

Trace element concentration in Cox's Bazar paleobeach groundwater, South-Eastern Bangladesh: potential impact on environment

A. A. Seddique^{1*}, H. Masuda², T. Maruoka³

¹Dept. of Environmental Science and Engineering,
Jatiya Kabi Kazi Nazrul Islam University,
Bangladesh
(*correspondence:aseddique@yahoo.com);²Dept.
of Geosciences, Osaka City Univ., Japan
(harue@sci.osaka-cu.ac.jp);³Graduate School of
Life and Environmental Sciences, Univ. of
Tsukuba, Japan
(maruoka.teruyuki.fu@u.tsukuba.ac.jp)

Cox's Bazar paleobeach (backdune area) areas have been over exploited the subsurface aquifers to meet the demand for thousands of tourists (over 1,000,000 tourists visit each year) along with domestic and agriculture purposes. One hundred fifteen groundwater samples were collected from different types of tubewells, which included hand pump fitted bore wells (<50m depth), moderately deep energized bore wells (50-100m depth) and deep bore wells (>100m depth), and analyzed for 17 trace elements (As, B, Ce, Cr, Cd, Cu, Fe, Mn, Mo, Ni, Pb, Se, Sr, Zn, Sb, U and Th) using ICP-MS.

The concentrations of trace elements in paleobeach groundwater varied greatly. As, Pb, Zn, Sb, Cr, Cd, Cu, Ce, Mo, Ni and Se did not exhibit significant elevated levels, but concentrations of Mn, B, Fe, Sr, U and Th exceeded the permissible limits for drinking water. Results also showed that about 5% of studied shallow tubewell waters (5-50m depth) exceeded the WHO (1998) guideline of U (2.0 μ g/l) with a maximum concentration of 10 μ g/l. Almost all of such U-enriched groundwater showed elevated concentrations of Th with a maximum of 127 μ g/l although WHO health-based drinking water guidelines were not determined so far for Th. High concentrations of Mn (0.01 to 29mg/l), Fe (0.01 to 89 mg/l), B (13 to 969 μ g/l) and Sr (1 to 24916 μ g/l) were also observed for 80% of the studied tubewells, some of which exceeded their WHO (2004) drinking water guidelines. Based on the spatial distribution of the tubewells with elevated concentrations of Mn, B, Fe, Sr, U and Th about 85% of this area have been contaminated with at least one of these elements. High Sr and B concentrations in some groundwaters suggest that the aquifer system was interacted with seawater. However, this study reveals for the first time that the radioactive heavy metals (i.e., U, Th) are found in the groundwater in Bangladesh and the source(s) of U, Th, Mn, etc are not identified yet. We hope that our results will serve to arouse public interest and lead to much research on a potential health hazard in the area studied.