Lowering Deaths per Terawatt Hour for Civilization

This site had previously analyzed the deaths per terawatt hour by energy source.

Energy Source	Death Rate (deaths per TWh)
Coal - world average	161 (26% of world energy, 50% of electricity)
Coal - China	278
Coal - USA	15
Oil	36 (36% of world energy)
Natural Gas	4 (21% of world energy)
Biofuel/Biomass	12
Peat	12
Solar (rooftop)	0.44 (less than 0.1% of world energy)
Wind	0.15 (less than 1% of world energy)
Hydro	0.10 (europe death rate, 2.2% of world energy)
Hydro - world including Banqiao)	1.4 (about 2500 TWh/yr and 171,000 Banqiao dead)
Nuclear	0.04 (5.9% of world energy)

Air pollution from fossil fuel (coal plants and oil used in cars and trucks) and developing countries burning wood or coal inside their homes are one of the biggest causes of all kinds of death and illness.

Worldwide, indoor smoke from solid fuel combustion causes about 21% of deaths from lower respiratory infections, 35% of deaths from chronic obstructive pulmonary disease and about 3% of deaths from lung cancer.

Indoor air pollution from solid fuel use and urban outdoor air pollution are estimated to be responsible for 3.1 million premature deaths worldwide every year and 3.2% of the global burden of disease.

In the year 2004, outdoor air pollution in urban areas was responsible for almost 1.2 million deaths (2% of all deaths) and 0.6% of the global burden of disease. Transportation-related air pollution, which is a significant contributor to total urban air pollution, increases the risks of cardiopulmonary-related deaths and non-allergic respiratory disease. Some evidence supports an association of transportation-related air pollution with increased risks of lung cancer, myocardial infarction, increased inflammatory response and adverse pregnancy outcomes (e.g. premature birth and low birth weight).

Exposure to particulate matter, including metals, has been linked to a range of adverse health outcomes, including modest transient changes in the respiratory tract and impaired pulmonary function, increased risk of symptoms requiring emergency room or hospital treatment, and increased risk of death from cardiovascular and respiratory diseases or lung cancer. Particulate matter is estimated to cause about 8% of deaths from lung cancer, 5% of deaths from cardiopulmonary disease and about 3% of deaths from respiratory infections.

Air Pollution Control Technology is Affordable and applies to Coal, oil, natural gas, Biofuel/Biomass and Peat

The Economics of retrofitting existing plants with air pollution control and the technologies that can be used was reviewed here

Summary of major air pollution control technologies.

Air pollution control technology	Removal efficiency of applicable pollutant
Cyclone	10µm 90% Fine dust 70%
Fabric filters	99.9% toxic metals 90%
Electrostatic precipitator	99.9% toxic metals 99%
Wet scrubbers	Depends on design or type used
FGD - Wet System	
Limestone	90%-98%
Lime	95%
FGD - Semi-Dry Systems	
Lime spray dryer	80%-90%
FGD - Dry Systems	
Calcium based sorbent injection	50%-60%
Sodium based sorbent injection	80%
Combustion Modifications	
Modifications of operating conditions	Depends on technique used
Low-NOx burners	40%-60%
Flue Gas Treatment	
SCR	60%-90%
SNCR	40%-60%
Activated carbon adsorption	-
Copper oxide adsorption	-
Wet absorption	-
Incineration	
Flares	>98%
Thermal incinerators	98%
Catalytic oxidisers	-
Regenerative thermal oxidisers	95%-99%

Data adapted from Howden Energy Systems (2004) and Burger (2005).

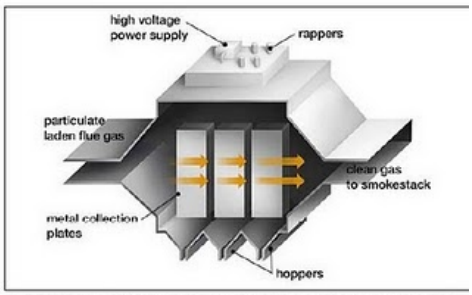


Figure 2.5 Schematic diagram of the side view of an electrostatic precipitator.
(Source: Dayley and Holbert, 2003.)

