

# POST-TSUNAMI LAND PARCEL RECONSTRUCTION IN ACEH: ASPECTS, STATUS AND PROBLEMS

BENNY, HASANUDDIN Z. ABIDIN, TONY S. HAROEN, ERNA HERYANI  
(National Land Administration Agency of INDONESIA)  
(Geodesy Research Division, ITB, INDONESIA)  
[hzabidin@gd.itb.ac.id](mailto:hzabidin@gd.itb.ac.id)

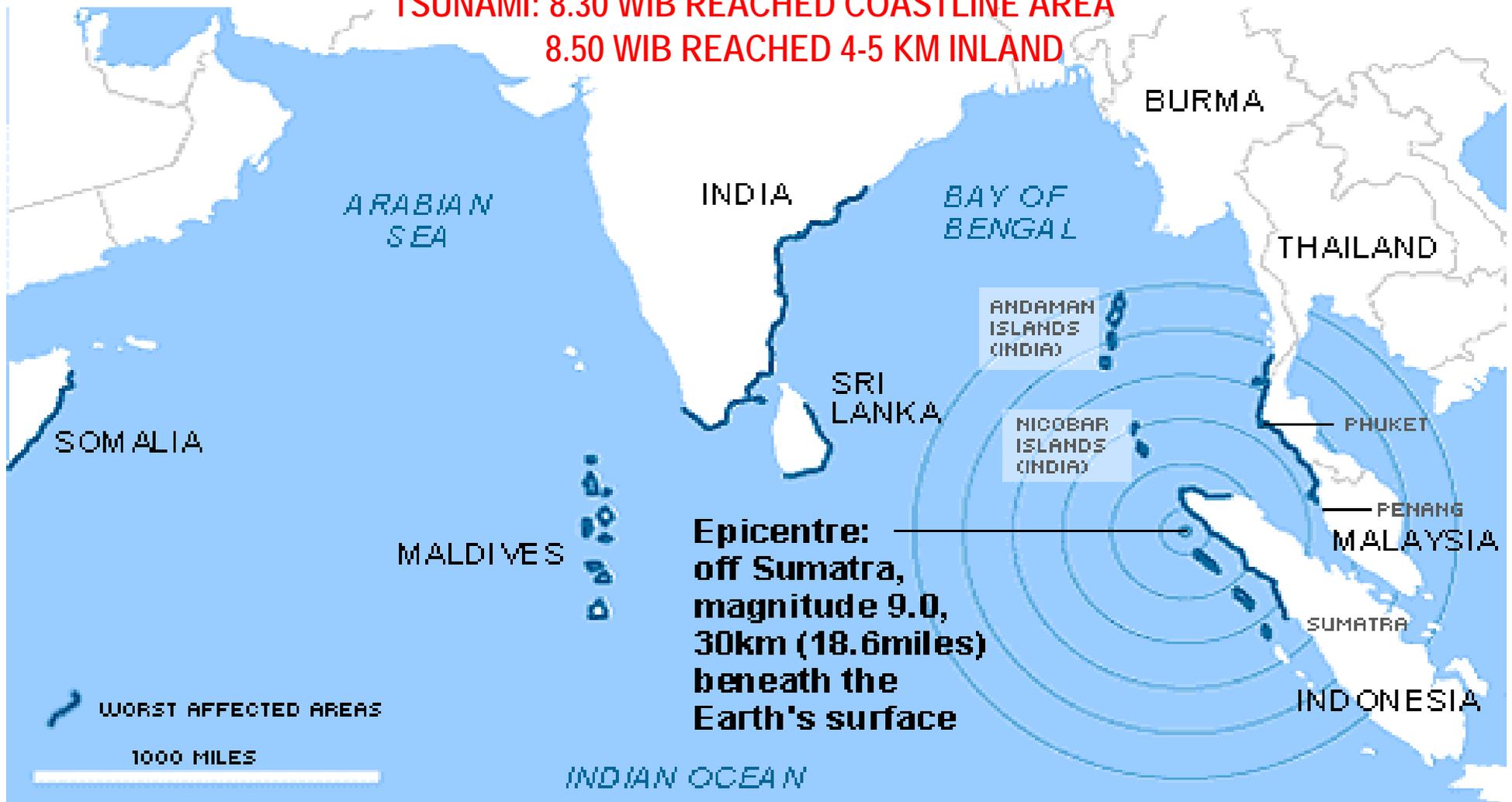
# The 2004 Great Sumatra Earthquake and Tsunami

