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**TOWARDS THE CREATION OF A REGIONAL DATASET FOR THE
TSUNAMI AFFECTED AREA**

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Towards the creation of a regional dataset for the tsunami affected area

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Abstract

In December 2004, the earthquake and the tsunami that followed have been at the origin of the biggest natural disaster that South East Asia has experienced this past century.

From a data point of view, the size of the affected area as been at the origin of problems never experienced before. Among them, the important differences existing between the concerned country in terms of data origin, scale and projection added themselves to the difficulties generally encountered when trying to obtain spatially distributed data in a very short time.

The existence, prior to the event, of a regionally consistent and seamless dataset generated by the concerned countries would have significantly reduced these problems and allowed the institutions involved in the relief efforts to rapidly access the data they were needing. As the regional dataset in question was not existing, the Working Group 2 of the Permanent Committee on Geographical Information System Infrastructure for Asia and the Pacific (PCGIAP) decided too launch a pilot project in order to develop it.

The present paper describe the process, present the current state of progress and future steps of this pilot project looking towards the possibility to create a regional data set that would be covering the entire PGCIAP Region.

Keywords: Seamless regional dataset, Bangladesh, Brunei Darussalam, Cambodia, China, India, Indonesia, Laos, Malaysia, Maldives, Myanmar, Singapore, Sri Lanka, Thailand, Vietnam.

Introduction

The idea of the development of a Regional dataset for the countries affected by the December 2004 tsunami has firstly been mentioned during PCGIAP Executive Board Meeting which took place in Bali, Indonesia in May 2005 just three and a half months after the event.

In November 2005, The workshop organized by the Working Group 2 of PCGIAP, which took place in Brunei Darussalam, proposed the development of such a dataset. A resolution has therefore been presented during the workshop and accepted by the PCGIAP Executive Board that followed. The text of this resolution reads as follow:

"The Workshop,

Recalling the huge disaster linked to the earthquake and the tsunami which happened in the Asia and the Pacific region the 26 Dec. 2004, and the necessity to react to such event at the regional level,

Noting the significance of the results obtained from WG1 Extraordinary Geodetic Campaign,

Recommends that WG2, jointly with WG1, to develop and implement a pilot project for the generation of a set of seamless data layers for the tsunami affected area to contribute to the creation of the AP seamless dataset in collaboration with Global Mapping, SALB and other similar initiatives."

During the same meeting, the following layers have been identified to be part of this dataset:

- international and administrative boundaries,
- transportation network,
- hydrography
- populated places.

These layers have been selected as they are part of the priority layers generally collected during the first phase of any relief effort.

In a first stage, the feasibility of such project has been evaluated through the creation of a preliminary seamless dataset looking at two selected layers (roads and rivers network) for 3 countries (Bangladesh, Myanmar and Thailand). This dataset was based on the data coming from the Global Mapping Initiative (Ver.0 for the rivers and Ver.1 for the roads). The results of this preliminary work is presented in Figure 1.

