

Shallow shear wave reflection seismics in the tsunami struck Krueng Aceh River Basin, Sumatra

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As part of the Project “Management of Georisk” of the Federal Institute for Geosciences and Natural Resources (BGR), Hanover, high resolution shallow shear wave reflection seismics was applied in the Indonesian province Nanggroe Aceh Darussalam, North Sumatra in cooperation with the Government of Indonesia, local counterparts, and Leibniz Institute for Applied Geosciences, Hanover. The investigations support earthquake site effect classification for reconstruction of buildings and infrastructure as well as groundwater exploration activities with focus on the city of Banda Aceh and the surroundings of Aceh Besar. The shear wave seismic surveys were combined with standard geoenvironmental investigations like cone penetrometer tests. They have partly been supplemented by shallow P-wave seismics for derivation of elastic subsurface parameters and identification of zones with abundance of groundwater.

The seismic site effect evaluation by shallow high resolution seismic investigations has been found to be an enormously useful method in the sedimentary regions of the Aceh province. Especially shear wave reflection applications were able to explore the subsurface stiffness down to 100 m depth and occasionally even more with remarkably high resolution, leading to geotechnical site classifications in terms of the IBC 2003. Moreover, the results are also useful for detailed insights into the basin sedimentation processes of the Krueng Aceh River delta concerning the exploration of new areas for safe foundations of buildings and for identification of fresh water aquifers in the tsunami flooded region. Using a vibratory seismic source, this technique was applied successfully also in areas of high building density in the city of Banda Aceh, or in areas of compacted near surface soil like farm tracks in the surroundings, i.e. mostly agricultural land use areas.