Research Report

Special Conference II: Development and Sustainability

Measures to reduce greenhouse gas emissions in regards to public health in urban areas

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Forum	Special Conference 2: Development and Sustainability
Issue:	Measures to reduce greenhouse gas emissions in regards to public health in urban areas
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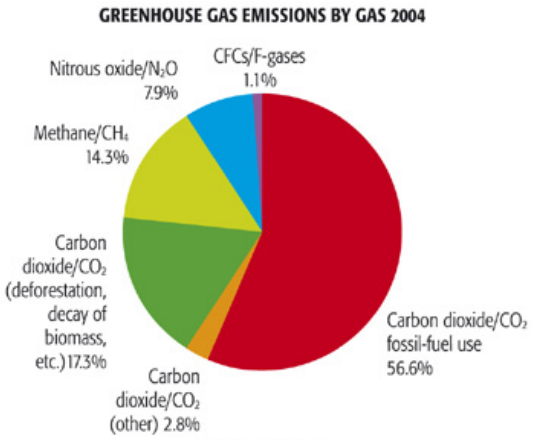
Introduction

Greenhouse gasses are widely known to lead to a widespread variety of adverse health effects, primarily pulmonary, however the processes that produce them are an integral part of most economies and lifestyles. Because of this, there has been an increasing concentration of these air pollutants across the world. It is particularly problematic within urban areas; in those areas, there are larger numbers of peoples who come into contact with the air of poor quality due to higher levels of pollution.

This is problematic from a public health perspective as these pollutants create issues beyond climate change, which they are most frequently associated with. The reduction in air quality as a direct result of these greenhouse gasses, serves to have a negative impact on the life expectancies of those subject to the pollution. This is through the exacerbation of preluding respiratory and cardiac diseases, as well as the creation of new ones. While they are not extremely harmful when exposure time is limited, the creation of them in urban centres creates a situation in which living areas have poor ambient air quality and therefore citizens are exposed for durations well above safe limits.



Greenhouse Gas Emissions by Gas
Mann and Kump. "Greenhouse Gas Emissions by Gas 2004." Graph. *e-education.psu.edu*. 21 07 08 web. 21 07 14. <https://www.e-education.psu.edu/meteo469/node/181>.

Over 70% of all greenhouse gasses are produced in urban areas despite making up only 2% of the Earth's landscape. It is incredibly evident that the efficiency of cities must be worked on in order minimise the volumes of waste gases entering the atmosphere. However, within the foreseeable future, even the most drastic changes would fail to eliminate any source of pollution and so the focal point should be to instil sustainable practice in all

urban lifestyles in order to mitigate any problems.

Solutions to the issue would provide multifaceted benefits and so great improvements in many areas. Improvements in overall public health would serve to create a better quality of life with less disease and so improve the workforce and therefore a countries economy. Similarly, economic benefits can be drawn from the act of producing fewer pollutants as the sustainable practises are not only more advantageous in long term, but the reduction of waste serves to ensure more efficient industry.

Definition of Key Terms

Air Quality Index (AQI)

The Air Quality Index serves as a means to convey the severity of air pollution within a localised area and therefore, the suitable actions to be taken in order to remain healthy under these conditions. The pollutants in ambient air may be measured in order to calculate give it a value from 0 to 500, where 0 is the best value, and then it is placed into a category which calls for various responses.

Alternative Energy

An alternative energy is one that is derived from a source the non-traditional source of hydrocarbons from fossil fuels. These have become increasingly popular in order to replace fossil fuels which are due to run out 2088. Alternative energies may be derived from a large number of sources such as the sun, in the case of solar energy, wind, for wind energy and plants for biofuels; while alternative fuels are often more sustainable, this is not a factor that is required for them to be considered as such, as is the case with biofuels which have been criticised due to a lack of sustainability. Due the absence of the combustion of fossil fuels, net change of the greenhouse gas carbon dioxide is zero which gives rise to the term carbon neutral. However, one should take note that they may still contribute to levels of other greenhouse gasses, such as nitrous oxides.

