



Evaluating the estimated methane emission into the atmosphere by landfills in Spain

David Calvo (1), María Asensio-Ramos (1), Laura Acosta (1,2), Mar Alonso (1,3), Cecilia Morales (1), Violeta T. Albertos-Blanchard (1,3), Cecilia Amonte (1,2), Fátima Rodríguez (1), José Barrancos (1,3), Gladys V. Melián (1,2,3), Eleazar Padrón (1,2,3), Erica Pérez (2), Franco Tassi (4), Brunella Raco (5), Dina López (6), Pedro A. Hernández (1,2,3), Nemesio M. Pérez (1,2,3)

(1) Instituto Volcanológico de Canarias (INVOLCAN), 38320 La Laguna, Tenerife, Canary Islands, Spain (nperez@iter.es), (2) Agencia Insular de la Energía de Tenerife (AIET), 38600 Granadilla de Abona, Tenerife, Canary Islands, Spain, (3) Instituto Tecnológico y de Energías Renovables (ITER), 38600 Granadilla de Abona, Tenerife, Canary Islands, Spain, (4) Dipartimento di Scienze della Terra, Università degli Studi di Firenze (UniFI), Firenze, Italy, (5) Istituto di Geoscienze e Georisorse – CNR, Pisa, Italy, (6) Department of Geological Sciences, Ohio University, Athens, USA

During the active life of a landfill and even decades after being closed, different damaging gases related with the decomposition of the wastes can be released into the atmosphere, such as carbon dioxide, methane, volatile organic compounds, etc. Biogas extraction systems are installed in order to control these emissions, but a percentage of it escapes into the atmosphere through the surface of the landfill as the so-called fugitive emission.

Methane, one of the most powerful greenhouse gases, is increasing in the atmosphere by 0.6% each year and more than 10% of the total anthropogenic emissions of this gas is originated in landfills. Normally, landfills report their methane emissions to the atmosphere using model-based methods on the rate of production and oxidation rate, and on the amount of methane recovered. This approach can involve large uncertainties due to inaccuracies of input data and assumptions in the estimation. Previous studies carried out in Canary Islands has shown that the estimation of greenhouse gas emissions that have been published in the Statal Register of Emissions and Pollutant Sources (PRTR-Spain), Ministry of Agriculture, Food and Environment of the Government of Spain, particularly methane, are overestimated. This also means that, if estimates of non-controlled diffuse emission are actually much lower than those estimated by mathematical models, the efficiency of the extraction system is much better than that appreciated.

In the period 2017-2019, we are carrying out a study to estimate the diffuse fugitive emission of methane into the atmosphere from landfills in Spain, financed by the Ministry of Science, Innovation and Universities. To do so, diffuse CH₄ emission measurements are performed in-situ

at 16 Spanish landfills with portable methane and carbon dioxide sensors, following the accumulation chamber method. To date, the following landfills have been studied: Arico's municipal landfill (0.7 km²) in Tenerife, Canary Islands; the whole Controlled Deposit of Pinto (1.1 km²), in Madrid, which is one of the biggest landfills in the country; the Complejo Medioambiental de la Costa del Sol (0.3 km²) in Malaga, Andalucía; the closed Miranda del Ebro landfill (0.05 km²) in Burgos, Castilla y León; the closed San Markos landfill (0.2 km²) in San Sebastian, País Vasco; and the waste treatment center of Gomencello (0.09 km²) in Salamanca, Castilla y León. A correct estimation of diffuse emission of CH₄ from Spanish landfills will help to better manage the wastes, to implement measures to prevent the emission of polluting gases into the atmosphere, to manage this powerful energy resource, and to create a mass of new expert researchers in this field.