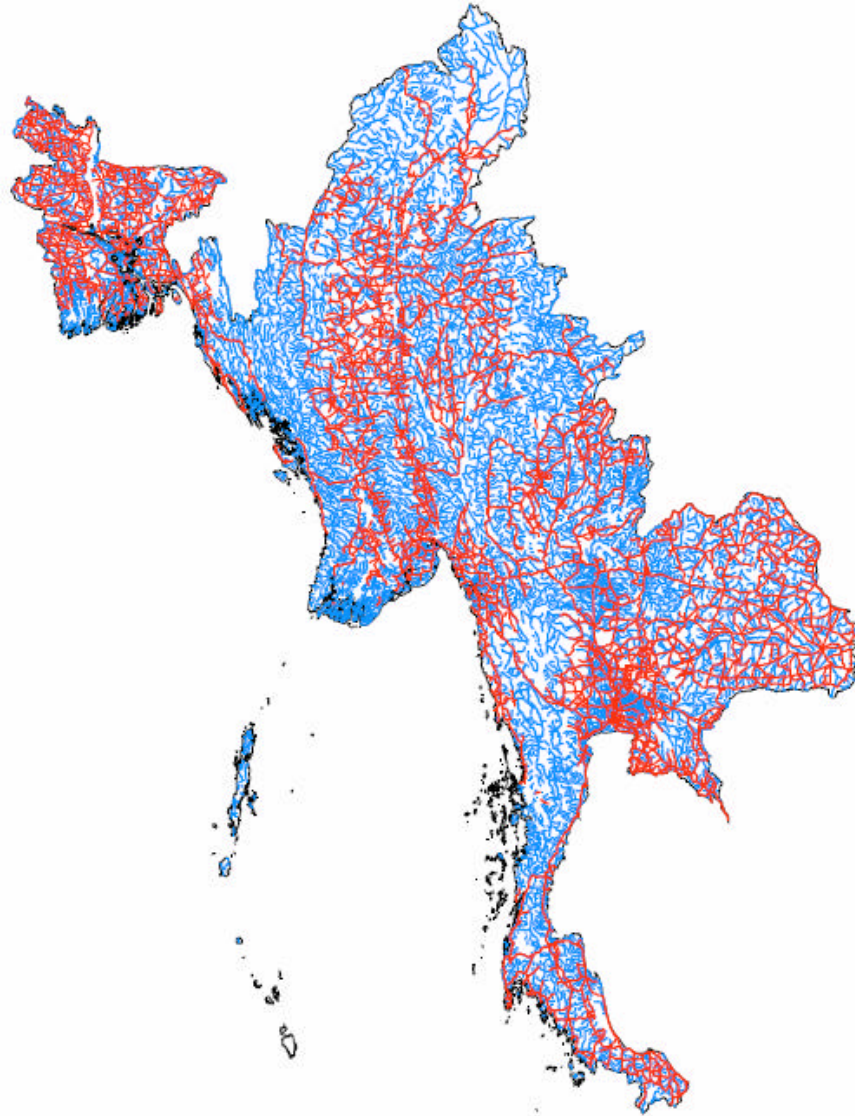


Figure 1 - Result of the feasibility study

Encouraged by this result, the pilot project itself has been official launched in April 2006.

As the results of such pilot project could go provide useful inputs for the development of a complete Asia-Pacific Fundamental Dataset, dataset required by PCGIAP in the context of the activities of its Working Group 2, countries not directly affected by the earthquake and tsunami but adjacent to them have also been added to the list for finally covering 14 countries: Bangladesh, Brunei Darussalam, Cambodia, China, India, Indonesia, Laos, Malaysia, Maldives, Myanmar, Singapore, Sri Lanka, Thailand, Vietnam.

Technical specification of the final data set

At the end of this process it is expected to have access to a seamless dataset that would correspond to the following specifications:

1. Resolution: 1:1,000,000
2. Horizontal accuracy 1000 meter.
3. Data format ESRI shape file
4. Datum: WGS84
5. Map Projection: Geographic Projection.
6. Attribute information complying with the Global Mapping [1] Specification for the rivers, roads and populated places and with the ones of the Second Administrative Level Boundaries dataset project (SALB) for the administrative boundaries [2],

In order to facilitate the connection between the country specific datasets and being able to insure the horizontal accuracy it has been proposed to use the 2000 Landsat global mosaic as ground reference.

In addition to cover the all globe this data set present the advantage of being freely available on the internet [3], downloadable by tiles in Tiff format or aggregates of tiles in MrSid format.

The Tiff format data set would have been more appropriate for this project but unfortunately, because of the important size of these files, the difficulties to download all the tiles that would cover the entire study area and the additional work that would have been required in order to create composites images it has finally been decided, in this first phase, to work with the MrSid format aggregated tiles.

It is nevertheless important to underline that the investigation made by Bakosurtanal demonstrated that the MrSid format tiles can be appropriate for evaluating the accuracy of the coastlines, hydrography and the roads if they are visible but would unfortunately not be useful for the populated places layer apart for helping identifying possible errors or location (e.g. towns located in the middle of a water body).

