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Economics And Air Pollution- An Analysis Of Chennai City

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Economics And Air Pollution- An Analysis Of Chennai City

Abstract

Air pollution causes a variety of environmental effects, besides harming human health. Acid rain is precipitation containing harmful amounts of nitric and sulfuric acids. These acids are formed primarily by nitrogen oxides and sulfur oxides released into the atmosphere when fossil fuels are burned. In the economics of pollution, we see that there is a point where both society and the environment have some satisfaction, or in other words, there is an optimum amount of pollution. The optimum amount of pollution can be defined as the point where the marginal benefit equals the marginal cost of pollution. Air pollution is responsible for major harmful effects on human health, animal lives, natural ecosystems and the man-made environment. It is also responsible for climate change due to the enhanced greenhouse effect, acid rain, and the depletion of the ozone layer that constitute important global environmental problems. The relationship between environmental degradation and economic growth has been object of constant debate among environmental economists. During the last two decades, the debate between economic growth and the environment introduced into the discussion. External effects or externality is one of the most basic concepts evoked by economists when looking at problems of environmental pollution. The market impacts of outdoor air pollution are projected to lead to global economic costs that gradually increase to 1% of global GDP by 2060. Costs related to additional health expenditures and labour productivity losses dominate in the long run. From an economics perspective, demand law suggests an inverse relationship between price and the quantity consumed of a marketable product. However, when a product does not have a very well-established market, this product will be most likely underpriced. This is the case of natural systems such as air or water. The lack of property rights for these natural inputs and the absence of environmental regulation or legal protection to pollution receptors make a firm to perceive air as an input that can be freely used, like a common resource, thus neglecting all external costs imposed to other agents of the economy. In other words, if there were well-defined property rights for air, firms would have to buy the right to pollute it and emissions could be internalized through a market mechanism. The six-scale Air Quality Index (AQI) rates air quality from ‘good’ (minimal impact) to ‘severe’ (affects healthy people and seriously impacts those with existing diseases). The air quality in Chennai has deteriorated sharply, with the AQI downgrading air quality in the city from ‘satisfactory’ to ‘very poor’.

Keywords

Air pollutant, Human health, Environment

12. ECONOMICS AND AIR POLLUTION- AN ANALYSIS OF CHENNAI CITY

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ABSTRACT

Air pollution causes a variety of environmental effects, besides harming human health. Acid rain is precipitation containing harmful amounts of nitric and sulfuric acids. These acids are formed primarily by nitrogen oxides and sulfur oxides released into the atmosphere when fossil fuels are burned. In the economics of pollution, we see that there is a point where both society and the environment have some satisfaction, or in other words, there is an optimum amount of pollution. The optimum amount of pollution can be defined as the point where the marginal benefit equals the marginal cost of pollution. Air pollution is responsible for major harmful effects on human health, animal lives, natural ecosystems and the man-made environment. It is also responsible for climate change due to the enhanced greenhouse effect, acid rain, and the depletion of the ozone layer that constitute important global environmental problems.

The relationship between environmental degradation and economic growth has been object of constant debate among environmental economists. During the last two decades, the debate between economic growth and the environment introduced into the discussion. External effects or externality is one of the most basic concepts evoked by economists when looking at problems of environmental pollution. The market impacts of outdoor air pollution are projected to lead to global economic costs that gradually increase to 1% of global GDP by 2060. Costs related to additional health expenditures and labour productivity losses dominate in the long run.

From an economics perspective, demand law suggests an inverse relationship between price and the quantity consumed of a marketable product. However, when a product does not have a very well-established market, this product will be most likely underpriced. This is the case of natural systems such as air or water. The lack of property rights for these natural inputs and the absence of environmental regulation or legal protection to pollution receptors make a firm to perceive air as an input that can be freely used, like a common resource, thus neglecting all external costs imposed to other agents of the economy. In other words, if there were well-defined property rights for air, firms would have to buy the right to pollute it and emissions could be internalized through a market mechanism.

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INTRODUCTION

There are numerous effects of air pollution on the ecosystem which in turn have various economic implications. In simple terminology, we can say that air pollution effects can be both direct and indirect. For instance, pollution of air primarily causes respiratory and other health hazards in people who are being directly exposed to various harmful gases. The secondary, and long run impact, would be that following the health problems, the productivity of workers might be adversely affected which in turn hamper output levels. This is how air pollution exerts an indirect effect on the overall economy.

