

The tsunami-early warning system for the Indian Ocean – ten years later

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The day after Christmas this year will mark the 10 anniversary of the tsunami disaster in the Indian Ocean. On 26 December 2004, a quarter of a million people lost their lives, five million required immediate aid and 1.8 million citizens were rendered homeless. The natural disaster, which caused extreme devastation over huge areas and the accompanying grief and anxiety, especially in Indonesia, Thailand and Sri Lanka exceeded the imaginable and reached such drastic dimensions, mainly due to the lack of a warning facility and a disaster management plan for the entire Indian Ocean region at this time.

Germany and the international community of states reacted with immediate support. Within the framework of the German Flood Victim Aid the Federal Government commissioned the Helmholtz Association of German Research Centres under the direction of the GFZ German Research Centre for Geosciences with the development of an Early Warning System for the Indian Ocean. From 2005 to 2011, with the large-scale project GITEWS (German-Indonesian Tsunami Early Warning System), the core of an integrated, modern, and effective Tsunami Early Warning System in Indonesia was established. With the follow-up project PROTECTS (Project for Training, Education and Consulting for Tsunami Early Warning Systems, 2011-2014) the personnel of the participating Indonesian institutions were trained to proceed independently and to take over responsibility for the operation of the Early Warning System as well as for the diverse technical and organizational components. In this ways PROTECTS which started in June 2011 and comprised a total of 192 training courses, internships, and

hands-on-practice courses, covering all aspects of operation and maintenance of the Tsunami-Early Warning System contributed significantly to the sustainability of InaTEWS.

Under the auspices of the Intergovernmental Oceanographic Commission of UNESCO and with the collaboration of international partner institutes from Germany, the USA, China and Japan, GITEWS was integrated into a Tsunami Early Warning System for Indonesia. GITEWS was positively reviewed by a commission of international experts in 2010 and handed over to Indonesia in March 2011. Since then it has been providing its services under the name InaTEWS – Indonesian Tsunami Early Warning System and is operated by the Indonesian Service for Meteorology, Climatology and Geophysics BMKG.

On 12 October 2011 the exercise drill "IOWAVE11" was carried out in the Indian Ocean. With this drill, InaTEWS successfully demonstrated that it could, furthermore, take over the role of a Regional Tsunami Service Provider (RTSP). Since then Indonesia, in addition to Australia and India, performs the double function as a National Tsunami Warning Center (NTWC) and also as a RTSP and takes over the responsibility for the timely warning of 28 states around the Indian Ocean in the event of a threatening Tsunami. With the on-going step-by-step development, a comprehensive all-encompassing InaTEWS could be successfully realized.

Indonesia now avails of one of the most modern Tsunami Early Warning Systems. On the basis of data from approx. 300 measuring stations a warning can be issued at a maximum of five minutes after an earthquake. These measuring stations include e.g. seismometers, GPS stations and coastal tide gauges. With the data gained from the sensors and using the most modern evaluation systems such as SeisComP3 which was developed by GFZ scientists for the analyses of earthquake data and a Tsunami simulation system in the Warning Centre it is possible to

compile a comprehensive picture of the situation. With the aid of a decision support system respectively classified warnings for the affected coastal areas can then be issued. A total of 70 people are involved the operation of the Warning Centre in Jakarta, with 30 employees working solely in a full shift system. According to information provided by the BMKG a total of 1700 earthquakes with a magnitude of more than $M=5$ and 11 quakes with a magnitude of 7 and higher have been evaluated and six Tsunami Warnings have been issued to the public by the Earthquake Monitoring and Tsunami Early Warning Centre since the hand over in March 2011.

Schooling, training and disaster precautions (capacity development) for the local community and Town and District councils have received special emphasis. This Capacity Development has been carried out since 2006 in three "typical" regions: Padang (Sumatra), Chilacap (South-Java) and Denpasar (Bali, tourist stronghold). Here particular emphasis was placed on understanding both the warnings issued and the planned evacuation measures.

Local disaster management structures are established with local decision-makers and Disaster Risk Reduction Strategies are developed. Specifically, the education of trainers who are, in turn, responsible for the further spreading of the developed concepts plays a significant role.

Another key element is the determination of hazard and risk maps as a basis for the local evacuation planning as well as for future town and land-use planning. In Bali communication with the hotel industry was an additional factor.

No Early Warning System will ever be able to prevent a strong earthquake and a resulting tsunami and also, in the future, there will be loss of life and material damage. However, through the existence of an Early Warning System and the integration of organizational measures

together with comprehensive capacity building the adverse effects of such a natural disaster can certainly be reduced.

Provided by Helmholtz Association of German Research Centres

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