

Research on disaster damages of Sumatra Earthquake in Indonesia

October 2009



**Asian Disaster
Reduction Center**

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1. Outline of Research

- Objective

Research on the Sumatra Earthquake which occurred on 30 September 2009 was conducted in Padang city, Pariaman city and Padang Pariaman district to contribute to their rehabilitation.

- Researchers

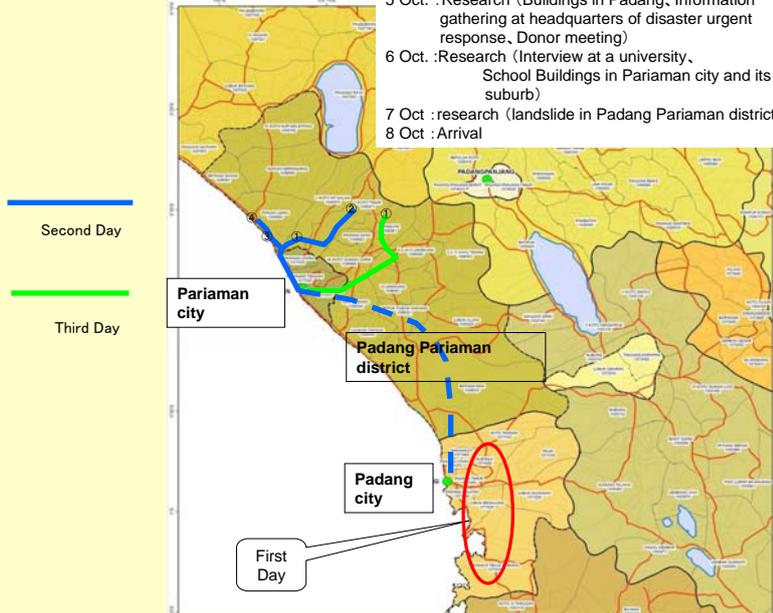
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Masaru Arakida (ADRC : Senior Researcher)

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Institute : Vice Chief Researcher)

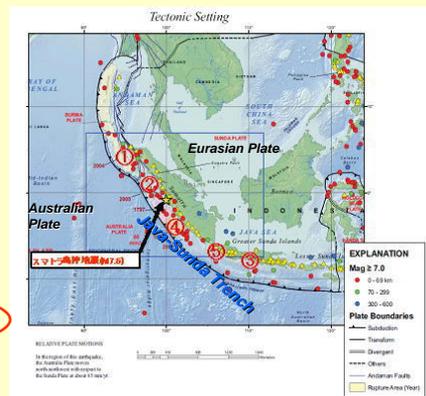
Itinerary

- 4 Oct. : Departure
- 5 Oct. : Research (Buildings in Padang, Information gathering at headquarters of disaster urgent response, Donor meeting)
- 6 Oct. : Research (Interview at a university, School Buildings in Pariaman city and its suburb)
- 7 Oct. : research (landslide in Padang Pariaman district)
- 8 Oct. : Arrival



2. Recent Earthquakes in Indonesia

No.	Date	Place	M	Dead* (Missing)
①	2004/12/26	North Sumatra (Off shore of Ache)	9.1	94,081 (7,191)
②	2005/03/28	North Sumatra (Nias Island)	8.6	905
③	2006/05/26	Java (Yogyakarta)	6.3	5,749
④	2007/09/12	South Sumatra	8.5	25
⑤	2009/09/02	West Java	7.0	81 (47)



Reference : USGS Earthquake Summary Map

*The numbers of the dead and the missing are totals within Indonesia.

3. Characteristics of Damages

- ① First earthquake in Indonesia which caused damages to modern buildings
 - In the centre of Padang city, damages are not ubiquitous but sporadic phenomenon concentrating on three or more-story reinforced concrete buildings.
 - Most of the damaged buildings are public facilities or commercial facilities such as city buildings, schools, hospitals, mosques, hotels and shopping malls.
 - ✘ In the Java earthquake in May 2006, most of the deaths were caused by crushing by collapsed bricks.



First floor crushed

3. Characteristics of Damages

- ② In the large areas of Pariaman and its suburb or Padang Pariaman district, low rise residences and schools were found damaged.
 - Few middle or high rise buildings exist in Pariaman city.
 - Especially in mountainous areas of Padang Pariaman district, damages to villages caused by landslides are devastating.



4-1 Outline of damages (As of 6 Oct.)