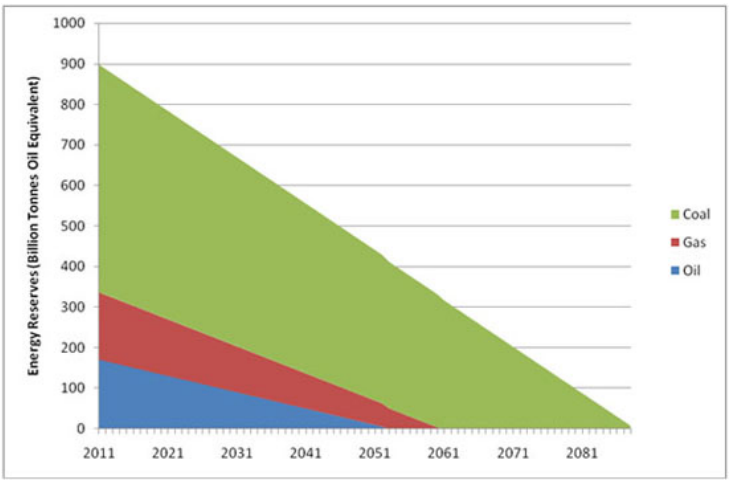
Disease Burden

The disease burden is the financial impact upon a person as a consequence of suffering from a disease as well as the effects on both morbidity and mortality. In terms of greenhouse gasses this means the money that must be spent on treatments but also the damage to the workforce due to a reduction in life expectancy and,

therefore, working years. The disease burden is often conveyed through either Quality-Adjusted Life Years (QALYs) or Disability-Adjusted Life Years (DALYs). As diseases consequent to the presence of air pollution are considered an environmental disease, the disease burden derived from this issue makes up the environmental burden of disease. Public health sectors are and the World Health Organisation concern themselves with reducing the impact of environmental issue and so therefore will be heavily involved.

Fossil Fuels

A fossil fuel is a hydrocarbon resultant from the decomposition of dead organisms over a period of millions of years. Due to the large timescale of the production of fossil fuels the rate at which they are made is incredibly small and negligible when considered against the rate of fuel consumption; it is because of this that fossil fuels have been deemed non-renewable. The process is which the energy is obtained from these fuels is through a combustion reaction in which the main products are water vapour and carbon dioxide, both of which are greenhouse gasses. Alongside this, there are very frequently impurities present within the fuel which can lead to additional waste products such as nitrogen oxides and sulphur dioxide.



Consumption of Fuels
"Consumption of Fuels." Graph. *Ecotricity.co.uk*. Web. 21 07 14 <https://www.ecotricity.co.uk/our-green-energy/energy-independence/the-end-of-fossil-fuels>.

Greenhouse Gasses

Any gas that is able to absorb and consequently reemit Infrared (IR) energy may be considered a greenhouse gas. The gas's interactions with IR energy serve to trap heat within the Earth's atmosphere and as a result lead to an increase in the average global temperature; this contributes to climate change through the greenhouse effect. While they are naturally occurring in the atmosphere, large scale anthropogenic release beginning at the industrial revolution has resulted in significant change in the atmospheres composition.

Particulate Matter Pollution

While particulate matter pollutants are not greenhouse gasses, they are inherently linked as they are produced by the same processes and also serve to pollute their air which causes very similar diseases. Particulates are small particles suspended in the air which are created by combustion. They may be divided into course particles, which have a diameter of ten micrometres, and fine with a diameter of 2.5 micrometres. Due to their minute size, they are able to enter deep into the lungs and from here permeate into bloodstream where they may go on to damage various organs. Measures taken to reduce greenhouse gas emissions will often lead to reduced particulate matter pollution and therefore multifaceted benefits.

Public Health

Public health concerns itself with ensuring that the health within a population may be it at its best and so result in longer life expectancies for individuals within it. This is often done through the analysis of the prevalence and risk of various conditions in order to minimise the development or transmission of it. Public health workers involve themselves with collecting data in order to realise any indicators of health risks and also ensuring that the public is well informed about the issues and may take appropriate measures in order to protect themselves.

