Addressing the Deteriorating State of Global Air Quality

Environmental Committee

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Introduction

An estimated 6.7-8.7 million premature deaths due to all sources of air pollution in 2021. Air pollution has been an ongoing issue globally for a significant amount of time. The air is contaminated by natural and man-made sources which include but are not limited to volcanoes, factories, cars, and wildfires. Prolonged exposure to bad ambient air quality can also lead to long term conditions. Some of these conditions could be heart diseases, lung cancer, acute respiratory diseases such as asthma and strokes.

The impact of the issue is far greater than imaginable and can be prevented in ways that tie to climate change. The world health organization's data suggests that 92% of people around the world live in everyday environments under the safe limit. The causes of polluted air range from.

Air quality is worst in big cities and populated areas because the biggest contributors to air contamination are man-made. This would include transportation, the creation of energy and cities infrastructure (unpaved roads, gas burners). These sources of air pollution release fine particles which are trapped in the lower layer of the atmosphere. This is usually the problem in Less Economically Developed Countries (LEDCs) and developing countries. Some of the countries with some of the lowest air quality (high concentration of particulate matter), are Bangladesh, Pakistan, India and Afghanistan.

Definition of Key Terms

Air Pollution

Chemicals/substances or fine particles are released into the atmosphere, which has harmful effects on biological organisms when inhaled. This occurs in mainly LEDC countries that have a high population density and very old public transportation systems which are incredibly unreliable and very inefficient in terms of input given to output received.

Man-Made

Unnatural occurrences, anything which is made by humans and does not fit in with nature and anything resultant from human interference. A few examples are cars, cities, houses and industrial smog.

Industrial Smog

A visible form of air pollution produced by sulfur and coal emissions combining in the lower layers of the atmosphere. This creates a visible yellow faint brown fog lingering in industrial areas.

Photochemical Smog
Visible smog which is very obviously black. You can see this in everyday life from coal-burning factories to old car exhausts, produced through the combustion of fossil fuels.

AQI
The Air Quality Index was created by the US Environmental Protection Agency (EPA) to compare and measure levels of pollution to their health risks.
The AQI was developed in the 1970s to inform US citizens about air pollution, since then the purpose has shifted and it is now a global index for health concerns which is used by many different countries and the UN.

Contamination
An action that makes a substance impure by bringing it into contact with something that is unwanted and influences the original state of something. e.g. The air is contaminated by car emissions.

Particulate matter
Also abbreviated to "PM", particles both solid and liquid/gas vary in size and composition. Particles like small sand grains, dust and car fumes can contaminate the air and make it hazardous. These particulate matter can cause inflammation in the lungs and negative long-lasting health effects.

LEDC/MEDC
"Less Economically Developed Countries" is abbreviated as LEDC. Based on development indices such as GDP, the standard of life, education, health, and the types of industries that dominate the market in the country, countries are classed as LEDCs or MEDCs, which is the abbreviation for More Economically Developed Countries.

GDP
Acronym for Gross Domestic Product. Within a country, the GDP is the total market value, often calculated as a value annually to estimate the size of the domestic economy and how it is developing.

Per Capita
Per capita is derived from the Latin phrase "by the head." Per capita is a statistical term that refers to the average per person and is occasionally used instead of "per person" in statistical reports.

General Overview

History

Air pollution can be dated back centuries ago, it was discovered by the Greeks and called “gravioris caeli" (heavy heaven) by the Romans. It is evident that air pollution was an issue in any big civilization. The difference is that nowadays we combust fossil fuels such as crude oil instead of wood. The discussion of environmental impacts and concerns already took place during those times. The 18th-19th century industrial revolution, known as a great time of innovation, started in Great Britain and transitioned to America and Europe in the early 19th century. Described as a time of innovation and revolution in the automatization of systems nowadays known as factories. The industrial revolution is credited to the creation of urban living environments as people shifted from agriculture to working in companies. As people lived together, the population density greatly increased and so the air pollution with it. The disregard for the air quality was high and especially overseen with the invention of steam-powered transportation.

However, during the Industrial Revolution, the use of fossil fuels became alarmingly increasing, with factories streaming soot and photochemical smog out of their chimneys in large amounts. During this time concerns were already raised, however, the economic gain due to quicker and cheaper production of goods was overwhelming.

Current situation

At this very moment, many cities in the world have an Air Quality index value far greater than the healthy amount stated by the World Health Organization. According to the WHO, 92% of the global population does not live at safe AQI levels.

