

CHAPTER 5

INCINERATION AND OPEN BURNING OF WASTE

5 INCINERATION AND OPEN BURNING OF WASTE

5.1 INTRODUCTION

Waste incineration is defined as the combustion of solid and liquid waste in controlled incineration facilities. Modern refuse combustors have tall stacks and specially designed combustion chambers, which provide high combustion temperatures, long residence times, and efficient waste agitation while introducing air for more complete combustion. Types of waste incinerated include municipal solid waste (MSW), industrial waste, hazardous waste, clinical waste and sewage sludge¹. The practice of MSW incineration is currently more common in developed countries, while it is common for both developed and developing countries to incinerate clinical waste.

Emissions from waste incineration without energy recovery are reported in the Waste Sector, while emissions from incineration with energy recovery are reported in the Energy Sector, both with a distinction between fossil and biogenic carbon dioxide (CO₂) emissions. The methodology described in this chapter is applicable in general both to incineration with and without energy recovery. Co-firing of specific waste fractions with other fuels is not addressed in this chapter, as co-firing is covered in Volume 2, Energy. Emissions from agricultural residue burning are considered in the AFOLU Sector, Chapter 5 of Volume 4.

Open burning of waste can be defined as the combustion of unwanted combustible materials such as paper, wood, plastics, textiles, rubber, waste oils and other debris in nature (open-air) or in open dumps, where smoke and other emissions are released directly into the air without passing through a chimney or stack. Open burning can also include incineration devices that do not control the combustion air to maintain an adequate temperature and do not provide sufficient residence time for complete combustion. This waste management practice is used in many developing countries while in developed countries open burning of waste may either be strictly regulated, or otherwise occur more frequently in rural areas than in urban areas.

Incineration and open burning of waste are sources of greenhouse gas emissions, like other types of combustion. Relevant gases emitted include CO₂, methane (CH₄) and nitrous oxide (N₂O). Normally, emissions of CO₂ from waste incineration are more significant than CH₄ and N₂O emissions.

Consistent with the *1996 Guidelines* (IPCC, 1997), only CO₂ emissions resulting from oxidation, during incineration and open burning of carbon in waste of fossil origin (e.g., plastics, certain textiles, rubber, liquid solvents, and waste oil) are considered net emissions and should be included in the national CO₂ emissions estimate. The CO₂ emissions from combustion of biomass materials (e.g., paper, food, and wood waste) **contained in the waste are biogenic emissions and should not be included in national total emission estimates**. However, if incineration of waste is used for energy purposes, both fossil and biogenic CO₂ emissions should be estimated. Only fossil CO₂ should be included in national emissions under Energy Sector while biogenic CO₂ should be reported as an information item also in the Energy Sector. Moreover, if combustion, or any other factor, is causing long term decline in the total carbon embodied in living biomass (e.g., forests), this net release of carbon should be evident in the calculation of CO₂ emissions described in the Agriculture, Forestry and Other Land Use (AFOLU) Volume of the *2006 Guidelines*.

This chapter provides guidance on methodological choices for estimating and reporting CO₂, CH₄ and N₂O emissions from incineration and open burning of all types of combustible waste. Where possible, default values for activity data, emission factors and other parameters are provided.

Traditional air pollutants from combustion - non-methane volatile organic compounds (NMVOCs), carbon monoxide (CO), nitrogen oxides (NO_x), sulphur oxides (SO_x) - are covered by existing emission inventory systems. Therefore, the IPCC does not provide new methodologies for these gases here, but recommends that national experts or inventory compilers use existing published methods under international agreements. Some key examples of the current literature providing methods include EMEP/CORINAIR Guidebook (EMEP 2004), US EPA's Compilation of Air Pollutant Emissions Factors, AP-42, Fifth Edition (USEPA, 1995), EPA Emission Inventory Improvement Program Technical Report Series, Vol. III Chapter 16: Open Burning (USEPA, 2001).

The estimation of indirect N₂O emissions, resulting from the conversion of nitrogen deposition to soils due to NO_x emissions from waste incineration and open burning, is addressed in Section 5.4.3 of this chapter. General background

¹ Waste generation, composition and management practices, including waste incineration and open burning, are addressed in detail in Chapter 2 of this volume.