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COUNTRY REPORTS

COUNTRY REPORT ON THE CURRENT STATUS AND ISSUES OF SURVEYING, CHARTING AND MAPPING AT THE NATIONAL LEVEL

Submitted by Indonesia **

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** Prepared by the National Coordinating Agency for Surveys and Mapping (BAKOSURTANAL)

THE SEVENTEENTH UNITED NATIONS REGIONAL CARTOGRAPHIC CONFERENCE FOR ASIA AND THE PACIFIC (UNRCC-AP)

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Bangkok, Thailand, 18 – 22 September 2006

COUNTRY REPORT ON THE CURRENT STATUS AND ISSUES OF SURVEYING, CHARTING AND MAPPING AT THE NATIONAL LEVEL

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1. INTRODUCTION

This Country report is an update to the previous report presented at the Sixteenth United Nations Regional Cartographic Conference for Asia and the Pacific, held in Okinawa, Japan, 14 – 18 July 2003. This report Covers the period from July 2003 to June 2006, and is prepared in line with the implementation of the resolutions as endorsed in the sixteenth United Nations Regional Cartographic Conference for Asia and the Pacific.

The progress in the field of survey, mapping, and charting, development of Indonesian National Spatial Data Infrastructure and Capacity Building is discussed in this country report.

1.1. NATIONAL SURVEYS AND MAPPING

During the last few years, Indonesia experienced bad moments of hazards that hit the country. Earthquake, tsunami, volcanic eruption, flood, landslides, forest fires caused loss of lives and damages of infrastructures. These multihazards and the consequeces pushed the Indonesian government to immediately take any measures necessary to mitigate the effects of multihazards, especially measures related to empower all government institutions, central and regional, and to work together in harmony.

In cooperation with international organization, Government of Indonesia is developing a Tsunami Early Warning System. In addition to that, Indonesia government institutions also develop thematic mappings related to these multihazards and improve the coverage of national base maps.

In relation to the government efforts related to make avialable Indonesian geospatial datasets, the national initiative of building the Indonesian Spatial Data Infrastructure is continued. The last ISDI Meeting held in Semarang Indonesia on 12 to 13 September 2006, recommeded that the development of ISDI should focus on the development of Geospatial Gateway, Geospatial Data and Metadata Standard, and the making of President Regulation.

To fulfill the higher level government official needs on geospatial data and information, these institutions also develop a Spatial National Information System SNIS. A poverty information system has been developed as one of the SNIS activities.

1.2. AUTONOMY AND THE SURVEYS AND MAPPING ACTIVITIES

The new autonomy law number 32/2004 replaces the autonomy law number 22/1999. Section number 152 is important and closely related to survey and mapping. The section states that all planning activities should utilize accurate and reliable data and information, including natural resouces and framework dataset. The section also states that in the utilization, this data and information should be managed in a nationally integrated regional information system.

As a consequence of the new law and regulations on autonomy, the challenge faced by spatial data and information producers is to create a vision of how to fulfil the requirenment of up to date and on time geospatial data for all users to support development of the country.

2. GEODETIC AND GEODYNAMICS ACTIVITIES: THE ESTABLISHMENT OF INDONESIAN TSUNAMI EARLY WARNING SYSTEM

The Aceh-Andaman is the first giant (Mw>9.0) earthquake of December 26, 2004 following by tsunami were natural disasters of unparalleled proportions in our lifetimes, and that killed more than 200,000 people in the countries around the Indian Ocean region has been considered as the most catastrophic tsunami in history. The tsunami disaster has triggered countries around the Indian Ocean region to establish a Tsunami Early Warning System for the Indian Ocean. Following the tsunami disaster several international meetings were held to deal with the need for the establishment of a regional warning system for the Indian Ocean. Among others are the Tsunami Summit held at Jakarta, 6 January 2005; the World Conference on Disaster Reduction held at Kobe, 18 – 22 January 2005; the IOC (Intergovernmental Oceanographic Commission) Meeting held at Paris, 3 – 8 March 2005; and the IOC Meeting held at Mauritius, 14 – 16 April, 2005.
The IOC Meeting that was held at Paris 3 – 8 March 2005 had resulted in a commitment that consist of:

(a) the tsunami warning system will be built and established through international cooperation under a UN (United Nations) umbrella; IOC will provide the international coordination mechanism and will work in close partnership with other agencies;
(b) the tsunami warning system shall be owned and managed by the member states of the Indian Ocean region, and will be built on national capabilities; and
(c) the tsunami warning system will “plug-in” into existing natural disaster management system.

All of the countries and international organizations that participated in those international meetings have committed to collaborate in the establishment of a regional tsunami warning system for the Indian Ocean. It was also agreed that such a system should comprise a network of national or sub-regional arrangements, which are connected to a regional coordination center within a common platform, and linked to future global early warning arrangements.
As a country that most suffered from the 2004 Aceh tsunami, the Indonesian Government has committed to establish the Indonesian Tsunami Early Warning System (Indonesian TEWS). The proposed design of the Indonesian TEWS basically will consist of five components as following (Figure 1.):

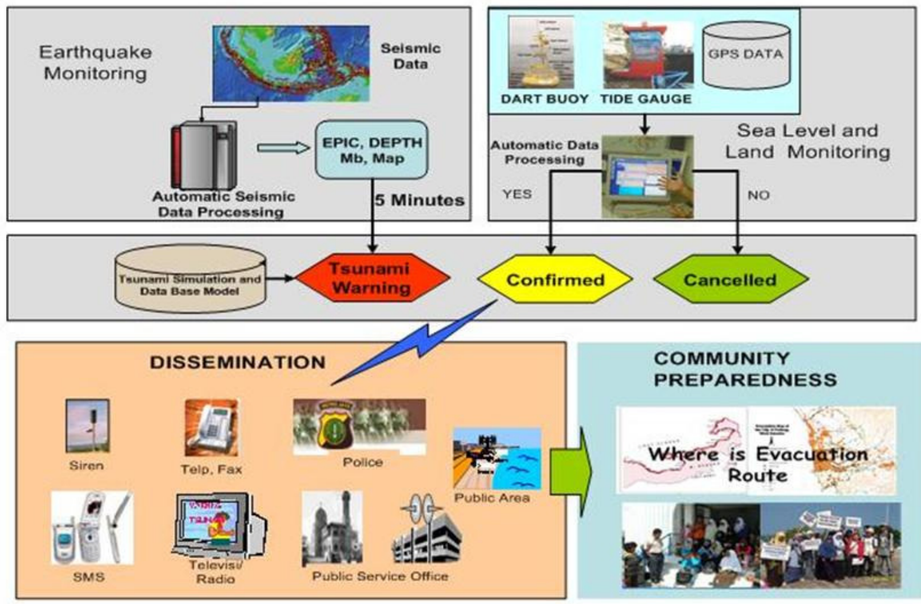


Figure 2. The scenario of time sequence of tsunami warning issuance

(a) Earthquake monitoring system,
(b) Sea level (ocean) monitoring system,
(c) Database of tsunami modeling,
(d) Dissemination of information, and
(e) Community preparedness.

Most of tsunamis in the Indonesian region are local tsunamis so that the tsunami warning should be issued in very short time. The Indonesian TEWS is designed to issue the tsunami warning at regional level within 5 minutes after the earthquake occurrence. At the national level the tsunami warning should be issued within 10 minutes after the earthquake occurrence. The scenario of time sequence of tsunami warning issuance is given in Figure 2. (BMG, 2006):

Improvement of existing monitoring network of the Indonesian TEWS
The National Tsunami Early Warning Center will be proposed as the Indian Ocean Tsunami Warning Center which will serves all of the countries in the rim of the Indian Ocean. To implement of the establishment of the Indonesian Regional and National Tsunami Early Warning Center, an improvement of the existing monitoring network is needed.

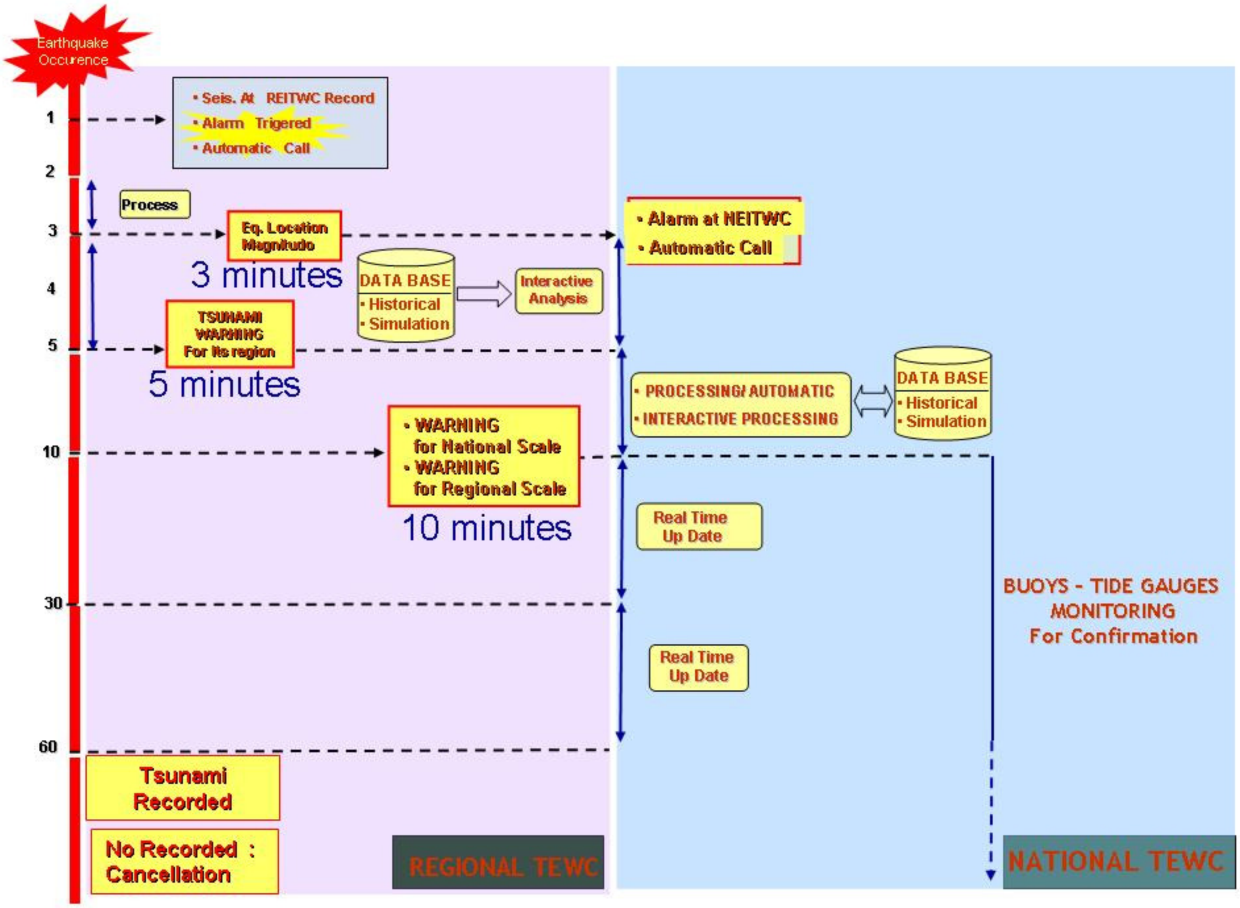


Figure 1. Components of the Indonesian TEWS (Suhardi et al., 2005)

2.1. Improvement of Earthquake monitoring network

The output of the improvement of earthquake monitoring network is determination of earthquake parameters within 5 minutes. The earthquake parameters that should be determined include: Origin time, Epicenter, Focal depth, and Magnitude (Mb: body wave magnitude, and Mwp: P-wave moment magnitude).

The outcome of the improvement of earthquake monitoring network is a capability to issue the tsunami warning timely. The issuance of tsunami warning will be based on (a) the earthquake parameters, (b) sea level information (from tide gauges and DART network), and (c) tsunami simulation database.

The scope of this improvement of earthquake monitoring network (Figure 3.) includes upgrading and establishing:

- 160 seismographic stations in national wide,
- 10 Indonesian Regional Seismographic Networks,
- A National Seismographic Network,

- Indonesian Regional Earthquake Information and Tsunami Warning Center (REITWC), Integration of the seismographs networks and the tsunami observation network,
- National Earthquake Information and Tsunami Warning Center (NEITWC),
- Improvement of the ASEAN Earthquake Information Center (AEIC),
- Data transmission system,
- Human resources development, and
- Preparation, operational and maintenance scheme.

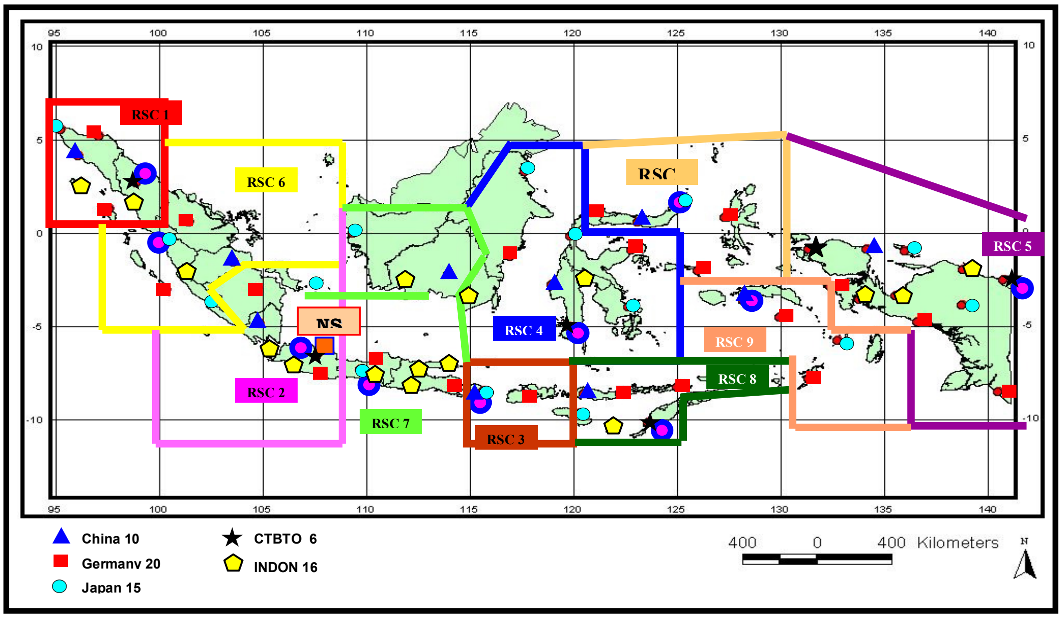


Figure 3.

2.2. Improvement of Ocean monitoring system

2.2.1. Tide Gauge Network

Assessing the threat and the risk are the basic consideration that should be carefully taken in designing deployment of tide gauges for TEWS. Assessing the threat should cover i) the likely tsunami generation mechanisms for the region such as earthquakes, landslides, volcanoes, ii) their likely source zones, iii) the characteristics of likely tsunamis such as frequency of occurrence, potential size of tsunami.
Volume of works and the number of each instrumentation required in the network and technical judgement as follows:

- Constructions of 60 new stations with concrete building attached to harbor or piers.
- Additional 60 new stations consisting of 60 pressure gauges and 60 radar gauges. Each station should be equipped with a least two types of recording for providing back up.

- 40 pressure gauges for up grade to the existing analogue stations
- 25 pressure gauges to provide back up for the existing stations equipped with digital float gauges
- 120 VSAT (satellite communication) with 1.2 kbps data transmission rate and 5 KHz bandwidth
- Main Hub and redundancy for VSAT for 150 clients located in the tidal data center which can serve data retrieval, remote monitoring. This should also provide main server and redundancy for data center refer

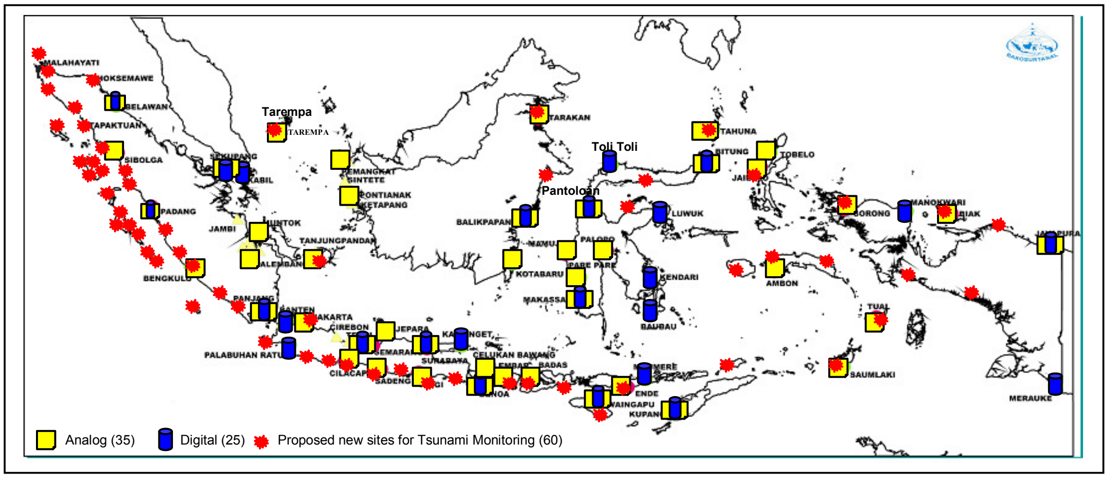


Figure 5. A proposed upgrade and new sites of tide gauges for the TEWS

2.2.2. Tsunami Buoy System

In order to support the Indonesian TEWS, we propose to have 15 Tsunami Buoys system designed for tsunami detection and warning system. The module may be fitted to existing SEAWATCH systems and/ or be an integrated part of new systems.

Tsunami buoy systems consist of an anchored seafloor bottom pressure sensors (BPS) (Figure 6.) and a companion moored surface buoy. The seafloor bottom pressure (BPS) consist of a pressure sensor, a processor, batteries and an acoustic modem. It is mounted to a bottom anchor using an acoustic release. It should be minimum one year operation. The BPS continuously measures the water pressure at the seafloor. Once per hour a measurement is transmitted to the surface enabling verification of the systems operation. The pressure measurements are processed by the seafloor processor in real-time and the tidal variations and the variations due to sensor instability are subtracted from the time series.

