

Title: GHGs EMISSIONS OF SOLID WASTE MANAGEMENT SYSTEM: A CASE STUDY OF DIFFERENT SOLID WASTE MANAGEMENT SCENARIO IN KATHMANDU, NEPAL.

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Abstract: Urbanization is expanding at a disturbing rate in Nepal which is squeezing municipal services, especially those dealing with the always expanding amounts of municipal solid waste (MSW). Currently, the greater part of the wastes produced in the city are not being sufficiently administered thereby threatening human wellbeing and the environment. It is an issue with financial, environmental, and social ramifications, making it both significant and complex. Notwithstanding metropolitan environmental contamination, wrong disposal causes the production of greenhouse gases like methane, leachates from landfill sites and energy consumption.

The assessment of MSW production and greenhouse gas (GHG) emission is important to reduce global warming. To address the issue, this study aimed to: (1) determine the MSW generation and composition in Kathmandu Metropolitan City (KMC); (2) compare different solid waste management (SWM) scenarios in terms of GHG emission in KMC; and (3) determine the feasibility of reducing methane emissions from SWM in the Sisdole landfill site, Kathmandu.

KMC was used as a model case study. A survey of 288 households in 32 wards of KMC was conducted to determine the MSW generation and its composition. Five different MSW management scenarios were developed, and greenhouse gas emissions were estimated for each scenario using the Intergovernmental Panel on Climate Change (IPCC) model and the Life Cycle Assessment (LCA) tool. The LandGEM model was used to estimate total landfill gas emission in the Sisdole landfill site.

The outcome is that per capita MSW generation in Kathmandu is 0.3 kg per day. It is estimated that households create around 76,879 tonnes of organic waste each year, most of which is uncollected:

the rest is disposed in an open dump site. Investigation showed that organic waste is 51% of the MSW; 49% is recyclable waste comprising 19% plastic, 13% textiles, 5% paper and paper items, 4% rubber and leather, 3% glass, 1% metal, and 4% 'other waste.

Five MSW management scenarios were tested: S0, S1, S2, S3 and S4; where: S0 is 'business as usual'; S1 is upgrade to landfill gas capture; S2 is composting; S3 is recycling; and S4 is integration of gas capture, recycling, and composting. The CH4 outflow is high at 15,136 m3 for scenario S0. The greatest decrease, 73%, in CH4 discharges happened with the integrated gas capture, composting and recycling (S4) system. Composting S2 is the best of the other three scenarios because of high volume of organic waste.

The quantity of CH4 generation from solid waste in the Sisdole landfill site was calculated as 1.050E+06 (Mg/year) in 2006. The maximum methane generation rate occurred during 2015-2035 with the peak generation being approximately 1.100E+07 (Mg/year). Based on these volumes, it is now necessary to consider installing methane capturing facilities.

The proposed S4 solid waste management technique will make an important contribution towards improving the SWM system in Kathmandu Metropolitan City (KMC) and elsewhere. Landfill discharge results can be used to calculate power generation planning from the MSW and to establish a gas capture system at the Sisdole landfill site, eventually supporting Nepal's contribution to global greenhouse gas emission reduction. It would also reduce environmental contamination by decreasing greenhouse gases from waste generation.

Keywords: Methane (CH4) emissions, Greenhouse gas (GHG), Kathmandu Metropolitan City (KMC), Municipal Solid Waste (MSW), Landfill.

Biography

Over the last ten years I have worked for various organisations including Eawag Research Limited, Switzerland ,UK aid projects and the Government of Nepal as a civil, environmental and sanitation engineer. I have just complted my PhD and Master's degree in enviromental sanitation engineering. I have published several peer-reviewed journal papers and articles in the national media related to enviromnetal and waste management.

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Session name/ number:
Category: Oral presentation