp 15 trillion. In the productive sectors, trade is the worst affected, reflecting the fact that Kota Padang, a major trading hub in the region, was badly affected by the disaster.

**Over 88 percent of all damage and losses are of a private 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. The private sector also plays a significant role in the provision of health and education services.

**Many government buildings collapsed in Kota Padang and in the other districts causing total damage and losses estimated at Rp 0.6 trillion.** The destruction of many government buildings paralyzed government services in the immediate aftermath of the earthquake. Two weeks later essential public services at the provincial and district level have been restored. In many instances services are being provided in tents and temporary offices, which is resulting in delays particularly in the provision of services at the *nagari* level. Implementation of existing government development plans is likely to be disrupted for the remainder of the year and administrative procedures for budget reallocations may prevent local governments from restructuring their programs in a timely manner. Local government will need to identify physical spaces to maintain an adequate level of public services. The capacity of local governments needs to be strengthened in a number of areas to cope with increasing responsibilities in the reconstruction effort.

**Infrastructure suffered damage and losses estimated at Rp 16.8 trillion, primarily the result of damage to housing, in line with the extent of damage observed in other similar disasters**. About 31 percent of the total housing stock in the affected districts has been either destroyed or damaged in some way, amounting to about 115,000 houses destroyed and over 135,000 houses damaged. The reconstruction of housing should be based on compliance with existing building standards, including accurate hazard maps to identify risk areas that may not be appropriate for building. Damage to transport infrastructure is relatively limited and concentrated in roads and bridges. Most roads were accessible after a few days, although transport may be slower due to repair work in many areas. Key roads in mountainous areas that are threatened by landslides will require extensive and immediate construction to remediate. The water and sanitation sector suffered severe losses, estimated at almost Rp 0.5 trillion, affecting both the publicly owned utilities (PDAMs) as

well as private and community water sources. A large number of households suffered disruptions in the supply of water for several weeks, and a month after the disaster the supply has not been fully restored. The sanitation sector has suffered different degrees of damage, increasing the risk of contamination of water sources due to their close proximity.

**Damage and losses in the social sectors are relatively limited, at about Rp 1.7 trillion.** Many education and health facilities in the province are damaged, Kota Padang and Kab. Pariaman being the worst affected areas. The health and education sectors each account for about 40 percent of damage and losses in the social sectors, with the remaining 20 percent being sustained by religious and cultural facilities, as well as facilities for the poor and vulnerable. Over 50 percent of the damage and losses are of a private nature, driven by the damage caused to mosques and other religious buildings but also to private education and health facilities. Transitory arrangements have allowed the resumption of public services in the education and health sectors, although there are concerns regarding the quality of services being provided in such difficult conditions. Preliminary assessments of damage show that it was often caused by relatively weak structures that failed to withstand the force of the earthquake. Going forward, it will be important to ensure that schools and health facilities are built in accordance with seismic building standrads.

**The earthquake had a significant impact on the productive sectors with damage and losses amounting to an estimated Rp 2.4 trillion.** Among these sectors, the trade and industry sector has been the most severely affected. The earthquake has disrupted thousands of small- and medium-sized enterprises (SMEs), mainly located in the urban areas of Kota Padang and Kab. Pariaman, while the larger enterprises have suffered relatively lightly. Many traditional and modern markets sustained significant damages. More than 70 percent of the hotel facilities in Kota Padang have been damaged or destroyed. Most tourism-related businesses have suffered from a decline in tourist arrivals following the earthquake. The finance sector has also suffered significantly: more than 2,000 borrowers are affected and a portion of the loan portfolios of the banking institutions are expected to become non-performing. However, the earthquake had less of an impact on the agriculture sector, although damage to irrigation systems and fishponds has affected the livelihoods of many rural and coastal households. The recovery in the trade and industry and tourism sectors will pose a significant challenge. Targeted assistance will be required to help SMEs within these sectors to resume their businesses and for many rural and coastal communities where families have sustained significant damage to their houses and productive assets so that they have the resources to restart their livelihood activities.

**At the macro level, the disaster is likely to have only a limited impact on the region's economy.** The earthquake will not have a major impact on the national economy, given that West Sumatra accounts for less than 2 percent of national GDP. Similarly, it will not have a significant impact on other macroeconomic fundamentals, such as the balance of payments or the fiscal deficit. At the regional level, the impact is likely to be more pronounced, although initial estimates also show a limited impact on the region's economy, lowering GRDP growth by 0.3 percentage points in 2009 and 1.0 percentage in 2010. The disaster may have a significant impact in terms of revenues collected by the districts and the province. Own-source revenues account for 43 percent of the province's total revenue and 13 percent in Kota Padang. The nature of this revenue (e.g. property and vehicle taxes) suggests a significant reduction in revenues at the provincial and district levels at a time when resources are most urgently needed to cope with the disaster. Appropriate mechanisms should be put in place through fiscal transfers and deficit financing to allow local governments to respond more effectively to the disaster.

**On average, the negative impact on employment is likely to be limited, as has been observed in other post-earthquake situations.** Preliminary estimates project a decline in employment of 41,000 people, particularly in the trade and industry and tourism sectors. This relatively limited impact at the macro level is likely to go hand in hand with a deterioration of welfare in the worst affected populations and economic sectors. The poverty level in the province is projected to increase by 1.5 percentage points to almost 10.8 percent in 2010, reversing the progress made over the past few years. The impact is likely to be localized, and particular attention should be paid to the poor and vulnerable in the worst affected districts, since coping mechanisms at the community level will be put under stress given that the destruction and job and income losses are concentrated in certain locations.

**Assisting affected communities to meet basic needs, such as food, shelter and water is a priority in the early recovery phase.** This is to a large extent being accomplished already. A survey conducted shortly after the disaster at the community level provides invaluable information about the needs of communities for the early recovery phase. At the community level, the availability of water and temporary shelter are highlighted as priority areas for government intervention in the immediate short term. Loss of livelihoods and jobs were also expressed as key concerns by the community. The next phase of the recovery period should ensure the normal functioning of public services at all government levels, including schools and health centers. This should be combined with the provision of temporary accommodation for those affected by the disaster, as well as targeted assistance to victims that have lost their livelihoods, e.g. through interim income generating activities. The reconstruction of transport, infrastructure, and housing, as well as economic recovery, will be part of the Government's reconstruction action plan for the region.

**The overall needs to rebuild the province are estimated at Rp 23 trillion, with the government's shared estimated at Rp 7.1 trillion.** The National Disaster Management Agency or Badan Nasional Penanggulangan Bencana (BNPB) will lead in coordinating and facilitating the recovery, reconstruction and rehabilitation, while implementation of the recovery program will be led by the provincial governments in West Sumatra and Jambi. After the emergency phase, the Government has committed to assisting affected communities in the early recovery phase, while at the same time starting the reconstruction and rehabilitation efforts of the region. Preliminary needs assessments recommend 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. The delivery of assistance should address the specific needs of particularly vulnerable groups, such as children, the elderly and families without the social protection associated with traditional kinship ties.

**In the housing sector, which accounts for around 78 percent of all needs, the Government has adopted a policy of assistance for the rebuilding of housing**. This assistance will provide Rp 15 million for destroyed or badly damaged housing, Rp 10 million for medium-damaged housing and a maximum of Rp 1 million for lightly damaged housing. However, this may prove to be insufficient to ensure that the rehabilitation of houses damaged or destroyed by the earthquake achieves seismic resistant compliance. The private sector has been badly hit, in particular the trade and industry and tourism sectors. The disaster will, at a minimum, affect the jobs and livelihoods of many people in the affected districts in a transitory manner. Although the Government is not obliged to compensate the private sector for damage and losses suffered as a result of the earthquake it still has an important role to play in facilitating the recovery of the private sector, as well as in

providing direct assistance to farmers, fishermen and small entrepreneurs who have lost their capital and may not be able to cope with the shock on their own.

**The West Sumatra earthquake was followed by a magnitude 7.0 earthquake the next day in Jambi province**. Damage in Jambi has been concentrated in Kab. Kerinci and damage and losses arising from this disaster are relatively limited. Three people are reported dead, with damage and losses estimated at slightly over Rp 100 billion. As in the case of West Sumatra, a large share of the damage is to housing, with little information is yet available on damage to infrastructure and the productive sectors. This is the fourth major earthquake to hit Jambi in the past 15 years, suggesting a significant need to focus on improving the resilience of the province to such disasters in the future.

**Government efforts should improve the region's preparedness to face similar disasters in the future.** These are unlikely to be the last earthquakes to affect the region, given both its history and the recognition that its location is in an area that is prone to seismic activity. The region needs to prepare itself better for future disasters. This will entail efforts at all government levels to become more resilient to such events in the future, as well as to be able to respond quickly and effectively when such events occur. In 2007, the Government passed Disaster Management Law No. 24, which provides the foundations for the development of the Indonesian disaster risk management system, including the establishment of the BNPB. One of the fundamentals of a good recovery process is to integrate disaster mitigation and preparedness into the relief, rehabilitation and development process to reduce vulnerabilities in the community. Disaster Risk Reduction (DRR) measures for recovery, reconstruction and rehabilitation represent a holistic approach for fine-tuning development processes through prevention, mitigation and preparedness combined with post-disaster response activities.

**One of the most urgent DRR measures needed in West Sumatra is an effective tsunami warning and evacuation plan, including public education regarding evacuation routes**. This is all the more important given that some seismologists believe that the potential remains for an even larger earthquake to strike West Sumatra, possibly with a magnitude of up to 8.5. The likelihood of such a major earthquake triggering a tsunami is high, and therefore reconstruction and rehabilitation should be undertaken with this possibility in mind.

**A reconstruction strategy that reduces risks should entail the rebuilding of livelihoods, as well as efforts to promote and implement risk reduction measures in the reconstruction and rehabilitation effort.** In practical terms, rebuilding livelihoods translates into a coordinated approach to provide income-generating activities for affected communities, which often take the form of cash transfer programs, cash-for-work or micro-finance activities. Measures to reduce the risks of disasters include the promotion of hazard-resilient construction for new buildings, especially schools and health centers, and the enforcement of strict building standards, especially for critical infrastructure. In addition, effective DRR requires addressing the existing issue of hazardous buildings, starting first with seismic retro-fitting of school buildings, health centers and key government buildings. Recognition of the importance of a DRR strategy should result in the elevation of DRR as a policy priority with the corresponding allocation of resources and using risk and vulnerability assessments in spatial planning and the planning of new infrastructure and facilities. The insurance industry can also play an important role by ensuring that insurance premiums properly reflect the risks of poor construction or non-compliance in insured buildings. Also important is the need to strengthen the capacity of local government institutions to protect

ecosystems that can serve towards reducing disaster risks and combating environmental degradation that can amplify disaster risks.

# Ringkasan Eksekutif

**Pada tanggal 30 September 2009, gempa yang berkekuatan 7.6 mengguncang Propinsi Sumatera Barat.** Kerusakan yang terjadi akibat gempa ini tersebar di 13 dari 19 kabupaten/kota dan memakan korban jiwa lebih dari 1.100 orang. Daerah yang terkena dampak paling parah adalah Kota Padang, Kota Pariaman serta Kab. Padang Pariaman. Data historis yang mencatat kegiatan seismik selama 200 tahun kebelakang memperlihatkan bahwa Sumatera Barat sangat rawan terhadap gempa, berkaitan dengan lokasinya yang terletak pada zona pertemuan dari empat lempengan tektonik yang besar. Struktur geologi daerah ditambah dengan pemukiman penduduk yang padat di zona amplifikasi gempa yang lebih tinggi membantu menjelaskan kerusakan besar akibat gempa bumi, baik dalam hal korban jiwa maupun kerusakan dan kerugian secara material.

**Kerusakan dan kerugian di Sumatera Barat diperkirakan mencapai Rp 21.6 trilliun atau setara dengan US$ 2.3 milyar.** Hampir 80 persen dari kerusakan dan kerugian terjadi pada sektor infrastuktur (termasuk perumahan), diikuti oleh sektor produktif dengan 11 persen. Sama halnya dengan bencana lain yang sejenis, perumahan merupakan sektor yang terkena dampak paling parah, dengan kerusakan dan kerugian bernilai lebih dari Rp 15 trilliun. Dalam sektor produktif, perdagangan mengalami dampak terbesar, mencerminkan fakta bahwa Kota Padang, yang merupakan pusat perdagangan besar di propinsi, terkena dampak yang parah akibat bencana.

**Lebih dari 88 persen dari keseluruhan kerusakan dan kerugian terjadi pada kepemilikan swasta**. Hal ini terutama disebabkan oleh besarnya kerusakan dan kerugian pada sektor perumahan yang dimiliki swasta dan diakibatkan oleh kenyataan bahwa sektor produktif (perdagangan, pariwisata, serta keuangan) mengalami kerugian yang besar. Sektor swasta juga memainkan peranan penting dalam jasa pelayanan kesehatan dan pendidikan.

**Terdapat banyak gedung pemerintahan yang runtuh baik di Kota Padang maupun di kabupaten/kota lainnya yang menyebabkan jumlah kerusakan dan kerugian diperkirakan sekitar Rp 0.6 trilliun.** Kerusakan di banyak gedung pemerintahan melumpuhkan kegiatan pemerintah segera setelah gempa bumi terjadi. Dua minggu kemudian, pelayanan publik utama pada tingkat propinsi dan kabupaten/kota umumnya telah pulih. Dalam banyak kejadian, pelayanan publik oleh pemerintah banyak dilakukan di tenda dan kantor sementara, yang menyebabkan terhambatnya pelayananan yang diberikan oleh pemerintah terutama pada tingkat Nagari. Pelaksanaan dari rencana pembangunan pemerintah saat ini kemungkinan terganggu untuk sisa tahun anggaran yang ada dan prosedur administrasi untuk realokasi anggaran dapat menghambat pemerintah daerah dalam merestrukturisasi program mereka dalam waktu yang singkat. Pemerintah daerah perlu mengidentifikasi ruangan fisik untuk mempertahankan tingkat pelayanan publik. Kapasitas pemerintah daerah perlu diperkuat dalam beberapa bidang untuk dapat mengatasi tanggungjawab yang meningkat dalam upaya rekonstruksi.

**Infrastruktur mengalami kerusakan dan kerugian senilai RP 16.8 trilliun, terutama disebabkan oleh kerusakan pada perumahan, seperti yang diamati dalam bencana lain.** Sekitar 31 persen dari keseluruhan stok perumahan di daerah yang terkena dampak hancur atau rusak dengan keparahan tertentu, sekitar 115,000 rumah hancur dan lebih dari 135,000 rumah rusak. Rekonstruksi untuk sektor perumahan harus mengikuti standar yang ada untuk pembangunan, termasuk penggunaan peta kerawanan yang akurat untuk mengidentifikasi area beresiko yang

mungkin tidak tepat untuk mendirikan bangunan. Kerusakan untuk infrastruktur perhubungan relatif lebih terbatas dan terkonsentrasi pada jalan dan jembatan. Kebanyakan jalan dapat dilalui setelah beberapa hari, meskipun kendaraan akan melaju lebih lambat dikarenakan perbaikan di banyak tempat. Jalan-jalan utama di daerah perbukitan rawan terhadap tanah longsor dan membutuhkan konstruksi perbaikan secara ekstensif. Sektor air dan sanitasi mengalami kerugian yang cukup parah, bernilai hampir Rp 0.5 trilliun, mempengaruhi baik fasilitas pemerintah (PDAM) maupun swasta dan sumber air masyarakat. Sejumlah besar masyarakat mengalami gangguan ketersediaan air selama beberapa minggu, dan hampir sebulan setelah kejadian pengadaan air belum pulih sepenuhnya. Sektor sanitasi mengalami berbagai tingkat kerusakan, meningkatkan resiko kontaminasi untuk sumber air berdasarkan jarak kedekatannya.

**Kerusakan dan kerugian pada sektor sosial relatif lebih terbatas sebesar Rp 1.5 trilliun.** Terdapat banyak fasilitas pendidikan dan kesehatan yang rusak di seluruh propinsi, dengan Kota Padang dan Kabupaten Pariaman sebagai daerah yang mengalami kerusakan terparah. Sektor kesehatan dan pendidikan mengalami masing-masing 40 persen dari keseluruhan kerusakan dan kerugian dalam sektor sosial ini, selebihnya berasal dari sektor keagamaan dan fasilitas untuk masyarakat rentan dan miskin. Lebih dari 50 persen dari kerusakan dan kerugian dialami oleh kepemilikan swasta, didorong oleh kerusakan yang dialami pada bangunan mesjid dan bangunan keagamaan lainnya dan juga oleh fasilitas pendidikan dan kesehatan swasta. Pengaturan sementara telah membuat pelayanan publik pada sektor pendidikan dan kesehatan berfungsi kembali, meskipun terdapat kekuatiran atas kualitas pelayanan yang diberikan pada kondisi sulit seperti sekarang ini. Penilaian sementara atas kerusakan menunjukkan bahwa struktur bangunan yang relatif lemah dan tidak dirancang untuk tahan gempa menyebabkan banyaknya kerusakan. Kedepannya, adalah penting untuk memastikan fasilitas pendidikan dan kesehatan dibangun sesuai dengan standar bangunan aman gempa.

**Gempa bumi memberikan dampak yang signifikan pada sektor produktif dengan kerusakan dan kerugian mencapai total Rp 2.4 trilliun.** Dalam sektor ini, perdagangan dan industri mengalami dampak terparah. Gempa yang terjadi telah mengacaukan ribuan usaha kecil dan menengah (UKM), yang umumnya beralokasi di daerah perkotaan di Kota Padang dan Kab. Pariaman, sementara perusahaan-perusahaan besar mengalami kerusakan yang relatif lebih kecil. Banyak pasar tradisional dan modern mengalami kerusakan parah. Lebih dari 70 persen dari bangunan hotel di Kota Padang rusak dan hancur. Selain itu, banyak usaha yang berkaitan dengan pariwisata mengalami penurunan jumlah wisatawan setelah gempa bumi terjadi. Sektor keuangan juga mengalami dampak yang signifikan: lebih dari 2,000 peminjam terkena dampak dan sebagian dari portofolio pinjaman di lembaga perbankan diperkirakan menjadi kredit macet. Gempa bumi, akan tetapi, memberikan dampak yang lebih kecil untuk sektor pertanian, walaupun kerusakan untuk infrastruktur seperti sistem irigasi dan tambak ikan mempengaruhi mata pencaharian penduduk di desa dan pesisir. Pemulihan di sektor perdagangan dan pariwisata akan menghadapi tantangan yang berat. Bantuan yang sesuai sasaran akan dibutuhkan untuk membantu UKM memulai kembali usaha mereka dan untuk masyarakat pedesaan dan pesisir yang mana keluarganya mengalami kerusakan yang signifikan atas rumah dan aset produktif agar mempunyai sumber daya untuk memulai kembali kegiatan pencaharian mereka.

**Pada tingkat makro, bencana yang terjadi kemungkinan besar akan memberikan dampak yang terbatas pada ekonomi daerah.** Gempa bumi di Sumatera Barat tidak akan mempengaruhi perekonomian nasional, dikarenakan perekonomian propinsi tersebut bernilai kurang dari 2 persen dari total PDB nasional. Sama halnya, gempa tidak akan memberikan pengaruh besar pada dasar-

dasar makro ekonomi lainnya seperti neraca pembayaran atau defisit fiskal. Pada tingkat daerah, dampaknya sedikit lebih terlihat, meskipun perkiraan awal juga menunjukkan dampak yang terbatas pada perekonomian daerah, yang menurunkan pertumbuhan PDB daerah sebesar 0.3 persen pada tahun 2009 dan 1.0 persen pada tahun 2010. Bencana yang terjadi kemungkinan memberikan dampak yang besar terhadap pendapatan kabupaten/kota dan propinsi. Pendapatan asli daerah berkontribusi sebesar 43 persen dari total pendapatan propinsi dan 13 persen di Kota Padang. Sifat pendapatan ini (contohnya pajak bangunan dan kendaraan) mengindikasikan penurunan yang besar dalam pendapatan propinsi dan kabupaten/kota, pada saat dimana sumber keuangan sangat dibutuhkan untuk mengatasi bencana. Mekanisme yang tepat harus dikembangkan melalui transfer fiskal dan pembiayaan defisit untuk membantu pemerintah daerah lebih efektif dalam menangani bencana.

**Secara rata-rata, dampak negatif atas pekerjaan juga cenderung terbatas, sebagaimana halnya dengan situasi pasca gempa bumi lainnya.** Perkiraan awal memproyeksikan penurunan pekerjaan terhadap 41,000 orang, terutama pada sektor perdagangan dan pariwisata. Dampak yang relatif terbatas pada tingkat makro ini kemungkinan akan berdampingan dengan penurunan kesejahteraan pada penduduk yang terkena dampak paling parah dan sektor ekonomi. Tingkat kemiskinan di propinsi diproyeksikan meningkat sebesar 1.5 persen poin hingga mencapai hampir 10.8 persen pada tahun 2010, membalikkan kemajuan yang sudah diperoleh beberapa tahun kebelakang. Dampak cenderung lebih terlokalisasi - dan perhatian yang utama harus ditujukan pada masyarakat miskin dan rentan di daerah yang terkena dampak paling parah - karena mekanisme bertahan pada tingkat masyarakat akan berada dibawah tekanan disebabkan kerusakan serta hilangnya penghasilan serta pekerjaan yang terkonsentrasi pada lokasi-lokasi tertentu.

**Membantu masyarakat untuk memenuhi kebutuhan dasar, seperti makanan, tempat tinggal, dan air merupakan prioritas dalam fase pemulihan dini.** Hal ini untuk sebagian besar sudah dilaksanakan. Survey yang dilaksanakan tidak lama setelah bencana pada tingkat masyarakan memberikan informasi berharga mengenai kebutuhan masyarakat pada fase pemulihan dini. Pada tingkat masyarakat, ketersediaan air, juga tempat tinggal sementara ditekankan sebagai area prioritas bagi intervensi pemerintah dalam jangka pendek. Hilangnya mata pencaharian dan pekerjaan juga dikemukakan sebagai masalah utama oleh masyarakat. Langkah selanjutnya dalam periode pemulihan harus memastikan berfungsinya kembali secara normal pelayanan publik pada berbagai tingkat pemerintahan termasuk pusat-pusat pendidikan dan kesehatan. Hal ini harus dikombinasikan dengan penyediaan tempat perlindungan sementara bagi mereka yang terkena dampak bencana dan juga bantuan yang terarah untuk korban-korban bencana yang kehilangan mata pencaharian mereka, seperti melalui kegiatan interim yang menghasilkan pendapatan. Rekonstruksi untuk perhubungan dan infrastruktur lain, perumahan dan juga pemulihan ekonomi, terutama pada sektor-sektor yang terkena dampak terparah disebabkan gempa bumi, akan menjadi bagian dari rencana aksi rekonstruksi pemerintah untuk daerah.

**Secara keseluruhan kebutuhan untuk membangun kembali propinsi diperkirakan sebesar Rp 23 trilliun, dengan bagian pemerintah sekitar Rp 7.1 trilliun.** Badan Nasional Penanggulangan Bencana (BNPB) akan memimpin koordinasi dan menfasilitasi pemulihan, sementara pelaksanaan dari program pemulihan akan dipimpin oleh pemerintah propinsi di Sumatera Barat dan Jambi. Setelah tahap tanggap darurat yang pertama, pemerintah telah berkomitmen untuk membantu masyarakat yang terkena dampak di fase pemulihan dini sementara pada saat yang bersamaan memulai upaya rekonstruksi di daerah. Penilaian kebutuhan awal merekomendasikan pemakaian pendekatan berbasis masyarakat untuk membangun kembali rumah,

fasilitas masyarakat, sistem irigasi, sekolah dan pusat kesehatan jika dinilai sesuai, dengan tetap mengingat bahwa pada beberapa kelompok masyarakat yang terkena dampak paling parah kemungkinan tidak tersedia kapasitas untuk melaksanakan kegiatan tersebut dan pendekatan yang berbeda mungkin diperlukan. Penyampaian bantuan harus menanggapi kebutuhan spesifik atas kelompok-kelompok rentan tertentu, seperti anak-anak, kelompok lanjut usia, atau keluarga yang tidak memiliki perlindungan sosial yang terkait dengan jalinan hubungan kekerabatan tradisional.

**Pada sektor perumahan, yang mencakup sekitar 78 persen dari keseluruhan kebutuhan, pemerintah telah mengambil kebijakan untuk membantu membangun kembali perumahan.** Bantuan sebesar Rp 15 juta akan diberikan untuk rumah yang hancur atau rusak berat, Rp 10 juta untuk rumah rusak sedang, dan maksimum Rp 1 juta untuk rumah dengan rusak ringan. Walaupun demikian, bantuan ini mungkin tidak mencukupi untuk menjamin rehabilitasi atas rumah yang rusak atau hancur mengikuti standar aman gempa. Sektor swasta juga telah terkena dampak parah oleh bencana, terutama sektor perdagangan dan pariwisata. Bencana yang terjadi akan, pada tingkat minimum, mempengaruhi secara sementara pekerjaan dan mata pencaharian bagi banyak orang di daerah yang terkena dampak. Meskipun pemerintah tidak berkewajiban mengkompensasi sektor swasta yang mengalami kerusakan dan kerugian akibat gempa bumi, pemerintah masih memainkan peranan penting untuk memfasilitasi periode pemulihan untuk sektor swasta dan juga untuk menyediakan bantuan langsung untuk para petani, nelayan, dan pengusaha kecil yang telah kehilangan modal dan kemungkinan tidak dapat mengatasi sendiri guncangan yang terjadi.

**Gempa bumi Sumatera Barat disusul oleh gempa bumi lain yang terjadi pada hari berikutnya yang berkekuatan 7.0 di Propinsi Jambi.** Kerusakan di Propinsi Jambi terkonsentrasi pada Kabupaten Kerinci dan kerusakan serta kerugian yang disebabkan oleh bencana ini relatif terbatas. Tiga orang dinyatakan meninggal, dengan kerusakan dan kerugian diperkirakan sedikit diatas Rp 100 milyar. Sebagaimana halnya dengan Sumatera Barat, kerusakan yang besar ditemukan pada sektor perumahan, dan hanya sedikit informasi yang tersedia mengenai kerusakan pada sektor infrastruktur dan produktif. Gempa tersebut merupakan gempa besar keempat yang mengenai propinsi tersebut selama 15 tahun kebelakang, mengindikasikan pentingnya kebutuhan untuk fokus pada peningkatan ketahanan propinsi terhadap bencana sejenis dimasa depan.

**Upaya-upaya pemerintah harus termasuk peningkatan kesiapan dalam menghadapi bencana yang serupa di masa depan.** Terdapat kemungkinan yang besar bahwa ini bukan merupakan gempa terakhir yang akan mempengaruhi daerah, didasarkan kenyataan sejarah maupun kenyataan bahwa lokasi daerah terletak pada area yang rawan terhadap kegiatan seismik. Daerah perlu untuk mempersiapkan dirinya lebih baik dalam menghadapi bencana di masa datang. Hal ini memerlukan upaya dari semua tingkat pemerintahan untuk menjadi lebih siap dalam menghadapi kejadian serupa di masa depan juga untuk dapat menanggapi secara cepat dan efektif jika hal ini terjadi. Pada tahun 2007, pemerintah Indonesia telah mengeluarkan Undang - Undang Penanggulangan Bencana No. 24/2007 yang memberikan dasar untuk pembangunan sistem pengelolaan resiko bencana di Indonesia, termasuk pendirian BadanNasional Penanggulangan Bencana (BNPB). Suatu fundamen proses pemulihan yang baik adalah dengan mengintegerasikan penanggulangan bencana dan kesiapan ke dalam proses bantuan, rehabilitasi, dan pembangunan untuk mengurangi kerentanan di masyarakat. Pengurangan Resiko Bencana (PRB) untuk pemulihan dan rekonstruksi memberikan pendekatan holistik untuk meningkatkan proses pembangunan melalui pencegahan, penanggulangan dan kesiapan, dikombinasikan dengan kegiatan penanggulangan pasca bencana.

**Salah satu elemen PRB yang paling mendesak dan dibutuhkan di Sumatera Barat adalah peringatan Tsunami secara efektif dan perencanaan evakuasi, termasuk pengarahan bagi masyarakat atas jalur-jalur evakuasi.** Hal ini terlebih lagi pentingnya mengingat beberapa ahli gempa percaya bahwa masih terdapat potensi untuk terjadinya gempa yang lebih besar di Sumatera Barat dengan kekuatan mencapai 8.5. Kemungkinan terjadinya gempa semacam itu dapat memicu munculnya tsunami, dan oleh karenanya proses rekonstruksi dan rehabilitasi harus memasukkan kemungkinan ini dalam perhitungan.

**Strategi rekonstruksi yang mengurangi resiko harus mengikutsertakan pemulihan kembali kehidupan masyarakat juga mempromosikan dan melaksanakan kerangka pengurangan resiko dalam upaya rekonstruksi.** Dalam istilah praktis, membangun kembali kehidupan masyarakat berarti melakukan pendekatan yang terkoordinasi dalam menyediakan kegiatan pemulihan mata pencaharian bagi masyarakat yang terkena dampak, yang sering dilaksanakan dalam bentuk program bantuan tunai, padat karya, atau kegiatan-kegiatan keuangan mikro. Kegiatan untuk mengurangi resiko bencana antara lain mempromosikan konstruksi aman gempa untuk bangunan baru, terutama sekolah dan pusat-pusat kesehatan dan penegakan hukum dan aturan dalam pembangunan, terutama untuk infrastruktur penting. Selain itu, PRB yang efektif membutuhkan solusi atas bangunan yang rawan bahaya, dimulai dengan penyesuaian kembali atas bangunan sekolah, pusat kesehatan, dan bangunan-bangunan pemerintah agar aman gempa. Pengakuan atas pentingnya strategi pengurangan resiko bencana harus menghasilkan pengurangan resiko bencana sebagai prioritas kebijakan sejalan dengan alokasi sumber daya dan menggunakan penilaian resiko dan kerentanan dalam perencanaan spasial dan perencanaan fasilitas dan infrastruktur baru. Industri asuransi juga dapat memainkan peranan penting dengan meyakinkan bahwa premi asuransi secara tepat mencerminkan resiko atas konstruksi yang buruk atau tidak sesuai aturan terhadap bangunan-bangunan yang dijamin. Sama pentingnya adalah untuk memperkuat kapasitas lembaga-lembaga pemerintah daerah untuk melindungi ekosistem yang bisa mengurangsi resiko dan memerangi degradasi lingkungan yang dapat meningkatkan resiko bencana.

# Introduction

**The two consecutive earthquakes that hit the provinces of West Sumatra and Jambi on 30 September and 1 October caused widespread damage across the provinces killing over 1,100 people**, destroying livelihoods and disrupting economic activity and social conditions. Resulting landslides left scores of houses and villages buried, whilst disrupting power and communication for days.

**This report describes the human loss, assessment of the damage to physical assets, the subsequent losses sustained across all economic activities, and the impact of the disaster on the provincial and national economies**. It provides the baseline data against which priorities can be identified, recovery, reconstruction and reconstruction plans can be designed, and progress can be monitored. Furthermore, given that the affected area is extremely vulnerable to hazards, as shown by past hazard history, this report also considers the implications for future disaster risk reduction.

**A comprehensive assessment was rapidly undertaken from 9 to 17 October 2009 using the ECLAC methodology for measuring disasters,**[1] which has been adapted over several years within Indonesia in response to various natural disasters. Estimates are based on information collected by the assessment team during field surveys and on valuable information collected and provided by the provincial and district governments. The efficiency with which the national, provincial and district governments were able to collect and provide data is highly commendable.

**The document is organized in three broad areas:** (i) background information on the disaster and its context; (ii) the impact of the earthquakes in human and economic terms; and (iii) the principles and approaches that will govern the early recovery and longer-term reconstruction and rehabilitation plans.

## Background information

**This section summarizes the latest available information on the West Sumatra earthquake.** This is followed by a section on the impact on local communities and provides the most recent official statistics on deaths and injuries caused by the disasters in West Sumatra. This is followed by a description of how the Government and international community have responded so far in meeting the immediate needs of those affected. Finally, a section looks into the social and economic background of West Sumatra, highlighting the region's vulnerability to natural hazards and laying out some key priorities in managing risks going forward.

[1] For details on this methodology read the Handbook for estimating the socioeconomic and environmental effects of disasters by ECLAC,2003, which can be found in http://www.preventionweb.net/english/professional/publications/v.php?id=1099

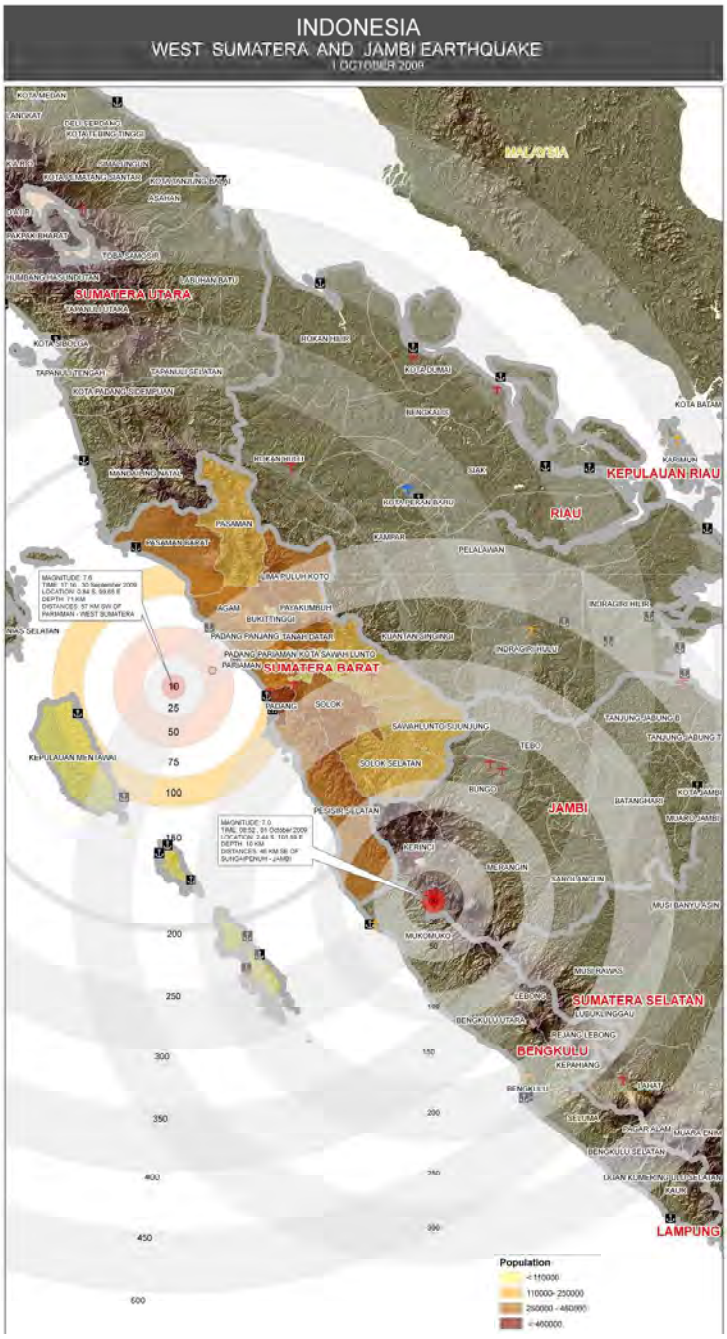
### Impact of the earthquakes in human and economic terms

**The report then goes into in-depth detail on the impact of the disasters with an assessment of human recovery needs, as well as damage and losses caused by the disasters.** This assessment summarizes total damage and losses for both the private and public sectors, and then presents assessments for cross-sectoral themes (the environment, regional governance and gender), the social sectors, the productive sectors and then infrastructure. The chapter on the economic and social impact evaluates the macroeconomic impacts of the earthquakes on the region's economy, as well as its likely impact on employment and the livelihoods of those affected.

### The way forward

**The final section of the report seeks to draw lessons and guidance from the damage and loss assessment for the early recovery, and longer-term reconstruction and rehabilitation process.** Given the region's vulnerability to natural hazards, this section begins with a chapter on risk reduction with recommendations in this area. Finally, the report details the principles and approaches required for the reconstruction effort and a preliminary estimate of financing needs, highlighting the importance of effective and transparent coordination and monitoring mechanisms.

## Map 1 Location of the earthquakes and their impact



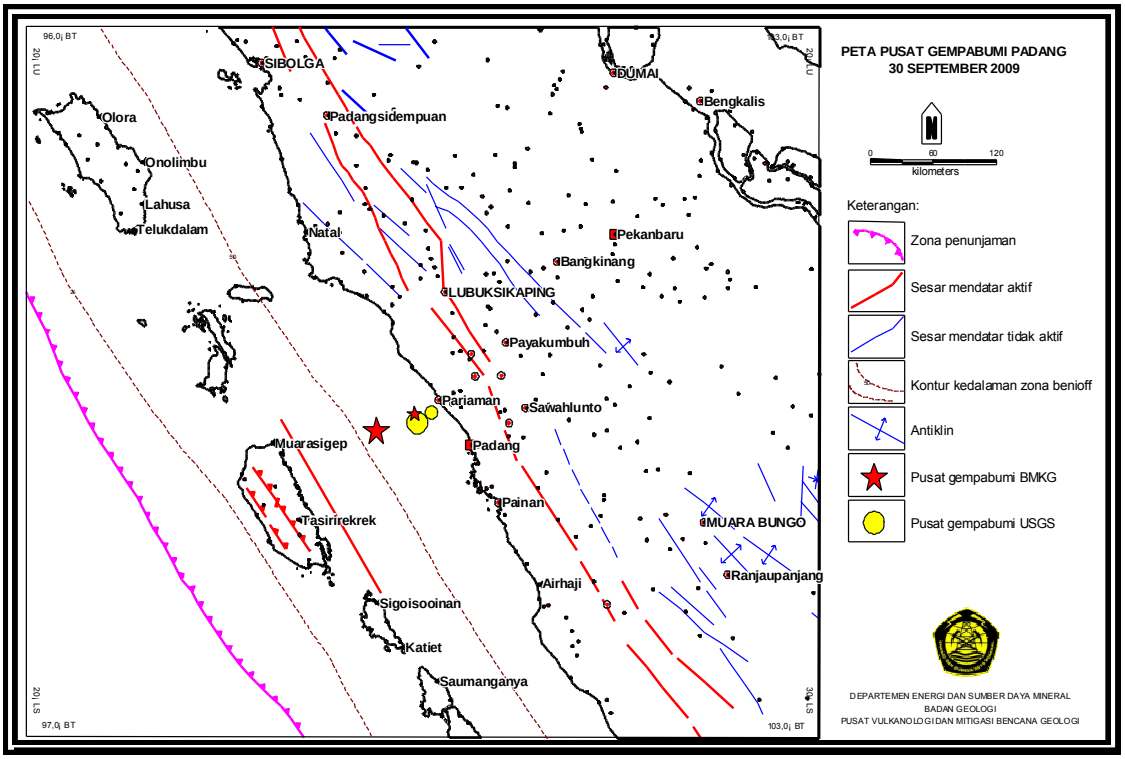
# CHAPTER I

# THE WEST SUMATRA EARTHQUAKE

## 1.1 THE WEST SUMATRA EARTHQUAKE

**A magnitude (Mw) 7.6 earthquake struck West Sumatra on 30 September 2009 at 5.16 pm local time, with an epicentre** at a depth of 71 kilometers according to the Indonesian Meterological, Climotological and Geophysical Agency (BMKG).[2] The epicentre was reported at 57 kilometers off the coast northwest of Pariaman at 0.84 longitude and 99.65 lattitude. A major Mw 6.2 aftershock occurred at 5.38 pm, with an epicentre at a depth of 110 kilometers and located at 0.72 longitude and 99.94 lattitude. A summary of the earthquake's locational information is provided in Map 1.1 produced by the Indonesian Volcanological and Geological Disaster Mitigation Center.

### Map 1. 1 Epicenter of the West Sumatra earthquake, 30 September 2009

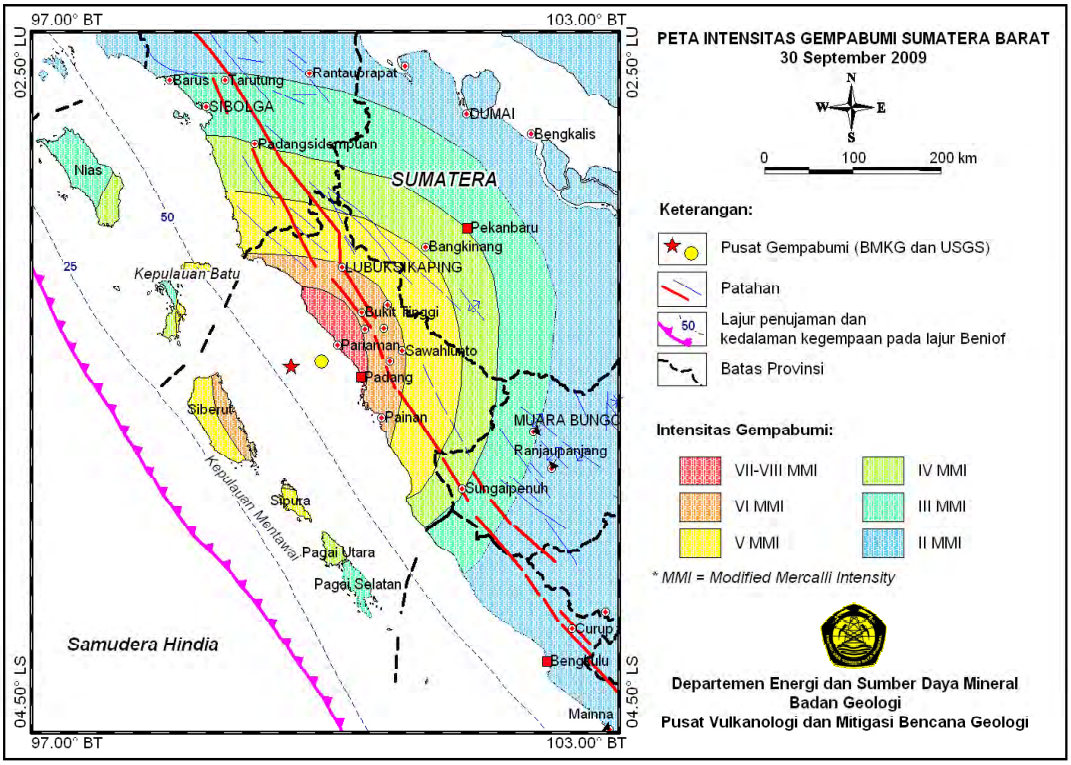



*Source:* Volcanological Survey of Indonesia (http://vsi.esdm.go.id)

[2] The U.S. Geological Survey (USGS) reported Mw 7.6 at the depth of 85 kilometers. Mw refers to the moment magnitude scale.

**The earthquake intensity was reported to be at VII-VIII MMI[3] in the vicinity of Kota Padang and at V-VI MMI in the surrounding districts, including Kab. Padang Pariaman** (Map 1.2). The earthquake caused major destruction to concrete structured buildings in Kota Padang and many one-storey houses in the surrounding districts. Eight districts (Padang Pariaman, Agam, Solok, Pasaman, Pasaman Barat, Pesisir Selatan, Tanah Datar and Mentawai) and five municipalities (Padang, Pariaman, Bukit Tinggi, Solok and Pariaman) were most impacted by the ground shaking. No tsunami was reported although a warning was issued for several minutes following the main earthquake event.

## Map 1. 2 Intensity of the West Sumatra earthquake, 30 September 2009



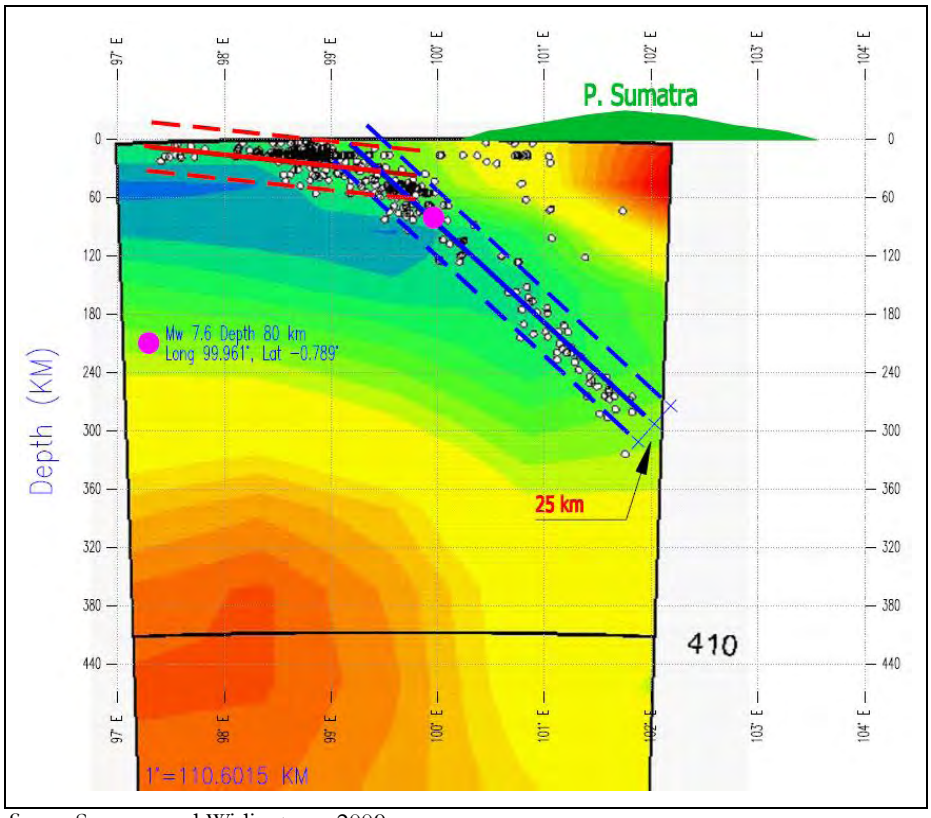

*Source:* Volcanological Survey of Indonesia (http://vsi.esdm.go.id)

**The earthquake occurred as a result of oblique-thrust faulting near the subduction interface plate boundary between the Australian and Sunda plates**, according to the U.S. Geological Survey. At the location of this earthquake, the Australian Plate moves north-northeast with respect to the Sunda plate at a velocity of about 60 mm/yr. On the basis of the currently available fault mechanism information and earthquake depth of 80 km, it is likely that this earthquake occurred within the subducting Australian Plate rather than on the plate interface itself. This earthquake was deeper than typical subduction thrust earthquakes that generally occur at depths less than 50 km.

[3] Modified Mercalli Scale indicating the effects of an earthquake on the earth's surface, I denotes no effect and XII denotes almost complete destruction.

**Preliminary analysis of the earthquake characteristics by the Center for Disaster Mitigation at the Bandung Institute of Technology (ITB) suggests that the hypocenter of the 30 September earthquake was located at the Benioff zone of the subduction between the Indo-Australian and Eurasian plates,** as shown in the lateral profile of the tomography of the subduction (Figure 1.1). Based on preliminary calculations, the earthquake propagation may have produced peak ground acceleration at the bedrock reaching 0.25-0.3g.[4] With the spatial variability of the local geological and geotechnical characteristics of Kota Padang and Kab. Padang Pariaman, the seismic amplifications in these locations are estimated to be in the range of 1.2-1.5g, which could have produced a relatively high ground acceleration in the range of 0.3-0.35g. The estimated spatial distribution of the ground acceleration of the 30 September 2009 earthquake is shown in Figure 1 below.

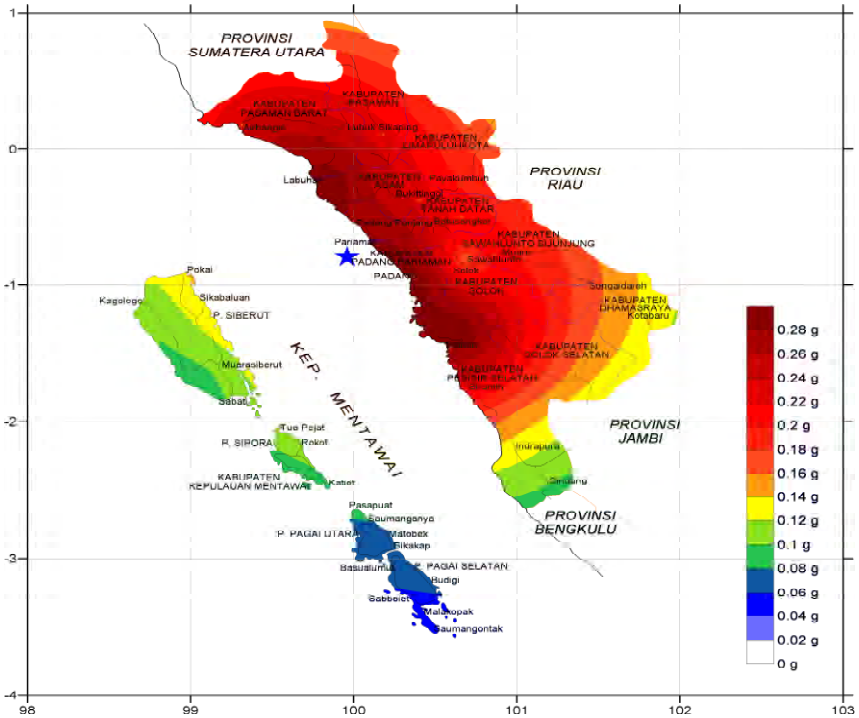
**Map 1. 3 Profile of 1-1' of the epicenter the location of the West Sumatra earthquake**




*Source:* Sengara and Widiantoro, 2009.

[4] Center for Disaster Mitigation, ITB, 2009.

**Map 1. 4 Spatial distribution of the estimated ground acceleration of the West Sumatra earthquake**




*Source:* Sengara, et al., 2009.

## 1.2 THE HUMAN AND COMMUNITY IMPACT

**The earthquake killed more than 1,100 people and injured a further 3,000** (Table 1.1). The death toll was intensified by landslides that burried at least three villages in the district of Padang Pariaman, burying a significant propotion of the inhabitants.

**Table 1. 1 Death toll and number of injured by district in the West Sumatra earthquake**

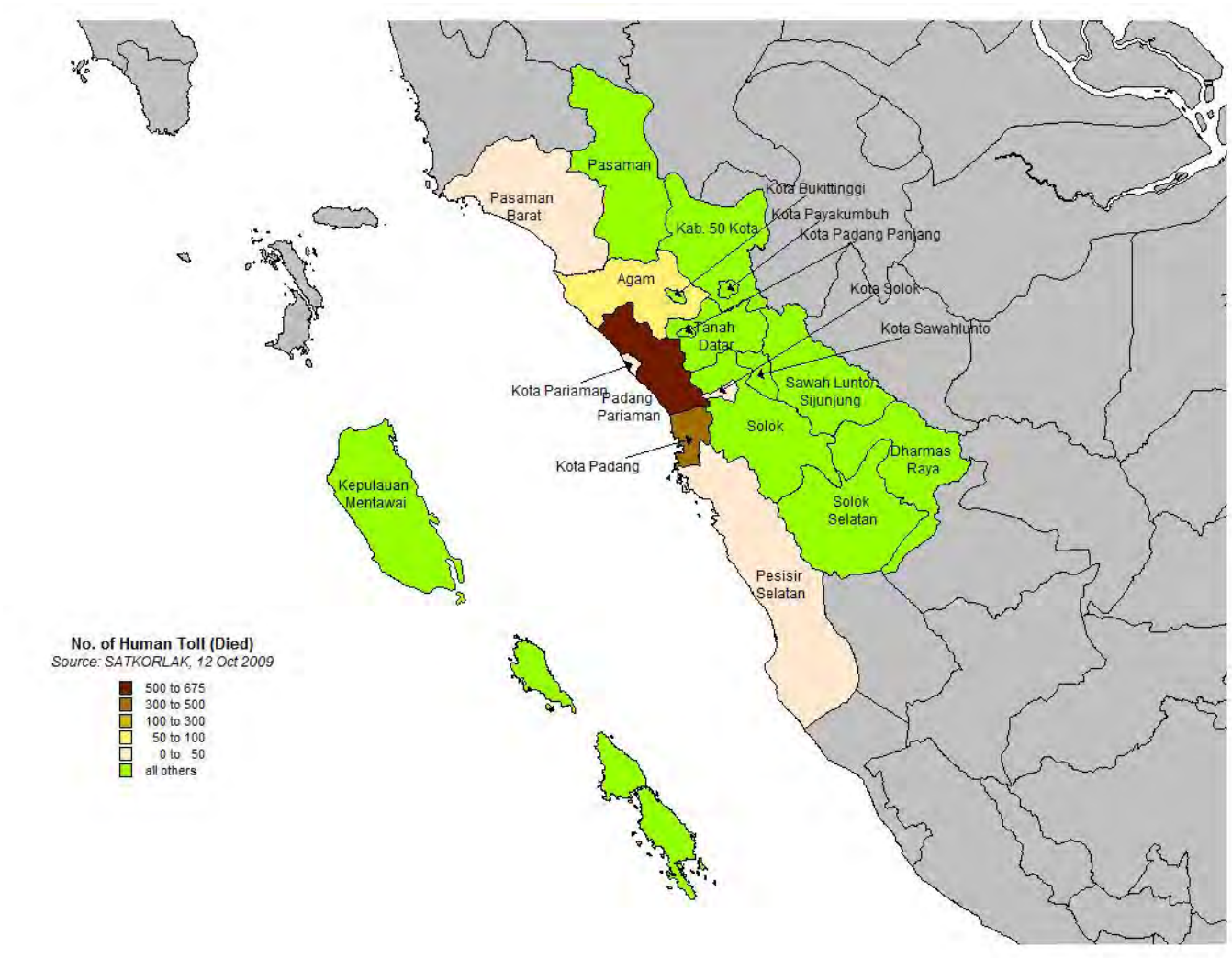
| Districts | Missing | Dead | Seriously injured | Moderately injured |
|---|---|---|---|---|
| Kota Padang | 2 | 313 | 431 | 771 |
| Kota Pariaman | - | 32 | 148 | 278 |
| Kota Bukit Tinggi | | - | - | - |
| Kota Solok | | 3 | - | - |
| Kota Padang Panjang | | - | 6 | 14 |
| Kab. Padang Pariaman | | 675 | 527 | 528 |
| Kab. Agam | | 80 | 90 | 47 |
| Kab. Solok | | - | - | 5 |
| Kab Pasaman | | - | - | - |
| Kab. Pasaman Barat | | 5 | 5 | 25 |
| Kab. Pesisir Selatan | | 9 | 7 | 20 |
| Kab. Tanah Datar | | - | - | - |
| Kab. Kepuluan Mentawai | | - | - | - |
| Total | 2 | 1,117 | 1,214 | 1,688 |

*Source:* BNPB, 15 October, 2009.

