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Assessing Temporal Dynamics of Groundwater and Soil Salinity and Impact on the Green Infrastructure after the Tsunami Event in Aceh, Indonesia

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Abstract

After the 2004 Tsunami the coastal area of Aceh-Indonesia was flooded up to 5 km land inwards. Losses of lives and infrastructure destruction were the major problems people faced. However, land subsidence due to the preceding earthquake and flooding also led to saltwater intrusion and mud deposits. In many areas, groundwater salinisation was only temporary, but long enough to cause damage to salt susceptible crops like rambutan or beans. Nevertheless permanent changes in groundwater quality and level obliged farmers in subsided or deposition areas to change crops or use new varieties. The aim of the study is to determine the impact of saltwater intrusion, in time, on soil and groundwater quality, as well to assess and to understand consequences for different tree crops. The study focuses on ten existing transects perpendicular to the coast of Aceh Barat. For these transects, EC, pH, several cations and anions in the groundwater have been analysed in 2006. These measurements are currently being repeated and datasets will be complemented with secondary data for shallow wells shortly after the tsunami. In addition, soil data and tree damage will be assessed. Secondary data comprise salt contents in soil and groundwater analysed by the Federal Institute of Geosciences in Hannover, the Indonesian Soil Research Institute and local Non-Governmental-Organisations. Own measurements include EC, pH, Na⁺, Mg²⁺, Ca²⁺ in soil and water samples. Sodium adsorption ratio and exchangeable sodium percentage will be determined for soils with high sodium contents. The different datasets collected between 2005 and 2007 will be compiled allowing a more specific assessment on the temporal process of groundwater (de)salinisation. Further, links between saltwater intrusion and tree crop damage shall be elucidated. For the latter purpose, interviews with farmers are conducted to assess the tree crop damage (as % mortality rate, yield depression or leaf shedding). These data are supplement with own field observations. Further results are expected about the salt tolerance of different species. Finally, based on the study, it should be possible to recommend suitable locations and tree species for rebuilding the “green infrastructure” in the area.

Keywords: Indonesia, salinisation, temporal dynamics, tree damage, tsunami

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