

WHITE PAPER

Air Pollution and Economic Dynamics: Challenges, Responses, and Monitoring Strategies

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Abstract

The paper explores the complex link between air pollution and the economy, looking at both the adverse and beneficial effects of air pollution on economic growth. Anthropogenic air pollution has a profound impact on human health, productivity, agriculture, and the environment. Air pollution has a disproportionately large economic cost in poor and middle-income nations, impeding their growth and well-being. On the other hand, efforts to reduce air pollution through mitigation measures and investments in clean technology can generate economic possibilities such as the formation of new sectors and green jobs.

Budgetary allocation for air pollution monitoring programs is also crucial from an economic perspective. Traditional monitoring networks are expensive to install and operate, which limits their spatial reach and efficacy. On the whole, monitoring and mitigating air pollution is critical for long-term economic growth. Societies can set the road for a healthier and more affluent future by capitalizing on the economic potential connected with air pollution reduction.

Introduction

Economy refers to the system that encompasses the production, consumption, and distribution of goods and services within a region, country, or the world as a whole. It is a complex network of various economic activities, interactions, and relationships that determine how resources are allocated, wealth is generated, and standards of living are affected.

The progress of a region's economy is measured by economic indicators such as gross domestic product (GDP), consumption, investment, and international trade and stability. Some of these indicators also take into account the environment, such as pollution and resource depletion.

The World Development Indicators have many such economic indicators that are used to track progress towards sustainable development goals - SDG 8 (decent work and economic growth) and SDG 2 (sustainable consumption and production) ^[1].

From an economic perspective, one of the primary issues for the climate policy and Air Action Plans is the expense of monitoring and mitigating air pollution and climate change.

Here, the economic impact is often compared to a baseline scenario, which is a hypothetical situation where no climate mitigation actions are taken. It is typically measured in terms of GDP, consumption, or welfare losses.

The impact on the economy can be positive or negative. In some cases, mitigation measures can lead to economic growth by creating new jobs and businesses in the clean energy sector. However, in other cases, mitigation measures can lead to job losses and economic disruption in sectors that are heavily reliant on fossil fuels ^[2].

The Link to Economy and Air Pollution

Air pollution takes its toll on the economy in several ways: it costs human lives, it reduces people's ability to work, it affects vital products like food, it damages cultural and historical monuments, it reduces the ability of ecosystems to perform functions societies need and it costs money in remediation or restoration.

A technical report published by European Environment Agency in 2014 assessed the cost of air pollution and greenhouse gases from industries by evaluating the number of harmful impacts caused by air pollution including premature death, hospital costs, lost work days, health problems, damage to buildings and reduced agricultural yields. The estimated cost was at least €329

billion and possibly up to €1 053 billion over the period 2008 - 2012 ^[3].

Damage costs by industrial sector (2008-2012)

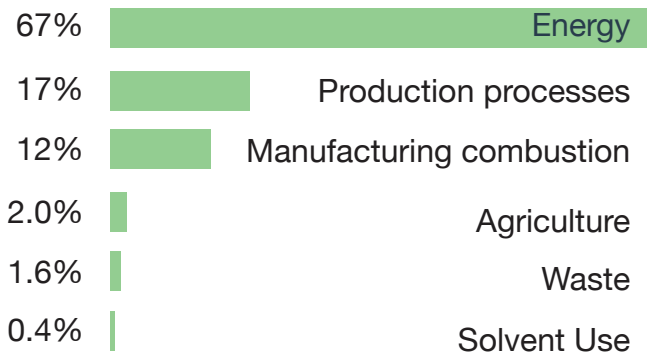


Fig: Sectoral contribution to air pollution and economy [3].

From the figure, it could also be inferred that, while industry and electricity generation benefit us all, this analysis indicates that the technology utilized by these facilities imposes hidden costs on our health and the environment. The industry is also only one component of the picture; it is critical to recognize that other sectors, particularly transportation, and agriculture, also contribute to poor air quality.

A similar study recently published by The World Bank found that air pollution cost the globe an estimated \$8.1 trillion in 2019, equivalent to 6.1% of global GDP ^[4].

Economic growth and its contribution to air pollution

In order to raise the GDP of developing nations, more focus is being placed on the growth of the industrial sector. This, in turn, contributes to air pollution. More than 95 percent of air pollution-related fatalities occur in low- and middle-income and developing nations. These coun-

tries require stringent policies, laws, and implementation mechanisms ^[5].

Economic costs of air pollution from fossil fuels as share of GDP in 2018

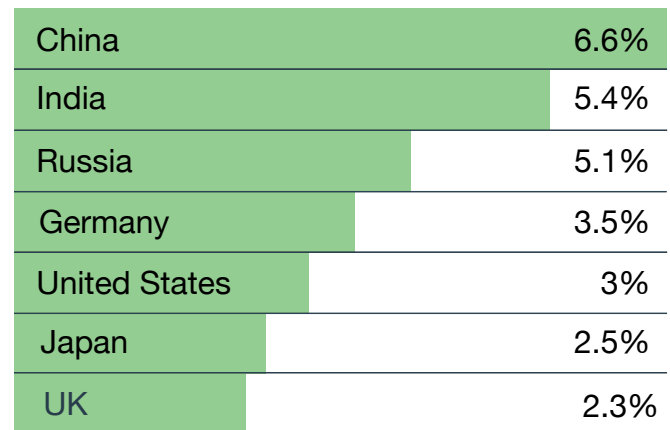


Fig: The percent of economic burden suffered by nations

According to the graph above, the economic impact of air pollution is disproportionately larger in low and middle-income countries such as China and India ^[6].