26 DECEMBER 2004,

EARTHQUAKE: 07.58 Local Time (WIB)

TSUNAMI: 8.30 WIB REACHED COASTLINE AREA

8.50 WIB REACHED 4-5 KM INLAND



# TSUNAMI IMPACTS



Observed  
maximum  
wave height  
 $\approx 34.5$  m



# CADASTRAL RELATED IMPACTS (1)

*1. The disaster has destroyed and wiped away the physical evidence of many land parcel boundaries*



**Parcel boundaries  
are completely disappeared**



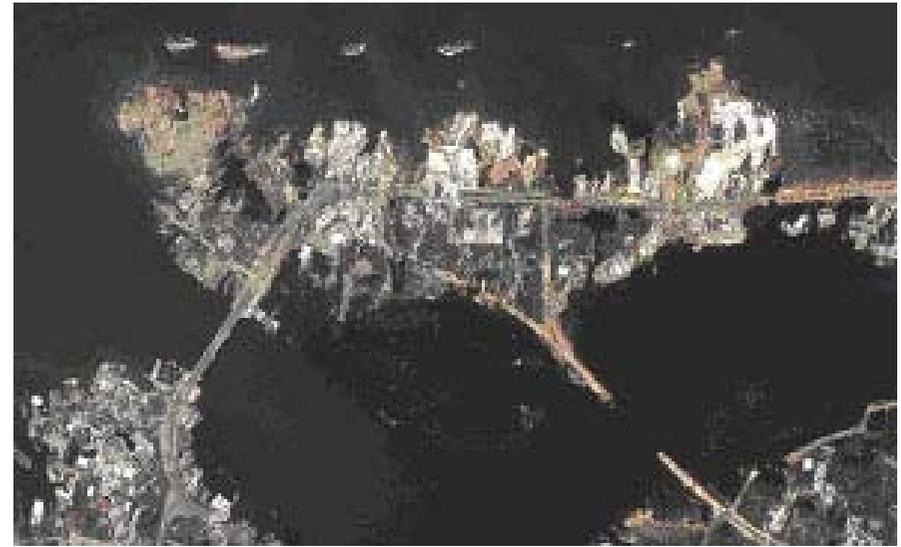
**Parcel boundaries  
are relatively still identifiable**