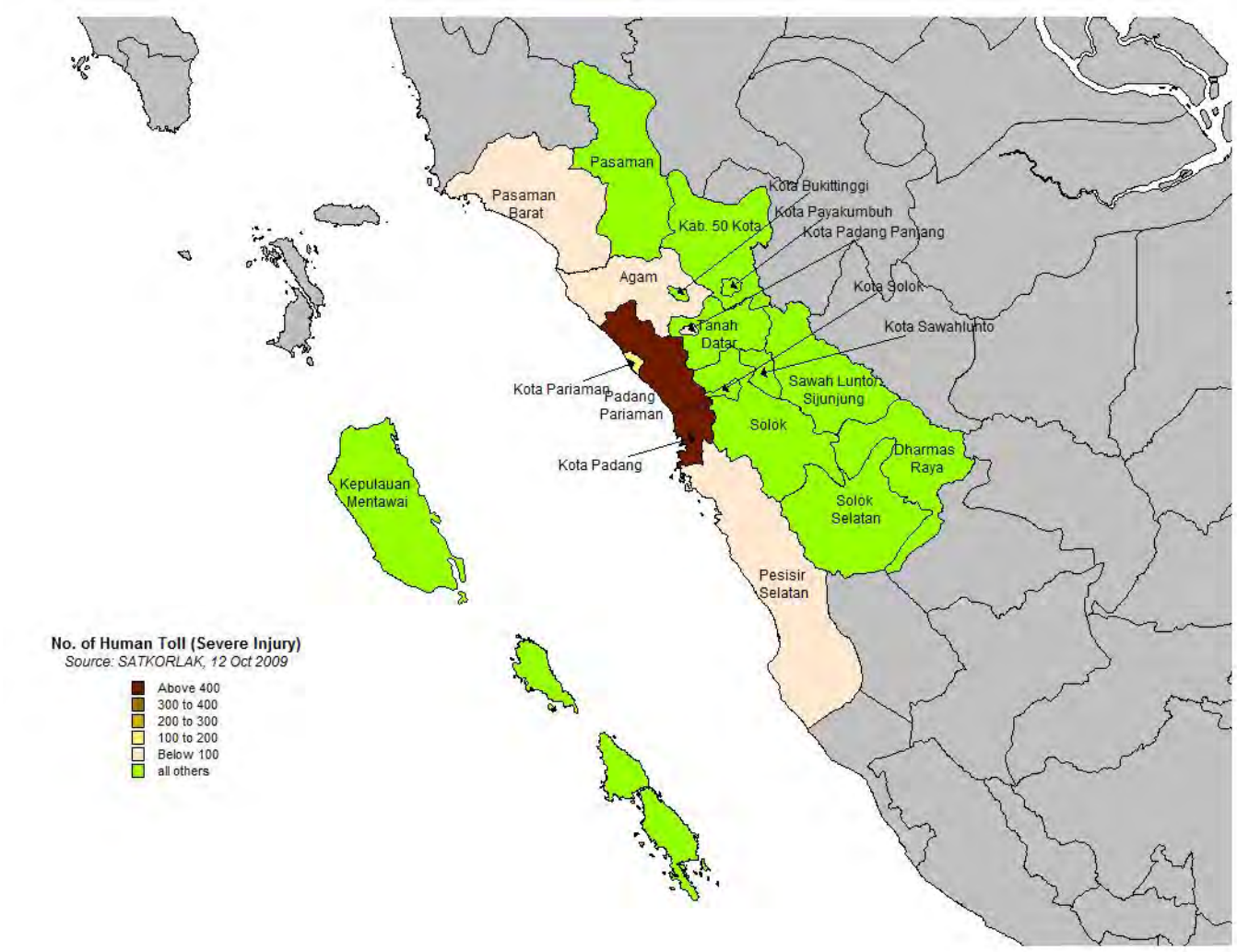
**The West Sumatra earthquake caused damage in 13 districts**. These districts are Kota Padang, Kota Pariaman, Kota Bukit Tinggi, Kota Solok, Kota Padang Panjang, Kab. Pariaman, Kab. Agam, Kab. Solok, Kab. Pasaman, Kab. Pasaman Barat, Kab. Pesisir Selatan, Kab. Tanah Datar and Kab. Kepulauan Mentawai. The subsequent 1 October 2009 earthquake caused damage in Kab. Kerinci and Kab. Merangin in the province of Jambi. The six worst affected districts are Kota Padang, Kab. Pasaman Barat, Kab. Agam, Kab. Padang Pariaman, Kota Pariaman, and Kab. Pesisir Selatan.

More than 15 days after the earthquake, access to some rural areas remained challening due to extensive debris or landslides. The ability of local government agencies to operate was crippled and in some instances paralyzed due to the destruction or heavy damage to their operational capacity and office facilities, including furniture, equipment and vital records. Heavy damage was incurred in urban/semi-urban districts/municipalities including KotaPadang (population: 777,893), Kota Pariaman (population: 338,098) and in Kab. Padang Pariaman (population: 78,920).

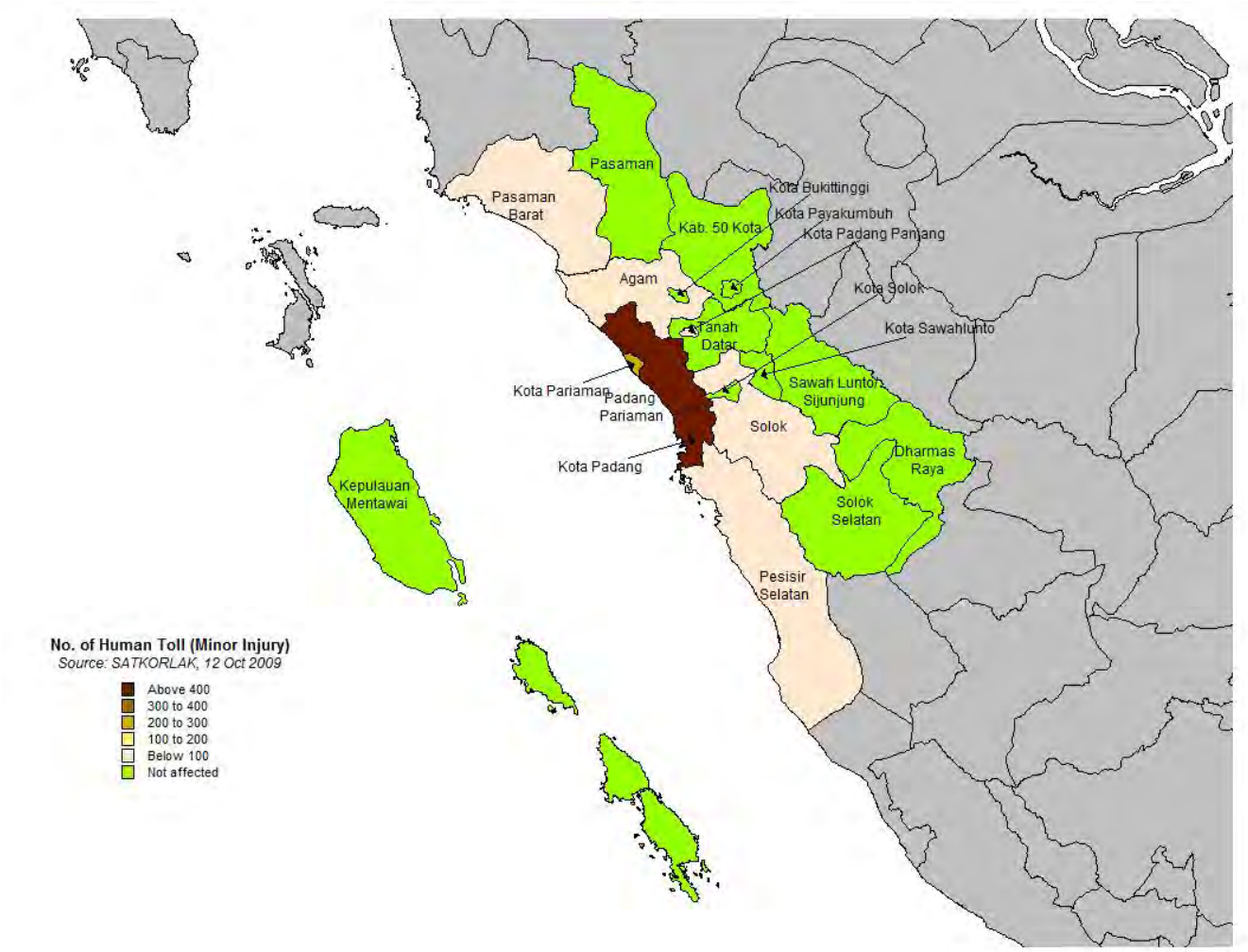
### Map 1. 5 Density of people killed by the disasters



## Map 1. 6 Density of people suffering severe injures



### Map 1. 7 Density of people suffering minor injures




## 1.3 THE RESPONSE

**The Government of Indonesia responded immediately to the emergency.** The Government declared a one-month emergency phase and indicated that it welcomed international assistance under close national coordination. President Susilo Bambang Yudhoyono visited West Sumatra in the immediate aftermath of the earthquake, as did Vice-President Jusuf Kalla and a number of senior government ministers. The Government provided an initial emergency relief fund of Rp 100 billion (about US$10.6 million), and indicated that up to Rp 6 trillion (about US$640 million) could be forthcoming. The Government provided tents, blankets and food, as well as medical personnel, emergency clean water facilities and toilets during its immediate response. It established an Emergency Coordination Post to facilitate extra commercial flights for numerous humanitarian workers entering the affected areas. The armed forces were also engaged in Search and Rescue Operations and provided air transportation to deliver relief aid, among other activities. National partners, including the Indonesian Red Cross, engaged immediately in emergency response efforts. The Government also initiated a process through the UN Early Recovery Cluster to undertake a

Human Recovery Needs Assessment (HRNA). A local NGO, Kogami, is the UN partner working through about 120 field enumerators from Andalas University to assess the perceived early recovery and reconstruction needs of communities in the six most affected districts of West Sumatra.

**The international community has responded by sending food, medical supplies, equipment, personnel and funds to aid the emergency relief process.** Amongst the many government contributions the European Union donated €3 million and the U.S. Government donated US$3 million with an additional US$3 million for the reconstruction program. The Asian Development Bank (ADB) approved a grant of US$3 million to the Government in response to the disaster. NGOs involved in the emergency relief include World Vision, Oxfam, the Red Cross and Red Crescent Movement, and Mercy Corps.

**The UN has worked hard to support the Government in coordinating the immediate response.** In both Padang and Jakarta, the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) worked to coordinate the response among international partners, both bilateral and non-governmental. Strong emphasis has been placed on the imperative need to work in close coordination with the Government, and provincial and municipal authorities. The cluster structure was established on the ground in the first day and is still in operation; an initial rapid assessment was conducted of the affected areas using a template previously prepared as part of the clusters' contingency planning. International Search and Rescue (SAR) teams were deployed to the affected areas to support national SAR and provided immediate medical assistance to survivors and helped assess the overall humanitarian situation in the expanded area. On 5 October, following discussions among the BNPB, UNDAC, and the West Sumatra Provincial SAR coordinator, it was agreed that national SAR teams were fully engaged in all sectors and international SAR teams were no longer necessary. The UN system in Indonesia immediately sent an inter-agency assessment mission to the affected area, comprising participants from FAO, OCHA, UNDP, UNFPA, UNICEF, and WHO to complement NGO assessments conducted quickly by national NGOs and the Indonesian Red Cross. The UN worked through its RC/HC office in coordination with the Government to prepare and issue a Humanitarian Response Plan requesting almost US$36 million in emergency assistance and early recovery assistance.

## 1.4 Social and Economic Background of the Affected Areas

**The affected 13 districts are home to roughly 3.75 million people.** Of the 13 districts, Kota Padang, the economic hub of the province, has the highest population. The total population of the province is about 4.76 million spread over 19 districts.

**The province is not considered to be poor but there are great disparities across the affected districts.** Four of the 13 affected districts are equal to, or above, the national average poverty rate (16.6 percent as of 2007) while the top five districts fare far better, with poverty rates of 5.9 percent for Kota Pariaman to 4.6 percent for Kota Solok.

**The earthquake has directly affected 62.5 percent of the population covering 78.85 percent of the geographic area of the province.** The total geographic area of the province is 50,939 $km^2$ while the affected geographic area is 31,842 $km^2$. The affected districts vary greatly in their geographic characteristics, including areas of coastline, highlands, small tropical islands and also densely populated urban areas.

**The affected districts also have very different characteristics in terms of population and density.** The most densely populated district is Kota Bukti Tinggi (about 4,021 inhabitants per $km^2$) while the least populated district is Kab. Kepulauan Mentawai (about 9 inhabitants per $km^2$). These figures compare with a national provincial average density of 94 inhabitants per $km^2$.

**Table 1. 2 Demographic summary by affected districts**

| | Population ('000s) | % of Province | % of Indonesia | Area ($km^2$) | Inhabitants (per $km^2$) |
|---|---|---|---|---|---|
| **West Sumatra Province** | **4,763** | **100** | **2.08** | **50,939** | **94** |
| Kab Agam | 430 | 9.02 | 0.19 | 1,887 | 228 |
| Kab. Padang Pariaman | 387 | 8.13 | 0.17 | 1,520 | 255 |
| Kab. Pasaman | 257 | 5.40 | 0.11 | 3,948 | 65 |
| Kab. Pesisir Selatan | 442 | 9.29 | 0.19 | 6,388 | 69 |
| Kab. Solok | 356 | 7.47 | 0.16 | 3,738 | 95 |
| Kab. Tanah Datar | 336 | 7.05 | 0.15 | 1,336 | 251 |
| Kab. Kepulauan Mentawai | 68 | 1.43 | 0.03 | 7,856 | 9 |
| Kota Bukit Tinggi | 106 | 2.23 | 0.05 | 25 | 4,201 |
| Kota Padang | 857 | 17.99 | 0.38 | 858 | 999 |
| Kota Padang Panjang | 54 | 1.14 | 0.02 | 23 | 2,357 |
| Kota Solok | 58 | 1.23 | 0.03 | 58 | 1,014 |
| Kota Pariaman | 71 | 1.48 | 0.03 | 98 | 723 |
| Kab. Pasaman Barat | 333 | 7.00 | 0.15 | 4,108 | 81 |
| **Indonesia** | **228,523** | **-** | **100** | **2,310,241** | **99** |

*Source:* BPS, 2008.
*Note:* The list contains affected districts only. There are a total of 19 districts in the West Sumatra province.

**The affected districts make up over 80 percent of the provincial GRDP.** Annual per capita income in the 13 affected districts is Rp 12.17 million, similar to the provincial annual per capita income (Rp 12.55 million, as shown in table 3 below), or about 70 percent of the national figure of Rp 17.32 million. However, the district-level figures vary greatly. Kab. Pesisir Selatan has the lowest annual per capita income of Rp 6.97 million, while Kota Padang has the highest at Rp 20.27 million.

### Table 1. 3 GRDP and GDP per capita, 2007

| | GRDP | | | | GRDP per capita | | |
|---|---|---|---|---|---|---|---|
| | Rp billion | % in Province | % in Indonesia | Population ('000) | Rp million | % in Province | % in Indonesia |
| **West Sumatra Province** | **59,799** | **100.0** | **1.5** | 4,763 | **12.55** | **100.0** | **72.5** |
| Kab. Agam | 4,463 | 7.5 | 0.1 | 430 | 10.38 | 82.7 | 65.4 |
| Kab. Padang Pariaman | 4,328 | 7.3 | 0.1 | 387 | 11.32 | 90.1 | 50.1 |
| Kab. Pasaman | 2,234 | 3.7 | 0.1 | 257 | 8.68 | 69.1 | 40.3 |
| Kab. Pesisir Selatan | 3,083 | 5.2 | 0.1 | 442 | 6.97 | 55.5 | 55.5 |
| Kab. Solok | 3,421 | 5.7 | 0.1 | 356 | 9.62 | 76.6 | 65.6 |
| Kab. Tanah Datar | 3,814 | 6.4 | 0.1 | 336 | 11.35 | 90.4 | 77.4 |
| Kab. Kepulauan Mentawai | 913 | 1.5 | 0.0 | 68 | 13.40 | 106.8 | 78.2 |
| Kota Bukit Tinggi | 1,436 | 2.4 | 0.0 | 106 | 13.54 | 107.8 | 117.1 |
| Kota Padang | 17,369 | 29.0 | 0.4 | 857 | 20.27 | 161.5 | 66.3 |
| Kota Padang Panjang | 623 | 1.0 | 0.0 | 54 | 11.48 | 91.5 | 74.7 |
| Kota Solok | 757 | 1.3 | 0.0 | 58 | 12.94 | 103.1 | 92.1 |
| Kota Pariaman | 1,126 | 1.9 | 0.0 | 71 | 15.94 | 127.0 | 71.3 |
| Kab. Pasaman Barat | 4,116 | 6.9 | 0.1 | 333 | 12.35 | 98.4 | 60.0 |
| All other districts in West Sumatra* | 10,995 | 18.4 | 0.3 | 1,007 | 10.92 | 86.9 | 63.0 |
| Indonesia | | | | | **17.32** | | |
| | **3,957,404** | | **100.0** | **228,523** | | | **100.0** |

*Source:* BPS, 2007.
*Note:* All figures are current rupiah prices.

**Agriculture accounts for almost one quarter of the province's economy, while trade and transportation together account for about one third, reflecting the status of Kota Padang as a main trading center** (Table 1.4). Agriculture is the main productive sector in nine of the 13 affected districts, with services being the main sector in Kab. Solok, Kota Bukitinggi, and Kab. Padang Panjang and transport in Kota Padang.

### Table 1. 4 West Sumatra's economic structure, 2007

| | West Sumatra | | Indonesia | |
|---|---|---|---|---|
| | Rp bn | Share % | Rp bn | Share % |
| Agriculture | 14,755 | 24.7 | 547,236 | 13.8 |
| Mining and Quarrying | 2,060 | 3.4 | 440,826 | 11.1 |
| Manufacturing | 7,179 | 12.0 | 1,068,806 | 27.0 |
| Electricity, Gas & Water Supply | 822 | 1.4 | 34,726 | 0.9 |
| Construction | 3,290 | 5.5 | 305,216 | 7.7 |
| Trade, Restaurant & Hotel | 10,368 | 17.3 | 590,822 | 14.9 |
| Transportation & Communication | 9,009 | 15.1 | 265,257 | 6.7 |
| Financial Services | 2,963 | 5.0 | 305,216 | 7.7 |
| Services | 9,352 | 15.6 | 399,299 | 10.1 |
| GDP (without Oil & Gas) | 59,799 | 100.0 | 3,540,950 | 89.5 |
| GDP Total | **59,799** | **100.0** | **3,957,404** | **100.0** |

*Source:* BPS, 2007.

**West Sumatra, including the affected districts, generates very little of its own revenue, and similar to other provinces in Indonesia, depends heavily on the central Government's general allocation fund (DAU).** Even Kota Padang, the province's capital, generates only 7.7 percent of its own income.

**Figures for West Sumatra show that the unemployment rate is higher than the national average.** The unemployment rate of West Sumatra is 9.7 percent, which is slightly above the national average of 8.5 percent. Coupled with this, the average minimum wage in the province (Rp 750,000 per month) is slightly lower than that of Jakarta (Rp 900,000 per month)

### Table 1. 5 Labor market, 2008

| | Indonesia | West Sumatra |
|---|---|---|
| Employment | 102,050,000 | 1,920,000 |
| Unemployment | 9,427,590 | 206,740 |
| Unemployment rate (%) | 8.5 | 9.7 |

*Source:* Sakernas, February 2009; BPS, 2008.

**There are more than 400,000 people living below the poverty line in the area affected by the earthquake, although the province as a whole compares reasonably well with national average poverty rates.** The province is in the fourth national decile (the tenth being the poorest decile). However, four of the affected districts, namely Kab. Padang Pariaman, Kab. Pesisir Selatan, Kab. Solok and Kab. Kepulauan Mentawai, are either on a par with, or above, the national poverty rate (16.6 percent in 2007). Attention will be needed in these districts to ensure that more people do not slip below the poverty line as a result of the earthquake. At the other end of the scale, Kota Solok has a poverty rate of only 4.6 percent.

### Table 1. 6 Poverty indicators in West Sumatra, 2007

| | Poor population ('000) | Poor (%) | Decile national (10 poorest) |
|---|---|---|---|
| **West Sumatra** | **529.2** | **11.9** | **4** |
| Kab Agam | 51.1 | 12.6 | 4 |
| *Kab. Limapuluh Kota* | *173.346.1* | *14.8* | *5* |
| Kab. Padang Pariaman | 62.5 | 17.1 | 6 |
| Kab. Pasaman | 94.642.8 | 17.9 | 6 |
| Kab. Pesisir Selatan | 54.6 | 13.2 | 4 |
| *Kab. Sawahlunto Siunjung* | *146.528.8* | *15.4* | *5* |
| Kab. Solok | 58.5 | 17.6 | 6 |
| Kab. Tanah Datar | 185.824.6 | 7.7 | 2 |
| Kab. Kepulauan Mentawai | 10.0 | 16.0 | 5 |
| Kota Bukit Tinggi | 172.35.2 | 5.2 | 1 |
| Kota Padang | 118.139.5 | 5.0 | 1 |
| Kota Padang Panjang | 246.12.6 | 5.2 | 1 |
| *Kota Payakumbuh* | *167.17.7* | *7.8* | *2* |
| *Kota Sawahlunto* | *1.1* | *2.3* | *1* |
| Kota Solok | 2.5 | 4.6 | 1 |
| Kota Pariaman | 3.9 | 5.9 | 1 |
| Kab. Pasaman Barat | 42.7 | 13.8 | 4 |
| *Kab. Dharmas Raya* | *23.8* | *14.4* | *5* |
| *Kab. Solok Selatan* | *21.3* | *17.4* | *6* |
| Indonesia | 37,170 | 16.6 | -- |

*Source:* BPS, 2007.
*Note:* Italics indicate districts not affected by the disaster.

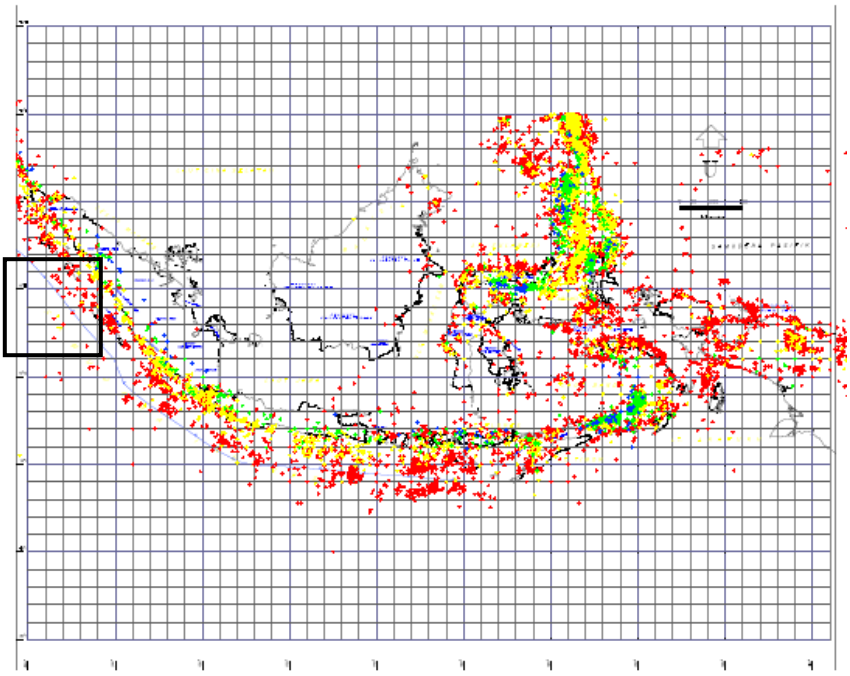
## 1.5 VULNERABILITY TO NATURAL HAZARDS

**The Indonesian archipelago is located at the convergence zone of four major tectonic plates: Eurasian, Indian-Australian, Pacific and the Philippines.** Interaction between the movements of these plates affected the seismo-tectonic characteristics of the Indonesia region. The Indian-Australian plate is moving northwards relative to Eurasian plate, whereas the Pacific plate is moving westwards relative to both the Indian-Australian and Eurasian plates. Some subduction and surficial fault mechanisms occur in the Indonesian region. The Sunda subduction zone that extends from western part of the Andaman islands in the northwest and the Banda islands in the east is the most active seismic source in the Indonesian region. The high seismicity in Sumatra, Java, Bali and the islands of Nusa Tenggara is affected by the Sunda Arc source zone.[5]

### 1.5.1 Historical Hazards and Risk Profile

**Historical data show that West Sumatra is particularly prone to seismic activity.** Map 1.4 of the siesmicity of the Indonesian regionshows earthquake occurrence data collected by the National Earthquake Information Center (NEIC) of the U.S. Geological Survey, and from other sources provided by the Indonesian Geological Research and Development Center. It provides historical data of recorded earthquakes in the past 200 years. The area of West Sumatra is shown to be among the most frequent earthquake stricken zones in Indonesia.

**Map 1. 8 Distribution of earthquake epicenters**

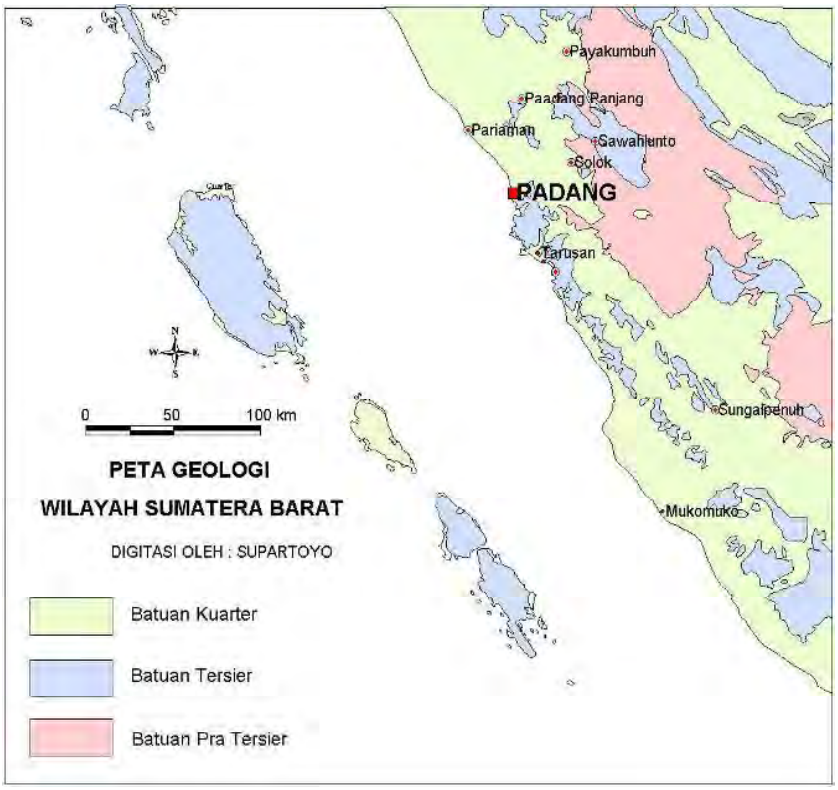


*Source:* Kertapati,1999, as referred to by Center for Disaster Mitigation, ITB, 2009.

[5] Progress Report: Risk Assessment Study to support the Formulation of National Action Plan for Disaster Risk Reduction (2010-12). The Center for Disaster Mitigation ITB and the World Bank (2009).

**West Sumatra's geology has contributed to an increased risk of landslides.** According to geologic map of West Sumatra (Map 1.5), the lowland areas of the province are situated in mostly quartenary sediment, whereas the upland areas are mostly tertiary and pre-tertiary sediments, which have been exposed by long-term erosion. The quartenary sediment consists of softer and looser material that may have amplified ground acceleration during the earthquake, and potentially eroded afterwards (creating subsequent landslide hazards). Many of these sedimentary areas are relatively densely populated because of their accessibility, as well as their suitablility for agriculture and settlement.

**Map 1. 9 Geology map of West Sumatra**

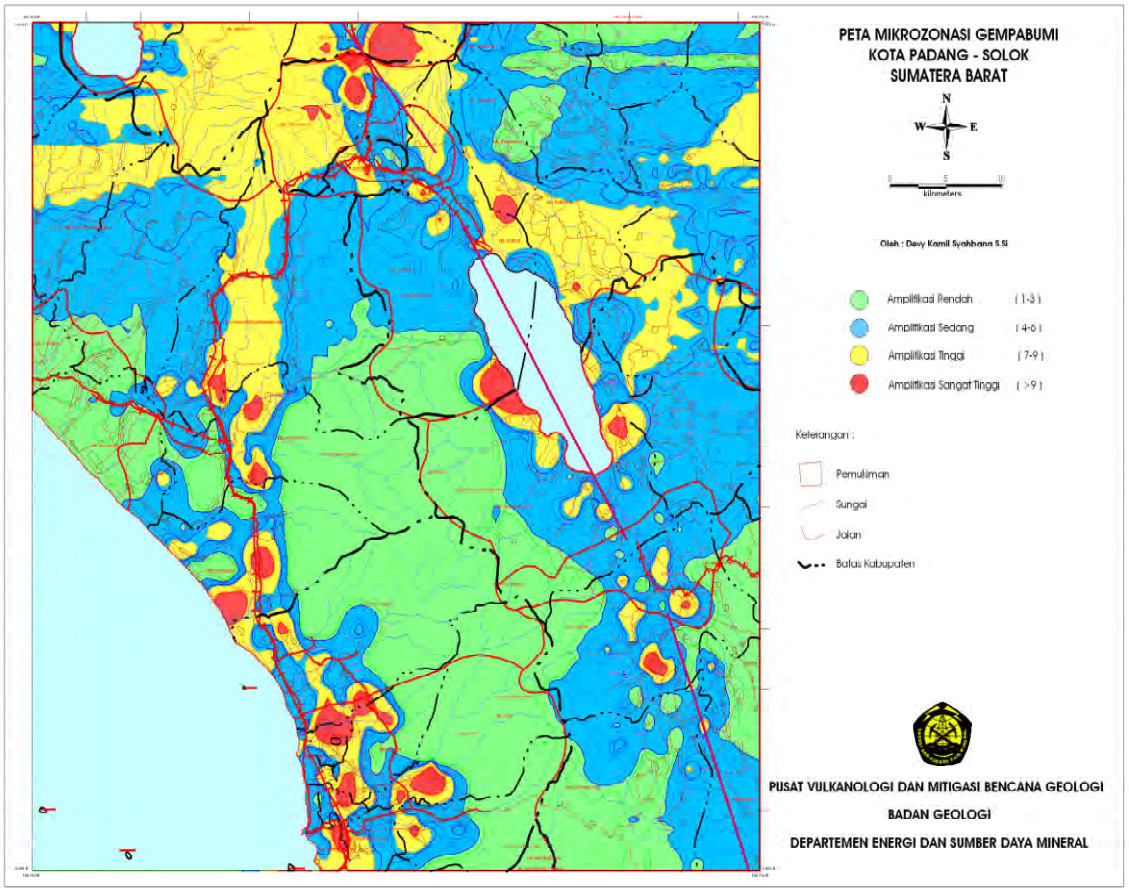



*Source:* Volcanological Survey of Indonesia (http://vsi.esdm.go.id)

## 1.5.2 Hazard Exposure in the Most Affected Areas

**Kota Padang and Kota Pariaman are at risk of larger ground amplification from earthquakes.** The Vulcanological Survey of Indonesia (VSI) has produced a micro-zoning map indicating areas in West Sumatra (particularly surrounding Kota Padang and Kota Solok) that are at high risk from potentially larger ground amplification of earthquakes. The micro-zoning map below shows that most of the areas in KotaPadang and some of the national road segments connecting Kota Padang and Kota Pariaman and the northern districts are situated on the very-high to high amplification zones. This may explain the more severe damage to houses and buildings in Kota Padang and Kota Pariaman, and along the national and provincial, as well as district, roads (including some landslide occurrences).

### Map 1. 10 Micro-zoning of Kota Padang and Kota Solok




*Source:* Volcanological Survey of Indonesia (http://vsi.esdm.go.id).

**There are continuing reports of landslides.** In its briefing on the 30 September West Sumatra earthquake, the VSI identified the high landslide vulnerability of many areas in the province, where the earthquake triggered landslides and increased the risk of subsequent landmass movements, especially during the rainy season. Additional landslides were reported several days after the earthquake, including in the area surrounding Lake Maninjau. Landslides also occurred along national roads with some fatalities, and subsequent events continue to occur as late as 19 October 2009.

## 1.6 Managing Disaster Risks: Key Priorities

**The main earthquake on 30 September 2009 triggered major destruction to houses and buildings located on the high amplification zones and/or that had relatively weak structural strength.** Road segments were also damaged, making access to some areas challenging. The damage to houses and businesses was amplified by the delays in transporting goods for relief purposes.

**While basic humanitarian needs have now been met with improved distribution of relief and emergency assistance, community early recovery through the provision of basic services has become an urgent priority.** The large number of damaged homes spread across dispersed locations poses a major challenge in ensuring that residents have appropriate temporary shelters. In rural areas such as Kab. Padang Pariaman, which has the largest number of severly damaged homes, rebuilding livelihoods through interim income-generating activities will be of critical importance, considering that many residents in these areas are dependent on agriculture and rural trade. The absence of safe shelter and the presence of damaged structures increase the population's exposure to hazards from subsequent aftershocks and possible landslides, as well as exposure to rainfall during the approaching rainy season.

**Equally important for managing further risks is the normalization of basic social services such as schools, health centers and religious facilities.** Damaged school buildings pose both the secondary hazards of collapsing structures and the disruption of normal school activities, which are critical for social recovery. The capacity of provincial and district governments is amongst the most adversely impacted as a result of the destruction of government buildings, as well as the properties of government employees. Normalizing public services is another urgent priority to enable them to assist the community in the early recovery, as well as in longer-term reconstruction and rehabilitation. Risks associated with future disasters, as well as other related hazards such as landslides, floods and communicable diseases, will require local governments to fully function once again if they are to facilitate community preparedness.

# CHAPTER II

# THE HUMAN RECOVERY NEEDS ASSESSMENT (HRNA)

## 2.1 Description of the Human Recovery Needs Assessment

### Purpose of the Assessment

**The Human Recovery Needs Assessment (HRNA) process is founded on assessing the perceptions of people and communities in the wake of a disaster.** These perceptions can then be used to inform the recovery and reconstruction process. The information captured through this assessment gives an insight into how the recovery and reconstruction process can be best implemented, based on the needs, demands and opinions of communities affected by the disaster. In this way, the findings of the damage and loss assessment are complimented by local level opinions.

### Methodology

**Data were collected from primary sources through household surveys**. These data were complemented by Focus Group Discussions (FGDs) and Key Informant Interviews (KII). A total of 600 households were interviewed in six of the worst affected districts (Agam, Kota Padang, Padang Pariaman, Kota Pariaman, Pasaman Barat and Pesisir Selatan) based on a purposive sampling method. The methodology was selected to obtain direct qualitative feedback from the affected communities regarding their understanding of needs. Therefore, it is important to recognize that the information presented in this chapter is based on community needs as perceived by households surveyed as an illustration of the overall perceptions and needs as seen by the disaster-affected population.

### Summary of the Results

**A summary of the results of the HRNA survey is outlined below and should provide an additional perspective to the sectoral chapters of the damage and loss assessment.** This section describes the statistical analysis and its implications for recovery and reconstruction efforts. The key statistics are presented here, with more detailed information on individual categories of needs presented in the Annexes to this report, along with the results of the FGDs, which were used as a measure to further explore or substantiate the results of the HRNA survey.

### Impact on various aspects of community lives and governance

**The HNRA survey suggests that the general perceptions of the affected communities are directed towards immediate survival.** The concerns are felt fairly broadly across basic issues such as lack of income, physical threats, shelter, food, clean water and health related issues.

**Table 2. 1 Perceptions regarding the general impact of the earthquake**
*Percent*

| Rank | Most Concerning Matters | % |
|---|---|---|
| 1 | Lack of / loss of income | 19.1 |
| 2 | Physical threat or injury / lack of safety | 18.0 |
| 3 | Lack of,or no shelter / housing | 16.9 |
| 4 | Lack of food | 16.2 |
| 5 | Lack of clean water | 13.6 |
| 6 | Health / lack of services | 11.8 |
| 7 | Children's education disruption | 4.4 |

*Source*: Joint Assessment Team.
*Note*: participants = 500.

The following sections will elaborate on the findings of the assessment.

## 2.2 Basic Needs

### Access to food

**People's access to food has been compromised but not to the level that they perceive themselves to be at risk of starvation.** They see themselves as able to survive for an average of one week without any food aid. In coping with the situation, people have adjusted their meal patterns. About one-third (30 percent) of the interviewed households reduced the size of their meals, another one third (32 percent) reduced the number of meals, and the other one-third (32 percent) changed the variety of food they consumed.

**Disasters affect people's access to food by disrupting the availability of food commodities in local markets.** Shortages of a commodity may be refelcted in price increase, pressuring households' allocations for food. More than 40 percent of households see themselves as having to adjust their household allocations for food. Taken together, this implies that until such time as the employment and livelihood systems return to normal, food support should be provided as part of the early recovery support to affected households.

### Social cohesion

**It is imperative that measures are put in place to assist communities in managing their water resources in order to avoid social tension.** The HRNA survey illustrates that issues potentially impacting social cohesion such as land ownership / use have not impacted social cohesion in the affected areas. However, tensions related to water sources have been identified as having the potential to undermine social cohension and create conflict in the months to come.

### Access to clean water, sanitation and hygiene

**Restoring access to clean water is also important for ensuring that households can maintain standards of sanitation and hygiene, particularly in urban areas**. More than 60 percent of people are dependant on piped or city water networks, rivers / ponds, or open sources. One third of those are dependant on city networks that experienced interruptions in the delivery of water, while other services have been relatively unaffected. Until basic services can be resumed, including clean water provision, urban households may need support to ensure their sustained access to clean water. These findings were substantiated by the discussions with FGDs.

### Access to shelter

**Temporary or transition shelter will be required in order to allow households to continue their daily activities,** regardless of the housing rehabilitation and reconstruction program. Nearly half of the survey respondents reported that their homes would require structural repair before they could safely return. More than a quarter thought that their homes would require complete reconstruction, while another 20 percent thought their homes would need substantial repair. The need for temporary/transitional shelter was confirmed by the discussions of the FGDs.

**Most of the affected households are counting on government assistance to undertake repair/reconstruction of their damaged/destroyed houses.** Only 21 percent thought that they would be able to rely on their own resources. Capacity to rebuild homes without assistance will be limited, as most communities do not have any insurance to cover property losses.

**Table 2. 2 Community expectations on funding sources for housing repair**

*Percent*

| Rank | Expected sources | % of total |
|---|---|---|
| 1 | Government assistance | 68 |
| 2 | Own funding | 21 |
| 3 | Borrowing | 8 |
| 4 | Borrowing | 2 |
| 5 | No Answer | 1 |

*Source*: Joint Assessment Team.
*Note*: participants = 435.

### Access to livelihoods

**Sixty-six percent of the surveyed households reported varying degrees of livelihood / employment disruption** that will require various levels of investment before they can be resumed. Given that livelihoods is one of the most strategic avenues for recovery this will be a particular area of focus for early recovery. The survey results were confirmed in FGDs, where the need to assist in the recovery of their livelihoods was reiterated.

**There is marked trend of people intending to leave the agriculture and trade sectors and seeking employment opportunities in other sectors** such as industry and manufacturing. People also sought employment in other sectors such as transportation in the two weeks subsequent to the disaster. Early recovery measures would need to focus on providing income opportunities in

agriculture-related activities. In rural areas, where there is a direct link between social structure and agricultural production, the social impacts of this shift needs to be considered in early recovery response.

**Table 2. 3 Changes in non-agricultural livelihoods**

*Percent*

| Rank | Main source of income other than agriculture | Before | After | Diff |
|---|---|---|---|---|
| 1 | Transportation service provider | 2.2 | 5.6 | 3.3 |
| 2 | Industry/Manufacture | 54.6 | 57.1 | 2.5 |
| 3 | Service provider | 10.4 | 11.2 | 0.8 |
| 4 | Private business employer | 0.6 | 0.4 | -0.1 |
| 5 | Government employer | 2.0 | 1.7 | -0.2 |
| 6 | Retail trading / commerce | 6.4 | 5.6 | -0.9 |
| **7** | **Agriculture product trading** | **21.8** | **10.7** | **-11.1** |
| 8 | Others | 2.0 | 7.7 | 5.8 |

*Source*: Joint Assessment Team.
*Note*: participants = 360.

### Access to education

**The pattern of damage to schools during earlier earthquakes in Indonesia was repeated here, indicating that Indonesian children are at risk from education facilities that are not earthquake resistant.** The most noticeable imapct on the edcuation sector is the physical destruction of school buildings. While more than 25 percent of respondents reported that schools were available and safe for continuing school activities, one in three reported that school buildings were no longer available and one in five stated that while school buildings were available they did not feel they were safe enough to allow their children to continue school activities.

**In many of those schools left standing, repairs will still be required in addition to structural repairs,** including provision of clean water, repair/reconstruction of latrines and toilets, electricity installation and repair to peripheral walls.

**Temporary or transition schools and facilities will be required to ensure that education can continue in a safe environment throughout the early recovery and reconstruction phases.** Half of respondents reported that school buildings were either completely destroyed or required substantial repair. Temporary schools and safe environments for education activities will need to be put in place.

### Safe and sustainable environment

**Hazardous rubble was perceived as the main environmental problem at household level,** indicating that efforts may be needed to support households in managing the debris created by the earthquake.

**Table 2. 4 Perceptions regarding the environmental impact of the disaster**
*Percent*

| Rank | Environment issue | % |
|---|---|---|
| 1 | Hazardous rubbles | 39.2 |
| 2 | Clean water contamination | 19.3 |
| 3 | Structural damage of water/land | 11.1 |
| 4 | Land contamination | 4.3 |
| 5 | None | 2.3 |
| 6 | Dead bodies | 2.2 |
| 7 | Others (write) | 1.1 |
| 8 | Don't know | 1.0 |
| 9 | No Answer | 0.8 |

*Source:* Joint Assessment Team.
*Note:* participants = 500.

**In terms of energy sources at the household level, a slight shift has been recorded towards using firewood from forest sources.** Change in the types of fuel being used by households may result in additional damage to the environment. There is 7 percent shift of household fuel types from commercial fuels to both commercial and forest firewood. While the shift is so far relatively small, further shifts to firewood from natural and forest sources may have detrimental environmental impacts over time.

### Access to community infrastructure and facilities

**Community infrastructure and facilities will be the backbone of community level recovery activities.** Disaster-affected community facilities are not typically managed by local governments and may therefore not be covered by the reconstruction effort. However, such facilities are critical to serve as the backbone of community level recovery activities. Community social and economic activities are often shaped in and around such small-scale facilities, which are usually self-financed and self-managed. More than one-third of the interviewed households observed that village religious facilities such as mosques (*surau*) are the center of their community activities and require urgent repair or reconstruction. Three other types of community facilities that need urgent repair, replacement or rebuilding include: water sources and networks; village footpaths and bridges; and village power generation. Community level recovery should stimulate community self-help recovery for and around the theme of community infrastructure and facilities. This may include but not be limited to community grants and or technical assistance for undertaking repair and reconstruction processes that may or may not include provision of construction materials.

**Table 2. 5 Perceptions regarding the repair of community infrastructure and facilities**
*Percent*

| No | Community infrastructure and facilities requiring urgent repair and reconstruction | % |
|---|---|---|
| 1 | Village religious facilities | 36.9 |
| 2 | Water sources / and networks | 18.1 |
| 3 | Footpaths and bridges | 12.7 |
| 4 | Village power generation | 10.3 |
| 5 | Village toilet and bath facilities | 6.9 |
| 6 | Village markets | 6.5 |
| 7 | Agriculture facilities (butcher, sundry, storage) | 3.2 |
| 8 | Others | 2.8 |
| 9 | Community multipurpose halls | 2.6 |

*Source:* Joint Assessment Team.
*Note:* participants = 451.

## 2.3 IMPACT ON VULNERABLE GROUPS

### Access to protection

**The mechanism to distribute aid and its fairness is a source of concern for affected communities.** With regard to people's rights to assistance and to property in a post-disaster context, the HRNA survey reveals that 50 percent of male and 52 percent of female respondents perceive the unfair distribution of assistance as a potential issue, followed by the loss of assets (20 percent of male and 21 percent of female respondents).

**According to a 2007. Ministry of Social Affairs survey, 380,965 people were living with pre-existing vulnerabilities in the 6 affected districts.** Vulnerabilities included, but were not exclusive to: 1) children affected by abuse or violence; 2) children in conflict with the law; 3) children with disabilities; 4) children living on the streets or in institutions; 5) women affected by gender-based violence; 6) adults with disabilities; and 7) elderly without family support. More than 60 care institutions were working in the affected districts prior to the earthquake and catering to this population. Protection to the vulnerable population should

- respond to the immediate protection needs of the affected population;
- restore dignity;
- reduce vulnerabilities;
- reduce the long-term threats and violations of people's right to protection; and
- reduce the overall impact of the natural disaster on people's protection and rights.

Humanitarian protection seeks to not only preserve the security and dignity of affected populations in an emergency but also to create an environment that enables respect for human rights.

**Participation in recovery planning of the affected population has been relatively low, with less than one-third perceiving that they were involved.** Affected populations have an entitlement to participate through community-based recovery and reconstriction programmes when they exist. The lack of participation by the members of affected communities proves to be a constant challenge relateing to the provision of humanitarian aid according to rights-based approaches.

**Table 2. 6 Perceptions regarding involvement in recovery planning**

*Percent*

| No | District | Yes | No | Don't Know | No Answer |
|---|---|---|---|---|---|
| 1 | Kab. Pasaman Barat | 41.5 | 39.0 | 14.6 | 4.9 |
| 2 | Kab. Pariaman | 36.5 | 46.8 | 10.3 | 6.3 |
| 3 | Kota Padang | 31.6 | 44.3 | 17.7 | 6.3 |
| 4 | Kab. Padang Pariaman | 27.6 | 49.0 | 13.3 | 10.2 |
| 5 | Kab. Pesisir Selatan | 27.5 | 32.5 | 30 | 10 |
| 6 | Kab. Agam | 23.2 | 57.1 | 10.7 | 8.9 |
| **All districts** | | **31.6** | **46.1** | **14.5** | **7.7** |

*Source*: Joint Assessment Team.
*Note*: participants = 444.

**Appropriate documentation and the protection of women and children are other key concerns for social protection in the recovery and reconstruction phase.** In an emergency it is critical to ensure that the affected population has access to their official documents, including birth certificates, national identity cards, and titles to their property. As women and the elderly are facing the burden of ensuring family care and daily subsistence during reconstruction, particular attention should be paid to their rights, respecting West Sumatra's unique cultural status as one of the largest matrilineal societies in the world.

**The gender-based violence strategy in West Sumatra continues to undertake activities** to

(i) share information, plans, and lessons learned on women and elderly issues and analyze the data collected as per agreed tools and standards in order to identify trends, priorities and recommend actions;
(ii) maintain a mapping of partners, assess the adequacy of ongoing programs, and identify gaps;
(iii) develop an appropriate program strategy to address protection and psychosocial needs of affected women and elderly;
(iv) develop an advocacy strategy for issues related to women and elderly that require the attention of the relevant authorities; and
(v) coordinate humanitarian funding mechanisms and relevant inputs to the Protection Response Plan and the mobilization of resources through humanitarian funding mechanisms in Indonesia.

**The earthquake has also negatively affected the rights of children.** In particular, the worsening socio-economic conditions expose children to the risk of abuse, violence, and exploitation. The child protection strategy in West Sumatra is to improve the protective environment of children by

prioritizing (i) an improvement of children's access to protection services for children and their families in vulnerable and extremely vulnerable situations, including psychosocial support for affected children, (ii) raise community awareness on preventing family separation, child abuse, violence, exploitation, and neglect by promoting decisions to be made according to the best interest of children and (iii) promoting children's participation in decisions that affect their lives.

# CHAPTER III

# SECTORAL EFFECTS

## 3.1 Assessment Methodology and Summary of Damage and Losses

This section evaluates: (i) damage to physical assets (such as houses, public and private facilities) in all areas affected by the earthquake; and (ii) the loss of income that the West Sumatra economy and households will experience until assets and livelihoods are restored to their original levels.

**The total damage and losses caused by the earthquake in West Sumatra are estimated at Rp 21.6 trillion (US$2.3 billion).**[6] Total damage is estimated at Rp 19.4 trillion (90 percent of the total) and total economic losses stand at Rp 2.2 trillion (10 percent). Damage is a proxy for the amount of financing, including contributions to those affected, that will be needed for reconstruction and rehabilitation from various sources, while the losses represent the reductions in economic activity and in personal and family income that will arise in the following months as a result of the disaster (Table 3.1).

[6] Estimates were made using information obtained from 9 to 22 October 2009. The US dollar equivalent is based on an Rp/US$ exchange rate of Rp 9,400 and annual inflation in Padang of 6 percent in 2010 and 2011.

**Table 3. 1 Summary of the West Sumatra earthquake damage and losses**
*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 |

*Source*: Joint Assessment Team.
*Note:* This summary table of damage and losses does not include data for Jambi province.

**The sectoral distribution of the disaster's impact mirrors that of other recent disasters in the country, with housing taking up the largest overall share at Rp 15.9 trillion (74 percent) of the total damage and losses.** Productive sectors lost Rp 2.4 trillion (11 percent), with the largest share in trade, while social sectors, dominated by education and health, lost a total of Rp 1.7 trillion (8 percent).

### Box 3. 1 Measuring damage and losses: the ECLAC methodology

The West Sumatra damage and loss assessment team used the methodology designed by the UN Economic Commission for Latin America and the Caribbean (ECLAC). This methodology has been used in post-disaster analysis around the world and has been continuously strengthened and refined since its inception in the 1970s. This methodology was used to determine the value of lost assets, define reconstruction requirements and assess the impact on each sector.

The assessed sectors are: (i) **infrastructure,** consisting of housing, water and sanitation, road and transport, energy, and telecommunication; (ii) **social sectors**, consisting of education, health, religious, and facilities for the poor and vulnerable; (iii) **productive sectors** consisting of agriculture, fisheries, livestock, irrigation, trade and industry, finance and tourism; and (iv) **cross-cutting sectors** consisting of government and public administration, and environment. The methodology also looks at the overall macroeconomic impact.

There are three main aspects in this assessment analysis:

- **Damage** (direct impact) refer to the impact on assets, stock (including final goods, goods in process, raw materials, materials and spare parts), and property, valued at agreed replacement (not reconstruction) unit prices. The assessment considers the level of damage (whether an asset can be rehabilitated or repaired, or has been completely destroyed).

- **Losses** (indirect impact) refer to flows that will be affected, such as production decline, reduced incomes, increased expenditures, etc. over the time period until the economy and assets are recovered. These will be quantified at present value. The definition of the time period is critical. If the recovery takes longer than expected, losses might increase significantly.

- **Economic and social effects** (sometimes called secondary impacts) include macroeconomic and fiscal impacts; livelihood, employment and incomes; and social impacts. The analysis aims to measure the impact of the disaster on economic growth, unemployment, poverty, etc. At national and sub-national levels.

**As in previous disasters, households and private companies share the overwhelming part of damage and losses, with an estimated total of Rp 20.8 trillion (89 percent), while public sector damage and losses are Rp 2.5 trillion (11 percent).** While some of the private businesses will be covered by insurance, a large number of private households will need to rely on public funds for the reconstruction and rehabilitation process if they are to recover.

**With a population of 4.7 million people, total damage and losses represent Rp 4.6 million on a per capita basis.** As reflected in most chapters, the bulk of the damage and losses will affect Kota Padang and Kab. Pariaman, significantly increasing the per capita burden in these two localities.

## 3.2. Cross-cutting Issues

### 3.2.1. Environment

#### Introduction

**A healthy natural environment sustains human existence and provides goods and services that improve people's quality of life and well-being.** Natural ecosystems are often resilient, but in some cases where natural and human systems interact, disruption of natural processes through catastrophic events can lead to adverse effects. Environmental degradation has cross-cutting consequences for most other sectors and it is often the poor who are most affected. This section describes environmental impacts, but many of the associated costs are incurred in other sectors — including housing, water, and agriculture — and are dealt with in those sections of this report.

#### Pre-disaster conditions

**West Sumatra's exposure to seismic activity and its steep terrain make the province uniquely susceptible to landslides.** Three-quarters of West Sumatra's land area is mountainous and risks of landslides and erosion affect around half the province. While the highlands provide some agricultural ground, many areas are too steep for cultivation and in some areas loss of forest cover and inappropriate land use exacerbates the risk of landslides.

