## ATMOSPHERIC BROWN CLOUDS

# EMISSION INVENTORY MANUAL







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### FOREWORD

Atmospheric brown clouds (ABCs) are widespread layers of regional scale plumes of air pollution consisting of a mixture of anthropogenic sulfate, nitrate, organics, black carbon, dust, and fly ash particles. Recent scientific findings suggest that the impacts of ABCs, which include short-lived climate pollutants (SLCPs) such as black carbon and tropospheric ozone, have reached a critical point that raises the need for urgent action. An Atmospheric Brown Clouds (ABC) study published in 2010 (Ramanathan and Xu, 2010) showed that mitigation of all four SLCPs (black carbon, methane, ozone precursors, and HFCs) using maximum available technologies will reduce global warming by 0.6 degree C by 2050. Prompted by this finding and other scientific studies, UNEP commissioned a global assessment of black carbon and tropospheric ozone. The UNEP report was published in 2011. It confirmed the ABC study and suggested that widespread and swift implementation of a small number of already available mitigation measures targeting black carbon and methane emissions will decrease global warming by 0.5 degree C. The report also showed that measures to control SLCPs can prevent crops losses of 30 to 140 million tons and some 0.7 to 4.6 million premature deaths globally. Those regions that cut down significant levels of emissions will benefit most.

The main sources of ABCs are industrial emissions, vehicular exhausts, burning of residential fuels including fossil and biofuels, and open biomass burning. Emissions from contained burning of fuels are still uncertain by a factor of 2-6. Emissions from open burning are even more uncertain. This poses a big challenge in designing sector- and source-based mitigation measures and technological, financial, or policy measures.

In order to address this challenge, UNEP commissioned a group of experts to prepare a comprehensive emission inventory manual that is user friendly, and can be used both as a guide in compiling emission inventories in developed and developing countries, and as a training material for human resource development. The Emission Inventory Manual is accompanied by an Excelbased workbook, which can be used for compilation and estimation of ABCs emissions from different sources.

We would like to express our gratitude to all of those who contributed to the compilation of this Emission Inventory Manual. This manual will provide governments, research institutions, and academia with a tool for compilation and identification of ABCs sources and a reliable reference for science- based decision making.

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