Assessment of Groundwater Vulnerability to Landfill Leachate Induced Arsenic Contamination in Maine, US

DRASTIC

The DRASTIC model evaluates the Intrinsic Vulnerability (IV) of groundwater by considering factors including Depth to water table, natural recharge rates, Aquifer media, Soil media, Topographic aspect, Impact of vadose zone media and hydraulic Conductivity:

DRASTIC Index (IV) = DDw + RRr + AAa + SSR + TTa + IL + CC

r = rating value; w = weight

Depth to Groundwater (Weight = 5)

Natural Recharge Rates (Weight = 4)

Aquifer Media (Weight = 3)

Soil Media (Weight = 2)

Topographic Aspect (Weight = 1)

Impact of Vadose Zone Media (Weight = 5)

Hydraulic Conductivity (Weight = 5)

Impact of Municipal Landfills (IL)

DRASTIC Intrinsic Vulnerability (IV)

Impact of Bedrocks (IB)

Overall Vulnerability (OV) = IV × IL × IB

Conclusions

The results provided a preliminary screening tool to identify potential areas with high risks of arsenic contamination in groundwater induced by the degradation of municipal landfill leachates. The proposed methodology can also be applied to groundwater vulnerability studies for other contamination problems in regional scales.

References


Naturally-occurring arsenic is often found to be bound to iron oxide minerals in soil and bedrocks in the New England area of US. Only in recent years have people found out that the degradation of organic-rich leachate migrating from municipal landfills may cause the reductive dissolution of iron oxide minerals and subsequently the release of sorbed arsenic to groundwater (Stollenwerk 2003; deLemos et al. 2006). A groundwater vulnerability study was conducted for this specific contamination scenario in Maine, US, using an index and overlay method that combines the classical DRASTIC model (Aller et al. 1987) with the potential impacts from municipal landfills as well as natural bedrocks in a Geographic Information System.