# CADASTRAL RELATED IMPACTS (2)

## *2. Submergence of parcels along the coast due to tsunami inundation and land subsidence caused by the earthquake*



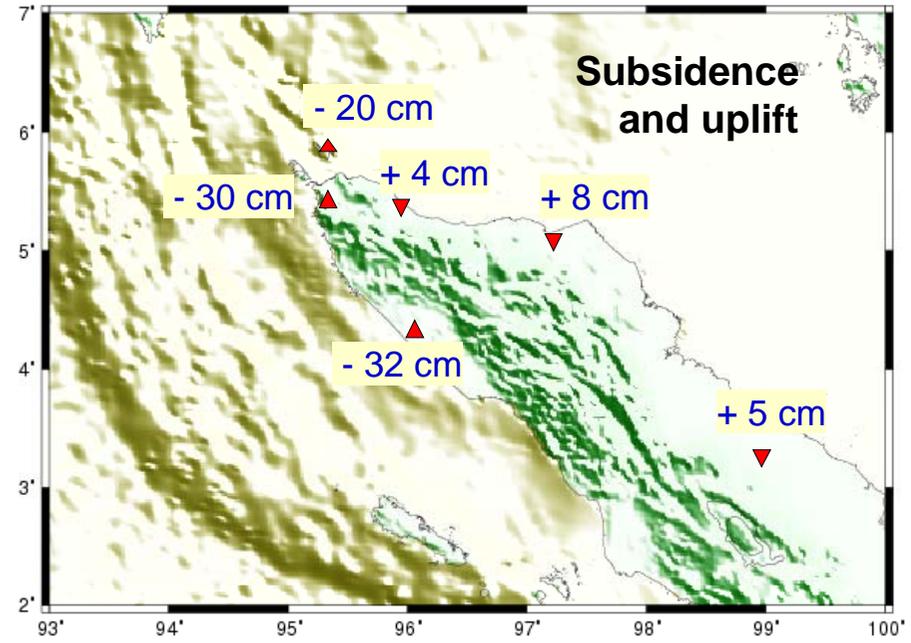
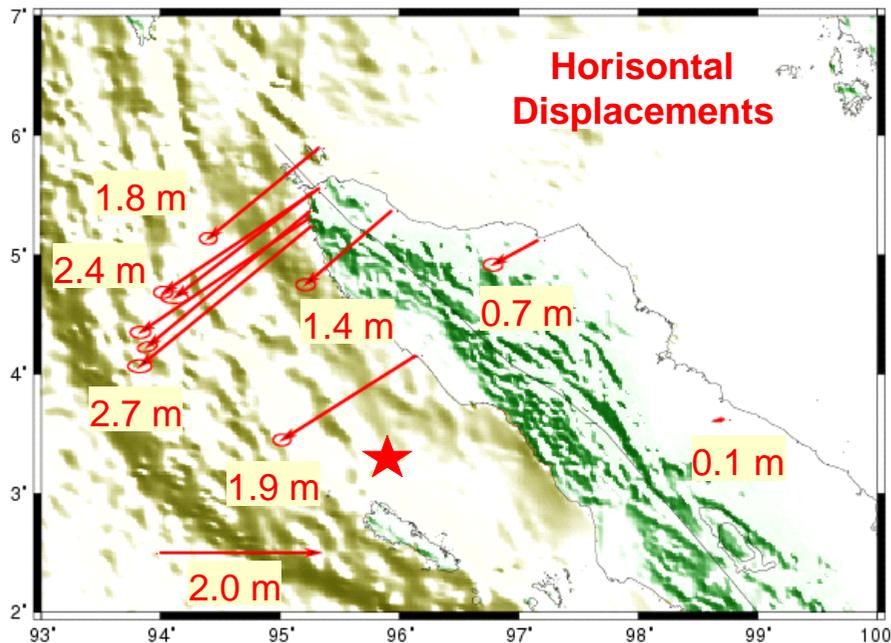
The 23 June 2004 image  
(before Tsunami)



The 28 December 2004 image  
(after Tsunami)

# CADASTRAL RELATED IMPACTS (3)

*3. The December 26th, 2004 earthquake has deformed the earth surface in both horizontal and vertical domain*



# CADASTRAL RELATED IMPACTS (4)

## *4. Loss and serious damage of land books and other land documents, including cadastral maps.*

- about 10% of land books were lost.
- the remaining 90% of land books were found in a critical condition (e.g., flooded with sea water and mud).
- about 80% of land documents were lost.
- almost all cadastral maps are destroyed.

# CADASTRAL RELATED IMPACTS (5)

## *5. Many land owners and their families and/or neighbours were died or missing*

- substantial amount of virtual evidence on land boundaries were also gone and obviously will complicate the reconstruction process.
- the disaster has also washed away substantial witness evidence with the dead or missing of the landowners & their neighbors.
- With the total victims (died and missing) of about 300.000 peoples, it can be expected that many parcels will be affected.

# CADASTRAL RELATED IMPACTS (6)

## *6. Large number of parcels were physically affected by the earthquake and tsunami*

- About 300.000 land parcels have been affected by the tsunami  
→ 170.000 urban land parcels and 130.000 rural land parcels.
- As is the case in many areas of Indonesia less than 25% of land parcels can be expected to be titled. Therefore, of the total number of affected land parcels, approximately 60.000 have been titled (40.000 being urban and 20.000 being rural).
- It is also estimated that 5% of titled land parcels were mortgaged, and these mortgages have been registered by BPN.

# CADASTRAL RELATED IMPACTS (7)

## *7. Significant damages to BPN infrastructures and resources caused by the earthquake and tsunami*

- More than 40 BPN staffs lost their lives, most of them from the Banda Aceh Land Office, which suffered about a 30% staff loss.
- Land Offices, including District Land Office in Banda Aceh were also completely demolished or damaged at different degrees and need to be rehabilitated.
- There was a severe damage and destruction of office facilities, and currently, there is a shortage of computers, photocopiers, scanners, digital cameras, printers, and stationery to support urgent record recovery.

