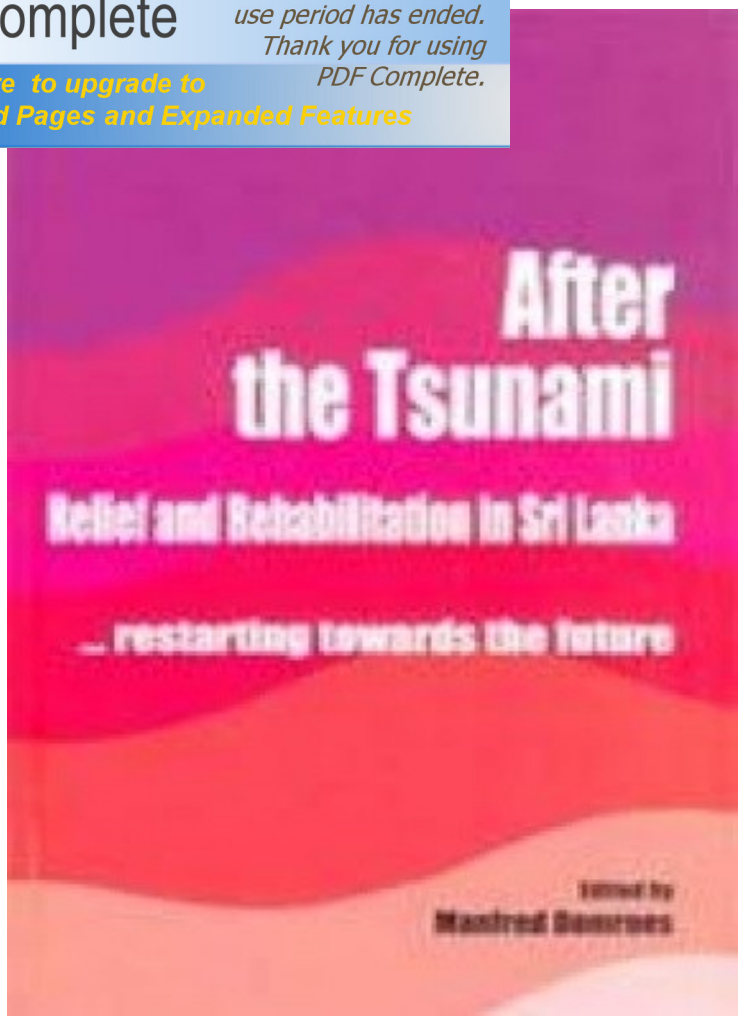

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Impact of the Tsunami on groundwater quality at Weligama Bay

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1.1.1.1 Abstract

Groundwater quality and the water table behavior at Weligama Bay have been studied in the aftermath of the Tsunami. 90 affected shallow dug wells, situated on a

for the study. The wells are sunk into the overlying precambrian granite gneiss. The top tal margin at Weligama Bay is very permeable ery favorable for saltwater intrusion. The study helped to prepare the hydro-geological and the hydro-geo-chemical maps of the area.

Prior to the Tsunami, water of these wells was non-saline and used by the people for drinking and other domestic purposes. The preliminary results of the study revealed that the electrical conductivity (EC) of wellwater in all wells situated in the Tsunami-affected region have become saline; the EC values, on average, increased from 300 to around 1300 µ Siemens/cm). Total dissolved solids of the wellwaters were around 1.000 mg/l.

It can be concluded that the underground pressure wave which has likely developed due to the Tsunami may have disturbed the freshwater-saltwater equilibrium resulting in the mixing of fresh groundwater with saline water.

1. Introduction

Affected by the Tsunami saline water infiltrated through the unsaturated zone especially in areas with permeable soils. Contamination of surface water occurred in many areas near human settlements due to the mixing of waste, including the contents of septic tanks, with seawater and other surface materials. In the affected areas almost all the open dug wells had been filled with seawater. Although seawater intrusion may have been extended to the entire groundwater aquifer the coastal or low-lying areas are located closely to the ground surface. The degree to which the saline water spreads out is dependent on the permeability of the rocks.

The Tsunami-affected areas extended up to two kilometers inland. The groundwater resources have been badly affected by increased saltwater intrusion and pollution of existing wells. Furthermore, contamination may have increased due to subsequent water stagnation in local depressions and drainage sinks. The pollutants that are present on the surface are also spread with the water and contributed to groundwater contamination. The wells are also likely to be polluted by bacteria and viruses in water inflowing directly from the surface. Streams and rivers are generally anticipated to have flushed clean, but the effect of saltwater and other materials' intrusion into groundwater systems is of great concern.

The Tsunami-carried waves may have also affected the freshwater and saltwater equilibrium. Under natural conditions, in coastal areas an equilibrium exists between seawater and freshwater which depends on the geological and hydro-geological conditions. Due to the high density of seawater, it tends to force its way underneath the freshwater. However, as the pizometric head of the freshwater is higher than for seawater, the fresh water continually discharges to the sea. The freshwater discharges are opposite to the inland movement of seawater, and thereby an equilibrium is established. Seawater that moves inland causes saltwater intrusion. Once the groundwater level equilibrium has been established, the water level will stabilize and only fluctuates annually when there are seasonal changes and natural hazards.

The Tsunami waves have in some areas heavily eroded coastal sediments resulting in a landward shift of the coastline and the intrusion of seawater in the coastal aquifers leading to shift landward over a similar distance which may affect

. As a consequence, water extracted from wells
ies.

on at places where exploitation of coastal water
untries, for example in countries of the Middle East, Japan, China, Israel, the Netherlands, Australia, New Zealand, Italy, England, and the Scandinavian countries, as well as in Russia and in countries of the Commonwealth Independent States (CIS).

During the post-Tsunami period, affected wells are pumped at a higher rate to remove the saltwater. At such locations the risk of deterioration of the water quality may exist if saline groundwater is affected by seawater intrusion.