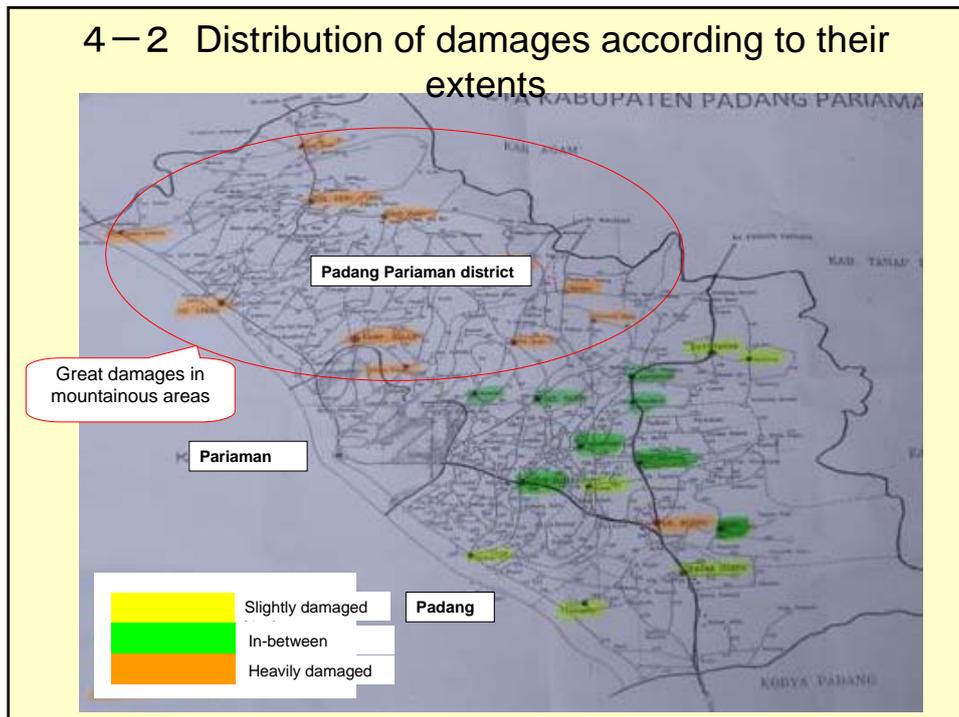
(West Sumatra Province)

- ✓ No. of dead 704 (Estimated death tall is more than 1000 and 4000 people are reported to still be under debris.)
- ✓ No. of missing 295
- ✓ No. of injured heavily: 746、 lightly: 1,455
- ✓ No. of evacuees N. A. (Most of them are temporarily in tents close to their residents)
- ✓ No. of damaged buildings Heavily damaged:

4-2 Characteristics of damages according to cities

- ✓ Padang city
 - The international airport was not damaged.
 - In the city of Padang, public facilities, hotels, large buildings were found damaged.
 - Padang city is located on a coastal plain and have some estuaries. Damages to bridges seemed to be minor. Only one damaged bridge which did not impair the traffic was found on the way to the city centre from the air port.
 - Liquefaction was not found nor the damages of roads.
- ✓ Pariaman City
 - Since few high rise buildings exist there, damages to many one-story residents and schools were distinctive.
 - no liquefaction was found.
 - no damage on roads was found.
- ✓ Padang Pariaman district
 - Damages caused by landslides are devastating.
 - Many one-story buildings were found collapsed.

4-2 Distribution of damages according to their extents



4-3 Conditions of Affected People

- ✓ Shelters
 - Large-scale shelters were not established. Most of victims were living in tents in their premises.
 - In a large scale landslide area we visited last day people were evacuated to big tents. This is not usual.
 - According to a villager in a suburb of Pariaman city, as of 7 October the enough number of tents were not provided for villagers. The villager also complained that while the family who were spending night lying on mats outside of their house cannot sleep well and feel uncomfortable and afraid of earthquakes.
- ✓ Commercial activities in Padang and Pariaman cities such as restaurants shops had been resumes.
 - Prices of dishes in restaurants increased in Padang and Pariaman cities by 20% right after the earthquake but they were decreasing now.
 - Many banks in Padang city were closed due to damages but their effects on citizens' lives are limited.

4-3 Conditions of Affected People

- ✓ We asked residents what kind of trouble they were facing?
 - Delayed delivery of necessities of life.
 - They wanted to know how to retrofit their houses.
- ✓ According to a Japanese aid worker working in Pariaman city, care for residents' stresses are necessary.



4-4 About Emergency Support (1/2)

- ✓ Governments' Activities
 - Information on damages and necessary goods of each community is relayed to head offices of cities and villages through sub-district, finally leading to a national level. According to their requests necessities are delivered but in mountainous areas deliveries are not properly implemented.
 - BNPB (Badan Nasional Penanggulangan Bencana or Disaster Management Agency) stationed in the Governor's House where disaster management center is established.



- ✓ Communication with the National Disaster Management Center
 - Established telecommunication system enable each organization to communicate it headquarters.

4 – 4 About Emergency Support (2/2)

- ✓ Police and Firefighting
 - No confusion was found in the implementation of policing and firefighting within earthquake stricken areas.
- ✓ Foreign aids and activities of NGOs
 - Daily donor meetings were held.
 - JICA set up tents for medical treatment in premise of the mayor house of Pariaman. Emergency rescue activities were declared to be finalized.