World Trade Organization (WTO) estimates, the global economic cost of outdoor pollution will amount to 1% of the whole gross national product after about 40 years, and the related medical expenditure will dominate in the long run. According to information gathered from a 2003 study of 49 Canadian counties, counties with poor air quality had higher medical expenses, while counties with more environmental quality investment had lower medical costs ^[7].

A study by the Organisation for Economic Co-operation and Development (OECD) evaluated the annual global welfare costs associated with premature deaths. It was assessed by calculating the individual willingness to pay to reduce the risk of premature death from outdoor air pollution. The study projected that the annual global welfare cost will increase from \$3 trillion in 2015 to \$18-25 trillion in 2060 ^[8].

The Role of leading organizations and world leaders

The contributions from numerous countries and regions impact global air quality trends. In order to monitor those several major organizations, including the World Health Organisation (WHO), The United States Environmental Protection Agency (USEPA), the United Nations Environment Programme (UNEP), the European Environment Agency (EEA), and many others, publish reports, scientific literature and major incidents on climate change and air pollution.

Aside from these independent organizations, various summits and conferences, such as the G20, G7, and COP26, are held in an international arena that brings together the leaders of the world's largest economies and stakeholders. It provides a forum for debate on global economic and financial issues and other urgent global topics such as the crisis of air, Water, and Climate.

However, air pollution is not an insurmountable problem. According to the sixth Global Environment Outlook published by UN Environment, meeting the Paris Agreement objectives for climate change mitigation will cost the United States \$22 trillion.^[9] Consequently, the health benefits of properly lowering air pollution can save \$54 trillion.^[10] The figures are completely clear: urgent action to reduce air pollution saves \$32 trillion. This is fantastic news for our health, the environment, and the economy.

The Budgetary Allocation of Funds to tackle air pollution

As previously highlighted, prominent development donors continue to put off air quality which is a crucial global health concern.^[11] International development donors pledged \$1.9 trillion in 2015-2020. Out of which, \$10.9 billion was committed to programs addressing air pollution between 2015 and 2021. Even though air quality directly supports the achievement of many SDGs, and despite the link between air quality improvements and climate change, air quality funding accounts for only 0.5% of total commitments ^[12].

In other words, for every \$1,000 spent by a development funder, only \$5 was spent to tackle ambient air pollution – the fifth biggest killer by health risk factor worldwide.

The budget for reducing air pollution and combating climate change includes funding for air quality monitoring initiatives. On July 7, 2021, EPA announced that it will make \$50 million in American Rescue Plan (ARP) funding available to improve ambient air quality monitoring for communities across the United States.

In a similar case, the National Clean Air Plan (NCAP) given by the MoEF&CC and the Government of India (GoI) diverted the majority of the budget towards air quality monitoring by installing and commissioning CAAQMs throughout the country. However, the deployment and maintenance of a high number of these fixed-air monitoring networks is very expensive. One can expect at least \$10K per station, excluding installation and maintenance costs. As a result of their expensive nature, the CAAQMs stations are spatially far away, unable to provide enough air quality data to tackle air pollution or evaluate mitigation strategies. This cost could be reduced by implementing low-cost sensor (LCS) technology, which, according to USEPA Air Sensor Guidebook, cost about \$100 to \$5,000 ^[13].

According to WHO, LCS should be introduced to

the monitoring network in countries with at least some reference-grade monitors to improve spatial coverage of air-quality monitoring.^[14] To reduce measurement uncertainty and maintain the data quality objectives, the quality assurance and quality control of LCS data should be emphasized. Several studies have been undertaken to examine the performance of LCS in various contexts, and the results have been shown to be complementing the reference grade analyzer systems.

According to Economic Models, the implementation of air pollution abatement and monitoring measures can have positive as well as negative impacts.^[15] It can result in employment losses in certain sectors (such as the fossil fuel industry) and job gains in others (such as the building and equipment industries). Overall, the long-term environmental policy will help the economy because it encourages more resource-efficient usage, and the health advantages would boost GDP by up to 10%. The prices of manufacturing the necessary equipment and, consequently, the abatement measures, will be decreased as the market for clean technology expands. The development of new technologies that help mitigate emissions is ongoing. Setting emission requirements for air pollution has shown to be an effective tool for enticing investment in clean technologies for monitoring and mitigation, as done under the different Protocols of the Convention.

Oizom's offering

Oizom being an environmental technology company plays a crucial role in air quality monitoring across the globe. The primary focus is to provide data-driven environmental solutions through advanced technologies like AI and IoT. Oizom's advanced, robust, and scalable air quality monitoring equipments monitors numerous air quality parameters, including particulate matter (PM_{2.5}, PM₁₀), gaseous pollutants (SO₂, NO₂, CO, O₃), and meteorological parameters. This data is

key to identifying and mitigating sources of air pollution, thus providing critical information to governments, environmental agencies, urban planners, and communities. Oizom's systems help these entities formulate strategies, policies, and measures to improve air quality, benefiting public health and the environment. Their use of cloud-based analytics also makes the collected data readily accessible and interpretable, facilitating quicker and more informed decision-making.

Concluding Remarks

Air pollution and the economy are inextricably connected and can have both beneficial and negative effects. Air pollution has a detrimental influence on economic growth in a variety of ways, including health effects, agricultural and crop yield loss, environmental clean-up expenses, and decreased productivity.

Allocating a budget to air pollution monitoring has a beneficial side and can provide economic opportunities. Investments in cleaner technologies, renewable energy, and pollution control measures can create new industries, green jobs, and innovation, contributing to economic growth and sustainability.

The overall beneficial impact that can be addressed is if budgetary funds are used appropriately, such as investing in air quality monitoring programs, which may lead to lower air pollution and, as a result, lower air pollution expenses.

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