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Quantification of emissions generated from domestic burning activities from townships in Johannesburg

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ABSTRACT

Domestic fuel burning activities have become a major source of urban air pollution. Studies have indicated that domestic burning activities, specifically in low-income settlements and townships, contribute greatly to the air quality problems experienced by most developing urban centres. Low-income households that exist within townships in South Africa, house a large portion of the South African population. These households burn vast quantities of coal, wood, paraffin as well as other substances in order to provide for their energy needs. Pollution emitted as a result of domestic burning activities is estimated to be one of the leading causes of respiratory illnesses, prevalent in inhabitants of low-income settlements. To better understand the relationship that exists between domestic burning and the resultant pollutants, a method of quantifying these pollutants has been developed for a completely un-electrified settlement, near Johannesburg, using the quantities and type of fuel consumed. A study, carried out in Zenzele during the winter months, in addition to a month before and a month after this period, allowed for the analysis of some of the more harmful winter fuels. Common fuel types consumed were identified through the analysis of census data and information gathered from questionnaires. In un-electrified households, paraffin and liquid petroleum gas (LPG), used specifically for cooking and lighting, are the most commonly used fuel types during the warmer months. During the colder months, however, residents of households in low-income settlements prefer to use solid fuels such as wood and coal. Factors such as seasonality, the availability and price of fuels as well as cultural aspects all have a bearing on residents' fuel choices and the quantity consumed. Emissions were quantified based on the quantities of wood and coal burnt in 15 households in Zenzele, using emission factors for SO_2, PM_{10}, CO_2 and CO. As the temperature declines, the rate at which these solid fuels are consumed increases. The most significant observations identified in this study are the diurnal and seasonal trends associated with domestic burning.

Key words: Domestic burning, domestic energy, low-income settlements, urban air pollution.