The photochemical and industrial smogs have gotten much less noticeable near factory spaces and car exhausts. This is due to widespread awareness created by the WHO, following this and the example set by major world nations such as the United States of America the air quality has already seen a great improvement in most MEDC countries. However the situation has only worsened or hasn’t improved in some of the most populated LEDC countries, this is due to a lack of infrastructure and government enforcement and policies.

Source of original issue

Climate change and air pollution are inextricably linked. Several air pollutants are climate forcers, meaning they can affect the climate and cause global warming. Air pollution has several significant environmental consequences and may have a direct impact on natural ecosystems and biodiversity. Excess nitrogen nutrients introduced by emissions can and have disrupted terrestrial and marine ecosystems.

The problem derives from the combustion of fossil fuels in densely populated areas. This is a clear issue in almost every major city in the world. However, cities with low GDP suffer the greatest from this due to their lack of development. Average life expectancy is drastically lowered as a result of this air pollution which most people are subject to.

Whilst these developing countries cannot improve their air quality, the global air quality will still be too low to prevent a substantial amount of premature deaths in the younger and older generations of the population. The LEDC with the highest air pollution is Bangladesh with a population of 165 million people.

In 2020 it was reported that Bangladesh has 77.10 fine particulate matter per cubic meter of air, which is more than double the amount China currently has. This value is considerably lower than previous years, which could be affected by the Pandemic. Within Bangladesh, there are up to 195000 deaths annually as a direct result of air pollution and bad air quality, estimated by the World Health Organization in 2016.

In Bangladesh, vehicular emissions and industrial emissions are the two major sources of air pollution. The majority of these are concentrated in urban areas. Almost all of the industry relies on coal and wood as primary energy sources, resulting in emissions of particulate matter, sulfur oxides, and volatile organic compounds. Furthermore, used vehicle rubber wheels are burned, producing black carbon and toxic fumes. These are toxic to one's health. Because Bangladesh has a rapidly growing population, housing for the general population is required. As a result of building projects, bricks are produced, introducing a large number of fine particles into the atmosphere.

The combination of high levels of population, bad public infrastructure, are the root cause of why these developing countries suffer from major air pollution.

Major Parties Involved

India

Whilst most countries are getting better at controlling their air pollution, even Bangladesh with the highest concentration of particulate matter per cubic meter, India is rapidly decreasing in air quality. The country is projected to have the highest population in the world at 1.38 billion currently, close to surpassing China at 1.4 billion.

A huge portion of the Indian population (more than 90%) lives in areas with air quality that is far worse than the World Health Organization standards, with coal-fired power plants, factories, and vehicles among the major sources of pollution. The problem becomes exponentially worse during the winter due to farmers' burning of crop stubble, which always covers northern cities, including the capital New Delhi, in choking photochemical smog.

Bangladesh

Bangladesh is ranked highest in particulate matter per cubic meter of air. This means the air quality is on average worse than anywhere else on the globe. A high concentration of particulate matter can lead to serious long term and short term illnesses and often premature death.

China

Whilst India almost has the same amount of people in the country, China's air quality has been increasing substantially. The particulate matter is 6.9x the safety guidelines set by WHO.
Even though the domestic PM has shrunk, when under close inspection China's cities have far worse air quality than countries with a lower rating air quality. China's most air-polluted city has more than 1000 AQI (more than 100 times a good air quality suggested by the US Environmental Protection Agency) whilst India's most air-polluted city has 250 AQI.

UNEC (UN)

The United Nations Environmental Committee is part of the UN and discusses global policies and ideas on improving the environment and making life for humans more sustainable. It also focuses on climate change mitigation and adaptation.

UNEP

The United Nations environment programme was established as a result of general Assembly resolution 2997. Its first director was Maurice Strong. UNEP works in accordance with NGOs to address environmental issues, it focuses on future related problems and often goes into partnership with corporations, to organize events that are beneficial for moving forward in environmental matters.

EPA

EPA is an acronym for Environmental Protection Agency. The EPA is a US government organization/agency, that made the Air Quality Index which is commonly used in scientific and data research. It provides a good measurement of the health impacts different levels of air quality provide.