Respiratory Disease

Respiratory disease is any illness afflicting organs or tissues that are involved within gaseous exchange in an organ. It has the closest relationship with air pollution, with cardiac illnesses also having a strong link, due to the direct exposure to pollutants that respiratory organs are faced with. The most common is asthma which leaves sufferers vulnerable to further conditions such as pneumonia and bronchitis.

Urban Areas

An urban area is one which is significantly built up and has a high density of people living within it, such as a city or town. As people live within close proximity of each other it serves to be economically beneficial and results in businesses primarily being located in urban centres. The large numbers of people and the significant work carried out within these result in vast greenhouse gas production. The United Nations Department of Economic and Social Affairs (UN DESA) predicts that by the year 2050 the numbers of people living within urban centres will increase by 84% and it is therefore necessary that practices change to facilitate this in a sustainable manner.

General Overview

Significant contributors to greenhouse gas emissions

The sources of greenhouse gas emissions are various and also differ in significance with regards to the issue however, transportation, industry and energy production play leading roles.

Transportation

The transportation sector, whether it is for domestic or industrial purposes, has consistently remained one of the greatest contributors to global greenhouse gas emissions. The majority of vehicles still use petroleum as their fuel source which leads to carbon dioxide emissions. While this may tackled through the emphasis of technologies such as hydrogen fuel cells or hybrid cars, changes to infrastructure in order to encourage public transport, could serve to increase transport efficiency and therefore greenhouse gas emissions.

Industry

In order to carry out the processes used to extract, refine and create tradable goods, waste by products such as greenhouse gasses must be produced. While it important to reduce these emissions, attempts to do so could serve to penalise businesses and result in reduced economic output; it is important to find the balance in order to find an appropriate, sustainable balance. However, optimising the efficiency of various industrial processes may, in instances, prove to be mutually beneficial for both industrialists and the environment; by reducing waste product of polluting gasses the atom economy is greatened and therefore fewer reagents need to be used for equal quantities of useful product.

Electricity

The production of electricity can be held accountable for 32% of the carbon dioxide emissions and also has comparatively high rates of methane emissions, a much more destructive greenhouse gas. While efficient electricity usage should be encouraged, this is not enough to stop the emissions and so alternative energy sources should be taken into account either to subsidise energy demands or to take on the full burden; as with all energy sources, each method of obtaining energy has its unique benefits and drawbacks, which must be thoroughly considered.

Distribution of disease associated with greenhouse gas pollution

Cities within more economically developed countries (MEDCs)

Unlike a large number of environmental issues, the issue of greenhouse gas emissions is generally more pressing within developed nations due to their larger industrial outputs. This can be seen through statistics such as Delhi, in India, producing 1,5 tonnes of carbon dioxide per capita whereas in Rotterdam, this figure is 29.8 tonnes per capita. However, in more developed nations, there is a greater access to the required medical attention and this can result in a smaller proportion of severe cases.

Susceptible groups of people

Exposure to high concentrations of air pollution can prove to have greater risks to children, particularly those less than five years of age for whom the probability of developing an illness is five times greater. Additionally, the elderly also are more susceptible to air pollution related diseases due to their lungs being already dirtier and the weakening of the immune system through ageing. Finally, those with pre-existing conditions in relevant organs, such as asthmatics, are at a disadvantage when dealing with pollutants and so new conditions may develop as well as the already present one being exacerbated.

Factors affecting the greenhouse gas emissions of a city

In order to gauge how best to reduce the greenhouse emissions of a city, it is vital to understand what factors influence the rate of pollution so that they may be appropriately addressed.

Geographical situation of a city

Within a city a large quantity of energy is used in order to provide comfortable living environments to the residence in both temperature and lighting and in order to create these conditions, electricity must be used. Therefore, the greater the difference between a cities actual climate and its desired one acts as a factor to part of the energy expenditure. For instance, Scandinavian countries are found far north and as a consequence have harsher winters; temperatures drop low and daylight hours are very short. It is in these situations where energy may be used to a great extent.