# PARCEL BOUNDARY RECONSTRUCTION PROCESS

Finding the location  
of missing boundary  
Points in the field

- Utilizing GPS technology, if the previous WGS84 coordinates of boundary are known.
- Utilizing terrestrial surveying principles, if the previous coordinates are known in local coordinate system.
- Utilizing natural or man-made objects around the parcels, if they still exist.
- Utilizing the help of aerial photos or satellite imageries of the areas.
- Utilizing information given by the owner (if still alive), inheritor, neighbors, family members, and/or community around the affected parcels.

*Adjudication*

Establishing agreement  
on the recovered location  
of boundary points.

**Consultation and agreement with the owner (if still alive), inheritor, neighbors, family members, and/or community around the affected parcels.**

Coordinate determination  
of the adjudicated  
boundary points

- GPS surveying
- Terrestrial surveying
- Combination of GPS and terrestrial surveying

# RECONSTRUCTION RELATED PROBLEM (1)

1. Most, if not all, of the affected parcels do not have their boundaries' coordinates in WGS84 system. The boundary relocation process using GPS technology, is therefore difficult to or can not be performed.
2. Many cadastral survey monuments were destroyed or missing by the earthquake and tsunami. This complicates the boundary reconstruction of parcels which their coordinates are related directly or indirect to this survey monuments.
3. Because of very strong earthquake and damaging tsunami, many man-made and natural objects have gone or destroyed. This will complicate the rough location searching of the parcel boundaries.

# RECONSTRUCTION RELATED PROBLEM (2)

4. Many parcels along the coast has either totally or spatially submerged by seawater inundation. This phenomena complicate the searching and relocation of the affected parcel boundaries.
5. Many owners or inheritors of land parcels are died or missing because of disaster. This will complicate the verification of parcel boundaries obtained by the reconstruction process.
6. Many land certificates (books) and other land documents, including cadastral maps, were destroyed or missing because of disaster. With this a lot of information on land parcel boundaries were also vanished, and make the land reconstruction become more difficult.
7. There are fake statement of land ownership made by some irresponsible peoples.

# REMEDIAL ENDEAVORS → RALAS Project

National Land Administration Agency (BPN) undertakes remedial endeavors under special project of **RALAS (Reconstruction Of Aceh Land Administration System)**,

## THE SPECIFIC OBJECTIVES OF THE EFFORTS ARE:

- (1). to recover and protect ownership land rights; and
- (2). to rebuild the land administration system.

## THE PROJECT WOULD INCLUDE THE FOLLOWING COMPONENTS:

1. reconstruction of land records, community-driven adjudication, surveying and mapping, registration of rights and issuance of title certificates and assistance in policy, legal and regulatory issues;
2. reconstruction and rehabilitation of land offices that were destroyed or damaged by tsunami, provision of necessary equipment, training and capacity building for the BPN staff, computerization and development of a back-up system for land-related data; and
3. support to project management, monitoring and evaluation, complaint handling mechanism and technical assistance to support project implementation.

# RALAS and Roles of BPN

The central part of BPN efforts in performing restoration of land records :

1. to reconstruct the land administration records system in the tsunami-affected provinces and
2. to recover the property rights of both formal and informal land holders.

## THIS INCLUDES:

1. reconstruction of land records damaged by tsunami;
2. community-driven adjudication, public awareness and participation;
3. surveying, mapping and adjudication of land parcels to enable property rights to be registered and certificates of title to be distributed to land holders or their heirs; and
4. preparation of new regulations, laws and decrees to support the expedient implementation of the project.

