

USING THE HYDROCHEMICAL DATABASE TANGCHIM TO MANAGE GROUNDWATER QUALITY DATA: THE CASE STUDY OF A LEACHATE PLUME FROM A DUMPING AREA

Gennaro A. STEFANIA ¹, Marco ROTIROTI ¹, Letizia FUMAGALLI ¹, Tullia BONOMI ¹

¹ Department of Earth and Environmental Sciences, University of Milano-Bicocca, Piazza della Scienza 1-20126, Milan, Italy, g.stefania1@campus.unimib.it

This work deals with a preliminary characterization of a groundwater pollution from a dumping area using the new online hydrochemical database TANGCHIM as supporting tool.

The study area is located in an Alpine fluvial valley (NW Italy) where glacial excavation was followed by glacial, lacustrine, alluvial and fan deposition in the Pleistocene and Holocene forming a gravelly mono-layer unconfined aquifer with local subdivision into an unconfined upper aquifer and a semiconfined deeper aquifer which occurs in the dumping area due to a discontinuous silty layer. Groundwater mainly flows from West to East with some local perturbations due to wells pumping and surface water drainage. Closely to the dumping area, groundwater depth range from 1.5 to 9.5 m with seasonal fluctuations up to 2 m. The dumping area is monitored by more than 30 piezometers, all tapped in the upper shallow aquifer. The dumping area is composed of two main landfills: a legal landfill (more recent and currently used) and an old illegal landfill (currently closed) plus other smallest waste deposits of which the locations are unknown. The legal landfill is used as point of collection of municipal solid waste and sludge of wastewater treatment plants, whereas both the illegal landfill and the other smallest deposits were filled with inert, plastic and urban wastes of different and unknown composition. Only the legal landfill has an impermeable surface (a clay layer) 1 m thick. An important aspect to consider is that the old landfill is located close and upstream to the legal landfill, preventing a proper groundwater monitoring downstream the used landfill.

The chemical data from the groundwater monitoring network have been managed by the TANGCHIM database (DB). This DB is able to store, display, and process the hydrochemical data related to water wells. TANGCHIM can store more than 430 chemical compounds which can be modified or added by the user. It also manages synonyms of chemical compounds to avoid data duplication by providing well-structured data. Data export can be performed through queries based on: (1) temporal period, (2) location, (3) chemical compounds and (4) well name. TANGCHIM is linked to the hydrogeological well database TANGRAM that is able to manage all the data related to water wells. The coupled use of these DBs allows a better understanding of the results of groundwater monitoring.

Results of the groundwater quality monitoring in the study area showed reducing conditions with low dissolved O₂ and high COD, NH₄, Fe, Mn and As that are typically found in leachate plume. The analysis of both hydrochemical and hydrodynamic data suggested that the plume is mainly from the old landfill and, likely, from other unknown waste deposits located into the dumping area.

This work highlighted the importance of constructing a structured and robust hydrochemical database in hydrogeological studies related to groundwater pollution.

