

## **Health Impacts from Non-Point Source Air Pollution**

Non-point sources of air pollution are difficult to define: they are numerous, widespread and not easily regulated (ESRD, 2009). There is little doubt that the human health effects of air pollution are far reaching, and emissions from non-point sources represent a significant portion of air pollution in Canada. Non-point source emissions are categorized mainly as area/open sources, mobile sources, and natural sources (biogenics).

### Mobile Sources

Mobile sources largely refer to transportation, such as wheeled vehicles, ships, aircraft and railroad. The main pollutants from mobile sources are carbon monoxide (CO) and nitrous oxides (NO<sub>x</sub>). The National Pollutant Release Inventory (NPRI) has isolated emissions from total mobile sources, and the data shows that mobile sources represent over half of the total emissions in Canada of both CO and NO<sub>x</sub>, and subsequently account for the vast majority of CO and NO<sub>x</sub> emissions in Canada (Environment Canada, 2010).

Nitrogen dioxide has the greatest effect on individuals with pre-existing respiratory problems; exposure to high levels of NO<sub>2</sub> causes breathing difficulty in individuals with asthma and bronchitis. NO<sub>2</sub> has been found to increase the chance of respiratory illness by lowering resistance to infection (Health Canada, 2006).

Acute health concerns from elevated exposure to CO are well understood within the home; however chronic ambient exposure to CO is associated with increased risk for cardiovascular events and death (Chen, 2007). Jovanovic et al (1999) found that professional drivers are at increased risk to have headaches and irritability, more likely to have diabetes mellitus and atherosclerotic disease, and statistically more likely to cause car accidents on account of higher exposure to CO. Finally, slight increases in ambient CO levels have been shown to increase emergency room visits for lower respiratory symptoms (Chen, 2007).

### Natural/Open Sources

Environment Canada defines open sources as those that emit air contaminants over large areas that diffuse to a great extent, such as dust from farms, construction, and from paved/unpaved roadways. Natural sources consist of biogenic emissions from vegetation, forest fires, and biological/geological sources. It can be estimated from NPRI data that open/natural source emissions account for over 90% particulate matter (PM) and volatile organic compounds (VOC) in Canada (Environment Canada, 2010).

The Canadian Council of Ministers of the Environment (CCME) report that epidemiological studies “not only demonstrate a significant association between acute exposure to ambient fine PM and increased population mortality and morbidity, but also clearly delineate an association between long-term exposure to fine PM and increased mortality due to cardio-respiratory illness and lung cancer, and reduced lung function growth of children” (CCME, 2004). Additionally, further research into low birth weight, birth defects, and infant mortality is revealing alarming associations to PM (CCME, 2004).

Pope & Dockery (2006) outline the vast body of emerging evidence of PM-related cardiovascular health effects and growing knowledge regarding interconnected pathways that link PM exposure with cardiopulmonary morbidity and mortality. Children, the elderly and those with pre-existing medical conditions, including diabetes, asthma, Chronic Obstructive Pulmonary Disease (COPD), are especially vulnerable.

PM exposure is responsible for both acute and long-term health effects. Exposure to particulate matter is associated with increased incidence of respiratory diseases including COPD, cancer and pneumonia. Short-term exposure to fine particulate matter has also been associated with increased incidence of cardiac disease including cardiovascular disease and ischaemic heart disease; it also places people at higher risk of heart failure (Pengelly & Sommerfreund, 2004).

### Ground-level Ozone

Ground-level ozone (O<sub>3</sub>) is formed by chemical reactions between NO<sub>x</sub> and VOC in hot, sunny conditions (EPA, 2012). The main health impacts of O<sub>3</sub> include both acute and chronic damage to the respiratory system, including airway inflammation, reduced lung function, and increased respiratory symptoms. Studies have linked O<sub>3</sub> exposure to reduced lung capacity and increased incidence of development of asthma, in addition to exacerbation of asthma or COPD symptoms (Ontario Medical Association, 1998).

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