# RALAS and Other Projects

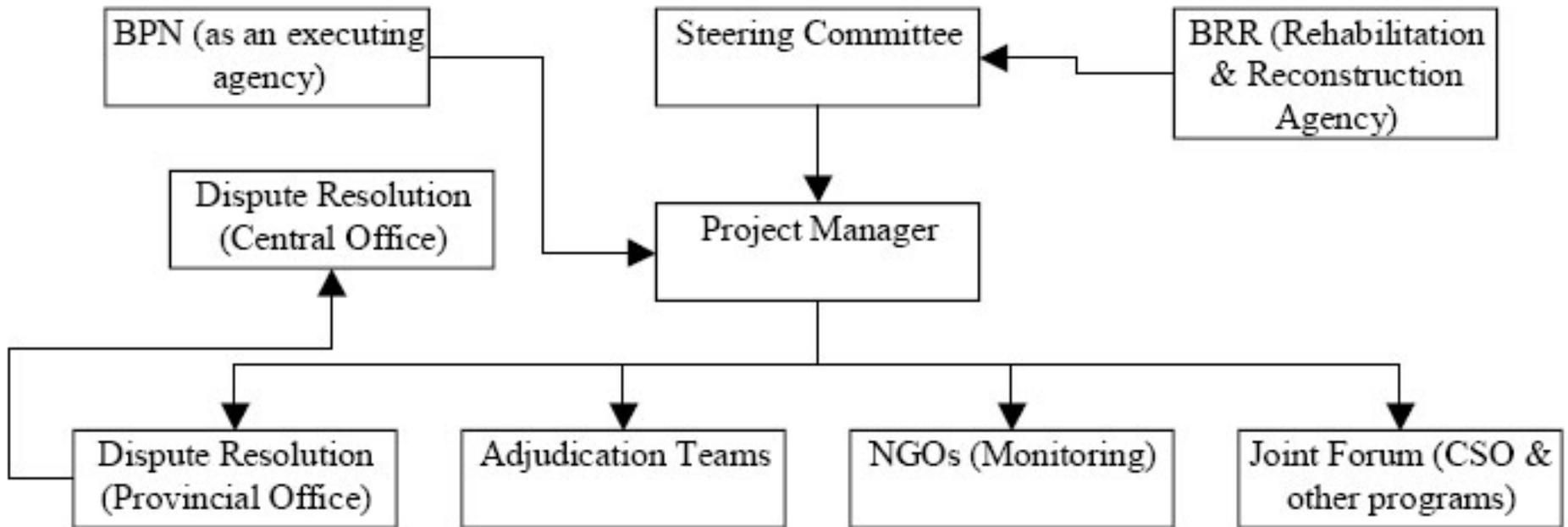
The RALAS project has been closely coordinated with other donors' activities related to land, notably :

1. **Restoration of land records** financed by JICA,
2. **Development of aerial photography maps for Aceh**, funded by the Government of Norway, and
3. **Other programs** supported UNDP, AusAID and UN Habitat.

# RALAS and NGOs

1. RALAS is also working with a number of NGOs and providing them training and support.
2. Through RALAS, particularly by CDA (Community-Driven Adjudication), BPN aims to ensure that community-led processes are conducted to a standard that will have a strong legal basis for future titling if desired by land owners.
3. The roles of NGOs in CDA include:
  - facilitating community agreement on ownership and boundary demarcation;
  - facilitating community-based dispute resolution; independent monitoring of land reconstruction; -
  - strengthening community institutions and decision-making processes with special attention to the rights of women, children and orphans.

# Organization of CDA (Community-Driven Adjudication)



# RESTORATION OF LAND RECORDS (1)

- Tsunami damaged all of land records that were stored in the BPN province office and district land offices.
- All of these records were paper-based and stored on the ground floors of the respective buildings.
- Severe damage was sustained by all land register books (which hold the title certificate records) and all cadastral land parcel plans.
- Unfortunately, all of the cadastral index maps, showing land parcels were irretrievably damaged.
- No duplicate copies of these index maps are held outside of the offices.

## RESTORATION OF LAND RECORDS (2)

- Almost 15 tons of land records have been airlifted to Jakarta for stabilization, and have been stored in a freezer with a special chamber for controlled vacuum drying.
- During the following 12-15 months, the records to be recovered have been specially treated and cleaned to enable digital reproduction using mounted 8 mega pixel cameras.
- Undertakes construction of new land offices to replace the ones destroyed by the tsunami, and the repair/renovation of the damaged offices.
- Training and capacity building of BPN staffs.
- The key outputs of the recovery of land records are digital land records and a computerized land records management system.
- Start a future program of Computerization and Development of Back-up System.

# SURVEYING AND MAPPING, REGISTRATION OF RIGHTS AND ISSUANCE OF TITLE CERTIFICATES (1)

The priority of effort for providing security of property rights are:

- (a) **Priority 1** – areas designated as settlement and housing areas, including areas necessary for the construction of public buildings such as schools, hospitals and government offices (estimated at 100,000 parcels);
- (b) **Priority 2** – all other tsunami affected areas (estimated at 200,000 parcels); and
- (c) **Priority 3** – land areas immediately adjacent to tsunami affected areas (estimated at 300,000 parcels).