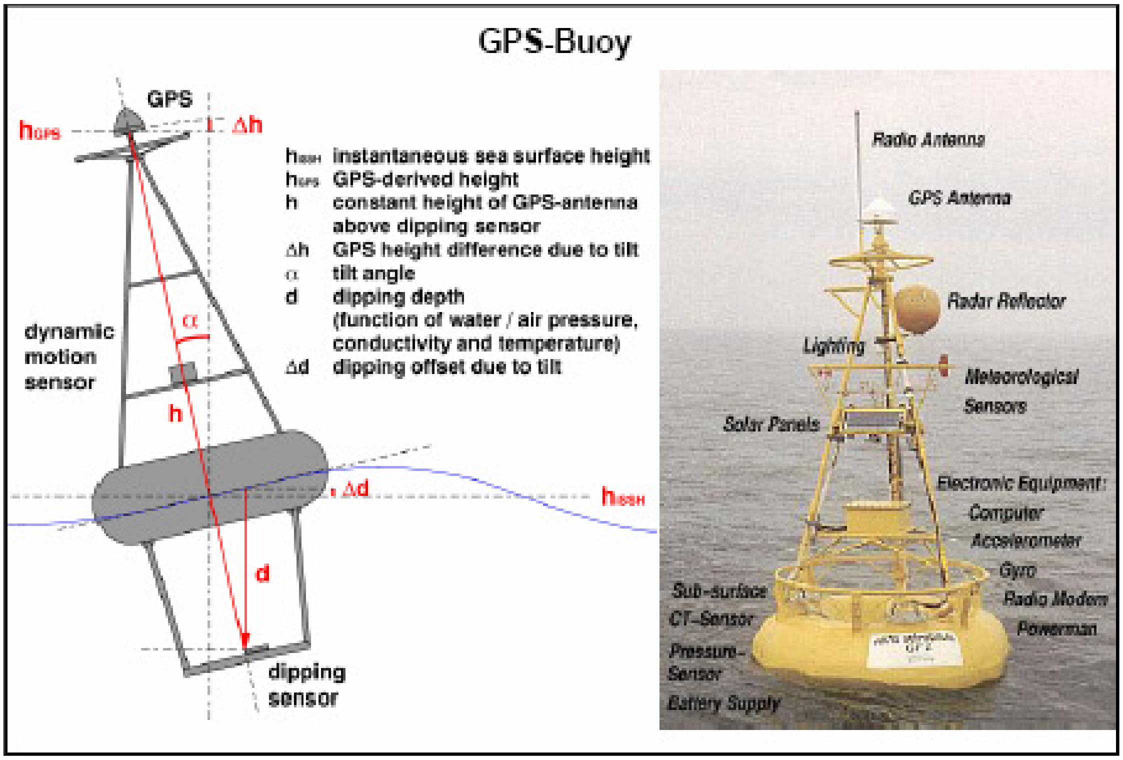


Figure 6. Moored Surface Buoy and install censors

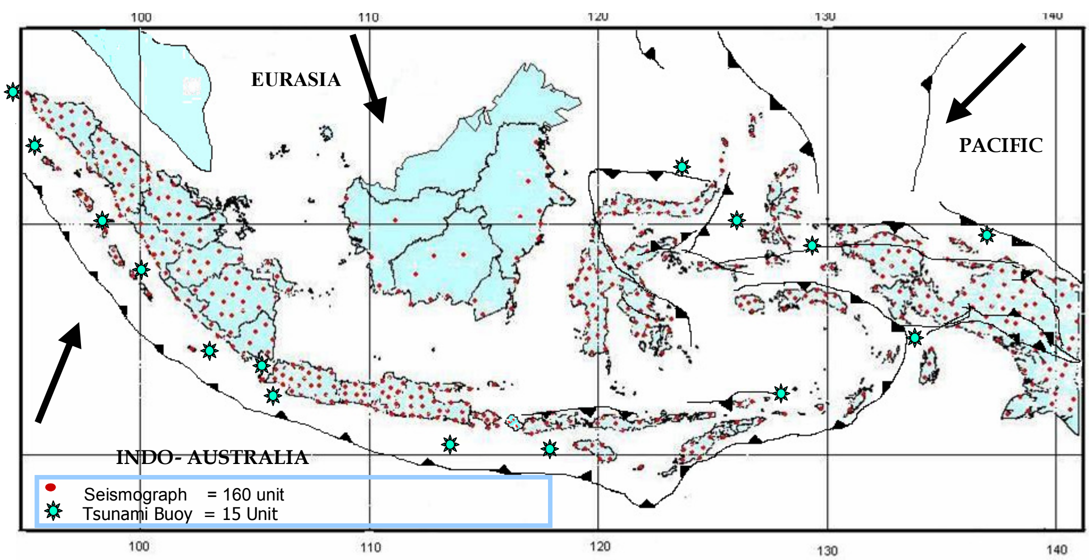


Figure 7. Planed Tsunami Buoy Locations

The proposed tsunami buoy locations (to be discussed) are West of Sumatra Island (5 buoys), Sunda Strait (1 buoy), South of Java Island (2 buoys), Bali and Nusa Tenggara (2 buoys), Nort of Sulawesi Island (1 buoy), West of Halmahera Island (1 buoy), West of Irian Jaya Island (2 buoys), and North of Irian Jaya Island (1 buoy). It is suggested that the buoy is deployed as close as possible to the trench. The given locations (Figure 7.) are approximation only and subject to change after final decision on discussion and deployment.

2.3. Development of the Tsunami Simulation Database

Availability of the tsunami simulation database is very important in issuance of the tsunami warning. The database will give information on arrival times of tsunami and tsunami heights along the coastal region that caused by the predicted tsunamis. Such database so far is not yet available in Indonesia. Therefore the development of the database of tsunami simulation is very important to support the proposed TEWS in the Indonesian region.The database of tsunami simulation will be developed for each Indonesian regional tsunami warning center (REITWC) so that there will be 10 REITWC's databases. The tsunami simulation will be performed for all of possible hypothetical tsunamis in each REITWC. The possible tsunamigenic earthquake sources will be identified based on the tsunamigenic earthquake characteristic that occurred in the region. Figure 8. shows the preliminary estimated tsunamigenic earthquake sources in the Indonesian region.
Output of the tsunami simulation will be arrival times of tsunami and tsunami heights along the coastal region. The result will be stored on a database. For the first three years the tsunami simulation will be performed for Sumatra, Java, and Bali islands.

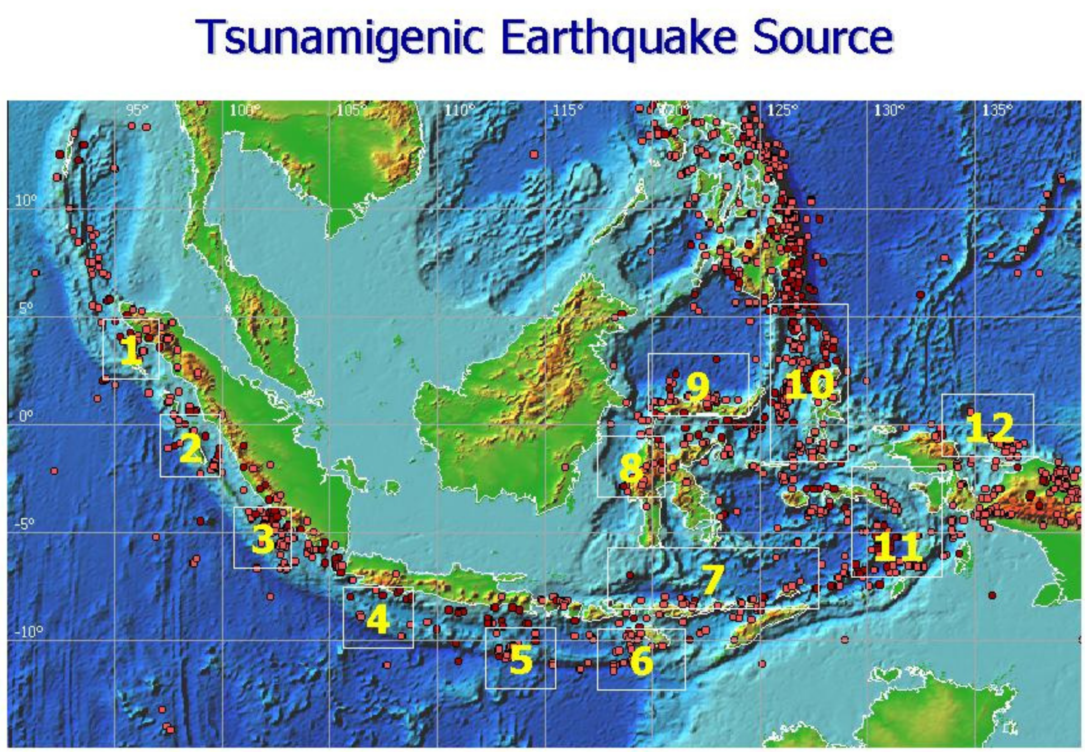


Figure 8. The preliminary estimated tsunamigenic earthquake sources

2.4. Improvement of Crustal Deformation Monitoring Network

Lessen learn from the 26.12.2004 and 28.03.2005 mega thrust earthquake and tsunami, it shows that the complex and dynamical tectonics in the Indonesian region and its surrounding, gives rise to some of the worlds most active crustal deformations. It is important to monitor and understand these deformations, as accompanying them are natural hazards of earthquakes, tsunami, and volcanoes.

We propose to collect continuous GPS data along active seismic belt and along ITF, in order to obtain precise crustal deformation measurements of high temporal resolution. Figure 7. shows location of the proposed continuous GPS for the TEWS. The locations have been carefully chosen to provide supplemental data which is crucial to distinguishing between different dislocation models which fit the current data (GPS and tidal) equally well.

Figure 7.

The high precision afforded by continuous GPS, in addition to supplying precise horizontal deformation, will also provide vertical displacement data to supplement the information gleaned from the tidal records.

Furthermore, the continuous nature of the proposed GPS measurements should enable us to resolve any time-dependent variations in strain accumulation such as fault creep and aseismic events (Figure 8.). Current estimates of earthquake recurrence intervals for Sumatra suggest that there is a significant chance of another large earthquake occurring at the subduction zone along Java trench within the next few decades.

In the last decade, major developments have taken place in the accuracy and ease-of-use of Global Navigation Satellite System (GNSS) equipment. This equipment is used for two main purposes: to locate tide gauge and buoy measurements into the same geocentric reference frame (*International Earth Rotations Service Terrestrial Reference Frame* [ITRF]) as altimeter

data for altimeter calibration purposes and production of combined mean sea surface products; and the measurement of changes in vertical land movements in order to convert the ‘relative’ sea level measurements of tide gauges to ‘geocentric’ sea level measurements (i.e. relative to the centre of the Earth).
With a sufficient temporal and spatial coverage, the GPS method may provide a valuable data source to detect and study climate changes. Since the zenith wet delay (ZWD) at a radio receiver is nearly proportional to the precipitable water, that is, the vertically integrated water vapor overlying the receiver, the possibility arises of using emerging networks of continuously operating geodetic GPS receivers to measure atmospheric water vapor content. Exploiting these networks for meteorological purposes could provide an important new data stream, which would complement those derived from regional radiosonde networks.
The fortunate aggregate of circumstances and available data along the subduction zone offers a unique opportunity to understand several phenomena related to subduction zones, including the recurrence of large earthquakes, tsunami, aseismic deformation, strain segmentation, and interpretation of the observational data and their applications in hazard mitigation in the Asia-Indian ocean region.

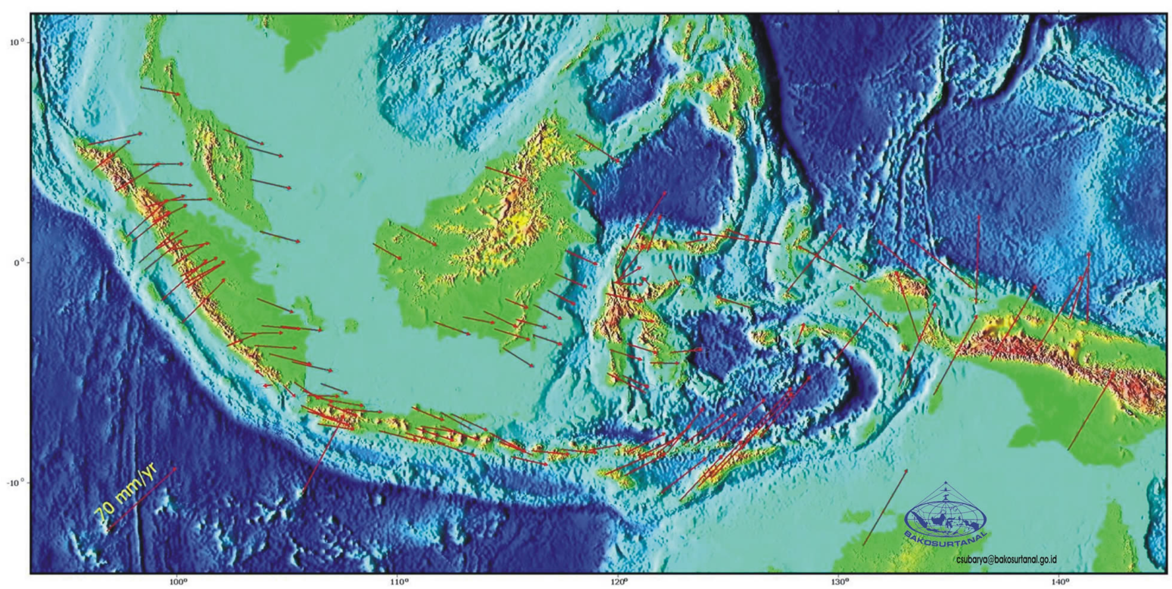


Figure 8. Velocity Field in Indonesia before devastating Sumatra Earthquake

2.5. Improvement of Ocean monitoring system

Disaster preparedness minimizes the adverse effects of a hazard through effective precautionary actions, rehabilitation and recovery. This is necessary to ensure the timely, appropriate and effective organization and delivery of relief and assistance following a disaster.
With regard to an effective tsunami warning system, dissemination of accurate information to the community is vital in the context of disaster mitigation. The use of various media is effective means to disseminate

information about disaster. The community should also be involved in the planning and mobilization of resources.

Furthermore, public awareness and education should also be seen as effective means for conducting long term disaster mitigation. With respect this, development of practical models as show cases for disaster mitigation which involve stakeholders (government officials, community leaders, teachers and NGOs) are necessary as prove of concepts. Also, drilling and simulation are necessary to be conducted as practical evacuation procedures in the event of a tsunami. As most parts of Indonesia is a seismic sensitive region, these practical models based on the developed community preparedness programs should be implemented in other regions in Indonesia vulnerable to tsunami.

There are nine major components involved in disaster preparedness: vulnerability assessment, the plan, the institutional framework, information systems, the resource base, warning systems, response mechanisms, public education and training, and rehearsals. These components provide a basis upon which a national disaster preparedness strategy can be developed. The disaster preparedness framework illustrated on the following pages outlines activities that are essential to the development of a preparedness strategy. Although an implementation sequence for these activities is suggested, some activities may be undertaken simultaneously, or even in reverse order.

2.6. Present Development Status Of Tide Gauge Stations Supporting TWS

There are three source of funding committed to contribute the realization of tide gauge stations supporting for Tsunami Warning Stations.

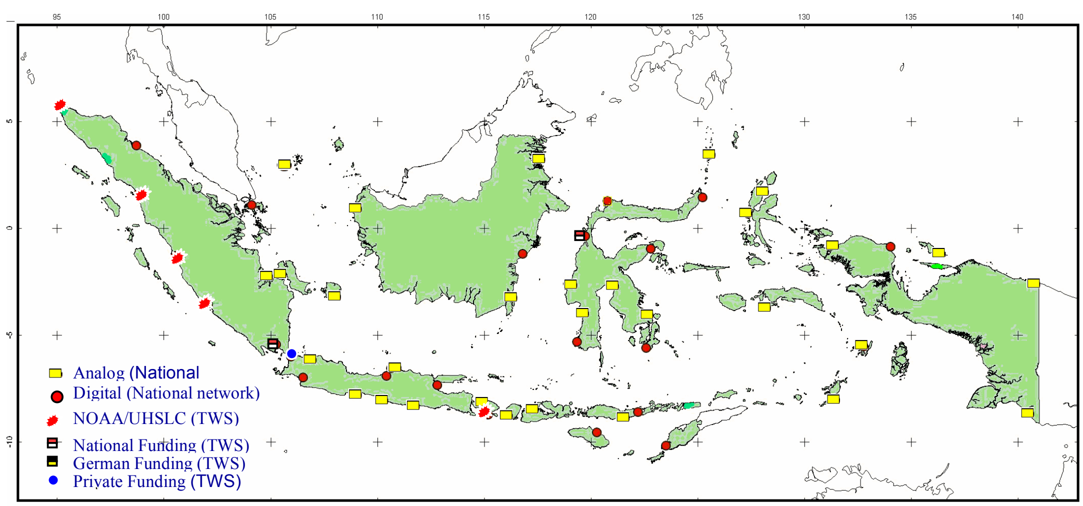


Figure 1: National Tide Gauge Network and the present status up-grade and additional stations supporting TWS

The three source of funding are Germany, USA (NOAA/University of Hawaii Sea Level Centre) and Indonesia governments are each committed to support for 10 stations which will be in place operational before 2007.All of the 30 stations will be maintained by BAKOSURTANAL and data will be transmitted online to BMG as the responsible institution for Indonesia TWS.

2.6.1. Germany-Indonesia Action Plan

A site survey for tide gauge stations was carried out by GeoforschungZentrum (GFZ) and BAKOSURTANAL in February 2006. The main objectives are such as i) to investigate site and physical oceanographic conditions of candidate sites in the outer arc islands of Western Coast of Sumatra, ii) to seek possible use of the existing tide gauge stations for up grade to real time stations, iii) to collect information regarding to site access, mobilizations, constructions, etc.

Based on the site survey, the following is agreed plan between Germany and Indonesia.