**The mountains are an important source of freshwater that feeds the province's rivers and provides its main source of drinking water.** However, damage to catchment areas and watersheds may affect water levels in some areas and may have impacts on the province's hydropower potential. There are also reports of dumping of waste from small-scale industrial activities into rivers and beach areas, and several rivers have poor quality water and high levels of mercury accumulation. In some areas, lack of sanitary facilities leads to further pollution of water bodies.

**West Sumatra's protected forests, including its two national parks, are under pressure from illegal logging and encroachment.** Forest degradation reduces the forest's capacity to provide environmental services including the protection of biodiversity, the stabilization of soil, and the sequestration of carbon.

## Disaster Impact

### *Landslides*

Vibration from the earthquakes caused widespread landslides on mountains, cliffs, and riverbanks, and this damaged settlements, infrastructure, and agricultural production in affected areas. The banks of Danau Maninjau were severely affected by landslides, and settlements along its shore continue to be under threat. As the soil remains unstable in some areas, identifying threats from further landslides and relocating people at risk needs to be given priority.

### *Sedimentation and water pollution*

Landslides in watersheds as well as collapsing riverbanks and lakesides increased sedimentation of some water bodies. There were no reports of environmental damage from spills, fires, or explosions of hazardous materials. Damage to rural sanitary facilities resulted in increased amounts of human waste entering streams and rivers, causing organic pollution. Pollution from damaged sanitation and from chemical spills needs to be identified and mitigated to avoid long-term ecological consequences. An estimated 100 hectares of slopes may need to be stabilized with ground cover to reduce sedimentation of rivers, although there is a need to further assess those areas. The cost of establishing ground cover is about Rp 6 million per hectare.

### *Groundwater systems*

While the subterranean impacts of the earthquake are still poorly understood, there are reports of wells filling with mud, of salinization of water sources, and of several houses in Padang being flooded by rising muddy groundwater. Changes to subterranean structures may have impacts on future water supplies, especially in rural areas where wells are widespread and important.

### *Damage to forests*

The Provincial Forest Service reports that landslides damaged 770 hectares of protection and conservation forestland in Agam, Padang and Padang Pariaman. No timber production from the main affected areas was recorded in recent Ministry of Forestry statistics, so losses from foregone production are assumed to be negligible. Forest ecosystems are adaptive to disturbance, and most of the damaged area will recover without loss of environmental service, but a portion of the area is likely to be of critical ecological importance. Of the area damaged, it is estimated that 50 percent was forested prior to the landslides and that 25 percent of that area, or around 100 ha, is of ecological significance. Losses of environmental services are estimated at Rp 2.3 million/ha/yr (see Annex on Environment) and the reforestation cost cited by the Ministry of Forestry is about Rp 6 million/ha. If rehabilitation occurs in three years, the NPV (using a discount rate of 10 percent) of lost environmental services and rehabilitation costs is estimated at Rp 1.1 billion.

### *Waste and debris*

The destruction of buildings resulted in large amounts of waste and debris. If not properly managed, waste may pose a risk to human health as well as ecological functions. Currently very little debris is reaching managed landfills, as it is being used locally for filling and paving, or for reconstruction. Burning of excess rubbish could reduce air quality and adversely affect human health. The Government does not anticipate problems disposing of excess waste in existing landfills, but the impacts on landscapes and pollution need to be monitored closely.

### *Local environmental management capacity*

The disaster destroyed buildings, vehicles and office equipment of many local government institutions, including the provincial forestry service and the environmental impact agency. This will likely impinge on the institutional capacity to respond to the current and anticipated environmental challenges. Early re-establishment of local environmental management capacity is essential for the rehabilitation and reconstruction program, including data collection and environmental monitoring.

**Table 3. 2 Damage and losses in the environment sector**

*Rp billion*

| | Disaster effects | | | Ownership | |
|---|---|---|---|---|---|
| Sub-sector, component | Damage | Losses | Total | Public | Private |
| Loss of critical protected forest cover | | 1.1 | 1.1 | 1.1 | 0.0 |
| Loss of soil stability in watersheds, incl. riverbanks | 0.6 | | 0.6 | 0.6 | 0.0 |

*Source*: Estimates of the Joint Assessment Team.

### Risk Management issues

**There is a need to incorporate environmental concerns in planning the reconstruction process to avoid further environmental degradation and reduce risks from future disasters**.

### *Relocation*

While most houses and infrastructure will be rebuilt on their original sites, some settlements and roads destroyed or threatened by landslides may need to be relocated, and this could lead to increased pressure on environmentally sensitive areas.

### *Increased logging*

Use of raw material for reconstruction may have significant environmental impacts. Rebuilding housing and infrastructure will require significant amounts of timber, and sand. The price of sawn timber in affected regions was reported to have doubled within weeks of the earthquake, creating large incentives for logging activities, some of which are likely to be unsustainable.

### *Water pollution*

Delayed repairs to damaged rural sanitation facilities could lead to increased surface and groundwater pollution. Inadequate sanitation in newly constructed buildings could exacerbate this problem in the long run.

### *Stabalizing slopes*

Some of the landslide occurrences were unavoidable due to steep topography and soil structure, but lost forest cover from logging activities and other inappropriate land uses may have contributed to the damage. Many steep slopes are cultivated with coconut trees, and these provide less soil stabilization than more dense vegetation cover, which should be considered in future land use planning.

### Disaster preventation awareness

The current disaster highlights the importance of creating awareness of the causes and risks of landslides and of directing human developments away from threatened areas.

## Recovery Framework

Environmental sector objectives for reconstruction and rehabilitation are threefold:

- minimize the environmental damage associated with the earthquakes;
- minimize the overall ecological footprint of reconstruction on the natural environment; and
- reduce future environmental risks.

**Efforts should be made to minimize the environmental damage associated with the earthquakes.** In the short term, further sedimentation of streams from erosion of unstable slopes or from further landslides should be monitored and addressed. This may involve stabilizing slopes that threaten environmentally critical areas. Also, efforts to provide environmentally benign sanitation facilities should be accelerated in areas where waterways are at risk from sewage pollution. In the medium and longer-term, sensitive areas that have been denuded by landslides should be rehabilitated.

**Environmental objectives should be integrated, or mainstreamed, into the planning process for reconstruction.** Reconstruction activities should be carried out according to environmental guidelines and be supported by environmental impact assessments. New houses and road developments should be built according to relevant seismic building standards, be sited away from environmentally fragile areas, and buildings should be planned with sanitation systems that minimize pollution risks.

**Experience from the 2004 disaster in Aceh has shown that rebuilding will increase demand for timber and other raw materials that may come from unsustainable sources.** Forest monitoring and enforcement of forestry laws will have to be improved to reduce illegal logging associated with construction. In addition, demand for construction timber could be managed by importing sawn timber from sustainable sources. Quarrying riverbeds for road construction materials will likely have adverse impacts on stream environments, and alternative sand and gravel deposits away from riverbeds should be explored and developed.

**Capacities to assess the existing damage and manage anticipated environmental impacts of the reconstruction process must be improved significantly and rapidly.** Bapedalda Sumbar will require added capacity to respond to increased demand for assessment and control of the environmental impacts associated with reconstruction. Building of new houses and infrastructure will require more environmental impact assessments and planning, and this will require a commensurate increase in Bapedalda's budget. The forest service will have to increase monitoring and law enforcement activities in the medium-term.

**Reconstruction provides an opportunity for improving environmental risk management.** Future environmental risks should be addressed by directing developments away from areas that are prone to landslides and by discouraging inappropriate land use on steep slopes. This will require increased capacity to carry out spatial planning, awareness building, monitoring and enforcement of rules.

**In order to calculate the costs involved in achieving the environmental objectives of reconstruction, planning and environmental agencies will need to take stock of the degree of damage and likely opportunities.** As a preliminary estimate we assume that current budgets

for forest protection and for environmental management need to be doubled for the reconstruction phase, which is assumed to cover two years. Forest protection efforts are shared between the Provincial Forest Dinas (Dinas Kehutanan Propinsi) and the Ministry of Forestry's Forest Conservation Unit (BKSDA), and these institutions had Rp 400 million and Rp 500 million allocated for forest protection in 2009 respectively. Doubling this figure leads to Rp 900 million in additional funding per year, or Rp 1.8 billion in total.

It is estimated that the costs of assessing environmental damage and risk, for processing additional EIAs, and for carrying out environmental planning is Rp 8.6 billion, in addition to the Bapedalda budget allocation in 2009 of Rp 4.3 billion.

**Table 3. 3 Reconstruction needs in the environment sector**

*Rp billion*

| Sub-sector needs | Estimated cost |
|---|---|
| Reforestation of critical forests | 0.6 |
| Stabilization of critical slopes | 0.6 |
| Increased forest monitoring and enforcement capacity | 1.8 |
| Assessment of environmental damage and risk, processing additional EIAs, and environmental planning | 8.6 |
| **Total** | **11.6** |

*Source*: Estimates of the Joint Assessment Team.

## 3.2.2. Government and Public Administration

**The collapsed office of Water Resources Management Agency**


**Debris removal at the provincial public library**

## Summary

**This section covers the estimation of damage and losses to the government and public administration sector.** It discusses damage and losses to buildings and properties belonging to national, provincial, district, sub-district and *nagari* levels of government. Law enforcement agencies (including the police, court houses and prosecutors offices) and the Indonesian Armed Forces are also included.

**The government sector experienced substantial physical damage as a result of the earthquake.** Among the damaged facilities were some nerve centers of government operations, such as the West Sumatra Governor's office and the town halls of Kota Padang and Kota Pariaman. In total, the damage and losses to government and public buildings is estimated at Rp 625.6 billion, comprising Rp 610.8 billion for the estimated value of damage to buildings, equipment, and official residents, and Rp 14.8 billion in losses, mainly for the cost of debris removal and the cost of temporary rental of offices. The provincial government of West Sumatra had followed good practice by insuring most of its public buildings against natural hazards, including earthquakes and part of the costs of reconstruction can be covered by proceeds from this insurance. Table 3.4 below provides a summary of the estimate of damage and losses to the government and public administration sector.

### Table 3. 4 Damage and losses in the government sector

*Rp billion*

| Government component | Disaster effect | | |
|---|---|---|---|
| | Damage | Losses | Total |
| Central government offices and equipment(1) | 124.8 | 1.8 | 126.6.0 |
| Provincial government offices and equipment | 264.3 | 3.3 | 267.6 |
| Local government offices and equipment | 159.3 | 7.7 | 166.5 |
| Sub-districts and *nagari* offices and equipment | 33.5 | 1.8 | 35.3 |
| Boarding houses (TNI and Polri) | 28.8 | 0.2 | 29.0 |
| **Total** | **610.8** | **14.8** | **625.6** |

*Source*: Estimates of the Joint Assessment Team.
Note: (1) including TNI, Polri, court houses and state prosecutors' offices

**The damage to buildings, equipment, and office premises is expected to affect the level of public services provided.** Early indications show that, at least at the level of district and provincial governments, while service disruption exists it appears to be manageable. Temporary arrangements have been made to relocate offices to alternative government premises or to rented premises, albeit at a lower level of capacity. At the *nagari* (customary bound villages) level, however, service disruption may be more significant since many *nagari* whose offices are damaged have yet to find permanent relocation premises. *Nagari* provides an important public service, particularly in land and people registration. *Nagari* are also at the forefront of the implementation of government programs, so their role is crucial in facilitating reconstruction at the village level once these activities start. There is a need to take into account potential legal problems arising from the loss of legal documents that can lead to conflicting claims of land ownership and trusteeship of orphans.

## Pre-disaster Conditions

**Local governments in the affected districts are led by *bupati* supported by 24 to 33 local government work units** (Dinas and Technical Agencies). Each district is further divided into sub-districts and *nagari* or *kelurahan* in the cities. The *nagari* government is led by a directly elected Wali *nagari* and organized along the customary boundaries. In each *nagari*, beside the *nagari* office there are also the offices of Kerapatan Adat Nagari (KAN, village customary deliberation councils), which can be considered the legislative branch in the *nagari*. The total number of *kecamatan* and *nagari* in the five worst- affected districts are respectively 69 and 303. Many of the provincial government buildings, such as the collapsed Bappeda office, were built in the 1980s and make use of the traditional Minang architectural style.

**After the 2007 earthquake, the provincial government of West Sumatra decided to insure most of its properties against earthquake hazards. Unfortunately, the district and city governments failed to make similar arrangements.** The provincial government used PT Askrida, a company owned by the association of regional development banks, as its insurer. The insurance covers damage caused by earthquake, tsunami and fire. The premium for the insurance was paid through the local government budget at about Rp 9 billion per year.[7] It is expected that some of the reconstruction costs for provincial government buildings will be covered by insurance pay-outs, although most district and city government buildings are only covered by limited insurance for fire risks.

## Damage and Losses Assessment

**The earthquake has caused substantial damage to government buildings in the most affected districts.** The government buildings that sustained heaviest damage include some of the main government operation centers. The West Sumatra governor's office and the town halls in Kota Padang and Kota Pariaman, were heavily damaged. Many government agencies have been relocated or had to make temporary arrangements. Initial assessments by the Public Works Department is underway and will provide recommendations on whether buildings should be re-built or need structural improvements.

**A large number of multi-storey public buildings collapsed and lost their ground floors.** Large openings on the ground floor such as lobbies, created a "soft storey" condition resulting in excessive displacement demands on columns leading to column failure and collapse.

[7] Interview with Head of Asset Management Division, DPKAD West Sumatra 15 October 2009.

**Damage to offices and equipment in Kota Padang account for 84 percent of the total damage.** Kota Padang has a higher number of offices house in buildings of a higher value due to the larger area and more sophisticated construction. Kota Pariaman and Kab. Padang Pariaman are the second and third most affected districts, respectively, in terms of value of the damage.

**The total losses are estimated at Rp 14.8 billion and are mostly accounted for by the cost of demolishing dangerous structures, removing debris and renting temporary office premises.** Some buildings will need to be completely demolished before rebuilding can start. The Government of Kota Padang has decided to relocate some of its offices to rented shops above the regional bus terminal in Bingkuang, about 30 km drive from the city. A similar approach has been used by the Government of Kab. Padang Pariaman.

### Key issues

**Government operations are expected to slow due to the lack of equipment and physical working space. However, service disruption at the district and provincial levels appears to be manageable.** Despite the challenge of working in a more difficult environment, government operations appear to have resumed, although not all government agencies have returned to full operating capacity. The need to operate manually in many offices has slowed down services considerably.

**Service disruption may be more profound at the *nagari* level, as some *nagari* have still to find relocated premises.** Observations during a field visit for the assessment indicated widespread damage, so it may be difficult for *nagari* officials to find convenient well-equipped alternative office accommodation, hampering their ability to provide usual services. Damage to buildings of the KAN may cause the non-state dispute resolution mechanism to stall, since KAN premises are usually chosen for dispute resolution. This observation is further strengthened by the HRNA, which revealed that one of the community's main concerns was disruption to public services at the local level.

**Legal problems may arise due to the loss of legal documents and records in damaged buildings.** Such documents include land certificates, identity documents, and birth certificates. This may compromise agreements between parties and create potential difficulties in claiming rights, such as insurance claims, land tenure, etc.

**Another impact of the disaster is the serious disruption of the execution of the local budget for the remainder of fiscal year 2009**. Early assessments with the Provincial Bappeda, Bappeda of Kota Padang and Kota Pariaman[8] indicate that as the budget revision (APBD-P) was already approved by the respctive DPRD prior to the earthquake, so the new realities will hinder the execution of the government projects for the current year. Local governments now need to consider readjusting their programs while maintaining compliance with prevailing regulations. This will also affect monitoring activities, which now have to recognise the fact that the projects may be adversely affected by the impact of the earthquake.

[8] Reference: Interview with Bappeda officials: Bappeda Sumbar, Bappeda Kota Padang, Bappeda Kota Pariaman from 4 to13 October 2009.

## Recommendations

Based on this preliminary assessment, the following actions are recommended in the government and public administration sector:

### Short term

1. Establish temporary office arrangements to resume core government operations and restore public services functions.
2. Immediately obtain basic equipment vital for the continued functioning of government operations.
3. Support the restoration of *nagari* service provision function through the provision temporary premises and equipments.
4. Organize the collection and recovery of government documents and files which currently may have been damaged by the earthquake.
5. Expedite the process of planning and budgeting to include the reconstruction activities. Particularly for the provincial government, the availability of the pay out from the insurance company should immediately be incorporated into the existing budget.
6. Fill local government capacity gaps (particularly in coordination, planning and budgeting, monitoring and evaluation, disaster management, and public information management) with technical assistance from external agencies.
7. Organize proper building demolition for the uninhabitable buildings and ensure that debris is recycled and/or properly disposed of.
8. Create a facility for re-issuing and/or republishing proper legal documents for those whose records have been lost.
9. Utilize and empower existing traditional institution such as Kerapatan Adat Nagari as an alternative dispute resolution and mechanism, particularly when reconstruction programs are implemented.
10. Establish systems to manage the influx of volunteers and support agencies.
    a. Establish a system where of the interventions, progress, and assets provided by all actors are clearly recorded on a regular basis; and
    b. Ensure that the information is accessible by the public, thereby fostering a transparent and accountable recovery process.
11. Establish emergency assistance and recovery information systems within local government agencies
    a. to map who is doing what, and where;
    b. to identify gaps and ongoing needs of early recovery and reconstruction activities; and
    c. establish GIS information systems in urban and semi-urban areas to monitor clearing activities and collect appropriate recovery and reconstruction documentation from structural engineer assessments.
12. Proactively clarify the status of the customary land together with National Land Agency (BPN) and with the involvement of local elders.

### Medium to longer term

1. Use proper earthquake resistant engineering techniques in the reconstruction of government offices. Assess existing buildings for their seismic adequacy and develop a seismic rehabilitation program for those buildings found to be deficient. Develop and update local spatial plans to also include disaster hazard maps and risks maps.
2. Undertake participatory planning for recovery, with full participation from the community. At the same time, ensure that RPJMD also incorporates disaster risks and recovery efforts.
3. Develop a business continuity plan to ensure the quick resumption of services in the event of another disaster.
4. Explore the possibility of the insurance arrangements to cover all public buildings both in the province and districts, down to the *nagari* level.
5. Improve disaster risk management capacity by:
    a. establishing a BPBD and regional emergency operation center;
    b. establishing provincial and district platforms on DRR;
    c. establishing and develop provincial and district DRR action plans;
    d. supporting the review and revision of current West Sumatra Disaster Management Plan based on lessons learned from current disaster impact, response, early recovery and reconstruction processes;
    e. establishing a Provincial DiBI;
    f. preparing a province-wide hazard assessment and mapping of landslide-prone areas to identify communities still threatened by landslides and as inputs for planning road and power reconstruction;
    g. preparing an assessment of needed tsunami evacuation shelters as a "build back better" input to the reconstruction of government facilities, schools and motor or foot bridges; and
    h. preparing urban and semi-urban multi-hazard disaster scenarios for most likely disaster types for Kota Padang, Kota Pariaman and other areas as needed; and
    i. establishing centers for DRR at local universities with possible specialization in disaster resistant housing and non-engineered buildings, and community-based micro planning.

### Table 3. 5 Damage and losses in the government sector

*Rp billion*

| | Disaster effects | | | Ownership by sector | |
|---|---|---|---|---|---|
| | Damage | Losses | Total | Public | Private |
| **Sub-sector, Component** | | | | | |
| Buildings | 514.4 | 0.0 | 514.4 | 514.4 | 0.0 |
| Equipment | 96.5 | 0.0 | 96.5 | 96.5 | 0.0 |
| Debris removal | 0.0 | 4.3 | 4.3 | 4.3 | 0.0 |
| Office rent cost | 0.0 | 10.5 | 10.5 | 10.5 | 0.0 |
| Total | 610.8 | 14.8 | 625.6 | 625.6 | 0.0 |

*Source*: Estimates of the Joint Assessment Team.

*Notes:* (1) Lower exports; higher imports. (2) Lower tax revenues; unexpected expenditures

**Table 3. 6 Early recovery and reconstruction estimates**

*Rp billion*

| Sub-sector needs | Early recovery | Reconstruction | Total |
|---|---|---|---|
| Reconstruction of buildings(1) and equipment | | 729.9 | 729.9 |
| Debris removal | 4.3 | | 4.3 |
| Office rental costs | 10.5 | | 10.5 |
| **Total** | **14.8** | **729.9** | **744.7** |

*Source*: Estimates of the Joint Assessment Team.

(1) Including inflation and retrofitting estimated at 7.5 precent of building costs

### 3.2.3. Gender

**Common perceptions of gender and the role of women in Indonesian society may not apply in the case of West Sumatra** which is dominated by Minangkabau culture and is one of the largest matrilineal societies in the world. Therefore, common assumptions related to, for example, vulnerability of female-headed households, the role of women in decision-making, the status of women within the community and divisions of labor, may in fact not be appropriate in the context of West Sumatra. This has implications for disaster management policies including those related to land and property ownership, decision-making, income-generating activities, housing reconstruction and conflict resolution. It will important that gender interventions in the recovery and reconstruction program do not undermine the role and status of Minang women in their communities, which are relatively significant compared with other patrilineal societies in Indonesia.

**Minangkabau culture in urban areas is now more heterogenous.** However, it is important to note that Minangkabau culture has adapted to local environments and has also undergone change, particularly in urban areas. It is also important to recognize the existence of other social groups, such as Jambak, Chaniago, Tanjung, Piliang and the ethnic-Chinese community who were also affected by the disaster, amongst which the matrilineal nature of Minangkabau culture may not be as strong or may not apply at all. There are also differences in the way that gender roles are interpreted in urban and rural areas. Some examples of sectors in which specific Minangkabau gender distinctions should be considered are discussed below.

#### Housing

According to Minangkabau custom, houses are mostly owned by women. Husbands will move from their mother's homes into their wives homes. This is particularly the case in rural areas where matrilocality is still practiced.

#### Agriculture

In rural areas where traditional agricultural systems are still used, a large proportion of agricultural land is owned by women, who also have responsibility for land ownership rotation and for oversight of share-cropping activities.

#### Livelihood programs

Women in Minangkabau society play an important role in generating household income, both through household industries and also labor outside the household, including share-cropping and

wage-based agricultural production labor. Livelihoods recovery programs should take this significant role into consideration.

Where traditional systems still apply, in disputes over land rotation and ownership a senior male figure or *tunganai/tungganai* is chosen to facilitate dispute settlement. His role would be one of conciliator or communicator rather than arbitrator, as "the real power over land remains with the constituent landholders... who are usually women" (Chadwick, 1991). Land resettlement negotiations may benefit from the existence of this traditional system of land conflict resolution.

## 3.3. Restoring Public Service and Fulfilling Basic Needs

### 3.3.1 Education

#### Summary

**Total damage and losses in the education sector in earthquake affected districts in West Sumatra are estimated at Rp 618.8 billion** covering schools under the Education Dinas, together with *madrasah* and *pondok pesantren* under the Ministry of Religious Affairs (MoRA). Out of 5,911 schools and pre-school facilities managed under the Education Dinas (District Education Administration),[9] 1,013 (17 percent) were damaged, most of them severely. The total damage and losses to education buildings and equipment under the Education Dinas were assessed at Rp 380.8 billion. Out of 693 *madrasah* supervised by the MoRA,[10] 175 *madrasah* (25.3 percent) and 102 *pondok pesantren* were damaged, and the damage and losses are estimated at Rp 237.9 billion. At the time of assessment, complete information on damage and losses relating to higher education and non-formal education institutions was unavailable and could not be included in this report.

#### Pre-disaster Conditions

**Kota Padang is the educational hub for West Sumatra, with a concentration of higher-education institutions, together with secondary and primary schools.** Before the earthquake, some 895,000 students were enrolled in education facilities supervised by the MoNE, while about 56,000 students were enrolled in *madrasah* schools, and 86,000 students[11] were registered in higher-education institutions. Educational achievement in West Sumatra has improved in the recent years and caught up with national averages. In 2008, the net primary school enrollment rate was 95 percent, with similar levels for both boys and girls. The transition rates to the junior secondary level and the senior secondary level have increased due to improved physical access to schools throughout the province. In 2008, net enrollment rates for junior secondary schools stood at 67

[9] Including Taman Kanak Kanak, PAUD, Sekolah Luar Biasa, Sekolah Dasar, Sekolah Menengah Pertama, Sekolah Menengah Atas, Sekolah Menengah Kejuruan (public and private).
[10] MoRA supervised education facilities include *madrasah:* RA, *madrasah ibtidaiyah, madrasah tsanawiyah, madrasah aliyah and pondok pesantren* (public and private).
[11] Source: Data Pokok Pendidikan Sumatera Barat 2007/2008.

percent and 45 percent for senior secondary schools (national enrollment rates stand currently at 71 percent in junior secondary and 50 percent in senior secondary).

**The education sector is characterized by public-private partnerships at all levels.** Around 30 percent of schools (pre-tertiary) and 68 percent of *madrasah* are privately managed; 82 out of 87 higher-education institutions in the province, including universities, academies and other higher-education institutes, are private. In addition, the private sector plays a vital role in delivering non-formal education. A large number of private non-formal training providers offer skills training courses, language classes, business and management programs, and computer training, etc.

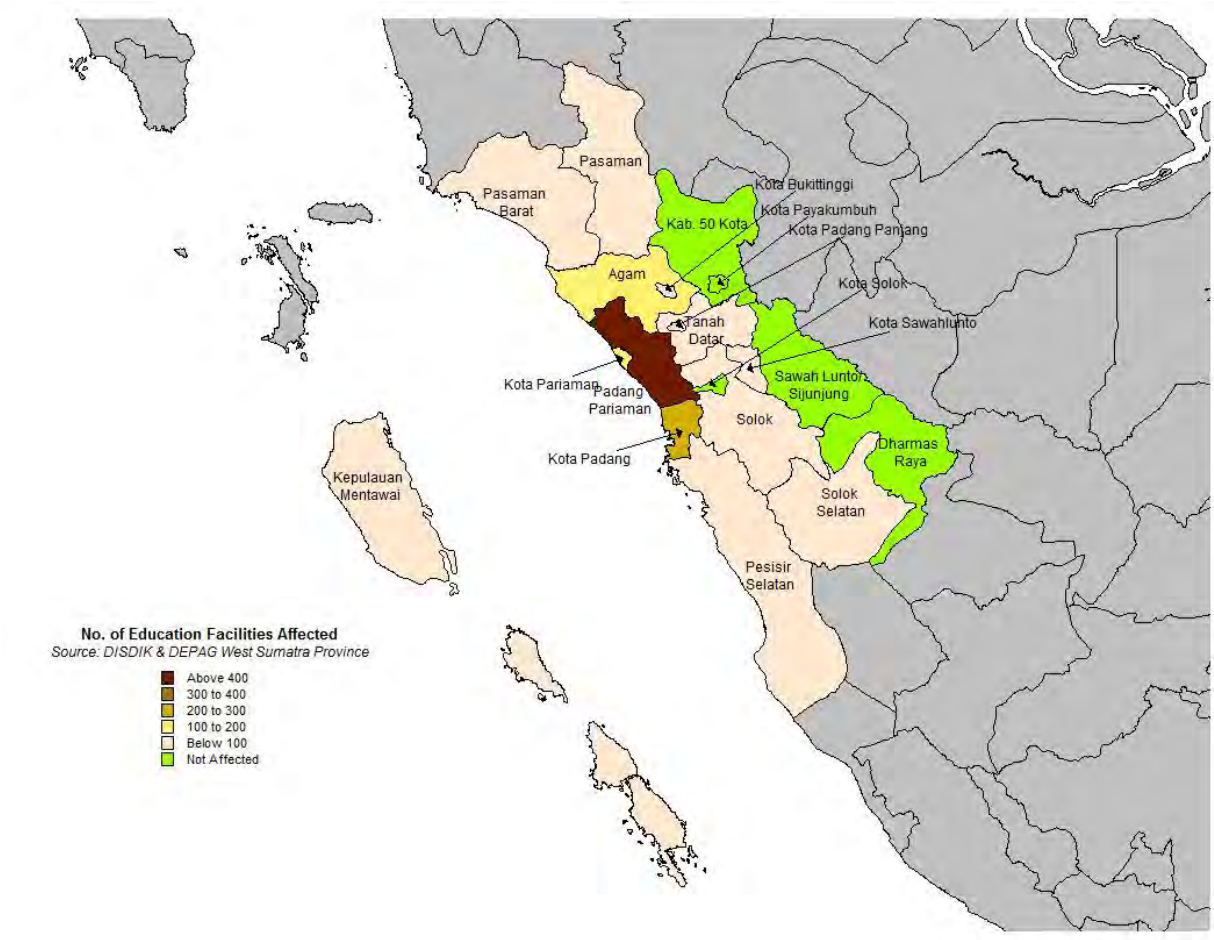
## Damage and Loss Assessment

**The earthquake has had a major impact on the education sector. In total, about 1,290 education facilities were badly damaged with the total damage estimated at Rp 593.8 billion.** Total losses are estimated to be about Rp 25 billion, primarily consisting of costs to establish temporary school premises.[12] Although, complete information on damage estimates at higher and non-formal education institutions were not available during the time of assessment, field visits suggest that at least 60 percent of higher education facilities and a great number of private non-formal training providers were also damaged by the earthquake.

**Kab. Padang Pariaman and Kota Padang were the most severely affected areas.** Preliminary estimates of damage and losses to education buildings in Kab. Padang Pariaman are estimated at Rp 271.8 billion, which accounts for about 44 percent of the total damage estimates to educational facilities in the province. In Kota Padang damage is estimated at Rp 182.1 billion (29 percent of the total damage). These estimates do not include damage to higher education institutions and private non-formal training providers, mostly located in Kota Padang.

[12] The Provincial Dinas has allocated Rp 12.5 billion to establish temporary classrooms (Rp 8 million per classroom) to cover 50 percent of needs. According to Provincial Dinas one teacher died in the earthquake; no additional costs occurred for temporary teachers. The loss assessment does not cover the financial value related to the physical or psychological treatment required by sick and traumatized students.

### Map 3. 1 Density of education facilities affected




### Table 3. 7 Summary of damage and losses to the education sector

*Rp billion*

| | Damage | | | Losses | Total damage and losses | Ownership | | Reconstruction needs |
|---|---|---|---|---|---|---|---|---|
| | Buildings | Furniture & equipment | Total | | | Public | Private | |
| **West Sumatra** | 530.59 | 63.19 | 593.78 | 25.00 | 618.78 | 509.96 | 108.83 | 1273.38 |
| Kab. Padang Pariaman | 240.03 | 20.20 | 260.24 | 11.60 | 271.84 | 265.72 | 21.32 | 551.59 |
| Kota Padang | 152.19 | 23.48 | 175.67 | 6.44 | 182.10 | 98.66 | 60.67 | 388.08 |
| Kab. Agam | 49.22 | 7.29 | 56.51 | 2.51 | 59.02 | 55.15 | 6.89 | 119.73 |
| Others | 89.15 | 12.22 | 101.36 | 4.46 | 105.82 | 90.43 | 19.94 | 213.98 |

*Source*: Estimates of the Joint Assessment Team.

**Poor structural quality of school buildings contributed to the high level of damage, since school construction often failed to follow the seismic building standards.** Many education facilities, particularly in rural and poorer areas, were constructed in the 1970s or 1980s as part of the Inpres program and have seriously deteriorated over the years due to severe weather conditions,

continuous use and inadequate maintenance. School rehabilitation funding received from various sources was mainly used by schools to improve the appearance of buildings, while the issue of weak structures remains unaddressed. In order to accommodate a the rapidly expanding number of students and increasing access to secondary education services, many existing schools were extended and additional schools were built. However, in order to maximize limited funds, often the enforcement of building codes and other safety standards was compromised.

**Although education facilities with about 240,000 students were seriously damaged, all affected classroomses were back in operation, by the time of this assessment,** albeit operating on reduced hours. In order to resume classes swiftly, school tents and other temporary arrangements have been set up by government agencies with the help of development partners and NGOs. Teachers are conducting classes in multi-grades and in shifts using tents and nearby undamaged or only slightly damaged buildings.

### Key Issues

**It may take up to two years until the education system in West Sumatra is back to normal** and all education facilities have been reconstructed and rehabilitated**.** The Government was successful in setting up temporary learning and teaching premises including tents for nearly all affected schools to ensure that students returned to their classes as quick as possible. At least 50 percent of students in the worst affected areas in West Sumatra will have to continue studying in tents and provisional classrooms in nearby buildings for about two years. Considering the large number of affected students, there is a risk of declining attendance rates and lower student achievement due to the poor learning environment in provisional facilities. Teachers also expressed concern that they could not assign homework to students due to damage to students' homes. Trauma, both among students and teachers, is widely reported.

**Inadequate budget allocated for maintenance has resulted in considerable deterioration of school buildings over the past 20 years.** Appropriate technical supervision is needed to ensure that seismic building codes and other safety measures are followed, both in future school construction, and in the rehabilitation of damaged school buildings.

### Preliminary Recommendations

**Detailed technical assessments of all education facilities are urgently required to confirm that remaining buildings and classrooms are safe to use.** Preliminary rapid damage assessments were mostly conducted by education personnel and district officers, who often do not have sufficient technical knowledge and experience. Field visits suggest that more classrooms may be designated unsafe and therefore the current preliminary damage estimates may be too low.

**A community approach should be developed when rehabilitating education facilities based on the MoNE's community based school construction program,** together with lessons learned from the PNPM Mandiri and other school reconstruction programs. Substantial evidence demonstrates that a community driven approach can be more effective in carrying out school rehabilitation. Infrastructure built with community participation costs much less than infrastructure built using other procurement methods, while still meeting or even surpassing quality standards. Evidence also indicates that community involvement in the design and construction process is likely to offer better cost recovery, operation and maintenance of completed facilities due to community members' strong sense of ownership. However, given that communities in seriously affected areas

will be fully occupied in re-establishing their own livelihoods, additional technical support should be given to them when they are involved in school reconstruction.

**A system to monitor the progress of the reconstruction needs to be established**, in order to ensure actors can be held accountable for delivering on their promises, that also to enable an assessment of where reconstruction activities have been "built back better".

### Reconstruction Needs

**Overall needs for both recovery and reconstruction within education sector is estimated at Rp 1,298 billion** Assuming that the rehabilitation of education facilities follows seismic building standards and other safety standards, the estimates for rehabilitation costs will be higher than damage estimates. Under the assumption that the reconstruction of education facilities will take about two years, total reconstruction costs are Rp 1,273 billion[13]; while recovery needs are Rp 25 billion.

## 3.3.2. Health


### Summary

**Total damage and losses in the health sector in earthquake-affected areas of West Sumatra are estimated at Rp 744.3 billion.** Damage to health facilities is projected to disrupt service delivery to around 23 percent of the population of West Sumatra. Total damage is estimated at about Rp 569.1 billion, while losses are estimated at Rp 175.2 billion.

### Pre-disaster Conditions

**West Sumatra's health indicators are far below national averages despite the relatively better access and utilization of health facilities in the province**. West Sumatra's infant mortality rate

[13] The reconstruction cost uses unit cost of Rp 2.5 million/$m^2$ plus furniture and debris removal. It is assumed to be completed in 2 years and has included inflation and scarcity index (index *kemahalan*).

(IMR) is 47 per 1,000 live births, higher than the national figure of 34 per 1,000 live births. The mortality rate for children under five years of age is 62 per 1,000, well above the national average of 45 per 1,000. The low level of health outcomes in the province is rather surprising given that West Sumatra has superior service access than the national average. For instance, the ratios of doctors and midwives to the population in West Sumatra are 22 and 59 per 100,000, respectively, higher than the national average of 18 and 48 per 100,000, respectively. The utilization of professional health providers, which provides an indication of access to healthcare services, also shows that the province performs above national average in the utilization of health facilities[14] and births attended by skilled midwives. Nevertheless, achievements in some important programs remain lower than the rest of the country, such as complete immunization coverage, which stands at 69 percent compared with 73 percent at the national level.

**The health service delivery is predominantly public, while the private sector share – although growing – is less than 1 percent**. In urban areas, such as Kota Padang, Kota Bukit Tinggi, Kota Pariaman, and Kota Padang Panjang, the private sector is becoming a significant player in health service delivery. In 2007, for instance, almost half of hospital beds in Kota Padang were owned by the private sector.[15] In terms of access, the poorest quintile visits modern health facilities less frequently than the top quintile, with only 39 percent of the poorest quintile registering health complaints compared with 52 percent from the richest quintile.[16] Health insurance coverage remains at around only 20 percent of the population.

## Damage and Loss Assessment

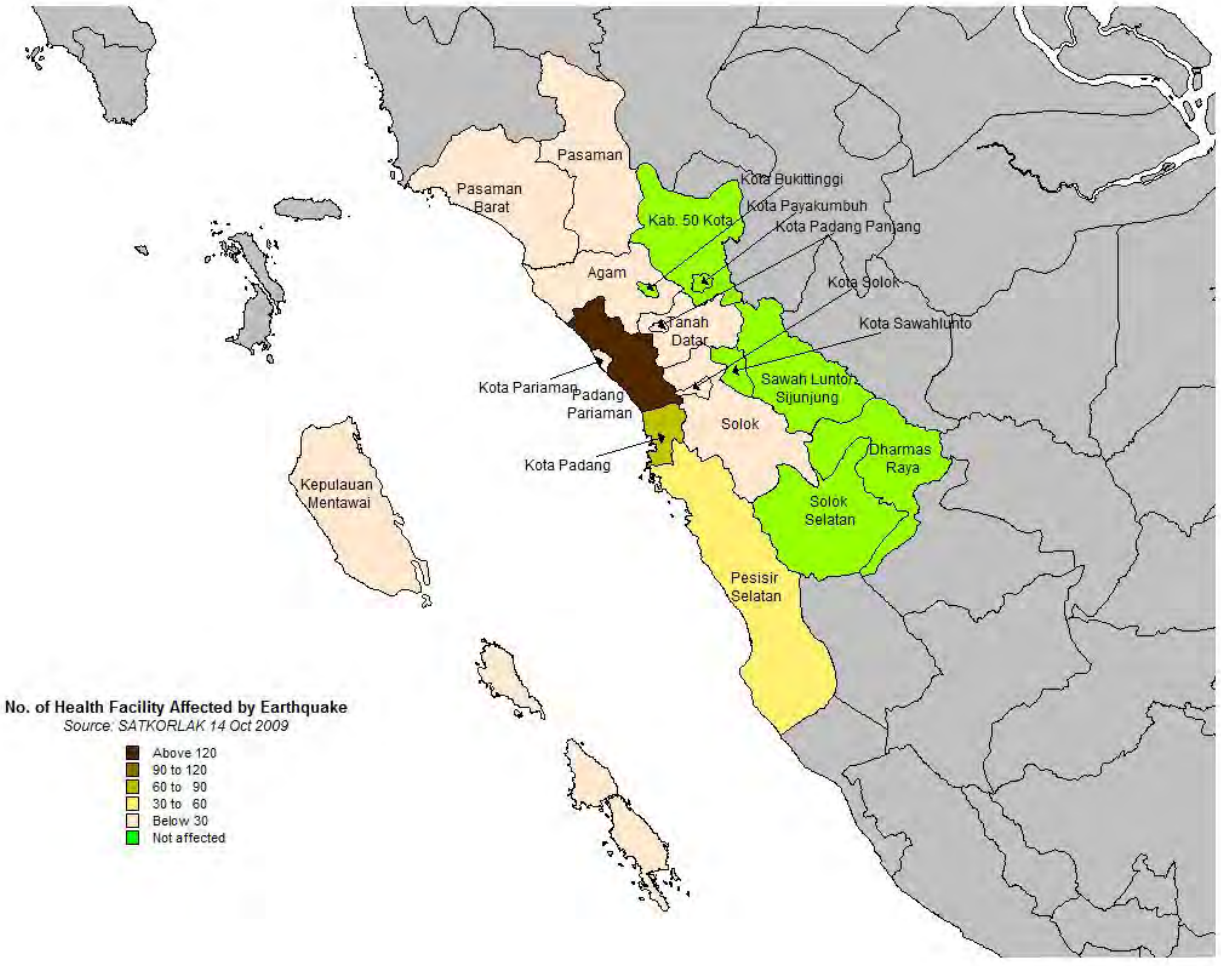
**The earthquake has caused damage to both public and private health facilities, disrupting health service delivery to around 23 percent of West Sumatra's population**. Hardest hit are Kab. Padang Pariaman and Kota Pariaman with almost 100 percent of their health centers affected, and most of which have been badly damage, including frontline health facilities such as auxiliary health centers and Polindes (village polyclinics). Most public primary care facilities in Kota Padang were also damage, although with a lower level of severity. With more private facilities available in Kota Padang, the damage is estimated to disrupt health service provision to around 25 percent of the city's population. In contrast, although only around 20 percent of public health facilities were affected in Kab. Agam, the damage is estimated to have affected almost half the population. Other districts that reported damage in health facilities that has affected more than 10 percent of the population are Kota Padang Panjang, Kota Solok, Kab. Pasaman Barat, Kab. Tanah Datar, and Kab. Pesisir Selatan. Damage to health facilities in districts

[14] Susenas 2007: utilization among the poorest is 39 percent compared with 36 percent for the national average; SDKI 2007 shows 80.5 percent compared with the national average of 73 percent.
[15] 1,041 private hospital beds to 2,232 total hospital beds, Padang City Statistics, 2007.
[16] Susenas 2007.

such as Kab. Pasaman, Kab. Solok and Kab. Kepulauan Mentawai has affected less than 10 percent of the population of each district.[17]

**Damage to hospitals has disrupted some elements of service and reduced the capacity of secondary health services**. Major damage incurred in the ambulatory building of the province's top referral hospital and this has affected outpatient and diagnostic services to clients. Around 80 percent of private hospitals in Kota Padang suffered various degrees of damage, with 40 percent considered minor and three large private hospitals considered major. These three latter hospitals have been forced to close their operations. During the data collection, the team found that there were private hospitals not in compliance with minimum health standards. Estimating damage and losses for the private sector as a whole is problematic, due to the absence of basic information (such as a list of private providers, infrastructure records, etc) on private health facilities.

### Map 3. 2 Density of affected health facilities




[17] Annex 'Table Estimates of Affected Population'.

**Table 3. 8 Summary of damage and losses in the health sector**

*Rp million*

| | Damage | | Losses | Total |
|---|---|---|---|---|
| | Buildings | Equipment | | |
| Kota Padang | 359,222.0 | 17,586.9 | 79,967.8 | 456,776.7 |
| Kab. Agam | 13,122.8 | 4,439.4 | 13,827.1 | 31,389.3 |
| Kab. Pesisir Selatan | 13,822.2 | 5,366.8 | 8,388.6 | 27,577.6 |
| Kab. Tanah Datar | 1,623.0 | 420.5 | 1,600.2 | 3,643.7 |
| Kota Pariaman | 9,204.3 | 3,164.4 | 11,527.4 | 23,896.1 |
| Kab. Padang Pariaman | 63,538.2 | 42,514.2 | 42,834.7 | 148,887.1 |
| Kab. Solok | 415.3 | 253.4 | 347.8 | 1,016.5 |
| Kota Solok | 2,458.9 | 337.9 | 2,076.3 | 4,873.1 |
| Kab. Pasaman | 193.3 | 253.4 | 231.8 | 678.5 |
| Kab. Pasaman Barat | 6,945.6 | 3,955.6 | 5,446.5 | 16,347.7 |
| Kota Padang Panjang | 18,037.4 | 1,835.8 | 8,637.7 | 28,510.9 |
| Kab. Mentawai | 286.4 | 84.5 | 287.0 | 657.9 |
| **Total West Sumatra** | **488,869.4** | **80,212.8** | **175,173.0** | **744,255.2** |

*Source:* Estimates of the Joint Assessment Team.

**Estimates of losses include the cost of health service deliveries incurred until reconstruction of assets has been completed, treatment for injured persons, lost revenue, and the cost of demolition and debris removal**. Total losses are estimated at Rp 175.2 billion. The immediate impact of the earthquake on the health of the population has been mitigated by emergency relief efforts, including emergency treatment of the injured, disease prevention, and also the supply of clean drinking water. Relief efforts provided and coordinated by government agencies are receiving support and donations from national and international relief organizations.

**Relief efforts are provided as an emergency response and also in order to prevent diseases**. These efforts respond to the demand for orthopedic surgery, given the nature of the skeletal injuries sustained. Basic disease surveillance, tetanus immunization, provision of clean drinking water, and spraying to prevent insect-borne diseases have been taken and although health problems such as common colds and diarrhea are reported to have increased in evacuation camps, no disease outbreaks have been observed.

## Reconstruction Needs

**The total needs for health facilities are estimated at Rp 701.9 billion.** These estimates cover the recovery needs of Rp 7.5 billion and the reconstruction needs of Rp 694.4 billion, with the projection of two year reconstruction period and include projected inflation.

## Key Issues

**Disruptions in health services and reduced access to healthcare are projected to affect a large number of people in the hardest hit areas**. Thus medium- and longer-terms efforts are critical in those areas in addition to emergency relief efforts. There were no casualties among health personnel and this has contributed to the quick overall recovery of services. However, the continuity of public health services is at risk, given the damage sustained by public health facilities.

### Preliminary Recommendations

**All actors must comply with minimum health facilities standards when reconstructing new public and private health facilities.** Reconstruction of health facilities should also follow seismic building standards for buildings in higher risk areas.

**Longer-term efforts and facilities such as long-term care for the disabled with spinal and bone injuries are needed,** as some families will not be equipped to deal with required long-term nursing care. Disaster-relief and longer-term psychological interventions for the population in affected areas need to be provided.

**A health financing mechanism is needed to deal with the medium- to long-term healthcare needs resulting from the earthquake.**

## 3.3.3 Religious buildings and facilities

### Summary

**Total damage and losses to religious buildings and facilities in West Sumatra are estimated to be about Rp 307 billion.** Of this, Rp 304 billion is damage and Rp 3 billion is regarded as losses. The damage affected 1,096 mosques, 995 small Muslim prayer houses (*langgar*/*surau*), 12 churches, and one *vihara* (Buddhist temple). Overall, over 12 percent of all religious buildings were damaged and about 300,000 people no longer have place of worship due to heavily damage or collapse buildings. As most religious buildings are community or privately built, the impact on publicly owned places of worship is relatively minor.

**The damage and loss assessment in the religious sector mainly covers places of worship and religious facilities,** such as haj *hajj* building facilities. Damage to office buildings under the coordination of the MoRA, including their representative offices in district and sub-district level offices, such as offices for Islamic marriages and divorce registrations, is covered under the government/public administration section. Damage on Islamic schools, comprising *pondok pesantren, madrasah ibtidaiyah, madrasah tsanawiyah, madrasah aliyah, and madrasah diniyah*, are covered in the education sector.

## Pre-disaster Conditions

**West Sumatra is home to a large number of mosques given that a majority of its population (98 percent) is Muslim. There are also small minorities of Christians, Buddhists and Hindus.** The pre-disaster data indicate that there were around 4,381 mosques, 12,189 *surau/langgar*, 55 churches, and six Buddhist temples in West Sumatra, of which some 76 percent of these religious buildings were located in the earthquake affected area. Kab. Padang Pariaman has the largest number of religious buildings in the province, with 2,860, followed by Kab. Agam, with 1,729. The smallest number of facilities is found in Kab. Kepulauan Mentawai and Kota Padang Panjang.

**In West Sumatra, the prayer house especially small mosques and *surau* play a significant role for community, beyond a place for praying.** Religious buildings function not only as places of worship but also as centers for village governance meetings, hubs for community organized activities and places to distribute information. In addition, mosques are also used for informal religious learning centers for children and adults.

## Damage and Loss Assessment

**Around 1,086 religious buildings in West Sumatra were badly damaged by the earthquake**, and about 563 and 455 buildings are considered moderate and lightly damage, respectively. Of the badly damaged premises, 49 percent are mosques and 50 percent are *langgar/surau*. The remaining 1 percent consists of eight churches and one *vihara*. Damage is also reported in the *hajj* facilities complex in the provincial capital (Kota Padang). Three buildings within the *hajj* complex used to accommodate *hajj* groups are considered badly damage.

**Overall damage and losses to places of worship are estimated at about Rp 307 billion and mostly affect privately owned premises.** Private premises experienced damage amounting to Rp 300 billion, while public premises suffered damage amounting to about Rp 7 billion. Based on the type of religious buildings, the estimated damage to Islamic prayers facilities is Rp 296 billion or 97 percent of total damage figure for places of worship, while those for Christian and Buddhist prayer facilities are Rp 2 billion and Rp 0.3 billion, respectively. The damage to *hajj* facilities represents about 2 percent of total damage. As for losses, this figure is considered small and mainly consists of the cost of cleaning debris from affected buildings.

**Table 3. 9 Summary of damage and losses to religious facilities by religion**

*Rp billion*

| | Damage | Loss | Public | Private | Total |
|---|---|---|---|---|---|
| Mosque | 217.1 | 2.2 | | 219.3 | 219.3 |
| Prayer house (*surau/langgar*) | 78.1 | 0.8 | | 78.9 | 78.9 |
| Church | 2.0 | 0.02 | | 2.0 | 2.0 |
| *Pura* (Hindu temple) | - | - | | - | - |
| *Vihara* (Buddhist temple) | 0.3 | 0.003 | | 0.3 | 0.3 |
| *Hajj* facilities (*Asrama Haji*) | 6.7 | 0.05 | 6.7 | | 6.7 |
| **Total** | **304.2** | **3.1** | **6.7** | **300.5** | **307.2** |

*Source:* Estimates of the Joint Assessment Team.

**Kab. Padang Pariaman is the most affected district, followed by Kota Padang**. Estimated damage and losses in Kab. Padang Pariaman are Rp 112 billion or 36 percent of the total damage and losses figure. In Kota Padang, damage to religious facilities is about Rp 79 billion, comprising 26 percent of total estimates in the province. Other districts that also experienced severe damage are Kab. Agam, Kota Pariaman, and Kota Pasaman Barat. No damage to religious facilities was reported in Kota Bukit Tinggi and Kota Solok.

**Table 3. 10 Summary of damage and losses to religious facilities by district**

*Rp million*

| | Damage | Loss | Total |
|---|---|---|---|
| Kab. Agam | 56,886.0 | 593 | 57,479.4 |
| Kab. Padang Pariaman | 110,855.0 | 1,156 | 112,011.2 |
| Kab. Pasaman | 1,878.5 | 15.8 | 1,894.3 |
| Kab. Pesisir Se;atan | 11,387.5 | 111.2 | 11,498.7 |
| Kab. Solok | 3,711.5 | 37.5 | 3,749.0 |
| Kab. Tanah Datar | 1,366.5 | 14.1 | 1,380.6 |
| Kab. Kep. Mentawai | 1,753.5 | 16.1 | 1,769.6 |
| Kota Bukit Tinggi | - | - | - |
| Kota Padang | 76,006.9 | 763.3 | 78,770.2 |
| Kota Padang Panjang | 3,748.5 | 36.9 | 3,785.4 |
| Kota Solok | - | - | - |
| Kota Pariaman | 17,664.5 | 180.8 | 17,845.3 |
| Kab. Pasaman Barat | 16,898.0 | 157.0 | 17,055.0 |
| **Total overall** | **304,156.4** | **3,082.4** | **307,238.7** |

*Source:* Estimates of the Joint Assessment Team.

**Damage to religious facilities has resulted in more than 300,000 people having no place of worship.** Places of worship for more than 42,000 households are moderately damaged, while another 134,500 people or about 34,000 households are left with places of worship that require minor repairs.

## Key Issues

**Funding for the reconstruction and renovation of religious facilities will be limited, as funding will have to come from the affected community themselves at a time when they will be focused on repairing their own damage houses.** Most religious buildings are built, managed, and financed by local people, with the funds generated by voluntary donations from households. In normal circumstances, construction of religious premises is prolonged as time is needed to accumulate sufficient funds. In the current situation, rebuilding religious facilities will be even more prolonged, possibly taking 2 to 3 years, particularly if there is no support from external funding.

**The earthquake damage not only affects religious activities, but also disrupts social activites of the community.** Religious buildings serve multiple functions for the community, including for social activities, a place for informal discussions by village leaders, the dissemination of information and news and, perhaps most important, a place for children to learn and recite the Quran. The loss

of a place for the community to interact and for children to learn their religion is considered as important issue by the community.[18]

### Preliminary Recommendations

**Funding from external sources would help communities to start the reconstruction and renovation of religious buildings.** Being centers of community life, the initial funding would also foster ruptured community networks.

**Focusing first on at least modest renovations of places of worship places that are only lightly damaged would speed up the revitalization of learning activities for children.** The reconstruction or rebuilding of places of worship is often prolonged. Therefore, by renovating slightly damaged facilities first, children will be able to resume their activities in a relatively shorter time.

### Reconstruction Needs

**The total reconstruction needs for religious buildings is estimated at Rp 344.1 billion.** Taking the inflation and the two-year period for reconstruction into account the reconstruction needs for public facilities are estimated at Rp 7.5 billion; while for the private facilities are estimated at Rp 336.6 billion.

## 3.3.4 Facilities for the poor and vulnerable

### Summary

**The total damage and losses to facilities for the poor and vulnerable are estimated at about Rp 18.9 billion.** The sum covers a total 62 facilities serving 4,268 occupants spread over 12 districts across West Sumatra. Overall, about 45 percent of social facilities are considered to be badly, medium, or lightly damaged. In terms of the type of facilities, the damage mostly affects orphanages, with replacement costs of about 57 percent of total damage and losses figure.

### Pre-disaster Conditions

**The provincial social office (Social Dinas) provides and manages the public social welfare facilities that are located in several districts.** Management of the public facilities is carried out by the UPTD (Unit Pelaksana Teknis Dinas/Technical Implementation Unit of the Dinas), while operation and management of private facilities is under the responsibility of District Social Office. The district office is accountable for registering, monitoring, supervising, and providing reports to provincial office. Although under government supervision, most private facilities are owned and financed by private foundations and initiatives. Private facilities consist mostly of orphanages, accounting for about 80 percent of total private facilities.

