

Assessment of Surface Water Quality near Landfill Sites Using a Water Pollution Index

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Abstract : Landfilling of municipal solid waste is a common waste management practice in Argentina as in many parts of the world. There is extensive scientific literature on the potential negative effects of landfill leachates on the environment, so it's necessary to be rigorous with the control and monitoring systems. Due to the specific municipal solid waste composition in Argentina, local landfill leachates contain large amounts of organic matter (biodegradable, but also refractory to biodegradation), as well as ammonia-nitrogen, small trace of some heavy metals, and inorganic salts. In order to investigate the surface water quality in the Reconquista river adjacent to the Norte III landfill, water samples both upstream and downstream the dumpsite are quarterly collected and analyzed for 43 parameters including organic matter, heavy metals, and inorganic salts, as required by the local standards. The objective of this study is to apply a water quality index that considers the leachate characteristics in order to determine the quality status of the watercourse through the landfill. The water pollution index method has been widely used in water quality assessments, particularly rivers, and it has played an increasingly important role in water resource management, since it provides a number simple enough for the public to understand, that states the overall water quality at a certain location and time. The chosen water quality index (ICA) is based on the values of six parameters: dissolved oxygen (in mg/l and percent saturation), temperature, biochemical oxygen demand (BOD5), ammonia-nitrogen and chloride (Cl-) concentration. The index 'ICA' was determined both upstream and downstream the Reconquista river, being the rating scale between 0 (very poor water quality) and 10 (excellent water quality). The monitoring results indicated that the water quality was unaffected by possible leachate runoff since the index scores upstream and downstream were ranked in the same category, although in general, most of the samples were classified as having poor water quality according to the index's scale. The annual averaged ICA index scores (computed quarterly) were 4.9, 3.9, 4.4 and 5.0 upstream and 3.9, 5.0, 5.1 and 5.0 downstream the river during the study period between 2014 and 2017. Additionally, the water quality seemed to exhibit distinct seasonal variations, probably due to annual precipitation patterns in the study area. The ICA water quality index appears to be appropriate to evaluate landfill impacts since it accounts mainly for organic pollution and inorganic salts and the absence of heavy metals in the local leachate composition, however, the inclusion of other parameters could be more decisive in discerning the affected stream reaches from the landfill activities. A future work may consider adding to the index other parameters like total organic carbon (TOC) and total suspended solids (TSS) since they are present in the leachate in high concentrations.

Keywords : landfill, leachate, surface water, water quality index

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