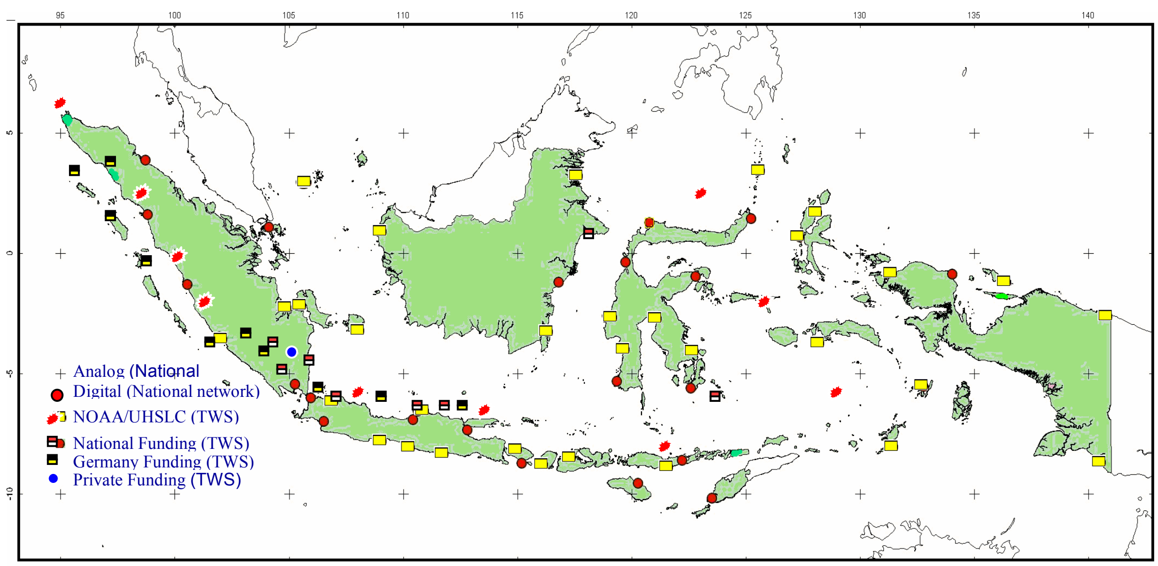


Figure 2: National Tide Gauge Network and 30 planned new stations supporting TWS. USA (NOAA/UHSLC), Germany, and Indonesia of which each country is committed to deploy 10 stations.

The first station to be setup is Sadeng [1]. The equipment will be floating gauge, pressure gauge, radar gauge. Additionally a GPS station needs to be installed. Prerequisite is the availability of the nearby office, power (220V), the monumentation for GPS and the monumentation for the VSAT antenna. The tidal house is already in place. For the installation we will fit some metal structures to the house to accommodate for the Kalesto and the solar arrays.

The second station will be Telukdalam [2]. The setup will be two pressure gauges, and a radar gauge. Additionally GPS and VSAT will be installed. The logistic prerequisites are the same as for Sadeng.

[3] Tapaktuan (Banda Ace); Float, Pressure, Radar
[4] Bengkulu (private jetty, Sumatra); Pressure, Pressure, Radar
[5] Krui (South Sumatra, Sunda Strait); Pressure, Pressure, Radar
Numbers [6, 7, 8, 9] should be go to the Island off Sumatra (+ [2], = 5 units in total)

Number 10 is left for the moment. Options are: Garut (Java, to West of Sadeng); Pressure, Pressure, Radar Banyuwangi (Eastern tip of Java); Pressure, Pressure, Radar Ujung Kulon (opposite to Krui, Sunda Strait); Pressure, Pressure, Radar

German prepare to install up to 5 units till the end of 2006, beginning 2007. As mentioned above, prerequisites are the building of a tidal house on a pier, monumentation for the GPS and the VSAT antenna. For the [2, 6, 7, 8, 9] we have to decide it separately.

Communication will be VSAT + PASTI. If power is available (220V) we may data stream all the values real time to BMG and BAKO. To do the later, BAKO may have to improve the network to the BMG warning center.

2.6.2. USA-Indonesia Action Plan

A plan for the installation of high rate data delivery tide gauge stations was initialized by BAKOSURTANAL and NOAA/UHSL for precise sea level monitoring applications such as sea level rise and climate prediction research by the end of 2003. The initial plan was then materialized in a faster manner after the Indian Ocean Tsunami.

NOAA has taken faster action to install the stations. The first installation was made in 22-24 April 2004 in Sibolga with. The next installation was carried out at Padang 16-22 December 2005. The installations were continued in January 2006 at Benoa (Bali) and Sabang (Aceh). All of the stations are equipped with data transmission, in every 15 minutes, using Meteosat operated by WMO. Data of all stations have been available on line on internet since the stations were completely installed.

2.6.3. Indonesian Funding

Indonesia contribution to establish the real time station network is currently coordinated under the Ministry of Research and Technology. The provision of tide gauge instruments is carried out in multiple years. The present status as the following:

- By the end of 2005, there are two instruments were purchased and the instruments were installed in Panjang and Pantoloan Ports by March 2006.
- In 2006, the budget allocation is provided for 8 set of instrumens and these should be installed in the following i) Teluk Ratai (Lampung Barat), ii) Waingapu (Sumbawa), iii) Ende (Flores), iv) Maumere (Flores), v)

Pelabuhan Ratu (Jawa Barat), vi) Prigi (Jawa Timur), vii) Luwuk (Sulawesi Tenggara), viii) Biak

3. MAPPING ACTIVITIES

The national program is intended to produce the national base maps in digital form either for land, marine, or air in the frame work of provision of geospatial data and information for the whole region of Indonesia in various scales, and also to support the development of the National geo-Spatial Data Infrastructure (NSDI).

3.1. Base Mapping

All the geospatial data in Indonesia have been produced and maintained by BAKOSURTANAL, which cover the national atlas at scale of 1:1,000,000 and 1:500,000, and the series of digital topographic (maps) database, starting at scale 1:250,000 and 1:50,000 for the entire land of Indonesia, up to scale 1:25,000 for the rapid developed area, including scale of 1:10,000 for urban / rural area in supporting the regional spatial management and post natural disaster reconstruction activities.

3.1.1. Topographic Maps

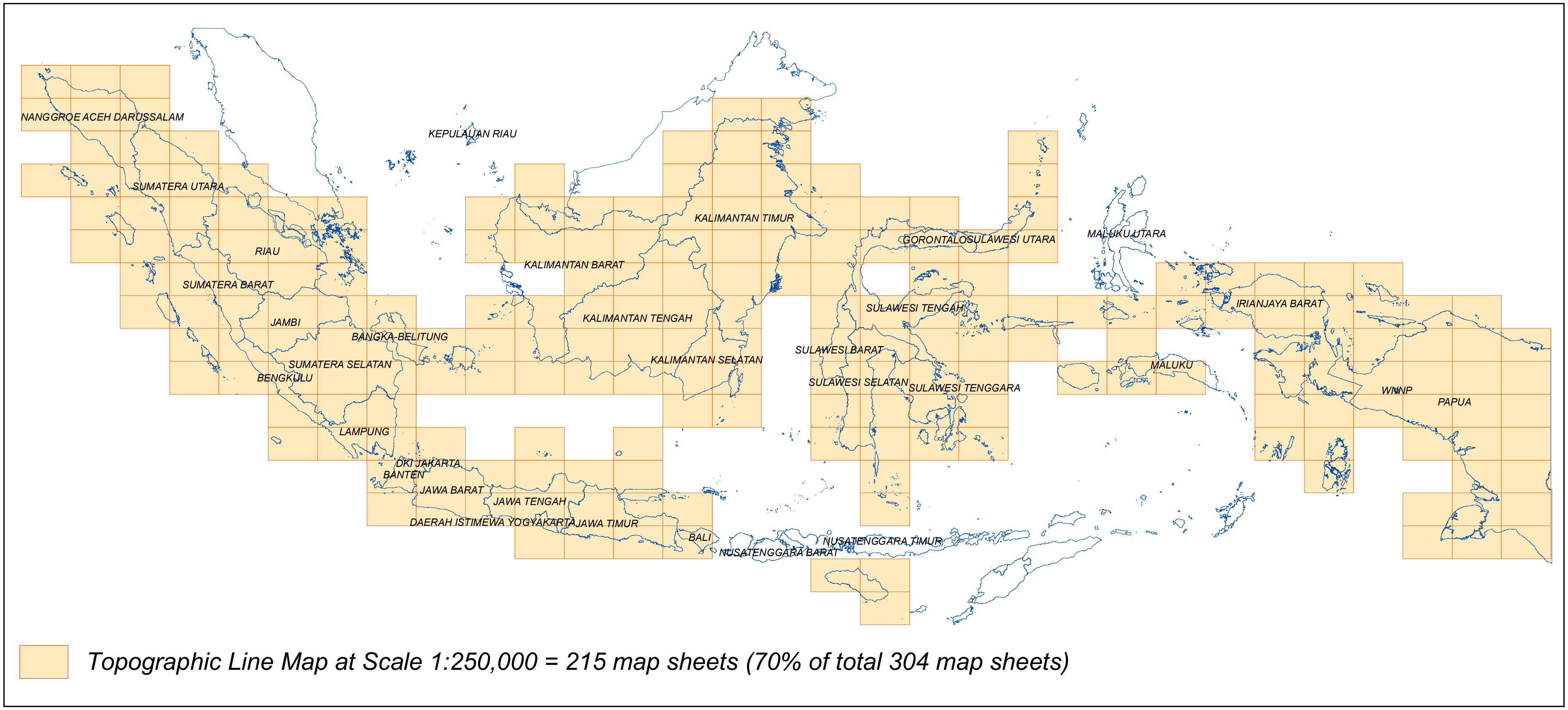
The availability of topographic maps at scale 1:250,000 covers only 70% (215 map sheets) of the country's total area comprising 304 map sheets. The more precise topographic maps than scale of 1:250,000 covers only part of the country, such as the topographic and image maps at scale 1:50,000 covers only 40% (1506 map sheets) of the country's total area comprising 3775 map sheets, topographic map at scale of 1:25,000 covers about 10% (1802 map sheets) of the country's total area comprising 16,950 sheets, and topographic map at scale 1:10,000 about 745 map sheets which also covered the post natural disaster area of Nanggroe Aceh Darussalam province.

The existing base map for the National Development Program includes topographic maps at scale of 1:50,000 for Java-Bali-Nusa Tenggara, and Sulawesi. The priority areas where map of this accuracy level are not available and need to be constructed regarding the whole of Sumatera, 30% of Kalimantan, 75% of Molucas, and for the whole of Papua areas.

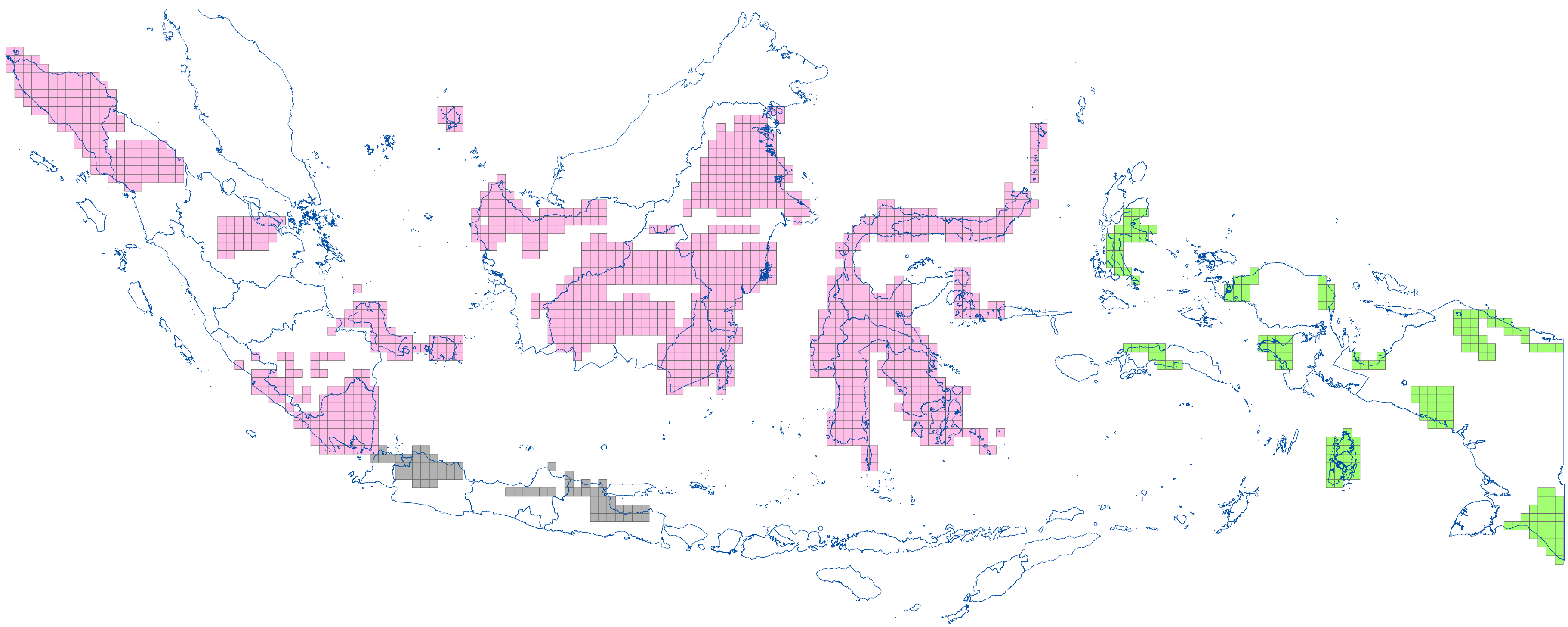
The basic data at scale of 1:250,000, though covers the entire land of indonesia has inherent limitations in the geographic information content. Therefore, an urgent need to construct data at a scale of 1:50,000 as mentioned above.

The status of the availability of topographic map covering the whole country can be seen at the index maps attached bellow.

DIGITAL TOPOGRAPHIC LINE MAPS COVERAGE FOR SCALE 1:250,000 OF INDONESIA AREA



DIGITAL TOPOGRAPHIC LINE MAPS COVERAGE FOR SCALE 1: 50,000 OF INDONESIA AREA

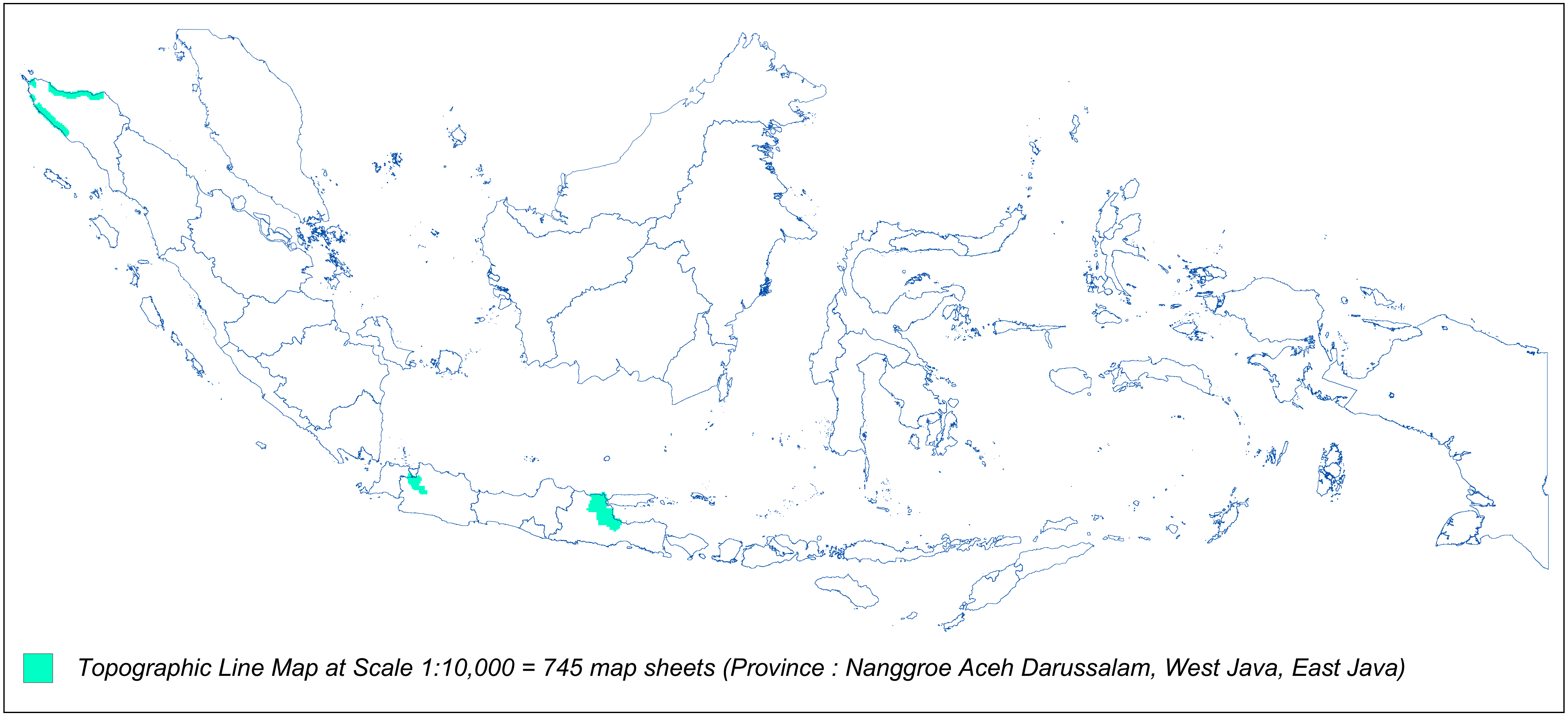


- Topographic Line Map at Scale 1:50,000 = 1,174 map sheets (40% of total 3,775 map sheets)
- Satellite Image (SPOT) Map at Scale 1:50,000 = 176 map sheets
- Airborne IF-SAR Image Map at Scale 1:50,000 = 156 map sheets (Java = 63 map sheets ; Kalimantan = 93 map sheets)

