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Analysis of the Causes of Urban Air Pollution, Measures To Solve It

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Abstract: In the process of urbanisation, the lack of attention to environmental issues has led to air pollution becoming more and more serious, with more and more cities experiencing haze and even extreme weather phenomena, posing a huge threat to people's health. Although more and more countries are paying attention to the problem of urban air pollution, they are still not receiving good results. This paper analyses the causes of urban air pollution from the perspective of industrial structure, urbanisation and other aspects, and proposes some measures to solve the problem.

1. Introduction

With the acceleration of urbanization and the increasing complexity of industrial structures, the situation and characteristics of air pollution in cities have changed significantly.[1] The rapid development of industries in everyday life has led to increased emissions of pollutants, such as nitrogen oxides, volatile organic compounds, mercury, and black carbon. As can be seen from Figure 1, secondary pollution in the form of PM2.5 and ozone has hindered the improvement of air quality in some cities and regions. The increase in pollutant emissions has also led to more frequent extreme weather events. As a result, more and more government departments, the scientific community, and the public have become concerned about air pollution. At this stage, the air environment in developing countries is characterized by a complex mix of pollutants, high concentrations, multiple scales, and multiple sources. [2]The choice between environmental quality and economic development has become a problem for many countries. Urban air pollution has become a central issue in the development of many countries, and the damage caused by air pollution has resulted in social and economic losses that cannot be ignored. As shown in Figure 2,

to solve the contradiction between urban development and air pollution, this paper analyzes the causes of air pollution from a realistic point of view, based on the actual situation in most cities. Additionally, effective measures to solve the problem are proposed.

