Access to energy has a positive effect on the health and well-being of people worldwide. However, the use of coal to generate electricity has negative health consequences that dwarf those of other energy sources, making coal by far the least preferable resource for meeting energy needs while protecting human health.

Pollutants generated by coal combustion can have profound effects on the health of communities, especially vulnerable individuals such as children, the elderly, pregnant women, and those suffering from asthma and lung disease in urban settings. Coal’s harmful effects include cardiovascular and respiratory diseases, and impairment of brain and nervous system development. Air pollution is carcinogenic to humans, and long-term exposure in particular can increase mortality rates, as evaluated by the World Health Organization. Coal pollution can travel long distances, thus affecting populations living far away from power plants. Moreover, coal combustion contributes to climate change, which is already having and will continue to have significant and growing health impacts for hundreds of millions of people worldwide. The mining and transport of coal, as well as the disposal of coal waste ash, can also have significant health effects.

Estimates of the combined health costs of coal-fired power generation are staggering, greatly increasing its cost to consumers if fully accounted for. Taken together, the health effects of coal are simply too burdensome to ignore, morally and financially. Around the world, in places like Beijing and Delhi, citizens and communities are advocating for urgent action to address poor air quality and other deadly impacts of coal.

**DEADLY ENERGY**

**The Health Impacts of Coal**

**HEALTH SECTOR SUPPORTS END TO COAL**

- The World Federation of Public Health Associations called for “a rapid phase out of coal for electricity production and greater investment in renewable energy technologies as a significant investment in global health and healthy communities.”
- Ministers of health gathered at the World Health Assembly in 2015 adopted a landmark resolution on “addressing the health impact of air pollution,” which urges governments to redouble efforts to identify, address, and prevent the health impacts of air pollution through multi-sectoral approaches.
- The 2015 *Lancet* Commission on Health and Climate Change (a special report from a prestigious medical journal) calls on governments to “protect cardiovascular and respiratory health by ensuring a rapid phase out of coal from the global energy mix.”
- The Healthy Energy Initiative – a global network of health professionals, academics, and organizations advocating for a shift away from coal and other fossil fuels towards clean, renewable energy – has become active in several countries and at the global level.

Photo Credit: groundWork/FOE South Africa
RESPIRATORY EFFECTS
Gases and particles (dust and soot) emitted from coal power plants enter the body through the mouth and nose, where some of them cause irritation. Eyes can also be irritated from acute exposure to acidic gases. In the bronchia and lungs, pollutants lead to inflammation and physiological stress, which over the long term causes cell death and changes the lung tissue. The following pollutants are of particular concern for respiratory health:

• **Particulate Matter (PM)** emitted or formed as a result of coal combustion contains small particles less than 2.5 micrometres in diameter (PM2.5) that travel deep into the airways and lead to respiratory stress, asthma, impairments in lung function. This results in increased numbers of emergency department visits and hospital admissions for infections and chronic obstructive pulmonary disease. Long-term exposure to PM2.5 is causally linked to the development of lung cancer. Note that NOx and SO2, whose primary health effects are described below, are also precursor gases that react in the atmosphere to form secondary PM, which often produces a greater health burden than the primary PM directly produced by coal combustion.

• **Sulphur Dioxide (SO2)** emitted by coal burning power plants leads to inflammation and hyper responsiveness of the airways, aggravates bronchitis, decreases lung function, and increases hospitalizations and emergency department visits for asthma and other respiratory conditions, particularly among children and adults over 65. Even low concentrations of SO2 are associated with increased risk of death from heart and lung conditions.

• **Oxides of Nitrogen (NOx)** are byproducts of fossil fuel combustion and react with chemicals in the atmosphere to create ground-level 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 PM2.5 has been linked to cardiovascular disease and death. The World Health Organization estimates that worldwide, 5% of cardiopulmonary deaths are due to particulate matter pollution. Long term exposure to PM2.5 can accelerate the buildup of plaque inside arteries and increase emergency department visits and hospital admissions for heart disease and congestive heart failure. An 8-18% increase in cardiovascular deaths is estimated to occur per 10 µg/m3 increase in average PM2.5 concentration. Furthermore, the arteries nourishing the brain can be affected, leading to an increased risk of stroke.