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In 2015, WHO and OECD estimated that the economic cost of premature death and disability from air pollution in Europe is close to USD 1.6 trillion. New technologies that contribute to emissions' reductions are constantly being developed. Setting emission limit values for air pollutants, as done under the different Protocols of the Convention, have proven to be an effective tool in stimulating investment in clean technologies. Benefits of improved technology to reduce air pollution

have been quantified in many cases.

AIR POLLUTION AND ECONOMICS

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. The relationship between environmental degradation and economic growth has been object of constant debate among environmental economists. During the last two decades, the debate between economic growth and the environment introduced into the discussion. External effects or externality is one of the most basic concepts evoked by economists when looking at problems of environmental pollution. The market impacts of outdoor air pollution are projected to lead to global economic costs that gradually increase to 1% of global GDP by 2060. Costs related to additional health expenditures and labour productivity losses dominate in the long run.

From an economics perspective, demand law suggests an inverse relationship between price and the quantity consumed of a marketable product. However, when a product does not have a very well-established market, this product will be most likely underpriced. This is the case of natural systems such as air or water. The lack of property rights for these natural inputs and the absence of environmental regulation or legal protection to pollution receptors make a firm to perceive air as an input that can be freely used, like a common resource, thus neglecting all external costs imposed to other agents of the economy. In other words, if there were well-defined property rights for air, firms would have to buy the right to pollute it and emissions could be internalized through a market mechanism.

The six-scale Air Quality Index (AQI) rates air quality from 'good' (minimal impact) to 'severe' (affects healthy people and seriously impacts those with existing diseases). The air quality in Chennai has deteriorated sharply, with the AQI downgrading air quality in the city from 'satisfactory' to 'very poor'. Economic assessments are used to evaluate the cost and the economic impact of a policy or regulation related to air quality management. They can also be used to estimate the economic value of the benefits of an air pollution policy or program. Taken together, these assessments can help identify air quality management policies needed to address the risks that have been identified, as well as to focus on the most cost effective ones.

OBJECTIVES OF THE STUDY

1.To study the economic impact of Air pollution using economic tools.

2.To analyse the economic effect of Air Pollution in Chennai City.

ECONOMIC TOOLS AND ANALYSIS OF AIR POLLUTION- AT INTERNATIONAL LEVEL

Economic models show that with the introduction of additional measures some sectors will lose jobs (e.g. the fossil fuel sector); but that other sectors will gain jobs (e.g. the building and equipment sectors). In the long run environmental policy will favour the economy as it stimulates more efficient use of resources, and the health benefits would increase GDP by up to 10%. A larger market for clean technologies will reduce the costs of producing the required equipment and thus the abatement measures. Countries that move first expand their possibilities for a growing clean tech industry. Reducing emissions is a wise long term investment that contributes to several development goals and ultimately will yield substantial benefits. The Convention sets emission limit values for air pollutants and these have proven to be an effective tool in stimulating investment in clean technologies, including in the energy sector, and will thus also promote sustainable industrialization.

A techno-economic database of information on control technologies for air pollution abatement and their costs is being developed internationally. The information may be used both in the formulation of draft revisions of technical annexes to existing Protocols to the Convention, as well as for input data to integrated assessment modelling. The information assists countries in identifying technologies, including for industry and in the energy sector that helps reduce air pollution which gives an affordable and clean energy and sustainable development in industry, innovation and infrastructure.

HEALTH BENEFITS AND ECONOMIC VALUE

The results of risk assessments can be used as part of an assessment of the economic benefits from reducing emissions. The Environmental Benefits Mapping and Analysis Program (BenMAP) is a tool for estimating health impacts, and the associated economic values, resulting from changes in ambient air pollution.

Economic Analysis

Guidelines for Preparing Economic Analyses establish a sound scientific framework for performing economic analyses of environmental regulations and policies.

Economic and regulatory impact analyses conducted by EPA for many air pollution rules,

as well as guidance and tools for cost, benefit and economic analyses for air pollution rules can be found at Economic and Cost Analysis for Air Pollution Regulations. The EPA report received extensive review and input from the Advisory Council on Clean Air Compliance Analysis, an independent panel of distinguished economists, scientists and public health experts established by Congress in 1991.

