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Some efforts for re-mapping the area and securing the available documented articles affected by tsunami in Aceh, Indonesia

Keywords: Re-topographic mapping; map archives; inter-institutional cooperation; rehabilitation and reconstruction of tsunami affected areas.

Summary

BAKOSURTANAL as a National Mapping Agency has re-mapped areas affected by tsunami disaster, by photographing all the coastal area of impacts to provide geospatial data for development of Aceh and Nias island. This activity, of course, supports the role and task of Bureau of Rehabilitation and Reconstruction (BRR) in Aceh. On the other hand, several maps related to land titles has been washed off by the tsunami waves during the such natural hazard occurred in the area of Aceh or Nanggroe Aceh Darussalam (NAD), Sumatra Indonesia on December 26, 2004. However, some efforts has been done to preserve the available important maps and documented articles. The National Land Agency (BPN) and National Archives of the Republic of Indonesia (ANRI) have successfully done such efforts with special machines to process assisted by Japan International Cooperation Systems (JICS) and Japan International Cooperation Agency (JICA). There are about 84 cubic meters records, including 255 maps being secured. On the final processing, a digital approaches can be introduced to secure the valuable documents to develop and build Aceh as before.

Introduction

BAKOSURTANAL has responsibility in providing national spatial base data such as topographic maps and other spatial data, in helping the disaster or natural hazard management in Aceh and North Sumatra Provinces. Other thing is to provide spatial information to establish spatial planning and action plan for disaster areas. Topographic maps of Aceh (NAD) and North Sumatra in the scales of 1:50,000, 1:250,000 and Marine Environmental Maps, scale of 1:500,000, and Atlas in the scale of 1: 600,000 in the forms of printed maps, can be downloaded from website: www.bakosurtanal.go.id.

The existing topographic maps in Aceh and Nias island are available in BAKOSURTANAL at the nominal scale of 1:50,000. These topographic maps provide information about transportation (roads), water bodies (river, pond and coastline), relief (contour) and control points, general land use (settlement, forest, pond, rice field and buildings), administrative boundaries and geographical names. Even though this map was printed in 1976, as a starting phase, relatively stable information like main road, height, river features still can be used as references

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and as basis for planning. Topographic maps can be used for National Land Agency (BPN) and other institutions for the purpose of thematic (land) mapping. Any new and updated geospatial information related to mapping the area of disaster are available in BAKOSURTANAL through Bureau of Rehabilitation and Reconstruction (BRR) for the uses of development program of Aceh.

Due to destructions caused by tsunami, the presentation of map content would not be actual anymore. Many geographic features being devastated cannot be shown on the existing maps. This is the reason why re-mapping the area affected by tsunami is necessity. Relevant geospatial technology will be applied for supporting survey and mapping activities in Aceh. The result will generate new maps which can be beneficially used as a base line planning for rehabilitation and reconstruction of the area. Besides updated maps as a plan, securing important documented articles through archiving is also required.

National Archives of the Republic of Indonesia (ANRI)

ANRI is a Non Departmental Government Agency has responsibility in preserving documents, including cartographic documents, such maps, etc. There are about 99,794 maps, including 3,072 maps from BAKOSURTANAL kept at ANRI. It should be noted that the oldest map dated in the early 17th Century.

On 26 December 2004 an earthquake occurred about 150 km of the coast of Nanggroe Aceh Darussalam (Aceh). This was the second largest earthquake in the world over the past generation. Forty-five minutes after the earthquake, a tsunami wave struck Aceh and within just a few minutes the wave flattened a 800 km. stretch of Aceh's coast- almost the same distance between Paris and Berlin overland or equivalent to coastline from San Francisco to Santiago. This natural disaster killed some 132.000 people with 37.000 still missing (BRR, 2005).