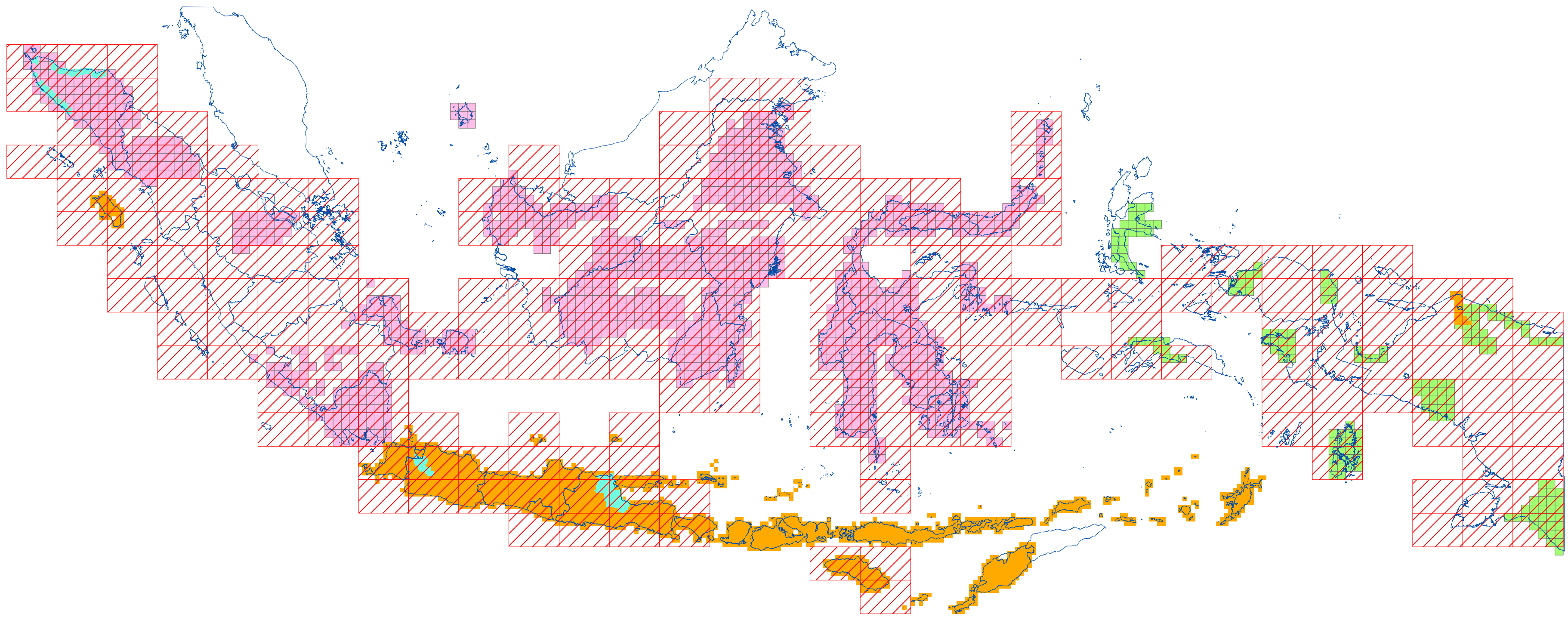
DIGITAL TOPOGRAPHIC LINE MAPS COVERAGE FOR SCALE 1: 25,000 OF INDONESIA AREA

Topographic Line Map at Scale 1:25,000 = 1,802 map sheets (10% of total 16,950 map sheets)

DIGITAL TOPOGRAPHIC LINE MAPS COVERAGE FOR SCALE 1: 10,000 OF INDONESIA AREA



MULTI SCALE DIGITAL TOPOGRAPHIC LINE MAPS COVERAGE FOR THE ENTIRE OF INDONESIA AREA



- Topographic Line Map at Scale 1:250,000 = 215 map sheets (70% of total 304 map sheets)
- Topographic Line Map at Scale 1:50,000 = 1,174 map sheets (40% of total 3775 map sheets)
- Satellite Image (SPOT) Map at Scale 1:50,000 = 176 map sheets
- Airborne IF-SAR Image Map at Scale 1:50,000 = 156 map sheets (Java = 63 map sheets ; Kalimantan = 93 map sheets)
- Topographic Line Map at Scale 1:25,000 = 1,802 map sheets (10% of total 16,950 map sheets)
- Topographic Line Map at Scale 1:10,000 = 745 map sheets (Province : Nanggroe Aceh Darussalam, West Java, East Java)

3.1.2. Marine, Coastal Map and Aeronautical Chart

The main program is to provide the spatial data for marine base maps and aeronautical charts through out the Indonesian archipelago.

The first program is to provide the marine spatial data on 1: 500.000 scale or resolution (see the map index-1), secondly to provide the hydrographic data on 50.000 and 250.000 scale or resolution, especially along the coast areas (larger resolution whenever needed), see the index map –2 and -3, and third is to provide the marine spatial data along the Indonesian Sea lane (ALKI I, II, III) see the index map – 4.

Provide the marine spatial data on base points areas and EEZ (see index map – 5 and –6).

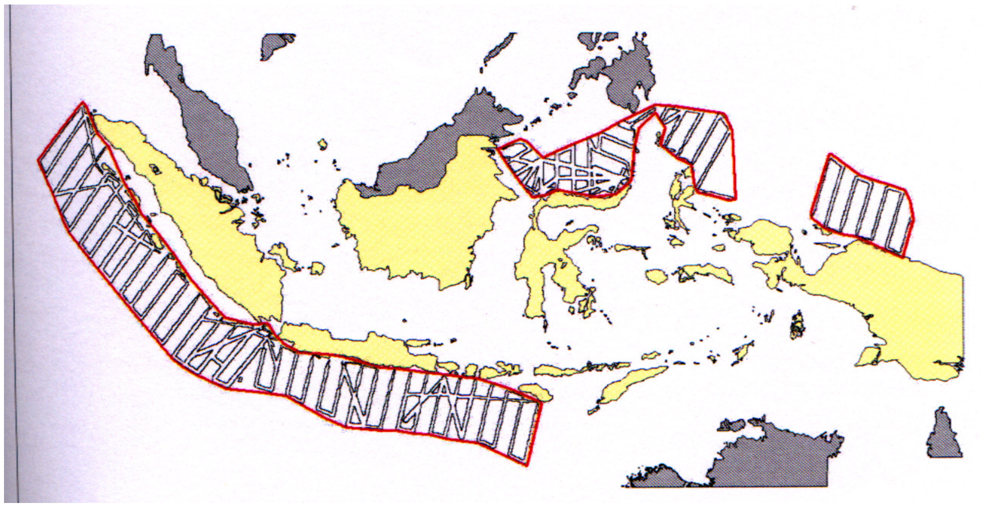
Provide Word Aeronautical Chart (WAC) on scale 1: 1.000.000 (under construction) the airport/strip and the surrounding areas charts on 1: 25.000 scale and 1: 250.000 scale.

The following table is the current coverage (2002)

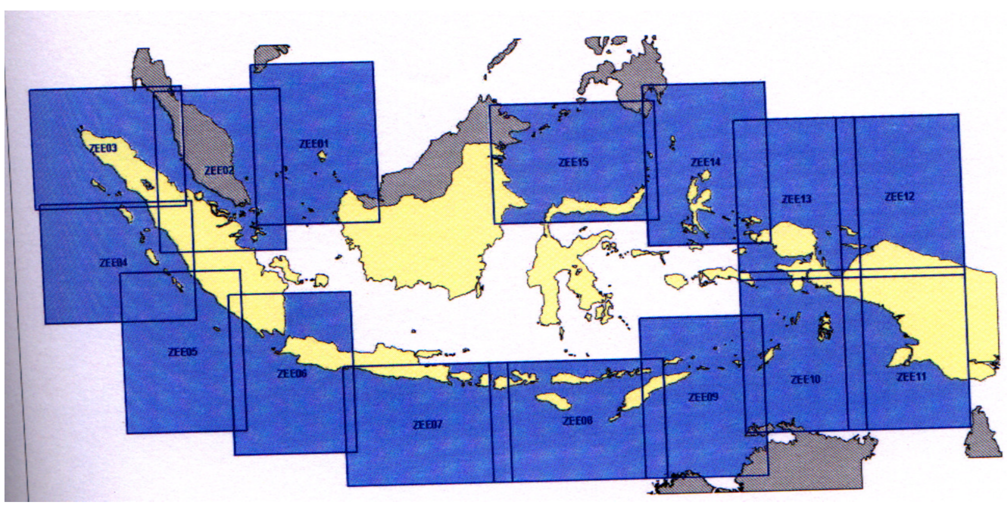
Tabel 3.1 MAPS COVERAGE, STATUS BY 2002

Activity	Coverage			**Remarks**	**Format**
	Area	**unit**	**quantity**		
Marine / hydrographic survey	ZEE areas Coastal areas	Sheet or line-km	See index map Equivalent to 171 sheets 1: 50k and 41 sheet of 1: 250k	Hydrographic Surveys (multibeam ES)	
Marine Base Mapping	Coastal areas	sheet	171 of 1: 50k maps and 41 of 1: 250k maps		Hardcopy, desktop cartograph ic, IS
Marine Thematic base mapping	Base point maps ZEE maps	Sheet Sheet	64 16		Desktop cartograph ic
Survey and Aeronautical Charting Airport and surrounding areas Civil Aviation Chart (VFR) World Aeronautical Charts (WAC)	Main airports Medan, Manado, Balikpapan, Jakarta and Denpasar areas	Sheet Sheet Sheet	13 6 5	1: 25.000 scale 1: 250.000 scale *under construction*	Desktop cartograph ic and DXF, hardcopy

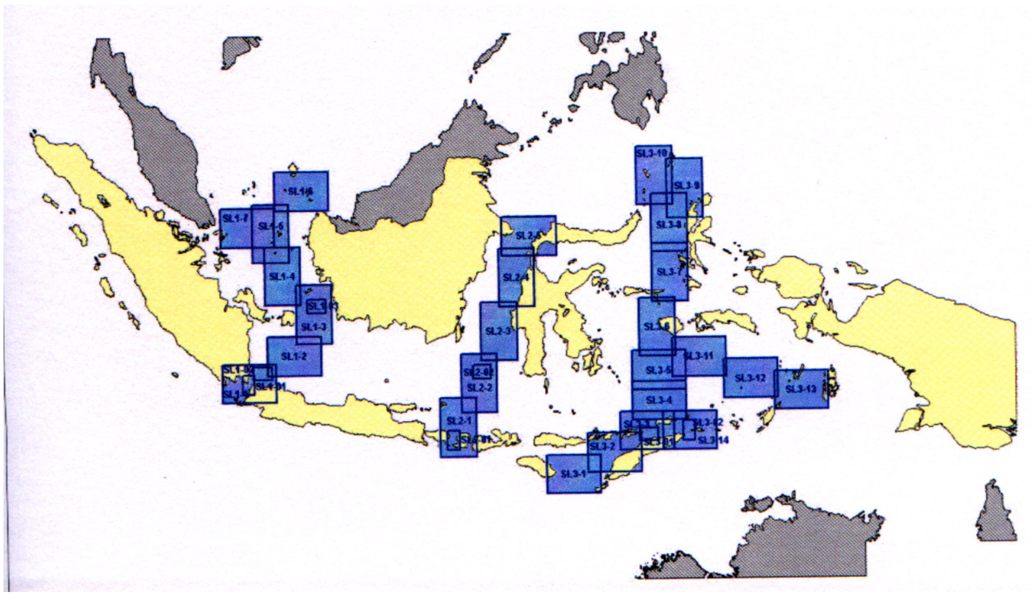
INDONESIAN EEZ - BATHYMETRIC DATA



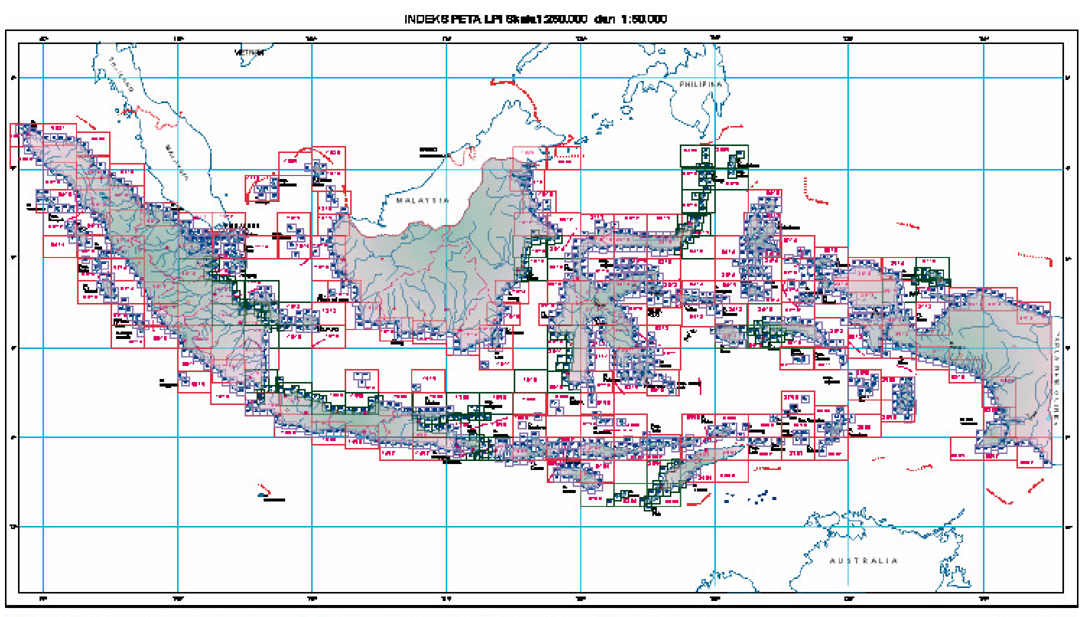
INDONESIAN EEZ INDEX MAP



INDONESIAN SEALANE BATHIMETRIC DATA



INDEX OF COASTAL MAP
SCALE 1: 50.000 and 1:250.000



3.2. GEOLOGICAL AND GEOPHYSICAL DATA AND INFORMATION FOR DISASTER MANAGEMENT AND SUSTAINABLE DEVELOPMENT

Realizing that the Indonesian Region is considered to be the country which is vulnerable from many geological disasters, the Government has put a particular attention towards the matter. Since the last two decades, the technical institutions (Geological Survey Institute (previously, Geological Research and Development Centre), Centre of Volcanology and Geological Mitigation, Centre of Geological Environment) under the Geological Agency, Department of Energy and Mineral Resources have performed a continuous inventory, research and mitigation programs on the subject of geoscience for geological hazards and mitigation.

Generally, the inventory, research and mitigation programs related to the disaster management done these institutions cover inventory and research in geological and geophysical for earthquake, tsunami, volcano eruption and landslide data. The results of these activities are presented in the form of maps, publication and unpublished reports. The maps produced as can be seen on the table 1. Most of the research results are stored as published and unpublished reports in the library. Others geological and geophysical data to support the disaster management are systematic geological and geophysical map of 1:100.000, 1:250.000, 1:1.000.000 and 1:5.000.000 scales, quaternary geological maps, geomorphological maps of 1:100.000 scale, engineering geological maps of 1:100.000 scale, geological environment maps scale 1:100.000 scales and hydrogeological maps of 1:250.000 scales.

Table-1. Mapping Results on Related Subject

No.	Subject	Scale	Result
	Seismotectonic map scale 1:100.000	Scale 1:100.000	27 Sheets
	Volcanic Hazard Map scale 1:50.000	Scale 1:50.000	69 sheets
	Landslide susceptibility Map Landslide susceptibility	Scale 1:100.000 Scale 1:500.000	27 sheets 2 sheets
	Earthquake Hazard Map of Indonesia	Scale 1 : 5,000,000	1 sheet
	Earthquake Ground Shaking Hazard Map of Indonesia	Scale 1 : 5,000,000	1 sheet
	Seismotectonic Map of Indonesia	Scale 1 : 5,000,000	1 sheet
	Engineering Geological Map	Scale 1:100.000	8 sheets
	Environmental geological Map	Scale 1:100.000	8 Sheets
	Hydrogeological Map	Scale 1:250.000	33 Sheets
	Quaternary Geology Map	Scale 1 : 50,000	26 sheets
	Geomorphology Map	Scale 1 : 100,000	19 sheets
	Systematic Geological Map of	Systematic Geological Map of	57 sheets

	Indonesia	Indonesia)	181 sheets
	Systematic Bouguer Anomaly of Indonesia	Scale 1:100.000 Scale 1:250.000	57 sheets 141 sheets

Table-2. Result of Research and Development on Related Subject

No	Subject	Area	Result
1	Neotectonic and seismotectonic Research	• Bandarlampung • Kota Agung • Liwa • Bengkulu • Sungaipenuh • Bukittinggi • Padangpanjang • Solok • Pasaman • Tarutung • Blangkejeren • Malang • Bandung • Seririt, Bali • Dieng • Leuwidamar • Jampang-Bogor • Saguling Dam • Citarum River • Bali • Bandung • South Sukabumi • Kuningan • Gorontalo • Wamena • Tarakan • South Lombok • Mataram, NTB • Parigi, Middle Sulawesi • Palu, • Jayapura • Kao, Halmahera • Maumere • Eastern part of Lombok • Biak Island • Bima-Great Sumbawa • Pelabuhan Ratu • Manado	- Report - Neotectonic setting - Seismicity - Earthquake source zone - Earthquake Risk Assessment

		• Toba Lake • Bulukumba, South Sulawesi • East Lampung, Lampung • Makassar, Sulawesi • Kendari	
2	Fault deformation research	• Great Sumatera Fault: Liwa, Solok-Singkarak, Tarutung. • Palu Koro Fault • Majalengka (Baribis fault)	- Report - Slip rate of the fault segmen
3	Earthquake investigation	• Yapen Island • Garut-Tasikmalaya • Karangasem, Bali • Curup, Bengkulu • Jayawijaya, Papua • Sunda Strait • Padang, Sumatera • Sukabumi • Gorontalo • Alor Island • Bantarkawung • Flores • Dilli • Parigi • Toli-toli • Kerinci, Jambi • Pelabuhan Ratu • Ambon, Maluku • Kabanjahe, North Sumatera • Jagong • Takengon, Aceh • Donggala, Sulawesi • Blitar, Java • Tanah Grogot, Kalimantan • Pandeglang, West Java • South Dempo • Banggai • Bengkulu, Sumatera • Cicalengka, West Java • Pandeglang, West Java • Aceh • Palu, Middle Sulawesi • Yogyakarta, Java	- Report - Isoseismal map - Earthquake hazard zone

3.3. GEO-INFORMATION INTEGRATION FOR TSUNAMI DISASTER IN THE GUIDANCE FOR SUSTAINABLE SPATIAL PLAN

3.3.1. History The Birth of Guidance for Tsunami Spatial Planning

Learning from the experiences of coastal disaster in Indonesia that recorded during 1965 – 2006 (more than 100 times, *Ater Latief, 2000*), sea earthquake and tsunamis are the importance of the worst coastal hazards. Hazards, including earthquakes, and tsunamis are having an increasing impact on humans, due to rising poverty and the onset of global environmental changes, coastal and marine biodiversity loss. In Indonesia, there are more than 80% industrial activities, 50 main cities or growth centers at coastal area. Consequently, the intense risk to the population and their socio-economic activities followed the magnitude of the coastal disaster. Thus, hazards only result in disasters if high risk conditions are present.

