Under embargo until 05:00am, Wednesday 12 February 2020

Media briefing: Toxic Air: The price of fossil fuels

The release of this report adds another layer of information to create an even clearer picture of the growing air pollution crisis faced by South Africa and the rest of the world. Previously, Greenpeace has released reports detailing the extent of nitrogen dioxide (NO2) and sulphur dioxide (SO2) pollution hotspots, particularly in the coal region of Mpumalanga, and the contribution of these dangerous pollutants to the increased risk of diseases such as asthma, stroke, and heart disease in those areas. It is clear from these reports that the air pollution coming from Eskom's coal-fired power stations is a major threat to the health of people living in South Africa.

For the first time, Greenpeace Southeast Asia and the Centre for Research on Energy and Clean Air (CREA) have quantified the global cost of air pollution from fossil fuels in this report, finding that it has reached an estimated R120 billion[1] per day, or roughly 3.3% of global GDP. An estimated 4.5 million premature deaths every year are attributed to air pollution generated from burning fossil fuels.

While the coal industry continues to push a deadly technology, the health of South Africans and of the country's economy continues to suffer.

Yet, while toxic air remains a global threat, the solutions are increasingly available and affordable. This is a problem we know how to solve. Moreover, many of the solutions to the air pollution crisis are also the solution to the climate emergency. In the case of South Africa's addiction to coal, a Just Transition away from fossil fuels and towards renewable energy will not only reduce toxic air pollution, but is also critical to limiting the global temperature increase to below 1.5°C from pre-industrial levels.

Key Findings

1. Costs

[1] All currency conversions in this document and the South African press release are based on the conversion rate between the US dollar and South African Rand on the 10th of February 2020.

According to this report, the **estimated total cost of air pollution generated from fossil fuels in South Africa is a staggering R94.7 billion every year.**

Air pollution is a major health threat to children, particularly in low income countries. **Worldwide an estimated 40 000 children die before their fifth birthday because of exposure to $PM_{2.5}$ pollution from fossil fuels.** Air pollution from fossil fuel-related fine particulate matter (or $PM_{2.5}$) contributes to an estimated 2 million preterm births each year, with **14 000 of those occurring in South Africa.**

Air pollution from burning fossil fuels, primarily coal, oil, and gas, is attributed to approximately 4.5 million premature deaths worldwide each year, a figure that exceeds global road accident deaths by more than threefold.[2] **An estimated 13 000 of these premature deaths occur in South Africa every year**. The incidence of stroke has been linked to $PM_{2.5}$ exposure, and 600 000 deaths from stroke annually can be attributed to fossil fuel derived $PM_{2.5}$ exposure.

An estimated 62 000 asthma-related emergency room visits in South Africa are attributable to $PM_{2.5}$ and ozone exposure.

Fossil fuel generated air pollution costs the world an estimated R120 billion per day, or roughly 3.3% of global GDP. Exposure to fossil fuel generated $PM_{2.5}$ alone is attributed to an estimated 1.8 billion days of work absences due to illness each year worldwide, equating to approximate economic losses of R1.5 trillion per year.

Table 1: Impact and cost breakdown per pollutant

Pollutant	Impact	Total Number	Total Cost (South African Rands)
		Central Estimate*	Central Estimate*
NO_2	**Premature Deaths****	500 000	5 trillion
	New Cases of Asthma in Children	4 000 000	240 billion
	Number of Children Living with Asthma Due to Air Pollution	16 100 000	
Ozone	**Premature Deaths****	1 000 000	5.6 trillion
	Asthma (Number of Emergency Room Visits)	5 600 000	15 billion

[2] World Health Organization. Global Health Observatory (GHO) data. Available at: https://www.who.int/gho/road_safety/mortality/en/

$PM_{2.5}$	**Premature Deaths****	3 000 000	26.5 trillion
	Asthma (Number of Emergency Room Visits)	2 700 000	5.2 billion
	Preterm Births	2 000 000	1.3 trillion
	Work Absences (Days)	1 755 200 000	1.5 trillion
Combined Pollutant Total	**Premature Deaths**	4 500 000	37.2 trillion
	Total Economic Cost		43.2 trillion

*Values shown represent a central estimate, upper and lower bounds of a 95% confidence interval are provided in 'Toxic air: The price of fossil fuels'

** The cost of premature deaths relates to the number of years of life lost based on life expectancy

NO_2, a byproduct of fossil fuel combustion in power plants and factories, is linked to roughly 4 million new cases of asthma in children each year, with approximately 16 million children worldwide living with asthma due to exposure to NO_2 pollution from fossil fuels. Exposure to $PM_{2.5}$ and ozone from fossil fuels is attributed to roughly 7.7 million asthma-related trips to the emergency room each year, with 67 000 of those occurring in South Africa.