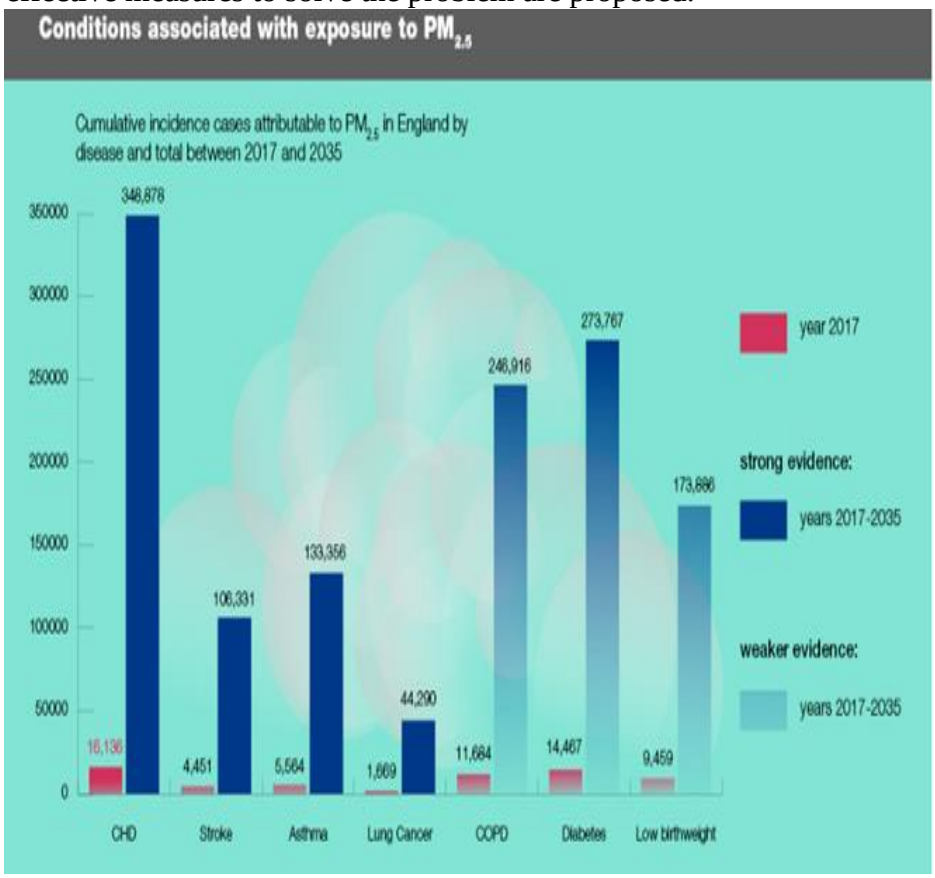

Figure 1. Conditions associated with exposure to PM2.5

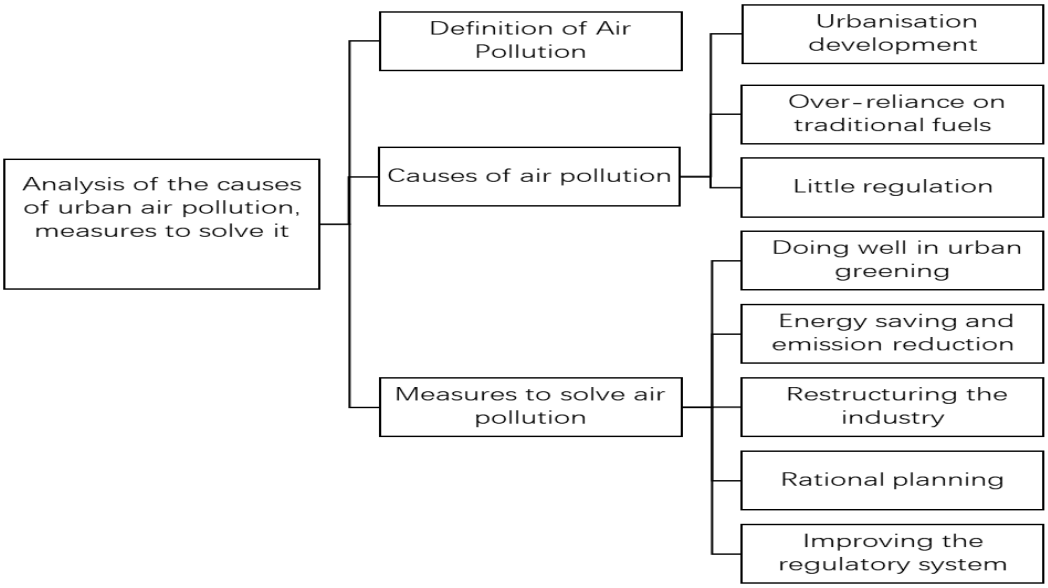

Figure 2. Analysis of the causes of urban air pollution

2. Definition of Air Pollution

The International Organization for Standardization (ISO) provides a definition of what air pollution is, air pollution is a phenomenon in which certain substances enter the atmosphere as a result of human activity or natural processes, presenting sufficient concentrations for a sufficient period of time, and thus posing a threat to the comfort, health, and welfare of humans or the environment.[3] As shown in Figure 3, air pollution is closely related to people's health. In simple terms, atmospheric pollution can be described as substances in the atmospheric environment that can affect humans, other living organisms, and so on due to their various characteristics under certain conditions. It is important to note that not all air pollution causes harm to humans and living things, but only when the quality of the atmospheric environment is degraded to a certain extent does it cause damage to both humans and ecological elements. [4-7] while the atmosphere has the ability to repair itself, the chemical composition or quantity of air pollutants can prevent it from doing so. If the types of air pollution are subdivided, they can be broadly divided into indoor air pollution and outdoor air pollution. Indoor air pollution mainly refers to pollution in closed spaces, such as air pollution in closed office buildings, shopping malls and other places of activity, while outdoor air pollution is mainly regional, open and other characteristics.[8-9]

