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## Diesel Vehicles and Equipment: Environmental and Public Health Impacts

### What are Diesel Emissions?

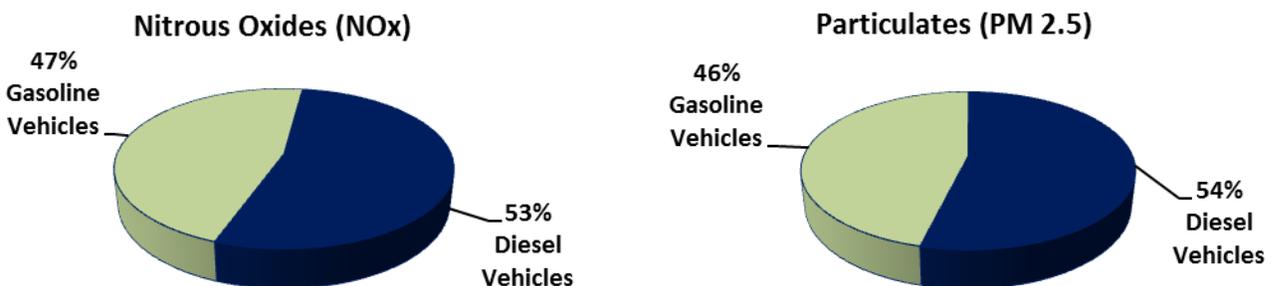
Diesel vehicles and equipment impact public health and the environment because of their exhaust, a highly complex mixture of over 40 gases and fine particles. Primary pollutants emitted from diesel engines include:

- Particulate emissions (PM)
- Carbon monoxide (CO)
- Carbon dioxide (CO<sub>2</sub>)
- Nitrogen oxides (NO<sub>x</sub>)
- Volatile Organic Compounds (VOCs)
- Other chemicals classified as “Hazardous Air Pollutants: (HAPs)

Environmentally, diesel emissions contribute to a number of air pollution problems including climate change, acid rain and ground level ozone (smog). In 2012, the International Agency for Research on Cancer (IARC), part of the World Health Organization (WHO), revised the classification of diesel engine exhaust to Group 1 (definite) carcinogen for humans, based on sufficient evidence that exposure is associated with an increased risk for lung cancer. Previously, the IARC classified diesel emissions as a Group 2A “probable” carcinogen.

Although they make up less than 5% of all vehicles on the road, the table below shows diesel vehicles contribute more than half the nitrous oxide and particulate emissions from on-road vehicles. This is partly because emission standards for diesel vehicles have lagged behind those for gasoline standards. While more stringent federal emission controls for heavy duty diesel fueled vehicles that took effect in 2007 sharply curtailed the pollution caused by this fleet, the longevity of diesel vehicles in general means that many older, dirtier diesel vehicles continue to operate on our highways.

**Comparison of Nitrous Oxides and Small Particulates Emissions from Gasoline and Diesel Vehicles**



Source: U.S. EPA National Emissions Inventory Database

## **Environmental and Health Effects**

The impacts of diesel exhaust remain a concern both here in New Hampshire and regionally. Diesel emissions adversely affect the environment by interfering with climate, the physiology of plants, animal species and entire ecosystems, as well as human property in the form of agricultural crops and man-made structures. We list climate as the most important environmental component due to the fact that global climate change has been recognized as one of the most important environmental problems of the 21<sup>st</sup> century. From a public health point of view, diesel emissions can aggravate or lead to heart and lung disease, cancer, asthma and other health problems.

Different diesel emission components adversely affect the environment and public health in different ways:

- Particulates impair visibility, adversely affect plant growth and damage soil structure and property. Black carbon particulates absorb energy, leading to atmospheric warming. Short term exposure aggravates heart and lung problems while long-term exposure can lead to the development of heart and lung diseases.
- Nitrous oxides are the primary pollutants that create low level ozone (smog), acid rain and nitrate particulates. Nitrous oxides also aggravate heart and lung problems and increase the susceptibility to respiratory infection.
- Carbon monoxide impairs the body's ability to transport oxygen throughout the body. It contributes to carbon dioxide, one of the greenhouse gases leading to climate change.
- Volatile Organic Compounds and nitrous oxides are the two leading pollutants that result in ozone formation. VOCs and hazardous air pollutants (HAPS) are associated with cancer as well as neurological, reproductive and respiratory health problems.
- Ozone is not directly produced by diesel engines but is formed by NO<sub>x</sub> and VOCs emissions combining in the atmosphere in the presence of sunlight. Ozone is a greenhouse gas, it slows plant growth by reducing photosynthesis and it directly damages plant cells. Ground level ozone decreases lung function, aggravates asthma and causes inflammation of lung tissues along with other respiratory problems.

An additional area of concern for the Department of Environmental Services (NHDES) is exposure to diesel exhaust by children travelling to and from school on buses. In a Yale University study, children were found to be exposed to school bus diesel particulates in concentrations sometimes five to fifteen times higher than background particulates levels.<sup>1</sup> NHDES has programs that encourage schools to reduce bus idling. Additionally, state law requires schools to develop policies that minimize vehicular emissions around schools.<sup>2</sup>

Another health problem associated with diesel exhaust is its disproportionate impact on low income urban neighborhoods where vehicle emissions are concentrated. Advocates for environmental justice cite proximity to traffic congestion and transportation hubs as the cause. Occupational exposure may also present an increased risk of related health problems to truck drivers, railroad workers and equipment operators.

For more information on diesel vehicles and equipment, please see the NHDES website at <http://des.nh.gov/organization/divisions/air/tsb/tps/msp/diesel-vehicles/index.htm> or contact NHDES' Mobile Sources Section at (603) 271-4848.

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<sup>1</sup> "Children's Exposure to Diesel Exhaust on School Buses, Environment & Human Health, Inc., <http://www.ehhi.org/reports/diesel/>

<sup>2</sup> New Hampshire RSA 200:48 Air Quality in Schools