Seismic and Tsunami Observations of Indonesia

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1. Seismic Monitoring

Agency for Meteorology, Climatology and Geophysics (BMKG) is responsible for the seismic monitoring system that consists of 162 broadband seismograph and accelerograph real time stations. In the BMKG Target in 2008, 160 seismic sensors and 500 accelerographs with grid spacing of about 100 km are purposed to be produced with processing time in 5 minutes. BMKG has installed and established the seismic monitoring network in collaboration with donor countries like German, Japan, China and CTBTO. BMKG also have 10 regional centers in supporting of earthquake monitoring system (Figure 1). BMKG had installed 162 broadband seismographs, and for 2012, BMKG plans to install approximately 25 broadband seismograph (Figure 2).

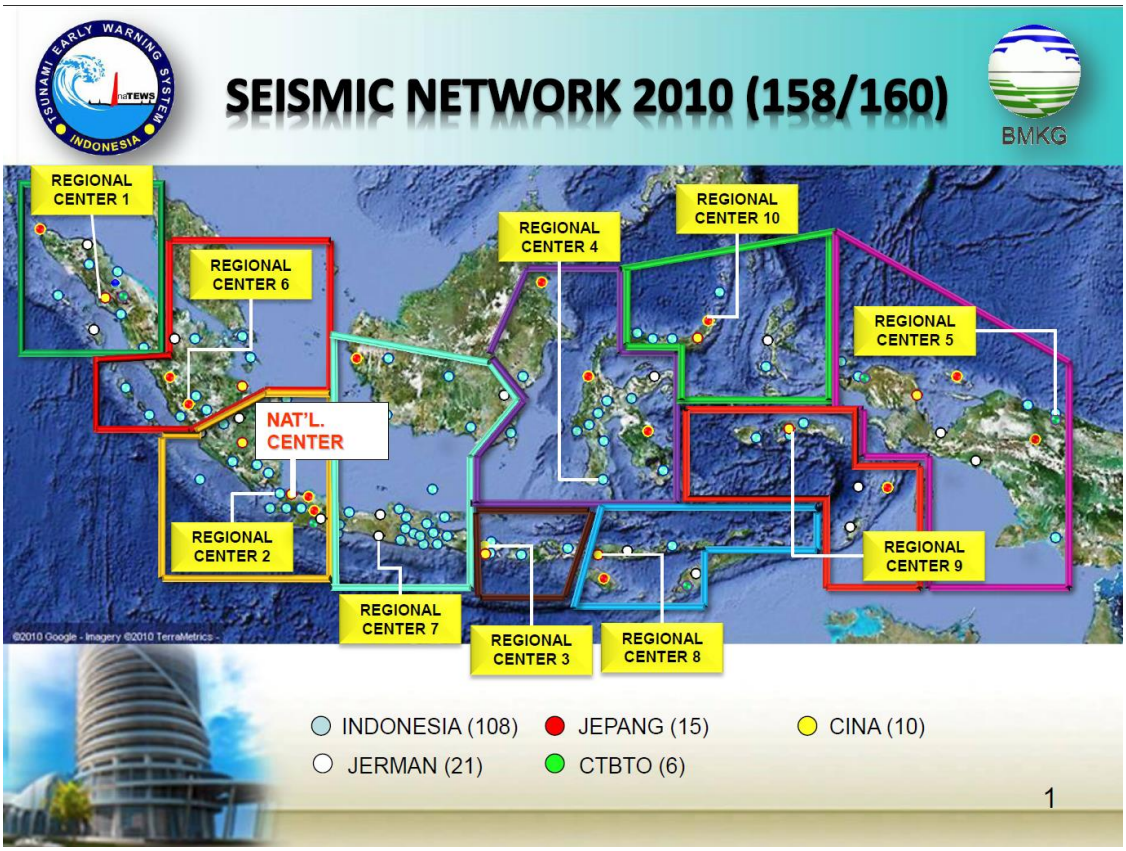

Figure 1. Seismic Network in 2011.