Damages on the properties and land administration were severe. The violent natures of the destructions, combined with the large death tolls, have wiped out the marks on the ground which define real property boundaries and brought about the properties with no owners and even the heirs. In additions, the destruction of land books and cadastral maps in several land offices were also serious. It will make the reconstruction of property rights even more difficult. Furthermore, several land offices were either completely destroyed or structurally damaged as well. These widespread destructions have resulted in significant legal and physical insecurity in land and property rights. The disaster affected areas were about 220 km long and around 5 km wide along the coastlines of Aceh and North Sumatra. In Banda Aceh City, the tsunami affected areas accounted for 70% of the district's total area. In Aceh Besar Regency and Aceh Barat Regency, over 90% of their geographical areas were affected by the tsunami. The tsunami destroyed many physical evidences of property boundaries. The devastated area conditions and the disaster trauma have also led the suffered citizens having difficulties to reconstruct the boundary of their properties. Approximately 300,000 land parcels have been affected by the tsunami. These encompass 170,000 urban land parcels and 130,000 rural land parcels. As it is the case in many areas of Indonesia, less than 25% of them are estimated had been registered or titled. Therefore, the total number of affected land parcels are

approximately 60,000 titled (40,000 in urban and 20,000 in rural areas). It is also estimated that 5% of titled land parcels were mortgaged and registered. (Winoto, 2006).

The forceful and gigantic earthquake and tsunami waves have not only destroyed the land and the people but also destroyed documents, both records, including vital records as well as archives. This unprecedented devastation has got global response, including recovery the documents. With the help of the Japanese government, National Archives of the Republic of Indonesia and the Land National Agency had successfully salvaged 6,565 land document books, corresponding to 42,966 land titles or totally about 84 m³. that had been submerged in mud. BPN estimates around 10% of land books were lost. However, the significant amounts of the remaining 90% of land books were found in a critical condition (e.g., flooded with sea water and mud). These shall need urgent (within a short period of time) conservation and restoration works. In addition to the land books, there were also serious loss of other kind of land documents (Winoto, 2006).

Response to the salvage the records

On 29 December 2004, three days after tsunami, Director General of the ANRI made a recovery plan for Aceh documents, i.e.:

- (a) Recovery plan for vital documents
- (b) Recovery plan for historical documents

On the 1st January 2005, seven days after tsunami, Director General of ANRI sent his staff to visit Aceh in order to see the condition of the documents and make a documentation. In the first week of February 2005, the Director General of ANRI visited Aceh and make coordination how to salvage the documents both vital and historical documents. The priority was to recover the vital documents of the National Land Agency (BPN) of Banda Aceh.

Almost one month (second week of January to first week of February) the staff of the BPN *soaking up the sun for drying* the vital documents which had been washed from muddy. They did not know that soaking up the sun for drying documents made the documents brittle. This activity had been stopped after hearing advise from the Indonesian National Archivist.

It should be informed that after tsunami struck in Aceh, a committee for saving cultural heritage damaged by Earthquake of Sumatra subsequent tsunami was set up in Japan. The committee consisted of 5 experts, i.e.: Mr. Shigeo Aoki, Mr. Masahito Ando, Mr. Teruko Saito, Mr. Isamu Sakamoto, and Mr. Masaya Takayam. Unfortunately the committee concerned more on historical documents rather than vital documents/records. On the other hand, the Japan International Cooperation (JICA) concerned more on vital records of the BPN rather than archival documents.

Actually, equal attention should be given to vital records as well as archival records. It should be noted that the function of ANRI is not only dealing with the management of archives but also dealing with the management of records. Land records or vital records of the BPN should be given first priority because land they related to the right of ownership of the society. Moreover, the delay of the recovery and restoration of the land records can trigger social, economic and politic in stabilization. Recovering and restoring land documents/records are also very important in order to support the Memory of Understanding between the Govern-

ment of the Republic of Indonesia and the Free Aceh Movement (GAM) signed in Helsinki on 15 August 2005. It seems that the tsunami gave the chance for peace, and the reconstruction effort presents an opportunity to strengthen that peace by bringing entire communities together to plan for their future. (BRR, 2005)

Fortunately, after the Indonesian Government requesting the Japanese Government to support the restoration of the damage land register documents/records, the government of Japan agreed to give a grant aid (except Vacuum Freeze Dry Chamber = as a landing equipment) to the government of Indonesia for recovering land records of the BPN, but not for recovery for historical records kept by Provincial Archives of Aceh. The government of Japan gives technical assistants, materials, and equipments. It should be informed that starting 23 February 2005 JICA dispatch an expert (Mr. Sakamoto) and provided necessary equipments, such as plastic boxes, etc. for the restoration support. The important equipment is one Vacuum Freeze Dry Chamber, one freezer and ten digital scanning cameras. The Vacuum Freeze Dry Chamber and freezer had been installed at the ANRI and the operation was officiated by the State Minister of Administrative Reform on 23 November 2005. It should be noted that the Vacuum Freeze Dry Chamber was sending to the ANRI after the Director General of ANRI signed the statement. The statement was signed on 27 July 2005, as follows:

- (1) We hereby state that 1 unit of Freeze Dryer (Model: FP-20-MB) provided by Ogawa Seiki Co.Ltd., 22 Sankyo Bldg., 2-9, Okubo 2-chome, Shinjuku-ku, Tokyo, Japan as per Contract No. NPTRI04-I301 shall be used only for re-conditioning for soaked papers and documents at the Arsip Nasional Republik Indonesia, Jl. Ampera Raya No.7, Jakarta 12560, Indonesia and shall never be used for the other applications.
- (2) We shall use the above mentioned products or any replicas for civil use only. We shall never use the products or any replicas for development and/or manufacture of weapons of mass destruction such as nuclear weapons, biological weapons, chemical weapons and missiles.
- (3) We shall never re-sell, re-transfer or re-export the products or any replicas to any other parties without your prior written consent.

In short, about 84 m³ land records were submerged and muddied could be saved after cleaning by water, the documents were soaked in the ethanol (alcohol: 70%). The use of ethanol had actually used to stop the growing of bacteria and fungus. In addition the use of ethanol was also to protect humans from the diseases. This activity had been done by 40 (forty) people from National Archives, National Library, Provincial Archives and BPN from February to March 2005. This activity is done under guidance of Mr. Sakamoto, a Japanese expert in paper conservation. The documents are keeping in wet and packed into plastic container and sealed. On 15 March 2005, the records were transported from Banda Aceh to Jakarta (by military transport aircraft, Hercules) in order to be restored. The documents had been stored in the cold storage minus 30° C to 40°C before drying by Vacuum Freeze Dry Chamber. The Chamber and the big Freezer were installed at ANRI in the end of October 2005.

Drying documents using the Vacuum Freeze Dry Chamber starting on 23rd November 2005 and it was officiated by Minister for Administrative Reform. The process of drying using the chamber is about 5 to 7 days (1 time = 52 trays = ± 104 bundles of documents). After drying, the documents are scanned. All the documents/records of the BPN (84 m³) have already been

drying and then the documents will be digitalized by digital camera scanner to build up cadastral map database of land titles. These activities are expected to contribute to the rehabilitation and reconstruction process in Banda Aceh by enabling more rapid data search on land titles. (http://www.id.emb-japan.go.jp/news05_54e.html)

Stages of efforts

There are two stages of effort to support rehabilitation and reconstruction of destructed area by tsunami in Aceh and South Sumatera: (1) to remapping topographically the area, and (2) to secure important documents.

Efforts for re-mapping Aceh

Reconstruction and rehabilitation of tsunami affected area of Aceh need a basic data called topographic map. Re-mapping (topographic) the coastal area becomes necessity for the benefit of physical planning of reconstruction the area.

To know more about the condition of disaster area, Fig. 1 illustrates the land before and after tsunami hitting the province of Nanggroe Aceh Darussalam (NAD). The extend of destructed area after tsunami can be clearly seen on Ikonos satellite image by changes of color.



Figure 1: Ikonos satellite images of NAD (a) before (Jan 10, 2003) and (b) after tsunami (Des 29, 2004) [spaceimaging.com]

Again, the role of BAKOSURTANAL in this case is to re-map the areas for the purpose of rehabilitation and reconstruction.

