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Global Quick Scan of the Vulnerability of Groundwater systems to Tsunamis

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Fresh groundwater resources in deltaic areas are used for domestic, agricultural and industrial purposes. These resources in the coastal zone are threatened by salinization of the aquifers due to global change (increase of groundwater extraction due to population growth), climate change (including sea level rise), as well as natural disasters such as floods and tsunamis. Studies of how the coastal fresh groundwater resources are affected by the latter phenomena are often done a posteriori, especially the studies related to tsunami effects (e.g. the 2003 Sumatra Tsunami). Then it is often too late to take appropriated measures to counteract the negative effects (e.g. on drinking water supply). These complex studies are time consuming, and need data which might not be available at the time of the disaster when a fast reaction of the water authorities is needed, e.g. to facilitate a quick and easy to access fresh water supply system. In our study we present a Global Quick Scan of the vulnerability of the deltaic fresh groundwater resources to tsunamis. We created a global database including the data needed to generate fast and simple models on the salinization of groundwater systems in the coastal zone. These quantifications give water manager a first approximation of the effects that a tsunami would have on the salinization of the fresh groundwater. The data collected in this database has been used to generate a map showing the areas with coastal groundwater systems vulnerable to tsunami effects, as well as a dataset of 500 2D models representing the physical characteristics of the most frequent coastal groundwater systems in tsunami vulnerable areas. These 2D models simulate the loss in fresh groundwater volume of the system and the characteristic time of a system before it recovers 90% of the fresh groundwater that was available previous to the tsunami event. A similar approach could be adopted for assessing the effect of sea level rise and future increased groundwater extractions on vulnerable coastal groundwater systems worldwide.