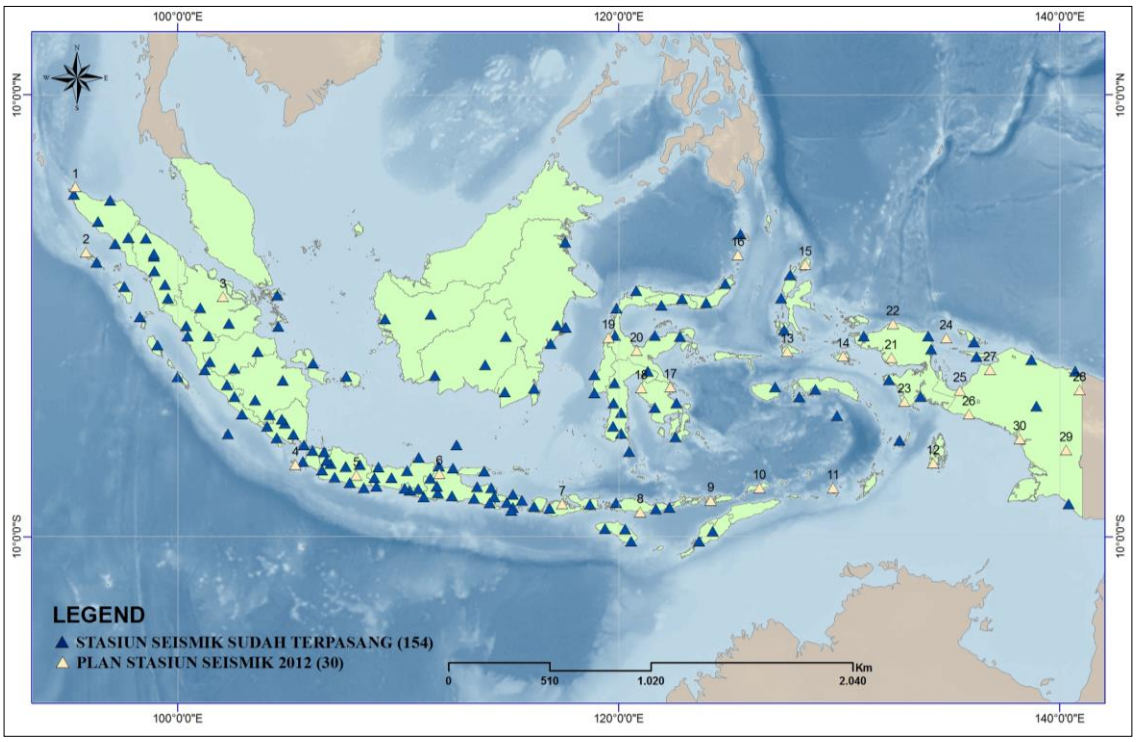

Figure 2. Current Status of Seismic Station and Plan 2012.

Every donor country uses their own instruments like seismometers and digitizers as well as technology and they are installed in place that distributes in Indonesia and transfer the data to National Center in Jakarta trough VSAT communication. Components of seismic monitoring are location in the bedrock including the seismic vault (bunker or shelter), seismometer/ accelerometer, digitizer, communication and data processing (Fig.3).

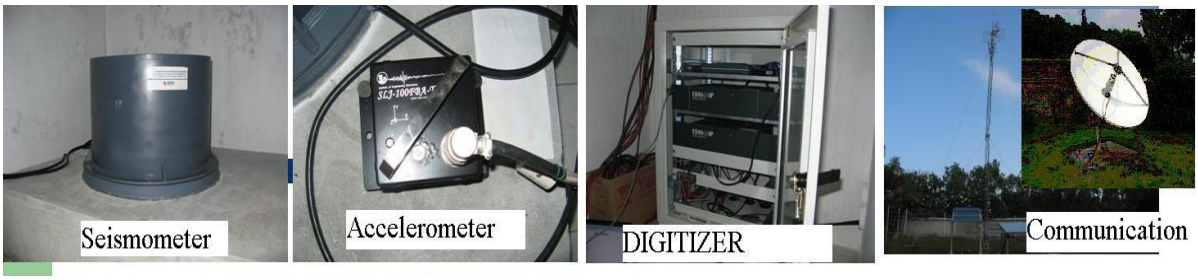

Figure 3. Chinese seismic instruments in stations in Denpasar, Bali.

Figure 4. German seismic station in Banyuwangi, East Java.

Figure 5. Indonesian seismic station in Bogor, West Java .

All seismograph stations are also equipped with accelerographs. Remaining accelerographs are installed in the tsunami areas for magnitude calculation and in large cities for engineering purposes. BMKG earthquake monitoring is operated on the basis of 24 hours and 7 days a week. Once the earthquake is detected by one or more stations, the operators on duty are taking immediate action to locate the event and to evaluate earthquake parameters. The polling of the network is done automatically. The result or the earthquake location is then reviewed by the operator on duty. In BMKG the operator on duty are in 5 groups, every group with 7-8 persons, one is the supervisor, the second is the leader and the others are the members of the group.

2. Tide Gauge, GPS and DART Buoy

Tide gauge is used for monitoring tide of sea level along the coast line. In Indonesia, National Agency for Survey and Mapping (BAKOSURTANAL) is responsible for monitoring the sea level (Fig.6, 7 and 8). Tide gauge stations are connected in real time and near real time to BMKG using GTS (Global Communication System) and dedicated communication from BAKOSURTANAL to BMKG.