4 – 5 Damages of Buildings

- ✓ Characteristics of damages to buildings
 - In Padang city 2or more-story reinforced concrete buildings were damaged with the first floors crushed which are used for parking spaces or shops.
 - According to a resident, there was enough time to go out of a building from its second floor right after the shock. Which seems to suggest that the earthquake did not cause instant destruction to the building.
 - In Padang city few damages to one-story buildings were found.
 - Most of the One-story buildings which collapsed were found to have walls made of bricks without enough mainstays. In some cases of buildings even with enough mainstays brick-made walls were found destroyed.
 - Damages to buildings with heavy upper structure and/or complex structure were distinctive. Buildings with many windows such as showrooms of cars were also found damaged.
- ✓ Features by regions
 - Damages to reinforced concrete buildings in urbane areas and to residents made of bricks in suburbs and mountainous areas are characteristic.
- ✓ Issues
 - Possibility that public buildings do not meet the building design criteria.
 - 3.8 million yen for rehabilitation of each school building are reportedly allocated. It is complained that the amount cannot afford to meet the building criteria.

Situation right after Earthquake



People running out of a hotel
(As of 30 October in Padang)



People evacuating by cars
(As of 30 October in Padang)

Provided by: Mr. Kohichi Shiaku, Earthquake Disaster Mitigation Research Center

Large Facilities in Padang (1/3)



Public facility with the first floor destroyed
and unique big roofs
(Padang as of 5 October)



Showroom with the first floor crushed
(Padang as of 5 October)

Large Facilities in Padang (2/3)



Leaning building with walls which cracked
(Padang as of 5 October)



Commercial building with the first floor
parking lot crushed
(Padang as of 5 October)

Provided by ADRC

Large Facilities in Padang (3/3)



Commercial building with the first floor crushed
(Padang as of 5 October)

We stayed at this hotel.
According to its owner,
the hotel did not
collapse because the
design criteria for
earthquake-resistant
structure were
observed.

Photo by ADRC

Residences in Pariaman city



Destroyed building due to the collapses of brick walls
(Padang as of 6 October)



One-story residence totally destroyed
(Padang as of 6 October)

Photo by ADRC

School Buildings in Padang Pariaman District



Collapsed junior high school's wall with pillars and beams reinforced by steels but the steels are found not connected properly.
(Padang Pariaman district as of 6 October)



Totally destroyed junior high school building with roofs made of a light material- corrugated tinplate- and limited number of thin pillars
(Padang Pariaman district as of 6 October)

Photo by ADRC

Headquarters of disaster risk management



Headquarters of disaster risk management in Pariaman city
Loading relief supplies on a truck for delivery
(On 6 October)



Headquarters of disaster risk management in
Padang Pariaman district while functioning
as a delivery center of relief supplies
(on 6 October)

Photo by ADRC

Victims and Supports



Victims living in tents built next to their
residences
(as of 6 October in Padang Pariaman district)



Base for relief operations including delivery
of supplies
(as of 6 October in Padang Pariaman district)

Photo by ADRC

Damages in Mountainous Area 1/5



100 people were killed by a debris flow.
The school and residences were buried under debris.
(On 7 October in Padang Pariaman district)

Photo by ADRC

Damages in Mountainous Area 2/5



Mosque destroyed by the debris flow
(On 7 October in Padang Pariaman district)

A house which just had a narrow escape from
damage by the debris flow
(on 7 October in Padang Pariaman district)

Photo by ADRC

Damages in Mountainous Area 3/5



List of the killed
(as of 7 October in Padang Pariaman district)

Pictures of buildings before the landslide
(as of 7 October in Padang Pariaman district)

Photo by ADRC

Damages in Mountainous Area 4/5



In Padang Pariaman district, debris flow crushed an elementary school resulting in as many as 100 deaths. Children with "X" on the pictures were ones killed. Those children were at homes which are close to the school.

Photo by ADRC

Damages in Mountainous Area 5/5



Collapsed residence close to the landslide area
(as of 7 October in Padang Pariaman district)



Scenery at the lower reach of the landslide
area
(as of 7 October in Padang Pariaman district)

Photo by ADRC



Restaurant in Padang city

The cook of a restaurant said "As soon as I felt a shock, I turned off fire since I was cooking. There was no damage to the building and reopened the restaurant on 2 October, when supplies of water and electricity recovered. The number of customers has also recovered and I suppose there is no damage to a market. The cost of living has gone up by 20%." (As of 7 October)

Photo by ADRC



Damaged bank office

With the office, the inside of which is not available, employees are working in front of the office. Since the demands of withdrawing were increasing, they were working hard to provide cash for branch offices. (Padang city as of 6 October)

Photo by ADRC



Salim Family, Nagasi Limau Parat, Padang Paliaman (6 October 2009)

Photo by ADRC



POSKO, Community Organization in Padang Pariaman (6 October 2009)

Photo by ADRC