**Prior to the earthquake, West Sumatra had a total of 137 social facilities with 129 private facilities and 8 public facilities.** Around 74 percent of the facilities are located in the affected area and comprise 82 orphanages, four nursing house, eleven handicapped centers, a prostitution rehabilitation center, several youth rehabilitation centers, and a school for students with disabilities. In terms of occupancy, occupants of private facilities number 4,696 people, while occupants of

[18] Information is based on the Focus Group Discussion and interview conducted by UN for Human Recovery Needs Assessment.

public facilities are spread across five districts in West Sumatra are number 885. Although there are significantly fewer public facilities than private, public facilities and buildings are relatively more complete, comprising main buildings, training buildings, residence halls, official houses, etc. The average occupancies rate in public facilities is also higher, with 110 people accommodated compared with only 36 people in private facilities.

**Kab. Agam has the largest number of social facilities with 23, followed by Kota Padang with 20.** The lowest number of facilities is found in Kab. Kepulauan Mentawai with only one facility available. The type of facilities that are available in each district varies. For example, the only facilities available in Kota Padang Panjang and Kab. Padang Pariaman are youth rehabilitation centers.

## Damage and Loss Assessment

**Within the affected area, about 60 facilities were damaged.** The total damage is estimated at Rp 17.1 billion, while the total losses are estimated at Rp 1.8 billion. The damage affects 43 orphanages, four nursing houses, ten centers for the disabled, three rehabilitation centers, a school for people with disabilities, and a Social Dinas office. Of a total 4,268 occupants in all these facilities, only one was slightly injured.

**Table 3. 11 Damage and losses to facilities for the poor and vulnerable**

*Rp billion*

| Type of Facility | Damage | Losses | Total | Private | Public |
|---|---|---|---|---|---|
| Orphanage | 9.9 | 0.8 | 10.8 | 6.2 | 4.5 |
| Nursing home | 1.2 | 0.2 | 1.3 | 0.1 | 1.2 |
| Centers for the disaabled | 0.5 | 0.05 | 0.5 | 0.5 | 0.05 |
| Prostitutes' rehabilitation center | 0.07 | - | 0.07 | - | 0.07 |
| Boys' rehabilitation facility | 4.6 | 0.6 | 5.2 | - | 5.2 |
| School for people with disabilities | 0.06 | 0.007 | 0.07 | 0.07 | - |
| Provincial Social Agency Office | 0.7 | 0.2 | 0.9 | - | 0.9 |
| **Total** | **17.1** | **1.8** | **18.9** | **6.9** | **12.0** |

*Source*: Estimates of the Joint Assessment Team.

**The replacement value of public facilities accounts for about 64 percent of the total damage and losses**. A higher estimate for public buildings is because public facilities generally consist of several buildings located within one complex. For instance, a public facility often has a dormitory for children, learning house/buildings, caretaker houses, the main function building, etc. Private facilities in contrast only consist of building that can accommodate a smaller number of people. The damage to public facilities is estimated at about Rp 12 billion and Rp 7 billion for private facilities.

**Based on data and information from several institutions no activities are still being conducted in tents.** This means that the activities in most facilities are still going, with the occupants of the facilities that are badly damaged reallocating to other facilities that are only lightly damaged or escaped damage. For example, the orphanage in Kota Pariaman has two facilities, one for men and one for women. When the women's facility was severely damaged, the women were moved into the men's facility.

**The provincial social office has formed a joint secretariat for child protection.** The role of this secretariat is to coordinate all aid from NGOs and other donors for facilities related to children. The type aid for these facilities includes installation of drinking water.

### Key Issues

**Financing the operation of damaged facilities for the next few months will be an issue particularly for privately owned facilities.** Most of the facilities (86 percent) that were damaged are owned by private foundation that depend on individual contributors whose also have financial problems post-disaster. In such circumstances, lack of basic needs may be problematic at social facilities providing shelter and services to the orphans, the elderly, and the disabled.

**The learning activities of children, particularly those in orphanages, have been disrupted, as many children have had to relocate to alternative facilities.** The situation may be no better for those studying outside orphanage complexes, as many schools were also affected by the earthquake.

**The earthquake has left many people homeless, posing problems for the facilities trying to cope with increased numbers of temporary occupants.** Increased demand for such services, costs on social facilities, and the risk of occupants overcrowding facilities are all issues for concern.

### Preliminary Recommendations

**Funding mechanisms through external resources for private facilities and government support for public facilities are needed to revive both private and public facilities..** Local governments can also motivate and facilitate the establishment of the joint facility board, as well as facilitating assistance coming from NGOs and international agencies. The joint facility board should be established in every affected district to provide guidance and support to private facilities. Timely assistance is essential to meet the basic needs of occupants.

**Local governments need to identify children in the orphanages whose learning activites have been disrupted.** Any suspension of learning activities needs to be addressed quickly to ensure that children can resume their classes as soon as possible.

**Local governments need to identify facilities utilized as temporary shelters to avoid any overcrowding** and aim to reallocate people whose houses were badly affected badly by the earthquake.

### Reconstruction Needs

**The reconstruction period of facilities for the poor and vulnerable is estimated to take about 2 years.** With inflation taken into account and by using a similar unit cost as the replacement value, the reconstruction needs are estimated to be about Rp 21.1 billion, covering public facilities of Rp 13.4 billion and private facilities of Rp 7.7 billion.

## 3.4. Restoring Economic Activity and Livelihoods

### 3.4.1. Agriculture, Irrigation and Fisheries

#### Summary

**Agriculture is the most important economic sector in West Sumatra,** accounting for 24 percent of GRDP in 2008. Some 60 percent of the province's population depends on the sector for their livelihoods, while the sector employs about 48 percent of the workforce.

**The overall impact of the earthquake on the sector appears limited**. The estimate of damage and losses of Rp 279.1 billion represents only about 2 percent of the sector's GRDP. The damage estimate is Rp 56.1 billion, of which damage to irrigation and river/flood protection infrastructure accounts for nearly 80 percent. The loss in terms of rice production, the main food crop, is estimated at about 2 percent of the province's annual rice production. The production loss in the fisheries sector is also estimated at 2 percent of its annual production, while losses in forestry and livestock represent small fractions of production in these two sub-sectors.

**The earthquake has affected the livelihoods of farming and fishing communities in the most affected districts but no significant long-term impact is foreseen**. However, many families will be faced by short-term impacts on their livelihoods as they had to make emergency repairs to their houses or find temporary shelter.

**The recovery and reconstruction processes to restore livelihoods are complementary activities that need to start as soon as possible**. The recovery needs are estimated at Rp 24.3 billion and that of the reconstruction program at Rp 48.4 billion: a total of Rp 72.7 billion.

**Agriculture is the most important economic sector in West Sumatra, accounting for 24 percent of 2008 GRDP.** The food crops sector is the most important sub-sector, accounting for 51 percent of the sector's GRDP, followed by estate crops (22 percent),[19] fisheries (12 percent), livestock (8 percent) and forestry (6 percent). Some 60 percent of the province's population depends on the sector for their livelihoods, while the sector employs some 48 percent of the workforce.

[19] The estate subsector includes tree crops and other crops like, among others, coffee, tea, sugarcane and tobacco.

## Pre-disaster Conditions

**West Sumatra has some 2.2 million hectares of agriculture land.** Its climate with a prolonged rainy season from September to March offers favorable conditions for agriculture and the long coast offers good potential for fisheries. Rice is the main food crop covering some 235,000 ha. Main secondary food crops include maize, peanuts, cassava and sweet potatoes. Medium and small-scale irrigation systems provide supplementary irrigation for some 182,000 ha of rice growing areas. Government-managed irrigation systems serve 137,000 ha and village-managed schemes serve the remaining 45,000 ha.

**Tree crops are grown on monoculture "estates" or as part of a mixed farming system of smallholder farmers.** Large and small-scale companies manage some 470,000 ha of estates. Oil palm is the dominant estate crop covering some 218,000 ha. Besides oil palm, other important tree crops are rubber (85,000 ha) followed by coconut (79,000 ha) and cinnamon (44,000 ha). Livestock is mainly integrated in smallholders' farming systems. The major fishing activities are concentrated along coastal areas. Traditional marine fisheries account for some 74 percent of the province's fish production, with fishponds (covering about 11,000 ha) and inland water bodies (54,000 ha) account for the remainder.

**The infrastructure supporting the agriculture sector was vulnerable to the earthquake.** This infrastructure includes irrigation canals, veterinarian health posts, fish-landing sites and hatcheries, and office buildings. Without the adoption of more earthquake resistant designs and full compliance with design specifications during construction, the sector's supporting infrastructure remains vulnerable to future high impact earthquake events. Agriculture land at the foot of steep slopes is vulnerable to earthquake-triggered landslides, as demonstrated by this earthquake and its aftershocks.

## Disaster Impact

**Although total damage and losses are estimated at Rp 279.1 billion, the overall impact of the earthquake on the sector appears limited**. The overall losses of Rp 223 billion represent about 2 percent of the GRDP of the agriculture sector. Overall damage is estimated at Rp 56.1 billion, of which damage to irrigation and river/flood protection infrastructure accounts for nearly 80 percent of the total. More than 80 percent of the damage and losses have been incurred by the private sector, almost all farming and fishing households.

## Damage

**Damage related to irrigation infrastructure** comprises damage to intake gates and the sliding and collapse of sections of canals and embankments. The most serious damage occurred in the villages of Kapalo Koto and Lubuak Laweh in Padang Periaman, where landslides buried about 100 ha of

ricefields and completely destroyed about 350 ha of irrigation systems.[20] Damage to river training and flood protection infrastructure includes partially collapsed riverbank protection work and weirs.

**Damage to fisheries infrastructure** includes damage to privately owned fish ponds and government-owned facilities such as fuel stations, harbor and landing sites, fish auction halls and hatcheries. Several office buildings have also been damaged and the cost of this damage is included in the Governance and Public Administration section of this report.

**Damage to livestock** includes damage to privately owned assets such as animal and poultry sheds and government-owned facilities such as markets, slaughterhouses, health and artificial insemination posts. Several office buildings have also been damaged and again, the cost of this damage is included in the Government and Public Administration section of this report.

### Losses

**The production loss for rice is estimated at about 2 percent of the provinvial annual rice production**. A slight reduction (10 percent) in the yield of the standing crop on some 41,000 ha is projected as farmers will need to give higher priority to non-farming activities to deal with the emergency situation following the earthquake. Furthermore, it is projected that the repairing of damaged irrigation infrastructure will delay the next cultivation season on some 10,000 ha. Fortunately, with significant rainfall during West Sumatra's rainy season, irrigation is less critical for the next crop season than in many other parts of Indonesia.

**For tree crops, the losses represent a small fraction of the province's overall tree crop production.** Smallholder-owned trees (mainly cinnamon, nutmeg, betel nut, and cacao) covering an area of less than 400 ha have been destroyed or uprooted. It will take 3 to 5 years, and in the case of the betel nut trees up to 10 years, before the replanted trees will again reach full production.

**For fisheries, total losses are estimated at 2 percent of the province's annual fishery production**. As in the case of rice, the province's fishery production is mainly impacted by the need of fishermen in the most earthquake affected districts to deal with the emergency situation. It is also reported that fishponds have been damaged and that fresh water supplies to some fishponds have been disrupted.

**Landslides have also caused losses, some of which may be long-term**. The landslides have buried 100 ha of ricefields and damaged about 250 ha of irrigation infrastructure. The estimated losses take into account that it may require 5 to 7 years before the ricefields are restored to the original production level. However, some land may have to be abandoned permanently. The losses in production due to the landslides have been included under food crop losses.

**The losses in livestock represent a tiny fraction of the sub-sector's production**. It is reported that some 400 animals (cows, buffalo and goats) died and about 10,000 chickens have been lost due to the earthquake.

[20] The landslides also swept down on four entire villages burying them under tons of debris.

**Table 3. 12 Damage and losses**

*Rp billion*

| | Disaster effects | | | Ownership by sector | |
|---|---|---|---|---|---|
| | Damage | Losses | Total | Public | Private |
| Food and tree crops | 5.1 | 146.0 | 151.1 | | 151.1 |
| Irrigation, river training and flood protection | 39.0 | 26.0 | 65.0 | 65.0 | |
| Fisheries | 6.8 | 49.0 | 55.8 | 4.0 | 51.8 |
| Livestock | 5.2 | 2.0 | 7.2 | 2.8 | 4.4 |
| **Total** | **56.1** | **223.0** | **279.1** | **71.8** | **207.3** |

*Source*: Estimates of the Joint Assessment Team.

## Human Recovery

**The earthquake has adversely impacted the livelihoods of several farming and fishing communities in the most affected districts. However, no significant long-term impact is foreseen.** Many families will face short-term impacts on their livelihoods as they take care of repairs to their houses or secure temporary shelters. A livelihood restoration program may need to be considered so that affected communities have the resources to rebuild their productive assets and resume their farming and fishing activities.

**Several families have been significantly to severely impacted by the earthquake.** These include families whose ricefields have been buried by landslide debris. It may take several years before these ricefields can be reclaimed and the pre-disaster production can be realized again. Other families lost valuable trees that provided cash income. It will take 3 to 6 years before replanted trees reach full production. Some families lost small-scale poultry farms. The poor among these families may need support to reclaim their land or find alternative land or employment, buy replacement livestock and restart their activites. A complementary support program targeting the poor mostly affected by the earthquake may need to be put in place.

## Risk Management Issues

**As mentioned above, the infrastructure supporting the agriculture sector was vulnerable to the earthquake. Therefore, the critical infrastructure required for realizing the sector's outputs should adhere to seismic building standards in a phased manner.** The design and construction standards applied determine the vulnerability of infrastructure to earthquakes. Poor construction quality adds to the vulnerability. Without the adoption of more earthquake resistant designs and full compliance with design specifications during construction, the sector's supporting infrastructure will remain vulnerable to future high impact earthquake events.

**For irrigation infrastructure, gradual replacement of stone masonry structures with reinforced concrete structures needs to be considered**. Most irrigation structures in the province are traditional stone masonry structures. Properly designed and well constructed reinforced concrete structures offer a higher degree of earthquake resistance. However, such structures are more expensive. It is therefore recommended to revisit the design of those structures that will need to be replaced in the future at the end of their service life. For new major structures, reinforced concrete should be considered as a first option, especially for critical structures that would disrupt irrigation supplies for a large area over a long time if they were damaged or destroyed by a future major

earthquake event. Stone masonry is also widely used for lining of tertiary and secondary canals. Where complete rebuilding is required, the lining could be replaced by mesh wire reinforced concrete lining. This has been successfully applied for canals damaged by the 2004 earthquake and tsunami in Aceh province.[21] The Aceh experience has shown that water-users' associations are capable of constructing such lining works through community contracts.[22]

**Although river training and flood protection works have only been partially damaged, it is important to recognize the increased vulnerability resulting from this damage.** Prioritization therefore has to be given to the rehabilitation of these works to prevent future damage possibly at a larger scale in the event of a major flood.

**For new buildings, sub-national government agencies associated with the agriculture sector should apply designs that have a higher degree of earthquake resistance.** The damage to the main office of the provincial fisheries department has disrupted services and valuable information may have been lost, illustrating the importance of investing in safer but more expensive buildings.

**The stability of hill and mountain slopes should be checked in areas where agriculture land or infrastructure is located near such slopes**. Where necessary, slope protection and/or stability measures need to be implemented to reduce the risk for future major earthquake events. Furthermore, current spatial planning and land-use regulations may need to be revisited. An awareness-raising campaign about the risk of landslides among communities living in or close to areas with high landslide risks should also be undertaken.

### Recovery Framework

**The recovery and reconstruction processes to restore livelihoods are complementary activities that need to start as soon as possible**. The recovery needs are estimated at Rp 24.3 billion and that of the reconstruction program at Rp 48.4 billion: a total of Rp 72.7 billion.

**Early recovery is needed for the farming and fishing communities affected by the earthquake.** The emergency response plan prepared by UN agencies and NGOs through the agriculture cluster and coordinated with the Government provides for a program of emergency supplies and repairs and limited emergency repairs of irrigation canals in Kab. Padang Pariaman and Kab. Pesisir Selatan. In addition, a broader livelihoods programs is to be implemented as soon as possible as part of the reconstruction effort so that affected communities have the resources to repair, rebuild or replace the privately owned productive assets and resume their farming and fishing livelihood activities through provision of essential inputs (for agriculture) and operating capital (for fishing boats and fish ponds) for those most in need.

**Efforts should be made to complete the repairs to the irrigation canals within the next two months as a large number of farm families would be affected by delays in the resumption of**

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[21] More information can be found at http://www.adb.org/Projects/ETESP/participatory-irrigation-Aceh.pdf

[22] Close to 500 community contracts with a total value of about Rp 50 billion were executed by water users associations.

**full irrigation services**. Where repair works are small-scale in nature, such work can best be undertaken by the water users associations and farmer groups. The community contract modality could be used to award repair contracts to the associations and groups with technical support from the agency staff. This contracting modality was successfully used for repairs of canals, and also fishponds by fishermen groups, damaged by the 2004 earthquake and tsunami in Aceh.[23] Community contracting offers direct local employment and income opportunities. Furthermore, the quality of work is usually better that work carried out by commercial contractors.

**Table 3. 13 Cost of early agriculture recovery**

*Rp million*

| Subsector Needs | Early Recovery Plan |
|---|---|
| Food and tree crops | 20,200 |
| Irrigation and river training & flood protection | |
| Fisheries | 4,700 |
| Livestock | |
| Cluster coordination and technical support | 5,600 |
| **Totals** | **30,500** |

*Source*: Estimates of the Joint Assessment Team.

## 3.4.2. Trade and Industry

### Summary

**Trade and industry account for almost 30 percent of West Sumatra's GRDP.** Although there are only a few large industries in Padang, trade and industry contribute more than 17 percent and 12 percent, respectively, to the province's economy, and are second and third to only agriculture. Together, trade and industry employ more than 520,000 people, or 25 percent of the provincial workforce (Sakernas, BPS 2008).

**The earthquake has had a devastating effect on the trade and industry sectors.** While large industries remain relatively intact, many SMEs have suffered significant damage and losses, amounting to Rp 1.3 trillion. More than a half, about Rp 621 billion, comes from potential losses that businesses will have to bear.

### Pre-disaster Conditions

**Some of the worst affected districts are also those that make the highest contributions to the local economy.** Kota Padang, Kab. Pariaman and Kota Pariaman together account for a significant 37 percent of total provincial GRDP and these three districts are also those most badly affected by the earthquake.[24] These three districts also contribute significantly towards the trade and industry sectors, accounting for about 13 percent of total trade and industry GRDP within the province.

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[23] More information can be found at http://www.adb.org/Documents/Presentations/ETESP/CFAN4-ETESP-Community-Participation.pdf

[24] About 80 percent of the damage housing also located in these three districts; Kota Padang, Kab. Pariaman and Kota Pariaman.

**Table 3. 14 Importance of worst affected districts to the province's GDP**
*Percent*

| District | Share of West Sumatra GRDP | Share of trade (district GRDP ) | Share of Industry (district GRDP ) | Share of Trade & Industry to West Sumatra GRDP |
|---|---|---|---|---|
| Kota Padang | 28 | 21 | 15 | 10 |
| Kab. Pariaman | 7 | 11 | 11 | 2 |
| Kota Pariaman | 2 | 11 | 11 | 1 |
| **Total** | **37** | **n/a** | **n/a** | **13** |

*Source:* Estimates of the Joint Assessment Team using 2009 GRDP estimates.

**The relatively few large industries located in West Sumatra were largely unaffected by the earthquake.** Contributing about 12 percent of GRDP, most large industries operate in the agri-business sector, such as palm oil and rubber. PT Agro Masang (Wilmar Group) and PT Family Raya have more than 150,000 ha of palm and rubber plantation, while PT Semen Padang is the largest industry in the region. According to the BPS Labor Survey (Sakernas) 2008, about 128,000 people are employed in this sector. This also includes SMEs, which mostly produce food, textiles and handicraft. Based on Industrial Statistic 2006, out of 5,400 SMEs in West Sumatra about 98 percent are small home-based enterprises.

**Trade in West Sumatra is dominated by SMEs.** With few large industries in the province, it is estimated that 98 percent of trading businesses, or about 195,000 units, employ over 390,000 people, or an average of only 2 people per business unit.

## Damage and Loss Assessment

**Kota Padang and Kab. Pariaman are the centers of trade in West Sumatra.** It is estimated that both districts have almost 200,000 SMEs and employ about 300,000 people. The earthquake has had a direct impact on thousands of these enterprises, as well as through disruptions to their supply chains.

**The overall estimate of damage and losses amounts to Rp 1,421 billion.**[25] Large enterprises,[26] mostly agro-based, suffered relatively less than medium-sized enterprises, which were mostly situated in urban areas. The damage primarily consists of destruction of immovable property such as buildings, equipment and inventory. It is estimated that these enterprises provide employment to at least 400,000 people.

[25] Overall damage and losses estimated for West Sumatra based on the survey in Kota Padang, which accounted for almost 30 percent of the economy. See details in annex.
[26] PT Semen Padang, which is the biggest industry in West Sumatra only reported minor damage and losses in its operation, amounted to only Rp 114 billion.

**Table 3. 15 Summary of damage and losses of trade & industry**
*Rp billion*

| | Damage | Losses | Total |
|---|---|---|---|
| Trade | 673,7 | 621,5 | 1,295.2 |
| Industry | 10.8 | 114.7 | 125.6 |
| Total | 684,5 | 736,2 | 1,420.8 |

*Source*: Estimates of the Joint Assessment Team.

**The trade sector is the hardest hit and accounts for 19 percent of employment in the province.** This sector typically comprises self-employed traders and SMEs, and the earthquake may have affected up to 300,000 people. Many traditional and modern markets were affected by the earthquake and damage to them is estimated to be slightly lower than their losses, at just over Rp 500 billion.

**Many modern markets have closed for further inspection, while others will need to be rebuilt.** All three large modern markets in Padang (Plaza Andalas, Pasaraya and Grand Basko) have been severely damaged, while many traditional markets are awaiting further inspection to establish the degree of damage. The three modern markets have potential combined market losses of over Rp 88 billion assuming a 6 month recovery period. Many traders in modern or semi-modern markets fail to insure their assets and therefore any lost assets may be largely irrecoverable.

> *"A large proportion of the economy in West Sumatra is dominated by small and medium enterprises. Most of them do not insure their assets and have debts with the banks. Now they face serious difficulties in repaying installments as their businesses have already been closed for almost a month. The Government, together with banking sector, need to find the best solution for this problem."* - Asnawi Bahar, Head of Trade and Industry Chamber.

**Micro and Small Enterprises (MSEs) suffered the most losses.** Whilst the estimated damage is relatively lower than losses, MSE losses account for more than 65 percent of total losses, at Rp 527 billion. Given that the recovery period may take several months, owners and workers of MSEs may not be able to cope with the damage and impending losses on their own. Carefully targeted assistance from the Government for these types of businesses may be needed to jump-start economic recovery and avoid a prolonged recovery period with the corresponding losses in terms of jobs and income.

**Table 3. 16 Damage and losses by enterprise size**
*Rp billion*

| | Damage | Losses | Total |
|---|---|---|---|
| Large enterprises | 10,8 | 114,7 | 125,6 |
| Medium enterprises | 340,1 | 147,5 | 487,6 |
| Micro & small enterprises | 280,1 | 527,5 | 807,6 |
| **Total** | **631,0** | **789,7** | **1,420,78** |

*Source*: Estimates of the Joint Assessment Team.

**The overall recovery and reconstruction needs for industry and commerce are estimated at Rp 795.5 billion.** The financing needs are estimated at Rp 134.2 billion for industry and Rp 661.3 for trade. The government's share on the financing needs is estimated around Rp 500 billion.

### Preliminary Recommendation

**Flexible labor markets are needed during the recovery phase.** In many cases after a disaster, employment opportunities arise during the reconstruction effort. It is important to utilize the transient workforce to fill reconstruction needs and facilitate the transfer of labor to other sectors or locations unaffected by the disaster.

**Immediate support could help to smooth out further losses.** In the aftermath of the disaster, many businesses have raised concerns about difficulties in accessing loans in order to replace lost inventory. Direct support could be in the form of rescheduling existing loans or making new loans available for working capital, with the necessary targeting mechanisms to support those businesses affected by the disaster.

**Improved help in risk mitigation is important.** In the medium term, the weak role of the insurance sector in providing risk mitigation and risk transfer mechanisms for enterprises needs to be addressed.

## 3.4.3. Tourism

### Summary

**The impact of the earthquake on the tourism sub-sector is more significant than initially thought.** This assessment estimates damage of about Rp 71 billion and losses of revenue of about Rp 376 billion. These damage and losses will be borne predominantly by the private sector (96 percent) with public tourist destination infrastructures and public facilities sharing only 4 percent. Almost 80 percent of star-graded hotels[27] in Kota Padang are severely damaged, rendering 76 percent of hotel rooms in the city unavailable for accommodating visitors. The optimistic scenario is that it will require 18 months to reconstruct hotels and associated infrastructure to their original levels.

[27] Star hotels are defined as 1-star to 5-star hotels although there is no standard method for assigning these ratings.

**Tourist destinations affected by the earthquake are mainly located in Kota Padang, and in Kab. Pariaman and Kab. Agam.** Tourist sites in other districts such as Kota Bukit Tinggi, Kota Payakumbuh, and Kota Solok were unaffected. In-depth interviews with key players in the tourism sub-sector suggest that West Sumatra's tourism industry does not only need to reconstruct its physical infrastructure (hotels, restaurants and tourist destinations) but may also need to rehabilitate its image in order to return the sub-sector to normalcy.

## Pre-Disaster Conditions

**Tourism plays a vital role in the economy of West Sumatra.** The province is an important tourist destination, and trade, hotels and restaurants (forming an important core of tourism) are significant contributors to GRDP, estimated at just over 18 percent in 2008. West Sumatra attracted close to 7 million visitors (37,762 foreigners and 6,729,514 domestic visitors) in 2008. In West Sumatra, there were 47 star-rated hotels, mainly located in Padang and Bukittinggi (1,804 rooms). Other districts have homestay-type accommodation such as *losmen* or *wisma*. The restaurant sub-sector (over 8,000 tables and 47,000 chairs) directly relates to the livelihoods of over 4,500 people.

## Damage and Loss Assessment

**The earthquake had an adverse impact on hotel and motel buildings, restaurants and tourist destinations.** In Kota Padang, for example, it is estimated that up to 80 percent of star-rated hotels and other facilities including restaurants and shops have been damaged or destroyed. Of the 47 star-rated hotels in West Sumatra, 24 have been damaged and 11 of these have been destroyed. Among the destroyed hotels are the Ambacang, Bumi Minang, Best Western Premier, Mariani, Nuansa and Hayam Wuruk. West Sumatra has also sustained damage to roads and infrastructure in tourism locations in Kab. Pariaman, and Kab. Padang Pariaman.

### Table 3. 17 Summary damage and losses in the tourism industry

*Rp billion*

| | Damage | Losses | Total |
|---|---|---|---|
| Hotels and home stays | 46,552 | 367,594 | 414,146 |
| Restaurants and food stalls | 7,392 | 8,280 | 15,672 |
| Tourist objects | 16,785 | 400 | 17185 |
| Total | 70,729 | 376,274 | 447,003 |

*Source:* Estimates of the Joint Assessment Team.

**Currently, all high quality hotels[28] are closed in Padang.** The reconstruction phase will last from 6 months (Pangeran Beach,160 rooms; Best Western Premier, 155 rooms) to more than 18 months (Bumi Minang, 160 rooms; The Ambacang, 108 rooms; Rocky Plaza, 106 rooms). Other hotels such as Inna Muara are open, but some of the rooms required renovation. In Padang Pariaman, 16 out of

[28] High quality hotels represent all 3-star hotels and above. Although this is quite crude and debatable measure, industry association, based on cost of construction per room, tend to classify a minimum of 3-star hotel as quality hotel.

42 hotels/accommodations were damaged. Fortunatelly, one favourite major tourist destination, Kota Bukit Tinggi, is unaffected by the earthquake.

**Employment in the sector will decrease in the short term, as many hotel employees will lose their jobs during the rebuilding of damaged hotel facilities.** This does not include job losses from restaurants and *warung*, and other tourism-related businesses , which are estimated to be higher than jobs lost by hotel employees. The share of informal jobs in the sector will likely rise.

**Geographically, the worst affected area is Kota Padang, followed by Kab. Pariaman and Kab. Agam.** In Padang alone, preliminary estimates indicate damage of Rp 60 billion and losses of revenue of about Rp 363 billion. Estimates of damage and losses in Padang account for about 90 percent of total estimated damage and losses. The rebuilding of severely damaged buildings and replacement of equipment and other facilities will take considerable time, causing prolonged disruption to the tourism sub-sector.

**The largest damage and losses are borne by the private sector**. It is estimated that total damage to buildings, equipments and facilities is Rp 71 billion (76 percent private and 24 percent public). On potential losses, the private sector will certainly be significantly impacted as it will take at least 18 months to rebuild hotels, while the public sector share accounts only for less than 5 percent of the potential losses. The indirect effects of the damage to the tourism industry on local government financial capacity are not captured by these loss figures.

### Preliminary Recommendations

In view of the severity of the damage and losses, the tourism industry will need help in returning to normalcy. Given that private sector losses are relatively high, government assistance should be carefully targeted to the private sector, while minimizing the negative impact on the rest of the economy and employment.

**A possibility to be considered is to provide a "targeted" tax holiday to assist the tourism sector in rehabilitating and reconstructing buildings and assets.** Property taxes could be reduced depending on the level of building damage (severe, moderate and light). Sub-national governments could also consider reducing taxes or licensing fees for tourism-related businesses. In Yogyakarta, for example, sub-national governments reduced property taxes by 50 percent over 2006 for lightly damaged properties and by 75 percent for moderately damaged properties. Similarly, the municipal government in Yogyakarta reduced taxes for tourism-related businesses by 25 percent over 2006. These tax holiday measures were effective in supporting a recovery of the tourism sector in Yogyakarta. However, tax holidays should be clearly targeted to avoid leakage to businesses not affected by the disaster.

**Hotel and restaurant business representatives expressed the need for debt restructuring and access to new capital.** Facilitating access to finance would provide players with the required resources to rehabilitate their businesses. For small-scale tourism-related businesses, intervention programs should concentrate on microfinance where the demand and need is strongest. Programs should be designed to assist potentially successful enterprises to develop strategies for non-performing loans, while they should avoid concentrating on disbursement targets.

## 3.4.4. Financial Sector

### Summary


**Commercial banks and the regional bank (BPD) in West Sumatra have been significantly affected by the earthquake, but the disaster is unlikely to have a significant impact on the banking sector at the national level.** About 2,438 borrowers are affected and loans valued at Rp 147 billion might become non-performing. Thirteen commercial banks and 11 of 107 rural credit banks (BPRs) in West Sumatra have reported loan losses and will need liquidity support, as repayment of loans will slow and depositors will seek to withdraw funds.

**Credit markets have a key role to play in the rehabilitation and restructuring process.** Banks should extend support to revive economic activity in the affected areas. Bank Indonesia (BI), the Government, and the banks themseles, will have to work to meet emerging needs albeit without dispensing with prudent banking regulations and operations.

**The damage suffered by non-bank financial institutions (NBFIs) will affect the recovery of enterprises, but remains modest in absolute terms.** The coverage by NBFIs in the affected areas is limited. The combined damage and losses of pawn shops and cooperatives together stood at Rp 82 billion.

### Pre-disaster Conditions

**The total assets of the West Sumatra banking sector at end August 2007 amounted to Rp 19.4 trillion, or about 0.8 percent of the total national banking system.** In West Sumatra, 18 commercial banks, including 13 private banks, conducted banking operations through 171 branches and sub-branches. In addition, 107 BPRs have an important presence in several of the affected districts providing essential micro-credit support. At end of August 2009, BI data showed that the value of deposits in commercial banks and rural banks in West Sumatra was Rp 16.22 trillion, while commercial loans disbursed amounted to Rp 17.9 trillion or 1.32 percent of total loans in Indonesia's banking sector. Of this, micro, small and medium-scale loans (each less than Rp 500 million) accounted for Rp 13.5 trillion or 80 percent of the total loans, suggesting a large number of loan accounts.

## Damage and Loss Assessment

Total damage and losses suffered by banks, NBFIs (including insurance) are estimated at Rp 1,018 billion.

**Table 3. 18 Damage and loss estimates in financial sector**

*Rp million*

| | Damage | Losses | Total |
|---|---|---|---|
| Banks | 63,649 | 152,204 | 215,853 |
| NBFIs | 4,376 | 78,000 | 82,376 |
| Cooperatives | 3,384 | - | 3,384 |
| Pawnshops | 992 | 78,000 | 78,992 |
| **Total** | **68,025** | **230,204** | **298,229** |

*Source*: Estimates of the Joint Assessment Team, Bank Indonesia, Kanwil Pegadaian Sumatra Barat, and Dinas Koperasi.

## Physical Damage

**Damage to banking infrastructure is substantial although banking operations remain normal**. Information on customers has not been lost. Many branch offices, ATMs and other equipment are damage, but internet banking, SMS banking and the telephone banking is working well even though communication networks and electricity in some affected areas are not functioning. Some banks reported damage to their facilities, including many BPD units damaged all over the region.

**The overall damage to banking infrastructure and facilities could reach Rp 63.6 billion**. Preliminary estimates from 3 state-owned banks and the BPD indicate that the total value of physical damage could reach Rp 21 billion, while 11 private banks reported Rp 42 billion in damage.

## Potential Loan Losses

**The disaster may reduce the ability of debtors to make repayments, but it will not impact the banks' share of non-performing loans (NPLs) significantly.** As of October 15, 2009, according to BI, it is estimated that potential loan losses of Rp 152 billion, or 27 percent of outstanding loans in West Sumatra, were from 2,438 borrowers who are affected by the earthquake. However, because the amount of local loans comapred with national loan portfolios is small, the impact of the disaster on the performance of the banking sector as a whole, and of the national banks in particular, is expected to be minimal. Besides, the affected banks appear to have made provisions in their balance sheets for the anticipated loan losses.

**Most banks suffered, including BPD and BPRs.** State-owned banks have higher potential loan losses due to the higher loan sizes. In addition, 13 out of the 107 BPRs have reported a combined increase in NPLs by Rp 14 billion from 1,846 borrowers. The estimated potential loan losses may worsen if the real sector of the affected regions does not recover and if financial institutions continue to face difficulties in recovering loans from the affected enterprises and other debtors.

**Early estimates of damage and losses in the non-bank financial sector (NBFS) are Rp 82.4 billion**. This comprises primarily office and equipment damage sustained at 96 registered cooperatives (Rp 3 billion) and value of office damage and business sales of 8 pawnshops covering up to 6 days of operation after the earthquake (Rp 78.9 billion).

**In addition to the damage and losses discussed in this section, the insurance industry is likely to suffer significant losses in the aftermath of the earthquake, as insurance claims start coming in.** Insurance losses may come to about Rp 1.3 trillion, and these may rise as more claims become known. Based on early estimates available, the total non-life insurance exposure in the affected area is estimated at Rp 720 billion (based on total sum insured).[29] The losses to the insurance industry are not captured in the total damage and losses, as it would amount to double counting losses, in the sector that has suffered the damage (e.g. a hotel in the trading sector) and as a loss to the insurance industry as the claim has to be paid. Often, payments by the insurance sector is used for rebuilding and reconstruction, both in the public and private sector, which should partially cover the damage and losses described in this report.

## Recommendations

- **Immediate recovery of the financial and real sector in West Sumatra**. The Government, Bank Indonesia, the banks and non-bank financial institutions need to accelerate reconstruction and rehabilitation of financial sector damage and losses. In addition, a recovery program for the real sector will help reduce the socio-economic impact of the disaster.
- **Apply accommodative policy and regulation on NPLs**. Regulations on NPLs could be relaxed, so that loans may be restructured to allow borrowers as well as banks some respite in the recovery process. However, potential NPLs should be treated as a commercial problem, and realistic solutions that avoid moral hazard need to be found, without further aggravating constraints faced by the private sector. In this regard, Bank Indonesia will apply specific regulation (PBI/No. 8/15/PBI/2009) for disaster-affected areas in which loans may be restructured for up to 3 years.
- **Indirect support through collateral replacement.** Collateral replacement or credit guarantee schemes may alleviate credit market constraints faced by SMEs that are unable to provide collateral and, at the same time, allow banks to function in a prudent manner.
- **Strengthening the local financial institutions**. As 80 percent of loans provided by banks and non-bank financial institutions in West Sumatra province are MSME loans, local non-bank and microfinance institutions need to be strengthened and supported to meet funding gaps. These programs may include linkages with larger commercial banks, channeling the government credit program through local banks and/or microfinance institutions, advisory services to local banks and non-banks financial institutions, etc.

[29] Based on report from 19 insurance companies.

## 3.5. INFRASTRUCTURE

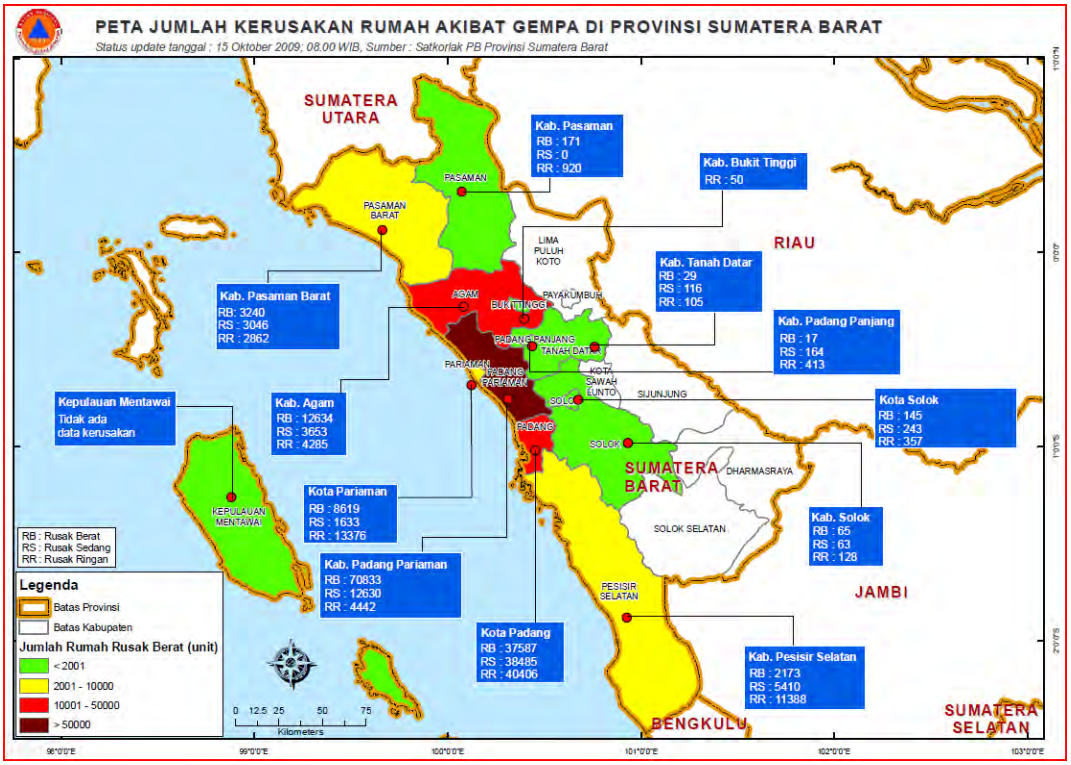
### 3.5.1. Housing

#### Summary

**The damaged sustained by the housing sector is the most costly and destructive of any sector, and will require considerable planning and investment**. Damage and losses are currently estimated at over Rp 15.95 trillion and reinvestment needs by the Government are estimated at Rp 2.97 trillion.

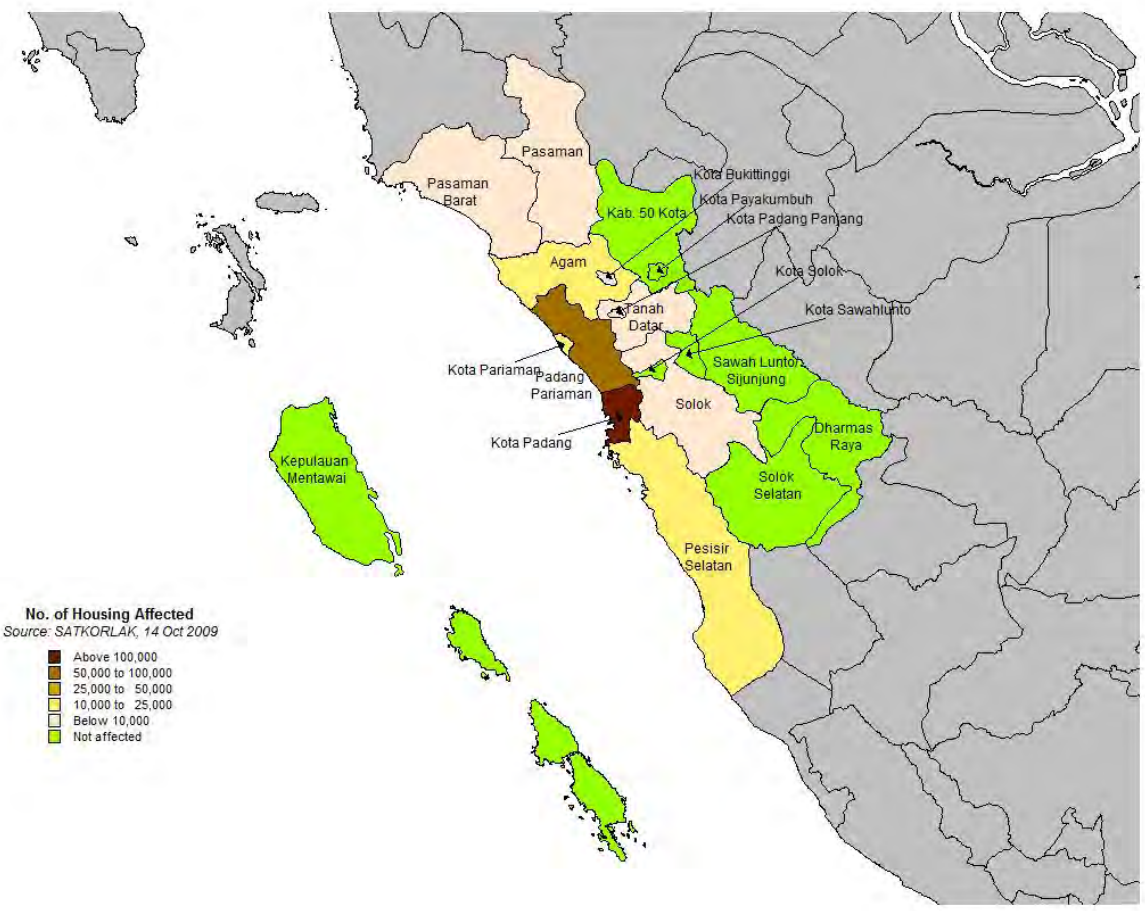
**In the wake of a disaster, there is an opportunity for West Sumatra to redevelop better, through improved building and construction standards, enhanced building designs, and the possibility of instituting an integrated development planning process.** Lessons from other successful cases of post-disaster reconstruction and rehabilitation also show that the principle for redevelopment lies in the focus on subsidizing better quality housing rather than providing funds for rebuilding to previous standards. While there is an immediate need for shelters, this should not overshadow the focus on redeveloping improved housing.

#### Map 3. 3 Housing destruction areas




*Source*: Satkorlak, 15 October 2009.

## Map 3. 4 Density of houses affected




## Pre-disaster Conditions

**The housing sector throughout Indonesia is complex, varying in formal and informal land titles and status, West Sumatra reflects the same.** The 13 *kabupaten* assessed had a total housing stock of 806,783, as reported in 2008. Generally, less than 15 percent of land is certified and most of the land (*tanah ulayat*) is traditionally managed within the *adat nagari* system. Much of development does not follow building codes or a formalized planning process, which has greatly added to the severity of the impact of the earthquake. In comparison to the 2006 Yogyakarta earthquake of similar magnitude and destruction, fewer casualties were experienced due to the timing of the event and differing density of establishments between West Sumatra and Central Java. The incidence of a high magnitude earthquake in March 2007 in West Sumatra also notably reduced casualties because it resulted in increased awareness of procedures during seismic events.

> "*My youngest daughter slept in a room that has been transformed into a mound of rubble. If this happened at night we definitely would have lost her."* - Ibu Daruni from Kecamatan Patamuan, a victim of the 30 September earthquake

## Damage and Loss Assessment


**Housing generally suffers the most during disasters in Indonesia because the damage exposes a combination of poor housing design, poor construction, weak settlement planning and regional seismic and geological conditions.** In urban areas such as Padang, there is a prevalence of more permanent buildings built from brick/concrete, which are more prone to destruction as experienced in previous earthquakes. There is a significant factor of quality; the majority of heavily damaged houses were of inadequate quality of masonry, concrete, and reinforcement. As with many large public and commercial buildings in Padang, part of the two-storey houses — especially shop-houses — also experienced the 'soft storey' phenomenon, where slender columns and large openings at the ground floor yielded under extreme loads from the heavier upper floors. In Kota Padang and the rural areas of Kab. Padang Pariaman, traditional houses are rare. Reportedly, only a few "*rumah gadang*" in Kab. Agam suffered medium damage. As shown in Table 1, about 31 percent of the total housing stock in the affected districts was either destroyed or damaged in some way. This amounts to about 115,000 units destroyed and an additional 135,000 units suffering some extent of damage.

**Kota Padang and Kab. Padang Pariaman recorded the highest levels of destruction.** Kota Padang and Kab. Padang Pariaman accounted for about 75 percent of all damaged housing. Within Kab. Padang Pariaman, destructive landslides swept away entire villages. Other nearby areas badly affected include Kota Pariaman, Kab. Pesisir Selatan, Kab. Agam, and Kab. Pasaman Barat.

**Table 3. 19 Summary of damage in the housing sector**[30]

| District | No. of Houses | Heavy Damage | Medium Damage | Light Damage | Total Damage | Total Damage (%) |
|---|---|---|---|---|---|---|
| Kota Padang | 150,421 | 33,597 | 35,816 | 37,615 | 107,028 | 71 |
| Kota Pariaman | 15,154 | 6,685 | 4,115 | 2,605 | 13,405 | 88 |
| Kota Solok | 11,234 | 2 | 2 | 6 | 10 | 0 |
| Kota Padang Panjang | 9,177 | 17 | 164 | 413 | 594 | 6 |
| Kab. Tanah Datar | 82,717 | 28 | 115 | 105 | 248 | 0 |
| Kab. Padang Pariaman | 91,069 | 57,931 | 16,291 | 12,945 | 87,167 | 96 |
| Kep. Mentawai | 16,191 | 3 | 0 | 136 | 139 | 0 |
| Kab. Solok | 80,211 | 145 | 243 | 357 | 745 | 1 |
| Kab. Pesisir Selatan | 102,903 | 1,156 | 3,596 | 5,510 | 10,262 | 10 |
| Kab. Agam | 97,907 | 11,796 | 3,797 | 4,353 | 19,946 | 20 |
| Kab. Pasaman | 53,925 | 197 | 13 | 931 | 1,141 | 2 |
| Kab. Pasaman Barat | 75,580 | 3,240 | 3,046 | 2,862 | 9,148 | 12 |
| **TOTAL** | **786,489** | **114,797** | **67,198** | **67,838** | **249,833** | **32** |

*Source*: BNPB.

**Damage assessments for housing began shortly after the earthquake through BNPB in coordination with Bappenas, Satkorlak and other local authorities.** The quick assessment process utilized a bottom-up approach through the local administrative units, with villages (*korong*) or *kelurahan* providing information on the level of damages to the sub-district. This was then reviewed by Satkorlak and various line ministries, regularly updating the data. The team for this overall damage and loss assessment report utilized the Satkorlak data and also compared with on-going detailed community development program surveys from PNPM. The PNPM program involved about 500 facilitators (already operational for 1 or 2 years), to assess damage to individual houses, categorizing damage on the basis of "destroyed or heavily damaged," "medium damage," and "light damage/habitable." The University of Andalas coordinated training and support from over 750 students of the technical departments of several universities. Provincial and district teams are also in the process of re-evaluating the earlier data and figures are still changing. The figures presented in this report utilize the data provided by BNPB as of 27 October 2009. However, preliminary results of the door-to-door survey by Andalas and PNPM suggest the need for additional work in the verification of these estimates. A summary of the estimated damage and loss figures is presented in Table 33. Details of all assumptions are contained in the annex.

[30] Different units costs are applied to different housing types in these estimates, including permanent, semi-permanent and non-permanent housing. Differentiation is also made between single and multiple storey houses.

**Table 3. 20 Estimated summary of damage and losses in the housing sector**
*Rp billion*

| District | No. of Houses (units) | Damaged Housing | Infra. Damage | Debris Removal | Furniture etc. | Temp. shelter | Total Effect |
|---|---|---|---|---|---|---|---|
| Kota Padang | 150,421 | 4,984.8 | 249.2 | 5.0 | 302.0 | 84.0 | 84.0 |
| Kota Pariaman | 15,154 | 774.0 | 38.7 | 0.6 | 57.1 | 16.7 | 887.0 |
| Kota Solok | 11,234 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 |
| Kota Padang Panjang | 9,177 | 7.6 | 0.4 | 0.0 | 0.1 | 0.0 | 8.2 |
| Kab. Tanah Datar | 82,717 | 6.0 | 0.3 | 0.0 | 0.2 | 0.1 | 6.6 |
| Kab. Pdg. Pariaman | 91,069 | 6,216.9 | 310.8 | 3.6 | 494.7 | 144.8 | 954.0 |
| Kep. Mentawai | 16,191 | 21.8 | 1.1 | 0.0 | 1.2 | 0.4 | 24.6 |
| Kab. Solok | 80,211 | 1.0 | 0.1 | 0.0 | 0.0 | 0.0 | 1.1 |
| Kab. Pesisir Selatan | 102,903 | 225.8 | 11.3 | 0.3 | 9.9 | 2.9 | 250.1 |
| Kab. Agam | 97,907 | 1,285.8 | 64.3 | 0.8 | 100.7 | 29.5 | 1,481.0 |
| Kab. Pasaman | 53,925 | 24.8 | 1.2 | 0.0 | 1.7 | 0.5 | 28.2 |
| Kab. Pasaman Barat | 75,580 | 407.4 | 20.4 | 0.3 | 27.7 | 8.1 | 463.8 |
| **TOTAL** | **786,489** | **13,956.1** | **697.8** | **10.6** | **995.5** | **287.0** | **4,189.0** |

*Source*: Estimates of the Joint Assessment Team.

**For the most part, people have been able to establish temporary living arrangements on the site of their destroyed homes with the use of tents, tarpaulins, and salvaged materials but the beginning of the rainy season will add to difficulties.** Anecdotal evidence indicates that households whose houses were completely destroyed were living inside tents in front of their houses. This allows communities to stay together rather than being broken up in temporary shelter sites. It also allows residents to protect their property and belongings in familiar surroundings. In many cases, residents have already begun to salvage valuables as well as building materials that can be reused for the reconstruction of their houses. Tarpaulins are also being used to protect remaining household assets from the elements but heavy rains that are beginning have resulted in some people returning to structures that are unsafe. Due to the limited availability of tarpaulins to cover the large affected population, some have moved to available shelters to sleep at night. BNPB reports an estimated 100,000 tents are still required to meet the needs of the affected population (OCHA). These conditions may require a rapid investigation into the appropriateness of providing additional temporary shelters.

## Considerations on the Damage and Loss Assessment

### *Land*

**A number of houses and '*dusun*' / sub-villages destroyed by landslides and many more are vulnerable to landslides and will not be able to be rebuilt in their original locations**. While certain limited agricultural / horticultural use of the land will be permitted, families will need to relocate to new locations in their *nagari* or *kecamatan*. This also entails location issues and assurance of livelihoods for the affected families. An estimated number of 250 families will require new sites for modest housing and tertiary infrastructure. Applying minimum semi-rural standards, 250 plots of 200m$^2$ and 40 percent local infrastructure will need a total of 7 hectares of land for housing.

### *Determining an Estimate for Total Damage and Losses*

**Aside from the considerations for direct housing damage, this assessment also factored in damage and losses that were expected to burden those affected**. These include debris removal (Rp 5,000 per m$^2$, total local infrastructure as part of the housing area, and furniture and other household property. Some personal effects of the victims were destroyed together with the houses. These include some productive capital, such as containers and sewing machines. In the still erect houses (including the heavily damaged ones) some assets could be saved. For this category , estimations of Rp 10 million, Rp 7 million and Rp 5 million are allocated for permanent, semi permanent and non-permanent respectively (per family) are calculated for heavily damaged houses. Impacts to water and sanitation per household are also significant and have been separately included in the corresponding sections of the DALA.

### *Upcoming Data*

Important disaggregated data on such aspects as gender, household head, age, household size, vulnerable groups, and income level as well as land tenure situation, renters, owners, etc, could not be collected within the timeframe of this assessment. Data collection by PNPM and Andalas is ongoing, however, and will be essential in informing reconstruction and recovery strategies and required interventions.

> *"All the brick houses were destroyed and all wooden structures were still left standing. I still have my wooden shop, while everyone else living here are in shelters at the town soccer field".* - An affected person at a rapidly constructed temporary shelter in Padang Sago

### *Needs Assessment*

**In Kota Padang, poor construction quality was the primary cause of physical damage, whilst improper building design and poor city layout/hazard zoning were contributing underlying causes.** Redevelopment should include a building code that will be rigorously applied to future construction, together with hazard maps, and an indication of risk areas that may be inappropriate for building.