In addition to that, each tile being projected according to its corresponding zone in the Universal Transverse Mercator (UTM) projection system a solution had to be found in order to comply to the project specification mentioned above. A specific protocol has therefore been prepared by Bakosurtanal in order to allow the countries to work with these tiles with the ArcGIS 9.0 software.

Source of the input data

In order to insure the validity of the information that will form the final data set priority has been given to data coming from the countries themselves.

This is why, for the transportation network, hydrography and settlements the work started on the basis of the data provided by the concerned countries to the Global Mapping initiative (Table 1). For the countries where GMver1 is currently under verification the consent for using this database will be asked to the country.

Countries	GMver1 available	GMver1 under verification	GMver0
Bangladesh	X		
Brunei Darussalam		X	
Cambodia			X
China		X	
India			X
Indonesia		X	
Laos	X		
Malaysia			X
Maldives			X
Myanmar	X		
Singapore			X
Sri Lanka	X		
Thailand	X		
Vietnam		X	

Table 1. List of primary source considered for the pilot project regarding the transportation network, hydrography and settlements

Taking advantage of the process already established with several of these countries, the results of the PCGIAP regional administrative boundaries pilot project (Rajabifard & Williamson, 2001) and in line with the recommendation adopted during the last PCGIAP Executive Board meeting, the international and administrative boundaries layer are compiled, edited and validated by the National Mapping Agencies through the Second Administrative Level Boundaries project (SALB). For more information regarding the SALB project please refer to the SALB project web site [2].

In this process, special care has been taken to insure interoperability with the other layers collected in the context of this pilot project. This is for example the case for the coastlines that will be based on the Landsat global mosaic data set.

Implementation of the pilot project and current state of the process

The development of the Regional tsunami dataset is carried out by the PCGIAP WG2 Pilot Project Team that has been appointed by the PCGIAP Executive Board during its last meeting in December 2005. This team, coordinated by Indonesia, consist of focal points for each of the PCGIAP member countries part of the project, the International Steering Committee for Global Mapping (ISCGM), the Second Administrative Level Boundaries dataset project (SALB) as well as those from Australia and Japan.

The dataset is developed in the context of a collaboration process among all the member of the Project Team. Each country is responsible for its own dataset, the team coordinator being himself responsible for organizing the project and joining the country specific datasets into the final seamless regional dataset.

The following specific timeline has been defined in order to reach the objectives fixed for this pilot project:

- December 2005 - Invitation to participate to the project sent to the countries by the PCGIAP secretariat
- April 2006 – Send proposal to country focal point asking for feedback before the 10 of May
- May 2006 – Sending of the final project process description document, the Landsat images and vector data to country focal points asking them to review, complete or update these datasets according to the specification and horizontal accuracy. Final files and information to be provided to Bakosurtanala before the 31 of July.
- August 2006 – Finalization of the integration of the data received from the countries regarding the transportation network, hydrography and the populated places into a seamless dataset by Bakosurtanal
- September 2006 – preparation of the report and slides for the PCGIAP meeting.

As of the beginning of August 2006, official answer indicating their willingness to participate in the pilot project have been received from 11 countries and a focal point to the project have been nominated for most of them (Table 2).

Despite having not yet received an official answer from India, information has been received from the National Mapping Agency indication that they are currently in the process of nominating someone to work on the project. For the Maldives and Myanmar, a process is currently taking place to invite them in the process.

Only ISCGM provided feedback to the pilot project process description document. These feedback have been integrated into the final version of the document sent to the different countries at the same time as the CD rom prepared by Bakosurtanal.