Timeline of Key Events

June 5th 1972	Establishment of the UNEC, United Nations Environmental committee
April 5th 2014	UNEA adopts resolution 1/7: Strengthening the Role of the United Nations Environment Programme (UNEP) in Promoting Air Quality
June 5th 2016	Actions on Air quality by UNEC
December 6th 2017	UNEA: Resolution 3/8 on Preventing Air Pollution and update report on Actions on Air Quality

Previous attempts to resolve the issue

China

China struggled with air quality issues. The cause of the problem for China in its most polluted and populated cities can be traced back to coal. The most used source of energy production. This problem is made exponentially worse by the increasing number of people who own their own cars, which tend to be extremely inefficient and polluting as many people in China cannot afford new models and expensive vehicles. Spread out over the country, almost 1 million coal power plants exist, and many are still to be constructed or in planning.
As a result of the 2013 smog outbreak, which was the worst since 1961 for the country, China "declared war" on air pollution. This is because the smog has covered 1.4 million square meters of China and influenced the lives of 800 million citizens which is a considerable amount more than half the country.

How did China combat air pollution, and were they successful? To combat air pollution China made an elaborate 5-year plan starting from 2013, based on the data gathered in 2012. China achieved most of the important targets of the action plan. Due to this, China was able to significantly reduce the amount of 2.5 micrometre Particulate matter, which was followed by a reduction of mortality due to air pollution in this category, by up to 9 percent. The plan included reducing outdated steel production capacity by up to 27 million tons and cutting cement production by 42 million tons. 50,000 coal-based furnaces were to be shut down permanently as part of the plan to boost non-fossil fuel energy production.

Possible Solutions

Air pollution and climate change are tied together. This is because the number one climate change driver is also the number one air polluter globally (the use of fossil fuels). Limiting the number of fossil fuels that can be used could easily improve air

quality. This means transitioning from coal/crude oil-based energy sources to nuclear power or sustainable eco-friendly energy producers such as wind farms, solar panels, geothermal energy and hydroelectricity.

Changing the public infrastructure to allow easier access to public transportation and promoting this with government incentives or taxes on individual transportation. This can be done by stopping/ partially stopping the funding which governments are providing to fossil fuel companies. Different types of transportation should be made more accessible, such as the use of bikes which for example the Netherlands makes easy with good public infrastructure.

Raising awareness about air quality in school alongside climate change can help children make the right decisions when growing up. An example of practical use of this education is knowing about indoor air quality and how bad cooking can affect the human body if a window is not opened or there isn't sufficient ventilation.

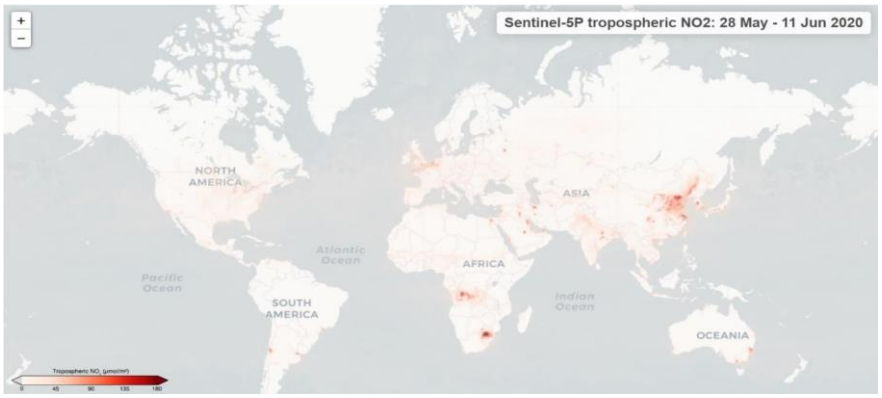
Governments should be encouraged to start monitoring air quality in all their municipalities hence adding more restrictions or increasing incentives for green choices.

Older diesel cars are extremely inefficient and often can be seen emitting photochemical air, which is unpleasant and also unhealthy, especially in high population-dense countries and cities. Banning older diesel cars would prevent more hazardous chemicals from being polluted into the air, risking citizens' lives.

Providing incentives promotes the use of clean vehicles with low (zero-emission) emissions such as electric, hydrogen or hybrid vehicles. This can be done by a tax reduction on buying the vehicle or providing cheaper parking spaces around the country for such cars.

Appendix/Appendices

- ESA, *Global Air Pollution maps.* https://www.esa.int/ESA_Multimedia/Images/2020/06/Global_air_pollution_maps_now_available



Bibliography

"92% of Us Are Breathing Unsafe Air. This Map Shows Just How Bad the Problem Is." *World Economic Forum*, www.weforum.org/agenda/2016/09/92-of-the-world-s-population-lives-in-are as-with-unsafe-air-pollution-levels-this-interactive-map-shows-just-how-bad-the -problem-is/. Accessed 21 Feb. 2022.