**The short-term needs assessment should focus on finding reasonable places for those affected to live and ensuring basic services.** The housing stock was reduced by 32 percent and will result in considerable strain on the sector. Although the reconstruction process has yet to start, the sub-national and central governments, together with NGOs and donor agencies who commit to building houses for the victims, need to act swiftly to move internally displaced persons (IDPs) out of tents.

**The early to medium term needs assessment estimated a total of Rp 17.9 trillion as the financial requirement for recovery and reconstruction.** A rapid recovery needs assessment suggests an investment of at least Rp 2.97 trillion, based on providing Rp 15 million for heavily damaged houses, Rp 10 million for medium damage, and Rp 1 million for light damage. However, based on discussions with those experienced in seismic building codes, some experts feel that these levels of investment may not be enough to rebuild or reto-fit damaged buildings to an adequate standard. If seismic resistant compliance is to be pursued, some experts suggest that a figure of Rp 25 million per heavily damaged house and Rp 10 million for lightly damaged houses might be required. Discussions are ongoing as to the adequacy of the rehabilitiation grants to rebuild and retrofit damaged houses in a manner that increases their resistance to future earthquakes. This would obviously have significant implications for the overall costs of reconstruction but would better reflect the true cost of rehabilitation to seismic building codes.

**Given the extent of damage and the risk of future earthquakes in West Sumatra, a strategy that targets investments on the most critical needs could be considered**, avoiding across-the-board compensation, and premised on sustainable principles in the long term. This approach would clearly focus on improving the structural quality of houses.

**Table 3. 21 Estimated summary of recovery needs to be financed by the Government for the housing sector**

*Rp billion*

| District | House recontruction | Transitional infrastructure | Technical assistance | Transitional shelter | Total |
|---|---|---|---|---|---|
| Kota Padang | 899.7 | 45.0 | 37.8 | 84.0 | 1,066.5 |
| Kota Pariaman | 144.0 | 7.2 | 6.0 | 16.7 | 174.0 |
| Kota Solok | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 |
| Kota Padang Panjang | 2.3 | 0.1 | 0.1 | 0.0 | 2.6 |
| Kab. Tanah Datar | 1.7 | 0.1 | 0.1 | 0.1 | 1.9 |
| Kab. Pdg. Pariaman | 1,044.8 | 52.2 | 43.9 | 144.8 | 1,285.8 |
| Kep. Mentawai | 5.0 | 0.2 | 0.2 | 0.4 | 5.8 |
| Kab. Solok | 0.2 | 0.0 | 0.0 | 0.0 | 0.2 |
| Kab. Pesisir Selatan | 58.8 | 2.9 | 2.5 | 2.9 | 67.1 |
| Kab. Agam | 219.3 | 11.0 | 9.2 | 29.5 | 268.9 |
| Kab. Pasaman | 4.0 | 0.2 | 0.2 | 0.5 | 4.9 |
| Kab. Pasaman Barat | 81.9 | 4.1 | 3.4 | 8.1 | 97.6 |
| **TOTAL** | **2,461.8** | **123.1** | **103.4** | **287.0** | **2,975.2** |

*Source*: Estimates of the Joint Assessment Team

*"The house is tilting now. We were lucky that it didn't fall over. I tried to clear out some of the areas that were dangerous. Now I tell my family to stay away from one of the walls. At first we were sleeping outside in a tent that was donated but now we have rearranged the house to make it livable for now. We will rebuild when we make enough money but now the rains have come."* - Staff member from the provincial planning agency (Bappeda)

## Preliminary Recommendations

The overall goal for redevelopment is to "build back better", strengthen communities, reduce risks, and to improve overall quality of life.

**The Government should take the lead quickly and coordinate support.** The Government should move rapidly into the reconstruction phase, as beneficiaries become moving targets when projects progress slowly. There is already considerable support pledged for redevelopment, and the Government should coordinate this process. There is a critical space for NGOs to contribute but programs should be coordinated and regulated. Programs need to be inclusive, aim to avoid competition among programs, and most importantly, follow a certain framework that the Government oversees in order to achieve overall objectives. In Aceh too much freedom for international support created a situation that was difficult to coordinate. It is important to also use existing national community programs and experienced institutions that ensure transparency of funds, speed, quality of houses, and ownership of the beneficiaries.

**Yogyakarta introduced one of the most successful housing redevelopment programs for rural areas and less dense urban areas. West Sumatra should follow the same framework.** Community based approaches have proven their efficacy in housing reconstruction after disasters: they are cheaper, faster, better, and result in high satisfaction levels. The Yogyakarta and Central Java program was among the fastest-ever large-scale housing reconstruction efforts in the world. The program was successful because it allowed flexibility and increased ownership of communities over their houses, increased participation, and resulted in better targeting, and was less prone to misuse of funds. The Government's contribution is only to support construction of "house structures" and not to build complete houses. Sufficient number of technical facilitators should quickly assist affected community and it is highly effective to utilize the existing experienced personnel active on the ground to avoid delay.

**Short-term solutions may not be best in the long term.** Immediate interventions such as shelters may be necessary for certain targeted areas during emergencies. However, temporary houses, barracks, and quick results often require considerable management that overshadows the goals for improving living conditions for the future. Transitional shelters should be for about 2 years lifetime at existing sites, and should be through community grants or other means. Furthermore, providing support only for the structure (foundations, beam and columns, roof only) ensures maximum benefits for the investment. Instead of providing complete houses, the focus should be on supporting structures that allow the Government to educate and increase community capacity for anticipation of future disasters. Aid to families for rebuilding should be considered as support to rebuild the core structure of the house (about $36m^2$) and not as compensation for destroyed assets. It is important to maintain the principle that the Government is not providing full compensation for destroyed assets, but is rather contributing to improved structure of houses and capacity building for disaster risk reduction at the community level.

### Community-managed Grants

**Providing funds at the discretion of communities is an effective means for early recovery.** This allows for adjustments to specific family needs and innovations. Along with the funds, close facilitation is to be provided to achieve the desired results and accountability.

### Quality Assurance

**The building failures experienced in Padang and other earthquakes demand a wide-scale response, ensuring that design and construction of buildings incorporate the extraordinary loads incurred during high magnitude earthquakes** (such as could strike West Sumatra), and that construction is executed with adequate quality. In the short term, rehabilitation and retro-fitting of buildings will have to ensure capability to resist stronger earthquakes. This applies also to expansion and modification of buildings. The quality enhancement and capacity building for seismic-resistant houses should be the overarching objective of the housing recovery program.

### Overall Re-development of Settlements

**Reconstruction of housing will be based on plans that aim at resilience of the neighborhood against major earthquakes in the long term.** Village planning should include other related risks, such as landslides or flooding, and prepare communities to cope with eventual disasters. Land-uses, rights of way to cope with emergency situations, adequate open spaces or buildings for refuge need to be decided; distance between buildings and density of neighborhoods need to be controlled; and adequate infrastructure and facilities need to be provided.

### Role of Sub-national Governments

**Naturally, these actions have to be enforced by building codes and an effective building permit and supervision system.** Neighborhood plans need to be reviewed and adjusted, and supported with guidelines and regulations. Unfortunately, public access to information on regulations and construction methods has generally been poor, especially in rural areas. Therefore, availability of information and technical services need to be brought to citizens, ideally at the sub-district level. The Government will provide alternatives that are cost-cutting and at the same time environmentally friendly. In addition, sub-national governments should protect the land and property rights of the victims of the earthquake. District/city governments will play a critical role in providing the secondary and primary infrastructure and facilities for settlement areas.

## 3.5.2. Water supply and sanitation

### Summary

**The damage to the water supply sector is comparable to that of the transport sector.** Total damage and losses to water supply and sanitation are are estimated to be Rp 450.1 billion, of which 53 percent is in water supply and 47 percent in sanitation. In water supply, 56 percent of the total impact has been incurred in the public sector and 44 percent in the private (alternative)[31] sector. In the urban sector, most of the damage has occurred in production and distribution facilities, resulting in technical, financial and institutional losses. Water supply services of five regional government-owned water supply enterprises (PDAMs) in Kota Padang, Kota Pariaman, Kab. Agam, Kab. Pesisir Selatan and Kab Pasaman Barat were impacted. Only 20 percent of households in Kota Padang are connected to the water supply network. The city's PDAM building sustained 50 percent damage, the piped water network services sustained 72 percent, and the customer services sustained 60 percent. In the affected areas, immediate debris cleaning and temporary stabilization measures are still ongoing. The rehabilitation costs of alternative water sources, such as rivers, springs, groundwater sources including wells and tube-wells, are difficult to assess as the baseline data are lacking. There is limited information available on environmental sanitation and resources below the ground. In the sanitation sector, total damage and losses are estimated at Rp 210.6 billion.

### Pre-disaster Conditions

**Urban water in the earthquake affected area is provided by PDAMs and alternative sources. Sanitation services are provided by the local government administration.** In Kota Padang, water supply is provided by Kota Padang PDAM. In the surrounding cities and districts it is supplied by PDAMs in Kab. Agam, Kota Pariaman, Kab. Pesisir Selatan and Kab. Pasaman Barat. The piped water supply delivery is centered within city and town levels, expanding to some district levels. However, a high proportion of citizens both in urban and rural areas depend on self-provisioning through alternative water supply systems from surface, rain and ground water sources. Sanitation coverage in Kota Padang is around 72 percent and services are provided by the local government administration through the Ministry of Public Works. The sanitation systems include on

[31] The damage to the alternative water supply systems, categorized as 'private' in this assessment report includes surface and groundwater sources. The damage estimates are extrapolated by taking the housing damage and loss data. However, this estimate only includes dug wells and does not provide a complete picture of the damage in the alternative sources sector. Damage in the urban and rural sectors is differentiated by the administrative boundary of supply services. All city levels services are categorized as 'urban' and district levels, as 'rural'.

site systems with septic tanks, *cubluk*, and MCK. Construction of household wells and toilets inside and outside the house is common. In rural areas, open defecation is prevalent. The use of river sources for water supply needs is common. There is limited information available on the impact of the earthquake on urban drainage and wastewater management. For solid waste management, Kota Padang has Instalasi Pengolahan Lumpur Tinja, a solid waste management facility with an open dumpsite of 61$m^3$ capacity per day and is operated and managed by the local government.

**Prior to the earthquake, the coverage of water supply services to Kota Padang was 61 percent.** This service was provided by Padang PDAM and included about 94 percent domestic consumers out of total connections in 11 sub-districts. Total service connections recorded in 2008 were 61,707. In Kab. Agam, before the earthquake services from PDAM Agam covered 9,989 total connections in 9 sub-districts, representing around 19.3 percent water supply coverage in the total administrative area. In Kab. Padang Pariaman, before the earthquake the total number of connections was 13,000 in 20 sub-districts and in Kab. Pesisir Selatan the total number of service connections before the earthquake was 6,800, representing about 13 percent of the total coverage of the total population of 250,000. In Kab. Pasaman Barat total households connected to piped water supply was 4,680, representing a total coverage of 7 percent of the total population of 350,000 in six sub-districts.

## Damage and Loss Assessment

**Damage to piped water supply has disrupted services to 29,784 consumer connections in cities and districts. Overall, there is moderate damage to both water supply and sanitation systems, both of a permanent and temporary nature.** Repair and reconstruction is ongoing, requiring new installations of some production (intakes and pumps) and distribution (pipes and connections) systems. In Kota Padang PDAM, new construction of the damaged water treatmemt plant and some segments in the conveyance network will be required. In the sanitation sector, a total of 135,000 private installations of toilets and septic tanks were damaged and around 80,973 of these will require new installations. Regarding water quality and urban drainage and solid waste management sectors, damage and losses appear to be temporary in nature. Limited information is available on these sectors at this stage of the assessment. However, an increase in the level of turbidity in water bodies has been reported by private and public water users. Likewise, some PDAM infrastructure installations in the city were reported to have sunk by a level of 20cm. Damage to water supply and sanitation facilities is summarized in Table 1. The total damage and losses for the water and sanitation sector is estimated at Rp 450.1 billion.

**Supply of piped water in the urban areas and, in particular, Kota Padang was disrupted for several days mainly due to damage to supply, production, and distribution facilities.** The leakages and broken pipes in the pipe networks and damage to the production facilities are significant. In the PDAM in Kota Padang, significant damage of about Rp 60 billion occurred in one water treatment plant, the PDAM main office and the accelerator buildings. Of a total of 1,800 km of installed pipe network, a total of 7,250 points of broken pipes in the network have been identified. An estimated 20,000 service connections were dysfunctional. Temporary measures to repair the leakages and resume services to disconnected consumers are ongoing. Rehabilitation and reconstruction efforts are expected to take about 6 months, although new infrastructure development may require a longer timeframe. There is minor damage to sanitation, solid waste management and waste water systems in and around Kota Padang. No report is available on damage to sewer lines and ground water. There is no visible damage to the open landfill site and there is limited information available on solid waste management.

**Table 3. 22 Summary of damage and losses in the water and sanitation sector**
*Rp billion*

| | Effects | | | Ownership | |
|---|---|---|---|---|---|
| | Damage | Loss | Total | Private[32] | Public |
| **Water and Sanitation** | **370.5** | **79.6** | **450.1** | **317.6** | **132.5** |
| **Water Supply** | **159.9** | **79.6** | **239.5** | **107.0** | **132.5** |
| *PDAM Water Supply* | *125.4* | *7.1* | *132.5* | *0.0* | *132.5* |
| Production units | 11.3 | 0.0 | 0.0 | 0.0 | 11.3 |
| Pipe network & connections | 54.1 | 0.0 | 54.1 | 0.0 | 54.1 |
| Tanker trucks | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Lost revenue | 0.0 | 5.7 | 5.7 | 0.0 | 5.7 |
| Additional operating cost | 0.0 | 1.4 | 1.4 | 0.0 | 1.4 |
| Water treatment plant[33] | 60.0 | 0.0 | 60.0 | 0.0 | 60.0 |
| *Rural Water Supply* | *20.7* | *43.4* | *64.1* | *64.1* | *0.0* |
| Dug wells new construction | 20.7 | 0.0 | 20.7 | 20.7 | 0.0 |
| Dug wells rehabilitation[34] | 0.0 | 31.0 | 31.0 | 31.0 | 0.0 |
| Dug wells cleaning | 0.0 | 12.4 | 12.4 | 12.4 | 0.0 |
| *Urban Water Supply* | *13.8* | *29.1* | *42.9* | *42.9* | *0.0* |
| Dug wells new construction | 13.8 | 0.0 | 0.0 | 13.8 | 0.0 |
| Dug wells rehabilitation | 0.0 | 20.8 | 0.0 | 20.8 | 0.0 |
| Dug wells cleaning | 0.0 | 8.3 | 0.0 | 8.3 | 0.0 |
| **Sanitation** | **210.6** | **0.0** | **210.6** | **210.6** | **0.0** |

*Source*: Estimates of the Joint Assessment Team.

**Water supply services were generally disrupted during the first two weeks of the earthquake.** In Kab. Agam, around 63.43 percent of the dysfunctional connections have been repaired. In Kab. Padang Pariaman, damage was reported at the production facility, including three WTPs and three intakes. In Kab. Pesisir Selatan, the earthquake damaged 7,000 of these connections. During the first two weeks, 30 percent of these connections were repaired by the PDAM. In Kab. Pasaman Barat,

[32] Private water supply systems include individualized and common property resources. The installations for accessing water from surface, ground and rain water technologies for water supply needs varies. Most PDAMs acquire bulk water supply needs from raw water sources such as rivers, springs and ground water in the provisioning of piped water supply services to both the rural and urban citizens.

[33] The water treatment plant in Kota Padang is badly damaged and is currently stabilized using temporary support structures, such as iron beams and wire mesh to hold the building from falling and sinking further. The plant is located at an elevation and the land at this site sunk 20 cm. The Ministry of Public Works has recommended that this water treatment plant be relocated with a new construction closer to the city and in flat terrain.

[34] Rehabilitation reflects infrastructure repair work required from the production and distributions points of service delivery. Older parts of town, such as China Town, where piped network shows considerable aging and increased damages may require replacement of pipes that were placed in the 1970s.

out of total installed connections, about 6,630 were damaged by the earthquake. Around 77.6 percent of the repair work is finished with services being resumed to the affected households.

**Information on private (alternative) water supply systems, such as systems using surface, rain and ground sources is limited.** However, increased levels of turbidity have been reported by PDAMs and consumers. Rainwater harvesting technologies were also employed by communities in the first few weeks after the earthquake. In urban areas, a total of 46,122 dug wells were impacted. Out of these, about 10 percent will require rebuilding about 13,800 will require infrastructure repair work related to production and distribution. The remaining 27,700 wells will require cleaning. In rural areas, the total numbers of wells requiring reconstruction, rehabilitation and cleaning is estimated at about 68,900, of which 10 percent will require new construction, 30 percent rehabilitation and 60 percent cleaning. In rural areas, for example Kab. Padang Pariaman, over 75 percent of the dug wells have been damaged The total damage to dug wells in both the urban and rural water supply sectors is estimated at Rp 107 billion.

**Data on sanitation are limited to toilets and septic tanks.** The damage to sanitation and septic tanks may have impacted water quality as conventional septic tanks are prevalent. Septic tank construction was often in close proximity to dug wells. There is a high possibility of contamination in both surface and ground water sources. However, limited information is available on this environmental damage. The current damage estimates in the sanitation sector total about Rp 323 billion and have been calculated from data on housing damage.

**All PDAMs in the affected districts are likely to experience increased costs associated with technical, financial and institutional management. This will increase operational and maintenance** costs due to the need for immediate repair, rehabilitation and new construction, resulting in revenue and opportunity cost losses. In the private water supply sector, challenges remain in capturing the real value of alternative water sources, environmental health and sanitation damage and losses due to the gaps in data at this stage of the assessment.

**The reconstruction needs assessment for water and sanitation are estimated at Rp 550.8 billion**. The reconstruction needs are taking into account a factor of relocation, retrofitting and a reconstruction period of two-year for water supply infrastructure and a 'building back better' approach using environmentally friendly design such as "bio filter" septic tank for sanitation.

## 3.5.3. Transport

### Summary

**While the earthquake and subsequent landslides have caused no damage to railways, ports and airports, they have caused widespread damage to roads and bridges.** Damage to roads was most evident in longitudinal cracking and pavement deformation caused by heave or subsidence. In addition, several sections of roadway in hilly terrain suffered damage from landslips. Failures of cut slopes above the road and side slopes below the road caused significant damage. In many instances emergency work has allowed roads to re-open but there remains a serious risk of further failures that could be triggered by more quakes or heavy rainfall. Damage to bridges was generally limited to settlement of approaches and cracks to abutment wing-walls and retaining walls. The total cost of the damage to roads and bridges is estimated at around Rp 294 billion, with total losses estimated at Rp 9.0 billion.

### Pre-disaster Conditions

**The road network in Sumatra follows the land form with national roads forming an eastern and western corridor divided by the mountain chain.** The total size of the road network in West Sumatra is around 28,883 km of which 2,400 km are national roads, 2,209 km provincial, and 24,274 km district roads. The road network in Sumatra carries the bulk of passenger and freight movements. There are three small unconnected railways in North, West and South Sumatra. The West Sumatra railway is 169 km long and carries mostly coal and cement. The airport and port of Padang represent the major civil aviation and maritime infrastructure in the province.

### Damage and Loss Assessment

**The earthquake caused no major losses to the transport sector.** With the exception of some roads leading to remote areas in Kab. Pariaman, which were impassable for two days, accessibility on most damaged roads was re-established relatively quickly and no significant traffic diversion has occurred during road works. One provincial road on the outskirts of Kota Padang on Jalan Purus is currently closed, causing a minor diversion to city traffic. The total cost of re-opening the national, provincial and districts roads to traffic is estimated by the Balai[35] at Rp 5 billion. The airport of Padang was temporarily closed to traffic immediately after the earthquake but the losses to the airline industry and to the civil aviation authority will likely be offset by the increase in air traffic during the weeks following the earthquake.

[35] Provincial road projects implementation agency under the overall directorate general of highways, Ministry of Public Works.

**There has been no damage to railways, ports and airports but some widespread damage to roads and bridges.** Damage to roads was most evident in longitudinal cracking and pavement deformation caused by heave or subsidence. In addition, several sections of roadway in hilly terrains suffered damage from landslips. Failures of cut slopes above the road and side slopes below the road caused significant damage. In many instances emergency work has allowed roads to re-open but there remains a serious risk of further failures that could be triggered by more quakes or heavy rainfall. Damage to bridges was generally limited to settlement of approaches and cracks to abutment wing-walls and retaining walls.

**The total cost of the damage to roads and to bridges is estimated at around Rp 294 billion.** This estimate is based on data provided by the local public works agencies through BNPB and Balai. Less than 1 percent of the total road network was damaged. The damage to district roads and bridges represents more than 75 percent of the total cost, of which 25 percent is located in Kab. Pariaman. A summary of the damage is presented in Table 3.23 and the detailed cost estimates for national, provincial and district roads are presented in the annex. Figures 3.1 and 3.2 show the location of damaged road links and bridges on the road network. Higher costs of transportation will be incurred when using damaged roads in the affected areas until the damage is repaired: this is estimated to be Rp 9.0 billion over a 12-month period.

**Table 3. 23 Summary of damage to roads and to bridges**

| | Roads (km) | Bridges/Culverts and Retaining walls (meters) | Roads (Rp bn) | Bridges/Culverts (Rp bn) | Total (Rp bn) |
|---|---|---|---|---|---|
| National | 4 | 250 | 56 | 4 | 60 |
| Provincial | 3 | 230 | 4.5 | 0.5 | 5 |
| District/City | 170 | 4,500 | 185 | 44 | 229 |
| **Total** | **177** | **4,980** | **245.5** | **48.5** | **294** |

*Source*: Estimates of the Joint Assessment Team.

## Needs Assessment and Recovery

**Repairing the road sections that have suffered medium and light damage can be funded from routine maintenance budgets, but the severely damaged links will require additional funding sources.** For many of the landslides, the cost of recontsruction work to prevent any reoccurrence of a similar nature could be significant. These sections of road remain unsafe and should be part of an emergency work program to prevent further damage and to maintain accessibility, particularly to remote areas. Some damaged roads that do not present risks to road-users may still require major work (e.g. realignment) and the repair work could be incorporated into road projects, which is currently being formulated in Sumatra.[36]

[36] The Directorate of General Highways is currently preparing a national road improvement project along the Western Corridor of Sumatra.

**The total recovery and reconstruction needs for transport sector are estimated at Rp 422.5 billion.** The recovery needs is estimated at Rp 5 billion; while the reconstruction needs are estimated at Rp 417.5 billion. The estimation is taking into account inflation with the assumption of reconstruction period of two-year as well as some relocation and retrofitting factors.

## Recommendations

**Landslides are a result of underlying geological conditions with weak base- and sub-soils prone to cracking and slipping when stimulated by seismic and climatic events (earthquakes and heavy rainfall).** Because of the geological and terrain conditions in many locations of Sumatra, it may not be feasible to construct fully resilient solutions and there will always be a risk of landslides.

Risks can be reduced in the future by implementing mitigation measures, including the following:

- Road re-alignment to safer routes and improvements to drainage at the top of cut slopes and on roadside drains above fill slopes;
- Provision of retaining walls to provide support to fill embankments and to provide protection from landslips and rock-falls from cut slope; and
- Improved monitoring of cut and fill slopes to provide early warning of failure.

## Figure 3. 1 Location of damaged national road links

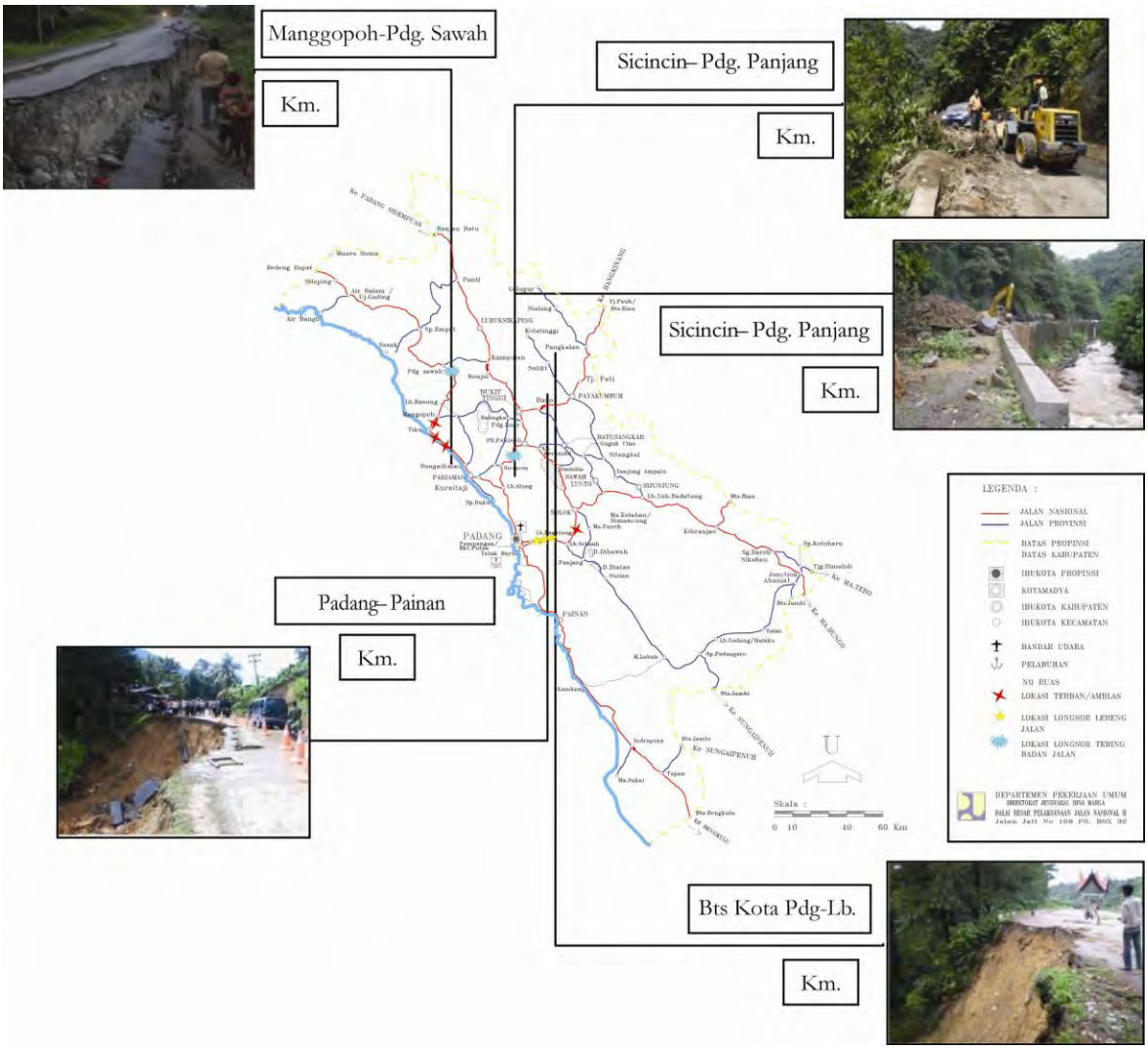
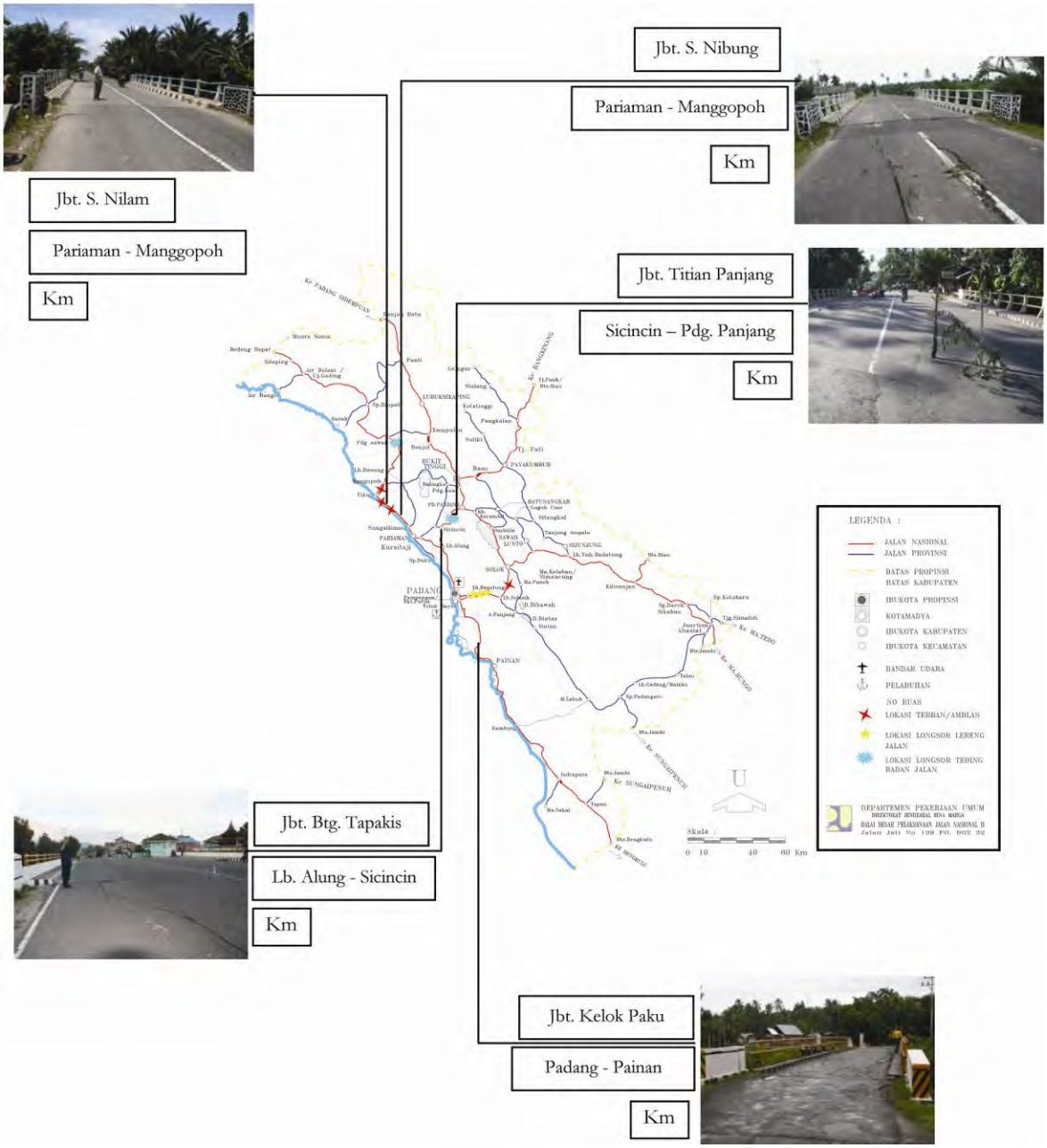


**Figure 3. 2 Location of damaged bridges (national roads)**



## 3.5.4. Communications

*"The network was back at pre-disaster traffic levels after 3-4 days"* – Operator manager

### Summary

**The earthquake caused limited damage to the telecommunication sector.** Most of the damage was due to the collapse of commercial real estate used in locating mobile network base-stations. Immediately after the earthquake, the lack of commercial power, the damaged buildings and some broken cables did result in differing degrees of outage of the seven telecommunication operators. Of the more than 1,000 base-station towers, not a single one collapsed, in sharp contrast to the collapse of many of the rooftop installed base-stations on commercial real estate of third parties.

**All telecommunication operators recovered most of the network and offered comparable coverage to pre-disaster levels.** Charter planes and land transport were used to bring necessary equipment to repair the damaged communication links. Temporary mobile base-stations, COMBAT cars (13 units for the largest mobile network), have been deployed to provide coverage in the areas where base-stations on commercial real estate had collapsed. Broken cable routes have been repaired and microwave links have been realigned. Temporary satellite (very small aperture terminal, VSAT) links and mobile phone chips (SIM) have been provided to support relief operations. As a result of rapidsupport from outside the region, both in terms of material and specialists, telecommunication infrastructure has been repaired and most operators were back at normal traffic levels within a few days of the earthquake.

**There is still the need to relocate fully operational equipment that is still located in, or on top of, damaged buildings.** For two operators this involves core network nodes, while for most of the major mobile networks this applies to rooftop base-station equipment on commercial real estate.

### Pre-disaster Conditions

**Telecommunication services are provided by 7 competing telecommunication operators.** These include Telkom (fixed telephony and Flexi CDMA fixed wireless), Telkomsel (leading GSM and 3G provider), Excelcomindo (GSM), Indosat (GSM + international telephony), Bakrie Telecom (Esia, CDMA fixed wireless), Hutchison (3, GSM), and Natrindo (Axis, GSM, just launched in February 2009). Mobile coverage is provided all over West Sumatra and in Padang all 7 mobile networks and the fixed network provide services. Base-station data are shown in Table 3.24.

**Table 3. 24 Base-stations per operator**

| | Telkom | Indosat | Telkomsel | XL | Bakrie Telecom | Hutchin-son | Natrindo | Total |
|---|---|---|---|---|---|---|---|---|
| West Sumatra | 90 | 180 | 951 | 292 | 37 | 32 | 200 | 1782 |
| Kota Padang | 25 | 29 | 256 (2) | 83 | 20 (1) | 11 | 25 | 449 |

*Source*: Estimates of the Joint Assessment Team.
*Notes*: (1) Estimate. (2) Comprising 225 GSM and 31 3G

## Damage Assessment

**The collapse of buildings and commercial real estate used for indoor or rooftop installations was the main cause of damage, not the self-supporting towers.** For two operators, Indosat and Natrindo, buildings housing core network elements were damaged with losses incurred as a result of relocation. The collapse of commercial real-estate used for indoor and rooftop installations has affected most operators. The number of locations/operator ranges from 1 to 4 per operator for five operators, and more on the large networks of XL (13) and Telkomsel (19). Permanent base-station locations have to be found to replace the temporary base-stations. Also some of the currently fully operational base-stations will still require relocation to new radio sites since they are on damaged buildings.

**Two operators suffered specific damage due to damaged buildings of the core network elements, including Indosat's MSC building and Natrindo's core network and the base-station controller in the Plaza Andalas.** Both operators have recovery teams on the ground working on implementing this migration. Furthermore, the Indosat Customer Care building was destroyed. A summary of the total damage and losses is in Table 3.25.

**Table 3. 25 Summary of damage and losses in telecommunications**
*Rp million*

| | Telkom | Indosat | Telkomsel | XL | Bakrie Telecom | Hutchinson | Natrindo | Total |
|---|---|---|---|---|---|---|---|---|
| Equipment | 761 | 2,209 | 10,105 | 376 | 47 | | 2,115 | 15,613 |
| New radio network sites | 259 | 470 | 3,455 | 2,209 | 517 | 517 | 1,034 | 8,460 |
| Minor damages | | 721 | 2,162 | 1,081 | | | | 3,964 |
| Losses due to core network relocation | | 1,880 | | | | | 9,400 | 11,280 |
| Main buildings | | 13,536 | | | | | 470 | 14,006 |

*Source*: Joint Assessment Team.
*Notes*: The damage to the Natrindo core is expected to require the installation of a new core first. Not included in this figure is an additional upfront investment of US$3 million which, after the core network migration results in equipment available for implementation elsewhere in Indonesia.

**Not all collapsed buildings caused damage to equipment. In several cases equipment installed on roofs has been retrieved and re-used at other locations**. The destroyed indoor base-stations in heavily damaged/collapsed shopping malls (photo) and hotels do not require an immediate replacement since the "source" of the traffic is no longer there.

### Loss Assessment

**All the main operators reported that the traffic was back to the normal pre-disaster levels after 3 to 4 days.** Some smaller shifts in subscribers/traffic may have occurred from networks with longer outage to networks with shorter outage. Beyond the immediate recovery period there are no additional losses anticipated for the telecommunication sector. Some new entrants to the market may have lost some market share and market confidence due to their relatively long outage, recent entry, and pending core network migration activities. Telkom, as fixed-line operator, has some revenue worries about some customers, such as hotels, which are likely to be out of operation for an extended period.

### Needs Assessment

**The reconstruction needs for telecommunication is estimated at Rp 1.3 billion.** The different operators judge the damage and losses to be limited in relation to their usual investments and revenue streams. The telecommunication sector is beginning to implement all the required actions to recover infrastructure and to secure continued undisturbed operations in the long run. No major bottlenecks have been identified.

### Recommendations

- In the mid-term the use of alternative power solutions, such as solar power, at base-station locations should be encouraged. This would reduce the dependency on PLN and gensets.
- Installations in or on top of commercial real estate require improved verification of the structural capabilities of these buildings. Although this may be more of a general construction issue and not a direct telecom issue, more consideration could be paid to placing installations only on buildings deemed reasonably earthquake proof.

## 3.5.4. Energy

*"We lost about 20% of our customers in the Padang and Pariaman areas due to the 30 September earthquake. We worked around the clock which enabled us to reconnect customers literally within a few days."* – General Manager of PLN Wilayah Sumatra Barat

### Summary

**The earthquake did not cause significant damage to the energy sector.** Most damage was to the supply of electricity to the residential consumers. The supply interruption affected mainly the Padang network grid, which includes the heavily damaged district of Pariaman. The loss of power supply to these two areas of West Sumatra was temporary and gradually all services were restored to normal conditions within ten days. Total damage and losses in the power sector are estimated at Rp 46 billion and Rp 6 billion, respectively. The oil and gas sector hardly suffered any damage except for some minor tearing at a few commercial petrol stations. [37]

### Pre-disaster Conditions

**The public power supply transmission and distribution in West Sumatra and elsewhere is managed by PT Perusahaan Listrik Negara (PLN), a state-owned enterprise.** The power supplied in West Sumatra is mainly through PLN's own power generation plants and includes one small independent power producer (IPP) with an output of 660 kilowatt (kW). Other possible IPPs projects are planned for the future as part of the overall fast track[38] programs. The total installed capacity of the Sumatra grid is about 4,600[39] megawatts (MW) out of a total of c. 30,000 MW available across the country. West Sumatra has a generating capacity of about 520 MW, of which a little more than 60 percent is hydropower and the rest coal-fired. However, as per norm in the power sector, at any given time not all plants operate at design capacity due to derating of units with time, routine maintenance shutdowns, and other technical reasons. In the case of hydropower plants in West Sumatra, these operate at an average capacity of 30 percent because of low water levels due to a prolonged drought in the region. Therefore, to meet an average daily demand of 260 MW, PLN operations in West Sumatra rely on 200 MW from the South Sumatra and 90 MW from the Jambi grids. . Some hydropower potential has also been tapped by community driven programs for

[37] The damage was incurred by Pertamina which will use its own financial resources for replacement and repair costs and therefore not included in the energy sector damage reporting.
[38] PLN is currently implementing the first 10,000 MW fast track program and a second one is planned for an additional 10,000 MW with at least 7,000 MW to be supplied from renewable sources.
[39] Source: PLN estimates.

developing microhydro schemes such as the 8 kilowatt (kW) scheme in Tanjung Durian. These off-grid projects allow the remote residents to make use of power in their homes and operate small businesses such as rice mills.

**Prior to the disaster there were about 1,150,000 households and those connected to the PLN grid numbered 777,000, giving an electrification ratio of 67.5 percemt, slightly above the national average of 64 percent.**[40] The remaining 83,000 connections are divided between the industrial, social, and public sectors. The electrification figures do not include the off-grid schemes in some of the rural areas of the province. The total transmission network spans 383 km with the longest segment linking Singkarak with Lubuk Alung, a length of 85.1 km.

*"Revenue loss whether big or small is simply not an issue for PLN. We pray for the souls of the departed victims of the earthquake. We have set up an assistance center in the interim for those who seek help in all dimensions and our CEO has mobilized a large team from our branches in Indonesia to accelerate the recovery."* – Senior PLN staff at the Wilayah office in Padang

## Damage and Loss Assessment

**The low-voltage distribution system network supplying residential households suffered the most damage leading to a failure of 23,769**[41] **customer connections.** Some substations and transformers were also affected by the earthquake but most of this equipment is easily replaceable. A total of 176 overhead transformers fell down due to the earthquake but 36 of them have already been reused. Structural damage to the networks is also evident but repairing will not be a challenging task. By mid-October, PLN had managed to restore power to 242 business enterprises and work is underway to reconnect those houses that suffered interruption of supply but did not suffer serious damage. PLN estimates that by end December 2009, connections to all customer segments should be fully restored and operations back to normal. Some control center buildings at various substations and at least two official PLN vehicles also suffered minor damage. A few short sections of the low voltage (20 kV) distribution network will also require restringing. The total damage is assessed to be about Rp 46 billion.

**The monthly turnover dropped by less than 1 percemt from an average of Rp 930 billion to about Rp 926.5 billion immediately after the earthquake.** This translates into a decline in power sales from an average monthly figure of 1,540 gigawatt-hours (GWh) to 1,535 GWh immediately after the disaster, a 0.3 percent drop. The revenue loss is low since most customers disconnected due to the disaster are the low-income social category and are charged a subsidized tariff of Rp 560.52/kWh. The majority of PLN's energy sales during normal operating conditions come from the business and industrial sectors, accounting for 52 percent of monthly revenue. These two consumer groupings pay an average tariff of Rp 1,003.08 and Rp 836.26 /kWh, respectively. However, out of 52,665 business customers, only 242 were impacted. The industrial sector lost just one connection out of the 286 industries supplied by PLN. Thus the overall system loss is estimated at Rp 6 billion for the months of October and November because PLN expects to be back at pre-disaster levels by early December 2009.

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[40] Source: Directorate General for Electricity and Energy Utilization of the Ministry of Energy and Mineral Resources.

[41] This figure and others used in this report were supplied by the management of the PLN Wilayah Office on 15 October 2009.

**Table 3. 26 Summary of damage and losses in the power sector**[42]

*Rp million*

| Sub-sector | Damage | Losses[43] |
|---|---|---|
| Generation | - | - |
| Substation | 1,870 | - |
| Transmission | - | - |
| Distribution | 34,760 | - |
| Office & Related | 9,680 | - |
| Lost Revenue | - | 5,960 |
| **Total** | **46,310** | **5,960** |

*Source*: Estimates of the Joint Assessment Team.

**The bulk of the distribution damage occurred in the Kota Padang and Kota Pariaman belt accounting for more than 70 percent of the total damage followed by Kota Bukit Tinggi.** PLN's operating costs did not increase after the earthquake because the power plants within the province and the surrounding areas were not affected and continued to function as usual. The Kota Padang system, which also supplies Kota Pariaman, was operating at 142 MW before the earthquake, although the current load has declined to 100 MW.[44] However, the demand will remain at these levels for at least a year or two, until damaged houses and businesses have been rebuilt ad connections restored. Although the anticipated power sales losses are expected to be small, there is no provision made for them because most of the customers are in the highly subsidized R1 tariff group, which covers little more than short-term avoidable costs of supply. The high voltage transmission network linking all the areas of the province was spared significant damage and some minor repairs have already bee completed.

## Needs Assessment

**PLN estimates that at least Rp 52 billion is needed to return to a business-as-usual scenario, while Rp 64 billion is required to "build back better".** In the light of the damage incurred, PLN management has agreed that the additional higher investment to "build back better" will be used to upgrade the existing system to newer design standards with high performance power.

**Reduction of system losses will help PLN to increase its net operating profit and improve cash flow despite low tariffs imposed by the central government.** PLN has announced a proposed national tariff hike for 2010. While subject to parliamentary approval, the increase would help improve PLN's margins and provide additional spending for routine maintenance in West Sumatra and elsewhere.

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[42] The estimates were provided by the PLN staff at the Kantor Wilayah in Padang which oversees the whole province. The damage figures include 10 percent value added tax (PPN).

[43] This is the sum of revenue losses for October and November. According to PLN staff, the assumption is that system will be at full operation by beginning December 2009.

[44] As per PLN's daily update report of 16 October 2009.


# CHAPTER IV

# THE ECONOMIC AND SOCIAL IMPACTS

This chapter discusses the broad impact of the earthquake on the well-being of the people of West Sumatra. It analyzes the impact of the earthquake on employment, aggregate economic activity and government finances, and on the livelihoods of the people in the region, particularly those likely to be pushed below the poverty line.

## 4.1 Macroeconomic and Fiscal Impact

**The West Sumatra earthquake has had a moderate effect on the province's economy.** Output in West Sumatra in the fourth quarter of 2009, immediately following the earthquake is likely to be 2 to 2½ percent below what it would have been had the earthquake not occurred; value added in the province in the year following the earthquake is likely to be cut by around Rp 1 trillion. These losses will cut growth especially in late 2009 and 2010, before activities recover to pre-earthquake levels from 2011. A swift and effective recovery and reconstruction effort has the potential to lift West Sumatra's growth in coming years, through the additional construction activity and boost to activity in the service sectors especially.

**While these shocks are significant for the region, and especially for the businesses directly affected, the scale and diversity of the aggregate Indonesian economy limits the national impact.** West Sumatra produced 1.4 percent of Indonesia's output in 2008, with higher shares of national transport and communications, and agricultural activity (3.3 percent and 2.6 percent of the national averages, respectively). Importantly, in terms of the losses flowing from the earthquake, manufacturing and mining industries are a smaller share of West Sumatra's economy than the national average. The impact on Indonesia's trade surplus is also likely to be limited. Only 1.2 percent of Indonesia's exports (by value) passed through the port of Padang in the first 7 months of 2009, and the port itself was not significantly affected by the earthquake, although some exporting firms are likely to have been impacted.

**Table 4. 1 West Sumatra's share of the national economy is modest**

| | Rp billion | Share (%) | Share of national production (%) | Sector's share in national economy (%) |
|---|---|---|---|---|
| Agriculture | 18,319 | 25.7 | 2.6 | 14.4 |
| Mining and Quarrying | 2,351 | 3.3 | 0.4 | 11.0 |
| Manufacturing | 8,535 | 12.0 | 0.6 | 27.9 |
| Electricity, Gas & Water Supply | 832 | 1.2 | 2.0 | 0.8 |
| Construction | 3,884 | 5.5 | 0.9 | 8.5 |
| Tourism | 12,464 | 17.5 | 1.8 | 14.0 |
| Transportation and Communication | 10,435 | 14.6 | 3.3 | 6.3 |
| Financial Services | 3,398 | 4.8 | 0.9 | 7.4 |
| Services | 11,014 | 15.5 | 2.3 | 9.8 |
| **GDP Total** | **71,233** | **100.0** | **1.4** | **100.0** |

*Source:* BPS.

**The trading and tourism sector has been most affected by the earthquake, and the effect will be ongoing.** Losses[45] in ongoing activity in the year following earthquake, not including the destruction of the capital stock, are projected at 3.2 percent of this sector's activity in 2010. Business and financial services will also incur significant ongoing costs, estimated at 3.8 percent of pre-earthquake activity, stemming from higher rates of non-performing loans and weaker demand. The impact on industry was immediate but even in the final quarter of 2009 is likely to be limited to 2.2 percent of baseline value added, with some small manufacturers at risk of suffering longer-term losses. Agriculture, producing one-quarter of the province's output, has been little affected, with some lost production in the seasons following the earthquake, due for example to disrupted irrigation systems, but limited ongoing impact.

**The boost to activity from the recovery and reconstruction efforts will offset some of these losses.** Much of the damage to property and public works will be repaired in the months and years after the earthquake, particularly in the first two years, and this repair work will boost construction

[45] Losses in a production sector, which approximate the total revenue foregone, are adjusted for the share of revenues in that sector that are generated within that sector itself, such that, for example, the goods sold by retailers and the electricity they use is not included in retailing activity.

activity. Much of this increased activity will spill over to neighboring areas not directly affected by the earthquake. For example, the cement factory was already operating at or near capacity prior to the earthquake, suggesting supplies will be sourced elsewhere. Even assuming little of the new construction activity stays in West Sumatra, the reconstruction effort is likely to add about 0.5 percentage points to GRDP through 2010 and most of 2011.

**Table 4. 2 The most heavily affected economic sector will be trading and hospitality, with a strong recovery and reconstruction effort able to offset the losses**

| | Gross value of impact (Rp billion) | | | Net impact on activity (Percent of value added) | | |
|---|---|---|---|---|---|---|
| | 2009 | 2010 | 2011 | 2009 | 2010 | 2011 |
| *Earthquake effect:* | | | | | | |
| Agriculture | -92.9 | -30.4 | -22.6 | -0.4 | -0.1 | -0.1 |
| Mining and quarrying | -- | -- | -- | -- | -- | -- |
| Manufacturing | -114.8 | -- | -- | -0.5 | -- | -- |
| Electricity, gas & water supply | -85.6 | -- | -- | -5.7 | -- | -- |
| Construction | -- | -- | -- | -- | -- | -- |
| Trade, restaurants & hotels | -230.0 | -706.9 | -61.3 | -1.1 | -3.2 | -0.2 |
| Transportation and communication | -- | -- | -- | -- | -- | -- |
| Financial services | -151.7 | -533.5 | -- | -1.2 | -3.8 | 0.0 |
| Services | -58.0 | -- | -- | -0.2 | -- | -- |
| **Total effect** | **-732.9** | **-1,270.8** | **-83.9** | **-0.5** | **-0.8** | **-0.1** |
| *Recovery and reconstruction effort:* | | | | | | |
| Agriculture | -- | -- | -- | -- | -- | -- |
| Mining and quarrying | -- | -- | -- | -- | -- | -- |
| Manufacturing | 5.7 | 5.7 | 5.7 | 0.0 | 0.1 | 0.1 |
| Electricity, gas & water supply | -- | -- | -- | -- | -- | -- |
| Construction | 758.6 | 12,068.2 | 9,836.8 | 1.8 | 29.0 | 49.5 |
| Trade, restaurants & hotels | 78.1 | 107.5 | -- | 0.4 | 1.0 | 1.0 |
| Transportation and communication | -- | -- | -- | -- | -- | -- |
| Financial services | -- | -- | -- | -- | -- | -- |
| Services | 16.3 | 16.3 | -- | 0.1 | 0.1 | 0.1 |
| **Total effort** | | | | **0.2** | **1.8** | **3.0** |
| **Net impact** | | | | **-0.3** | **1.0** | **2.9** |

*Source*: Estimates of the Joint Assessment Team

**Sub-national government fiscal positions will be impacted by the relatively larger losses in formal sector firms and the costs of reconstruction.** In 2007, the provincial government of West Sumatra sourced 43 percent of its revenues internally, while the Kota Padang government sourced 13 percent of its revenues itself. These largely flowed from revenues such as property taxes and firms in the formal sector. The earthquake's impact on hotels and retail properties suggests regional government revenues risk falling by around 4 percent given the sector's activity. In addition, government spending will be burdened by the cost of repairing government facilities, supporting the general reconstruction effort, and higher operating costs in the intermediate phase. This will pressure the provincial and district governments' financial positions, with some offsetting support coming from additional transfers from the central Government.

## 4.2. IMPACT ON LIVELIHOODS AND EMPLOYMENT

**Preliminary estimates suggest that 41,000 jobs will be immediately lost due to the earthquake, or about 2.1 percent of pre-earthquake employment in West Sumatra.** Workers in the tourism sector are likely to be most at risk of losing employment, with preliminary estimates of 19,000 jobs likely to be lost or 4.5 percent of pre-earthquake employment. At 44 percent of the workforce, agriculture is the largest employer in West Sumatra, and about 1 percent of these workers are at risk of losing some or all of their income in the season immediately following the earthquake. While production and revenues of the major industries in the province (cement and palm oil refining) were immediately affected by the earthquake, shutdowns were temporary at the major plants. However, the impact on small-scale manufacturers is likely to be more prolonged and some of the almost 100,000 industrial workers are likely to suffer lost income.

**After the initial shock, jobs are expected to gradually return first as businesses and public services recover and through the reconstruction effort.** Estimates generally suggest that rebuilding the lost infrastructure, particularly shopping areas and hotels, should take two years. Over this period the jobs lost immediately after the earthquake are likely to gradually return. In the meantime many new jobs are likely to be created in construction. Many of the additional construction jobs may be filled by workers from outside the province rather than those laid-off from hotels, restaurants or trading firms, who may face difficulties in switching sectors. Even based on conservative assumptions, reconstruction is likely to create 20,000 to 30,000 jobs in the province.

**Table 4. 3 Impact of the disasters on employment**

*Thousands*

| | 2008 | Immediate impact |
|---|---|---|
| Agriculture | 866 | -14 |
| Mining and Quarrying | 24 | -- |
| Manufacturing | 98 | -2 |
| Electricity, Gas & Water Supply | 9 | -2 |
| Construction | 71 | -- |
| Trade, Restaurant & Hotel | 427 | -19 |
| Transportation and Communication | 98 | -- |
| Financial Services | 20 | -1 |
| Services | 346 | -3 |
| **Total** | **1,960** | **-41** |

*Source*: Estimates of the Joint Assessment Team

**The loss of jobs will mean lower incomes.** Formal sector employers, more common among trading firms and accommodation, were relatively severely affected by the earthquake. As these employers tend to provide their employees with better salaries, the loss of these jobs is likely to have a disproportionate impact on average income levels. While many of the jobs lost are likely to be made up by jobs in construction, the new construction jobs are likely to pay less well and offer inferior conditions to many of those lost.

**The immediate impact of the earthquake on poverty is potentially substantial.** West Sumatra had a poverty rate of 11.9 percent in 2007, and poverty is projected to have fallen as fast as the national average since then, to 9.5 percent in 2009. If the earthquake had not occurred, then given per capita growth and inflation projections, poverty was expected to have fallen from 9.5 to 9.3

percent by early 2010. The immediate effect of the earthquake on employment and incomes could see poverty rise to 10.8 percent, a 1.5 percentage point increase. Such an increase is due to two factors. First, lower economic growth per capita after the earthquake, combined with faster growth in poorer households' costs of living, will reduce real consumption for many households. While only 10 percent of households in West Sumatra were in poverty before the earthquake, many more households live not far above it and are thus vulnerable to even moderate shocks. Second, and more significantly, 1.7 percent of the workforce is projected to lose their jobs in the short term, eroding their incomes. A large loss of income could temporarily move many of these households below the poverty line.