Urban form

Cities with poor land planning will often end up to be sprawling and take up incredible large areas. It is in these situations that greenhouse gas emissions may be greatened as this creates an inefficient infrastructure resulting in more resources being required to achieve similar actions.

Consumption patterns of residents

In cities where residents are more economically secure, they will have a greater buying power and as a consequence the consumption patterns will change to increase consumption. The consequence of this is that greenhouse gas emissions will be increased as the processes that are integral to sustaining these patterns release greenhouse gasses and in order to meet the demand, the waste products must be made in a larger scale.

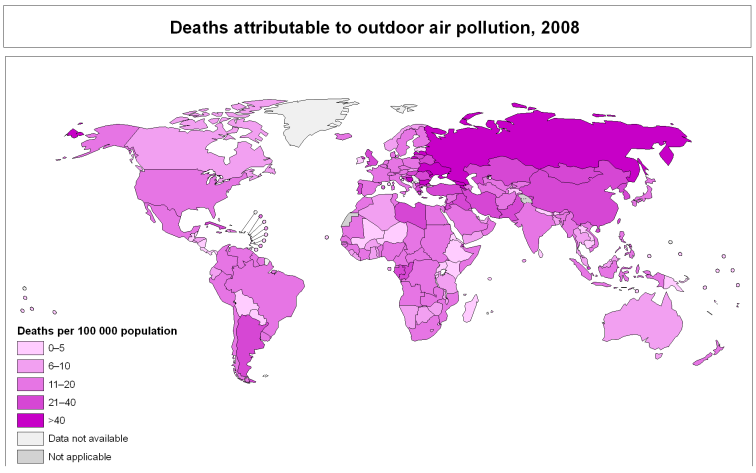
Major Parties Involved and Their Views

China

Due the large scale factory production that occurs within China, levels of air pollution are consistently, inordinately high and as a consequence associated illnesses are rampant; in one single year, 1.2 million deaths were attributed to the air pollution. In 2008, during the Beijing Olympics an emergency plan was introduced entailing the shutting down of many factories and while this successfully reduced air pollution, the economic loss was great and therefore this has not been maintained.

European Commission

The European Commission serves as a body in which policies and regulations made by the European Union (EU) are created and upheld. It is responsible for the Clean Air for Europe (CAFÉ) which served to tackle the issue of air pollution within Europe by setting regulations to which all members must abide. This has been largely successful



Deaths Attributable to Outdoor Air Pollution, 2008
WHO. "Deaths Attributable to Outdoor Air Pollution, 2008." *WHO.int*. Web. 21 07 14 <http://gamapserver.who.int/mapLibrary/Files/Maps/Global_oap_deade_2008.png>.

although there have been instances in which countries have failed to stay below certain requirements as seen in London in which air pollution greatly exceeded legal boundaries in the year 2013.

The Russian Federation

In The Russian Federation, there are an annual 33,000 deaths as a result of air pollution which is notably high for a More Economically Developed Country. This is due to the air in Russia being among the most polluted with over 200 cities significantly exceeding air pollution limits. The problem is so significant that it is the cause of 41% of all respiratory problems within Russia. This stems from the lack of pollution control in Soviet times as it was deemed irrelevant and hindered industry so since the 1990s the pollution has gradually improved.

United Nations Environment Programme (UNEP)

The United Nations Environment Programme is an organisation that was founded in 1972 and concerns itself with environmental issues and therefore air pollution. In order to directly address the issue of air pollutants, the UNEP created the Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants (CCAC) in 2012 in order to raise awareness, improve scientific understanding, and encourage more sustainable practises. The Environmental Data Explorer (EDE) contains the information collected by the UNEP and has been publicised and is used in order study changes in environmental factors such as the quantities of air pollutants in the atmosphere

World Health Organisation (WHO)

