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Inventory of aerosol and sulphur dioxide emissions from India. Part IIâ€”biomass combustion

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Abstract

A spatially resolved biomass burning data set, and related emissions of sulphur dioxide and aerosol chemical constituents was constructed for India, for 1996â€“1997 and extrapolated to the INDOEX period (1998â€“1999). Sources include biofuels (wood, crop waste and dung-cake) and forest fires (accidental, shifting cultivation and controlled burning). Particulate matter (PM) emission factors were compiled from studies of Indian cooking stoves and from literature for open burning. Black carbon (BC) and organic matter (OM) emissions were estimated from these, accounting for combustion temperatures in cooking stoves. Sulphur dioxide emission factors were based on fuel sulphur content and reported literature measurements. Biofuels accounted 93% of total biomass consumption (577Â MTÂ $yr^{â^{'}1}$), with forest fires contributing only 7%. The national average biofuel mix was 56Â :Â 21Â :Â 23% of fuelwood, crop waste and dung-

cake, respectively. Compared to fossil fuels, biomass combustion was a minor source of SO_2 (7% of total), with higher emissions from dung-cake because of its higher sulphur content. $PM_{2.5}$ emissions of 2.04Â TgÂ yrâ^'1 with an â€œinorganic fractionâ€ of 0.86Â TgÂ yrâ^'1 were estimated. Biomass combustion was the major source of carbonaceous aerosols, accounting 0.25Â TgÂ yrâ^'1 of BC (72% of total) and 0.94Â TgÂ yrâ^'1 of OM (76% of total). Among biomass, fuelwood and crop waste were primary contributors to BC emissions, while dung-cake and forest fires were primary contributors to OM emissions. Northern and the east-coast India had high densities of biomass consumption and related emissions. Measurements of emission factors of SO_2, size resolved aerosols and their chemical constituents for Indian cooking stoves are needed to refine the present estimates.

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Keywords

Biofuels; Forest biomass; Black carbon; Organic matter; INDOEX

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