

Healthy Energy Initiative



ENERGY FACTS: HEALTH EFFECTS FROM COAL USE IN ENERGY GENERATION

SUMMARY

Scientific research has shown that the pollutants generated by coal combustion can have profound effects on the health of local communities, especially vulnerable individuals including children, the elderly, pregnant women, and those suffering from asthma and lung disease in urban settings. On a global scale, coal emissions can travel long distances affecting populations living remote from power plants. Moreover, coal combustion contributes to climate change, whose health impacts are already significant and growing.

GENERAL BACKGROUND

Access to electricity has a positive effect on population health, but the use of coal causes negative health effects. Forty percent of the electricity produced in the world is generated from the combustion of coal. Across the globe, approximately 1,200 new power plants are currently proposed, 76% of them in China and India. Each step in the coal life cycle generates pollution.

- **Mining:** Hazardous substances in excess soil and slurry contaminate water supplies;
- **Transport:** Diesel emissions contribute to local air pollution;
- **Coal ash:** Landfills that leak fly ash waste contaminate water supplies;
- **Coal combustion:** Air-borne pollutants include: particulate matter (PM), sulfur dioxide, oxides of nitrogen, carbon dioxide, mercury, arsenic, chromium, nickel, other heavy metals,

acid gases (HCl, HF), hydrocarbons (PAHs), and varying levels of uranium and thorium in fly ash.

In addition to effects on local residents, power plant emissions can be transported long distances, even globally. Populations especially vulnerable to health effects from air pollution include children, the elderly, pregnant women, and people with lung conditions like asthma and chronic obstructive pulmonary disease. The World Health Organization reports that in 2012, around 7 million people died – one in eight total global deaths – as a result of air pollution exposure. Estimates using the relatively tight pollution standards of Europe show that the worldwide health toll from air pollution due to coal combustion may be 210,000 deaths, almost 2 million serious illnesses, and over 151 million minor illnesses per year, not including the effects of climate change. The pollution standards are not as protective in countries like China, where it is estimated that coal combustion for electricity production there causes 250,000 deaths per year.

RESPIRATORY EFFECTS

Effects on the respiratory system are caused by pollutant-induced oxidative stress which leads to inflammation, cytotoxicity, and cell death.

- **Particulate Matter** emitted during coal combustion contains small particles less than 2.5 micrometers in diameter (PM_{2.5}), which travel deep into the airways and lead to: respiratory symptoms, asthma, decrements in lung function, emergency department visits and hospital admissions for infections and chronic obstructive pulmonary disease. A 10 µg/m³ increase in PM_{2.5} is associated with a 1 - 3.4% decrease in FEV₁, a measure of lung function, in asthmatic children. Long-term exposure to PM_{2.5} is causally linked to the

development of lung-cancer.

- Sulfur Dioxide (SO₂) emitted by coal burning power plants leads to inflammation and hyper responsiveness of the airways; aggravates bronchitis; decreases lung function; increases hospitalizations for asthma and other respiratory conditions; and increases asthma emergency department visits in susceptible individuals, particularly among children and adults over 65. Even low concentrations of SO₂ are associated with increased risk of death from heart and lung conditions. For every 10 parts per billion increase in SO₂ concentration there is a 0.4 - 2% increased risk of death.
- Oxides of Nitrogen are by-products of fossil fuel combustion and react with chemicals in the atmosphere to create ozone (smog) and nitrogen dioxide (NO₂). NO₂ exposure among asthmatic children can increase wheezing, cough, and decrements in lung function. It increases susceptibility to viral and bacterial infections, increases hospital admissions and emergency department visits for respiratory causes, and at high concentrations can cause airway inflammation.

CARDIOVASCULAR EFFECTS

Inhalation of PM_{2.5} has been linked to cardiovascular disease and death. The proposed mechanism is oxidative stress leading to inflammation and cytotoxicity. The World Health Organization estimates that worldwide, 5% of cardiopulmonary deaths are due to particulate matter pollution. Long term exposure to PM_{2.5} can accelerate the development of atherosclerosis and increase emergency department visits and hospital admissions for ischemic heart disease and congestive heart failure. An 8 - 18% increase in cardiovascular deaths is estimated to occur per 10 µg/m³ increase in average PM_{2.5} concentration.

REPRODUCTIVE HEALTH

Evidence is sufficient to conclude that exposure to air pollution (containing SO₂, PM, NO₂, and ozone) during pregnancy can cause low birth weight. Infant mortality was shown to increase with increased coal consumption in countries that had mid to low infant mortality rate at baseline (in 1965) such as Chile, China, Mexico, Thailand, Germany, and Australia.

NEUROLOGICAL EFFECTS

Consumption of methylmercury-contaminated fish from mercury emissions locally, regionally, and internationally by pregnant women can cause developmental effects in their offspring such as lower intelligence levels, delayed neurodevelopment, and subtle changes in vision, memory, and language.

CLIMATE CHANGE

Two of the major greenhouse gases contributing to climate change, carbon dioxide (CO₂) and nitrous oxide (N₂O), are products of coal combustion. Public health will be affected by climate change as a result of:

- extreme weather events such as floods, hurricanes, and droughts that in turn, increase disease and injury, and adversely affect water quality and food security;
- an increase in the growing ranges of some weeds, grasses, and trees that may increase the severity and prevalence of allergies;
- the spread of climate-sensitive diseases such as tick- and mosquito-borne diseases and food- and water-borne pathogens;
- an increase in ground-level ozone and smog, which aggravate asthmas and increase hospital visits; and an increase in the number of extremely hot days which leads to heat-related mortality.

INDOOR COAL COMBUSTION

Using solid fuels such as coal for heating and cooking is estimated to cause 667,000 deaths from pneumonia in children under the age of five, 693,000 deaths from chronic obstructive pulmonary disease per year worldwide, and over 16,000 deaths from lung cancer in South and East Asia alone.

COST OF THE HEALTH BURDEN FROM THE USE OF COAL

The monetary value of the damage to public health and the environment has been estimated to be 18 - 45 U.S. cents, or 1.6 - 5.8 c€ per kWh of coal-fired electricity produced.

This fact sheet was produced by the Health Care Research Collaborative, a joint effort between the University of Illinois, Chicago School of Public Health and Health Care Without Harm's Healthy Energy Initiative. It is based on the Research Collaborative literature review entitled, "Scientific Evidence of Health Effects from Coal Use in Energy Generation," published in April 2013. To access the document or for more information please visit www.healthyenergyinitiative.org