"About Air Quality Data." *Minnesota Pollution Control Agency*, 17 May 2013, www.pca.state.mn.us/air/about-air-quality-data#:~:text=The%20Air%20Qualit y%20Index%2C%20or. Accessed 21 Feb. 2022.

"Actions on Air Quality." *UNEP - UN Environment Programme*, 2 July 2017, www.unep.org/resources/assessment/actions-air-quality?_ga=2.20330488.1972179748.1613980885-2109218196.1581402840. Accessed 21 Feb. 2022.

"Actions on Air Quality Report Update." *UNEP - UN Environment Programme*, 25 Mar. 2020, www.unep.org/explore-topics/air/what-we-do/taking-stock-global-efforts/act ions-air-quality-report-update.

"Ambient (Outdoor) Air Quality and Health." *Who.int*, World Health Organization: WHO, 22 Sept. 2021, www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-an d-health. Accessed 21 Feb. 2022.

"Bangladesh Air Quality Index (AQI) and Air Pollution Information | AirVisual." *Www.iqair.com*, 2022, www.iqair.com/bangladesh. Accessed 22 Feb. 2022.

Bruyninckx, Hans. "Cleaner Air Benefits Human Health and Climate Change." *European Environment Agency*, 2017, www.eea.Europa.eu/articles/cleaner-air-benefits-human-health. Accessed 22 Feb. 2022.

Deziel, Chris. "Components of Smog." *Sciencing*, 2018, sciencing.com/components-smog-4233.html. Accessed 21 Feb. 2022.

Fosdike, Henry. "The World's Most and Least Polluted Countries." *U-Earth EU*, 6 Oct. 2021, www.u-earth.eu/post/world-most-least-polluted-countries. Accessed 22 Feb. 2022.

"Global Air Pollution Maps Now Available." *Www.esa.int*, www.esa.int/ESA_Multimedia/Images/2020/06/Global_air_pollution_maps_now_available. Accessed 22 Feb. 2022.

"History of Air Pollution." *US EPA*, 4 Sept. 2014, www.epa.gov/air-research/history-air-pollution#:~:text=Air%20pollution%20ha d%20become%20a. Accessed 22 Feb. 2022.

Huang, Yangzhong. "How Beijing Addresses Its Air Pollution Problem." *Council on Foreign Relations*, 2018, www.cfr.org/blog/how-beijing-addresses-its-air-pollution-problem. Accessed 22 Feb. 2022.

"India Air Quality Index (AQI) and Air Pollution Information | AirVisual." *Www.iqair.com*, 2022, www.iqair.com/india. Accessed 22 Feb. 2022.

Khomenko, Sasha, et al. "Premature Mortality due to Air Pollution in European Cities: A Health Impact Assessment." *The Lancet Planetary Health*, Jan. 2021, 10.1016/s2542-5196(20)30272-2.

Kumar, Karthik. "What Are the Main Causes of Air Pollution?" *MedicineNet*, 12 May 2021, www.medicinenet.com/what_are_the_main_causes_of_air_pollution/article.htm. Accessed 22 Feb. 2022.

Mackenzie, Jillian, and Jeff Turrentine. "Air Pollution: Everything You Need to Know." *NRDC*, 22 June 2021, www.nrdc.org/stories/air-pollution-everything-you-need-know. Accessed 22 Feb. 2022.

Roser, Max. "Data Review: How Many People Die from Air Pollution?" *Our World in Data*, 4 May 2021, ourworldindata.org/data-review-air-pollution-deaths. Accessed 22 Feb. 2022.

Singh, Rajesh. "Bloomberg - Are You a Robot?" *Www.bloomberg.com*, 11 Jan. 2022, www.bloomberg.com/news/articles/2022-01-11/india-s-deadly-air-pollution-keeps-getting-worse-not-better. Accessed 22 Feb. 2022.

Vohra, Karn, et al. "Global Mortality from Outdoor Fine Particle Pollution Generated by Fossil Fuel Combustion: Results from GEOS-Chem." *Environmental Research*, vol. 195, no. 110754, Feb. 2021, p. 110754, 10.1016/j.envres.2021.110754.

World Health Organization. "Air Pollution." *Who.int*, World Health Organization: WHO, 30 July 2019, www.who.int/health-topics/air-pollution#tab=tab_1. Accessed 22 Feb. 2022.