**However, reconstruction efforts and government livelihood assistance would mitigate much of this.** A 1.5 percentage point increase in poverty represents a maximum effect in the immediate aftermath of the earthquake before firms have started to recover and re-employ their staff. The reconstruction effect will provide employment for many of those who have lost jobs, possibly up to half of the newly unemployed. Under such circumstances, the poverty rate would only increase to 10.2 percent. Furthermore, although not quantified here, expected government support of livelihoods, such as in fishing and agriculture, would further mitigate the effects on household consumption. Thus, while poverty is expected to increase without immediate assistance, after reconstruction begins and with livelihood assistance the increase in poverty could be less than 0.5 of a percentage point.

**Table 4. 4 The impact of the earthquake on poverty in West Sumatra**

*Percent*

| | 2009 | 2010 |
|---|---|---|
| Baseline | 9.5 | 9.3 |
| Earthquake without recovery and assistance | | 10.8 |
| Earthquake after reconstructions begins | | 10.2 |

*Source*: Estimates of the Joint Assessment Team.

**The moderate impact of the earthquake across the overall economy of greater West Sumatra masks more severe effects in some sectors and areas.** The region affected by the earthquake has strong traditions of drawing on collective support mechanisms, such as *gotong royong*, that individual households would normally rely on for support following a major shock. The concentration of damage in some areas may test these mechanisms, as most households have suffered significant losses, reducing the pool of available labor for rebuilding while expanding the needs. This in turn may exacerbate losses by, for example, slowing recovery, and, in the longer term, reducing human capital as victims pushed below the poverty line from the earthquake suffer from deteriorating health and their children from poorer education.

## 4.3. SOCIAL IMPACT

### Implications for recovery, reconstruction and rehabilitation

**The dominant Minangkabau culture has many distinctive features that should be taken into consideration during recovery, reconstruction and rehabilitation.** The dominant culture in West Sumatra is Minangkabau, which has many distinctive and unique features that may have important implications for the recovery, reconstruction and rehabilitation process. However, it is important to avoid approaching Minangkabau society as a homogenous static entity and necessary to recognize that Minangkabau traditional systems have been adapted to the local areas and therefore take on a different nature depending on the location of the district. Distinctions also need to be recognized in the interpretation of Minangkabau culture in urban as opposed to rural contexts. The existence of minority ethnic groups also needs to be taken into account, such as the ethnic-Chinese whose community was badly affected by the earthquake. It is important therefore to take a case-by-case approach towards each of the affected districts in order that social structures, capital, and norms are fully recognized. This section therefore seeks to draw attention to distinctive features of Minangkabau culture that may influence recovery, reconstruction and rehabilitation policy and to underline the need for further understanding of cultural patterns and social norms at the community level. Most importantly, this section seeks to avoid making mistaken assumptions that could lead to administrative arrangements that undermine existing social structures.

**Pre-existing social structures and systems:** As mentioned, this section gives only a superficial overview of the dominant Minangkabau culture and provides a first step towards understanding the social impacts of the disaster, for further follow-up at the district level on a case-by-case basis. The purpose is to flag elements of West Sumatra culture that need to be understood in order to develop appropriate recovery and reconstruction policies.

**Social structure:** Minangkabau society has a unique customary matrilineal social system. This traditional or customary system runs in parallel to Islamic systems (considered often to be patrilineal) and also in parallel to formal governance mechanisms, including laws and regulations. This is particularly relevant in relation to property and land rights, land management, kinship and inheritance. These systems are executed at the community or *nagari* level.

**Property:** Property, including houses and land, typically belong to women and are passed down the female line.

**Land ownership:** The ownership of inherited land is rotated along strict patterns amongst members of the wife's lineage who, in broad terms, can be considered to represent an informal landholding corporation. Men receive ownership of land only under exceptional circumstance, for example if there are no female family members to receive rotated ownership. A senior male figure, or *tungganai,* is sometimes chosen to help resolve disputes over land ownership. However, the real power over the land is retained by the constituent landholders of the corporation, who are usually women.

**Land management:** In rural areas of West Sumatra, share-cropping is a common land-management practice, whereby landowners hand over the management of their land to a relative or close acquaintance. The harvest from the land is divided equally in two and half is given back to the

landowner. In many rural communities the women of elite households have much greater control of land and labor than any other group in the village.[46]

**Social protection:** The land-tenure relationship between landowner and sharecropper also provides a basis for social protection. While the sharecropper is expected to manage the land and produce a satisfactory yield, the landowner has certain social obligations towards the person to whom the land is entrusted for cultivation. The ties between landowner and sharecropper often go back over a number of generations.

**Income generation:** The responsibility for generating income is perhaps more equally distributed in a Minangkabau household than might be expected. Both men and women engage in income generating activities, including management of sharecropped land and also wage labor.

**Conflict resolution:** As mentioned in relation to disputes over land-ownership rotation, community level models for conflict resolution exist, as do traditional figures of authority such as the *tungganai*, the *ninik mamak* (male family figure head represented by the eldest uncle), *bunda kandung*, a traditional women's governance forum, and religious leaders.

**Vulnerable groups:** Those most vulnerable, particularly in rural areas, are those who are both landless and lack strong kinship and community ties. Share-cropping relationships usually occur amongst members of the same kin or those who have close social ties. Consequently, 'new' members of a community will have limited access to sharecropping opportunities and will need to rely on wage-labor activities. As landholders typically use close kin for harvesting, daily labor opportunities in rural areas are limited. There are limited opportunities outside the agricultural sector in rural West Sumatra, with the result that daily wage laborers have limited options.

### Post-disaster recovery and reconstruction: potential social impact

**Livelihoods generating interventions:** Any disruption to agricultural activity will have an impact on social relations. Sharecropping land tenure arrangements are vulnerable to the sudden sale of land on the part of the landholder, which occurs when there is a sudden need for capital. In the aftermath of the disaster, if landowners need to sell their land in order to rebuild houses that have been destroyed, this will result in the sharecropping arrangement being ended and the related sharecropper losing her (sometimes his) access to a livelihood. Therefore, livelihood interventions in rural areas may need to consider sharecroppers as a potential target group who are at risk of losing their livelihoods and in need of external support in generating incomes.

**Vulnerable groups:** Vulnerable groups who lack land and also kinship or social ties should be a target for social protection interventions, particularly in the early recovery stage. Given that this group rely particularly on wage (usually daily) labor and have no other potential source of income, they should be prioritized as beneficiaries for 'cash-for-work' programs.

**Housing rehabilitation and reconstruction policies:** Policies related to housing reconstruction and rehabilitation should recognize that, in many cases, the proprietor is usually the woman of the household. Therefore, policies introduced in other post-disaster reconstruction and rehabilitation

[46] Blackwood, 1997.

programs related to joint-land titling should be seriously considered before implementation, as they have the potential to seriously undermine traditional ownership rights of women in West Sumatra.

**Participatory approaches:** On the whole, women play a significant role in decision-making in Minangkabau communities. Furthermore, senior women in a community usually hold a significant degree of political power. While efforts should nevertheless be made to ensure the participation of women who are the exception and to whom this general rule does not apply, participatory approaches to decision-making throughout the reconstruction process should make use of existing decision-making fora. Attention should be paid to vulnerable groups such as those mentioned above.

**Land management:** A system of common ownership of communal land (*tanah ulayat)* is still practiced in many rural areas of West Sumatra. This system has frequently come into conflict with modern administrative regulations. One example occurred in 2002, when demonstrations were held against the introduction of a regulation relating to common land ownership by the provincial government (Benda-Beckmann, 2004). This is of significance for new land management policies that may be introduced as a result of the reconstruction and rehabilitation program. For example, one of the key recommendations of this report that resonates throughout all the sectors is the need for better land management to mitigate the impacts of future disasters. Given that this may necessitate a renegotiation of land boundaries and use of communal land, land management policies should take into consideration the importance of *tanah ulayat* to the communities of West Sumatra.

# CHAPTER V

# FOCUS ON KERINCI IN JAMBI

## Summary

One day after the earthquake hit West Sumatra, another large earthquake occurred in the province of Jambi on 1 October, affecting 43 villages in the district of Kerinci (Kab. Kerinci) but sparing the vast majority of inhabitants. As the culture of the people of Kerinci is different from those of the Minangkabau people in West Sumatra, this chapter separately addresses the impacts and needs of those affected in Jambi. The many hazards to which the district is vulnerable are also highlighted and some priorities for disaster risk management are suggested.

## 5.1. The Social and Economic Background

### Geography and Population

**Jambi's geography consists of low land costal areas to the east and mountains to the west, including Sumatra's highest active volcano.** The province lies to the east of West Sumatra. Kab. Kerinci lies in a valley within the mountainous region on the western side of the province.

**The district is about 418 km from Kota Jambi** and borders with Kab. Solok Selatan (West Sumatra) in the north, Kab. Bungo and Kab. Merangin in the east, Kab. Bengkulu Utara (Bengkulu Province) and Kab. Pesisir Selatan (West Sumatra).

**Kab. Kerinci is rich in natural resources and is known for its stunning natural beauty.** Kerinci Seblat National Park is one of three national parks which together make up the Tropical Rainforest Heritage of Sumatra Site, a UNESCO World Heritage Site, and it is the largest national park in Sumatra. The park is home to some of the world's most endangered species such as the Sumatran tiger.

**Kab. Kerinci is culturally distinctive from a matrilineal social system found in West Sumatra.** Customary or *adat* laws still retain a large influence in the district, particularly in relation to matters of kinship and property. Despite superficial similarities with the Minangkabau culture (also matrilineal), Kerinci culture is different from Minangkabau in most respects.[47] Therefore, it is important to consider Kerinci as an entirely separate case. This is of particular importance when considering the division and distribution of property.

**The administrative area of Kab. Kerinci about 7 percent of Jambi province.** Of this area, half of the land lies within the boundaries of the Kerinci Seblat National Park. The remainder is divided into twelve sub-districts or *kecamatan* with diverse characteristics including geographic and demographic features. The district consists of a mountainous area including an active volcano, Gunung Kerinci. The total population for Kab. Kerinci is 235,418 and the population in the affected districts totals 91,544.[48]

[47] Watson, 1992.
[48] Kerinci District Government data.

### Table 5. 1 Demographic summary by district and sub-district

| Sub-districts in Kerinci | No. of villages | Area km² | Inhabitants | Density per km² |
|---|---|---|---|---|
| **Total District** | **209** | **3,808,50** | **235,418** | **62** |
| **Kayu Aro** | **29** | **328,05** | **36,259** | **111** |
| *Gunung Tujuh* | *11* | *162,50* | *11,613* | *73* |
| *Gunung Kerinci* | *11* | *350,00* | *11,613* | *33* |
| **Siulak** | **27** | **590,20** | **30,464** | **52** |
| *Air Hangat* | *22* | *216,75* | *21,446* | *99* |
| *Air Hangat Timur* | *16* | *160,00* | *18,613* | *116* |
| **Depati VII** | **14** | **25,80** | **14,242** | **552** |
| **Sitinjau Laut** | **15** | **58,25** | **14,150** | **243** |
| **Danau Kerinci** | **14** | **298,47** | **16,207** | **54** |
| **Keliling Danau** | **20** | **304,39** | **22,898** | **40** |
| **Batang Merangin** | **14** | **567,32** | **22,898** | **40** |
| **Gunung Raya** | **16** | **746,77** | **15,284** | **20** |

*Source:* District Government of Kerinci.
*Note:* Italics indicate affected sub-districts.

## Economic and Fiscal Framework

The economy in Kab. Kerinci is dominated by the agricultural sector with the main exports being coffee, cinnamon, tea and cloves.

### Table 5. 2 Income in each sector as a percentage of GRDP in Kab. Kerinci, 2008

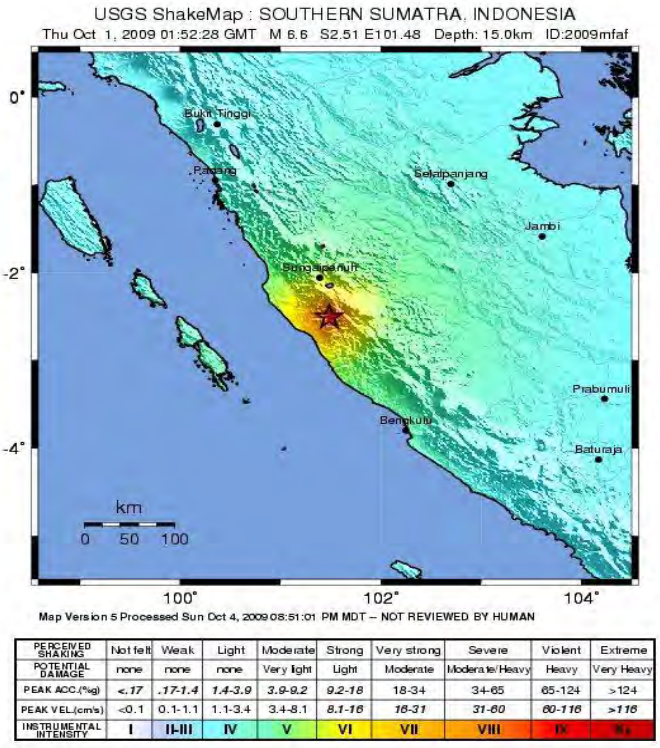
| | Current price | | Constant price (2000) | |
|---|---|---|---|---|
| | Rp million | % of GRDP | Rp million | %of GRDP |
| Agriculture | 1,594,168 | 67.1 | 679,050 | 67.8 |
| Mining & Quarrying | 9,124 | 0.4 | 4,466 | 0.4 |
| Manufacturing | 53,576 | 2.3 | 27,828 | 2.8 |
| Electricity, Gas and Water | 15,835 | 0.7 | 6,886 | 0.7 |
| Construction | 76,006 | 3.2 | 34,465 | 3.4 |
| Service, Hotel & Restaurants | 218,799 | 9.2 | 87,068 | 8.7 |
| Information and Communication | 88,294 | 3.7 | 41,429 | 4.1 |
| Real Estate Financing & Enterprise services | 20,225 | 0.9 | 8,409 | 0.8 |
| Services | 301,361 | 12.7 | 111,329 | 11.1 |
| **Total GRDP** | **2,377,387** | **100.0** | **1,000,928** | **100.0** |

*Source:* Jambi Provincial Government data, 2008.

## 5.2. The Nature of the Disaster

**The earthquake that struck Jambi on 1 October 2009 at 8.52 am local time was of a magnitude of 7.0 with an epicenter at a depth of 10 kilometers.**[49] The earthquake occurred in the Gunung Raya sub-district. Most of the impact of the earthquake was felt in Kab. Kerinci, with some minor impact in Kab. Merangin.

**Map 5. 1 Location and intensity of the Jambi earthquake**




*Source:* U.S. Geological Survey.

## 5.3. The Response

**The emergency phase in Kerinci was largely managed by the district authorities.** The district government of Kerinci responded to the disaster by establishing Posko, or information centres, dispatching a data and evaluation team and allocating between Rp 5 million and Rp 125 million to the affected villages from the district government budget. The district government of Kerinci also declared a period of emergency over 1-14 October. The district government also distributed food and water, and aid was also collected from the private sector, both financial and in kind. A total of almost Rp 1.43 billion was collected in Kab. Kerinci.

[49] BNPB data.

## 5.4. Human and Community Impact

**In Kab. Kerinci three lives were lost, while 11 people were badly injured and 58 lightly injured.[50] Forty-three villages (*desa*) in eight sub-districts were affected.** Those sub-districts were: Gunung Raya, Batang Merangin, Danau Kerinci, Keliling Danau, Sitinjau Laut, Kayu Aro, Air Hangat and Siulak. The highest numbers of affected villages were in the sub-districts of Gunung Raya (17) and Batang Merangin (16).

## 5.5. The Damage and Losses

**The majority of the damage was sustained in Gunung Raya and Batang Merangan sub-districts.** 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.

**Table 5. 3 Physical damage recorded by the district government of Kab. Kerinci**

| | Location | Housing | Education | Health | Offices | Roads | Irrigation | Religious facilities |
|---|---|---|---|---|---|---|---|---|
| **1** | **Gunung Raya** | | | | | | | |
| | Heavily Damaged | 62 | 13 | - | | 12 | 39 | 1 |
| | Moderately Damaged | 438 | 27 | 3 | 3 | 2 | - | 4 |
| | Lightly Damaged | 986 | 1 | 3 | 1 | - | - | 6 |
| **2** | **Keliling Danau** | | | | | | | |
| | Heavily Damaged | - | - | - | - | - | - | - |
| | Moderately Damaged | 1 | - | - | - | - | - | - |
| | Lightly Damaged | 9 | 1 | 2 | - | - | - | - |
| **3** | **Danau Kerinci** | | | | | | | |
| | Heavily Damaged | - | - | - | - | - | - | - |
| | Moderately Damaged | 1 | - | - | - | - | - | - |
| | Lightly Damaged | 15 | - | - | - | - | - | - |
| **4** | **Batang Merangan** | | | | | | | |
| | Heavily Damaged | - | 3 | - | - | - | - | |
| | Moderately Damaged | 42 | 6 | 2 | - | - | - | 1 |
| | Lightly Damaged | 481 | 1 | 1 | - | - | - | 2 |
| **5** | **Sitinjau Laut** | | | | | | | |
| | Heavily Damaged | - | 1 | - | - | - | - | - |
| | Moderately Damaged | - | - | - | - | - | - | - |

[50] District government of Kab. Kerinci data.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Lightly Damaged | - | - | - | - | - | - | - |
| **6** | **Depati VII** | | | | | | | |
| | Heavily Damaged | - | - | - | - | - | - | - |
| | Moderately Damaged | - | - | - | - | - | - | - |
| | Lightly Damaged | - | 1 | - | - | - | - | - |
| **7** | **Kayu Aro** | | | | | | | |
| | Heavily Damaged | - | 1 | - | - | - | - | - |
| | Moderately Damaged | - | - | - | - | - | - | - |
| | Lightly Damaged | - | 1 | - | - | - | - | - |
| **8** | **Air Hangat** | | | | | | | |
| | Heavily Damaged | - | - | 1 | - | - | - | - |
| | Moderately Damaged | - | - | - | - | - | - | - |
| | Lightly Damaged | - | - | - | - | - | - | - |
| | **Total** | **2035** | **56** | **12** | **4** | **14** | **39** | **14** |

*Source:* Satkorlak, District Government of Kab. Kerinci, 10 October 2009.

**Early estimates by the district government of Kerinci indicate an initial value of Rp 101.2 billion in damage and losses.** However, damage and losses in some sectors have still to be estimated and therefore the final total is almost certain to be higher.

### Table 5. 4 Damage and loss estimates by the district government of Kab. Kerinci

| No | Sector/Sub-sector | Damage | | Losses | | Total | |
|---|---|---|---|---|---|---|---|
| | | Rp billion | % | Rp billion | % | Rp billion | % |
| **A** | **Housing** | **66,948** | **66.1** | **-** | **-** | **66,948** | **66.1** |
| | | 66,948 | 66.1 | - | - | 66,948 | 66.1 |
| **B** | **Infrastructure*** | - | - | - | - | - | - |
| | Transportation | - | - | - | - | - | - |
| | Energy | - | - | - | - | - | - |
| | Post and | | - | | - | | |
| | Telecommunication | - | | - | | - | - |
| | Water sources infrastructure | - | - | - | - | - | - |
| **C** | **Social** | **34,338** | **33.9** | **-** | **-** | **34,338** | **33.9** |
| | Health | 989 | | - | - | 989 | - |
| | Education | 17,608 | | - | - | 17,608 | - |
| | Religion | 15,741 | | - | - | 15,741 | - |
| | Social Organizations | - | | - | - | - | - |
| **D** | **Economy** | **-** | **-** | **-** | | **-** | **-** |
| **E** | **Cross Cutting** | **-** | **-** | **-** | **-** | **-** | **-** |
| **TOTAL** | | **101,286** | **100** | | | **101,286** | **100** |

*Source:* District Government of Kab. Kerinci, estimates, 10 October, 2009.
*Note:* *Damage recorded but value not yet estimated.

## 5.6. KERINCI'S HISTORICAL HAZARD RISK PROFILE AND VULNERABILITY

**Kerinci is vulnerable to many hazards and has experienced a number of disasters over the past 15 years.** The district is vulnerable to earthquakes, landslides, volcanic eruption and flooding. In 1995, for example, an earthquake of magnitude 7.3 struck Kab. Kerinci and caused human casualties and structural damage. Evidence of the damage of this earthquake can still be seen in the area as several buildings were never rebuilt. Another earthquake occurred in 1999, and in 2007 the effects of the magnitude 7.9 Bengkulu earthquake were also felt in Jambi. Frequent landslides occur in areas including the two arterial roads linking Jambi to the province of West Sumatra. Settlements in areas such as Siulak are further exposed to the risk of landslides by soil erosion caused by deforestation on the mountain sides.

## 5.7. MANAGING DISASTER RISKS – KEY PRIORITIES

**Given that Kab. Kerinci is vulnerable to many hazards, it will be important for the district government to consider disaster risk reduction activities in future planning and budgeting.** Given the area's location in a valley and its vulnerability to landslides, risk mapping should be an important part of future human settlement planning. The similarities in the patterns of destruction between the 1 October 2009 earthquake and the 1995 earthquake, stretching across the valley floor, draw particular attention to the need for careful disaster risk management in the affected areas. The correlation between deforestation and landslides also needs to be taken into consideration in exploitation of forest for timber resources.

**The impact of disasters also has the potential to adversely impact Kerinci's rare natural environment and biodiversity.** Given Kerinci's status as a steward of important natural resources and some of the world's most endangered species, it will also be important for the district government to ensure that disasters and their subsequent reconstruction phases do not put extra pressure on the resources of Kerinci National Park and do not undermine the status of the World Heritage Site. This will include protecting the forest from encroachment for building materials for reconstruction or for wood for burning in brick kilns.

# CHAPTER VI

# REDUCING RISKS

### REDUCING RISKS

**While a disaster of such magnitude as the 30 September 2009 earthquake is always regrettable, especially the loss of life, it can be viewed as an opportunity to rebuild communities with improved disaster resilience**. Efforts to reduce future risks of similar or other disasters should therefore be an inherent part of the reconstruction and rehabilitation process. Indeed, this is especially urgent in the case of West Sumatra, as there are many experts in the earthquake community who believe that the 30 September 2009 event may be a precursor to a larger earthquake. Some believe that a seismic gap exists in the offshore Sunda Trough that is capable of unleasing a magnitude 8.5 earthquake, with the strong likelihood of this triggering a tsunami. Therefore, reconstruction and rehabilitation should be undertaken with such a scenario in mind. Given the risks of a tsunami in the region, one of the most urgent disaster risk reduction measures needed in West Suamtra is an effective tsunami warning and evacuation plan, including public education regarding evacuation routes. Public building design should also include measures that might offer shelter in the case of a tsunami. For example, schools could be built on more than one storey, offering refuge on upper floors in the case of a tsunami.

## 6.1. POLICY, INSTITUTIONAL ARRANGEMENTS AND PARTNERSHIPS FOR DISASTER RISK MANAGEMENT

**The principles of disaster risk management (DRM) are well captured in several policy documents of the Government.** The 1945 Constitution, for instance, stipulates that 'the Republic of Indonesia is responsible to protect the whole Indonesian nation and the entire motherland' with the aim to provide protection on life and livelihoods, inclusive protection against disasters, in the framework of realization on general welfare.[51]

**Disaster Management Law No. 24/2007 specifically lays down concrete foundations for the development of an Indonesian DRM system.** Law No. 24/2007 is now supported by three government regulations and one presidential decree, the latter of which regulated the establishment of a dedicated National Disaster Management Agency (BNPB). BNPB was only formally inaugurated in January 2008. As a guardian of disaster risk management in Indonesia, BNPB's two main tasks are a) to formulate and issue policies on DRM, and b) to coordinate the implementation of DRM activities in a planned, integrated and comprehensive manner.

**At the local level, provinces and districts have been developing necessary regulations or Perda for DRM and the establishment of local DRM agencies or Badan Penanggulangan Bencana Daerah (BPBD).** The Ministry of Home Affairs and BNPB have also issued guidelines for the establishment of BPBD. In West Sumatra, the provincial government was working to develop Perda, as well as BPBD at the time of the earthquake. However it had already drafted and exercised its disaster response plan, Rencana Penanggulangan Bencana Provinci Sumatera Barat Tahun 2008-2012.

**The Government has made DRR one of its priorities in national development.** Informed by the Hyogo Framework for Action 2005-2015, a global blueprint for disaster risk reduction (DRR),

[51] From the National Action Plan for Disaster Reduction 2006-09, published in 2006 by National Development Planning Agency (Bappenas) and National Coordination Agency for Disaster Management (then Bakornas).

the Government has put DRR as one of priorities in national development. It has also made institutional commitments to mainstream DRR into development framework. As its first endeavor, the Government created the National Action Plan for Disaster Risk Reduction (NAP-DRR) in 2006.[52] But in the absence of strong legal frameworks in DRM, the implementation of this action plan was not closely monitored.

**There is now a national platform for DRR stakeholders and practitioners to discuss and make recommendations for policy development.** Another endeavor has been the development of national platform or Planas PRB Indonesia, which is a coordination / partnership forum where DRR stakeholders and practitioners gather to discuss and make recommendations for policy development. Under the BNPB's guidance, five sectors were invited to form Planas PRB Indonesia that included government agencies, academia, private sector, civil society organizations and media. The international community consisting of UN agencies, international non-governmental organizations, Red Cross/Red Crescent national societies, and donors, was also invited as an active contributing partner. Planas PRB Indonesia was formally launched in April 2009, complementing the global and regional coordination efforts and promoting further partnership. Domestically within Indonesia, West Sumatra was considered as one of three pilot provinces to organize a provincial-level forum. The Planas and its subsequent regional and local forums have provided venues for collaboration and long-term partership in reducing risk from disasters through development.

**Best practice requires that relief, rehabilitation and development programs are integrated.** One of fundamental principles in a good recovery process is the integration of relief, rehabilitation and development, which implies a longer-term perspective behind post-disaster action. In essence, it means that relief and rehabilitation should contribute to long-term development and the reduction of vulnerability where possible – they should not simply reconstruct the existing risk.[53] Indonesia is not a stranger in the 'relief-development continuum'. Having experienced several catastrophic events including the 2004 tsunami and the 2006 Yogyakarta earthquake, Indonesia has learned to ensure that there is a painless transition from relief to rehabilitation and further to development.

**There is an opportunity to influence development outcomes that are strenghtened by sound recovery actions.** As both the BNPB and Bappenas are currently undertaking planning processes of five-year medium term development plan (or RPJM), as well as the next NAP-DRR 2010-2012, there is a strategic opportunity to influence development outcomes that are strengthened by sound recovery actions. Among the enhanced approach being introduced in the upcomping NAP-DRR is the use of risk assessment as the basis to determine priority areas and actions. Preliminary result of this risk assessment (see map below) clearly indicated that the West Sumatra region (and even the recently affected earthquake regions of West Java) are rated as very high risks from earthquake.

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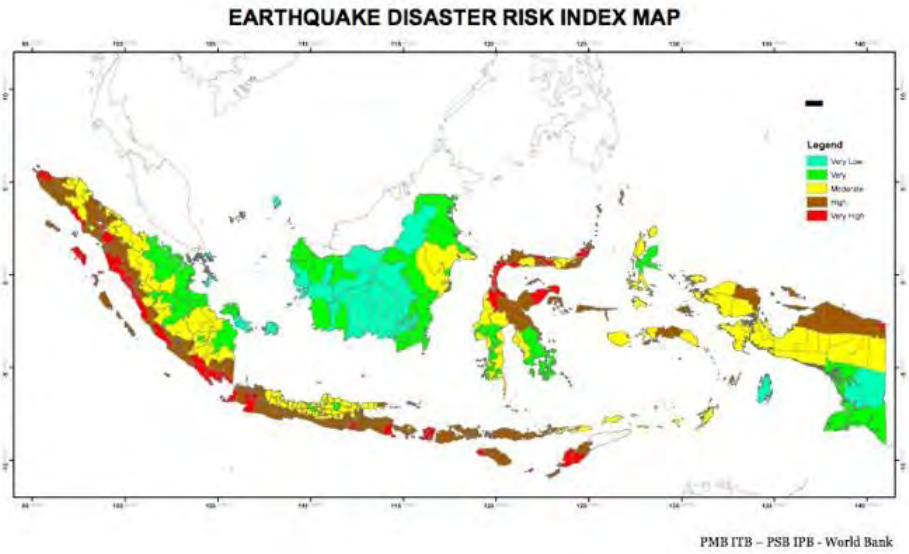
[52] Ibid.

[53] From John Twigg's *Disaster Risk Reduction, Mitigation and Preparedness in Development and Emergency Programming* in Good Practice Review, 2004.

**Map 6. 1 National risk assessment maps for earthquake**




**The 30 September earthquake occurred ahead of this action plan.** While the NAP-DRR 2010 to 2012 had envisioned that priority actions to reduce risks from earthquake in West Sumatra would be carried out beginning in 2010, a major earthquake event occurred much ahead of this action plan. This further strengthens the argument that immediate actions, especially through the upcoming rehabilitation and reconstruction will have to include significant element of risk reduction, both through structural and non-structural measures.

## 6.2. Disaster Risk Reduction Measures for Recovery and Reconstruction

**DRR is an integrated and holistic approach.** DRR is an integrated and holistic approach for fine-tuning development processes through prevention, mitigation, and preparedness, combined with post disaster response activities including rehabilitation and reconstruction. It is important to note that DRR is not a separate area isolated from both emergency and development interventions but an approach to strengthen both areas.

**There are several known approaches to risk reduction after disasters.**[54] One is about rebuilding livelihoods. Preservation of livelihoods is vitally important to poor and vulnerable community, and vulnerability is closely linked to livelihood security. After a disaster, earning income will soon be a priority for the affected populations. However, the influx of unplanned relief goods and outside labor can undermine local markets and income-earning opportunities. Protecting livelihoods is clearly an approach to reduce vulnerability that can be done, for example, by providing income generating opportunities e.g. cash for work, or even through direct financial assistance e.g. cash transfer programs or micro-finance.

**There is also a window of opportunity for promoting and implementing risk reduction measures.** The other approach is related to the belief that disasters generally present a 'window of

[54] Ibid.

opportunity' for promoting and implementing risk reduction measures because the consequences of failing to act are so strongly implanted in the minds of all involved. In this case, people tend to think about the problem of risks; the disaster may already have forced some changes in their behaviors or attitude; the community has to make decisions about recovery; and technical and expert advice and resources become available from different sources, when they do not normally happen. It is difficult to predict how long the window will last, but this can be an entry point to address DRR.

**In the recovery phase, there are many sectors and programs that DRR measures can be incorporated.** For instance, further dissemination and reinforcement of applying the Ministry of National Education (MoNE)'s Technical Guidelines for the Construction of New Junior Secondary School, which elaborates safer designs and building material specifications of earthquake resilient schools, could help construct a safer school, reducing future risks. For some academicians and scientists, this is also an opportunity to collect damage and exposure information for a robust disaster modeling that could eventually benefit future public awareness/education as well as early warnings. Other sectoral DRR measures[55] in recovery, reconstruction and rehabilitation may include:

| Education | Health | Infrastructure |
|---|---|---|
| • Incorporating DRR modules into the school curriculum and higher education<br>• Promoting hazard resilient construction for new schoolsUndertaking vulnerability assessment of schools in hazard-prone areas<br>• Undertaking vulnerability assessments of schools in hazard-prone areas. | • Promoting hazard resilient construction for new hospitals<br>• Implementing disaster preparedness plans in hospitals<br>• Undertaking vulnerability assessment of hospitals in hazard-prone areas | • Introducing DRR assessments for the construction of new roads, bridges and other major infrastructure<br>• Promoting the use of hazard risk information in land-use planning<br>• Ensuring compliance and enforcement of building codes and laws, especially for critical infrastructure |
| **Governance** | **Environment** | **Sustainable livelihoods** |
| • Elevating DRR as a policy priority and encouraging allocation of necessary resources<br>• Ensuring and enforcing the implementation of DRR initiatives and assigning accountability, as well as facilitating participation by all relevant stakeholders | • Strengthening capacities to protect ecosystems that can help reduce disaster risk (e.g. mangroves and coral reefs)<br>• Combating environmental degradation that enhances disaster risk (e.g. deforestation) | • Promoting diversified income opportunities<br>• Introducing effective insurance and credit schemes to compensate for crop damage and loss to livelihood<br>• Implementing social protection mechanisms such as for those who have or acquire impairments as a result of a disaster |

[55] From AusAID's DRR Policy, *Investing in a Safer Future: a Disaster Risk Reduction Policy for the Australian Aid Program*, June 2009.

The following components are required if DRR measures are to be successfully implemented: [56]

- **Risk analysis is critical**. This analysis needs to identify the links between hazards, vulnerability, and risks. Participatory approaches are useful to conduct these analyses at a community level but it is also important to have a robust technical understanding of the nature of hazards and people's vulnerabilities to them. In West Sumatra reconstruction, mapping the known risk level and the actual impacts of this earthquake will provide valuable knowledge for the current reconstruction as well as future development efforts.
- **Capacity building is essential**. Investing in developing the technical expertise and management capacity of staff and practitioners in DRR is essential. Avoid creating new and parallel structures but find a better way to support local institutional capacity and processes, even though it may require a significant investment in time and processes. The Government had made a political decision that West Sumatra reconstruction will be done by provincial level task force with direct assistance from the Government. This presents an opportunity to build provincial and local capacities, which would continue to stay post reconstruction.
- **Linking DRR work at different sectors and levels is necessary**. There is evidence that DRR is most effective when deliberate efforts are made to facilitate linkages between sectors, communities, sub-national, national and regional level initiatives. Support at the local level can harness and strengthen local capacities and resources that communities can draw on to prevent, mitigate or cope with disasters. However, a strong national and/or regional policy framework is essential to support, resource and scale-up community based initiatives. The assistance provided by the Government through rehabilitation and reconstruction fund, as well as rehabilitation and reconstruction action plan that is being drawn by Bappenas are both instruments that can be used to build convergence and synergy to ensure that priority and concrete risk reduction outcomes (e.g., in providing community with core building structure that is earthquake proof) will be achieved.
- **Measuring and demonstrating impact is important.** Improving the evidence base on DRR strategies is important for on-going support and success. A DRR approach will be assessed in terms of measurable improvements in the lives of the communities. At the organizational level, this requires an investment in results-based management, with strong baseline date to measure success against. As the Government has already had several community-based as well as regional development initiatives that deliver development investment (e.g., on economic empowerment, basic infrastructure, social services, etc.), it would be possible to link rehabilitation and reconstruction efforts to the existing initiatives to ensure targeted impacts and longer term DRR program sustainability.

[56] From Irish Aid's *Integrating DRR into MAPS Partners' Programming* (a case-study in May 2009).

**As DRR supports the principles of 'building back better' and 'do not harm', it is rather natural to incorporate DRR principles in the process of recovery, reconstruction and rehabilitation.** This may require small behavioral changes in building practices or further reinforcement of building standards, for instance, but it later saves lives and livelihoods against future catastrophic events. In the Indonesian context, the focus needs to be more on the capacity building aspects of building standards compliance, and on ensuring that the buildings standards and codes that already exist are properly adhered to. Here the private sector can learn from the recent experience and offer support in elevating the importance of complying with building standards. Given the fact that most provincial government buildings are now insured, and that the claims on the insurance industry will likely exceed Rp 180 billion, private sector insurers will have much more reason to ensure that building standards are fully respected in the future — especially in view of the risks of further earthquakes in the region.

# CHAPTER VII

# EARLY AND LONGER-TERM RECOVERY, RECONSTRUCTION AND REHABILITATION NEEDS

## 7.1 GUIDING PRINCIPLES

**A set of guiding principles governing the implementation of economic recovery and reconstruction, using disaster risk reduction standards have been adopted by the Government**. Indonesia's leaders have already considered a set of guiding principles to govern the design and implementation of activities to achieve full recovery and long-term reconstruction in the affected areas of Padang. The purpose of such agreed on principles is to ensure and enhance the effectiveness of recovery and reconstruction efforts, to increase transparency and accountability of different stakeholders, and to ensure that resources are translated into results on the ground.

**Post-disaster schemes must follow a clear distinction between economic recovery and reconstruction activities**, although both set of activities are to be started simultaneously. The recovery program will be designed to ensure that income generation, basic services rehabilitation, and productive activities are kick started promptly and that they achieve "normalcy" levels as soon as possible after the disaster. Reconstruction activities are to be implemented involving a "build back better" strategy in order to rebuild and reinforce all physical assets that may have been destroyed and that they will withstand the negative force of future natural events. Both programs – economic recovery and reconstruction – are essential and must be synchronized to ensure people's welfare and development at levels commensurate to those foreseen before the disaster.

**Those principles, outlined briefly below, build on lessons learned from other recovery and reconstruction programs** carried out across Indonesia after the 2004 earthquake and tsunami in Aceh, the 2006 Yogyakarta and Central Java earthquake, the 2009 West Java earthquake, as well as from similar recovery and reconstruction efforts in other disaster-stricken areas across Indonesia and other countries in the world.

### Coordination

- **The National Disaster Management Agency will take the lead.** The National Disaster Management Agency (BNPB) will take the lead in coordinating and facilitating the recovery, reconstruction and rehabilitation efforts, whilst implementation will be led by the provincial governments of West Sumatra and Jambi.

- **The recovery, reconstruction and rehabilitation process needs to start immediately.** The recovery, reconstruction and rehabilitation process should start immediately and be implemented rapidly in order to prevent any amplification of economic, social, and cultural losses already sustained. Plans must be developed swiftly and the momentum maintained.

- **The Government will support the basic needs of affected communities for four months.** During the recovery period, the Government will continue to support those communities affected by meeting basic needs for a period of four months.

## Financing

**Funding for the two programs of economic recovery and reconstruction will come from a variety of sources**. Government own funds will be complemented with private sector funding, supplemented with insurance proceeds, international donations and (re-oriented and fresh) loans, should be able to meet post-disaster funding needs. The private sector – utilizing personal and enterprise savings, insurance proceeds, and newly acquired credit – will constitute a significant portion of the financing of needs.

**The international community, including international financial institutions and other development partners, must also provide assistance** through grants and loans to supplement the national efforts for recovery and reconstruction. The Government will also combine its limited resources with the promotion of concessional and commercial term credit lines to the private sector to meet both recovery and reconstruction needs. Given this context, the following financing principles will be employed:

- **Funding from the national budget and foreign aid.** Funds from the national budget and foreign aid will be coordinated by the BNPB together with Bappenas and the Ministry of Finance, and will be allocated appropriately across those sectors in need.

- **International assistance.** International assistance will be primarily directed towards the reconstruction and rehabilitation of public and social facilities (such as schools, health centers, places of worship), as well as infrastructure projects (including roads, electricity, water and sanitation and irrigation), and other sectors as appropriate.

## Monitoring

**All agencies involved in the recovery, reconstruction and rehabilitation program must undertake appropriate audits** of their activities and funds, the results of which will be made publicly available at regular intervals in both print media and electronically. In addition, comprehensive and straightforward systems for monitoring activities, tracking funds and evaluating projects and programs must be implemented by all stakeholders, including the provision of regular and transparent reporting. Independent complaint-handling mechanisms should be made available to beneficiaries to enable greater accountability.

## Mitigating future risks

**Integrated disaster mitigation, preparedness and risk-management plans are needed i**n order to reduce the impact of future disasters. These must adopt improved construction and building standards that are earthquake proof, to reduce the impact of future similar disasters. The re-use of salvaged materials from the destruction should be avoided in order to avoid already fatigues materials increasing risk of future damage. Schemes such as the provision of concessional credit lines in combination with the private banks, that enforce improved design and construction standards, will assist in decreasing risk in the reconstruction of buildings.

In addition to the above standards, the following principles should also be considered as guidance:

- Develop community-driven approaches that are people-centered and participatory, and build the capacity of local communities and allow for feedback on the quality of the recovery and reconstruction efforts.
- Wherever possible, existing channels and programs should be utilized.
- Ensure that policy responses and programs respect the local Minangkabau and Kerinci matrilineal cultures and traditional *adat* customs, where the matrilineal inheritance of properties and/or titles is common place.
- Wherever possible, common standards and approaches should be adopted.

## 7.2 Overall Early and Longer-term Recovery and Reconstruction Approach

**Meeting the needs of those affected in an equitable, efficient and well-coordinated manner.** The Government has agreed an approach towards recovery, reconstruction and rehabilitation that aims to ensure that the immediate needs of those affected are met in an equitable, efficient, effective and well-coordinated manner. The approaches detailed below are once again based on the Government's experience in recent years in coordinating and facilitating responses to natural disasters. The Government therefore requests that all stakeholders involved, including national organizations and international partners, respect and abide by the following processes and requirements:

### Housing

(i) **Financing of the housing rehabilitation program.** The financing of housing rehabilitation program is expected to be fully borne by the central and provincial governments through a Housing Rehabilitation Assistance scheme. The scheme will provide three tiers of grants to households based on the level of damage to the house:

**Table 7. 1 Level of housing rehabilitation grants**

*Rupiah*

| Level of damage | Amount | Provided by |
|---|---|---|
| Destroyed / heavily damaged | 15,000,000 | Central government |
| Partially destroyed / medium damage | 10,000,000 | Central government |
| Lightly damaged | 1,000,000 | Provincial governments |

*Source*: BNPB

(ii) **Reconstruction will use a community driven approach.** Housing reconstruction will be implemented under a community-driven approach with technical supervision, standard building designs and training provided and financed by the Government. The number of houses eligible for assistance within each category of damage will be decided through a verification process by the Central Government.

### Public and social facilities

(iii) **Funds from the international community and private donations.** In addition to the financing from the central and provincial governments, any forthcoming funds from the international community will be directed towards the reconstruction and rehabilitation of public and social facilities including schools, health centers, and places of worship. Contributions from private sources will also be directed to these vital sectors.

### Infrastructure and environment

(iv) **Infrastructure and environment programs.** Infrastructure and environment programs (such as roads, energy, and irrigation) will also be funded directly by the central and provincial governments with support from the international community where it is available.

(v) **Government buildings.** Government buildings will be financed fully by the central and provincial governments.

## 7.2.1 Restoring Public Service and Fulfilling Basic Needs

**Many services are provided by the private sector through public-private partnerships, or with substantial community funding.** A significant number of basic public services, most importantly those at the village or *kelurahan* level and those accessed by the poor, are actually provided either via the private sector, through public-private partnerships, or with substantial community funding. In the education sector, public-private partnerships are the norm, with around 30 percent of pre-tertiary and 68 percent of *madrasah* privately managed, often catering to the lower income stratas of society. Facilities for the poor and vulnerable, such as orphanages, nursing homes, houses for people with disabilities or rehabilitation centers are also predominantly privately funded (94 percent) by foundations and initiatives. Religious facilities such as mosques, small prayer houses and places of worship of other religions are community or privately built and play an important community role beyond being places for praying. The health sector is the exception with predominantly public service provision and a low (10 percent) private sector provision.

**The structural weakness of many school buildings is well known.** In the education sector, the structural weakness of many school buildings constructed in the 1970s and 1980s in the country has been well known for some time; recent natural disasters have all shown significant damage in the sector, avoiding a much larger human toll only because they occurred outside school attendance hours. School rehabilitation funding has so far mostly addressed the appearance of schools rather than the more fundamental issue of addressing weak structures.

**All education facilities, damaged or not, will need to be propeorly assessed to ensure their safety.** Going forward, recovery, reconstruction and rehabilitation recommendations need to take into account both the urgent need to ensure that all education facilities, damaged or not, are properly assessed to ensure their safety, and likewise that all facilities, public or private, are given access to adequate funding for "building back better". A detailed technical assessment of all education facilities is thus the most immediate need, followed by a rehabilitation and reconstruction program based on MoNE's community-based school construction program and lessons learned from the PNPM Mandiri and other school reconstruction programs, while at the same time monitoring and enforcing strict adherence to seismic and other safety building standards.

**Funding mechanisms will need to take into account the current ownership structures and tap into external resources.** Funding mechanisms for facilities for the poor and vulnerable will likewise need to take into account the current ownership structure and be based on a combination of external/private resources and limited government support to revive both private and public facilities accordingly. Likewise, rebuilding and renovating religious facilities will need to tap into external resources (such as foundations and international assistance) to assist the local communities with rebuilding, since many of the affected communities will be overstretched in providing donations for prayer house reconstruction when their houses are damaged. In both cases, focusing first on minor renovations of facilities to revitalize learning activities for children – at orphanages and prayer houses – will ensure that children can resume their activities in a short period of time while reconstruction takes place over the next two years.

**The structural weaknesss of many community level health facilities is also well known.** Similar to the education sector, the structural weakness of many community level health facilities has also been well known for some time. Insufficient funding has prevented weak structural problems from being addressed. Reconstruction of health facilities at the community level (such as Polindes and Pos Kesehatan Desa) should follow a community-driven development approach with the communities in charge of reconstruction, while hospitals and health centers (Puskesmas) need to comply with strict enforcement of seismic and other building standards, as well as regulations on minimum requirements for health facilities regarding buildings, equipment, service provided and personnel.

### 7.2.2 Economic Activities and Livelihoods

**The productive sectors in West Sumatra were severely hit.** Agriculture, tourism, and the trade and industry sectors account for a large share of the GRDP and the majority of employment in the region. While the few large industries hare mostly intact, small and medium-sized traders in the regional trade centers of Kota Padang and Kab. Pariaman have been most severely affected, with market buildings closed and few of them owning asset insurance. Employment in the tourism sector will decrease in the short term as the majority of high quality hotels in the region are damaged, with spillover effects on restaurants, food stalls, and other tourism-related businesses. The earthquake's impact on agriculture appears to be more limited, with irrigation structures accounting for nearly 80 percent of the total damage in this sector, affecting farming communities at least temporarily. While the financial sector has been affected by substantial building damage, banking operations have remained normal and will play a key role in the recovery, reconstruction and rehabilitation process.

**Rapid recovery needs to be the focus in the productice sectors.** Emphasis in the productive sector needs to be on swift recovery, reconstruction and rehabilitation programs to restore livelihoods and assist affected communities in resuming economic activities quickly. Short-term livelihood impacts can turn into much longer term losses if support fails to be mobilized within the next few months. Labor-intensive programs, such as for example the clean-up and repair of public facilities, and the gradual replacement of stone masonry structures by reinforced concrete structures via community contracts with water-user associations, as well as immediate support to prevent further losses via the rescheduling of existing debt and new loans for working capital with appropriate targeting mechanisms, will help businesses affected by the disaster. A particular focus should be on restoring micor- and small-enterprise viability, as this sub-sector is the least able to cope unaided.

**The tourism sector can learn useful lessons from the experience of Yogyakarta in 2006.** With regard to the tourism sector, a targeted tax holiday to assist those with lightly to moderately damaged properties, coupled with a reduction in licensing fees for tourism-related businesses, worked well in Yogyakarta and should also be considered in West Sumatra. In addition, the financial sector, in particular government-owned banks, can support a speedy recovery by providing or mediating the provision of immediate fresh loans to restore economic activity, as well as indirect support through credit guarantee schemes or collateral replacement. In the medium term, strengthening the insurance sector to provide risk-mitigation and risk-transfer mechanisms for more enterprises needs to be addressed.

### 7.2.2 Infrastructure

**Rehabilitating and rebuilding houses will be central to West Sumatra's reconstruction efforts.** As in the aftermath of previous recent natural disasters in Indonesia, rehabilitating and rebuilding houses will be central to the West Sumatra reconstruction efforts. Housing destruction exposes a combination of poor housing design, poor construction, and specific seismic and geologic conditions, as well as poor city layout/hazard zoning. While some infrastructure sectors, namely transport, energy, telecommunication, suffered no major losses, housing destruction was substantial and comparable to that experienced in Yogyakarta in 2006, albeit with fewer casualties due to the timing of the earthquake and a lower housing density in the West Sumatra region.

**There is now an opportunity to reconstruct better quality housing.** Given that the region is particularly prone to earthquakes, there is now an opportunity to reconstruct housing better, through improved building standards and construction processes, improved building design, and the opportunity of instituting an integrated development planning process. Experience gathered from recent disasters in Indonesia shows that government leadership and coordination focused on better building structures – foundations, beams and columns, roofs – rather than funding complete houses, has contributed to improved redevelopment of communities. Building on the successful housing redevelopment programs in Yogyakarta, community-based approaches should be the priority, as they have proved to be cheaper and faster, and resulted in better quality and higher satisfaction levels amongst the affected communities. Emphasis needs to be on fast reconstruction, to move people quickly out of temporary shelters. Using existing national community-driven programs and mechanisms will ensure speed, transparency of funds, quality of houses, and ownership of beneficiaries.

**Damage in the energy and telecommunication sectors was largely temporary.** Damage in the energy and telecommunication sectors wewa mostly of a temporary nature, with no major bottlenecks or losses identified, given that the companies involved (PLN and public and private telecommunication operators) have already largely restored services. Damage to roads and bridges has been widespread. Medium to light damage can be funded as routine maintenance while unsafe road sections should be part of an emergency work program or come under a road re-alignment program towards safer routes as part of risk mitigation. Damage to water supply and sanitation has been more substantial than in these sectors but, since the sector is largely non-piped, a substantial amount of wells and toilets can probably be rehabilitated and cleaned through a labor-intensive approach.

## 7.3 Financial Needs[57]

**Full economic recovery should be achieved within 18 months**, including the early recovery of human needs as estimated by the Government assisted by the United Nations. Full reconstruction of destroyed assets may require an estimated period of 24 months.

**The total financial requirements for economic recovery, from early to medium term, are estimated at Rp 3,230 billion, while total reconstruction needs are Rp 19,674 billion** (US$343.6 million and US$2,092.9 million, respectively). This estimate includes the funds that the Government of Indonesia together with local governments will need to provide, as well as assistance that may be provided by donors, insurance payments and own contributions that the private sector and individuals will need to make to rebuild their businesses and lives. The government share of the financial requirements is estimated at Rp 7,086 billion (US$753.8 million). Government may want to seek assistance from donors or multilateral institutions in meeting the needs for public recovery and reconstruction funds.

[57] The financial needs to ensure economic recovery, in all affected sectors and at all levels, including the personal or household income level, and full reconstruction according to improved, disaster–resilient standards of all destroyed physical assets.

## Table 7. 2. Summary of Needs for Economic Recovery and Reconstruction

*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** |

*Source*: Estimates of the Joint Assessment Team.
*Note:* The data contained in this table do not include the financial needs of Jambi province.

**This needs estimate is based primarily on bringing the province back to where it was before the earthquake.** In most cases, improvements to facilities to make them more resilient to future earthquake according to seismic building standards have been introduced in the estimate of needs. New buildings for utilities have been included when necessary, as well as funds to repair the damage to infrastructure caused by the disaster. As such, the estimates reflect financing that will be required in addition to regular allocations for operation and maintenance, and it would often make more sense to incorporate the repairs to physical infrastructure in existing operation and maintenance plans by increasing allocations, rather than separate projects.

**The estimated needs for reconstruction to a large extent do not include an estimate of investments needed for the recovery of the private sector.** Restoration of the private sector and commercial activity does not necessarily fall under the responsibility of the Government. Many businesses had insurance (as reflected by the large contingent losses estimated for the insurance industry) against damage and losses from such a disaster and many will be able to recover using existing resources and financing from banks. The private sector has often shown incredible resilience in difficult circumstances and an ability to recover from natural disasters. In some circumstances, farmers, fishermen and entrepreneurs, may not be able to recover from the disaster without assistance. With stocks and machinery damaged, inputs lost and sales forgone and no access to credit, many small businesses may not be able to cope with the disaster, and the estimated needs foresee assistance in these circumstances. The Government can still play a role in assisting the private sector, even if not directly providing funds. It can facilitate negotiations with banks to enhance the availability of capital in these difficult circumstances, it can issue regulations that promote recovery and stimulate economic activity, and it can facilitate discussions with NGOs, donors and other institutions that may be interested in helping the private sector to recover from the disaster.

**Assistance to civil society and privately managed social institutions could be provided by NGOs**. As in the case of the private sector, the Government may not be able to provide assistance to institutions that provide social services but are privately managed, such as mosques, community groups and health and education facilities. In such cases, the Government could facilitate the recovery of these institutions through a positive regulatory environment, as well as coordination with national and international institutions that would be interested in assisting in this area.

**This assessment of reconstruction needs reflects the understanding of needs arising from the damage and loss assessments, as well as discussions with local authorities, communities and the private sector.** This assessment was conducted two weeks after the earthquake and is based on the best available information under relatively difficult circumstances. As more information becomes available regarding the extent of the damage and losses to infrastructure, social services, the productive sector or other cross-cutting sectors, these core minimum needs may need to be revised. This assessment of damage and losses, as well as the estimate of needs, should be the starting point for a plan to rebuild West Sumatra, to be developed over the next few months. This plan will define in greater detail the activities needed in each sector, necessary resources, as well as the source of funds to meet identified needs, which again may result in a revision of the estimated needs.

## 7.4 Coordination. Monitoring and Aid Tracking

**Comprehensive systems for monitoring activities, tracking funds and evaluating projects and programs will need to be implemented by all stakeholders** The Government has specified that comprehensive and straightforward systems for monitoring activities, tracking funds and evaluating projects and programs must be implemented by all stakeholders providing regular and transparent reporting. Independent complaint-handling mechanisms should be made available to beneficiaries to enable greater accountability.

**The National Disaster Management Agency will take the lead.** The Government has also required that the National Disaster Management Agency (BNPB) will take the lead in coordinating and facilitating the recovery, reconstruction and rehabilitation efforts, whilst implementation will be led by the provincial governments of West Sumatra and Jambi.