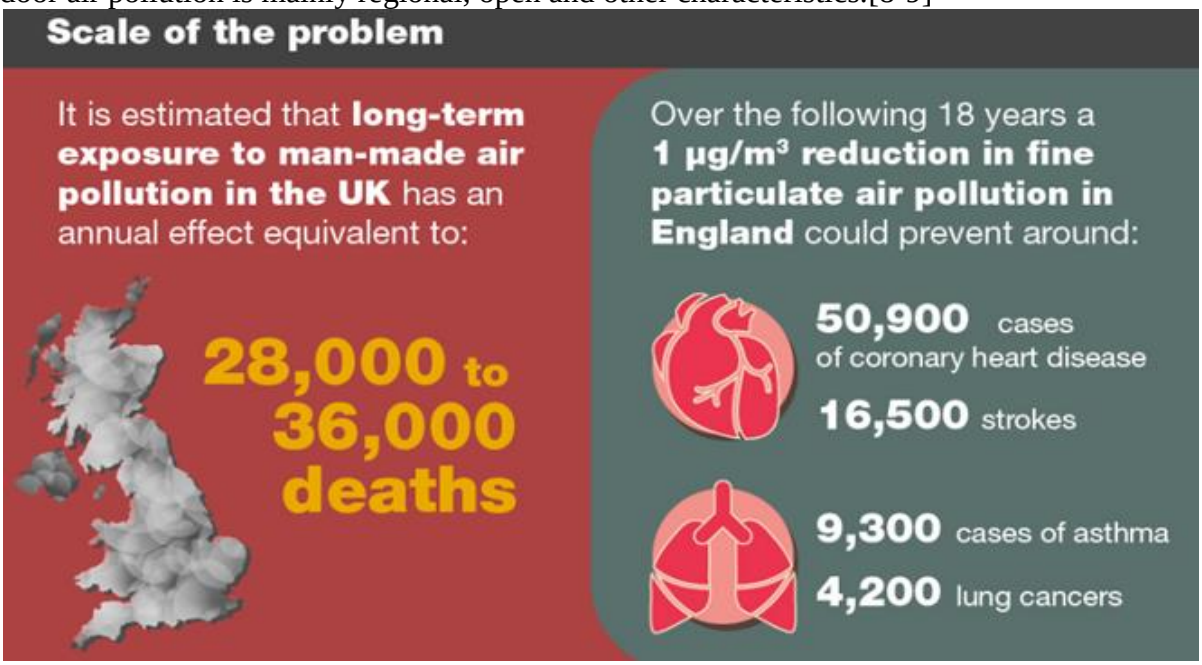

Figure 3. Scale of the problem [10]

3. Causes of air Pollution

3.1. Urbanisation Development

With the rapid development of the urban economy, the process of urbanisation has been accelerating and to meet people's needs, various cities are vigorously developing infrastructure projects. Figure 4 shows the pollution caused by urbanization development. During the construction process, a large amount of dust is inevitably generated and this has become one of the main sources of air pollution. This dust is mainly made up of many large diameter particles of dust, which are often interspersed with many metallic substances, and in the process of air circulation will often breed a large number of bacteria, which will enter the respiratory system when people breathe, thus endangering people's health. In addition, with the development of the city, the scope of the city is

also increasing, people's living standards are constantly improving, and people's pursuit of material and cultural life is also increasing. For example, the demand for private cars is gradually increasing as well as the diversification of leisure and entertainment life. At present, the production of private cars is still on the rise, so the petrol burned in cars and the diesel burned in lorries are causing serious pollution to the environment. The number of motor vehicles is increasing to meet the daily travel needs of people. In air pollution, exhaust emissions from motor vehicles are also one of the main sources of pollution, and the increasing number of motor vehicles also contributes to the increase in air pollution.[11-13]

