INFOTOX (Pty) Ltd

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Retrieval and scientific interpretation of ecotoxicological information

PostNet Suite 112 Private Bag X25723 Monumentpark 0105 SOUTH AFRICA

Tel: 27(12) 346 4668 Fax: 086 513 5478 Cell: 082 416 5864

e-mail: Info@infotox.co.za www.infotox.co.za

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Air Pollution Abatement and Health Benefits

Air concentrations of compounds that exceed the ambient air quality guidelines or standards indicate that adverse health conditions may develop, but simple comparisons between exposure concentrations and ambient air quality guidelines are inadequate to quantify health outcomes. Ambient air quality standards are used for regulatory management of air quality and are not intended for risk quantification. Therefore it is important to note that it is common to observe increases in mortality or hospitalisation rates even in areas where air concentrations do not exceed the environmental air quality guidelines or standards.

Epidemiological evidence supports an association between exposure to the criteria pollutants[1] and various health effects, such as respiratory symptoms or illness (e.g., asthma), cardiovascular health effects and premature mortality.

Estimation of impacts of air pollutants on health may therefore not be restricted to areas in which the guideline concentrations or standards are exceeded, but should also include areas in which concentrations are within limits. Exposure assessment involves quantification of concentrations of criteria air pollutants and development of activity patterns of receptors to develop scenarios in which communities may be exposed. Quantification of pollutant concentrations may be based on measured air concentrations or on modelled concentrations derived through air dispersion modelling of quantified emissions from stationary or mobile industrial or household sources. INFOTOX has applied this methodology in many community health risk assessments relating to air pollution.

In health economics the cost-of-illness (COI) framework is applied to quantify the costs of health risk factors in monetary terms. COI studies estimate the burden of diseases on society. These studies are also used to estimate health benefits when air pollution levels are reduced, based on the amount of money that could be saved by preventing exposure of members of communities susceptible to the adverse health effects of air pollution. This information is used in cost-benefit analysis to evaluate justification of financial investments in pollution abatement in context with associated potential health benefits. This methodology is well-established and is based on an extensive and intensively-reviewed database.

The methodology for the monetisation of the quantified health effects in the South African context can be applied, since costs of emergency facility visits and hospitalisation rates are determinable to calculate the COI for morbidity effects (illnesses). In cost-benefit analysis, the value of a statistical life (VSL) is needed to calculate the COI for mortality effects. The methodology for the calculation of

[1] The criteria air pollutants are carbon monoxide (CO), nitrogen dioxide (NO2), particulate matter (PM), sulphur dioxide (SO2), and ozone (O3).

the VSL in the South African context has been developed. Given the difficulties in dealing with a diverse society, the approach provides estimates for the VSL that are applicable to South Africa and are in context with similar estimates for other countries. INFOTOX co-authored a scientific paper on this subject that has been submitted for publication. INFOTOX scientists have the necessary experience in toxicology and epidemiology and have applied these disciplines in many health risk assessments for exposure to the criteria pollutants.