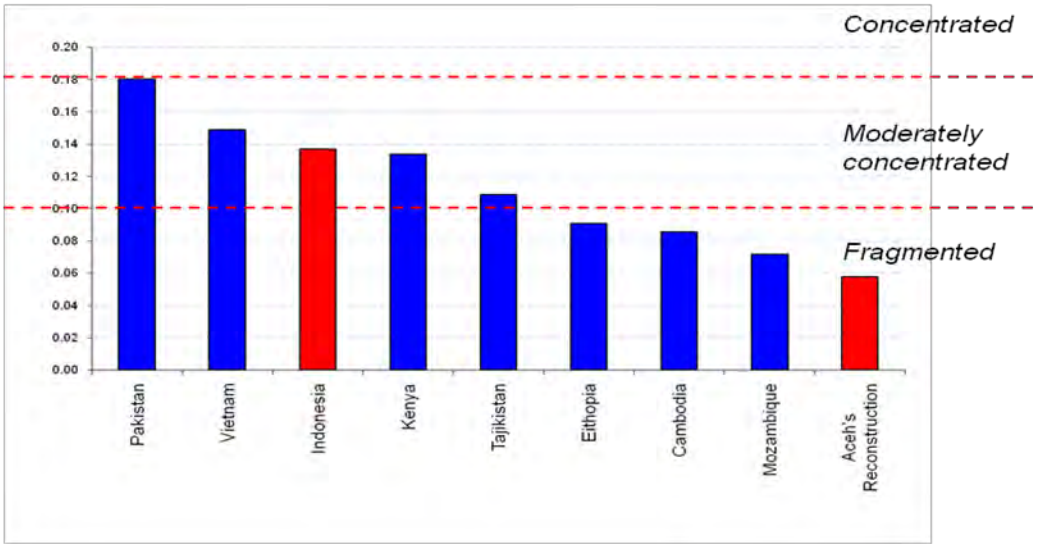
### Aid Tracking

**Aid-tracking efforts should be primarily targeted at ensuring the Government has the necessary information to be able to effectively manage the recovery, reconstruction and rehabilitation program.** This means that data collection and analysis efforts should focus on tracking movement of funds against actual needs on the ground. Commitments, allocations and disbursements should be tracked on a quarterly basis in order that the Government is able to manage funds and respond to gaps in the reconstruction and rehabilitation program or other needs as they develop. This type of fund tracking will require active data collection by the Government from all agencies involved in reconstruction rather than passive receipt of data. Past reconstruction experiences in Indonesia have shown that relying on agencies to input or submit their own data into a passive database results in overlap, inconsistency and poor quality data. Fund tracking will also be important for demonstrating transparency throughout the reconstruction and rehabilitation program and will also contribute to analysis of Indonesia's national disaster response management.

### Coordination

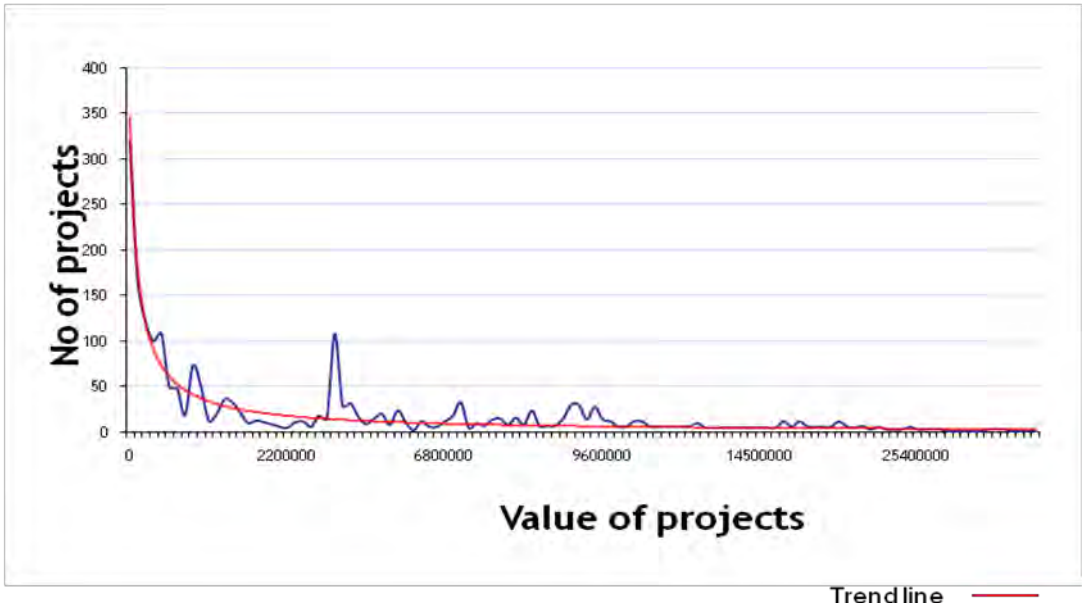
**Past reconstruction experiences in Indonesia have shown that funds are used most efficiently when they are consolidated.** Therefore, donors and NGOs should seek mechanisms to harmonize their funds are far as possible and direct these through the BNPB. This will not only insure that funds are used most effectively but will also take a considerable burden off the resources of the Government. Figure 7.1 shows the level of aid fragmentation in Aceh which, as can be seen in Figure 7.2, is a direct result of the very high number of small projects. Efforts should be made in West Sumatra and Jambi to ensure that this trend is avoided.

**Figure 7. 1 Comparison of Hirshman-Herfindhal indices: a common measure of how concentrated or fragmented aid is in recipient countries**




*Source:* Masyrafah & McKeon, 2008.

**Figure 7. 2 Number of projects against value of projects (US$)**




*Source:* Masyrafah & McKeon, 2008.

### Monitoring

In order to monitor the overall progress of the recovery, reconstruction and rehabilitation program an 'account management' systems has been found to be effective in past programs. In Aceh, for example, about 85 percent of the funds were implemented through 15 institutions. Therefore, a system was created whereby the progress of these 15 institutions was monitored and dedicated resources were allocated by the Government to support their implementation. In this way, 85 percent of the program was monitored and supported. In West Sumatra and Jambi a similar approach of identifying the top 15 institutions with the largest funds and providing support in project implementation should be considered.

# ANNEXES

# ANNEX: DATA AND METHODOLOGY

## Infrastructure

### HOUSING

**Assumption:**

1. The data used for this report based on local government information to BNPB.
2. Cost per m2 between Rp 600,000 – Rp 3,000,000 for various types of construction, applying Podes data on P/"permanent", SP/"semi-permanent" and N/"non-permanent" houses, for single and two floors or more
3. Average floor areas (between 70 – 100m2 in urban areas, 100-120m2 in rural areas).
4. Distribution of each type of P, SP, N, in urban areas: 58% single floor permanent houses, 15% 2/more floors permanent etc; in rural areas: 46% single floor permanent, 12% two floors / more permanent, etc.
5. Degree of damage: heavy damage or totally destroyed is counted as 100% loss, while medium damage 50% and light damage 10%.
6. It is assumed that Government will pay compensation of Rp15 million to the owners whose house was totally destroyed, Rp5 million for medium damage and Rp1 million for light damage.
7. Tertiary infrastructure is calculated at 6% of housing cost and other technical add-ons at 4% for all types of houses.
8. Local government owned houses are insignificant in number (less than 1%).

## Table A.1: Housing Damage and Loss Summary

| | Number of Housing (PODES 2008) | | | Housing Damage Assessment 26 October 2009 | | | | | | Losses (trillion Rp) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Permanent | Semi Permanent | Non Permanent | No. of House | RB | RS | RR | Total | % heavy damage | % total | House damage | T.Infra | Debris removal | Furniture | Tshelter | Total |
| Kota Padang | 109,183 | 25,855 | 15,383 | 150,421 | 33,597 | 35,816 | 37,615 | 107,028 | 22% | 71% | 4.98 | 0.25 | 0.00 | 0.30 | 0.08 | 5.63 |
| Kota Pariaman | 13,010 | 1,529 | 615 | 15,154 | 6,685 | 4,115 | 2,605 | 13,405 | 44% | 88% | 0.77 | 0.04 | 0.00 | 0.06 | 0.02 | 0.89 |
| Kota Bukittinggi | 11,141 | 5,829 | 3,324 | 20,294 | - | - | - | - | 0% | 0% | - | - | - | - | - | - |
| Kota Solok | 8,616 | 1,962 | 656 | 11,234 | 2 | 2 | 6 | 10 | 0% | 0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Kota Padang Panjang | 5,005 | 2,737 | 1,435 | 9,177 | 17 | 164 | 413 | 594 | 0% | 6% | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 |
| Kab. Tanah Datar | 44,803 | 24,850 | 13,064 | 82,717 | 28 | 115 | 105 | 248 | 0% | 0% | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 |
| Kab. Padang Pariaman | 53,187 | 28,857 | 9,025 | 91,069 | 57,931 | 16,291 | 12,945 | 87,167 | 64% | 96% | 6.22 | 0.31 | 0.00 | 0.49 | 0.14 | 7.17 |
| Kab. Kep. Mentawai | 1,668 | 3,180 | 11,343 | 16,191 | 145 | 243 | 357 | 745 | 1% | 5% | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 |
| Kab. Solok | 28,961 | 32,336 | 18,914 | 80,211 | 3 | - | 136 | 139 | 0% | 0% | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Kab. Pesisir Selatan | 55,161 | 24,142 | 23,600 | 102,903 | 1,156 | 3,596 | 5,510 | 10,262 | 1% | 10% | 0.23 | 0.01 | 0.00 | 0.01 | 0.00 | 0.25 |
| Kab. Agam | 54,529 | 27,084 | 16,294 | 97,907 | 11,796 | 3,797 | 4,353 | 19,946 | 12% | 20% | 1.29 | 0.06 | 0.00 | 0.10 | 0.03 | 1.48 |
| Kab. Pasaman | 25,122 | 22,469 | 6,334 | 53,925 | 197 | 13 | 931 | 1,141 | 0% | 2% | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 |
| Kab. Pasaman Barat | 32,234 | 25,532 | 17,814 | 75,580 | 3,240 | 3,046 | 2,862 | 9,148 | 4% | 12% | 0.41 | 0.02 | 0.00 | 0.03 | 0.01 | 0.46 |
| **Total** | **442,620** | **226,362** | **137,801** | **806,783** | **114,797** | **67,198** | **67,838** | **249,833** | **14%** | **31%** | **13.96** | **0.70** | **0.01** | **1.00** | **0.29** | **15.95** |

## WATER AND SANITATION

### Data

Information on water and sanitation was gathered from The Ministry of Public Works, local PDAMs, Posko Bencana Water Sector at the Governor's office, the Global WASH Cluster Rapid Response team, UNICEF, Asian Development Bank, The World Bank, other donor agencies and aid agencies supporting the emergency relief effort. Data verification was undertaken with field visit and spot checks, in particular on leakages and land subsidence. Limited information was available on un-piped sources, rural water supply (surface and ground water) and environmental sanitation (especially the impact on water quality). The assessment team conducted site visits to inspect rural and urban damages. The assessment for water and sanitation focused in the cities of Padang and Pariaman; and districts of Padang Pariaman, Pasaman Barat, Pesisir Selatan and Agam.

### Assumptions

**PDAM Damage:** Data on existing assets (production and distribution facilities, Water Treatment Plant, pipe network and connections) are complete based on PDAM information. This data was verified by cross-checking with the most recent diagnostic report (2008) and SWOT analysis undertaken by the World Bank's Water and Sanitation Program (WASAP-B).

**PDAM Losses**: The calculation of potential losses for PDAM is based on preliminary information gathered from the PDAM and site visit. Potential losses are caused by the broken pipe networks and connections, damaged Water Treatment Plant (WTP) at Gunung Pangilun, Damaged PDAM office building and the accelerator building, decrease in production capacity and the requirement for additional water truck operation. The potential loss is assumed for two months for additional water truck operation and three months for connection damage. The infrastructure damage, such as the WTP, and the office and accelerator buildings will be included in the needs assessment.

**Rural Water Supply**: Individual household water supply is assumed to be consisting of mostly shallow dug wells. SUSENAS 2007 data was used as a base line, extrapolating the data from the housing with dug wells, accounting for about 236,662 units. According to the housing damage in the surrounding 6 districts and the city, damaged dug wells estimate were 135,002 units. Total dug-wells that were damaged from the housing information were around 85%. The cost to build a new dug well with protection is estimated at Rp.3,000,000 cost to rehabilitate a dug-well is Rp.1,500,000 and cost for cleaning dug-wells is around 300,000. Unit costs are based on MPW standards, complemented by assumptions made by the assessment team.

**Sanitation:** The sanitation assessment only calculated losses for private toilets with septic tanks. Limited information available on water quality, drainage, wastewater damage and contamination of surface (rivers, springs and open sources) and ground water made it difficult to assess the damage and loss costs on the environmental health and ecology. From 2007 SUSENAS data, private houses with toilets with septic tanks were 201,144 units. Around 40% of these septic tanks were calculated as damaged or only around 60% from the total house that were damaged in the earthquake. The cost of building a new septic tank with environmentally friendly design, using Bio Filter Septic Tank costs Rp.4,000,000 per unit. This unit cost is calculated to estimate the total sanitation sector losses.

## Table A.2: Damages in (PDAM) Water Supply

| No | Description | Volume | Unit Price | Cost (Rp) |
|---|---|---|---|---|
| **1. PDAM Kota padang** | | | | |
| | Production facilities | 1 unit | 68,019,130,900 | 68,019,130,900 |
| | Pipe network | 2 unit | 21,630,743,482 | 21,630,743,482 |
| | Connection | 20,000 | 250,000 | 5,000,000,000 |
| | | | | **94,649,874,382** |
| **2. PDAM Padang Pariaman** | | | | |
| | Production facilities | 6 units | 872,000,000 | 872,000,000 |
| | Pipe network | 4,295 | 75,000 | 322,125,000 |
| | Connection | 5900 unit | 250,000 | 1,475,000,000 |
| | | | | **2,669,125,000** |
| **3. PDAM Kab. Agam** | | | | |
| | Production facilities | 4 units | 350,000,000 | 350,000,000 |
| | Pipe network | 37,900 | 16,935,000,000 | 16,935,000,000 |
| | Connection | 1,452 | 250,000 | 363,000,000 |
| | | | | **17,648,000,000** |
| **4. PDAM Pesisir Selatan** | | | | |
| | Production facilities | 3 units | 1,220,300,000 | 1,220,300,000 |
| | Pipe network | 8,682 | 3,873,855,000 | 3,873,855,000.0 |
| | Connection | 932 | 250,000 | 233,000,000.0 |
| | | | | **5,327,155,000** |
| **5.PDAM Pasaman Barat** | | | | |
| | Production facilities | 4 units | 800,000,000 | 800,000,000 |
| | Pipe network | 13,260 | 3,906,700,000 | 3,906,700,000 |
| | Connection | 1,500 | 250,000 | 375,000,000 |
| | | | | **5,081,700,000** |
| **Total Damages in PDAM Water Supply** | | | | **125,375,854,382** |

**Table A.3: Losses in PDAM Water Supply**

| No | Description | Volume | Unit Cost (Rp) | Total Cost ( Rp ) |
|---|---|---|---|---|
| 1. PDAM Padang City | | | | |
| | Lost revenue | 1356000 | 3,352 | 4,545,312,000 |
| | Additional operating cost | 63600 | 20,000 | 1,272,000,000 |
| | | | | **5,817,312,000** |
| 2. PDAM Padang Pariaman | | | | |
| | Lost revenue | 354000 | 2,500 | 885,000,000 |
| | Additional operating cost | 3600 | 20,000 | 72,000,000 |
| | | | | **957,000,000** |
| 3. PDAM Kab. Agam | | | | |
| | Lost revenue | 82764 | 1,431 | 118,435,284 |
| | Additional operating cost | 1440 | 20,000 | 28,800,000 |
| | | | | **147,235,284** |
| 4. PDAM Kab. Pesisir Selatan | | | | |
| | Lost revenue | 55920 | 1,200 | 67,104,000 |
| | Additional operating cost | 1440 | 20,000 | 28,800,000 |
| | | | | **95,904,000** |
| 5. PDAM Kab. Pasaman Barat | | | | |
| | Lost revenue | 90000 | 1,025 | 92,250,000 |
| | Additional operating cost | 960 | 20,000 | 19,200,000 |
| | | | | |
| | | | | **111,450,000** |
| **Total Loss** | | | | **7,128,901,284** |

*Source* : Calculation result

*Note* : Lost revenue is caused by loss connection x consumption per conn per month x during three months
Additional operating cost is caused by operating water
truck

## Table A.4: Damages in Private Water Supply in Rural and Urban Areas

| No | District / City | Cost for Reconstruction of Wells | | |
|---|---|---|---|---|
| | | New Construction Rp | Rehabilitation Rp | Cleaning Rp |
| **A** | **Rural Water Supply** | | | |
| 1 | Kab. Pesisir Selatan | 346,830,000 | 520,245,000 | 208,098,000 |
| 2 | Kab. Padang Pariaman | 15,252,900,000 | 22,879,350,000 | 9,151,740,000 |
| 3 | Kab. Agam | 3,538,800,000 | 5,308,200,000 | 2,123,280,000 |
| 4 | Kab. Pasaman Barat | 972,000,000 | 1,458,000,000 | 583,200,000 |
| | | **20,110,530,000** | **30,165,795,000** | **12,066,318,000** |
| **B** | **Urban Water Supply** | | | |
| 5 | Padang City | 10,079,100,000 | 15,118,650,000 | 6,047,460,000 |
| 6 | Pariaman City | 2,005,500,000 | 3,008,250,000 | 1,203,300,000 |
| | | **12,084,600,000** | **18,126,900,000** | **7,250,760,000** |
| | **Total Cost** | | | **99,804,903,000** |

*Note* : Unit price to build new dug well Rp. 3,000,000
Unit price to rehabilitate a dug well Rp. 1,500,000 (50% from new build)
Unit price to clean a dug well Rp. 300,000 (10% from dug well)

## Table A.5: Number of Wells Requiring New Construction, Rehabilitation and Cleaning

| No | District / City | No. of Houses Dug Wells (*) | No Of Houses Damaged (**) | No. of Dug Wells Damaged (***) | Reconstruction of Wells New 10% (****) | Rehablitation 30% (****) | Cleaning 60% (****) |
|---|---|---|---|---|---|---|---|
| 1 | Kab. Pesisir Selatan | 59,465 | 1,156 | 1,156 | 116 | 347 | 694 |
| 2 | Kab. Padang Pariaman | 50,843 | 57,931 | 50,843 | 5084 | 15253 | 30506 |
| 3 | Kab. Agam | 28,028 | 11,796 | 11,796 | 1180 | 3539 | 7078 |
| 4 | Kab. Pasaman Barat | 51,710 | 3,240 | 3,240 | 324 | 972 | 1944 |
| 5 | Padang City | 64,270 | 33,597 | 33,597 | 3360 | 10079 | 20158 |
| 6 | Pariaman City | 9,346 | 6,685 | 6,685 | 669 | 2006 | 4011 |
| | Total | 263,662 | 114,405 | 107,317 | 10,732 | 32,195 | 64,390 |

*Note* : (*) Susenas data 2007
(**) Data updated on October 14, 2009 at 08:00 PM from Satkorlak Penangulangan Bencana
(***) Data analysis compares between (*) with (**)
(****) Assumption

### Table A.6: Cost To Build New Septic Tank

| District / City | Private Toilet with Septic Tank ( * ) | No. of Houses Damaged ( ** ) | No. of Private Toilets Damaged ( *** ) | Cost To Build New Rp |
|---|---|---|---|---|
| Kab. Pesisir Selatan | 2,708 | 1,156 | 1,156 | 4,624,400,000 |
| Kab. Padang Pariaman | 18,585 | 57,931 | 18,585 | 74,340,000,000 |
| Kab. Agam | 42,889 | 11,796 | 11,796 | 47,184,000,000 |
| Kab. Pasaman Barat | 13,330 | 3,240 | 3,240 | 12,960,000,000 |
| Padang City | 116,794 | 33,597 | 33,597 | 134,388,000,000 |
| Pariaman City | 6,838 | 6,685 | 6,838 | 27,352,000,000 |
| **Total** | **201,144** | 114,405 | 75,212 | 300,848,400,000 |

*Note* : ( * ) Susenas Data 2007

( ** ) Data updated on October 14, 2009 at 08:00 pm from Satkorlak Penanggulangan Bencana.

( *** ) Analysis compares between ( * ) with ( ** )

Assumption using cost of a Bio Filter Septic Tank Rp. 4,000,000 which is environmentally conventional septic tanks.

## ENERGY

### Table A.7: Summary of Damages in Energy Sector

| No. | Unit | Damage (Rp million) Head Office (Kantor Wilayah) | Padang Branch | Bukittinggi Branch | Solok Branch | Payakumbuh Branch | Total Damage (Rp) |
|---|---|---|---|---|---|---|---|
| 1 | Generation [1] | - | - | - | - | - | **-** |
| 2 | Substation | - | 1,870 | - | - | - | **1,870** |
| 3 | Transmission [2] | - | - | - | - | - | **-** |
| 4 | Distribution [3] | - | 31,900 | 1,760 | - | 1,100 | **34,760** |
| 5 | Office Equipment and Related [4] | 5,830 | 3,658 | 149 | 44 | | **9,680** |
| | **Total (Rp)** | **5,830** | **37,428** | **1,909** | **44** | **1,100** | **46,310** |

[1] There were no PLN operated power generation plants or IPPs which were damaged.

[2] The transmission component covers only the 150 kV lines which did not suffer any damage.

[3] The distribution system covers distribution transformers, medium voltage lines (20 kV), low voltage lines (220 kV), and customer connections.

[4] This includes damage to PLN buildings, company equipment, and vehicles.

## TRANSPORTATION

### Table A.8: Estimated Costs for Roads and Bridges Damage

| No. | Road Status | Roads/ bridges | Volume/ length ( Km/m) | Unit | Estimated Costs ( Rp) | Total (Rp) |
|---|---|---|---|---|---|---|
| **I** | **National Roads** | | | | | |
| | | Roads | 4 | Km | 56,000,000,000 | |
| | | Bridges | 250 | no. | 4,000,000,000 | |
| | Total National | | | | | **60,000,000,000** |
| **II** | **Provincial Roads** | | | | | |
| | | Roads | 3 | Km | 4,695,369,520 | |
| | | Bridges | 230 | m | 224,059,250 | |
| | Total Provincial | | | | | **4,919,428,770** |
| **III** | **Kabupaten (district) Roads** | | | | | |
| | | Roads | 170 | Km | 166,645,750,000 | |
| | | Bridges | 4,500 | m | 43,974,900,000 | |
| | | Unspecified | | | 18,305,000,000 | |
| | Total Kabupaten | | | | | **228,925,650,000** |
| | | | | | | |
| | **Total Roads and Bridges** | Roads | 177 | km | 227,341,119,520 | |
| | | Bridges | 4,980 | m | 48,198,959,250 | |
| | | Unspecified | | | 18,305,000,000 | |
| | **GRAND TOTAL** | | | | 293,845,078,770 | **293,845,078,770** |

Assumptions:
[1] Costs assumed at Rp 2-3 billion per kilometer
[2] Costs assumed at Rp 20 million per metre
[3] Costs assumed at Rp 1-2 billion per kilometre
[4] Costs assumed at Rp 1million per metre
[5] Costs assumed at Rp 1 billion per kilometre
[6] Costs assumed at Rp 10 million per metre
All data was provided the national and provincial agencies and figures were finalized on 16 October 2009

**Assumption:**

The losses are estimated at $2,750 per day or $80,000 per month. Assuming that the severely damage roads will be repaired within 12 months, the total loss will be around $US 960,000 or Rp 9.0 billion (Rp 9400/USD).

**Table A.9: National Roads in West Sumatra**

| No | Link Name | Link No | Damage | | Type of damage | Location | Estimated Cost (Rp.) |
|---|---|---|---|---|---|---|---|
| **1** | **Pariaman - Manggopoh** | | | | | | |
| | Lb Alung - Kuraijati | `06.027 | 10 | m | shoulder cracking | Km. 48 + 575 | |
| | | | 155 | m | cracking, 4 locations | Km. 66 + 800 - 70+650 | |
| | | | 276 | m | cracking and subsidence, 8 locations | Km. 71+500 - 75+300 | |
| | | | 95 | m | cracking and subsidence, 5 locations | Km. 77+200 - 80+300 | |
| | | | 197 | m | cracking and subsidence, 9 locations | Km. 82+600 - 90+400 | |
| | Ruas Jalan Duku - Ketaping - Bts. Pariaman | P.075 | 35 | m | cracking and landslide, 3 locations | Km. 93+400 - 98+980 | |
| | | | **768** | m | | | **2,000,000,000** |
| **2** | **Manggohpoh - Padang Sawah - Simpan Empat** | | | | | | |
| | Ruas Jalan Tanjung Ampul - Tanah Badantung | `06.047.1 | 15 | m | cracking | Km. 111+400 | 45,000,000 |
| | Ruas Jalan Junction - Abai Siat | | 175 | m | cracking and subsidence, 8 locations | Km. 125+000 - 128+900 | 525,000,000 |
| | Ruas Jalan Simancung - Tanjung Ampalu | | 175 | m | cracking and subsidence, 8 locations | Km. 132+800 -133+800 | 525,000,000 |
| | Special treatment area | | | | special treatment for landslide | Km 124 & km 128 | 2,905,000,000 |
| | | | **365** | m | | | **4,000,000,000** |
| **3** | **Sicincin - Padang Panjang** | | | | | | |
| | | `06.003 | 50 | m | landslide from cutting | Km. 65+250 | |
| | | | 100 | m | landslide from cutting | Km. 65+250 | |
| | | | **150** | m | | | **500,000,000** |
| **4** | **Simpang** | | | | | | |

| No | Link Name | Link No | Damage | | Type of damage | Location | Estimated Cost |
|---|---|---|---|---|---|---|---|
| | **Haru - Lubuk Selasih (Bts Kota Padang)** | | | | | | |
| | | `06.022.12K | 18 | m | road failure / collapse | Km. 5+500 | 54,000,000 |
| | | | 221 | m | | Km. 12+200 - 16+500 | 663,000,000 |
| | | | 232 | m | landslides, 6 locations | Km. 16+950 - 17+950 | 696,000,000 |
| | | | 130 | m | landslide | Km. 18+000 | 390,000,000 |
| | | | 60 | m | landslide, 2 locations | Km. 22+350 - 22+400 | 180,000,000 |
| | | | 140 | m | landslide, 5 locations | Km. 23+400 - 24+200 | 420,000,000 |
| | Bukit Putus - Bts Kota Padang | `06.022.12K | 480 | m | landslide and cracking, 11 locations | Km. 114+450 - 125+350 | 1,440,000,000 |
| | | | 304 | m | landslide and rock fall, 9 locations | Km. 114+450 - 125+350 | 912,000,000 |
| | special treatment areas | | | | special treatment for landslide | | 38,245,000,000 |
| | | | **1,585** | m | | | **43,000,000,000** |
| **5** | **Batas Kota Padang - Painan** | | | | | | |
| | Ruas Jalan Bts kota Padang - Bts kota Painan | `06.016 | 30 | m | road failure, subsidence | Km. 30+200 | 90,000,000 |
| | | | 45 | m | landslide | Km. 34+800 - 35+100 | 135,000,000 |
| | | | 100 | m | landslide | Km. 44+200 | 300,000,000 |
| | | | 100 | m | road failure, subsidence | Km. 70+400 | 300,000,000 |
| | Special treatment area | | | | special treatment for landslide | km 24 | 4,265,000,000 |
| | | | **275** | m | | | **5,000,000,000** |
| **6** | **Painan - Batas Bengkulu** | | | | | | |
| | Ruas Jalan Painan - Kambang - Indrapura | `017.1 | 155 | m | road failure, subsidence, 3 locations | Km. 80+200 - 83+250 | 2,000,000,000 |
| | | ,017.2 | 140 | m | road failure, subsidence, 5 locations | Km. 123+600 - 135+100 | |
| | | | 205 | m | road failure, subsidence, 3 locations | Km. 151 + 600 - 157+000 | |
| | | | **500** | m | | | **1,500,000,000** |
| | **TOTAL** | | **3,643** | m | | | **56,000,000,000** |

## Table A.10: National Bridges in West Sumatera

| No | Bridge name and link location | Link No | Damage | | Type of damage | Location | Estimated Cost Rp |
|---|---|---|---|---|---|---|---|
| | **Bridges** | | | | | | |
| 1 | Sei Lingkar (Sitangkai - Tanjung Ampalu) | P.004 | | | Oprit Jembatan Amblas | Km. 143+750 | 4,000,000,000 |
| 2 | Sei Pacek (Pangkalan - Sialang) | P.076 | | | Oprit Jembatan Amblas | Km. 190+450 | |
| 3 | Kacik (Lubuk Basung - Sei Limau) | P.072 | | | Loneng Terban & Oprit Jbt Amblas | Km. 127+700 | |
| 4 | Air Terjun (Lubuk Basung - Sei Limau) | P.072 | | | Loneng Terban & Oprit Jbt Amblas | Km. 143+100 | |
| 5 | Anak Air (Lubuk Basung - Sei Limau) | P.072 | | | Oprit Jembatan Amblas | Km. 137+050 | |
| 6 | Talao (Ruas jalan Duku - Ketaping - Bts. Pariaman) | P.075 | | | Oprit Jembatan Amblas | Km. 35+850 | |
| 7 | Manggopoh (Jalan Duku - Ketaping - Bts. Pariaman) | | | | Oprit Jembatan Amblas | Km. 40+000 | |
| 8 | Muaro Tantangan I | P.068 | | | Oprit Jembatan Amblas | Km. 134+550 | |
| 9 | Muaro Tantangan I | P.068 | | | Oprit Jembatan Amblas | Km. 157+900 | |
| | **TOTAL** | | | | | | **4,000,000,000** |

## Table A.11: Kabupaten (district) Roads in West Sumatra

| Status | | Roads/ Bridges | Volume | Unit | Estimated Cost (Rp) | Total Cost (Rp) |
|---|---|---|---|---|---|---|
| **District Roads - Rural** | | | | | | |
| | Kabupaten Agam | Roads | 38.70 | Km | 21,000,000,000 | |
| | | Bridges | 7.00 | m | 910,000,000 | |
| | | Culverts | 48.00 | m | 1,800,000,000 | |
| | | Retaining Walls | 33.00 | m | 604,000,000 | |
| | **Total Kab. Agam** | | | | | **24,314,000,000** |
| | Kabupaten Solok | Roads | Volumes Not Given | | 8,305,000,000 | |
| | | Bridges | - | | - | |
| | **Total Kab. Solok** | | | | | **8,305,000,000** |
| | Kabupaten Pesisir Selatan | Roads | 22.85 | km | 32,421,750,000 | |
| | | Bridges | 188.00 | m | 5,449,900,000 | |
| | **Total Kab. Pessel** | | | | | **37,871,650,000** |

| Status | | Roads/ Bridges | Volume | Unit | Estimated Cost (Rp) | Total Cost (Rp) |
|---|---|---|---|---|---|---|
| | Kabupaten Pariaman | Roads | 71.70 | km | 40,742,250,000 | |
| | | Bridges | 618.00 | m | 9,550,000,000 | |
| | **Total Kab. Pariaman** | | | | | **50,292,250,000** |
| | Kabupaten Mentawai | Roads | Volumes Not Given | | 10,000,000,000 | |
| | | Bridges | - | | - | |
| | **Total Kab. Mentawai** | | | | | **10,000,000,000** |
| **District Roads - Town/City** | | | | | | |
| | Jalan Kota Padang | Roads | 33.75 | km | 70,550,000,000 | |
| | | Bridges | 2,265.00 | m | 22,380,000,000 | |
| | **Total Kota Padang** | | | | | **92,930,000,000** |
| | Jalan Kota Pariaman | Roads | 3.73 | km | 1,931,750,000 | |
| | | Bridges | 381.00 | m | 3,281,000,000 | |
| | **Total Kota Pariaman** | | | | | **5,212,750,000** |
| | **TOTAL** | **Roads** | 170.73 | km | 166,645,750,000 | |
| | | **Bridges** | 3,459.00 | m | 41,570,900,000 | |
| | | **Culverts** | 48.00 | m | 1,800,000,000 | |
| | | **Retaining Walls** | 33.00 | m | 604,000,000 | |
| | | **Unspecified** | | | 18,305,000,000 | |
| | **Grand Total** | | | | 228,925,650,000 | **228,925,650,000** |

## Social Sector

### EDUCATION

**Assumption:**

*** Damage Estimate**

- Unit cost for heavy damaged classroom in TK, PAUD, SD,MI, RA, TPA =Rp. 80 Million
- Unit cost for heavy damaged classroom in SLB,SMP,MTS,SMA,SMK,MA, Pesantren =Rp. 85 Million
- Medium damaged classroom = 60% of unit cost for heavy damaged class room
- Light damaged classroom = 30% of unit cost for heavy damaged class room
- Unit cost include furniture, teaching aid, and basic equipment
- Unit cost are based on MONE figure in school construction in DAK using community participation approach
- Assumption on damage estimate are based on data provided by Dinas Kaputen Provinsi, Dinas Pendidikan Kabupaten , Dinas Pendidikan Nasional , Departemen Agama Provinsi, and they all agreed to these estimates
- Information on damaged computers and laboratories are not available

**** Estimate for Reconstruction**

- Unit cost for reconstructing a heavy damaged classroom in TK, PAUD, RA, TPA =Rp. 80 Million
- Unit cost for reconstructing a heavy damaged classroom in SLB, SD,MI =Rp. 140 Million
- Unit cost for reconstructing a heavy damaged classroom in SMP, MTS, Pesantren =Rp. 180 Million
- Unit cost for reconstructing a heavy damaged classroom in SMA,MA,SMK =Rp. 225 Million
- Medium damaged classroom = 60% of unit cost for heavy damaged class room
- Light damaged classroom = 30% of unit cost for heavy damaged class room
- Unit cost for reconstructing a heavy damaged classroom in TK, PAUD, RA, TPA =Rp. 80 Million
- Unit cost for reconstructing a heavy damaged classroom in SLB, SD,MI =Rp. 140 Million

- Class size of TK, PAUD, RA, TPA =34 m2
- Class size SLB, SD,MI =56 m2
- Class size of SMP, MTS, Pesantren =72 m2
- Class size SMA,MA,SMK =90 m2
- Debris removal cost is estimated at Rp.5000 per $m^2$

- Unit cost for furniture ,teaching materials and books in a heavy damaged classroom in TK, PAUD, RA, TPA =Rp. 5 Million
- Unit cost for furniture ,teaching materials and books in a heavy damaged classroom in SD,MI =Rp. 12.5 Million
- Unit cost for furniture ,teaching materials and books in a a heavy damaged classroom in SMP, MTS, Pesantren =Rp. 14 Million
- Unit cost for furniture ,teaching materials and books in a a heavy damaged classroom in SMA,MA =Rp. 18 Million

- Unit cost for furniture ,teaching materials and books in a  a heavy damaged classroom in SMK =Rp. 20 Million
- medium damaged class material = 60% of unit cost for heavy damaged class material
- Light damaged class  material = 30% of unit cost for heavy damaged class material

- The reconstruction will be carried out over 2 years, 50% in each year
- The scarcity index is set at 10%
- Inflation is  estimated at 5.5% yearly

## Table A.12a: Damage in Education Sector by School Type and Level

| Source | School Level | Total School in Damaged Region | School Damaged | | | Percentage School Damaged | Total Student in Damaged Area | Student in Damaged School | Percentage Student Affected by the Damage | Class Damaged | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Public | Private | Total | | | | | Heavy | Medium | Light | Total |
| Disdik Sumbar | SLB | NA | 3 | 20 | 23 | NA | NA | 1,040 | NA | 21 | 5 | 7 | 33 |
| Disdik Sumbar | PAUD | NA | - | 20 | 20 | NA | NA | 146 | NA | 52 | 27 | 111 | 190 |
| Disdik Sumbar | TK | 1,314 | - | 28 | 28 | 0 | 45,090 | 1,659 | 0 | 29 | 24 | 9 | 61 |
| Disdik Sumbar | SD | 3,071 | 672 | 10 | 682 | 0 | 523,544 | 110,677 | 0 | 2,004 | 639 | 599 | 3,233 |
| Disdik Sumbar | SMP | 418 | 149 | 5 | 154 | 0 | 149,589 | 70,568 | 0 | 578 | 291 | 368 | 1,029 |
| Disdik Sumbar | SMA | 202 | 54 | 6 | 60 | 0 | 91,857 | 35,278 | 0 | 309 | 186 | 183 | 463 |
| Disdik Sumbar | SMK | 139 | 28 | 18 | 46 | 0 | 38,178 | 17,832 | 0 | 202 | 120 | 126 | 350 |
| Depag Sumbar | RA | NA | - | 28 | 28 | NA | NA | NA | NA | 10 | 17 | 8 | 35 |
| Depag Sumbar | MI | 84 | 21 | 15 | 36 | 0 | 10,833 | NA | NA | 45 | 83 | 39 | 167 |
| Depag Sumbar | MTS | 290 | 41 | 39 | 80 | 0 | 45,821 | NA | NA | 116 | 104 | 94 | 314 |
| Depag Sumbar | MA | 116 | 15 | 16 | 31 | 0 | 16,287 | NA | NA | 42 | 48 | 28 | 118 |
| Depag Sumbar | Pondok Pesantren | NA | NA | 102 | 102 | NA | NA | NA | NA | 1,278 | 486 | 72 | 1,836 |
| Depag Sumbar | TPA | NA | NA | 1,222 | 1,222 | NA | NA | NA | NA | 431 | 449 | 342 | 1,222 |
| **MONE** | | 5,144 | 906 | 107 | 1,013 | | 848,258 | 237,200 | | 3,195 | 1,292 | 1,403 | 5,359 |
| **MORA** | | 490 | 77 | 1,422 | 1,499 | | 72,941 | | | 1,922 | 1,187 | 583 | 3,692 |
| **TOTAL** | | **5,634** | **983** | **1,529** | **2,512** | **0** | **921,199** | **237,200** | **0** | **5,117** | **2,479** | **1,986** | **9,051** |

Table A.12b: (Continued)

| Source | School Level | Damage (in Rp million) | | | Loss (in Rp million) | | | Reconstruction (in Rp million) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Public | Private | Total | Public | Private | Total | Public | Private | Total |
| Disdik Sumbar | SLB | 272 | 1,947 | 2,219 | 63 | 418 | 480 | 737 | 5,272 | 6,008 |
| Disdik Sumbar | PAUD | - | 8,120 | 8,120 | - | 418 | 418 | - | 10,252 | 10,252 |
| Disdik Sumbar | TK | - | 3,688 | 3,688 | - | 585 | 585 | - | 4,651 | 4,651 |
| Disdik Sumbar | SD | 214,198 | 3,110 | 217,309 | 14,035 | 209 | 14,244 | 434,564 | 6,310 | 440,874 |
| Disdik Sumbar | SMP | 60,134 | 1,280 | 61,415 | 3,112 | 104 | 3,216 | 162,730 | 3,464 | 166,193 |
| Disdik Sumbar | SMA | 34,923 | 5,494 | 40,417 | 1,128 | 125 | 1,253 | 113,196 | 17,808 | 131,004 |
| Disdik Sumbar | SMK | 14,496 | 12,007 | 26,503 | 585 | 376 | 961 | 47,838 | 39,623 | 87,460 |
| Depag Sumbar | RA | - | 1,808 | 1,808 | - | 585 | 585 | - | 2,281 | 2,281 |
| Depag Sumbar | MI | 4,608 | 3,912 | 8,520 | 439 | 313 | 752 | 9,283 | 7,881 | 17,165 |
| Depag Sumbar | MTS | 10,557 | 7,004 | 17,561 | 856 | 815 | 1,671 | 28,606 | 18,978 | 47,584 |
| Depag Sumbar | MA | 4,386 | 2,346 | 6,732 | 313 | 334 | 647 | 14,885 | 7,962 | 22,847 |
| Depag Sumbar | Pondok Pesantren | - | 135,252 | 135,252 | - | 104 | 104 | - | 258,861 | 258,861 |
| Depag Sumbar | TPA | - | 64,240 | 64,240 | - | 84 | 84 | - | 78,199 | 78,199 |
| | **MONE** | 324,024 | 35,646 | 359,670 | 18,922 | 2,235 | 21,157 | 759,064 | 87,380 | 846,444 |
| | **MORA** | 19,551 | 214,562 | 234,113 | 1,608 | 2,235 | 3,843 | 52,774 | 374,163 | 426,937 |
| | **TOTAL** | **343,575** | **250,208** | **593,783** | **20,530** | **4,470** | **25,000** | **811,839** | **461,542** | **1,273,381** |

### Description of School Level:

| | | |
|---|---|---|
| SLB | School for the disabled | Dinas Pendididkan |
| PAUD | Early Childhood Education | Dinas Pendididkan |
| TK | Kindergarten | Dinas Pendididkan |
| SD | Primary School | Dinas Pendididkan |
| SMP | Junior Secondary | Dinas Pendididkan |
| SMA | General Senior Secondary | Dinas Pendididkan |
| SMK | Vocational Senior Secondary | Dinas Pendididkan |
| RA | Kindergarten | Departemen Agama |
| MI | Primary School | Departemen Agama |
| MTS | Junior Secondary | Departemen Agama |
| MA | General Senior Secondary | Departemen Agama |
| TPA | Informal Islamic Early Childhood Education | Departeman Agama |
| MDA | Informal Islamic Primary School | Departemen Agama |

### Table A.13: Damage in Education Sector by Districts (in Rp million)

| District Name | Damage | | | Loss | Damage & Losses | | | Reconstruction |
|---|---|---|---|---|---|---|---|---|
| | Building | Furniture & Equipment | Total | | Total | Public | Private | |
| Kab. Padang Pariaman | 240,035 | 20,204 | 260,239 | 11,597 | 271,836 | 265,720 | 21,323 | 551,594 |
| Kota Padang | 152,186 | 23,480 | 175,666 | 6,438 | 182,104 | 98,665 | 60,673 | 388,076 |
| Kab. Agam | 49,224 | 7,290 | 56,514 | 2,507 | 59,021 | 55,148 | 6,893 | 119,729 |
| Kota Pariaman | 34,098 | 4,449 | 38,547 | 1,714 | 40,260 | 38,751 | 3,671 | 81,684 |
| Kab. Pesisir Selatan | 13,335 | 2,152 | 15,488 | 693 | 16,180 | 14,846 | 2,298 | 32,692 |
| Kota Padang Panjang | 14,336 | 918 | 15,254 | 677 | 15,931 | 8,373 | 8,373 | 32,317 |
| Kab. Pasaman Barat | 9,189 | 1,500 | 10,689 | 474 | 11,163 | 9,339 | 2,395 | 22,644 |
| Kab. Mentawai | 6,517 | 1,300 | 7,817 | 347 | 8,163 | 6,631 | 1,950 | 16,560 |
| Kab. Tanah Datar | 6,630 | 976 | 7,606 | 337 | 7,943 | 7,665 | 684 | 16,114 |
| Kab. Solok | 2,020 | 333 | 2,354 | 117 | 2,470 | 2,813 | 78 | 4,767 |
| Kota Bukit Tinggi | 637 | 126 | 763 | 34 | 797 | 586 | 251 | 1,616 |
| Kab. Solok Selatan | 428 | 93 | 521 | 23 | 544 | 381 | 190 | 1,103 |
| Kab. Pasaman | 1,600 | 295 | 1,895 | 18 | 1,913 | 441 | - | 3,686 |
| Kota Sawahlunto | 280 | 60 | 340 | 15 | 355 | 373 | - | 720 |
| Kota Solok | 79 | 14 | 93 | 11 | 104 | 225 | 45 | 79 |
| **TOTAL** | 530,593 | 63,190 | 593,783 | 25,000 | 618,783 | 509,957 | 108,826 | 1,273,381 |

## HEALTH

### Methodology:

Methodology Sources for the baseline data were collected from the Province reports and proposals submitted to the Bank during the implementation of a World Bank funded project, Health Workforce and Services (HWS) Project. The most updated data on the Province health facilities and personnel used as the baseline for the assessment was from the HWS Project Final Evaluation Report dated April 2009.

Post disaster data for both public and private health facilities, primary and secondary level of care was collected by the assessment team, in collaboration with the Provincial Health Office and Public Health Division School of Medicine Andalas University. The field data collection was conducted from October 12 to 17, and seems that Bappeda-led team had been established to collect data on damages; the health team only collected private facilities data in the two hardest hit cities, Padang and Pariaman. The health team also validated data collected by Bappeda-led team by cross checking with the Provincial Health Office.

The data collected was on government-owned health facilities including its network such as Health Center network consist of auxiliary health centers, mobile health centers, and Polindes (maternity post). Posyandu (Integrated Health Posts) usually does not have physical structure so they are included in the loss estimates. Health staff quarters, health schools and training facilities are not included in the estimates and will be covered by other sectors.

Data collection on private health facilities only includes: general and specialty (eye, mental, maternal) hospitals. It excludes private practices and other supporting facilities such as pharmacies, and clinical laboratory.

### Assumptions:

Unit costs for damages were estimated using information from the Department of Public Works, Ministry of Health, and also market price for medical equipment. The assumptions underlying the various estimates are listed below:

- Assume all temporary health clinics operating are granted by donors.
- Assume all primary health centers, auxiliary health centers, and Polindes has similar room size in square meters (standardized).
- Pharmacies, private practices, and also clinic laboratory damage reports not available.
- The damage costs for private practices, based on average costs for doctor, nurse, and midwife practices, are not yet calculated.
- The damage costs for drug warehouses and mobile health clinics are not reported.
- The damage costs to drugs and supplies in all of the health facilities/pharmacy units are not reported.
- The public health program costs used are for the 'High Impact Scenarios' and adjusted from October 1999 to October 2009 using BPS deflators.
- Health Staff Quarters and health schools/training facilities are not included.

- UPTD for Health such as Lung Clinic (BP4), Eye Clinic (BKMM), and District Health Laboratory (Balai Labkes) are not included.
- Public health campaigns and trauma mitigation have not been calculated.

For Loss on Health Program
Losses were estimated as costs of programs and activities of those which would have normally been incurred had there been no earthquake. The programs included are basic public health programs[58].

**For Loss on Health Treatment**

- The numbers for the severely injured who needed hospitalization and underwent surgery and the ambulatory care patient are from the data released by the Crisis Center Ministry of Health Indonesia dated October 26th, 2009
- The unit costs for the skeletal injuries are using the average tariffs of orthopedic cases from the Diagnostic Related Groups Tariffs for B Type Hospital, MOH publication, October 2007, while for other injuries using average tariffs for various type of injuries from the same source.
- Rehabilitation costs and length is estimated based on the usual, customary and reasonable experience
- Length of inpatient is based on hospital claims reports from Jamsostek and Jamkesmas program

**For Loss of Revenue**

- Unit costs used for public sector are based on actual local government user fee regulated by local regulation
- Unit costs for private sector are based on claims reports from Jamsostek and Jamkesmas program

[58] Based on 'Health Strategy in a Post-Crisis: Decentralizing Indonesia' S.Lieberman and P. Marzoeki, World Bank 2000 the health programs are Expanded Program on Immunization (EPI), Lung TB, Vector Control, Diarrhea, Acute Respiratory Infection (ARI), Maternal and Child Health (MCH), Nutrition, and Water &Sanitation.

## Table A.14: Damage and Loss in Health Sector

*(in Rp million)*

| | BUILDINGS | | | | | | MEDICAL EQUIPMENT | |
|---|---|---|---|---|---|---|---|---|
| | MAJOR | | MOD | | MIN0R | | | |
| | Public | Private | Public | Private | Public | Private | Public | Private |
| **Damage Estimate** | | | | | | | | |
| Public Hospital | 208,910 | 57,088 | 31,067 | 30,280 | 3,329 | 59,880 | 7,220 | 6,716 |
| Public Health Center | 21,549 | | 14,703 | | 7,256 | | 11,278 | |
| Private Clinics | | 7,798 | | 4,679 | | 5,019 | | 11,147 |
| Auxilliary Health Center | 15,896 | | 5,113 | | 3,544 | | 28,829 | |
| Polindes | 11,170 | | 1,203 | | 387 | | 15,023 | |
| | | | | | | | | |
| Damage | 257,525 | 64,886 | 52,086 | 34,958 | 14,516 | 64,899 | 62,350 | 17,863.49 |
| Loss | | | | | | | | |
| Rubble Clearing/Removal | | | | | | | 1,952.88 | 842.22 |
| Public Health Programs (18 months)* | | | | | | | | 39,591.83 |
| **Total** | | | | | | | | **611,469.46** |

*Public Health Program only conducted/delivered by Public Sector, assuming that reconstruction of health facilities will take 18 months

## Table A.15: Estimate Loss: Health Treatment due to the Earthquake (Emergency and Service during Emergency Period)

| Total Inpatient | Volume | Length of Time | Unit Costs | Total Costs |
|---|---|---|---|---|
| Surgery (other than Orthopedics Surgery)# | 442 | | 2,107,617 | 931,566,714 |
| Skeletal Surgery (Orthopedics Surgery) | 123 | | 5,977,037 | 735,175,551 |
| Hospitalization of the injured+ | 1,214 | 7 | 80,800 | 686,638,400 |
| Hospitalization of those who had surgery+ | 565 | 14 | 80,800 | 639,128,000 |
| Ambulatory clinic patients* | 32,715 | | 81,500 | 2,666,272,500 |
| Rehabilitation for those who underwent Orthopedics surgery** | 123 | 3 | 5,000,000 | 1,845,000,000 |
| Total | | | | **7,503,781,165** |

*#) including trauma surgery*
*+) inpatient days*
**) Including temporary clinics; includes all visits regardless of the reasons for the visit - including acute respiratory infection, diarrhea,*
*all kind of ambulatory care diseases, maternal visits, and all family planning services*
***) in months*

### Table A.16: Estimates on Loss of Revenue (18 months) (Rupiah)

| | Public | Private | Total |
|---|---|---|---|
| Primary Care | 18,270,780,000 | 14,775,172,500 | 33,045,952,500 |
| Hospital | - | - | - |
| - Outpatient | 3,982,500,000 | 30,146,850,000 | 34,129,350,000 |
| - Inpatent | 17,491,489,848 | 40,619,262,231 | 58,110,752,079 |
| Total | 39,744,769,848 | 85,541,284,731 | **125,286,054,579** |

## RELIGIOUS

### Table A.17: Number of religious buildings pre-disaster in West Sumatera

| | Islam | | Protestant | | Catholic | | Buddhist |
|---|---|---|---|---|---|---|---|
| | Mosque | Langgar/surau/private | Church | Rumah Kebaktian | Church | Rumah Kebaktian | Vihara |
| Kepulauan Mentawai | 44 | - | 24 | 0 | 4 | 0 | - |
| Pesisir Selatan | 472 | 694 | 0 | 0 | 0 | 0 | - |
| Solok | 301 | 1,180 | 0 | 0 | 0 | 0 | - |
| Sawahlunto/Sijunjung | 174 | 681 | - | - | - | - | - |
| Tanah Datar | 358 | 1,146 | 0 | 0 | 0 | 0 | - |
| Padang Pariaman | 317 | 2,541 | 0 | 1 | 1 | 0 | - |
| Agam | 507 | 1,222 | 0 | 0 | 0 | 0 | - |
| Limapuluh Kota | 401 | 919 | - | - | - | - | - |
| Pasaman | 283 | 595 | 3 | 0 | 3 | 0 | - |
| Solok Selatan | 155 | 254 | - | - | - | - | - |
| Dharmasraya | 165 | 293 | - | - | - | - | - |
| Pasaman Barat | 399 | 588 | 0 | 0 | 0 | 0 | - |
| Kota Padang | 508 | 780 | 8 | 0 | 3 | 0 | 3 |
| Kota Solok | 44 | 115 | 0 | 0 | 0 | 0 | - |
| Kota Sawahlunto | 45 | 232 | 1 | - | 1 | - | - |
| Kota Padang Panjang | 34 | 80 | 0 | 0 | 1 | 0 | 1 |
| Kota Bukittinggi | 38 | 132 | 2 | 0 | 1 | 0 | 1 |
| Kota Payakumbuh | 77 | 529 | 1 | - | 1 | - | 1 |
| Kota Pariaman | 59 | 208 | 0 | 0 | 0 | 0 | - |
| **Total** | **4,381** | **12,189** | **39** | **1** | **15** | **0** | **6** |

## Table A.18: Percentage of population by religion

| | Moslem | Protestant | Catholic | Hindu | Buddhist | Other | Total |
|---|---|---|---|---|---|---|---|
| Kepulauan Mentawai | 20.92 | 53.32 | 24.90 | 0.02 | 0.00 | 0.84 | 100 |
| Pesisir Selatan | 99.91 | 0.02 | 0.06 | 0.00 | 0.00 | 0.00 | 100 |
| Solok | 99.74 | 0.17 | 0.08 | 0.01 | 0.00 | 0.00 | 100 |
| Sawahlunto/Sijunjung | 99.66 | 0.11 | 0.21 | 0.01 | 0.01 | 0.00 | 100 |
| Tanah Datar | 99.85 | 0.09 | 0.05 | 0.01 | 0.01 | - | 100 |
| Padang Pariaman | 99.69 | 0.16 | 0.15 | 0.00 | - | - | 100 |
| Agam | 99.64 | 0.30 | 0.05 | 0.00 | 0.00 | 0.00 | 100 |
| Limapuluh Kota | 99.80 | 0.14 | 0.06 | 0.00 | 0.00 | - | 100 |
| Pasaman | 99.26 | 0.26 | 0.47 | 0.00 | 0.00 | 0.00 | 100 |
| Solok Selatan | 99.08 | 0.00 | 0.91 | 0.00 | 0.00 | 0.00 | 100 |
| Dharmasraya | 98.56 | 0.00 | 1.43 | 0.00 | 0.01 | 0.00 | 100 |
| Pasaman Barat | 99.40 | 0.00 | 0.60 | 0.00 | 0.00 | 0.00 | 100 |
| Kota Padang | 95.17 | 2.08 | 1.90 | 0.22 | 0.62 | 0.02 | 100 |
| Kota Solok | 98.96 | 0.59 | 0.42 | 0.02 | 0.01 | 0.00 | 100 |
| Kota Sawahlunto | 99.29 | 0.43 | 0.26 | 0.02 | - | - | 100 |
| Kota Padang Panjang | 98.66 | 0.34 | 0.73 | 0.16 | 0.11 | 0.00 | 100 |
| Kota Bukittinggi | 98.02 | 0.63 | 1.11 | 0.04 | 0.17 | 0.02 | 100 |
| Kota Payakumbuh | 98.61 | 0.45 | 0.73 | 0.01 | 0.19 | 0.01 | 100 |
| Kota Pariaman | 99.05 | 0.00 | 0.74 | 0.01 | 0.19 | 0.01 | 100 |
| **Sumatera Barat** | **97.77** | **1.16** | **0.91** | **0.04** | **0.10** | **0.02** | **100** |

## Table A.19: Number of damage religious facilities

| | Mosque | Prayer house (Surau/langgar) | Church | Vihara |
|---|---|---|---|---|
| Kab. Agam | 252 | - | - | - |
| Kab. Padang Pariaman | 285 | 465 | - | - |
| Kab. Pasaman | 13 | 9 | - | - |
| Kab. Pesisir Selatan | 73 | 24 | - | - |
| Kab. Solok | 19 | 5 | - | - |
| Kab. Tanah Datar | 8 | - | - | - |
| Kab. Kep. Mentawai | 8 | - | 6 | - |
| Kota Bukittinggi | - | - | - | - |
| Kota Padang | 263 | 333 | 6 | 1 |
| Kota Padang Panjang | 24 | - | - | - |
| Kota Solok | - | - | - | - |
| Kota Pariaman | 37 | 131 | - | - |
| Kab. Pasaman Barat | 114 | 28 | - | - |
| **Total overall** | **1,096** | **995** | **12** | **1** |

### Table A.20: Assumptions of rehabilitation cost

| | Mosque | Prayer house (Surau/ langgar) | Church Protestant | Church Catholic | Pura (Hindu temple) | Vihara (Buddhist temple) | Haji Facilities (1 storey) | Haji Accommodation (2 storey) |
|---|---|---|---|---|---|---|---|---|
| **Assumed facility size (M2)** | **200** | **75** | **200** | **200** | **200** | **200** | **300** | **600** |
| **Assumed cost/M2 by type of damage** | **2,000,000** | **2,000,000** | **2,000,000** | **2,000,000** | **2,000,000** | **2,000,000** | **2,000,000** | **2,500,000** |
| Destroyed/ Heavily (0.70) | 1,400,000 | 1,400,000 | 1,400,000 | 1,400,000 | 1,400,000 | 1,400,000 | 1,400,000 | 1,750,000 |
| Medium (0.50) | 700,000 | 700,000 | 700,000 | 700,000 | 700,000 | 700,000 | 700,000 | 1,250,000 |
| Minor (0.30) | 420,000 | 420,000 | 420,000 | 420,000 | 420,000 | 420,000 | 420,000 | 750,000 |
| **Equipment/ furniture** | **5,000,000** | **2,000,000** | **7,500,000** | **7,500,000** | **5,000,000** | **5,000,000** | **10,000,000** | **46,500,000** |

*Clean up cost of debris: Rp 15,000/m2*

## FACILITIES FOR THE POOR AND THE VULNERABLE

### Table A.21: Damage Assessment for Facilities for the Poor

| Kind of Facility | Percentage of Damage | | | Private | | | | Public (*Government*) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Earthquake | | | | | | | | | | |
| | Before | Damage | % | Total | S | M | L | Total | S | M | L |
| Orphanage | 82 | 43 | 52 | 42 | 14 | 9 | 19 | 1 | 1 | - | - |
| Nursing house | 4 | 4 | 100 | 2 | - | 1 | 1 | 2 | - | 1 | 1 |
| Handicapped Center | 11 | 10 | 90 | 8 | 1 | 4 | 3 | 2 | 1 | - | 1 |
| Prostitution Rehabilitation | 1 | 1 | 100 | - | - | - | - | 1 | - | 1 | - |
| Youth Rehabilitation | 2 | 2 | 100 | - | - | - | - | 2 | 1 | 1 | - |
| School for Disabilities | 1 | 1 | 100 | 1 | - | 1 | - | - | - | - | - |
| Dinas Social Provincial Office | 1 | 1 | 100 | - | - | - | - | 1 | - | 1 | - |
| **Total** | **102** | **62** | **60** | **53** | **15** | **15** | **23** | **9** | **3** | **4** | **2** |
| a. Number of occupant | | | | 3,383 | | | | 885 | | | |
| b. Die | | | | - | | | | - | | | |
| c. Injured | | | | - | | | | 1 | | | |

Note: **S**=Severe Damage; **M**=Moderate Damage; **L**=Light Damage

***Methodology and assumption:***

The data was obtained from Provincial Social Dinas of West Sumatera and confirmation via telephone was conducted by Provincial Social Dinas to several facilities in the districts to clarify the data. The data was coming from affected districts consists of Kab. Padang Pariaman, Kab. Kepulauan Mentawai, Kab. Pesisir Selatan, Kab. Solok, Kab. Tanah Datar, Kab. Agam, Kab. Pasaman Barat, Kota Padang, Kota Padang Panjang, Kota Solok, and Kota Pariaman.