Table 2: Global economic cost breakdown per pollutant

Pollutant	Impact	Central Estimate*
NO_2	Total Cost to Economy	R5.2 trillion
	% GDP	0.4%
Ozone	Total Cost to Economy	R5.7 trillion
	% GDP	0.4%
$PM_{2.5}$	Total Cost to Economy	R33.2 trillion
	% GDP	2.5%
	Work Absences (days)	1 755 200 000
Global cost of all pollutants	Total Cost to Economy	R43.7 trillion
	% GDP	3.3%

*Values shown represent a central estimate, upper and lower bounds of a 95% confidence interval are provided in 'Toxic air: The price of fossil fuels'

The economic cost of air pollution reflects pollution concentrations, population size and the availability and cost of healthcare. We found that **China Mainland, the United States and India bear the highest costs from fossil fuel air pollution worldwide, at an estimated R13.5 trillion, R9 trillion and R2 trillion per year, respectively**.

Yet while the cost of our reliance on coal, oil and gas continues to soar both in terms of our health and in terms of the climate emergency, life-saving alternatives are increasingly widespread and affordable.

2. Solutions

Many solutions to fossil fuel air pollution are also the solutions to the climate crisis. Clean transport and renewable energy not only bring significant reductions in toxic pollutants such as $PM_{2.5}$, NO_2 and ozone, but also help to keep climate change-causing greenhouse gases out of the atmosphere.

Moreover, solutions to the air pollution crisis have been shown to bring significant financial returns. According to a study published by the United States Environmental Protection Agency, every R15 invested under the United States Clean Air Act yielded at least R451 in return[3]. The financial benefits of air pollution reduction are visible in high- and low-income countries alike.

Clean energy

A phase-out of existing coal, oil and gas infrastructure is not only essential to avoid the worst impacts of global climate change, but it brings major health benefits due to the associated reduction in air pollution.

Research shows that the closure of coal-fired power plants can yield health benefits that exceed the value of electricity generated.[4] According to a study published in the Proceedings of the National Academy of Sciences, an expanded fossil fuel phase-out and investment in clean energy sources could reduce premature deaths related to air pollution worldwide by up to nearly two thirds.[5]

The Just Transition to renewable energy is essential both to prevent catastrophic climate change and to protect our health. It is urgent that we embark on the Just Transition to renewable energy in South Africa, we cannot afford to delay any longer. While fossil fuel companies continue to market outmoded technologies, our communities pay the price.

Methodology

Researchers used published global datasets describing surface level concentrations of $PM_{2.5}$, ozone and NO_2 to perform a health impact assessment and subsequent cost calculation for the year 2018.

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[3] United States Environmental Protection Agency: Office of Air and Radiation. The benefits and costs of the Clean Air Act from 1990 to 2020. Available at: https://www.epa.gov/sites/production/files/2015-07/documents/fullreport_rev_a.pdf (2011) [Accessed January 9, 2020].

[4] Strasert, B., Teh, S. C. & Cohan, D. S. Air quality and health benefits from potential coal power plant closures in Texas. *J. Air & Waste Manage.* 69, 333–350 (2019).

[5] Lelieveld, J., et al. Effects of fossil fuel and total anthropogenic emission removal on public health and climate. *PNAS* 116, 7192–7197 (2019).

The health impacts are determined by combining pollutant concentration maps[6,7] with country-level health statistics[8] and functions that describe the incidence of health outcomes for a given pollutant concentration[9]. The assessment incorporates recent research that quantifies the contribution of fossil fuels to global air pollution levels and health impacts. Total health costs are then determined using published estimates of the disease or impact specific cost, adjusted to the level of economic output or income in each country.

Further details on the methodology are available in the report.

[6] Lelieveld, J., et al. Effects of fossil fuel and total anthropogenic emission removal on public health and climate. *PNAS* 116, 7192–7197 (2019).

[7] Larkin, A., et al. Global land use regression model for nitrogen dioxide air pollution. Environmental science & technology 51.12: 6957-6964. (2017)

[8] GBD 2017 Mortality Collaborators. Global, regional, and national age-sex-specific mortality and life expectancy, 1950–2017: a systematic analysis for the Global Burden of Disease Study 2017. The Lancet. 392:1684-735. (2018).

[9] Burnett, R, et al. Global estimates of mortality associated with long-term exposure to outdoor fine particulate matter. Proceedings of the National Academy of Sciences 115.38: 9592-9597. (2018).