Indoor air–specific recommendations

World Health Organization Recommendations to try to save 1.9 million lives each year in the developing world

* Investigate effective interventions and implementation methods for sustainable and financially viable changes to reduce indoor air pollution.

* Encourage the substitution of solid fuels in the home by cleaner and more efficient fuels and technology.

* Encourage the use of improved stoves to lower pollution levels in poor rural communities where access to alternative fuels is limited and biomass remains the most practical fuel.

* Improve ventilation in homes, schools and the working environment.

* Change user behaviour (e.g. drying wood before use).

* Prevent and remediate problems related to dampness and mould in housing to decrease the risk of exposure to hazardous microbes.

* Eliminate or reduce tobacco smoking indoors. Prohibit smoking in public buildings.

* Promote risk reduction strategies for indoor radon exposure.

There are also known safety measures to be taken with coal mining. (5000 deaths per year). Improved ventilation, prevention of gas and dust buildup. Shifting away from coal usage to safer energy sources.

Oil

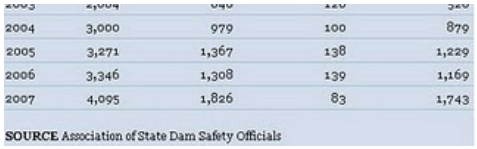
Standards for cars and trucks can be improved and there is retrofit and new technology for reducing particulates from current and future vehicles.

There are also safety measures to be taken with drilling (British Petroleum)

Hydroelectric power

Number of Deficient Dams in United States by Repair Status				
YEAR	# OF DEFICIENT DAMS	# OF HIGH HAZARD DEFICIENT DAMS	# OF HIGH HAZARD REPAIRED DAMS	# OF HIGH HAZARD DAMS NEEDING REPAIR
2001	1,348	488	124	364
2002	1,536	646	163	483
2003	2,004	648	120	528

The American Civil Engineering Society and the Association of State Dam Safety Officials indicates what needs to be done to fix and makes dams in the US safe



2004	3,000	979	100	879
2005	3,271	1,367	138	1,229
2006	3,346	1,308	139	1,169
2007	4,095	1,826	83	1,743

SOURCE Association of State Dam Safety Officials

In 2009, the Association of State Dam Safety Officials (ASDSO) estimated that the total cost to repair the nation's dams totaled $50 billion and the needed investment to repair high hazard potential dams totaled $16 billion. These estimates have increased significantly since ASDSO's 2003 report, when the needed investment for all dams was $36 billion and the needed investment for high hazard potential dams was $10.1 billion.

The 2009 report noted an additional investment of $12 billion over 10 years will be needed to eliminate the existing backlog of 4,095 deficient dams. That means the number of high hazard potential dams repaired must be increased by 270 dams per year above the number now being repaired, at an additional annual cost of $850 million a year. To address the additional 2,276 deficient—but not high hazard—dams, an additional $335 million per year is required, totaling $3.4 billion over the next 10 years

Similar studies and efforts are needed in other countries. There also should be better planning and preparation in the event of dam failures. Prevent people from building along the flood plain.

Nuclear Energy

There are deficiencies in the older plants and they should be brought up to a higher standard. This needs to be kept in perspective with where the greater risks are. Simple things like sealing backup diesel engines and burying fuel tanks or using passive safety systems are well known and should be implemented where appropriate.

Solar

Have less rooftop solar and more solar like Coolearth or integrate the rooftop solar into the roofing tiles so there is less incremental risks to workers falling.

Wind

Try to shift to kite generated wind that uses less steel and concrete. Using up to ten times more steel and concrete is a source of mining and industrial deaths.

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