There were two types of facilities for the vulnerable and the poor. First is private facilities which is managed and owned by individual or foundation, and second is public (government) facilities which is managed by UPTD (*Unit Pelaksana Teknis Dinas*, Technical Management Unit of Agency) at the Provincial Social Dinas (although the public facilities are located in the districts, the management is under provincial agency).

The calculation of damage is based on the following replacement cost: severely damage is 440 million per unit; moderate damage is 66 million per unit; and light damage is 22 million per unit. The unit price is only for private facilities, while the calculation of public facilities is using data from Provincial Social Agency.

Calculation of losses consists of cost for temporary buildings and cost of demolition and removal of rubble using percentage that depends on the level of damage and type of building (multiple storey or not), approximately between 5-15%.

- **Productive Sector**

## AGRICULTURE, FISHERIES, LIVESTOCK

### Assumptions for Foodcrop (Paddy) Loss calculations

General assumptions:

- Average crop intensity: 2 crops per year
- Farmgate price: 3500 Rp/kg
- Formula for gross income of agricultural production:
  *yield x area x farmgate price x crop intensity*

Detailed assumptions for losses due to landslide in Kapalo Koto, Lubu Laweh and Pulau Air:

- 100 ha completely destroyed, 250 ha affected due to destruction of irrigation systems.
- For both areas (100 ha as well as 250 ha): two year period of total loss of production during reconstruction of rice fields and irrigation systems.
- Average yield of full production: 4.7 t/ha
- For destroyed 100 ha, which are now covered by debris: five more years of reduced yield due to reduced soil quality. The yield is assumed to recover from 2 t/ha in year three to full yield of 4.7 t/ha in year seven.

Formula: *Losses (Million Rupiah) =yield x area x crop intensity x years x farmgate price*

Assumptions for losses due to delay of production due to less attention to farming activities:

Loss factor: 2 months value of annual net income (10%)

- Net income is 60% of their gross income

**Table A.22 : RGDP Agriculture in West Sumatera 2008 (current price)**

| | 2007 | 2008 | Share to RGDP % | Share to Agriculture RGDP % |
|---|---|---|---|---|
| Food crops | 7,489,662 | 8,860,632 | 12.5% | 51.3% |
| Estate crops | 3,353,780 | 3,846,952 | 5.4% | 22.3% |
| Livestoct | 1,206,850 | 1,388,730 | 2.0% | 8.0% |
| Forestry | 934,185 | 1,098,987 | 1.6% | 6.4% |
| Fishery | 1,770,391 | 2,077,438 | 2.9% | 12.0% |
| **Total Agriculture** | **14,754,868** | **17,272,739** | **24.5%** | **100.0%** |
| **Total RGDP** | **59,799,045** | **70,614,210** | **100.0%** | |

### Table A.23: RGDP Agriculture in West Sumatera 2008 (constant price)

| | 2007 | 2008 | Growth '08 |
|---|---|---|---|
| Food crops | 4,030,224 | 4,221,789 | 4.8% |
| Estate crops | 2,024,583 | 2,143,271 | 5.9% |
| Livestoct | 630,976 | 660,210 | 4.6% |
| Forestry | 468,217 | 466,329 | -0.4% |
| Fishery | 884,920 | 945,721 | 6.9% |
| **Total Agriculture** | **8,038,919** | **8,437,319** | **5.0%** |
| **Total RGDP** | **32,912,969** | **35,007,922** | **6.4%** |

### Table A.24: Paddy, Production, Area, and Yield Wet Land

| | Harvested area (ha) | Yield ton/ha | Paddy production 2008 (ton) | Paddy field area (ha) |
|---|---|---|---|---|
| Kota Padang | 10,100 | 5.8 | 58,290 | 6,657 |
| Kab Padang Pariaman | 43,962 | 4.4 | 192,640 | 24,064 |
| Kota Pariaman | 4,671 | 5.2 | 24,462 | 2,592 |
| Kota Padang Panjang | 1,621 | 5.3 | 8,569 | 690 |
| Kab Pasaman | 40,905 | 4.4 | 180,890 | 22,295 |
| Kab Pasaman Barat | 21,276 | 4.0 | 85,508 | 14,840 |
| Kab Pesisir Selatan | 48,955 | 4.6 | 227,279 | 29,100 |
| Kab Agam | 51,278 | 4.7 | 241,711 | 28,682 |
| Kab Solok | 53,109 | 4.6 | 245,571 | 23,555 |
| Kab Sijunjung | 16,218 | 4.2 | 68,042 | 12,113 |
| Kab Kepulauan Mentawai | 183 | 4.0 | 740 | 2,382 |
| Kab Tanah Datar | 38,428 | 5.6 | 214,371 | 23,025 |
| Kota Bukittinggi | 577 | 6.1 | 3,502 | 400 |
| **Total 13 Kab/Kota** | **331,283** | **4.7** | **1,551,575** | **190,395** |
| **Total West Sumatera** | **413,662** | **4.69** | **1,941,280** | **235,952** |

**Table A.25: Area of Wet Land**

| | Irrigation System Used | | | |
|---|---|---|---|---|
| | Techniqu | Semi Technique | Simple | Village |
| Kota Padang | 4,022 | 257 | 626 | 1,476 |
| Kab Padang Pariaman | 3,931 | 4,577 | 5,323 | 4,795 |
| Kota Pariaman | | 1,536 | 315 | 98 |
| Kota Padang Panjang | | | 690 | |
| Kab Pasaman | 2,426 | 9,382 | 6,299 | 2,281 |
| Kab Pasaman Barat | 3,893 | 2,303 | 1,224 | 2,663 |
| Kab Pesisir Selatan | | 11,839 | 3,766 | 6,698 |
| Kab Agam | 1,395 | 12,423 | 5,349 | 5,149 |
| Kab Solok | 6,919 | 5,164 | 4,560 | 5,514 |
| Kab Sijunjung | | 1,491 | 3,228 | 2,068 |
| Kab Kepulauan Mentawai | 10 | 125 | 222 | 885 |
| Kab Tanah Datar | | 3,768 | 7,635 | 5,744 |
| Kota Bukittinggi | | 170 | 148 | 30 |
| **Total 13 Kab/Kota** | **22,596** | **53,035** | **39,385** | **37,401** |
| **Total West Sumatera** | **29,526** | **62,630** | **49,467** | **43,611** |

## Table A.26: Estate Crop Damage and Losses Calculation

| | | area damage (ha) due to landslide | price per hectare | back to normal (mo) | monthly income loss/ha | Input cost per tree | Damage IDR | Losses IDR |
|---|---|---|---|---|---|---|---|---|
| **Agam** | | | | | | | | |
| | Coconut tree | 7.5 | 4,050,000 | 36 | 400,000 | 25,000 | 30,375,000 | 120,500,000 |
| | Casiavera | 214.6 | 1,650,000 | 36 | 800,000 | 15,000 | 354,131,250 | 6,188,700,000 |
| | Pinang | 10.7 | 1,000,000 | 120 | 300,000 | 15,000 | 10,700,000 | 392,700,000 |
| | Nutmeg | 43 | 1,850,000 | 36 | 6,000,000 | 15,000 | 79,550,000 | 9,295,500,000 |
| **Pesisir Selatan** | | | | | | | | |
| | Rubber tree | 3 | 6,000,000 | 60 | 300,000 | 25,000 | 18,000,000 | 66,500,000 |
| **Kota Pariaman** | | | | | | | 0 | |
| | Coconut tree | 2 | 4,050,000 | 36 | 400,000 | 25,000 | 8,100,000 | 41,300,000 |
| | Cacao | 2 | 4,050,000 | 48 | 1,500,000 | 36,000 | 8,100,000 | 162,000,000 |
| **Padang pariaman** | | | | | | | | |
| | Cacao | 22.5 | 4,050,000 | 48 | 1,500,000 | 36,000 | 91,125,000 | 1,638,000,000 |
| **Total** | | | | | | | **600,081,250** | **17,905,200,000** |

### Table A.27: Livestock Damage and Losses Calculation

| Damages | | Losses | |
|---|---|---|---|
| Type | Cost (Rp M) | Type | Cost (Rp M) |
| **Sheds** | | | |
| chicken | 1,831 | | |
| quail | 3 | cow | 1,516 |
| cow | 301 | buffalo | 48 |
| buffalo | 57 | goat/sheep | 151 |
| horse | 2 | broiler | 100 |
| goat | 12 | quail | 5 |
| *embung* | 150 | village hen | 187 |
| | | duck | 24 |
| **Buildings and equipment** | | | |
| animal slaughterhouse | 1,400 | | |
| slaughtering places | 430 | | |
| cattle market | 130 | | |
| *Pos Keswan* | 520 | | |
| *Pos IB* | 385 | | |
| | **5,221** | | **2,031** |

### Table A.28: Fisheries Damage and Losses Calculation

**Losses based on:**

annual value of marine and fish pond (*tambak)* production: Rp 3,263,260 million
Loss of catch: 2 weeks >> loss factor 3.85 %
earthquake affecting 50% of sector's production

**Damages:**

| Type | Cost (Rp M) |
|---|---|
| TPI | 340 |
| PPI | 1,024 |
| Pier | 300 |
| Workshop | 100 |
| Pool fish | 2,579 |
| UPI | 407 |
| Fish Seed | 1,945 |
| General Water Conservation | |
| **Total** | **6,807** |

## WATER RESOURCES AND IRRIGATION

### Table A.29: Damages of Water Resources and Irrigation schemes

| | *Million Rupiah* |
|---|---|
| River/Flood protection | 15,830 |
| Irrigation (primary & secondary) | 24,376 |
| Irrigation (tertiary) | 1,260 |
| Rice-fields 100ha | 2,000 |
| **TOTAL** | **43,466** |

## TRADE AND INDUSTRY

### Table A.30: Estimated GDP of West Sumatera Trade and Industry Sector (Rp million)

| District | Industry Sector | Trade Sector | District's GDP | District's Share | Trade's share to District's GDP | Industry's Share to District's GDP |
|---|---|---|---|---|---|---|
| Kab. Agam | 651,822 | 876,369 | 5,726,186 | 7% | 15% | 11% |
| Kab.Padang Pariaman | 641,707 | 617,267 | 5,641,227 | 7% | 11% | 11% |
| Kab. Pasaman | 128,384 | 345,444 | 2,850,880 | 4% | 12% | 5% |
| Kab. Pesisir Selatan | 510,808 | 820,578 | 3,938,169 | 5% | 21% | 13% |
| Kab. Solok | 291,446 | 574,800 | 4,466,894 | 6% | 13% | 7% |
| Kab. Tanah Datar | 561,907 | 590,203 | 4,803,473 | 6% | 12% | 12% |
| Kep.Mentawai | 86,345 | 231,151 | 1,209,729 | 2% | 19% | 7% |
| Kota Bukit Tinggi | 192,892 | 398,544 | 1,868,997 | 2% | 21% | 10% |
| Kota Padang | 3,379,726 | 4,628,576 | 22,136,424 | 28% | 21% | 15% |
| Kota Padang Panjang | 70,053 | 83,678 | 803,695 | 1% | 10% | 9% |
| Kota Solok | 91,549 | 101,916 | 976,890 | 1% | 10% | 9% |
| Kota Pariaman | 165,354 | 154,799 | 1,450,226 | 2% | 11% | 11% |
| Kab. Pasaman Barat | 1,270,400 | 1,343,865 | 5,354,855 | 7% | 25% | 24% |
| **West Sumatera** | **9,388,540** | **13,710,383** | **78,356,291** | **100 %** | **N/A** | **N/A** |

*Note:* Assumption on Estimated of West Sumatera GDP 2009, using 6 percent growth's scenario and 4 percent inflation.

## Table A.31: Medium Small Enterprises Damage and Losses in Kota Padang

| | Unit affected | | | Damaged Assets (a) | | | Damaged Inventory | | | Potential Loss (c) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sub District | Heavy | Mod | Light | Heavy | Mod | Light | Heavy | Mod | Light | Heavy | Mod | Light |
| Bungus Teluk Kabung | 1 | | 18 | 380 | - | 2,565 | 37 | - | 252 | 612 | - | 11,016 |
| Koto tengah | | | | - | - | - | - | - | - | - | - | - |
| Kuranji | 17 | | 20 | 6,460 | - | 2,850 | 634 | - | 280 | 10,404 | - | 12,240 |
| Lubuk Begalung | 9 | 6 | 9 | 3,420 | 1,425 | 1,283 | 336 | 140 | 126 | 5,508 | 3,672 | 5,508 |
| Lubuk Kilangan | 2 | | 15 | 760 | - | 2,138 | 75 | - | 210 | 1,224 | - | 9,180 |
| Nanggalo | 1 | 3 | 8 | 380 | 713 | 1,140 | 37 | 70 | 112 | 612 | 1,836 | 4,896 |
| Padang Barat | 91 | 33 | 68 | 34,580 | 7,838 | 9,690 | 3,392 | 769 | 951 | 55,692 | 20,196 | 41,616 |
| Padang Selatan | 7 | | 150 | 2,660 | - | 21,375 | 261 | - | 2,097 | 4,284 | - | 91,800 |
| Padang Timur | 28 | 18 | | 10,640 | 4,275 | - | 1,044 | 419 | - | 17,136 | 11,016 | - |
| Padang Utara | | | | - | - | - | - | - | - | - | - | - |
| Pauh | | 4 | 6 | - | 950 | 855 | - | 93 | 84 | - | 2,448 | 3,672 |
| **Total** | **156** | **64** | **294** | **59,280** | **15,200** | **41,895** | **5,816** | **1,491** | **4,110** | **95,472** | **39,168** | **179,92** |

*Note:* The survey is conducted in collaboration with University Andalas student within 2 weeks after the earthquake in Kota Padang only.

## TOURISM

### Table A.32: Summary of Damage and Losses Sub-sector: Tourism

| No | City/Regency | Item | # Pre-Disaster | Level of Damages | | | # non | Damages | Losses | Private/ | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (Podes 2008) | SD | MD | LD | damages | (million rupiah) | (million rupiah) | Public | |
| 1 | Padang | Hotel and home stays | 56 | 8 | 3 | | 45 | 44,072 | 355,104 | Private | Buildings, equipment and capital damage. Income losses estimated ranging from 6 to 18 months. |
| | | Restaurant | 10,994 | 12 | 2 | | 10,980 | 7,392 | 8,280 | Private | Food stalls and warung have not been accounted for. Light damages have not yet included. Hundreds of people jobless |
| | | Tourist object | | 5 | | | | 8,890 | 301.5 | Public | Damages on roads, bridges, gazebos, parking areas and other assets/facilities. Losses calculated on basis of forgone retribution and user fees of tourist destinations |

| No | City/Regency | Item | # Pre-Disaster (Podes 2008) | Level of Damages SD | MD | LD | # non damages | Damages (million rupiah) | Losses (million rupiah) | Private/ Public | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | **60,354** | **363,384** | | Preliminary estimates of damages and losses in district of Padang |
| | | | | | | | | | | | |
| 2 | Pariaman | Hotel and home stay | 7 | | 1 | 5 | 1 | 1,250 | 6,250 | Private | |
| | | Restaurant | 1,098 | | | | 1,098 | | | Private | Information on restaurants and food stalls not yet captured |
| | | Tourist object | | 3 | | | | 4,430 | 250 | Public | Damages on roads, bridges, gazebos, parking areas and other assets/facilities. Losses calculated on basis of forgone retribution and user fees of tourist destinations |
| | | | | | | | | **5,680** | **6,500** | | |
| | | | | | | | | | | | |
| 3 | Padang Panjang | Hotel and home stay | 6 | | | | 6 | | | Private | |
| | | Restaurant | 1,149 | | | | 1,149 | | | Private | |
| | | Tourist object | | 3 | | | | 800 | 100 | Public | Damages on roads, bridges, gazebos, parking areas and |

| No | City/Regency | Item | # Pre-Disaster (Podes 2008) | Level of Damages SD | Level of Damages MD | Level of Damages LD | # non damages | Damages (million rupiah) | Losses (million rupiah) | Private/ Public | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | other assets/facilities. Losses calculated on basis of forgone retribution and user fees of tourist destinations |
| | | | | | | | | **800** | **100** | | |
| | | | | | | | | | | | |
| 4 | Padang Pariaman | Hotel and home stay | 2 | | | | 2 | | | Private | |
| | | Restaurant | 4,954 | | | | 4,954 | | | Private | |
| | | Tourist object | | | 3 | 5 | | 1,200 | | Public | Damages on roads, bridges, gazebos, parking areas and other assets/facilities. Losses calculated on basis of forgone retribution and user fees of tourist destinations |
| | | | | | | | | **1,200** | | | |
| | | | | | | | | | | | |
| 5 | Pesisir Selatan | Hotel and home stay | 45 | | | | 45 | 30 | 240 | Private | |
| | | Restaurant | 5,175 | | | | 5,175 | | | Private | |
| | | Tourist object | | 2 | 1 | | | 590 | | Public | Damages on roads, bridges, gazebos, parking areas and |

| No | City/Regency | Item | # Pre-Disaster (Podes 2008) | Level of Damages | | | # non damages | Damages (million rupiah) | Losses (million rupiah) | Private/ Public | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | SD | MD | LD | | | | | other assets/facilities. Losses calculated on basis of forgone retribution and user fees of tourist destinations |
| | | | | | | | | **620** | **240** | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| 6 | Agam | Hotel and home stay | 27 | 3 | 4 | 1 | 19 | 1,200 | 6,000 | Private | |
| | | Restaurant | 4,658 | | | | 4,658 | | | Private | |
| | | Tourist object | | 1 | 1 | 1 | | 275 | 50 | Public | Damages on roads, bridges, gazebos, parking areas and other assets/facilities. Losses calculated on basis of forgone retribution and user fees of tourist destinations |
| | | | | | | | | **1,475** | **6,050** | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | Solok | Hotel and home stay | 5 | | | | 5 | | | Private | |
| | | Restaurant | 685 | | | | 685 | | | Private | |
| | | Tourist object | | | 4 | | | 600 | | Public | Damages on roads, bridges, gazebos, |

| No | City/Regency | Item | # Pre-Disaster (Podes 2008) | Level of Damages SD | MD | LD | # non damages | Damages (million rupiah) | Losses (million rupiah) | Private/ Public | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | parking areas and other assets/facilities. Losses calculated on basis of forgone retribution and user fees of tourist destinations |
| | | | | | | | | **600** | | | |
| | | 7 | | | | | | | | | |
| **Total** | | | | | | | | **70,729** | **376,274** | | |
| **Private** | | | | | | | | **53,944** | **375,874** | **429,818** | |
| **Public** | | | | | | | | **16,785** | **400** | **17,185** | |
| **Total damage and losses** | | | | | | | | **70,729** | **376,274** | | |

**Key assumptions:**

Damage and losses calculated on basis of:

a. recovery period: 18 months (optimistic scenario)

b. occupancy rate 70-80% (city of Padang and Bukittinggi), 50-60% (other districts)

c. district income (fees, taxes, retribution of tourism sector), based on district realization figures (*Laporan Realisasi Anggaran)*

d. Average room rate per night:

five star hotels: Rp. 500,000 - 600,000

four star hotels: Rp. 400,000- 450,000

three star hotel: Rp. 300,000- 350,000

two star hotel: Rp. 200,000 - 250,000

motels/Wisma/Losmen: 150,000

e. Cost/hotel room

five star hotels: Rp. 100,000,000 including 5% facilities such as lounge etc

four star hotels: Rp. 80,000,000 including 5% facilities such as lounge etc

three star hotel: Rp. 70,000,000 including 5% facilities such as lounge etc

two star hotel, motels, wisma: Rp. 20,000,000-30,000,000 including 5% facilities such as lounge etc

## Cross Cutting Sector

## FINANCIAL AND BANKING

### Table A.33: Snapshot of West Sumatra Banking Sector, Pre-disaster, as of End of August 2009

*In Rp billion*

| Number of Banks have Business in West Sumatra | West Sumatra Province | Indonesia | % of Share |
|---|---|---|---|
| Commercial Banks: | 18 | 122 | 14.75% |
| State Banks | 4 | 5 | 80.00% |
| Private Banks (including foreign and JV) | 13 | 91 | 14.29% |
| Regional Bank (BPD) | 1 | 26 | 3.85% |
| Rural Credit Banks (BPR) | 107 | 1,763 | 6.07% |
| | | | |
| Number of Banks Offices/Branches | | | |
| Commercial Banks: | 171 | 12,616 | 1.36% |
| State Banks | 52 | 3,739 | 1.39% |
| Private Banks (includng foreign and JV) | 54 | 7,506 | 0.72% |
| Regional Banks (BPD) | 65 | 1,371 | 4.74% |
| Rural Banks | 202 | 3,446 | 5.86% |
| | | | |
| **Total Bank's Assets** | **19,422** | **2,419,388** | **0.80%** |
| **Total Bank's Deposit** | **16,257** | **691,818** | **2.35%** |
| Total Commercial Loans | 15,040 | 1,365,942 | 1.10% |
| Working Capital Loans | 5,761 | 677,147 | 0.85% |
| Investment Loans | 2,546 | 280,340 | 0.91% |
| Consumption Loans | 6,733 | 408,455 | 1.65% |
| NPL (%) | | 3,98 | |
| Credit Rural Banks (BPR) | 18 | 27,290 | 0.07% |
| Working Capital Loans | 7 | 13,952 | 0.05% |
| Investment Loans | 3 | 1,565 | 0.22% |
| Consumption Loans | 8 | 11,773 | 0.06% |
| NPL (%) | | 5.00 | |

*Source:* Bank Indonesia.

**Table A.34: Commercial Banking Credits by Sector in West Sumatra, Pre-disaster, as of August, 2009**

*In Rp billion*

| Sectoral Distribution of GRDP | West Sumatra Province | Indonesia | |
|---|---|---|---|
| Agriculture | 1,748 | 74,675 | 2.34% |
| Mining | 62 | 34,560 | 0.18% |
| Manufacturing (Industry) | 944 | 245,352 | 0.38% |
| Utilities (Electricity, Gas & Water) | 4 | 24 | 16.67% |
| Construction | 270 | 62,898 | 0.43% |
| Trading, Restaurant and Hotel | 4,187 | 280,324 | 1.49% |
| Transportation and warehousing | 180 | 69,886 | 0.26% |
| Finance and Services | 833 | 161,246 | 0.52% |
| Others - including Consumer Loans | 6,812 | 411,771 | 1.65% |
| **Total** | **15,040** | **1,340,736** | |
| **Total (%)** | **1.12** | **1.00** | |

## GOVERNMENT

### Assumption:

1. Data of district/city governments and sub district/nagari damage facilities was mainly provided by District/Local Governments and compiled by Bappeda
2. Damage Data of Provincial government and central government institution at the province level (non TNI/Polri) are provided by PU Cipta Karya Province, the Higher Court, and Prosecutor Office.
3. Data of Ministry of Religious affairs damage building are provided by Ministry of Religious Affairs
4. Data of damage to military and police facilities are provided by respective institution.
5. If the district provided monetary value of damage estimates, the figure was accepted I as long as the unit cost is reasonable.
6. For central and provincial government institution in Padang, damage value was estimated using the average size of 1,500 m2 multiplied by a local unit cost for complex multi storey building provided by PU (see below table). The average floor area is based on observation and checking at Baseline data of provincial asset ledger.
7. For central government institution in other district and district government offices (including Padang), the average size is 450m2 based on average size of the local government offices in Pariaman City.
8. Average size of Official residency is 150m2, TNI/Polri Boarding house 45m2, and Kecamatan/nagari offices 200m2,. Where a reasonable estimate from the region is not available, the estimation was done through the multiplication of average size by local unit cost.

9. Heavily damage building was estimated at 100% of replacement value, medium damage 50% and light damage: 10%
10. Damage Equipment value is estimated as 25% of total damage for heavily damage, 12.5% for medium damage, and 5% for light damage.
11. Debris removal cost for provincial and central government offices in Padang is estimated by using 14 days usage of  of excavators and 8m3 dump truck . Rental cost for excavator is 3.5 mio/day and daump truck is 960,000/day. In other cities and for Padang's smaller offices it is estimated on the basis of 6 days of excavator and dumptruck usage.
12. Cost of debris removal for houses and Nagari offices is 10 mandays x Rp. 100,000/day.
13. All of heavily and medium damage of Padang and Pariaman cities government are assumed to rent temporary office space for 1.5 years at the rate of 36 mio/year in Padang and 24 mio/year in Pariaman
14. 75% of heavy and  medium damage provincial office are assumed will have to rent an office at the rate of 36  mio/year in Padang and 24 mio/year elsewhere.

## Table A.35: Number of Damaged Government Building per Unit

| Type of Building/Ownership | LOKASI (KAB/KOTA) | No. of Damage | | | Average Floor Area (m2) | Unit Cost/M2 |
|---|---|---|---|---|---|---|
| | | Heavy/Collapse | Medium | Light | | |
| **Central Government Offices (Including TNI/POLRI)** | | | | | | |
| | Kota Padang | 15 | 7 | 21 | 1500 | 3,157,000 |
| | Kota Pariaman | 1 | - | - | 450 | 3,597,000 |
| | Kab. Padang Pariaman | 1 | 3 | - | 450 | 2,134,000 |
| | Kota Solok | | | | 450 | 2,807,000 |
| | Kab. Solok | | | | 450 | 2,807,000 |
| | Kota Bukit Tinggi | | | | 450 | 2,807,000 |
| | Kota Padang Panjang | | | 1 | 450 | 4,598,000 |
| | Kota Payakumbuh | | | | 450 | 2,807,000 |
| | Kab. Tanah datar | | | | 450 | 2,870,000 |
| | Kab. Agam | | | | 450 | 2,134,000 |
| | Kab. Pesisir Selatan | | | 1 | 450 | 3,221,000 |
| | Kab. Pasaman | | | | 450 | 3,682,000 |
| | Kab. Pasaman Barat | | 1 | | 450 | 3,682,000 |
| **Provincial Government Offices** | | | | | | |
| | Kota Padang | 27 | 34 | 28 | 1500 | 3,157,000 |
| **District/City Governments Offices (including official residency)** | | | | | | |
| | Kota Padang | 26 | 88 | 35 | 450 | 3,157,000 |
| | Kota Pariaman | 4 | 2 | 2 | 450 | |
| | Kab. Padang Pariaman | 4 | 7 | 4 | 450 | |
| | Kota Solok | | | | 450 | 2,807,000 |
| | Kab. Solok | 7 | 1 | 21 | 450 | 2,807,000 |
| | Kota Bukit Tinggi | | | 3 | 450 | 2,807,000 |
| | Kota Padang Panjang | | | | 450 | 4,598,000 |
| | Kota Payakumbuh | | | | 450 | 2,870,000 |
| | Kab. Tanah datar | - | - | - | 450 | 2,870,000 |

| Type of Building/Ownership | LOKASI (KAB/KOTA) | No. of Damage Heavy/Collapse | Medium | Light | Average Floor Area (m2) | Unit Cost/M2 |
|---|---|---|---|---|---|---|
| | Kab. Agam | 2 | | | 450 | |
| | | | - | 2 | | 2,134,000 |
| | Kab. Pesisir Selatan | 7 | 11 | 33 | 450 | |
| | | | | | | 3,221,000 |
| | Kab. Pasaman | 1 | | | 450 | |
| | | | - | 3 | | 3,682,000 |
| | Kab. Pasaman Barat | - | | | 450 | |
| | | | 4 | 9 | | 3,682,000 |
| **TNI/POLRI Boarding Houses** | | | | | | |
| | Kota Padang | 159 | 214 | | 45 | |
| | | | | 20 | | 1,871,000 |
| | Kota Pariaman | 2 | | | 45 | |
| | | | 18 | | | 2,164,000 |
| | Kota Padang Panjang | | 7 | | 45 | 2,289,000 |
| | Kab. Mentawai | | | | 45 | |
| | | | 9 | | | 2,289,000 |
| | Kab. Padang Pariaman | 3 | 2 | 2 | 45 | 1,951,000 |
| | Kab. Agam | 2 | | | 45 | |
| | | | - | - | | 1,951,000 |
| **Kecamatan, Nagari/Kelurahan Offices** | | | | | | |
| | Kota Padang | 30 | | | 200 | |
| | | | 9 | 7 | | 1,989,000 |
| | Kota Pariaman | | | 74 | 200 | |
| | | | | | | 2,134,000 |
| | Kab. Padang Pariaman | 10 | 15 | 8 | 200 | 2,134,000 |
| | Kota Solok | | | | 200 | |
| | | | | | | 1,683,000 |
| | Kab. Solok | | | | 200 | |
| | | | | | | 1,683,000 |
| | Kota Bukit Tinggi | | | | 200 | |
| | | | | | | 1,683,000 |
| | Kota Padang Panjang | | | | 200 | 2,568,000 |
| | Kota Payakumbuh | | | | 200 | |
| | | | | | | 1,683,000 |
| | Kab. Tanah datar | | | | 200 | |
| | | | | | | 1,674,000 |
| | Kab. Agam | 1 | | | 200 | |
| | | | 2 | - | | 2,134,000 |
| | Kab. Pesisir Selatan | | | | 200 | |
| | | | | | | 2,168,000 |
| | Kab. Pasaman | | | | 200 | |
| | | | | | | 1,934,000 |
| | Kab. Pasaman Barat | | | | 200 | |
| | | | | | | 1,934,000 |

## Table A.36: Damage and losses (in Rp billion)

| | Disaster Effects | | | Ownership by Sector | | Effects on: | |
|---|---|---|---|---|---|---|---|
| | Damage | Losses | Total | Public | Private | BOP* | Fiscal Sector** |
| **Subsector, Component** | | | | | | | |
| Buildings | 565 | | 565 | 565 | | .. | .. |
| Equipment | 95.5 | | 95.5 | 95.5 | | .. | .. |
| Debris Removal | | 4.5 | 4.5 | 4.5 | | .. | .. |
| Office Rent Cost | | 9.4 | 9.4 | 9.4 | | .. | .. |
| **Total** | **660.5** | **13.9** | **674.4** | **674.4** | | **..** | **..** |

* Lower exports; higher imports

** Lower tax revenues; unexpected expenditures

## Table A.37: Early Recovery and Reconstruction (in Rp billion)

| Early and Longer Term Recovery and Reconstruction (US$ Million)* | | | |
|---|---|---|---|
| Subsector Needs | Early Recovery (US$ Million) | Reconstruction (US$ Million) | Total (US$ Million) |
| **Reconstruction of Buildings** | | 38.9 | 38.9 |
| Equipment | | 10.1 | 10.1 |
| Debris Removal | 0.5 | | 0.5 |
| Office Rent Cost | 1 | | 1 |
| **Total** | **1.5** | **49** | **50.5** |

1 USD = Rp. 9,400

## ENVIRONMENT

Calculation of value of lost environmental services from deforestation:

The Forest Service reported that landslides affected 770 hectares of forestland. It is assumed that only 50% of this area was forested prior to the landslides and that 25% of the previously forested area, or roughly 100 ha, is of critical ecological importance.

The value of lost environmental services is derived from the value used in the Aceh DALA, which was US$ 209 /ha/yr and which was based on several references. An annual inflation factor of 4% was used to reach US$ 245/ha/yr, equivalent to IDR 2.3 million /ha/yr.

It is assumed that critical areas will be reforested after three years at a cost of IDR 6 million per ha, leading to a restoration of environmental services after the end of three years. Using a discount rate of 10% on lost environmental services and reforestation costs leads to an NPV of IDR -1.1 billion.

**Table A.38: Calculation of Value of Lost Environmental Services from Deforestation**

| year | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| Loss of Environment Services | (2,300,000) | (2,300,000) | (2,300,000) | (2,300,000) |
| Reforestation Cost | | | | (6,000,000) |
| Total Loss per year | (2,300,000) | (2,300,000) | (2,300,000) | (8,300,000) |
| Discount Rate | 10% | | | |
| NPV per ha | (11,388,771) | | | |
| NPV for 100 ha | (1,138,877,126) | | | |

## The Economic and Social Impact

The estimated economic impact of the earthquake aims to measure the loss in ongoing economic activity flowing from the earthquake. These losses in large part flow from, but are separate to, the one-off loss in the stock of human and physical capital – the loss of lives, poorer health, and destruction of buildings and stocks caused by the earthquake.

The projected losses to each sector represent the fall in that sector's revenues or income. These revenues include the amount the sector would have paid for its inputs – for the electricity a shop uses and the goods it stocks on its shelves, for example. As the economic impact on the sector relates to its value added, these inputs need to be subtracted from the estimated losses. This can be done by multiplying the losses by the ratio of the value of inputs to the sector sourced form other productive sectors to the value of its total sales. The statistician reports the value of inputs and outputs for each sector in its input-output tables. These are available for West Sumatra from a 2007 economic survey, and where possible these have been used in this report. The two exceptions were the trade, accommodation and restaurants sector, where the coefficient was based on those reported in Indonesia-wide 2005 input-output tables and the coefficient used in the 2006 Yogyakarta and Central Java earthquake damages and loss assessment, and construction, where the coefficient was lowered significantly to account for the extent to which a sudden expansion in construction activity is likely to flow out of the province.

It is assumed that the projected impacts on sectoral output have proportionate impacts on employment in the sector. In other words, the estimate is based on a 1 percent fall in value added activity in the sector indicates that employment in that sector being likely to fall by 1 percent. This assumption appears reasonable given the preliminary nature of the loss assessment, and the uncertainties surrounding the applicable input-output coefficient in these circumstances and relationship between employment and output across the various firms affected by the disaster.

The impact on poverty is based on a model that links per capita spending and employment to projected sectoral income and employment impacts of the disaster. Household-level per capita expenditure and sector of employment data were drawn from provincial details within the National Socio-economic Survey (Susenas). In the model, real household consumption is influenced by two key factors: sectoral GDP growth per capita and relative inflation in poverty basket prices. A household's consumption increases as per capita production grows in their sector of employment. However, their real spending power falls with inflation, and the real consumption of the poor and near-poor falls further if poverty basket prices (such as food and fuel) increase by more than core inflation.

## Human Recovery Needs Assessment Survey Results

The following tables contain the survey results that provided the analysis for Chapter Two on Human Recovery Needs. The methodology and the findings of the survey can be read in full in Chapter Two.

### ACCESS TO FOOD

**Table A.39: Number of Days Withstanding without Food Aid (Days)**

| No | Kabupaten/Kota | Average |
|---|---|---|
| 1 | Kota Pariaman | 7.41 |
| 2 | Kabupaten Pasaman Barat | 6.37 |
| 3 | Kabupaten Padang Pariaman | 6.13 |
| 4 | Kota Padang | 5.51 |
| 5 | Kabupaten Pesisir Selatan | 5.30 |
| 6 | Kabupaten Agam | 4.56 |
| **Overall Average** | | ***5.88*** |

n=500

**Table A.40: Perception Regarding Environmental Impacts of Disaster (%)**

| No | Access to food | Increase | No Change | Decrease |
|---|---|---|---|---|
| 1 | Price of food | 62 | 21 | 2 |
| 2 | Household's money allocation for food | 36 | 16 | 42 |
| 3 | Availability of food in the market | 2 | 63 | 56 |

n=500

### SOCIAL COHESION

**Table A.41: Typical Source of Community Quarrels Before/After the Disaster**

| No | Issues triggering community quarrels | % Before | % After | Diff |
|---|---|---|---|---|
| 1 | Water source use | 1.94 | 8.81 | 6.88 |
| 2 | Use of public facilities | 1.61 | 3.96 | 2.35 |
| 3 | Property and trade | 3.87 | 4.85 | 0.97 |
| 4 | Working relationship | 0.32 | 0.44 | 0.12 |
| 5 | Agricultural assets (water, livestock, crops) | 2.58 | 2.20 | -0.38 |
| 6 | Dignity, pride, ethnicity, religion | 3.23 | 2.20 | -1.02 |
| 7 | Land ownership/use | 10.00 | 5.29 | -4.71 |

n= 310

## ACCESS TO CLEAN WATER, SANITATION AND HYGIENE

### Table A.42: Situation of Access to Clean Water (%)

| No | Source of Clean Water | Before | Not functioning |
|---|---|---|---|
| 1 | Water pipe network | 20.8 | 33.0 |
| 2 | Ponds/river | 20.0 | 10.2 |
| 3 | Open sources | 19.0 | 15.3 |
| 4 | Closed sources | 13.7 | 12.1 |
| 5 | Open pumps | 2.8 | 3.7 |
| 6 | Closed pumps | 2.0 | 5.6 |
| 7 | Tanker | 1.8 | 0.5 |
| 8 | Others | 19.8 | 19.1 |

n=493

### Table A.43: Defecation Practice after Disaster (%)

| No | Defecation practice | Male | Female |
|---|---|---|---|
| 1 | Private/family latrine | 45.6 | 46.7 |
| 2 | Public toilet | 26.0 | 26.5 |
| 3 | Latrine close to the house | 13.2 | 13.9 |
| 4 | Field near the house | 3.7 | 3.6 |
| 5 | Open field | 8.8 | 6.5 |
| 6 | Don't know | 0.2 | 0.2 |
| 7 | No answer | 2.4 | 2.5 |

n=493

## ACCESS TO SHELTER

### Table A.44: Impact on House Structures

| No. | Impacts on Housing | % |
|---|---|---|
| 1 | Heavily damaged (cannot be used without structural repair) | 44 |
| 2 | Completely destroyed (cannot be repaired, need reconstruction) | 26 |
| 3 | Seriously damaged (could be used, need substantial repair) | 20 |
| 4 | Lightly damaged (could be used safely, need repair) | 8 |
| 5 | No damage (only cleaning needed, minor repair and replacement) | 1 |

n=435

### Table A.45: Expected Sources of Funding for House Repair/Reconstruction

| No. | Expected Sources for Damaged House Repair/Reconstruction | % Total |
|---|---|---|
| 1 | Government assistance | 68 |
| 2 | Own funding | 21 |
| 3 | Borrowing | 8 |
| 4 | Borrowing | 2 |
| 5 | No Answer | 1 |

n= 435

## ACCESS TO LIVELIHOOD

### Table A.46: Perception Regarding General Impact of Disaster (%)

| No | Status of Livelihood/Employment | % |
|---|---|---|
| 1 | Disrupted | 66 |
| 2 | Completely (needs complete reinvestment for restarting) | 23 |
| 3 | Heavily (needs major reinvestment for resumption) | 20 |
| 4 | Seriously (need sizeable reinvestment for resumption) | 23 |
| 5 | Not disrupted (could resume with no major investment) | 34 |

n=500

## ACCESS TO EDUCATION

### Table A.47: Perceptions on the Availability and Safety of School buildings

| No. | Availability and Safety of School Buildings | % |
|---|---|---|
| 1 | No building available | 37.0 |
| 2 | Available and safe | 27.4 |
| 3 | Available but unsafe | 19.2 |
| 4 | Don't Know | 7.7 |
| 5 | No Answer | 8.7 |

n=500

### Table A.48: Remaining / Functioning School Facilities

| No. | School Facilities | % |
|---|---|---|
| 1 | Clean water | 27.3 |
| 2 | Toilet/latrine | 21.5 |
| 3 | Electricity | 20.0 |
| 4 | Peripheral walls | 17.2 |
| 5 | Don't Know | 8.8 |
| 6 | No Answer | 5.2 |

n=500

## SAFE AND SUSTAINABLE ENVIRONMENT

### Table A.49: Types of Household Fuel Before and After Disaster (%)

| No | Type of Household Fuel | Before | After | Diff |
|---|---|---|---|---|
| 1 | Firewood– forest | 30.3 | 35.5 | 5.2 |
| 2 | Firewood – fields/purchase | 11.8 | 13.8 | 2.0 |
| 3 | Electricity | 6.0 | 5.1 | -0.9 |
| 4 | Gas / LPG | 11.1 | 8.1 | -3.0 |
| 5 | Kerosene | 40.2 | 37.1 | -3.2 |
| 6 | Others (write) | 0.1 | 0.0 | -0.1 |
| 7 | Don't know | 0.0 | 0.0 | 0.0 |
| 8 | No Answer | 0.4 | 0.5 | 0.0 |

n=500

## IMPACT ON GOVERNANCE

**Table A.50: Perception on level of Governance Functions Two Weeks After Disaster**

| No | District | % |
|---|---|---|
| 5 | Pesisir Selatan | 85.0 |
| 4 | Agam | 72.7 |
| 6 | Pasaman Barat | 65.8 |
| 1 | Padang | 64.1 |
| 2 | Pariaman | 63.8 |
| 3 | Padang Pariaman | 49.0 |
| | **Average** | **62.8** |

n=444

**Table A.51: Perception of Government Functions Most impacted by Disaster (%)**

| No | District | Economic | Health-Social | Admin | Peace & Order |
|---|---|---|---|---|---|
| 1 | Agam | 64.9 | 14.0 | 7.0 | 0.0 |
| 2 | Padang | 20.7 | 17.1 | 13.4 | 1.2 |
| 3 | Pariaman | 19.6 | 18.1 | 15.9 | 1.4 |
| 4 | Pesisir Selatan | 19.5 | 26.8 | 0.0 | 0.0 |
| 5 | Padang Pariaman | 15.2 | 21.9 | 8.6 | 3.8 |
| 6 | Pasaman Barat | 8.7 | 12.9 | 4.2 | 0.0 |
| | **Average** | **24.7** | **20.0** | **10.3** | **1.5** |

n=444

**Table A.52: Perception of Government Facilities Requiring Priority Repair**

| No | Damaged Government Facilities | Damage | Repair Priority |
|---|---|---|---|
| 1 | Government office (village, sub dist, city | 11.5 | 28.4 |
| 2 | Public facilities (agricultural, health, social, etc.) | 10.7 | 31.7 |
| 3 | Public activity infra/facilities | 6.2 | 16.3 |
| 4 | Line service offices | 3.0 | 7.7 |
| 5 | Police station | 2.6 | 5.4 |
| 6 | Local Parliament building | 0.5 | 0.9 |
| 7 | Others | 37.5 | 9.5 |

n= 451

## RESULTS OF FGD HELD AS PART OF THE HRNA PROCESS

FGDs were used as part of the HRNA process in order to substantiate the results of the household level surveys.

## COMMUNITY INSIGHTS ON REDUCING RISKS

In the introduction to this section on the perceived needs of affected communities regarding Human Recovery Needs Assessments it was explained that one of the tools used was holding Focus Group Discussions (FGDs) with specially selected representative groups in each district such as community leaders, farmers, fisher folk, etc.

These FGDs yielded rich information and ideas, NOT just about problems, but more important, about the views of affected communities on solutions and ways to reduce risk to future disasters. In

other words, the HOW to respond and recover from what has happened in due to the recent earthquake and landslides in West Sumatra. Below is a selection taken from the FGDs of "Issues" followed by "Identified Needs" or that represent community perspectives on actions that should be taken and HOW they should be done.

### Infrastructure

Issue(s): Community water resources management.

Identified Need(s): As water sources and use has been highlighted to be one of potential community friction, some of the early recovery intervention must be directed towards community-based water source management until the authorities restore the overall water management system.

### Housing

Temporary/transitional shelter. Nine out of ten respondents require temporary/transitional shelter while waiting for their spontaneous / self-supported or assistance for substantial repair to complete reconstruction of their houses.

### Governance

Issue(s): Public and government facilities were extensively damaged therefore their services and administrative functions have been crippled, interrupted.

Identified Need(s): Prioritized restoration of local government's agencies ability to deliver 1) life saving or life sustaining emergency assistance, 2) early recovery planning and implementation 3) to support people's spontaneous recovery and 4) to restore basic services should be done. Transparent participation of communities in early recovery planning (community level, home rebuilding, etc.)

Issue(s): Generally people's trust of government agencies to allow participation and be fair has decreased since the earthquake.

Identified Need(s): Transparent participation of communities in recovery planning and budget decision making, community led development planning and reconstruction.

Issue(s): There is a perception that people and communities will have a difficult time communicating and causing the government to understand their current needs effectively (i.e. type of emergency or recovery assistance they really need, about extent of house damage, type of house they want to re-build, etc.)

Identified Need(s): Provide early recovery community development assistance to communities to ensure input of communities and better ways to plan communities and rebuild houses

### Livelihoods

Issue(s): Demand for general-purpose products (i.e. *Sembako*) has dropped suggesting peoples incomes and livelihoods have decreased.

Identified Need(s): People need livelihood assistance during the coming 6 months to ensure they have incomes.

### Agriculture

Issue(s): Damage or destruction of agricultural irrigation systems will not allow needed water to be delivered to rice paddies and will result in a decline in the economy of the community and loss of many livelihoods. Many farmlands damaged by landslides.

Need(s): Communities must work together using their existing capacity of community self-help systems (*gotong royong*) on emergency repair of agricultural irrigation systems. Immediate (early recovery) provision by Government of funds for emergency repair materials would help this. TNI members could expand and support community self-help systems (*gotong royong*). Build Back Better Opportunity: Improve roads and bridges for better market access for farmers and re-located or designed differently so landslides will not block them after earthquakes or rains in the future.

### Health

Issue: Many school children are experiencing trauma which is affecting their schooling and their daily lives.

Need(s): Conduct trauma counseling at schools for school children and students

### Shelter

Issue(s): People and communities would like to re-build their houses so they will not be damaged again by earthquakes or landslides again but don't know how.

Issue(s): People are concerned that that they will not be given enough money to rebuild a disaster resistant house or that they will be required to pick a pre-identified design or construction system.

Issue(s): Community self-help systems (*gotong royong*) are seen as one-way to help other community members rebuild their houses.

Issue(s): Houses should be demolished in a safe way and in a way that materials (i.e. doors, windows, hardware, timber, etc.) can be reused when homes are re-built.

Issue(s): Community self-help systems (*gotong royong*) are seen as one-way to help other community members to rebuild.

Identified Need(s): Identify and establish early local government and community agreement on "Build Back Better" disaster resistant house standard rebuilding guidelines.

Identified Need(s): Launch simple public awareness campaign about where to get information on how re-build your house safely ensuring that spontaneous shelter rehabilitation is disaster resistant and

Identified Need(s): Establish "Build Back Better" disaster resistant house information/community outreach centers to provide outreach and information on standard rebuilding guidelines

Identified Need(s): Develop government policy and procedures to ensure that future house construction (after reconstruction) is done using disaster resistant construction and materials to keep a disaster like this from happening again.

Identified Need(s): Early mobilization of and networking with communities, local businesses, CSOs and Civil Society

### Water, Sanitation and Hygiene

Issue(s): Access to clean drinking water is still a challenge.

Need(s): Assessment and emergency/temporary restoration of clean and safe water delivery systems to critical semi-urban and semi-urban facilities (i.e. health facilities, operational schools, government facilities) and for poor communities

### Cross-Cutting – Disaster Risk Management

Issue(s): Government and communities need to improve their preparedness for future disasters and do what is needed to make sure that this will not happen again.

### Cross-Cutting – Restore Basic Services and Infrastructure

Issue(s): There is a need to quickly repair roads and bridges to allow emergency access and rural access to town markets

### Cross-Cutting – Clearing and Demolition

Issue(s): There is a need to support communities to clean-up, clear of debris (especially dangerous houses or structures) using through community self-help systems (*gotong royong*), with the help of TNI or other productive and fast ways

### Cross-Cutting – Psychological

Issue(s): Many people, especially students, are facing trauma and need some way to help them get back to work, school and/or back into their daily lives.
Need(s): Post Disaster counseling from religious orgs

### Cross-Cutting – Conflict

Issue(s): There is a general concern that conflict and mistrust among communities and individuals will increase due to inequities of emergency and recovery assistance. Because of house damage and living in tents survivor's belongings are at risk not secure which may result in conflict and mistrust among communities and individuals. *Sembako* price increases (9 basic necessities) are causing stress economically, especially on the poor and potential conflict.

Need(s): Establish management information systems (MIS) for local government to track who, what, where mapping and gaps/needs of early recovery activities

The two consecutive earthquakes that hit the provinces of West Sumatra and Jambi on 30 September and 1 October caused widespread damage across both provinces, killing over 1,100 people, injuring about 3,000, destroying livelihoods, and disrupting economic activity and social conditions. Resulting landslides in West Sumatra left scores of houses and several villages buried, disrupting power and communications for days. The first of these events was felt across Sumatra and Java in Indonesia, and in neighboring Malaysia, Singapore and Thailand.

These earthquakes are the latest in a series of disasters that have struck Indonesia this year. The Government is managing on-going disaster recovery, reconstruction and rehabilitation efforts across the country, including in Papua and West Java. The Damage and Loss Assessment and Human Recovery Needs Analysis outlined in this report serve to remind us of the hazards that Indonesia faces and help to give an accurate picture of the damage sustained and the needs of those living in the affected regions.

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