**Health Risk Assessment Manual**

# **PM2.5**

PM2.5, or particulate matter with a diameter of 2.5 micrometers or smaller, primarily originates from combustion processes, including vehicle emissions, industrial activities, and residential heating. Released into the air, these fine particles can penetrate deep into the respiratory system, leading to adverse health effects such as respiratory and cardiovascular issues. To mitigate PM2.5 pollution, stringent emission controls on vehicles and industrial facilities, transitioning to cleaner energy sources, and promoting sustainable urban planning are essential. Additionally, public awareness campaigns, the use of air purifiers, and wearing masks in highly polluted areas can help reduce personal exposure to PM2.5, contributing to overall air quality improvement.

# **PM10**

PM10, or particulate matter with a diameter of 10 micrometers or smaller, originates from various sources, including vehicle exhaust, industrial emissions, construction activities, and natural sources like dust storms. When inhaled, PM10 can cause respiratory and cardiovascular problems, as well as contribute to visibility reduction and environmental degradation. To address PM10 pollution, effective dust control measures at construction sites, improved industrial emission standards, and the promotion of cleaner technologies are crucial. Urban planning that minimizes traffic congestion and green infrastructure can also help mitigate PM10 levels. Additionally, public education on the health risks associated with PM10 exposure and the adoption of personal protective measures, such as the use of masks and proper ventilation, play essential roles in reducing the impact of PM10 on human health.

# **NO2**

Nitrogen dioxide (NO2) primarily arises from combustion processes, particularly in vehicles, power plants, and industrial facilities. Once released into the atmosphere, NO2 can lead to respiratory problems, aggravate asthma, and contribute to the formation of ground-level ozone and fine particulate matter. Long-term exposure has been linked to adverse health effects, including cardiovascular diseases. To address NO2 pollution, implementing stricter emission standards for vehicles and industries, promoting public transportation, and transitioning to cleaner energy sources are crucial. Urban planning initiatives, such as creating green spaces and pedestrian-friendly zones, can also help reduce NO2 levels. Additionally, fostering awareness about the health impacts of NO2 and supporting policies that encourage sustainable practices contribute to comprehensive efforts in mitigating this air pollutant.

# **NH3**

Ammonia (NH3) is primarily emitted from agricultural activities such as fertilizer application and livestock waste, as well as industrial processes and combustion of fossil fuels. While ammonia itself is not a direct greenhouse gas, its atmospheric reactions can contribute to particulate matter formation and contribute to air and water pollution. High concentrations of ammonia in the environment can lead to soil and water quality issues, and its atmospheric deposition can harm ecosystems. To address ammonia pollution, best agricultural practices, such as precision fertilization and proper manure management, can reduce emissions. Improved industrial processes and technologies, along with the use of catalytic converters in vehicles, can also minimize ammonia releases. Stricter regulations, public education, and the promotion of sustainable farming practices are crucial for mitigating ammonia's environmental impact.

# **SO2**

Sulfur dioxide (SO2) primarily stems from the combustion of fossil fuels containing sulfur, such as coal and oil, in power plants and industrial facilities. Once released into the atmosphere, SO2 can lead to adverse effects, including respiratory problems, acid rain formation, and damage to vegetation. To address SO2 pollution, adopting cleaner energy technologies, like renewable energy sources and low-sulfur fuels, is crucial. Implementing stringent emission standards for industries, enhancing air quality monitoring systems, and encouraging the use of scrubbers in power plants can effectively reduce SO2 emissions. Additionally, public education on the health risks associated with SO2 exposure and promoting lifestyle changes, such as reducing reliance on fossil fuels, can contribute to long-term solutions for mitigating SO2 pollution.

**CO**

Carbon monoxide (CO) primarily stems from incomplete combustion of fossil fuels in vehicles, industrial processes, and residential heating systems. As a colorless, odorless gas, CO can be particularly dangerous, binding to hemoglobin more readily than oxygen, leading to oxygen deprivation in the body. The resulting health effects range from headaches and dizziness to more severe outcomes, including death in high concentrations. To address CO pollution, strict emission standards for vehicles and industries, the promotion of cleaner technologies, and routine maintenance of combustion appliances are crucial. Installing and regularly checking carbon monoxide detectors in homes is also vital for early detection and prevention of CO exposure, emphasizing the importance of public awareness and safety measures.

# **OZONE**

Ozone in the Earth's atmosphere, commonly known as ground-level ozone, is not emitted directly but forms when pollutants from vehicles, industrial facilities, and other sources undergo chemical reactions in the presence of sunlight. While stratospheric ozone protects us from the sun's harmful ultraviolet radiation, ground-level ozone can have detrimental effects on human health, causing respiratory problems and aggravating pre-existing conditions. It also harms vegetation and ecosystems. To address ozone pollution, reducing emissions of precursor pollutants such as nitrogen oxides and volatile organic compounds is crucial. Implementing stringent air quality regulations, promoting cleaner technologies, and encouraging sustainable transportation are key strategies. Public awareness and education about the sources and health effects of ozone pollution can further contribute to effective mitigation measures.