



Air Quality and Climate Impact of Charcoal Use in Africa

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Demand for charcoal in Africa is growing at a rate of 7 % per year, due to unavailable and unaffordable energy alternatives. Its production and use, including plastic burning to initiate combustion, release large quantities of trace gases and aerosols that impact air quality and climate. Here we develop an inventory of emissions of reactive trace gases and aerosols to assess the impact of the production, use, and transport of charcoal in Africa in 2014 on global air quality and climate. We combine open access datasets of land cover, population density, road network and United Nations energy statistics data for African countries to map charcoal production to production zones 5-10 km from major roadways, transport by unregulated trucks to urban centres, and use in urban households. We estimate that 208 Tg of fuelwood is required to produce charcoal in 2014. This is 24 % of annual biomass burned from intense seasonal open fires in Africa. Emissions from charcoal are highest in East and West Africa where most of the charcoal is produced and in densely populated urban areas where charcoal is consumed. Total annual emissions are 0.05 Tg BC, 60 Tg CO, 0.1 Tg NO_x, and 0.2 Tg OC, and 8.4 Tg CH₄. The inventory is developed for 2014, but can be estimated for other years using urban population as a predictor for annual trends in charcoal emissions. Finally, we apply the inventory to the GEOS-Chem chemical transport model to estimate the contribution of charcoal production, transport, and use in Africa to regional air pollution (fine particles and ozone) and global climate.