

# Investigation of possible effect of cemeteries on groundwater

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Groundwater, a critical resource for human consumption and ecological sustainability, faces significant contamination risks from various human activities, including those associated with cemeteries. Burial sites have the potential to pollute groundwater, particularly when directly connected to underlying aquifers. Despite the acknowledged risks, the literature reveals a notable gap in the development of comprehensive models that accurately predict the extent and mechanisms of this contamination. Existing studies have not fully addressed the complex processes governing the transport of contaminants from cemeteries to groundwater, especially in varied geological settings. To bridge this gap, the study developed a novel mathematical model to assess the impact of cemeteries on groundwater contamination. The specific objectives were to develop a decay model incorporating both classical and fractional behaviours, simulate the transport of contaminants using the advection-dispersion equation, and evaluate the influence of different burial practices and geological conditions on groundwater quality. Numerical simulations were conducted under various environmental conditions. The findings demonstrated that cemeteries can significantly affect groundwater quality, particularly in areas where burial sites are directly connected to aquifers. The model effectively captured the decay process, revealing that human remains can be a persistent source of contamination, especially in warm and humid climates. Furthermore, the simulations indicated that reusing graves could exacerbate groundwater pollution, making it a less environmentally sustainable option compared to single-use graves. These findings highlight the importance of considering environmental conditions and burial practices in assessing groundwater contamination risks and provide valuable insights for improving cemetery management practices and policy decisions to protect groundwater resources. The developed model offers a more accurate prediction of contamination spread, providing valuable insights for improving cemetery management practices and informing policy decisions aimed at protecting groundwater resources.