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Project Summary

Approach for Estimating Global Landfill Methane Emissions

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This report is an overview of available country-specific data and modeling approaches for estimating global landfill methane. Current estimates of global landfill methane indicate that landfills account for between 4 and 15% of the global methane budget. The report describes an approach for using country-specific and field test data to develop a less uncertain estimate of global landfill methane. Development of enhanced emissions factors for landfills and other major sources of methane will improve the understanding of atmospheric chemistry and feedback effects, will target mitigation opportunities, and will ensure cost-effective mitigation strategies.

This Project Summary was developed by EPA's Air and Energy Engineering Research Laboratory, Research Triangle Park, NC, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

In response to concerns about global warming, the U.S. EPA's Office of Research and Development (ORD) has initiated a program to characterize the effects of global change, including identifying and quantifying emission sources. EPA's Air and Energy Engineering Research Laboratory (AEERL) is part of this effort, and is particularly concerned with quantifying emissions sources both in the U.S. and globally.

Considerable effort has been expended studying carbon dioxide (CO_2) emissions since CO_2 is responsible for most of the global warming. Methane is of particular concern since its radiative forcing potential has been estimated to be 20 to 30 times that of CO_2 on a mole basis; furthermore, atmospheric methane is increasing at a faster rate than any other greenhouse gas except for chlorofluorocarbons. Although the major sources of methane are known qualitatively, considerable uncertainty exists about the quantitative emissions from each source. One of the goals of AEERL's global climate research program is to develop enhanced emission factors for methane sources. This will improve the understanding of atmospheric chemistry and feedback effects, will target mitigation opportunities, and will ensure cost-effective mitigation strategies.

The current state of knowledge for landfills—a major source of methane—is summarized in this report. The report provides an evaluation of the approaches currently available for estimating global landfill methane. The report also provides an overview of data from current literature on methanogenesis in landfills, an evaluation of methane emission models, and interviews with experts in this field. An approach is identified using country-specific and field test data for reducing the uncertainty associated with current estimates of global emissions of landfill methane.

The best approach is obviously determined by a variety of factors including the desired level of accuracy, desired resolution, data limitations, and budget and time constraints. The level of accuracy is largely

determined by the needs of the users of the model outputs which have widely varying needs. Policymakers need quantitative measures of landfill emissions in order to develop mitigation strategies and to assign priorities to mitigation programs. However, they may need only one number, such as average annual global methane emissions from a given source; the finest resolution they may need is likely to be at the country-specific level. At the other end of the spectrum are the outputs needed to supply information to regional and global atmospheric models. If so, the resolution of the data will need to be finer. Spatially, the emissions may be needed for grid cells as large as 10°x10° or as small as 1°x1°. Temporally, time periods of less than a year may be desirable.

At this time, it is recognized that these divergent needs exist, and it is not certain that the needs of all users can be met. The limitations to meeting all these needs are partly related to the costs of model development. Even more critical, however, is the large amount of uncertainty associated with modeling methanogenesis. Cost considerations aside, the data required as inputs for a mechanistic model of methane production may not exist. These considerations have been taken into account in developing a model for estimating global landfill methane.

The report summarizes conclusions and recommendations of this study, discusses several different modeling approaches that are currently available, discusses data needs and availability, presents a conceptual scheme for a global landfills model, and outlines a program to develop that model further.

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The complete report, entitled "Approach for Estimating Global Landfill Methane Emissions," (Order No. PB91-149534/AS; Cost: $17.00, subject to change) will be available only from:
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