GPS is used for monitoring earth deformation, which is very useful for making earthquake predictions. In Indonesia, who is responsible for monitoring GPS is National Agency for Survey and Mapping (BAKOSURTANAL). GPS stations are connected in real time using dedicated communication from BAKOSURTANAL to BMKG.

DART buoy is used for monitoring water pressure under the sea, which is located in the sea along the vault that is potential for tsunami source. Assessment and Application Technology Agency (BPPT) is responsible for monitoring the DART buoy. All data are transmitted via satellite in near real time to BMKG. In case tsunami occurs, tide gauge displays the data. The same case for the DART buoys, where the tsunami traces would display the data.

To meet the criteria of tsunami early warning system, all networks need to be upgraded and integrated for Indonesia tsunami early warning system purposes and coordinated by Ministry of Research and Technology (RISTEK) and centered at BMKG as the institution which has responsible for issuing the earthquake information and tsunami warning. The development of Indonesia tsunami early warning system is supported by the German Government under the GITEWS project (German-Indonesia Tsunami Early Warning System), by Japan, the Peoples Republic of China, the United States of America and France.

Figure 6. Tide Gauge Network in 2011.

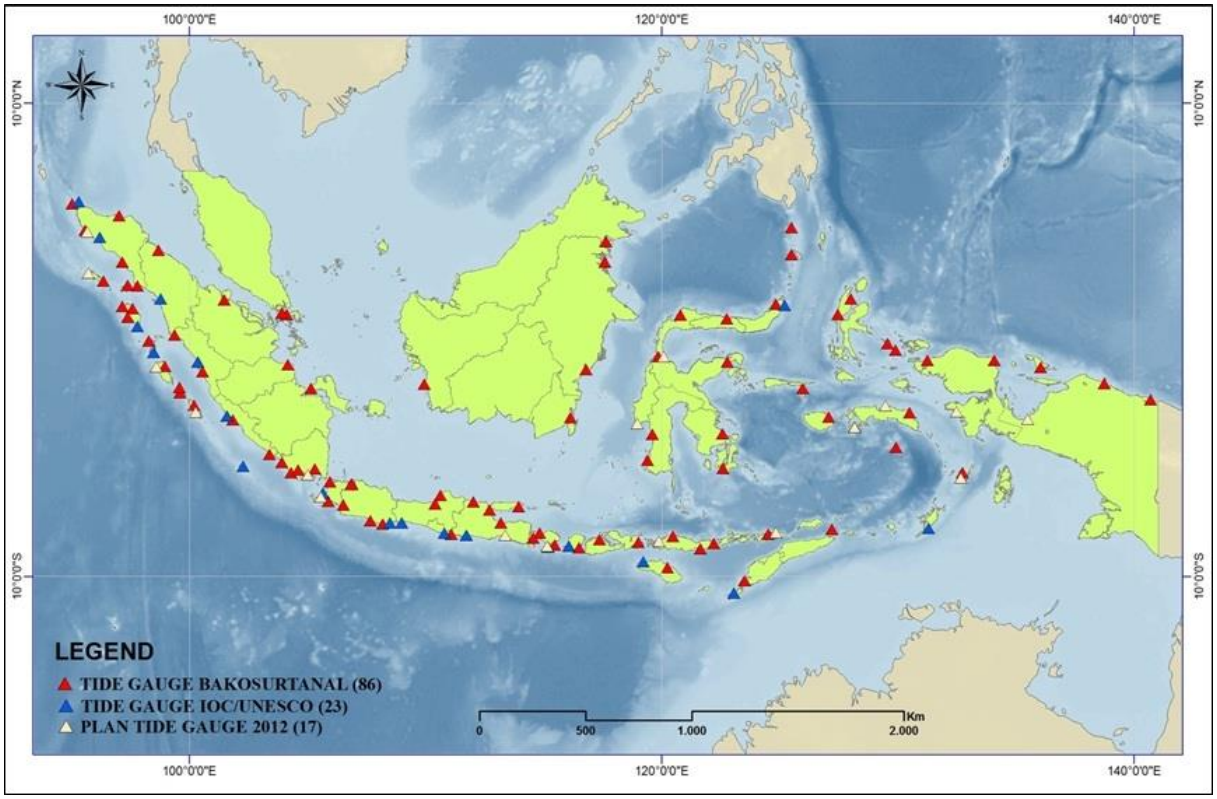

Figure 7. Tide gauge station in 2011 (109 stations) and plan 2012 (17 tide gauge stations).

Figure 8. Tide Gauge Station, Seblat.