CANCER AND OTHER CHRONIC DISEASES
Not only has air pollution been classified as a known cancer-causing substance for humans, but also coal mining dust emissions can increase the risk for lung cancers. Heavy metals (such as arsenic and cadmium) and organic toxicants (such as PAHs and dioxins) are present in high concentrations in coal fly ash and coal sludge, and are also emitted directly from smoke stacks. They can harm the liver and kidneys as well as other vital organs, and can cause cancer.

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, pre-term birth and complications during pregnancy. 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
Coal power plants are the second largest source of mercury releases to the environment globally, due to their emissions of gaseous mercury as well as mercury in their waste water. Mercury is known to accumulate in sediments and organic tissue, thus increasing in concentration while making its way up the food chain. Human exposure occurs mostly through the consumption of contaminated fish and shellfish. Consumption of methyl mercury-contaminated food by young children and pregnant women can cause developmental effects in these children and in the foetus. Effects include lower intelligence levels, delayed development of the brain and central nervous system, attention deficit disorders, and subtle changes in vision, memory, and language.

MENTAL HEALTH AND SOCIAL HARMs
Coal projects can also impact mental health (which also affects physical health) and damage the social and economic well-being of communities. These mental health and social harms may include: distress related to concerns about adverse health impacts; costs associated with environmental damage and declining land values; concerns regarding noise and air pollution; social divisions and inequalities between those benefiting from the coal industry and those who do not; and distress and disempowerment resulting from asymmetries of power, influence, and access to information and resources.
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 US cents per kWh for US power plants, which would at least triple its cost to consumers. An EU-wide cost estimate arrived at 5.3 c€ per kWh, ranging between 0.4 and 29.5 c€ per kWh for individual countries. In the EU alone, coal is responsible for 18,000 premature deaths and four million lost working days each year, costing up to €43 billion annually. The costs of coal pollution are estimates of direct health costs such as medication and hospital visits from the higher rates of disease, lost productivity as people are sick and remain absent from work, as well as societal costs from premature mortality.

Additionally, researchers at the International Monetary Fund recently estimated that fossil fuels are subsidized by US $5.3 trillion in 2015, 6.5% of global GDP, greater than the health spending of all the world’s governments. Ending these subsidies, which include the health and other costs imposed on governments for dealing with air pollution, would slash premature deaths from outdoor air pollution by 55% – about 1.6 million lives a year – with coal accounting for a 93% share of this reduction.

HEALTH IMPACTS OF COAL THROUGH ITS LIFE CYCLE

Each step in the coal life cycle generates pollution that has repercussions for human health. To learn more, refer to Coal Factsheet #1, available at http://endcoal.org/resources/end-coal-fact-sheets/.

COAL KILLS

While a global estimate is not yet available, an aggregation of estimates from different countries suggest that at least 800,000 people die prematurely each year as a consequence of coal:

- 670,000 premature deaths per year in China
- 80,000 to 115,000 premature deaths per year in India
- 13,000 premature deaths per year in the United States
- 23,300 premature deaths per year in Europe

HEALTH IMPACTS OF COAL THROUGH ITS LIFE CYCLE

How coal-fired power plants can make you sick

Coal-fired power plants expose people to toxic particles, ozone and heavy metals. The most serious health impacts are due to microscopic particles (PM2.5) formed from burning coal and released into the atmosphere, water, soil and food. These particles penetrate deep into the lungs and into the bloodstream, causing deaths and numerous health problems.

- Lung cancer
- Asthma attacks
- Infections and cough
- Impaired lung function
- Impaired lung growth in children
- Heart attack
- Heart rate variability
- Heart disease
- Lower birth weight
- Impaired fetal growth
- Premature birth
- Impaired mental and physical development
- Decreased sperm quality

Infographic courtesy of Greenpeace
The Lancet Commission on Health and Climate Change states that “climate change is the biggest global health threat of the 21st century,” and that “responding to climate change could be the greatest global health opportunity of the 21st century.”

Two of the major greenhouse gases contributing to climate change, carbon dioxide and nitrous oxide, are products of coal combustion. In fact, coal is responsible for 44% of global CO2 emissions. Coal mining releases methane, a potent greenhouse gas.

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;
- changing precipitation patterns and higher temperatures with adverse effects on food security, leading to malnutrition of large population groups;
- 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 asthma and increase hospital visits; and
- an increase in the number of extremely hot days and tropical nights which leads to heat-related mortality.

Coal is a deadly and costly source of energy that must be phased out of the global energy mix in order to protect the lives, health, and well-being of current and future generations.

ENDNOTES

4 Healthy Energy Initiative. www.healthyenergyinitiative.org