ECONOMICS OF AIR POLLUTION-INDIAN SCENARIO

It has been estimated by a study that air pollution cost India 8.5% of its GDP in 2013. A World Bank study shows that welfare costs and lost labour income due to air pollution amounted to 8.5% of India's GDP in 2013 Measures to safeguard the environment are often considered to be economic spoilers as they entail putting restrictions on economic activity such as shutting a polluting factory or scrapping old vehicles. What is not taken into account while making these calculations is the cost imposed on people living in regions where pollution and environmental degradation is higher.

The cost of air pollution: strengthening the economic case for action, a joint study by World Bank and University of Washington, released on Thursday, might be useful in dispelling such a blinkered view on costs of controlling pollution. According to the report, total welfare losses between 1990 and 2013 because of premature deaths from air pollution increased by 94%. Of this, damages from ambient PM 2.5 air pollution rose by 63% during this period to $3.5 trillion, while damages from household air pollution from cooking with solid fuels jumped almost four-fold to $1.5 trillion, adjusted to the purchasing power parity (PPP) in 2011.

In terms of welfare losses because of air pollution, India ranks second after China at $505.1 billion, or 7.69% of its gross domestic product (GDP), in 2013. Premature deaths due to air pollution in 2013 cost the global economy about $225 billion in lost labour income, or about $5.11 trillion in welfare losses, worldwide, according to the report.

India reported the highest loss in labour output in 2013 owing to air pollution globally at $55.39 billion (2011 PPP-adjusted), or 0.84% of its GDP. China followed close behind with $44.56 billion, or 0.28% of its GDP, lost due to forgone labour output.Adding welfare costs and costs of lost labour due to air pollution puts India's GDP loss at more than 8.5% in 2013. India's GDP growth at constant prices was less than 7% in 2013-14. So air pollution alone might be offsetting the Indian economy's growth efforts. As is to be expected, increasing air pollution also entails large-scale suffering. The report ranks air pollution as the fourth biggest fatal risk factor in the world. Air pollution kills more people than tobacco, alcohol or drug use or unsafe sex in most countries. At 10.1% of total deaths globally, air pollution ranked fourth among the leading fatal health risks after metabolic risks, dietary risks and tobacco smoke. For poorer countries, the impact of bad air quality has been worse. Low- and middle-income countries account for 93% of the deaths and non-fatal illness each year from air pollution. India and China also accounted for the highest number of deaths due to air pollution in 2013. But while China reported an increase of only 7% between 1990 and 2013, deaths due to air pollution in India during the same period increased by 34.5%.

The number of deaths due to air pollution was also higher for children and older people. In 2013, the mortality rate due to air pollution was 18 deaths per 100,000 people under age 5, which increased to 397 deaths per 100,000 in people over age of 70, according to the report. Disability-adjusted life years, too, were higher for young children and among adults aged 60-64 years. Disability-adjusted life year is a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability or early death. For young children, the majority of deaths resulted from lower respiratory infections, while for the older age groups, heart and pulmonary diseases were the major causes.

SCENARIO IN CHENNAI

Chennai is one of the important coastal mega cities in India. It is located in the eastern coastal side of South India. Many industries have come up in the city over the past two decades which are located near the coast. Due to change in the roughness length and difference in land and sea temperatures, sea breeze is developed and Thermal Internal Boundary Layer is observed. Due to this all the pollutants released from the industries will be dispersed towards the inland and in turn affect the environment and health. Tamil Nadu constitutes the south-eastern extremity of the Indian peninsula. Chennai is the capital city of the State, besides being an important district. The district city is one of the metropolises of India and serves as the gateway of the culture of South India. Chennai is situated on the north-east end of Tamil Nadu on the coast of Bay of Bengal. It lies between 12* 9' and 13* 9' of the northern latitude and 800 12' and 800 19' of the southern longitude on a `sandy shelving breaker swept beach'. It stretches nearly 25.60 kms along the Bay coast from Thiruvanmiyur in the south to

Thiruvottiyur in the north and runs inland in a rugged semi-circular fashion. It is bounded on the east by the Bay of Bengal. Chennai is one of the leading cities in India today from the point of view of trade and commerce, with the fourth largest port in the country and the first to have developed a full-fledged container terminal tointernational standards. Chennai is also one of the most important industrial cities of the sub¬continent.

The data is collected from Central Pollution Control Board (CPCB) New Delhi, for the period from 2000-2004 in industrial and residential areas for the selected coastal Mega City-CHENNAI.

