

Sensitivity Analysis of Population in The Generation of Hazardous and Non-Hazardous Wastes, and Gas from Dumpsites of Ogbomosoland in Nigeria

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Abstract

This paper applies the principles of system dynamics modeling in studying the pattern of population changes and the corresponding non-hazardous wastes and gas being generated from the dumpsites of Ogbomosoland, Nigeria. The five (5) Local government Areas (LGAs) of Ogbomosoland were categorized as Urban (Ogbomosó North and Ogbomosó South) and Rural (Oriire, Ogo Oluwa and Suurulere) based on the size, population of residents, consumption pattern and socio-economic activities of the area. A sensitivity analysis of the simulated variables i.e the population, wastes and gas, was performed by employing the developed model results. Findings showed that the wastes and gas increased with the increased population in the 1000 years period. Also, gas production exceeds wastes generation rates for the rural LGAs in all cases. After a 25 years benchmark, when the simulated population of the urban and rural LGAs are respectively 303,411 and 344,735, the rates of waste generation are 3.33×10^6 and 6.22×10^6 m³, while the corresponding rates of gas production is 2.44×10^3 and 6.47×10^3 m³ in same order. The study concludes that wastes and gas generation from dumpsites are highly sensitive to population growth. It also concluded that the rate of gas generation is higher in organic wastes of the rural LGAs. The maximum population permissible in the model is 300,000 thus design of full-fledge landfills is recommended to replace the existing dumpsites in the study area.

Keywords: system dynamics, sensitivity analysis, population, non-hazardous wastes

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