

# **Evaluation of Landfill Cover Design Options for Waste Disposal Sites in the Coastal Regions of Ghana**

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## **Abstract**

Uncontrolled leachate generation from operational and closed waste disposal sites is a major environmental concern in the coastal regions of Ghana which have abundant surface water and groundwater resources. The Ghana Landfill Guidelines requires the provision of a final cover or capping system as part of a final closure plan for waste disposal sites in the country as a means of minimizing the harmful environmental effects of these emissions. However, this technical manual does not provide explicit guidance on the material types or configuration for landfill covers that would be suitable for the different climatic conditions in the country. Four landfill cover options which are based on the USEPA RCRA-type and evapotranspirative landfill cover design specifications were evaluated with the aid of the HELP computer program to determine their suitability for waste disposal sites located in the Western, Central and Greater Accra regions. The RCRA Subtitle C cover which yielded flux rates of less than 0.001 mm/yr was found to be suitable for the specific climatic conditions. The RCRA Subtitle D cover was determined to be unsuitable due to the production of very large flux rates in excess of 200 mm/yr. The results for the anisotropic barrier and capillary barrier covers were inconclusive. Recommendations for further study include a longer simulation period as well the study of the combined effects of different topsoil vegetative conditions and evaporative zone depths on the landfill water balance. The use of other water balance models such as EPIC, HYDRUS-2D and UNSAT-H for the evaluation of the evapotranspirative landfill cover design options should also be considered.

**Keywords:** leachate, groundwater, landfill cover, waste disposal, Ghana, HELP Model

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