The increase in human casualties and property damage during 1965-2006 as the impact of tsunamis hazardous on several main coastal cities, specifically tsunami which is caused more than 200.000 victims on 10th December 2004 in Aceh Province, has initiated the Directorate Spatial Plan of Marine Coastal and Small Islands, Directorate General of Marine Coastal and Small Islands, Department of Marine and Fishery Affairs of Indonesia in 2005 to prepare the technical Guidance for spatial planning on hazard sensitive coastal zone due to minimize the spread of risks.

The processes of setting up the concept of the Guidance are started from satellite imagery analysis of hazardous area at several places in Aceh Province (West Coast of Meulaboh, Lok Nga, West Aceh; North Coast of Banda Aceh; and East Coast of Singkil, East Aceh). The input of the process is landsat TM 7 and ICONOS before and after tsunami. The output of analysis process is base map of hazard zone and several thematic maps (land cover, digital terrain model (DEM), land utilization, map of infrastructures, and hazard and risk map). Satellite imagery analysis was followed by field observations due to check and to complete the physical-environment and socio-economic information which are needed. The survey has taken place at several locations mentioned above for many months. While data collection had been processing the value of the data from the fields was often changed and inconsistent. The Taskforce that consist of staff from all Directorate Generals of Department of Marine and Fishery Affairs, was responsible to do many tasks on the fields, not only gave first aid to the victims but also collected the data needed by the process design of the Guidance.

After ten moths the process, the draft of the Guidance was finished and the materials ready to be discussed widely among stakeholders. Fortunately, the process was parallel with the process of preparing 'Grand Design the Program of Reconstruction and Rehabilitation of Nangroe AcehDarussalam After Tsunami' which was coordinated by National Development and Planning Board (Bappenas). Those Grand Design covered the theme of

Spatial Planning Program for disaster area at its article. Thus, as far as the draft concept of Grand Design was discussed by stakeholder the draft concept of Guidance was discussed due to its improvement. There were several discussion due to collect the input for draft improvement which are taken place at Jakarta for national level and at Aceh for local level. The angle of view of national stakeholder about the Guidance is quite sharp on political and socio-economic aspects while it was focus on infrastructure rehabilitation and housing delivery for the victims. Based on the reason that the focus area of planning only cover tsunami disaster zone and its surrounding, so the substations of the Guidance give stressing on environment and physical aspects of coastal planning.

3.3.2. Principles of Sustainable Coastal Planning Written In The Guidance

The main purpose of the Guidance is to set up the steps for utilizing the coastal zone where the impact of tsunami hazard would be happened. The steps deal with 5 (five) principles of coastal spatial planning in the line of sustainable development. There are started by identifying zones covered by tsunami run up; identifying coastal geomorphology related to hazard threat; strengthen coastal ecosystem zone due to prevent disaster; allocating the proper socio-economic facilities refer to significant of their function; and are finalized by designing the concept of coastal utilization.

The first principle is to identify any part of the coastal zones which will be covered by run up of tsunami. Of course the far away of the covered area only come from a prediction which is calculated by mathematical model for tsunami run up based on experience data of tsunami at Japan, Indonesia, and Philippine since 1960. The first principle will give valued information about prediction of area covered by tsunami run up under the level of magnitude.

The second principle is to identify the vary of coastal geomorphology in the context of hazard level. Coastal geomorphology can be divided by types of slopes and component of soil substrate. The closest coastal form (gulf and bay) the biggest tsunami hazard, the steepest slope the smallest tsunami hazard, the hardest substrate coastal bed, the biggest defend of coastal. By the principle it can be predicted the level of hazard will be threaten the coastal zone. The output of this step is classification of the area into very sensitive, moderate sensitive, and low sensitive area to tsunami run up.

The third principle is to understand the ecological function of coastal ecosystem. The natural ecosystem in the tropical coastal region is occupied by mangrove, seaweed, and reef. Beside natural, manmade ecosystem (water break) often found at several part of coastal zone. The principle of sustainable coastal plan is to protect and to sustain the function of natural coastal ecosystem. It is prove that natural ecosystem can protect coastal zone from any hazard better than man made ecosystem.
The fourth principle is classifying the infrastructures based on their function and level or amount of people utilized. It recommends infrastructures can be

located in very sensitive hazard zones if their function relate urgently to coastal and marine utilization and will not generate activities amount of people. It means that any infrastructures which have any vital functions for daily people activities should not be located at very sensitive zones, eg. hospital, government offices, industries, electricity installation, etc.

The fifth principle is designing the utilization of land and waters in sustainable manner. In this, the spatial distribution of socio-economic activities is designed in effective and efficient relationship among them. While the concentration of settlements is allocated spatially to create a comfort and safe living for society in the long period, the natural resources in the coastal can be utilized in sustainable manner.

It is hoped that the principles stated in the Guidance can be effectively applied by any spatial planners due to prepare the concepts of sustainable coastal land use plan at the district, municipality, and regencies in Indonesia. Of course, it is needed a set of qualified database and supported by a capable decision support system.

3.3.3. Current Data Management System for Sustainable Coastal Planning

Decision Ministry of Marine and Fishery Affairs Number: 15/Kep/2006 guides the needs of base data identification for coastal and marine planning in sustainable manner. Technically, the ministry decision on base data identification clearly guides various geo-information needed by any level detailed of coastal planning. The various geo-information are oceanography, coastal geomorphology, land cover and land use, and coastal ecosystem. Besides physical geo-information, information about the quality of waters and marine resources like sea water pollution, amount and quality of various fish and their water environment is specifically guided for any level of coastal disaster areas.

Taskforce who has responsible to prepare base data is given by any level of government administration. It means that any level of government should have a multi sectors team which focuses on base data preparation activities started from district to national level of base data preparation. By this management system of base data preparation, the setting up of management information system at national level would relate to province, regency/municipality, and district level. It is hoped can be guaranteed base data at all level of management data will consistent.

As an example, when the earthquake 6.8 scale of Richter on seventeenth July, 2006 at west coast of West Java Province, caused about 3 m height tsunami wave and distributed its run-up about 100 meters away into resettlement area. As stated by the Guidance, the area of tsunami run-up distribution has been identified before by the geo-information analysis of the area. By analyzing geomorphology, coastal land cover, and bathymetry information, it can be understood why South coast of Ciamis, Cilacap, and

Kebumen suffer the worst impact of disaster, while south coast of Purworejo, Bantul, and Kulon Progo have safe position from the disaster.

According to the result of geo-information integration analysis, the coasts where the tsunami run-up was far away into the land, it is identified that the slope is relatively plain, the coast classified as a bay, and their land covers are weak to face the run-up. While after the disaster, hazard map which given hazard risk information on estimated socio-economic loss, can be evaluated by information integration of socio-economic on geo-information.

3.3.4. Research Activities

The research activities conducted in the Department of Marine and Fisheries Affairs consist of Marine Cadastre Mapping in the Strait of Madura.

The area of the Madura Strait is a fast growing coastal and marine area. Current utilization of the segment of the northern Java coastal and marine area include utilization by various sectors for economic and non-economic related activities. Spatial utilization related to economic activities is represented by the Port of Tanjung Perak, various Fishery Ports, a Special Port for Petro-Chemical Industry, area of culture fisheries, capture fisheries, agriculture, submarine electricity cable, submarine pipe, recreation areas and other economic related uses. Moreover, the Madura Strait is also used for Naval Base. Therefore, spatial utilization of the Madura Strait area is complex. Marine Cadastre Mapping is an ongoing effort to map the spatial utilization of the Madura Strait as a tool for marine spatial management and to minimize conflict among users and sectors.

3.4. INTEGRATED DATABASE FOR NATURAL DISASTER

In cooperation with the Geophysics and Meteorological Agency, and the Directorate General of Geology, BAKOSURTANAL produced multi hazard map of land slide and flood, particularly for Java Island.

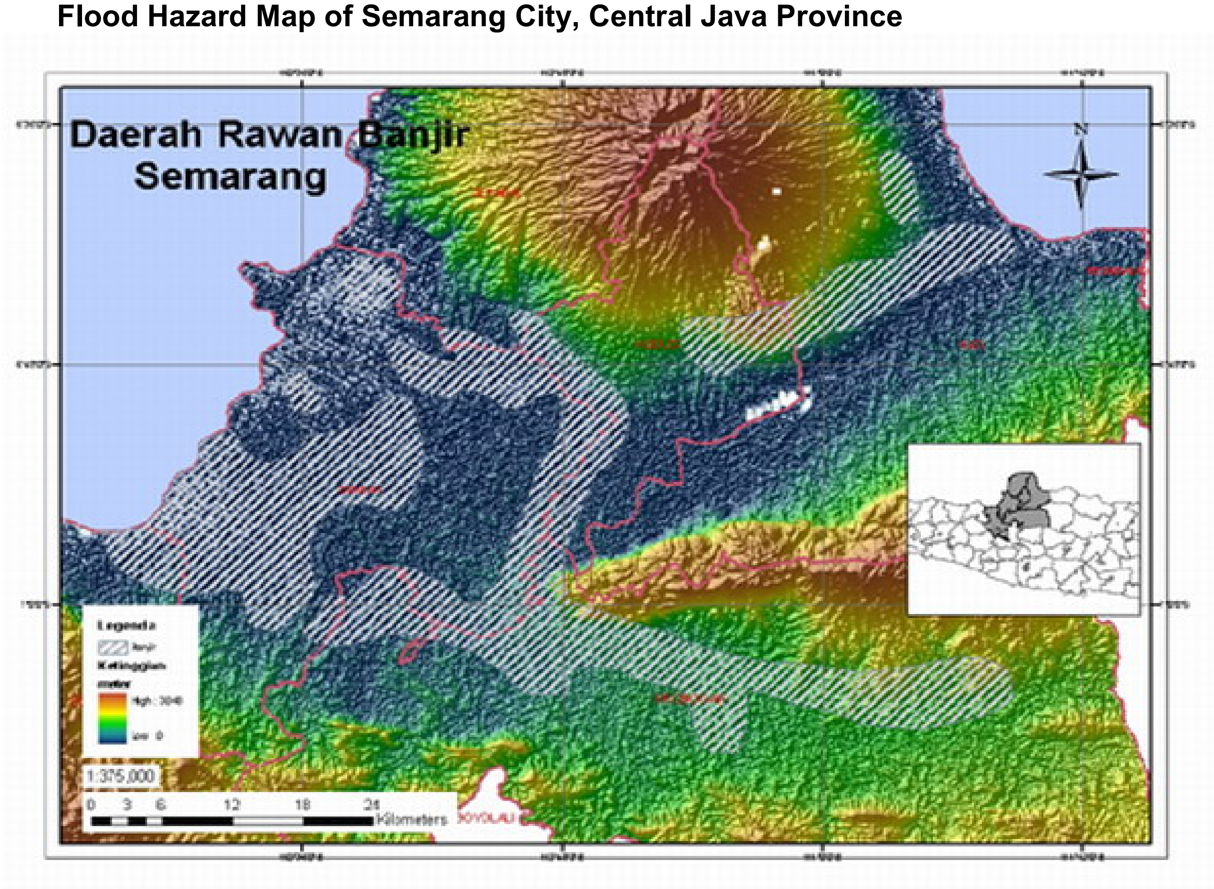
Geographically, the Indonesia region representing archipelagic country with second longest coastal area in world, is located in tectonic plate of Asia, Australian, and the Pacific, so that most of this region represent active earthquake band. Besides, the topography was predominantly characterized by mountains with steep slope. In a state of that way, these areas become vulnerable to various natural disaster types, like earthquake, volcano eruption, tsunami, land slide, floods, drought, and forest fire.

Up till now, the activity of natural disaster preparedness is still having the character of emergency, which is in a temporer plan and action at the time of and after the happening of disaster. This action relates to evacuation of victim, distributing of aid and rehabilitation activities. If the action can be planned or managed before the disaster, then the expense needed for this preparation will much cheaper compared to amount of loss generated by natural disaster without preventive effort.

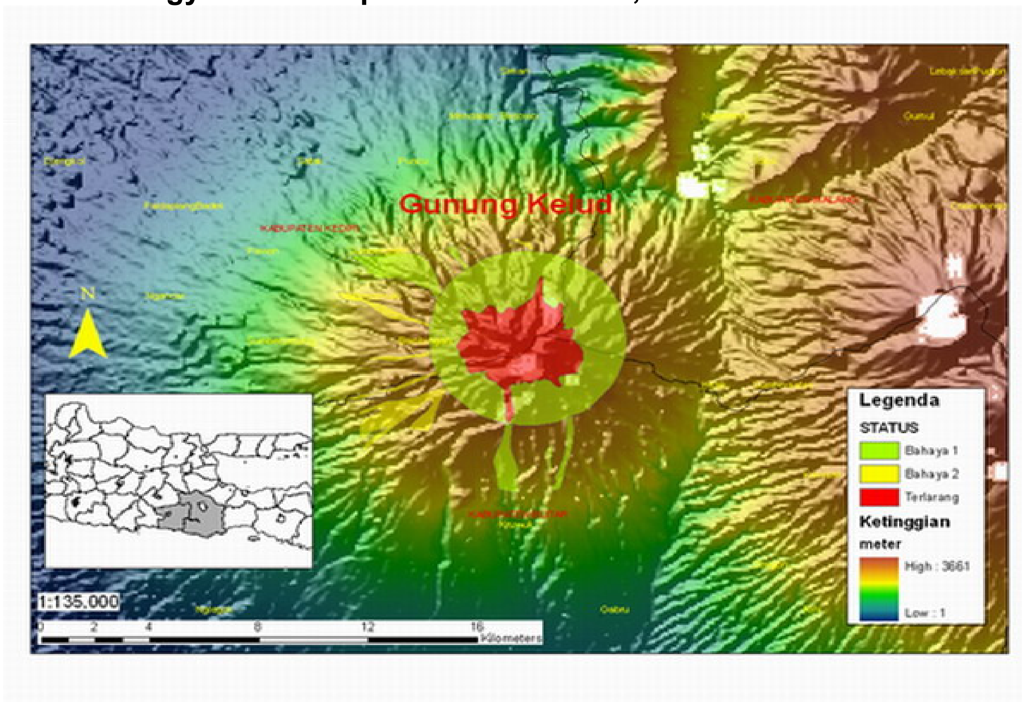
Natural disaster data and information, which comprehensively present disaster information, represent as resistor in disaster management. Therefore, a database system, based on GIS (Geographic Information System), is needed. This system can combine several types of spatial disaster data or information in the form of map with numerical data.

