Cadastral Base Mapping Activity in Indonesia

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SUMMARY

The Indonesian national land Agency (BPN) has formed a deputy for survey and mapping in 2006. The formation was meant to speed up the availability of large scale base map for cadastral and land registration need. Since 1960, when the Agrarian Act was issued, only five percent of the total area of Indonesia (approximately 1.900.000 square Km) has been mapped by the scale of 1:10.000, 1:2500 and 1:1000. By the launching of the Agrarian Reform program in 2007, one of its goals is to complete the registration of the whole land parcels within 18 years. As consequences, more than 3 million parcels have to be measured and registered every year. This program has pushed that cadastral base map with suitable scale covering the whole area must be available before that time scale. This paper explores the existing status and condition of large scale map and strategic planning to complete the map covering the whole area of Indonesia.

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1. INTRODUCTION

Almost 220 million people of Indonesia live on 1.900.000 square kilometers of land (Depdagri, 2007), where fifty-one percent of the area is forest (DepHut, 2007). Indonesia consists of more than 17.000 islands. Only 4000 islands are populated. The area is administrated into 33 provinces and subdivided into ± 450 districts or local government.

Until 2006 only less than 10 percent of the area has been plotted into maps with a scale of 1:1000 and 1:2500. The lack of national large scale base map is one of the conditions that have to be resolved for a good land registration. The National Land Agency (BPN) had been reorganized in 2006 and a new Deputy namely Deputy Head for Survey and Mapping (DSM) was set-up (BPN, 2006). The decision was made to accelerate the completion of base map for cadastral purposes.

In 2007 the Government launched the Agrarian Reform Program. One of its objectives is the government would like to have the whole land parcels measured and registered within less than 20 years. This program has pushed that cadastral base map with suitable scale covering the whole area must be available before that time scale.

2. THE DEPUTY OF SURVEY AND MAPPING (DSM)

Deputy of Survey and Mapping (DSM) consists of Directorate of Survey responsible for densification of cadastral reference point network, Directorate of Base Mapping, Directorate of Thematic Mapping and Directorate of Land Valuation.

DSM bears the responsibility to formulate and establish policies in Survey and Mapping and also function in:

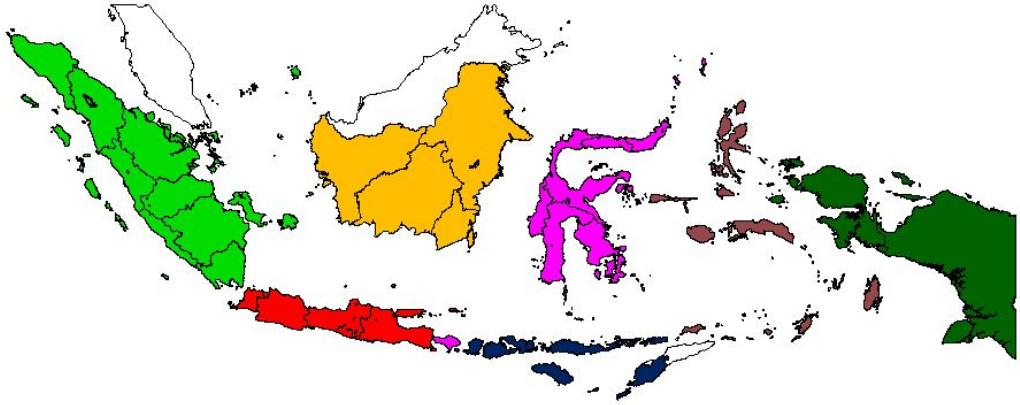
- technical policies in survey, measurement, and mapping;
- Conducting cadastral geodetic reference points;
- Conducting national base mapping;
- Conducting land related thematic maps; and
- Conducting a land valuation program and land potential survey

DSM conducts the base maps. The products are presented in the form of maps in various scales, among them (BPN, 2006):

1. Base map of Land Administration in the Urban area Scale of map 1:1.000/1:2.500;

2. Base map of Land Administration in the rural area scale of 1:5.000 or 1:10.000;
3. Thematic maps in various scale.

The above maps will be used as a based for cadastral survey as well as land registration. The cadastral survey and land registry is conducted by the other deputy namely Deputy of Cadastre and Land registration.
Figure 1. Indonesia Archipelago



3. BPN MAPPING SCENARIO

Indonesia with its 1,900,000 square km is the 15th largest country in the world. It consists of forested area (51 %), plantation (37 %) and dense populated area (8 %). It has been reported that only 90,000 sq km of that area have been mapped into 1:1000 and 1:2500 map scale. This condition is one of the reason why the DSM has to be formed with one of the main task is conducting mapping program for the whole country.