There are at least three activities as a grant from Norway, Australia and France to help in rehabilitating and constructing the tsunami impacted area in Aceh. First, Norwegian support (The Norwegian Agency for International Development/ NORAD) as a grant for the activity of digital aerial photography and Emergency GIS for Northern Sumatra in 2005. The purpose of this activity is to provide updated and reliable information on the actual status of the area hidden by the tsunami. The updated geo-spatial information collected will create the base for planning of the reconstruction. The result is digital base maps in nominal scale of 1 to 5,000 covering an area of 450 square kilometers and digital base maps in nominal scale of 1: 10,000 covering an area of 3, 014 square kilometers has been completed. About 6350 km² of Acehese coastal regions were covered. The potential use of the activity results (mapping products: digital orthophotos and base maps), will be excellently suited for the rehabilitation and reconstruction works, like for town planning, land titling, infrastructure (railways, harbors, dams, road etc., including cut and fill calculations). Secondly, Aceh Mapping Assistance Project Phase I and II through the Australian Agency for International Development (AusAID) as part of subsidiary arrangement in the form of the Australia Indonesia Partnership for Reconstruction and Development (AIPRD) in 2006. The result of the activity is data acquisition for Nias (completed) while for Aceh data is still in processing. Phase I has been already done, while phase II will be started April 30, 2007. Thirdly, France help to survey and complete line mapping of the main urban area of Nanggroe Aceh Darussalam where are damaged by the tsunami on December 26, 2004.

In the survey work, collecting data and geo-spatial information using GPS technology. Survey of 540 km² to complete topographic maps in the scale of 1 : 10,000 covering geographical names (toponymy), road/ street names (odonymy), localization, category and functions of buildings, administrative boundaries, and street graph. There are some productions like urban topographic maps, scale 1 : 10,000 (Banda Aceh, Meulaboh, Sigli, Bireun and Lhokseumawe); Urban maps of Meulaboh, Banda Aceh, in the scale of 1: 15,000; and general sight of the province of NAD, 1: 250,000. In the operation, surveyed data and GPS to geographic information systems can be integrated.

Effort to secure land documents (records/archives), including maps

There are several activities to secure land documents including maps, as follows:

- a) Washing and cleaning the documents from any dirt,
- b) Soaking documents in the ethanol (alcohol 70%)
- c) Wrapping the documents in a waterproof paper and put in the plastic box,
- d) Transporting the documents from Banda Aceh to Jakarta by Hercules
- e) Storing the documents in the cold storage minus 30-40⁰C in Fisheries Company in the North of Jakarta
- f) Transporting the documents from cold storage to ANRI ,
- g) Defrosting the documents in the special room (24 hours),
- h) Putting the documents into Freezer (24 hours),

- i) Putting the documents into Vacuum Freeze Dry Chamber (5-7 days or 120 to 160 hours),
- j) Transporting the documents to the Conservation Room,
- k) Cleaning the documents
- l) Restoring the documents using *leaf casting machine* and by traditional method.
- m) BPN's main concerns in performing restoration of land documents/records are to reconstruct the land administration records system in the tsunami-affected provinces and to recover the property rights of both formal and informal land holders. These include: (i) reconstruction of land records damaged by tsunami; (ii) community-driven adjudication, public awareness and participation; (iii) 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 (iv) preparation of new regulations, laws and decrees to support the expedient implementation of the project. (Winoto, 2006).
- n) It has been mentioned before that there were 255 maps which had been rescued. The size of the map: 105x74 cm (172 maps) and 57x74 cm (83 maps). These maps are restored by traditional method and can not be restored by leaf casting machine.
- o) Digitizing documents/records by digital scanning camera.

It should be informed that on 29 March 2007, the Indonesian Parliament approved the draft of the Disaster Prevention Act which covers that documents/archives should be protected from disaster.

Before entering closing remarks, allow us to quote statements, as follow:

“Archives are an essential part of the cultural heritage of the global community. They contribute to establishing and maintaining the diversity of the world's culture” (Axel Plathe, 1999)

“A Nation without archives would get an amnesia collective syndrome and will be trapped in the present which full of uncertainty. Therefore, it is not mistaken if it is said that archival condition of nation can be seen as indicator of their sturdiness of the spirit of nationalism” (Moerdiono, 1996)

Closing remarks

There are two parallel actions of the Government of Indonesia to secure geo-spatial information documents to support the development of NAD:

- a) BAKOSURTANAL as a National Mapping Agency has conducted re-mapping the area, by photographing all the coastal area of tsunami impacts, and support the activity of BRR in Aceh.
- b) ANRI, BPN and assisted by JICA secured many damaged maps and documented articles related to land titles in the area. There are 84 cubic meter articles, including maps being secured. On the final processing, a digital approaches can be introduced to secure the valuable document to develop and build Aceh as before.
- c) For reconstruction and rehabilitation of the disaster area, helping from governmental institution is required. BAKOSURTANAL, ANRI-BPN, is an example three gov-

ernmental institutions done integrated and cooperative work in order to make and build Aceh development.

