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DLR technology and expertise for a tsunami early warning system in Indonesia

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Tsunami early warning and decision support

On 11 November 2008, almost four years after the devastating tsunami catastrophe, President Susilo Bambang Yudhoyono of Indonesia inaugurated the InaTEWS tsunami early warning system (Indonesian Tsunami Early Warning System) in the Indonesian capital Jakarta. Germany has made a significant contribution to this system. The German Remote Sensing Data Center (Deutsches Fernerkundungsdatenzentrum; DFD) of the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) has developed and put in place a Decision Support System (DSS) for InaTEWS, which will enable significantly improved tsunami early warning for the Indian Ocean.

Germany has been prominently involved in setting up this system in the context of the German Indonesian Tsunami Early Warning System (GITEWS).

The propagation times of tsunamis in Indonesia are very short due to the geological conditions in the region. This means that a tsunami early warning is only useful when it is generated quickly and automatically. DLR's Decision Support System (DSS) will help to make this possible. Quick and effective evacuation of people out of the affected coastal areas before catastrophe strikes is equally important. DLR therefore also performed a risk assessment, investigating the possible consequences of a tsunami impact on the co ast. This assessment provides important groundwork for preliminary measures in vulnerable areas and for evacuation planning.

In order to make tsunami advance warning even more reliable in the future, DLR also investigated new Earth observation technologies while developing the DSS. This research is also important for enabling transfer of the early warning system to other areas vulnerable to tsunamis, such as the Mediterranean.

The tsunami catastrophe 2004 seen from space

"I am pleased that DLR was able to bring its years of experience and its expertise in Earth observation and crisis information to this technologically sophisticated project, thereby contributing to its success," said Professor Johann-Dietrich Wörner, Chairman of the DLR Executive Board. "One of the most pressing tasks for space research is to use all available technological resources in order to protect life on Earth."

Tsunami early warning and decision support

All available data, information and models of the early warning system are merged into the so-called Decision Support System (DSS) developed by DLR. This system processes all sensor data, recorded by for instance seismometers or data buoys, and synthesises them with the hazard simulations. Staff of the early warning centre in Jakarta is able to get an overview of the situation based on the available information. An up-to-date situation report and proposed actions are generated on the basis of continually refreshed information and improved constantly through an interactive process. The situation report and proposed actions will be clearly displayed on multiple monitors When the decision is taken to issue a warning, the provinces that are at risk as well as the competent authorities are alerted using several means of communication – such as radio, fax and text message - at the same time.


Quick and effective evacuation

The DSS is specially tailored for use in crisis situations. Its user interface and process sequences have been designed in such a way as to allow staff to take decisions quickly and reliably, even under high time pressure and stressful conditions. The system's multiple redundancy makes it highly reliable. Its databases not only contain extensive geographic datasets, but also risk information and hazard maps pre-processed by DLR. All these elements add up to a system which is unique in the world, both conceptually and in terms of its complexity.

Two years of testing and optimising

The project now enters the important system optimisation phase, which will last for the next two years. During this phase, the interaction between the different components needs to be adjusted, operations staff need to be trained and coached and problems occurring during day-to-day operation need to be solved. So far, several individual components of the system have already been put to use in the provisional warning centre in Jakarta. Over the past few weeks, a new building has been completed, the required communication and computer hardware has been integrated into the system, and all software components have been installed. This means that the system as originally conceived is now available for the first time.

Tsunami warning centre in Jakarta

GITEWS is a joint project of DLR, the Alfred Wegener Institute for Polar and Marine Research (Alfred-Wegener-Institut für Polar- und Meeresforschung; AWI) in Bremerhaven, the Federal Institute for Geosciences and Natural Resources (Bundesanstalt für Geowissenschaften und Rohstoffe; BGR) in Hannover, the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) in Eschborn, the GKSS Research Centre (GKSS Forschungszentrum) in Geesthacht, the German Marine Research Consortium (Konsortium Deutsche Meeresforschung; KDM) in Berlin, the Leibniz Institute for Marine Sciences (Leibniz-Institut für Meereswissenschaften; IFM-GEOMAR) in Kiel, and the Institute for Environment and Human Security of the United Nations University (UNU-EHS) in Bonn. The project is led by the German Research Centre for Geosciences (Deutsches GeoForschungszentrum; GFZ) in Potsdam. GITEWS was funded by the German federal government through the Federal Ministry of Education and Research (Bundesministeriums für Bildung und Forschung; BMBF).

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