It is understand there should be multi scale of maps available to registry land parcels with various type of land used as stated above. Namely 1:1000 scale for dense populated area, up to 1:10,000 maps for plantation and forested area. Various mapping technology will be applied from Aerial photographs and satellite imaging with various spatial resolution. The Aerial photographs is the most favorable solution, however this technology is most expensive technique. Therefore satellite imagery will also be utilized for mapping specific area such as forest, plantation, rural and sub-urban area.

	Island	Area (Sq Km)	Population
1	Jawa	130,000	130,700,000
2	Sumatra	430,000	43,000,000
3	Sulawesi	180,000	15,900,000
4	Bali, NTT, NTB	70,000	11,900,000
5	Kalimantan	490,000	12,200,000
6	Maluku,North Maluku	70,000	2,300,000
7	Irian	400,000	2,400,000
8	Other small islands	130,000	2,800,000
	Total	1,900,000	221,000,000

Table 1, Names of islands, area and its population

The mapping program will start from the main big islands where the most populated islands are a first priority. Table 1 indicated islands and its population

To speed up the program to cover the whole country by a base map, a scenario had been set-up. Considering that visual ground information (raw-imagery data) is more priority than spatial geometric accuracy. In the first phase, satellite imagery with proper resolution may be used. Satellite imagery with a suitable resolution of the entire land surface of Indonesia will have to be collected for the next 3-5 years. Starting last year, satellite imagery covering almost 30 percent of the area (550.000 sqkm) had been purchased. It consists of imagery with 0.6 m resolution for Java, Bali, NTB and NTT and 2.5 m resolution for Sumatra and Sulawesi. Budgets for purchasing similar amount of coverage have been proposed this year. It is planned that the whole area of a country has to be fully covered in the year 2010. The raw-images are then distributed to each provincial office to be utilized and processed.

During this year, a specific budget is allocated for purchasing hardware and software for each province. An initial one week training course had also been conducted last April. The course in image processing was given for staff from every provincial office (2 staffs per provinces). This 66 person of the trainees will then be the trainer, when they are back in their provinces. Their task is not only responsible in processing the imagery but also conducting the training as such there is enough trained staff in their office to produce the base map.

The second phase which is more complex and tedious works, is image processing. A process to orthorectify the imagery becomes a base map. Sufficient ground control points must available in orthorectyfing those images. When, either densification of GCPs or DEM is not completed, all existing GCP and other sources such as small scale topographic map or SRTM will be utilized. It understood that those sources of control points are insufficient for a proper base map processing, therefore an intermediate map or pre-base-map will be produced. Pre base-map will then be used as a base for land recording, land administration and thematic activity.

The presence of DEM with suitable density and accuracy for large scale map is highly expected within few years. All provinces are then will start the activity by processing their pre-base-map as such their base map will be completed after a few years.

Although all area have been covered by satellite imagery, there are still exist 100,000 sqKm of housing area that need a larger scale map. The area need to be plotted by aerial photography into 1:1000 scale map. The area are scattered in ± 70,000 locations with each location covers approximately 1.50 sq Km.

4. CLOSING REMARKS

The discussion above illustrates an understanding the complexities in providing large scale map in Indonesia. The issue of funding, time, manpower and technology are interrelated. An integrated activity in the national level is urgently needed. Networking and cooperation between government institution and private sectors must be developed. Understanding to support the policy related to the management in the local and field level needs to be directly addressed. On the other hand, an international discussion is also need to be improved.

An integrated forum has been started as the initial steps towards the mapping activity. This forum hopefully could accelerate mapping activity. The forum must conducted regular meeting.

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BIOGRAPHICAL NOTES

Irawan Sumarto currently holds position as Director of Base Mapping at National Land Agency of Republic of Indonesia. He received his PhD degree in 1997 from Curtin University of Technology, Australia. His major interest is in Photogrammetry and Image Processing.

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