ANALYSIS AND RESULTS OF THE STUDY

The concentration of SO2, NO2 and SPM in Chennai are analyzed from 2000 to 2004. The pollution levels in this mega city of India have been exceeded the WHO air quality guidelines. The data is collected for three industrial and two residential areas at different locations in the city, these are Kathivakkam (I), Manali PS (I), Thiruvottiyur (I), General Hospital (R), Santhome (R).

AIR QUALITY INDEX:

The following discussion summarizes the information that can be drawn from the calculated indices. AQI for four places of Chennai city are given in Tables 2 to5

Air quality Index for T.Nagar

	2007	2008	2009	2010	2011	2012
JANUARY	94	105	105	154	154	123
FEBRUARY	119	129	207	109	119	125
MARCH	101	141	132	170	103	164
APRIL	100	98	98	125	137	111
MAY	91	124	194	154	210	246
JUNE	57	149	111	178	113	190
JULY	91	182	170	133	92	92
AUGUST	88	96	160	160	182	96
SEPTEMBER	90	113	182	167	287	176
OCTOBER	97	121	160	177	279	176
NOVEMBER	135	144	164	83	255	271
DECEMBER	143	162	204	129	253	107

Likewise, the concentration levels of SO2, NO2 and SPM are observed from the data collected from CPCB. The concentrations of SO2 and NO2 are observed to be in low conditions according to NAAQS standards in both industrial and residential areas (6). But compared to residential areas i.e., General Hospital and Santhome the concentrations in the industrial areas i.e., Kathivakkam, Manali PS and Thiruvottiyur are observed to be more. The concentrations of SO2 range from 6.10µgm-3 at residential areas and 40.90µgm-3 in industrial areas. An increase in the concentrations of SO2 and NO2 is observed from 2000 to 2004. Low conditions of NAAQS standards are observed in the concentrations of SPM in both industrial and residential areas

Air Quality Index for Kilpauk

	2007	2008	2009	2010	2011	2012
JANUARY	164	156	156	95	44	92
FEBRUARY	99	139	121	94	115	271
MARCH	117	149	113	190	135	541
APRIL	100	95	95	98	162	301
MAY	91	123	143	76	113	301
JUNE	81	103	86	99	81	212
JULY	129	79	119	78	127	162
AUGUST	52	87	94	87	176	170
SEPTEMBER	147	200	119	97	137	168
OCTOBER	154	135	99	93	125	160
NOVEMBER	200	165	149	63	86	170
DECEMBER	182	128	119	79	170	115

Air Quality Index for Anna Nagar

	2007	2008	2009	2010	2011	2012
JANUARY	94	105	105	154	154	123
FEBRUARY	119	129	207	109	119	125
MARCH	101	141	132	170	103	164
APRIL	100	98	98	125	137	111
MAY	91	147	194	154	210	246
JUNE	57	149	111	178	113	190
JULY	91	182	170	133	92	92
AUGUST	88	96	160	160	182	96
SEPTEMBER	90	113	182	167	287	176
OCTOBER	97	121	160	177	279	176
NOVEMBER	135	159	164	83	255	271
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Air Quality Index for Adyar

	2007	**2008**	**2009**	**2010**	**2011**	**2012**
JANUARY	**54**	**61**	**61**	**30**	**44**	**53**
FEBRUARY	**45**	**61**	**74**	**37**	**29**	**76**
MARCH	**39**	**44**	**43**	**40**	**36**	**91**
APRIL	**31**	**39**	**36**	**31**	**41**	**58**
MAY	**36**	**49**	**51**	**43**	**59**	**77**
JUNE	**31**	**41**	**25**	**36**	**34**	**78**
JULY	**40**	**27**	**19**	**29**	**44**	**65**
AUGUST	**31**	**24**	**39**	**33**	**55**	**57**
SEPTEMBER	**32**	**44**	**33**	**27**	**55**	**71**
OCTOBER	**53**	**67**	**50**	**28**	**86**	**71**
NOVEMBER	**43**	**53**	**60**	**34**	**75**	**83**
DECEMBER	**63**	**61**	**65**	**45**	**92**	72

If the index is 0 to 100 the air quality is good, if the index is 101-200, the air quality is moderate, if the index is 201-300, the air quality is poor, if it is 301-400, the air quality is very poor, if it is 401-500, the air quality is severe.

