Contamination of drinking water resources in the Mekong delta floodplains: Arsenic and other trace metals pose serious health risks to population

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Abstract: This study presents a transnational groundwater survey of the 62,000?km^2 Mekong delta floodplain (Southern Vietnam and bordering Cambodia) and assesses human health risks associated with elevated concentrations of dissolved toxic elements. The lower Mekong delta generally features saline groundwater. However, where groundwater salinity is < 1?g L^{-1} Total Dissolved Solids (TDS), the rural population started exploiting shallow groundwater as drinking water in replacement of microbially contaminated surface water. In groundwater used as drinking water, arsenic concentrations ranged from 0.1-1340??g L^{-1}, with 37% of the studied wells exceeding the WHO guidelines of 10??g L^{-1} arsenic. In addition, 50% exceeded the manganese WHO guideline of 0.4?mg L^{-1}, with concentrations being particularly high in Vietnam (range 1.0-34?mg L^{-1}). Other elements of (minor) concern are Ba, Cd, Ni, Se, Pb and U. Our measurements imply that groundwater contamination is of geogenic origin and caused by natural anoxic conditions in the aquifers. Chronic arsenic poisoning is the most serious health risk for the ~ 2 million people drinking this groundwater without treatment, followed by malfunction in children's development through excessive manganese uptake. Government agencies, water specialists and scientists must get aware of the serious situation. Mitigation measures are urgently needed to protect the unaware people from such health problems.

Author Keywords: Cambodia; Drinking water; Manganese; Salinity; Trace elements; Vietnam

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