Through establishing this system, natural disaster data in many institutions will be compiled. Therefore, comprehensive natural disaster data and information can be easily and accurately accessed by the community. This system, later, is expected to be as an early warning system for the Indonesian community. As the first step, this natural disaster database compilation is focused particularly in Java island. Through this approach, communities which live in vulnerable area of natural disaster will be more ready to anticipate it, if condition of natural disaster really happened, so that the loss generation will be able to be minimized

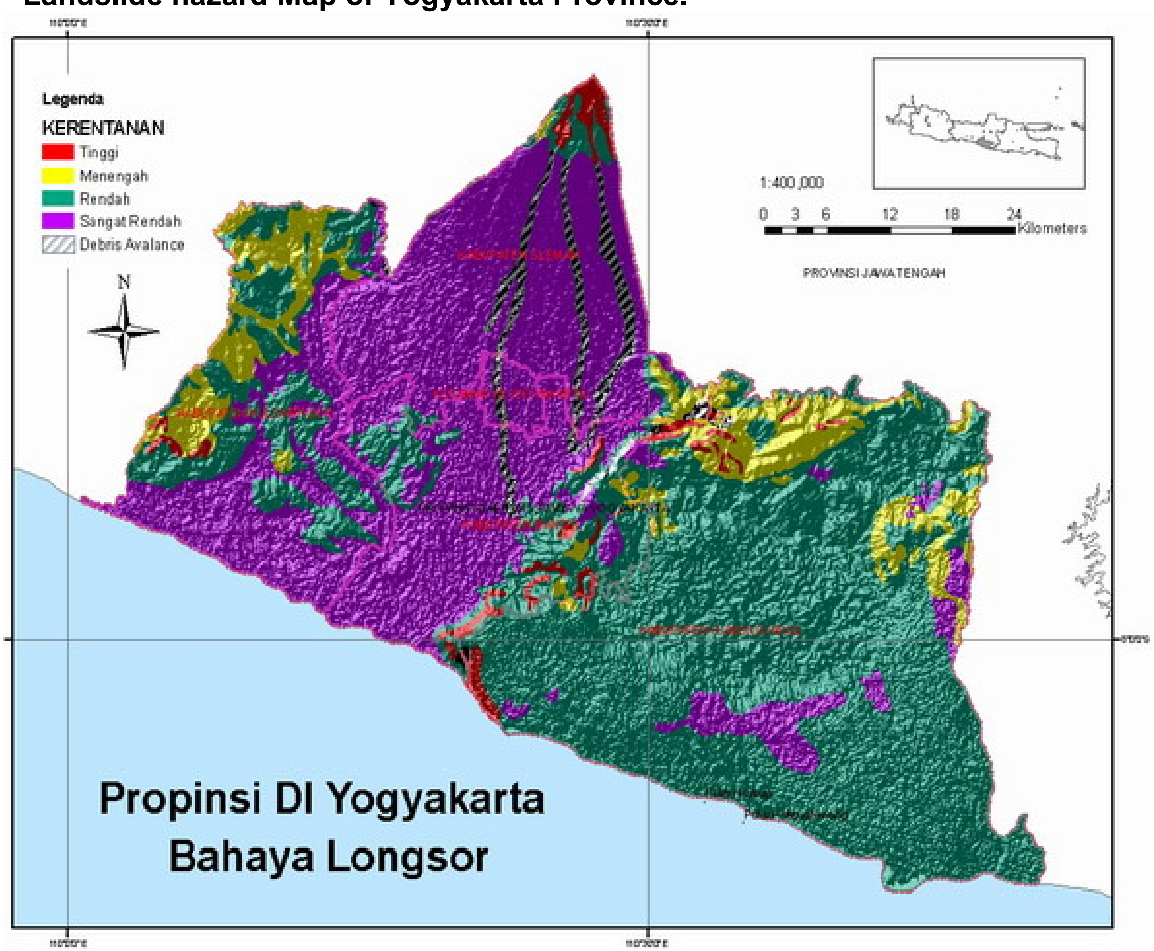
Flood Hazard Map of Semarang City, Central Java Province



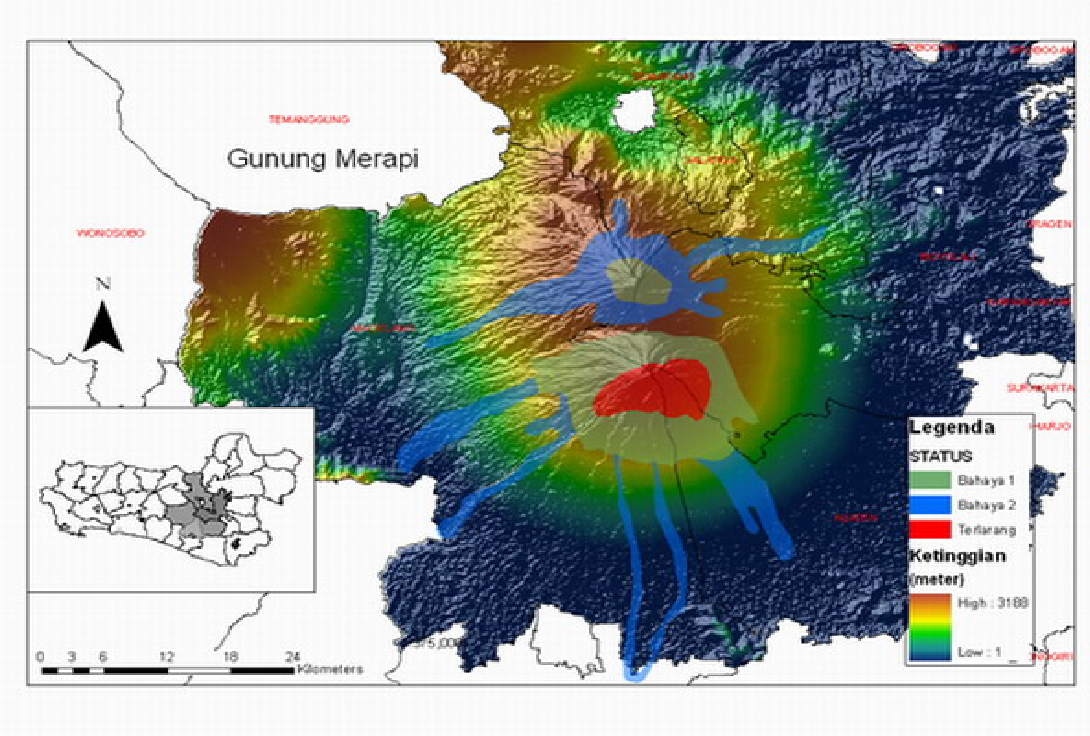
Volcanology Hazard Map of Kelud Volcano, East Java



Landslide hazard Map of Yogyakarta Province.



Volcano Hazard Map of Merapi and Merbabu Volcano



3.5. MARINE NATURAL RESOURCES SURVEY AND MAPPING

The marine natural resources and environmental survey and mapping program aim at inventory of land natural resources, compilation of marine natural resources accounting, and implementing land assessment, including compilation of the marine natural resources thematic database, and providing the national standards in the form of norms, guidance, procedures, standards and technical specifications for surveys and mapping of the marine natural resources.

Coastal resource mapping have been done in Alor Regency-East Nusa Tenggara and Banggai Regency-Central Sulawesi in 2006. Information produced to this activities are: coastal typology, land cover, mangrove, coral reef and Sea grass distribution, fish resources, sea water quality, and demographic condition of the coastal area. Another activity is mapping of ecosystem condition in Sunda Strait area and some of its small island, that have been done at 1:250.000 scale, and for some selected area at 1:50.000 scale.

Marine Natural Resource Accounting activities, producing 1:50.000 of Fish, Mangrove Forest, and Coral Reff Accounting for Selayar Regency, Bulukumba Regency, Sinjai Regency-South Sulawesi, and Banggai Regency-Central Sulawesi.

Executive practitioner in sustainable regional development needing general information at regency level. For that purpose, Geographical description of Singkawang Regency and Pontianak Regency-West Kalimantan, Alor

Regency, and West Sumba Regency-East Nusa Tenggara as well as Tidore Regency-North Maluku has ben produced.

More information concerning the marine natural resources survey and mapping can be access through www.bakosurtanal.go.id

3.6. SOIL AND AGROCLIMATIC MAP

During the first 100 years of its exixtance, indonesian Center for Agricultural Land Resources Research and Development (formerly ***"Indonesian Soil Research Institute"***), has played important roles in developing land resources inventory and data base, technologies for optimation of the land resources use, and environmental management as well as hazard mitigation technologies. Land resources inventory supported by development of soil clssification, soil mapping technology, and GIS/remote sensing technology. Some thematic maps as results of those activities will be presented as below.

3.6.1. Status of Soil Mapping.

Soil resources mapping program in Indonesia has been carried out by Indonesian Center for Agricultural Land Resources Research and Development (ICALRDD).

This program started since this Institute has been established in 1905. the objectives of this program is to conduct soil resources inventory and to supplay soil resources information for agricultural development. Soil mapping activities have been carried out at various map scale, e.I. exploretory (1:1,000,000), reconaisance (1:250,000), detailed reconaisance (1:100,000), semi detailed (1:50,000), and detailed (≥ 1:25,000) level.

Each scale reflects information level and target that will be gained (Table 1). Up to 2005 (Table 2), soil resources mapping at exploratory level has been completed for the whole of Indonesia and has been presented in Atlas format. Whereas at reconaisance, detailed reconaisance, semi detailed, and detailed level are only, respectively, 109.7 juta ha (58.3%), 7.6 juta ha (4.0%), and 24.5 juta ha (13.0%) completed.

Those maps have not been presented in atlas format yet, and stored both in digital and hard copy fromat. Interpretation of soil map has resulted other thematic maps, such as land suitability maps for various commodities and agricultural landuse planning maps for supporting space development planning, especially in agricultural sector.

Soil map is basic information to produce many kinds of interpretation maps as well as land suitability maps for several kinds of agricultural commodities, nutrition status of P&K, recommendation for fertilizer used on paddy fields, recommendation for spatial planning of agriculture, agro ecological zones, etc.

Table 1. Level of mapping, scale and it's purposes

Level of mapping	Map scale	Purpose
1. Exploratory	1:1.000.000	Physical planning at national level
2. Reconnaisance	1:250.000	Physical planning at provicial level
3. Detailed reconnaisance	1:100.000	Physical planning at regency level and/ specific purpose e.l. watershed management, soil degradation, agro-ecological zones, etc.
4. Semi-detailed	1:50.000	Physical planning at district level and/ specific purposes: irigation, transmigration, estate crops. Field trial, land clearing, development of rice field, etc.
5. Detailed	≥ 1:25.000	

Table 2. Status of soil mapping in Indonesia up to 2005.

Island	Total area	Level of soil mapping			
		Exploratory	Reconnaiss	Detailed reconnaiss	Semi detail & detailed
……………………………… X 1,000 ha ………………………………					
Sumatera	47,241	47,241	47,241	2,227	4,180
Java & Madura	13,210	13,210	13,210	2,715	4,507
Western part of Indonesia (KBI)	60,451	60,451	60,451	4,942	8,687
Nusa Tenggara	7,209	7,209	5,340	12	1,554
Kalimantan	52,890	52,890	27,680	891	9,072
Sulawesi	18,743	18,743	11,404	1,003	2,547
Maluku	7,817	7,817	800	55	499
Papua	41,105	41,105	4,016	684	2,176
Eastern part of Indonesia (KTI)	127,764	127,764	40,240	2,645	15,848
Total area (ha)	188,215	188,215 (100 %)	109,691 (58.3%)	7,587 (4.0%)	24,535 (13.0%)

3.6.2. Agro Ecological Zone (AEZ) Map of Indonesia at scale 1:250,000.

3.6.3. Results of GIS and Remote Sensing Technology research

a. Map of Critical Land on 13 Provinces at scale of 1:250,000 (non digital version): NAD, North Sumatera, Banten, West Java, Central Java, Bali, NTB, NTT, Central Sulawesi, Southeast Sulawesi, South Sulawesi, North Sulawesi, and Gorontalo.
b. Map of Land Degradation at scale of 1:100,000 (digital processing) : West Java, and Citarum Watershed-West Java.
c. Maps of Tsunami affected agricultural area (1:100,000) – NAD, consists of : Map of Soil Salinity, Map of Mud deposit thickness, and Map of Permanently inundated area (including eroded area).

d. Map of Standardized Rice Field (1:250,000) : Java, Bali, Lombok, Sumatera, Kalimantan, Sulawesi.
e. Map of Primary and Secondary Rice Field (1:250,000) : Java, Bali, Lombok, South Sulawesi, South Kalimantan, and Lampung.
f. Map of Vulnerable to Drought on Rice Field Area : (1) at scale of 1:100,000 (Multi-Watersheds on Western part of West Java, Citarum Watershed and Northern coast of West Java, and Brantas Watershed-East Java), and at scale of 1:250,000 (Java, Bali, NTB, Lampung, North Sumatera, and South Sumatera).
g. Map of Landslide susceptibility at scale of 1:100,000 : (1) Paddy Field area on Citarum Watershed, and (2) Agricultural area on Multi-Watersheds on Western part of West Java.
h. Map of vulnerable to flood on Rice Field Area : (1) at scale of 1:250,000 on Java; and (2) at scale of 1:100,000 on Multi-Watersheds in Western part of West Java, Citarum Watershed and Northern coast of West Java, and Brantas Watershed-East Java.
i. Research on Rice Production Estimation by using Remote Sensing Technology (case study areas : Java, Bali, and Lombok).
j. Research on Land Degradation by using Remote Sensing Technology (1:100,000), a case study area is West Java.
k. Research on Potential Erosion Mapping Method for vegetable land in highland area.
l. Research on drought monitoring agricultural land by using Remote Sensing Technology.

3.6.4. Map of NPK Fertilizer Recommendation on Paddy Field in Indonesia (2006) at scale of 1:250,000.

These maps visualize government policy to NPK Fertilizer recommendation on Paddy Field in Indonesia at specific location or District (Kecamatan) level valid by PERMENTAN No. 01/Kpts/SR.130/1/2006.

3.6.5. Map of typology tidal swamp area in Sumatera, Kalimantan, and Papua at scale of 1:500,000.

3.6.6. Agroclimatic map of Indonesia at scale of 1:1,000,000.

3.7. PROGRESS IN THE BOUNDARY MAPPING ACTIVITIES

Indonesia is an archipelagic country having 33 provinces, 436 districts, 5263 subdistricts, and more than 60,000 villages. In land, Indonesia shares its borderlines with Malaysia, Timor Leste and Papua New Guinea. While in sea, Indonesia is bordered with India, Thailand, Malaysia, Singapore, Vietnam, Philippines, Palau, Papua New Guinea, Australia, and Timor Leste. .

In addition to the previous country report submitted by Indonesia, the following updates in boundary mapping activities are reported.

3.7.1. Indonesian International Land Boundary Mapping

Among the international land boundaries, the Indonesia and Timor Leste border area has been mapped jointly and completed by 2005 using CBDRF and WGS84. The area is covered by 17 sheets line maps of 1:25,000 scale and 26 sheets imagery maps of 1:10,000 scale. The border area between Indonesia and Papua New Guinea, has been covered by 27 map sheets of 1:50,000 scale, further update is needed for its geodetic reference frame, as well as for additional information along the border. Land border mapping of the Indonesia-Malaysia border is planed to be started this year. The datum and coordinates system of the border area mapping need to be unified, so that a program of Common Border Datum and Reference Frame (CBDRF) has been initiated since 2004 to use the World Geodetic System 1984 (WGS84) in order to build a common geodetic datum system. The new joint border maps having border points in the common border datum and coordinate system for Indonesia and Timor Leste have now been produced jointly.

3.7.2. Indonesian International Maritime Boundary Mapping

Indonesia international maritime boundary neighboring with ten countries, i.e. India, Thailand, Malaysia, Singapore, Vietnam, Philippines, Palau, Papua New Guinea (PNG), Australia, and Timor Leste. At present, Indonesia has jointly established its maritime boundary with seven neighboring states.

From the year 1969, 16 segments of maritime boundaries have been delimited, two of these bondaries delimiting the territorial seas, and the others are delimiting seabed (continental shelf) boundaries and economic exclusive zone. There are some segments of maritime boundaries need to be further negotiated. Recently, on going negotiation is being in progress with Malaysia, Philippines and Singapore. This include segments in the Sulawesi Sea and in the southernmost part of the Malacca Straits. The EEZ and Continental Shelf boundary between Indonesia and Philippines situated in in the Sulawesi Sea, the Philipina Sea in the western Pacific Ocean. In addition, delimitation process for Territorial Sea in the west sector of Singapore strait between Indonesia and Singapore has ben started in January 2006.

3.7.3. Administrative Boundary Mapping within Indonesia

Administrative boundary mapping program has been started in 2001 for supporting the Department of Home Affairs and local government in managing its administrative region within their authorities. Up to present, all of the provinces have been mapped in various scales. For the district boundaries, about 150 districts (30%) have been mapped. While for the sub district level, the responsibility is with local governments. To pursue a further progress in the local government level, some short trainnings have been conducted to cope with the local administrative boundary mapping.

3.7.4. Delineation of the outer limit of the Indonesia Continental Shelf

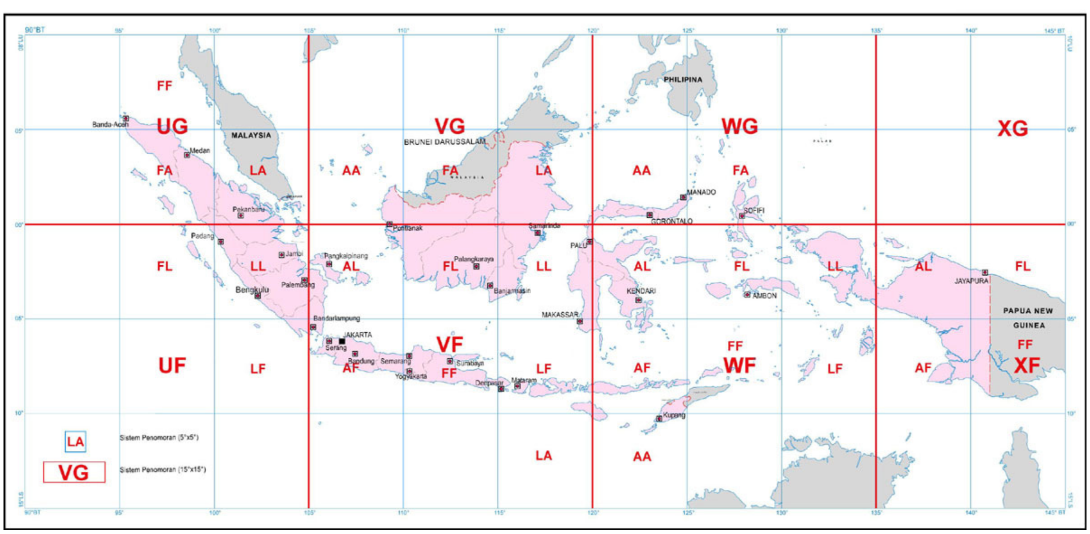
With reference to the provisions within Article 76 of the UN law of the Sea Convention, Indonesia as coastal states intends to delineate the outer limits of the continental shelf beyond 200 nautical miles. The desktop study has been carried out using bathymetric data from DMRM project, global sea bottom topographic data from ETOPO2 and sediment thickness data from NGDX/NOAA. Preliminary studies results shows a map that in the West of Sumatera, South of Sumba Island and North of Papua indicate its potential prospect for Indonesia to claim continental shelf limits extending 200 nautical miles. To ensure more precise results, geophysical mapping by seismic survey have been conducted in West of Sumatera in the beginning 2006. The result gives a wider possible continental shelf claim in addition to the result of the desktop study. Furthermore similar survey in another areas, will be carried out in the near future.

3.8. GLOBAL MAPPING AND ATLAS OF INDONESIA

3.8.1. Global Mapping

On behalf of BAKOSURTANAL, which has ratified a membership to International Steering Committee for Global Mapping (ISCGM), Atlas center has been developing global map of Indonesia at scale 1:1million in the last two years. This map consists of 4 vector layers and 3 raster layers and is developed using a datum based on International Terrestrial Reference Frame 94 (ITRF94). This datum is now represented by the World Geodetic System 1984 (WGS84). Vector layers are; Transportation, Boundaries, Drainage, and Population centers. And raster layers are; Vegetation, Landcover, and Landuse. While vector layers will be in seamless form for whole country (Indonesia), raster layers will be carried out in 28 tiles (a tile consists of 5°x5° area), using tiling system made by ISCGM.