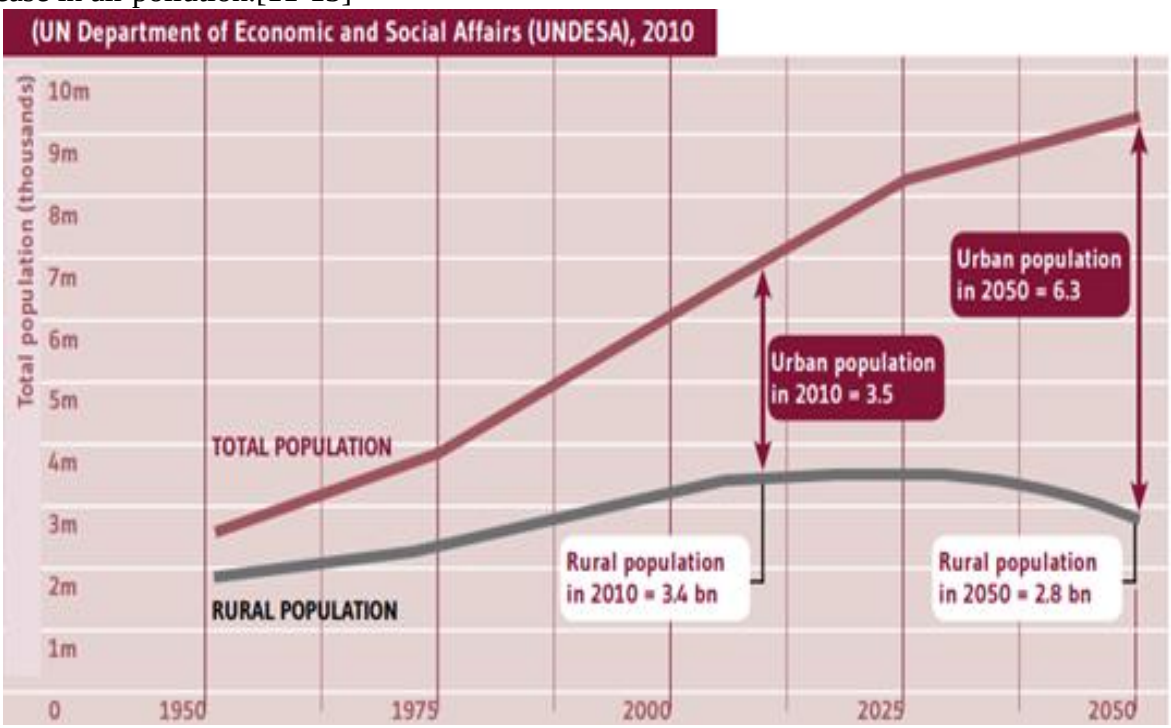

Figure 4. Urbanisation projections, 1950-2050

3.2. Over-reliance on Traditional Fuels

With the development of developing countries, urbanisation and industrialisation are major trends. However, this has also led to a tendency for developing countries to choose "high-input, high-consumption, high-pollution" industries in the early stages of development, which are significant for economic growth but also full of threats to the ecological environment. Studies have also shown that demographic factors, economic size and industrial structure are all positively correlated with carbon emissions. Air pollution in cities can be broadly divided into two types: industrial air pollution, which is caused by industrial agglomeration, and domestic air pollution, which is caused by the agglomeration of people living in the city, mostly through coal burning and domestic waste. Many cities have therefore designated specific areas for industrial production and have a unified plan for industrial production in the city, which facilitates communication and cooperation between enterprises and allows for the unified management of pollutant emissions. At present, in order to protect the environment, countries have been researching alternative sources of new energy. Although some initial results have been achieved in the research of new energy sources, coal is still the main source of the industry as well as life and has an important role in industrial production. The burning of coal generates a large number of pollutants, which can lead to significant pollution of the urban atmosphere. When these pollutants exceed the self-regulating limits of the environment, they can be harmful to the health of the inhabitants.[14]

3.3. Little Regulation

Pollution caused by accelerated industrialisation with the accelerated modernisation of cities, the development of cities has become more and more dependent on industry, and the development of the economy has become more and more dependent on the energy industry and the chemical industry to help, but both of these two areas belong to industries that are seriously polluting in terms of environmental pollution. Coal, oil and other fossil raw materials due to the development of science and technology water can not keep up with the development, making many chemical plants and pollutants can not be well combustion, so the emission of gas with high concentrations of soot, heavy metals, etc., to a large extent increased the burden on the atmosphere, resulting in pollution; and chemical industry in recent years with the development of the chemical industry more and more chemical raw materials appear, pollution of more and more kinds, making The difficulty of management has also increased. Although the development of industrialisation has caused huge losses to the ecological environment, the state's supervision of environmental pollution is not strong enough and the relevant regulatory system is still not perfect. The lack of laws and regulations to regulate environmental pollution is the reason why the public does not attach much importance to environmental protection. This will undoubtedly lead to a decline in air quality.

4. Measures to Solve Air Pollution

4.1. Doing Well in Urban Greening

Do a good job of greening the city to maintain the ecological balance. Plants are always the best "purifier". Plants can absorb carbon dioxide from the air through photosynthesis and convert it into oxygen and water vapour. Sixty per cent of the total mass of the atmosphere above the earth comes from terrestrial plants, and a 10,000m2 evergreen broad-leaved forest can consume 1,000kg of carbon dioxide per day. In addition, some plants can absorb toxic gases. The government should therefore increase its efforts to plant trees and encourage citizens to actively participate in tree-planting activities to improve urban air quality. Cities can develop greening policies according to their level of development and air pollution, for example, by building parks, green areas and botanical gardens in urban areas to increase the coverage of urban vegetation; in sandy areas where the natural environment is harsh, turf and trees should be planted as the main objects, to play the role of a vegetation barrier to protect against wind, sand and dust. The construction process may cause secondary pollution to the atmosphere. It is therefore important that the construction company takes basic anti-pollution measures, such as watering, covering and fencing, to minimise the impact of dust on the urban environment. For most of the public facilities, as they are leaking on the surface, they should be protected with a good dust cover to ensure that the coverage of coal, material and ash piles is at least 95%. For grasslands with serious sanding, rotational grazing, banning and livestock control should be used to improve sanding and minimise sandy weather in the area, which will also reduce the particulate matter content in the atmosphere at the source. [15]