The air quality in T. Nagar and Anna Nagar lies between moderate and poor status. The air quality in Kilpauk liesbetween very poor and severe status.AQI remains good in Adyar. From the above tables AQI got worsened from the year 2007 to 2012.

Impacts on Human Health

Gender of respondents.

	Frequency	Percent	Valid Percent	Cumulative
Male	81	89.0	89.0	89.0
Female	10	11.0	11	100
Total	91	100	100	

Occupation of respondents.

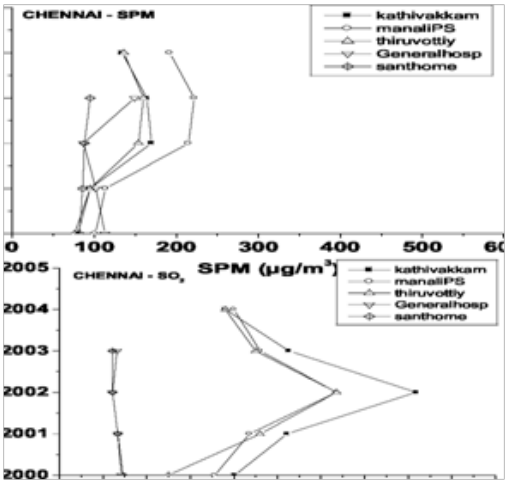
	Frequency	Percent	Valid Percent	Cumulative %
DRIVER	31	34.1	34.1	34.1
VENDOR	47	51.6	51.6	85.7
PASSERBY	13	14.3	14.3	100.0
Total	91	100.0	100.0	

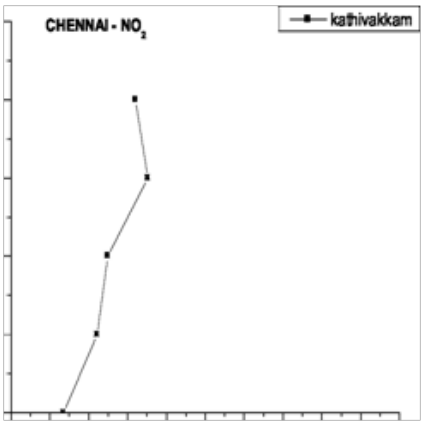
Age of respondents

	Frequency	Percent	Valid Percent	Cumulative %
<=30	24	26.4	26.4	26.4
31-40	30	33.0	33.0	59.3
41-50	21	23.1	23.1	82.4
>50	16	17.6	17.6	100.0
Total	91	100.0	100.0	

Person with disease

	Frequency	Percent	Valid Percent	Cumulative %
Valid no disease	45	49.5	49.5	49.5
Disease	46	50.5	50.5	100
Total	91	100	100	





CONCLUSION

1.The analysis of data collected from CPCB, Delhi during 2000 to 2004 shows that the concentration levels have been increased from 2000 to 2004 due to dense population and rapid industrialization. Industries, automobiles, domestic fuel consumption and the use of domestic appliances contribute to the emissions while gases from garbage dumps contaminate the air. Due to increase in pollutants the temperatures inside the cities are higher around 40 C to 60 C compared to the surrounding rural areas.

2.Increasing economic growth and energy has lead to a significant increase in the emissions of air pollutants.

3.Rising emissions, together with other factors, such as climate change, has led to increasing concentrations of particulate matter (PM2.5) and ground level ozone.

4.Increasing concentrations of PM2.5 and ozone has led to substantial effects on health and the environment. In particular, premature deaths from outdoor air pollution in 2010 amounted to around 3 million people, while they are projected to be 6-9 million in 2060.

5.The annual costs of these premature deaths from outdoor air pollution, calculated using estimates of the individual willingness-to-pay to reduce the risk of premature death, are projected to be USD 18-25 trillion in 2060. In addition, the costs of pain and suffering from illness are estimated at estimated at around USD 2.2 trillion by 2060.

SUGGESTIONS

1.Measures have to be taken by government to improve ambient air quality taking in view of the public health. These measures include usage of clean fuel such as CNG, closure of high polluting industrial units, phasing out off older vehicles, periodic check on vehicle pollution certificates and encouraging people to use public transport means like metro rails and high capacity buses. The survey results prove that most of the people affected by air pollution resulted in chronic diseases.

2.The people also has to take up some severe precautions to bring down the concentration of pollutants and reduce the use of energy consumable goods.

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