



## **Geoethical issues involved in Tsunami Warning System concepts and operations**

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The main goal of a Tsunami Warning System (TWS) is to mitigate the effect of an incoming tsunami by alerting coastal population early enough to allow people to evacuate safely from inundation zones. Though this representation might seem oversimplified, nonetheless, achieving successfully this goal requires a positive synergy of geoscience, communication, emergency management, technology, education, social sciences, politics. Geoethical issues arise always when there is an interaction between geoscience and society, and TWS is a paradigmatic case where interaction is very strong and is made critical because a) the formulation of the tsunami alert has to be made in a time as short as possible and therefore on uncertain data, and b) any evaluation error (underestimation or overestimation) can lead to serious (and sometimes catastrophic) consequences involving wide areas and a large amount of population. From the geoethical point of view three issues are critical: how to (i) combine forecasts and uncertainties reasonably and usefully, (ii) cope and possibly solve the dilemma whether it is better over-alerting or under-alerting population and (iii) deal with responsibility and liability of geoscientists, TWS operators, emergency operators and coastal population. The discussion will be based on the experience of the Hellenic National Tsunami Warning Center (HL-NTWC, Greece), which operates on 24/7 basis as a special unit of the Institute of Geodynamics, National Observatory of Athens, and acts also as Candidate Tsunami Service Provider (CTSP) in the framework of the North-Eastern Atlantic, the Mediterranean and connected seas Tsunami Warning System (NEAMTWS) of the IOC/UNESCO. Since August 2012, when HL-NTWC was officially declared as operational, 14 tsunami warning messages have been disseminated to a large number of subscribers after strong submarine earthquakes occurring in Greece and elsewhere in the eastern Mediterranean. It is recognized that the alerting process and procedure are quite complex and deserve an open and wide debate, that at the moment seems to be absent from media, scientific community and society, very likely until the next tsunami disaster.