The World Health Organisation is an United Nations organisation concerned with the improvement of public health around the world. It has published numerous reports concerning environmental factors as a cause of disease which includes greenhouse gasses. These provide vital information to the general public so that they may be informed about causes, diseases and treatments. Additionally, the World Health Organisation regularly acts a partner to the UNEP and this has given rise to initiatives such as the Health and Environment Linkages Initiative (HELI) which serves to provide guidelines during a countries policy creation

Timeline of Events

The timeline shows that the issue of air pollution in urban centres is a relatively new issue that postdates the industrial revolution. Events such as the Great Smog in London and the 1948 Donora smog served to draw attention to the issue of air pollution. This culminated in the first legislature tackling air pollution to be created by the government of The United States of America. As shown, this has been continued so that even now there are acts made in order to combat greenhouse gasses.

Date	Description of event
1940-1870	The industrial revolution leads to large scale use of fossil fuels in manufacturing
October 28th 1948	Air inversion leading to smog in Donora, Pennsylvania results in the death of 20 people and 7,000 illnesses
December 5th 1952	The Great Smog of '52 occurs in London causes 4,000 premature deaths and 100,000 illnesses
December 17th 1963	Air Quality Act signed into American Law to later become the Clean Air Act of 1970 which leads to the creation of the US Environmental Protection Agency (EPA)
May 4th 2001	The Clean Air for Europe (CAFÉ) is launched in order to address the issue of air pollution within the European Union
September 21st 2007	200 countries agree to completely eliminate the use of Chlorofluorocarbons (CFCs) by the year 2020
2010	The deaths of 1.2 million people in China are attributed to poor ambient air quality
February 16th 2012	The Climate and Clean Air Coalition (CCAC) to Reduce Short-Lived Climate Pollutants is formed

UN involvement, Relevant Resolutions, Treaties and Events

While there have been various resolutions and conferences relating to air pollution there is very little that remains specific to the issue in regards to urban centres which have unique nuances to other areas when it comes to the issue. It is therefore necessary for there to be further UN involvement in the issue at hand.

- UN Conference on Environment and Development, 22 December 1989 **(A/RES/44/228)**

- Programme for the Further Implementation of Agenda 21, 28 June 1997 **(A/RES/19/29)**
- 2012 United Nations Climate Change Conference – Doha, Qatar 26 November 2012

Evaluation of Previous Attempts to Resolve the Issue

It has been repeatedly shown that it within our capabilities to reduce the emissions of greenhouse gasses; in China, in the lead up to the 2012 Beijing Olympics, large numbers of industrial estates were made to shut down either completely or during certain hours due to the inordinately high levels of air pollution and the result was that the pollution was reduced to safe levels. Unfortunately, the economic disadvantages lead to this being discontinued after the event. However, this clearly demonstrates restrictions on industry can be successful in reducing greenhouse gas emissions however future methods must remain sensitive to the economic impacts.

International guidelines, such as those from Clean Air For Europe, have also been successful in reducing levels of greenhouse gas emissions despite there being occasions whereby countries have been unable to stay within required limits. However they may not be suitable for other developing nations that would not view signing on to similar agreements as beneficial towards them.

Possible Solutions

Due to the large number of underlying causes to the issue, there is a need to address them all individually and to make sure that the steps taken work together in a cohesive manner to form as pragmatic a solution as possible.

It is important to consider means in which industrial practices may be made more sustainable and ways to encourage relevant persons to implement them. Actions that penalise large contributors to gas emissions could serve to damage economic prospects which would create a negatively self-substantiating system of unsustainability; however it is important that proper incentives are put into place.

Additionally, a strong educational basis would provide a multitude of benefits. Firstly, it could serve to instil small scale sustainable practices within the homes located within these urban areas to reduce waste of energy and resources which would serve to reduce

emissions. Furthermore, an understanding of the nature of the problem would make responses within the general public more effective as they would know what precautions may be taken and also when there is a problem that needs to be addressed.

Outside of these ideas, the numbers of possible courses of actions are countless and each route has its own benefits. It is therefore important to find suitable measures that directly address the issue whilst bearing in mind the socioeconomic ramifications to their actions and considering their worth.

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