Index for global map of Indonesia based on tiling system made by ISCGM



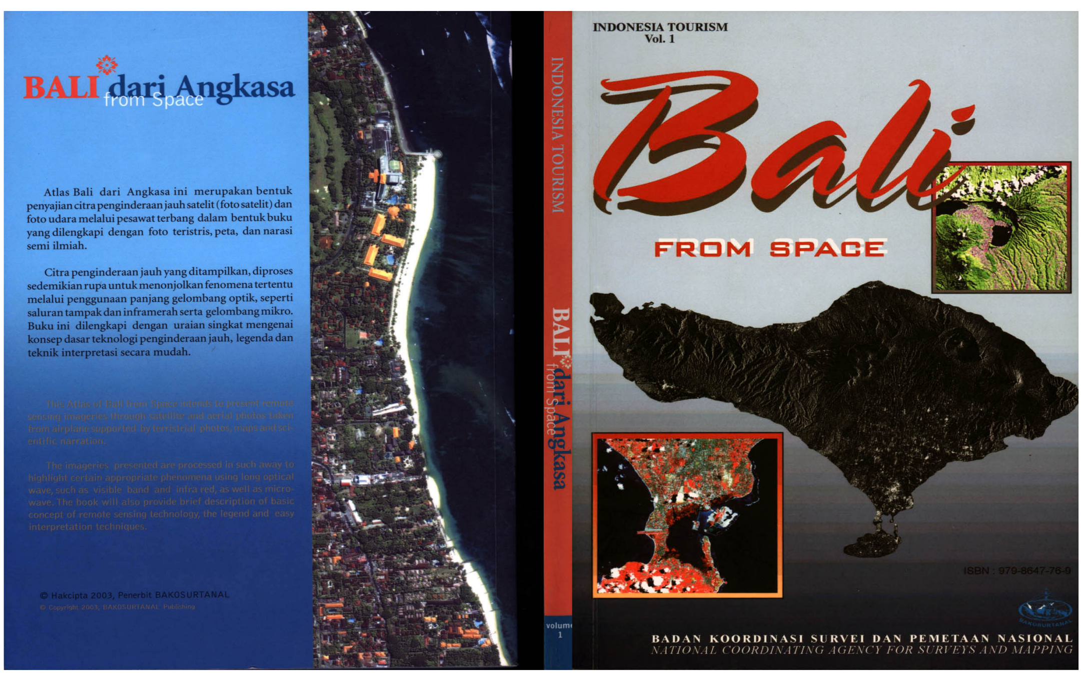
Boundaries layer has been delivered to the secretariat of ISCGM last year and verification has been given by the secretariat. In year 2006, atlas center emphasizes to establish 3 vector layers (transportation, drainage, and population centers). Using base maps at scale 1:250.000 and then generalize them into 1:1Million maps, the process is going smoothly well and estimated to be accomplished in late November 2006.

Since the source maps (base maps) use various geodetic datum that lead us into geodetic problems, the use of other material as a reference is needed to have a valid geometric accuracy. In this particular case landsat ortho-rectified images are used as the reference. The data is then fitted into those images to increase the geometric accuracy. During the early 2006, a set of ground truth sites forms was sent by the secretariat to national mapping organizations to be filled and resent to ISCGM. Atlas center used landcover map of Indonesia, which is made by BAKOSURTANAL, to fill the forms, after made an adaptation for the classification in accordance to landcover classification made by ISCGM.

After the completion of these vector layers, hopefully by the end of 2006, our aim in the development of global map of Indonesia will be the establishment of raster layers and up-dating information within the vector layers.

3.8.2. Atlas books and Multimedia atlas CDs

BAKOSURTANAL has made some atlas books and multimedia atlas CDs for various themes spreading from natural resources to tourisms. Some of these products were made in two languages, Indonesia and English.



In the last three years, BAKOSURTANAL has produced seven digital atlases under multimedia format, six of them cover provinces; west sumatera, lampung, west java, special region of yogyakarta, east java, manado city, and one covers all of Indonesia. These CDs give information about the province at glance, maps, tourist spots, hotels, restaurants, banks and money changers, handicrafts, travel agents, videos, etc. Several atlas books were also made with interesting design and information. Some of these atlas books are NTB from space, Bali from space, and Tsunami (Aceh). These books contain some satellite images, maps, text preview, and pictures to give more perspective about geo-information to readers.

3.9. POST TSUNAMI MAPPING OF ACEH

For supporting rehabilitation and reconstruction of Aceh that was badly hit by Tsunami 2004, BAKOSURTANAL set up mapping programs to develop geospatial data of Aceh necessary for planning support of the rehabilitation and reconstruction of Aceh.

The mapping programs cover the production topographic dataset of 1:10,000 for coastlines area, 1:50,000, 1:250,000, and DEM. This geospatial datasets will be used as a base map for making of Aceh Spatial Management Map.

This mapping is organized by BAKOSURTANAL and the Rehabilitation and Reconstruction Agency, a government agency set up for rehabilitating and reconstructing of Aceh.

4. DEVELOPMENT OF INDONESIAN NATIONAL SPATIAL DATA INFRASTRUCTURE AND NATIONAL SPATIAL INFORMATION SYSTEM

4.1. NATIONAL SPATIAL DATA INFRASTRUCTURE

The development of the National Spatial Data Infrastructure (NSDI) in Indonesia is still going on. During the last three years the development was concentrated on the physical components. As resulted from previous national coordination meetings, especially from the 2005 national meeting in Bali, the development of Indonesian NSDI should focus on the development of NSDI legal aspect, metadata, fundamental dataset standard, clearinghouse and capacity building, in order to bring NSDI into an operational phase.

In relation to the legal aspect, a Presidential Regulation has been arranged together with all government agencies involved. This legal product regulates fundamental dataset, custodian of the dataset, agency’s clearinghouse, national clearinghouse, fundamental dataset and metadata standards and funding. The progress of the arrangement of the regulation is as expected and now is seeking for the President approval.

In the development of metadata, the NSDI stakeholders agreed to utilize the FGDC metadata standard as the standard for developing of geospatial metadata in Indonesia. To help data producers in developing their metadata, a metadata maker called the National Spatial Medatata is developed and distributed to these producers. In addition to that, a metadata training for the producers is organized every year and socialization of metadata development is established through seminars and meetings. At present, about 4000 metadata records are available in XML format consisting data as follows:

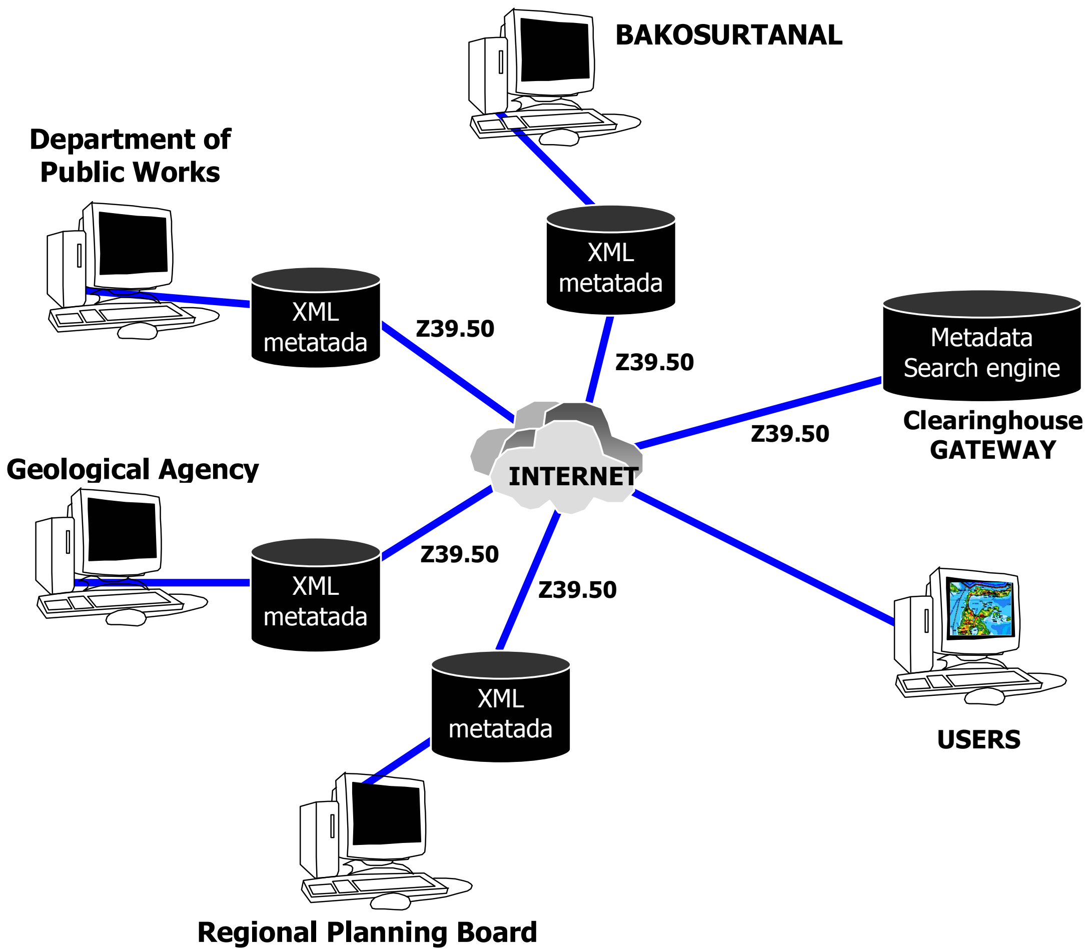
- land topography
- marine and coastal topography
- national atlases
- horizontal control networks
- geothermal
- metallic mineral
- non-metallic mineral
- coal
- soil atlas
- sea charts
- regional infrastructure
- distribution of disaster victims
- marine and coastal resources

To facilitate data sharing and use, Indonesian fundamental dataset should comply to a nationally adopted standard. Working together with the National Standard Agency (BSN) of Indonesia, Indonesian Standard of Fundamental Dataset is now developed. A draft of Spatial Data Codefication Framework document has been completed and will be submitted to the BSN technical committee meeting for adoption to a national standard.

The national clearinghouse consists of two components, the gateway clearinghouse and the data producer or agency clearinghouse. The gateway clearinghouse should facilitate user access and metadata search engine. The agency clearinghouse should provide access for the gateway clearinghouse and should develop its metadata. The connection between the gateway clearinghouse, agency clearinghouse and data user will be established through internet. The development of national clearinghouse contains component follows:

- Gateway Clearinghouse Prototype
- Agency Clearinghouse Installer

At present, three governmental agencies are connected to the gateway namely: Department of Public Works Geological Agency of the Department of Energy and Mineral Resources and Regional Planning Board of Province of West Java.



National Clearinghouse Prototype

The annual national coordination meeting on NSDI was successfully organized on 16-17 May 2005 in Denpasar Bali. Around one hundred participants from central and regional government institutions, private sectors, and academia attended the meeting. There were six issues were recommended by the meeting namely: Data Standard, Codification Framework, Metadata standard, Clearinghouse, Human resourses development and Presidential Regulation, which were to carried out in 2005 and 2006.

Beeing a member of global and regional spatial data infrastructure community, Indonesia participate actively in the events related to this community, as follow:

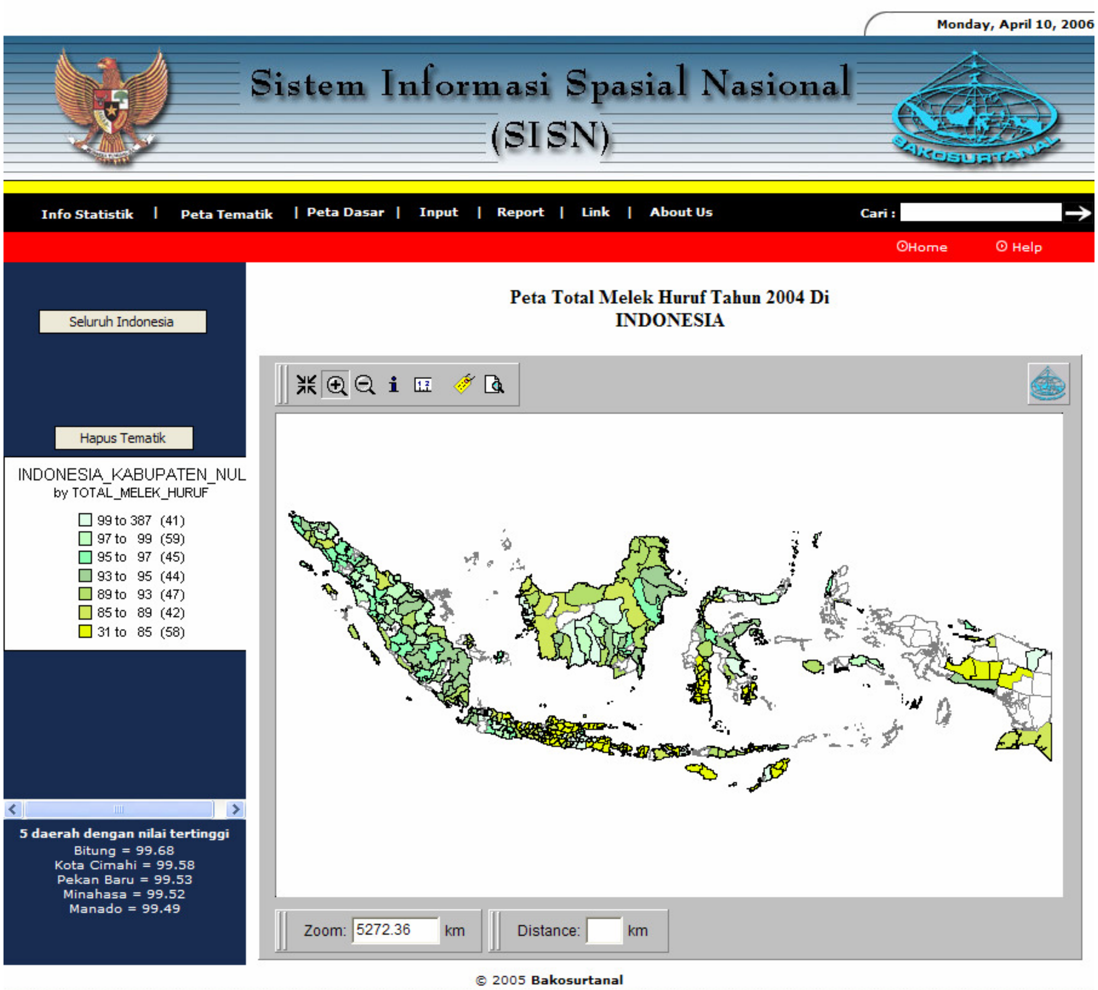
- UNRCC-America, July 2005, in New York, USA
- PCGIAP Executive Board Meeting, May 2005, in Bali, Indonesia
- Map Asia2005, August 2005, in Jakarta Indonesia
- PCGIAP Executive Board Meeting 2005 in Brunei Darussalam

4.2. NATIONAL SPATIAL INFORMATION SYSTEM

The National Spatial Information System (NSIS) is a national initiative aims at creating spatial information for top decision makers to support them making decision on national development issues, making use of spatial data produced in relation to NSDI.

This system was`initiated by the Ministry of Resarch and Technology in the end of 2004 understanding that such system was required and spatial data needed by the system was available as resulted from efforts carried out in relation to the NSDI development. In addition to that, the Secretary of Vice President urged the government to provide spatial information that could be utilized for reducing national poverty, mitigating disasters and increasing national investment.

At present, initiated by BAKOSURTANAL, a spatially based poverty information system has been developed. This system allows user to create information related to poverty in Indonesia such as a number of poor people in certain areas. This system makes use of provincial and district administrative boundary dataset and statistical dataset and also make use of a web based GIS application to create the proverty information.



A further development of the system is to add a function in such a way that statistical information can be updated to the system by the authorized person in provincial and district offices.

The development of the NSIS involves many data producers, spatial analysts from different fields and decision makers. Cooperation amongst these parties are required in order to get full access to data, funding, and experts.

4.3. REORGANIZATION IN THE NATIONAL LAND AGENCY

To improve and speed up the completion of the cadastral mapping the President of the Republic of Indonesia issued a new regulation called the Presidential Regulation No.10/2006. The regulation reorganized the task of the National Land Agency (NLA). Under this regulation the NLA organization is reorganized and restructured.

A new deputy called the Deputy for Survey and Mapping has been added to the NLA organization. The duty of this deputy is to complete the large scale topographic and thematic mapping.

The product of this deputy that is the large scale topographic and thematic maps are urgently needed as base maps for land parcel base mapping.

Indonesia has approximately 190 million hectare of land that must be mapped. This consists of approximately 80 million pieces of lands. However, at this moment it is only 25 million pieces of lands or around thirty percent of the national land has been surveyed and mapped.

In relation to the establishment of the cadastral control points, until now approximately 23,000 GPS network points mostly in Java and Sumatera have been surveyed and adjusted.

