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Evolution of Geochemical Properties of Tsunami Affected Soils in Southern Coast of Sri Lanka

A.A.C. Priyantha[1, 2], Rohana Chandrajith[3], Bernard Prame[2], Shamalee Siriwardane[2] and Priyanka Jayalath[2]

[1]Postgraduate Institute of Science, University of Peradeniya, Peradeniya, Sri Lanka.
[2]Geological Survey and Mines Bureau, No 04, Galle Road, Dehiwala, Sri Lanka.
[3]Department of Geology, University of Peradeniya, Peradeniya, Sri Lanka.
(e-mail: aachinthaka@yahoo.com)

ABSTRACT

The giant tsunami wave of 26 December 2004 contaminated the surface soils in inundated regions with marine sediments and oceanic water containing various salts and organic matter. This severely changed the physical and chemical nature of coastal soils, making those not suitable for agricultural activities, though those may recover with time. In order to investigate the physico-chemical properties of tsunami affected soils, sampling was carried-out in the south-western coastal zone from Akurala to Hikkaduwa in 2010, five years after the tsunami event. Twenty soil samples were collected from 0.2 – 0.5 m depths along seven traverses which run approximately perpendicular to the coast line. Three soil samples were obtained as reference samples from an area which was not inundated by the tsunami and about 200 m away from the inundation line. The soils were predominantly sandy clay and lateritic clay. Sandy soils which contained more than 50% sand were not considered for chemical analysis. Samples were analyzed for their pH, electrical conductivity, Na, K, Mg, Ca, Cu, Ni, Co, Zn, Mn, Pb, Cr and Fe and the results were compared with available data from previous studies.

The average soil salinity in the Tsunami Affected Areas (TAA) is 389 μS cm^{-1}. It is 265.6 μS cm^{-1} in Reference Samples (RS) indicating the general salinity levels in the coastal areas. The average pH of TAA is 6.75, which is 6.6 in RS. It is evident that the trace element concentration is higher in the TAA compared to RS. The concentrations of trace elements in TAA and RS are (in mg/kg) Cu (6.26, 5.91), Ni (6.82, 5.82), Zn (18.91, 20.80), Co (91.88, 46.79), Mn (17.97, 10.71), Pb (7.34, 3.94) and Cr (11.30, 10.10). Except Zn, all other trace elements are higher in TAA compared to RS. The major elements also showed a similar trend. Higher concentrations of trace elements are observed in Thelwattha and Peraliya regions which were severely affected by the tsunami. The values are compared with soils and sediments collected just after the tsunami in the same region and with soils from Bundala National Park, located in the southern coast that was not inundated by tsunami. It is evident that the soils of south-western coastal zone are gradually alleviated to its natural conditions.