Acknowledgement

Special thanks to Ir. Rudolf W. Matindas, MSc., Head of National Coordinating Agency for Surveys and Mapping (BAKOSURTANAL) for his supports.

References

Albia, J. Van (2006), Management of Disaster Prevention and Archives Preparedness, *International Gathering on Tsunami and Archives: the Unexpected Possibilities*, Jakarta: 17 – 18 July, 2006.

Archival Act Number 7 of 1971

BAKOSURTANAL (2005/6), Cartography for the Rehabilitation and Reconstruction of Nanggroe Aceh Darussalam (NAD), *Progress Report version 4*, Jakarta: Enrique Indonesia Edition.

BAKOSURTANAL (2005), Creation of An Emergency GIS for the Rehabilitation and Reconstruction of Nanggroe Aceh Darussalam (NAD) and Northern Sumatera (Sumut), *Final Report*, Jakarta: Blom.

BRR (2005), *Aceh and Nias one year after the Tsunami : the Recovery Effort and Way Forward*. Banda Aceh.

BRR (2006), *Building a land of Hope : One year report Executed Agency of the Rehabilitation and Reconstruction Agency for Aceh and Nias*, April 2006.

BRR (2007), *Sekilas Pelaksanaan Terkait Pengelolaan Data Keruangan (Geospasial) di Naggroe Aceh Darussalam (NAD)*, Presentasi Deputi Operasi di DPR, 2 Maret 2007.

Circular of the Minister for Administrative Reform SE/06/M.PAN/3/2005 on Disaster Prevention and Recovery Plan.

Committee on Disaster Prevention (1997), *Guidelines on Disaster Prevention and Control in Archives*, ICA, December 1997.

Disaster Prevention Act (Draft), (2007).

Disaster Preparedness and Collection Salvage Plan, by Los Angeles Preservation Network. Los Angeles: LAPNet, 1996.

Dean, J. F, (2001), *Disaster Preparedness and Recovery Planning and Precautions in Time of War and other Catastrophe*, Jakarta: International Conference on Preservation of Archives in Tropical Climates.

Diposaptono,s. & Budiman (2006). *Tsunami*, Bogor: Penerbit Buku Ilmiah Populer.

Fortson, J. (1992). *Disaster Planning and Recovery: A How-To-Do-It Manual for Librarians and Archivists*. New York: Neal-Schumann Publishers, Inc.

Heritage Emergency National Task Force (1997). *Emergency Response and Salvage Wheel*. Washington DC.

International Preservation News

Kompas/KCM (2005), *Tanah Rakyat Aman*,

<http://www.kompas.com/kompas-cetak/0501/12/geliat/1496542.htm>

Menyelamatkan Marwah Bangsa, *Media Kearsiapan Nasional*, Edisi 46, 2006, Jakarta: pp. 5-12.

Presidential Speech on Leader's Summit, January 6, 2004.

Press Release 2005: *Starting Final Process Banda Aceh Land Title Document Restoration*, 23 November 2005. http://www.id.emb-japan.go.jp/news05_54e.html

Press Release 2004: *Gempa dan Tsunami di NAD dan Sumut, Ketersediaan Data dan Informasi di BAKOSURTANAL*, 11 January 2004. <http://www.bakosurtanal.go.id>

Planet Ark (2005), *Washed off the Map, Acehese Chart Uncertain Future*, <http://www.planetark.com/dailynewsstory.cfm/newsid/28895/newsDate/10-Jan-2005/story>

Regulation of the Director General of the National Archives of Republic Indonesia Number 06 of 2005 on Disaster Prevention and Recovery Plan.

Technical Leaflet, Emergency Management, "*Emergency Salvage of Wet Books and Records*".

Utomo, D. (2006), *Tsunami and International Cooperation*, Jakarta: the Case of Aceh.

Winoto, J. (2006), *Restoration of the Post –Tsunami Damaged Archives: the Case of Land Registration Documents in Aceh*.