



Non-controlled biogas and VOCs emission to the atmosphere from Arico's landfill at Tenerife, Canary Island, Spain

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Landfills are important sources of greenhouse gases like CO_2 and CH_4 as well as other trace gas components to the environment. A large number of organic volatile components (VOCs) are present as tracers in landfill gases, and some of them are considered to be carcinogenic and toxic. In order to control emissions of these contaminants, biogas extraction systems must be installed in landfills. However, in spite of the technical efforts to minimize biogas emissions, a significant amount of non-controlled biogas emissions are released into the atmosphere through the landfill surface. The evaluation of non-controlled CO_2 and CH_4 emissions to the atmosphere by landfills has important technical and environmental implications. It will allow to have a better estimation of the biogas emission to the atmosphere by landfills and to evaluate the efficiency of the biogas extraction system by comparison non-controlled vs controlled biogas emission values. The aim of this study is to evaluate the non-controlled emission of CO_2 , CH_4 and VOCs from the new Arico's landfill (Tenerife, Canary Islands), which has an extension of $45.000\ m^2$. A surface degassing survey of 30 sampling sites was carried out during July, 2004. Surface CO_2 and CH_4 flux measurements were performed by means of a double flux portable NDIR spectrometer and according to the accumulation chamber method. Surface CO_2 and CH_4 flux values ranged from negligible to $650\ gm^{-2}d^{-1}$ and $20\ gm^{-2}d^{-1}$, respectively. Landfill surface-air gas samples for VOCs analysis were collected inside accumulation chamber by grab-sampling in $400\ cm^3$ stainless-steel canister. VOCs analysis were carried out by means of GC/MS/MS. Non-controlled emission rate of VOCs were estimated by multiplying surface CO_2 efflux times $(VOCs)_i/CO_2$ weight ratio at each sampling site. The spatial distributions of CO_2 , CH_4 and VOCs at the new Arico's landfill showed a

different distribution pattern for each volatile component, and it seems related to actual use of this landfill. Taking into consideration the spatial distribution of the CO_2 , CH_4 and VOCs efflux values as well as the landfill's area, the non-controlled emission of CO_2 , CH_4 and VOCs to the atmosphere by were estimated about 1.200 Kgd^{-1} , 230 Kgd^{-1} , 8.9 Kgd^{-1} , respectively. The VOCs emission fraction related to BTEX components is about 66,3%, since the total output of non-controlled emission of BTEX species were estimated about 5.9 Kgd^{-1} .