4.4. THE DEVELOPMENT OF INFORMATION SYSTEM FOR THE EAST CANAL FLOOD PROJECT.

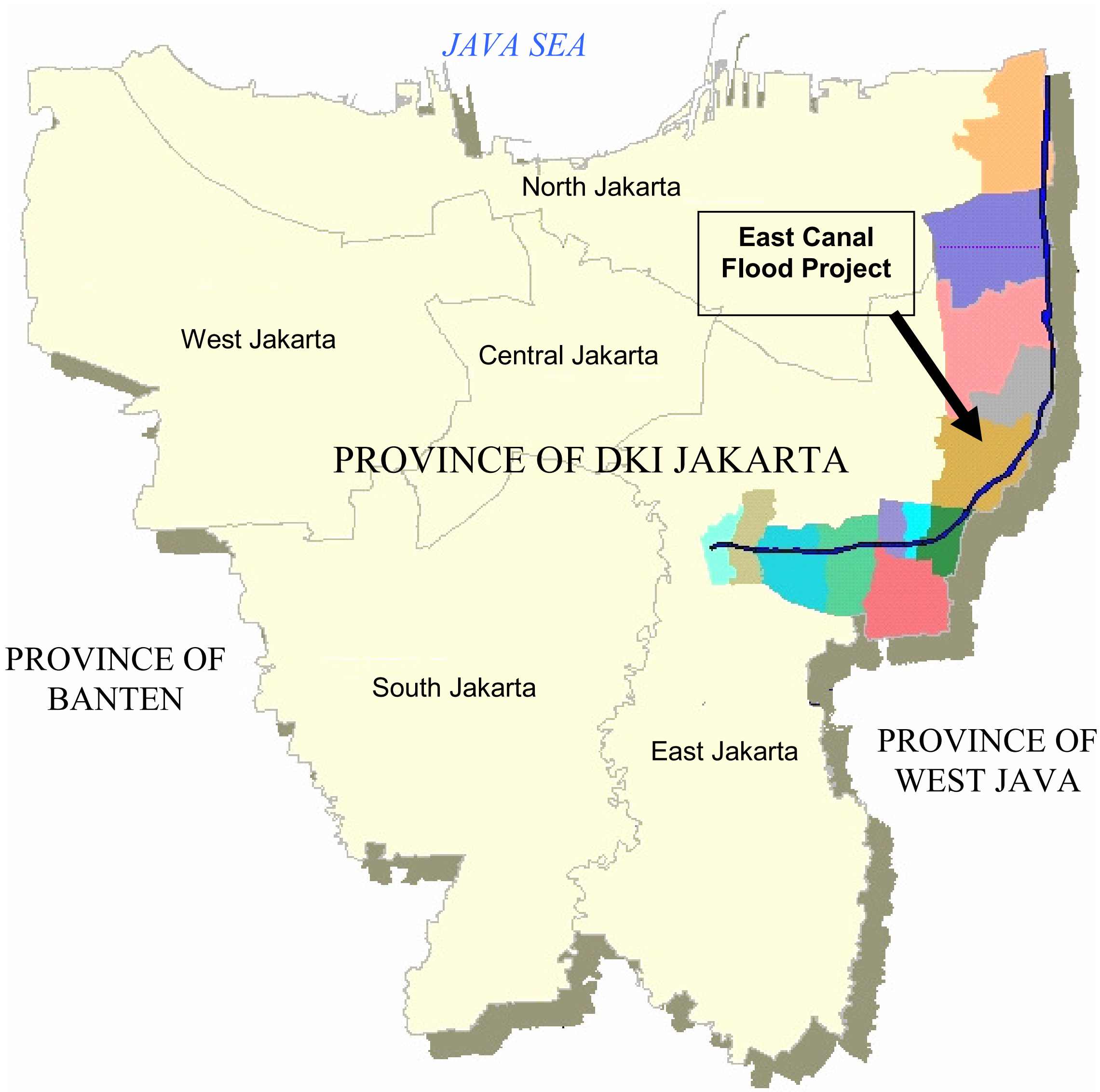
The Province of DKI Jakarta occupies on a large flat area with many rivers flowing on it from mountainous areas. This geographical location makes the province become prone to flood. Flood is one of the problems the Province of DKI Jakarta has that seriously needs a control so that the effect of it to the people can be minimized. The flood that happened in 2002 was the worse one that caused many people to be evacuated to safety places and also caused losses and damages.

The government of the province set up a plan to develop a project in the eastern part of the province, called the East Canal Flood Project, for controlling the flood. The plan will also include the improvement of the city drainage in the vicinity along the channel.

The channel crosses 13 settlements areas in the north and east of Jakarta. It has 23.575 km long and + 200 meter wide. It catches waters from rivers of Kali Cipinang, Kali Sunter, Kali Buaran, Kali Jatikramat, and Kali Cakung. The catchment area of channel covers area of 20,074 hectare.

The development of the East Canal Flood Project will have some advantages as follow:

- Generate the regional growth of the east and north of Jakarta based on river front oriented
- Reduce of flood areas
- Protect Industrial, warehouse and settlement zone of east Jakarta
- Refill ground water
- Provide water transportation infrastructures and recreation places

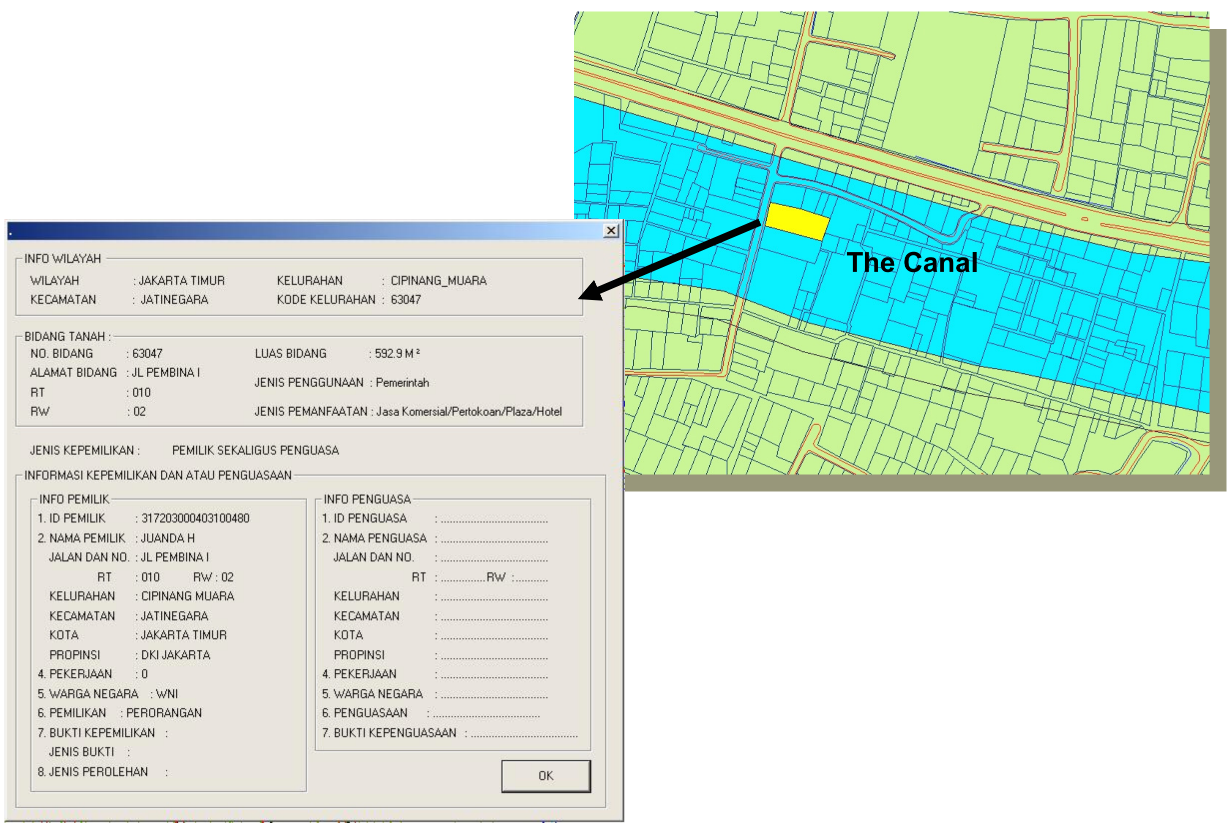


To support the East Canal Flood Project development, the government of Jakarta develop an information system to provide accurate information necessary to support an accurate project development planning. The information system should display a base map, orthophoto, P4T, predicted land price, taxed land price, project trace and cadastral information.

The base map contains information of road networks, drainage, administrative boundary and buildings at 1:1,000 map scale. This information is produced by Land and Mapping Agency of Jakarta. The cadastral information consists of parcel boundaries along with their attributes of Parcel ID, address, utilization, owner ID and owner name. This information is provided from the Land and Building Tax Map of Jakarta, produced by the Land and Building Tax Service.

Other information included in the information system is Land Use and Utility information. The utility information consists of electricity networks, telecommunication networks and drinking water pipeline networks.

There are problems encountered dealing with the development of the information system, those are the uptodateness, accuracy, and the spatial framework differences of the information. To keep information up to date and accurate, data verification using field survey and aerial photographs is carried out.



The East Flood Canal Project Information System

The source data for the information system is produced by several agencies with different coordinate systems. For this purpose, all data involved is transformed into one coordinate system.

5. BUILDING ON CAPACITY

5.1. THE INDONESIAN SURVEYORS ASSOCIATION (ISA)

Indonesian Surveyors Association (ISA) is the English term for the *Ikatan Surveyor Indonesia* (ISI) which has been established since 1972. The association has more than 1000 members, but only about one fourth of them are active members. The level of qualification of ISA members are categorised as expert and skill. University graduates from geodetic department are considered expert, while Diploma holders in surveying from secondary and vocational education level are qualified as skill level.

According to its new statute, the Management Board of ISA has s service periode of 3 years, and its President and Vice are elected by the ISA Congress. The last ISA Congress which was held in Batu-Malang, on September 2005 elected the new President and Vice President to form the new Management Board of ISA for the period 2005 – 2008. Ir. Benny, M.Si was elected as the New President, and Dr. Irawan Sumarto was the Vice President.

In this report, ISA as one of the Indonesian country societies in surveying and mapping, present its brief report as follow.

5.1.1. The 2005-2008 ISA Management Board

President of the Association (ISA)	:	Ir. Benny, M.Si.
Vice President	:	Dr. Irawan Sumarto
Secretary General	:	Ir. Sugeng Prijadi, M.App.Sc.
Treasurer and Vice	:	Ir. Wenny Rusmawar Idrus.
Board Members		Ir. Sutadi Wirianata Dr. Ir. Dudung Muhali H. M.Sc. Ir. Desrizal Gindow, MPA Ir. M. Rachmansyah Ir. Djumawan Idik, MT. Dr. Ir. Ketut Wikantika, M.Sc. Dr. Ir. Teguh Hariyanto Ir. Suyus Windayana Ir. Ali Nurhidayat Dr. Ir. Hasanuddin Z.Abidin, M.Sc. Ir. Giantoro Pamungkas

Dr. Ir. Samsul Bachri, M.Sc.
Ir. Sumarno. MT.
Ir. Kosasih Priyatna, M.Sc.
Ir. Amin Sulistyo
Ir. Bebas Purnawan, M.Sc.
Ir. Tony S.Haroen, M.Sc.
Dra. Diah Kirana K, M.Sc.
Ir. Erwin Romel
Ir. Sri Lestari Munajati, M.Agr
Ir. Saidi Pranoto
Ir. Anton Leonard
Ir. Aribono Hendarto
Ir. G. H. Anto
Ir. Indra Hadimidjaja
Ir. Laksito P.
Sylvia Nayoan, BE.
Elvira, BE.
Marnasip K,Simbolan SH.

ISA Mailing Address :

1. BAKOSURTANAL
   Jl. Raya Bogor Km. 46, Cibinong,
   INDONESIA
   Tel.&Fax.+62-21-8751256, Attn.
   Sugeng Prijadi
   Email : infoisi@yahoo.com
   Website : www.isi.or.id
2. Dept. Geodesi ITB
   Jl. Ganesha 10, Bandung,
   INDONESIA

5.1.2. ISA Programs and Activities

- Certification of surveyors has been carried out since 2001.
- To conduct trainings to maintain professional qualification in cooperation with surveying industries, universities and government institution in the country.
- As a member of International cooperation such as International Federation of Surveyors (FIG), International Society for Photogrammetry and Remote sensing (ISPRS), and ASEAN Federation of Land Administration and Geomatics (ASEAN-FLAG)
- To conduct seminars in the fields of land surveying, geodetic surveying, GPS, GIS, cadastral, and engineering surveying which are carried out annualy in cooperation with other associations and government agencies.
- Regular meetings of ISA

5.1.3. The 2006 ISA AGENDA

- ASEANFLAG MEETING in Jakarta, 26 August 2006
- ISA Annual seminar in Balikpapan, September 2006
- Marine Cadaster Seminar, Tangerang-Banten, November 2006

5.2. TRAINING

Several universities and institutions have been providing education and training in the filed of Geomatics. In order to anticipate the demand of human resources in the field of Geomatics, the education and training in this field should be nationally coordinated and integrated. The coordination and integration might be applied through standardization of curriculum, materials, guidance and mechanism.

On the job training in some institution is an effective and efficient alternative to educate new staffs in the field of Geomatics. This training could be used to motivate staff and provide a forum to exchange knowledge among the staffs.

5.2.1. Training Center Activities in BAKOSURTANAL

- Technical Cooperation Amongst Developing Countries (TCDC) Training Course.
  The TCDC training course under sponsorship of UN-ESCAP and the Government of Republic of Indonesia is addressed for the junior staff from Asia Pacific developing countries who is involved in mapping. The aims of this course are to provide participants with a theoretical background and practical skill in using Geographic Information System (GIS) and Remote Sensing (RS) technologies for any applications and identifying the appropriate information required by planners and decision-makers in regard to develop the sustainable land use planning and management. BAKOSURTANAL (the National Coordinating Agency for Surveys and Mapping) is the host organizer for this course.
  The course title for this year is the Application of Remote Sensing and Geographic Information Systems for Risk Management and Disaster Reduction and it has started since July 3rd, 2006. Twelve participants respectively from Nepal, Vanuatu, Fiji, Lao PDR, Sri Lanka, India, Thailand, Kyrgistan, Afghanistan, and Indonesia have joint for this course for two months. The course is conducted in two places and divided into two sessions. The first session is carried out at BAKOSURTANAL Cibinong. Participants are provided to the basic concepts of surveying and mapping, including Remote Sensing, Geographic Information System, Global Positioning System (GPS) and Digital Cartography. The second session will be conducted at PUSPICS-UGM Yogyakarta, and they will be provided with the application of RS and GIS.

- Training for national participants,

  Several topics of the training are being introduced. For examples: Training course in GIS and Remote Sensing, Positioning with GPS, Digital Cartography, Bathymetric surveys, course in determination of border survey, etc. The course duration of each title is about 10 – 20 days. BAKOSURTANAL also provides taylor made training based on user needs.

Other training activitiy within the last three years, is that BAKOSURTANAL has give a 1-2 days course for local government staff about how to read and how to use a map.

Training Division of BAKOSURTANAL has trained about more than 1500 national participants and more than 200 international participants.

5.2.2. Education Center for Satellite Image Interpretation (PUSPICS)

PUSPICS, stands for Pusat Pendidikan Interpretasi Citra Satelit or Education Center for Satelite Images Interpretation and was established in 1983,. It is situated at the Faculty of Geography, University of Gajah Mada, Yogyakarta. The center has been actively involved in providing training and building cooperation with other institution nationally and internationally.
To date, PUSPICS has trained quite a number of people in form of :

- Regular Training : more than 500 participants
- Training center for developing countries : more than 200 participants
- Non-regular training : more than 700 participants

6. OTHER ACTIVITIES

a. BAKOSURTANAL has been sending the staffs to study abroad and also to attend seminars/ conferences to improve his/her knowledge in the environment of geospatial and its technology, and also has been sending some staffs to join with the working group on PCGIAP, ICA, ISCGM, FIG, etc
b. On the other hand, BAKOSURTANAL also received some students from universities in Indonesia to do on the job training or to do a project for his/her assignment.
c. To improve knowledge on surveys and mapping of highschool geographic teachers, BAKOSURTANAL gives one day workshop for the teachers. To date, more than 700 geographic teachers have received this knowledge.
d. To raise the public awareness about the use of geospatial knowledge and intelligence, and also how to access the geospatial data and information, BAKOSURTANAL sucessfully organized an exhibition called : the 1st Indonesian Geospatial Technology Exhibition 2006, on 23-27 August 2006 in Jakarta.

7. RESEARCH AND DEVELOPMENT FACILITY

BAKOSURTANAL, in cooperation with Government of Yogyakarta and University of Gajah Mada established the Geospatial Laboratory of Parangtritis Coastal Area on the unique sand dunes phenomena in the coastal area of Parangtritis, Central of Java. This laboratory is expected to become a part of South Java Coastal Marine Techno Park. This laboratory is established for conducting research and development activities in coastal surveys and mapping method, training and education in coastal and ecosystem survey and mapping, and academic research for local regulation draft about the sand dune conservation. The equipment of the laboratory was provided by theTechnology Assessment and Application Agency and the National Institute of Aeronautics and Space.

8. CONTRIBUTING AUTHORS

The National Coordinating Agency for Surveys and Mapping highly appreciate the contribution from various authors in the compilation of this report. The following is the list of those who have contributed:

- Rudolf W. Matindas, Head of National Coordinating Agency for Surveys and Mapping
- Ferrianto H Djais, MMA, Director of Coastal and Marine Spatial Planning and Small Islands, Dept. Marines and Fisheries
- Rosediana Renny P, MT, Head of Land And Mapping Agency of Province Of DKI Jakarta
- Djadjang Sukarna, Head of Geological Surveys, Geological Agency
- Dr. Sugiarta Wirasantosa, M.Sc, Head of Research Center for Marine Territory and Non-living Resources, Dept. Marines and Fisheries
- Parluhutan Manurung, Head of Gravity Field and Tides, National Coordinating Agency For Surveys And Mapping
- Agus Hermawan and Nurwajedi, National Coordinating Agency for Surveys and Mapping
- Agus Santoso, National Coordinating Agency for Surveys and Mapping
- Sobar Sutisna, Dr, National Coordinating Agency for Surveys and Mapping, Indonesian Surveyor Association
- Cecep Subarya, National Coordinating Agency for Surveys and Mapping
- S.S.O. Poentodewo, Dr, National Coordinating Agency for Surveys and Mapping
- Bebas. Purnawan, National Coordinating Agency For Surveys And Mapping
- Suwahyuono, National Coordinating Agency For Surveys And Mapping
- Henny Lilywati, Deputy of Spatial Data Infrastructure, National Coordinating Agency For Surveys And Mapping
- Suharto Widojo, Head of Center for Atlas, National Coordinating Agency For Surveys And Mapping
- D. Subardja and Kusumo Nugroho, Department of Agriculture.

9. FURTHER INFORMATION

For further information concerning this report please contact the Head of the Indonesian Delegation :

Rudolf W. Matindas
Chairman of National Coordinating Agency for Surveys and Mapping
Jl. Raya Jakarta – Bogor, Km.46, CIBINONG 16911, Indonesia

Phone : +62 21 875 4592
Fax : +62 21 875 2064, 875 4592
e-mail : secr@indo.net.id
web : www.bakosurtanal.go.id