Country	Answer to invitation letter received	Nominated focal point	CD rom received
Bangladesh	Yes	To be nominated	Yes
Brunei Darussalam	Yes	To be replaced	Yes
Cambodia	Yes	Mr. Chin Chharom	Yes
China	Yes	Prof. Chen Jun & Ms. Ji Xiaoyan	Unknown
India	Not yet	To be nominated	Yes
Indonesia	Yes	Mr Bebas Purnawan	Yes
Lao People's Democratic Republic	Yes	Mr. Phouangphanh Sayasane	Yes
Malaysia	Yes	Mr. Wan Zainuddin	Unknown
Maldives	Not yet	To be nominated	Not sent
Myanmar	Not yet	To be nominated	Not sent
Singapore	Yes	Mr. Victor Khoo	Yes
Sri Lanka	Yes	Ms A.L.S.C. Perera	Yes
Thailand	Yes	Col.Krith Bundit & Maj. Attawoot Kiatiwat	Yes
Vietnam	Yes	Mr. Le Minh Tam	Yes

Table 2 - current state of progress regarding the transportation network, hydrography and settlements layers

Because of some unexpected delay in the process and, in some case, difficulties of communication with the National Mapping Agencies of the concerned countries, it has been decided to start working on the primary data mentioned in Table 1 in order to create a first seamless data set to for the transportation network, hydrography and settlements to be presented during the coming UNRCC-AP Conference. This data set will be created in the continuity of the feasibility study presented in Figure 1. Because of the short amount of time available, this work will be done in priority for the countries that have been hit by the tsunami, namely: Bangladesh, India, Indonesia, Malaysia, Myanmar, Sri Lanka, Thailand and the Maldives.

In terms of administrative boundaries, the progresses made so far for the selected countries are presented in the paper by Ebener & Guigoz (2006). This paper will also be presented during the 17th UNRCC-AP Conference.

Regarding the coastline, an intern has started to work on improving the data set currently use in the context of the SALB project in order to make it comply with the pilot project specifications.

Discussion and conclusion

At the time of writing this paper a large amount of work remains to be done in order to create the seamless data set for the tsunami affected area.

Nevertheless, the work accomplished so far already provides some important information regarding the feasibility of project that would create a seamless data set not only covering the countries that have been affected by the 2004 Tsunami but the all PCGIAP Region. Such process would also insure a more smooth update of the data required by global initiatives and project such as Global Mapping and SALB.

It firstly confirm the importance to keep an up-to-date contact information database for the NMAs. Solutions, such as a regular direct contact with these institutions, should be envisaged by the PCGIAP secretariat.

It also underline the importance to have a better knowledge of the GIS/Remote Sensing capacities at disposal of the different NMAs. This information would not only be useful for capacity building but also to know in advance if they would be able to answer specific technical request such as the ones formulated in the context of this pilot project.

The difficulty to download the large Tiff format tiles of the Landsat Global Mosaic highlight also the need to find a solutions to the limited internet access that most of the countries do encounter in the Region. Having access to these data and the capacity to treat them would considerably increase the quality of the resulting data set.

Although this pilot study very much relies on existing processes such as the Global Mapping initiative and the SALB project, it is expected that it will contribute to the development of a regional Spatial Data Infrastructure (SDI) by and for the PCGIAP member countries and this in line with the PCGIAP statutes [4].

It is therefore believed that the present pilot project should continue beyond the 17th UNRCC-AP Conference hoping that the work already done will encourage the concerned countries to participate more actively by bringing not only better data but also their own knowledge into it.

Acknowledgment

The authors of this paper would like to take the opportunity of this paper to first thank all the National Mapping Agencies who have so far contributed in this project.

They then express their gratitude to the PCGIAP secretariat for its support and help in contacting the countries part of the project.

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Web sites

[1] The Global mapping initiative: <http://www.iscgm.org/cgi-bin/fswiki/wiki.cgi>

[2] SALB project: http://www3.who.int/whosis/gis/salb/salb_home.htm

[3] Landsat Global Mosaic:
<http://glcfapp.umiacs.umd.edu:8080/glcf/esdi?command=searchMap>

[4] PCGIAP Statutes: <http://www.gsi.go.jp/PCGIAP/pcstat.htm#a3>