Chapter 6
Health Effects of Air Pollution in Urban Environment

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ABSTRACT

In the last few decades, urban development and growing industrialization has caused air pollution to become a major issue in urban areas of developing and developed countries. Urban area is more susceptible compare to other because of higher exposure time of urban residents, due to unbound interference of air pollutants in indoor environment. Exposure to air pollutants has been associated with increased mortality and hospital admissions due to respiratory and cardiovascular diseases. This chapter focused on sources and health effects of air pollution in urban areas in India. Most of the urban areas of India are suffering from higher concentrations of air pollutants including gaseous and particulates.

INTRODUCTION

In the last few decades, urban development and growing industrialization has caused air pollution to become a major issue in urban areas of developing and developed countries. Mostly urban areas suffer from serious air quality problems due to increasing population levels, combined with changes in land use and increases in vehicular traffic. Inhalation of air pollutants deeply connected with increasing hospital admissions and mortality due to respiratory, cardiovascular and other lungs related diseases. The World Health Organization has identified ambient particulate pollution of urban areas as a public health menace, based on estimates of air pollution related deaths and disability. Global efforts to understand and mitigate the health effects of particulate air pollution have a rich and interesting history. United States reported apparent health effects at unexpectedly low concentrations of ambient particulate pollutants. Daily changes in air pollutants concentration proportional to daily hospital admissions in several cities (Schwartz et al., 1990; Fairley, 1990; Schwartz 1991; Pop et al., 1992; Schwartz and Dockery, 1992; Dockery et al., 1992; Schwartz 1993) and long-term exposure was associated with respiratory illness in children and cardiopulmonary mortality in adults (Dockery et al., 1993; Pop et al., 1995). Air pollution was associated with a wide range of health end points, including respiratory hospitalizations (Pop, 1989,

DOI: 10.4018/978-1-5225-7387-6.ch006

1991) lung function and respiratory symptoms (Pop, 1992, 1991, 1993) school absences (Ransom and Pop, 1992) and mortality (Pop, 1992; Archer, 1990).

Global CO_2 emissions were 41% increase against the 1990 level (Olivier et. a., 2011). Urban areas are critically important to the control of greenhouse gas emissions because more than half of the world's population live in urban areas. Developing, implementing and monitoring effective plans and policies that can be linked to reductions in GHG emissions have proven difficult (Albers & Deppisch, 2013; Andrews, 2008; Ewing et. al., 2008; Foley et al., 2005; Lundqvist, 2016; Wheeler, 2008). Residents of large urban areas are exposed to air pollutants concentration that often exceeds the established air quality standards. Diesel vehicles have been identified in several studies as a major contributor to ambient concentrations of air pollutants. It remains unclear to which levels the air pollutant emissions of diesel cars have to decrease to effectively mitigate urban air pollution across urban areas. Residents of many larger cities are still exposed to gaseous and particulate air pollutants concentrations that often exceed the established air quality standards (EEA, 2015). Most cases were found in urban areas, mainly caused by traffic-related pollutant emissions originating from diesel vehicles. Policy makers expected the air pollutants emissions of diesel cars to decrease considerably when introducing more stringent Euro 5 and Euro 6 emission limits (EC, 2012, 2008a, b).

POLLUTANTS IN URBAN ENVIRONMENT

Approximate 3000 different anthropogenic air polluting compounds have been identified, in which most are organic (WHO, 2008). Vehicular emission, a notorious air pollution source in urban environment contains about 500 different compounds, such anthropogenic compound emissions from various domestic, industrial and automobile sources have increased many times and eventually have led to many global environmental problems (Mohanraj and Azeez, 2005). The most hazardous of the air pollutants are products of fossil fuels, primarily the byproduct of combustion fuel engines in most vehicles. Impacts of these substances in the atmosphere can often be aggravated by water vapor, natural dust and sunlight. Which activate chemical reactions and produce a secondary set of hazardous pollutants, including ozone, secondary organic aerosols, sulfates and nitrates. Most urban air pollution comes from road traffic, and is comprised of a mixture of airborne particulate matter (PM), oxides of sulfur (SOx), oxides of nitrogen (NOx), carbon monoxide (CO), carbon dioxide (CO2), volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), and ozone (Thurston, 2008).

Carbon monoxide is produced by incomplete combustion that occurs in an internal combustion engine, or by a furnace, or any other device that uses fuel. Almost all countries in the world have regulations on the maximum allowable Carbon monoxide concentrations in the exhaust of combustion devices. CO's most evident impact is to reduce blood's ability to circulate oxygen in living body. High concentrations of Carbon monoxide can be fatal, but even at its low concentration in the ambient air it causes headaches and dizziness. Nitrogen oxides (NOx), including NO and NO_2, are also produced by internal combustion engines. The most obvious and common producers of NOx are vehicles that run on diesel and on gasoline. Sulfur oxides (SOx) also produced by combustion are the outcome of sulfuric substances in the fuel; SOx is mostly produced by diesel engines since standard gasoline normally contains lower levels of sulfur. Petrochemical plants are another source for emitting SOx. Another major pollutant at lower elevations is ozone (O_3). In the stratosphere ozone acts as a shield, preventing harmful ultraviolet light reaching the earth. However at or near ground level it can be quite harmful. As a result of complex chemical reactions