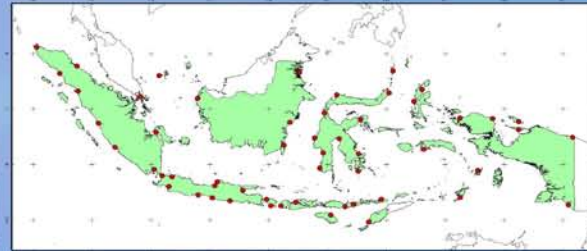


# DEVELOPMENT of Indonesian Sea Level Monitoring Network Supporting for PRECISE APPLICATIONS

60 operational stations before 26 Dec 2004



Lesson learned from the Indian Ocean Tsunami, Indonesia have been improving the existing national sea level monitoring network not only for serving mapping but also dedicated to applications required more precise observations such as weather and climate research, and multi hazard assessment and tsunami warning system.

The improvements are mainly focused on three parts namely  
i) to densify the station distribution with real (or near real) time data communication,  
ii) to set up precise datum and iii) to up grade the tide staffs with high quality material.

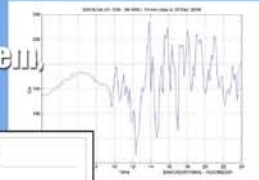
First, based on the grand design of Indonesia Tsunami Warning System, in addition to the existing 60 stations, it is planned to set up a number of 60 real time stations situated adjacent to the tsunamigenic plate boundaries. Most of the stations would be part of Indian Ocean Tsunami Warning System (IOTWS) with the establishment coordinated by IOC/UNESCO.

At present there are 7 of 60 planned real time stations in place of which 4 stations were set up under cooperation with the University of Hawaii Sea Level Centre (UHSLC), 2 stations funded by the Indonesia Government and one stations donated by the OTT Company of Germany. It is expected by the end of 2006, there would be 20 stations installed. Second, efforts on providing precise datum have been carried out annually with precise geodetic leveling from the tide gauge staff to Tide Gauge Bench Mark (TGBM) and precise GPS measurements at TGBM, referenced to the latest International Terrestrial Frame (ITRF). Lastly, improvement of the tide gauge staff from sheet steel to that of fiber glass bar is expected to provide high quality, and long life stable staff meter. We identified that using the vertical staff gauges of sheet steel or aluminum is one of the error sources such as discontinuity in the sea level reading time series and improper joint between the sheet steels of a tide staff. Errors caused by discontinuity in sea level readings may occur when the station operators are mistakenly archived the data record of tide staff change. At least every one or two year replacement of sheet steels should be carried out since the scale readings are becoming deteriorated resulting from regular cleaning of the staff from coral and sea creatures. Improper joints between sheet steel of a tide staff are not perfectly made during the replacement. Therefore, we designed new type of tide gauge staffs made of fiber glass bar with the reading scale covered by strong and transparent resin layer. This staff bar with size of 5 cm x 8.5 cm x 3 meters, consecutively for thickness, width and length, it could provide high stable reading scale for more than ten years. It expected that the high resolution observations with real time data communication, precise datum and high stable tide staffs, this will contribute significant improvements in the sea level monitoring in the Indonesian Archipelago.

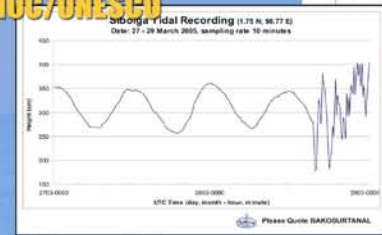


Shoreline uplifted by Nias earthquake

## Real time stations for Indian Ocean Tsunami Warning System, established under coordination of IOC/UNESCO



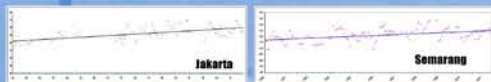
Examples of the tidal recordings derived from several operational stations during the Indian Ocean Tsunami and Nias Earthquake.



IOC assessment team visiting sea level monitoring centre in BAKOSURTANAL



Proposed 60 Real Time stations for TWS



Trends of sea level rise derived from more than a decade tide gauge observations, sample from Jakarta and Semarang Ports

Quality tide gauge staff of bar type made from fiber glass and reading covered by transparent resin



GPS measurements at the tide gauges in Indonesia Archipelago



Precise geodetic leveling from tide gauge staff to tide gauge bench mark