4.2. Energy saving and emission reduction

Energy saving and emission reduction, development of new energy sources. The current energy structure of the world is still dominated by traditional fuels such as coal, which accounts for 73% of the total energy consumed, but in the process of coal consumption, a large number of pollutants such as sulphur dioxide, nitrogen oxides, carbon monoxide and suspended particles are emitted. The solution to the air pollution problem is therefore to improve the energy mix and develop new sources of energy. In terms of improving the energy structure, we can use more secondary energy

sources such as natural gas and gas; in terms of developing new energy sources, we can focus on developing solar, wind and geothermal energy sources. However, as coal is still the dominant source of energy, to improve the current environmental situation, we should first promote the production and use of washed coal, etc., so as to reduce the emissions of sulphur dioxide. The use of energy is currently low due to the irrational use of energy, and serious thought needs to be given to how to make the best use of the limited energy available. Only if this problem is solved will the prevention and control of air pollution be greatly improved. [16]

4.3. Restructuring the industry

Adjust the industrial structure and optimise production patterns. The most effective way of solving air pollution is to adjust the existing industrial structure. For the sustainable development of a country, enterprises with high emissions, serious impact on the ecological environment and low resource utilisation should be shut down or, in serious cases, closed down. At the same time, enterprises with low emissions, high environmental protection and high resource efficiency should be developed. By rationalising the production pattern of enterprises, optimising the structure of their production and operation, and combating pollution, the industrial layout should be optimised, thus completing the task of industrial restructuring. For the tertiary and high-tech industries, the state should give certain policy preferences to promote the growth of enterprises and urge them to develop in the direction of low carbon, low pollution and low consumption. In the context of developing a circular economy, enterprises should carry out energy-saving and emission-reduction work following the relevant national regulations, minimise the number of pollutants emitted and actively follow the national call for cleaner production, to better protect the atmosphere. The government should also strengthen the supervision and management of highly polluting and energy-consuming enterprises. Enterprises should be required to reflect on and rectify their situation, and retrofit their sewage treatment and exhaust gas treatment facilities. The government should also organise learning sessions on the scientific use of resources and transfer the cost of environmental protection to maximise the use of resources so that enterprises will pay attention to environmental protection while ensuring their profits.

4.4. Rational planning

Make comprehensive arrangements and rational planning. Local governments should minimise vehicle emissions by rationally designing roads. In recent years, the number of motor vehicles in cities has been increasing as a result of the increasing pace of economic development, and the huge number of motor vehicles has not only put enormous pressure on urban traffic but also seriously affected the urban environment. Therefore, the reduction of vehicle emissions and the rational planning of urban roads should be the most important measures in the fight against air pollution. The government can plan the traffic arteries that are often congested according to the specific traffic conditions, make reasonable arrangements for the installation of roads, and introduce a corresponding traffic restriction system. Large lorries, they should be allowed to travel on bypass roads and not in urban areas. Strictly manage the registration of new vehicles. For newly purchased vehicles, the registration before, must do a good vehicle exhaust test, if the exhaust content does not meet the relevant provisions, then the vehicle management department can not handle the relevant procedures for it. At the same time should also do a good job of daily inspection and supervision, do a good job of random inspection, roadside inspection and annual inspection, for the exhaust gas failed vehicles, should be allowed to install the corresponding purification device, so as to control the vehicle exhaust emissions.[17]

4.5. Improving the regulatory system

Improve the regulatory system and increase supervision. As more and more people pay attention to environmental issues, localities should actively improve the relevant testing methods and standards regarding environmental pollution monitoring. To be able to accurately understand and evaluate the state of air quality and the necessary supervision and management of ambient air pollution. Taking China as an example, China has formulated and issued relevant ambient air quality standards and air pollutant emission standards one after another, taking into account the country's development path and the current state of pollution. Among them, the ambient air quality standards are based on the Law of the People's Republic of China on Environmental Protection and the Law of the People's Republic of China on the Prevention and Control of Air Pollution. Its purpose is to improve ambient air quality and prevent ecological damage, thereby creating a safe and suitable living environment for urban residents and protecting human health. Only with clear monitoring standards can we better regulate the various industries more strictly and improve the current situation of urban air pollution.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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