# SURVEYING AND MAPPING, REGISTRATION OF RIGHTS AND ISSUANCE OF TITLE CERTIFICATES (2)

Activities supported by the RALAS project include :

- (1). acquisition of suitable high-resolution pre-tsunami satellite imagery to prepare maps to support BPN's mapping, surveying and adjudication and to also prepare maps to be provided for CDA;
- (2). adjudicate community to prepare a complete official inventory of land parcels, parcel boundaries and land holders;
- (3). survey all land parcels and produce digital cadastral records and index maps necessary for the land administration system;
- (4). validate CDA and distribute land titles for previously titled land and also informal lands for which legitimate possessory rights can be claimed;
- (5). additional land surveying, geodetic infrastructure, mapping and imagery to support post-tsunami reconstruction of affected and adjoining areas.

# SURVEYING AND MAPPING, REGISTRATION OF RIGHTS AND ISSUANCE OF TITLE CERTIFICATES (3)



Example of parcel boundary determination in Aceh with GPS.

120 parcels in 1 day



Example of parcel boundary determination in Aceh with Total Station

110 parcels in 4 days

# SURVEYING AND MAPPING, REGISTRATION OF RIGHTS AND ISSUANCE OF TITLE CERTIFICATES (4)

An example of mapping process in the village of Kajhu, Aceh Besar involving people as the key stakeholder



# IMPACTS OF SOCIAL ISSUES TO LAND RECORDS

There are three critical social aspects that affect decisions on property rights that have impacts to land records:

1. **inheritance aspects**, especially that many members of the community have died → *about 100,000 inheritance cases.*
2. **potential land conflict**, not only outside the family structure, but also within the family; and
3. **rights of surviving widows and children**, some of which were adopted outside the community → *around 10,000 children orphaned by the tsunami.*

# Closing Remarks (1)

1. Land reconstruction process in Aceh after the earthquake and tsunami of 26 Dec. 2004 is indeed not an easy task to accomplish.
2. Many technical, social and legal complications that have to be taken into consideration.
3. The previously turbulence political background in Aceh region and the peace efforts that are being established among a few fractions there, should also be taken into account; especially in establishing a reliable and stable land administration system in the future.

# Possibility of Land-Owner-Document Condition

<i>No.</i>	<i>Land Parcel</i>	<i>Owner</i>	<i>Land certificate</i>	<i>Official Document</i>
1.	<i>Exist</i>	<i>Exist</i>	<i>Exist</i>	<i>Exist</i>
2.	<i>Exist</i>	<i>Exist</i>	<i>Exist</i>	<i>No</i>
3.	<i>Exist</i>	<i>Exist</i>	<i>No</i>	<i>Exist</i>
4.	<i>Exist</i>	<i>Exist</i>	<i>No</i>	<i>No</i>
5.	<i>Exist</i>	<i>No</i>	<i>Exist</i>	<i>Exist</i>
6.	<i>Exist</i>	<i>No</i>	<i>Exist</i>	<i>No</i>
7.	<i>Exist</i>	<i>No</i>	<i>No</i>	<i>Exist</i>
8.	<i>Exist</i>	<i>No</i>	<i>No</i>	<i>No</i>
9.	<i>No</i>	<i>Exist</i>	<i>Exist</i>	<i>Exist</i>
10.	<i>No</i>	<i>Exist</i>	<i>Exist</i>	<i>No</i>
11.	<i>No</i>	<i>Exist</i>	<i>No</i>	<i>Exist</i>
12.	<i>No</i>	<i>Exist</i>	<i>No</i>	<i>No</i>
13.	<i>No</i>	<i>No</i>	<i>Exist</i>	<i>Exist</i>
14.	<i>No</i>	<i>No</i>	<i>Exist</i>	<i>No</i>
15.	<i>No</i>	<i>No</i>	<i>No</i>	<i>Exist</i>
16.	<i>No</i>	<i>No</i>	<i>No</i>	<i>No</i>

# Closing Remarks (2)

4. For successful reconstruction and restoration program of Aceh, it is compulsory that land rights recovery and protection should be completed as soon as soon as possible.
5. Recovering and protecting land property rights will place a solid foundation for reconstruction work, spatial planning, compensation, and long term economic development; and it is also essential for establishing social justice and ensuring long-term social stability.
6. Effective and efficient land reconstruction in Aceh will also require conducive cooperation and communication among all stake holders, e.g community, central and provincial governments, and the NGOs .

*Thank You*