

Smog can Cost More than What We are Earning Now: A Case Study of Fangshan District in Beijing, China

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Abstract Smog is a kind of air pollution, which is really a serious environmental problem that can be found all over the world, and it is mainly caused by industrialization and urbanization. It is covering most of regions in China recently [28]. According to Xudong Zhu (2013), ninety percent of causes of the smog are from human movements, especially movements on energy consumption and pollutant discharge, especially from the industrial production. In this study, a research on the causes of smog at general level and local level of Fangshan has been done. Also the impacts of smog on human health and socio-economic development have been analyzed; the study researched on the impacts only based on aspects directly related to human wellbeing. Both the discussions on causes of smog and on impacts of smog on human wellbeing from three perspectives, the global perspective, the national level that focusing on general information of China, and the specific discussion on smog in Fangshan, which is the local level. The reason why Fangshan has been chosen as the specific spot is that Fangshan now is impacted by smog seriously, and this study is done for calling for attention on the impacts of smog on human beings, particularly in Fangshan, which could be an increasingly terrible environmental problem for every state in the world.

Keywords Smog, Beijing air pollution, Human health impacts, Socio-economic impacts, Industrialization and urbanization

1. Introduction

The rapid urbanization and the extraordinary inspiration of urbanism of some places like Fangshan, have led to serious environmental pollution such as smog, and this kind of air pollution is always considered as borderless problem. So many experts state that urbanization should be sustainable in terms of economic and environmental development. For achieving the sustainable development and appropriate urbanization, environmental pollution like smog should be understood and eliminated, this research has been conducted to help people understand the causes and impacts of smog. This study is based on secondary data from library research and it is focusing on one kind of air pollutions that is called smog. In this report, I am going to discover how recent urbanization become the main cause of the smog, and more importantly, how the smog have impacts on human welfare including human health and socio-economic development that closely related to human life. Smog is now become an increasingly serious environmental problem over the world, especially in China, nearly three-quarters areas in China are influenced by the smog [28], and the living quality of human

beings somehow has been reduced by the impacts of smog. Here the particular place, Fangshan District in Beijing has been chosen to be the representative of places in China that harassed by the smog and it is where this study is focusing on.

The objective of this study is to illustrate that how environmental pollution like smog is caused by the so-called urbanization, and what the impacts of smog on human beings are, furthermore, to call for attention on the necessity of policy modification that aims to the more appropriate urbanization model, and to make people take the environmental health into account in order to achieve the sustainable development and urbanization. Also this study might be helpful for further study on policy making to the smog that caused by inappropriate urbanization.

Urbanity is a way of life that linked with urban life and civilization, and urbanization is the process of achieving urbanity [20]. According to the World Development Model that created by Chenery and Sequin in 1975 [9], the early stage of urbanization is heavily based on industrialization, which means the mass production method and utilization of resources and technologies. And environmental pollution or environmental externality is always being the companion with the industrialization, especially the current industrialization in the least developed countries [25].

Usually smog does not appear within relatively high moisture content, which is the main feature that

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meteorologists use to distinguish smog from fog. If the relative moisture content is less than 80%, the poor visibility is caused by smog. And there is no clear dividing line between smog and clear zones since the particulate matters are evenly distributed in the air [8].

Many historical experiences on the internationally urbanized cities, for instance, the London Smoke Disaster in 1952 [23], the smog disasters in United States within the past decades in Pittsburgh, Donora and Los Angeles, also the smog disasters that happened in Yokkaichi, Japan, since 1955, also the smog impacts in Germany and Italy since the start of industrialization period [1]. From the international examples above, the conclusion could be that smog can be seen as the result of rapid development of industrialization, and the situation of smog disasters has become the most serious problem in these more industrialized countries when they were at the peak process of the industrialization and mass production. Based on the historically international experiences, smog might be defined as the necessary process that a country needs to pass in order to achieve the statement of high level of industrialization and urbanization, at least with respect to currently popular development models of most countries in the world. Recently, smog is more likely to happen in countries with rapid developing countries related to industrialization, according to the smog report on LA region, it has not gotten rid of the disaster of smog yet and impacted by it seriously [4]. Internationally, smog has becoming an environmental problem that has impacts on human health and socio-economic development in more industrialized countries.

Smog, and other air pollution like green gases, has become big issues world widely. The Paris Framework Agreement on Climate Change [11] has addressed the issue of industrial discharge and the greenhouse gases abatement internationally, which insisted the command and control approach and economic incentives for solving the problem. Thus it can be seen that the problem of air pollution like smog has being the international problem and need to be controlled and reduced since its impacts on human beings and the whole environment.

In the case of China, China is experiencing rapid industrialization and urbanization; it is in the process of urban transition and the flourishing era of industrialization. Although the urbanization and industrialization have bringing the rapid economic development and political development to China and are making China become powerful in the world pattern recently [29], on the other hand, there have been many environmental problems caused by the uncontrolled industrialization for maintaining the rapid economic growth, smog is one kind of the environmental pollution and nowadays it has becoming the core environmental issue in most part of China since the impacts it can cause [21].

Based on the analysis from Sun (2013), smog has not only appeared in China, it is a common phenomenon in many urban societies. The particulate matters that form smog are basically from human activities such as industrial production,

agriculture, and tail gas from transportation; at the same time, the particulate matters combined with the local environmental factors, so that smog has become a problem in the area [21]. In China, the problem of smog is more serious and expanding within the northern part of the mainland, according to the data from the Platform of National Air Quality on January 14, 2013, there have been 33 cities that were seriously impacted by smog, and most of them are located in the northern part of China [26]. From the analysis of Wang (2014), the main reason why the problem of smog is worse in northern cities is because of their long-term experiences of industrial production, especially production of energy and steel industries, also their colossal heat supplying system. In sum, the northern part of China could be seen as the dominant region of industrialization of China, so the situation of smog is quite serious in the region. Within the region, Fangshan District in Beijing could be seen as a significant site of smog polluted cities [6].

2. Methods

2.1. Research Site

As illustrated in the Figure 1, Fangshan is a district at the southern west of Beijing, China. It is an industrial district where providing land for construction of an industrial park, at the same time, Fangshan is the place where a huge amount of factories assembling. And also it is next to Tianjin and Hebei, where are the important producing areas of energy and steel industries [3]. Industrial activities are the main factor that causes smog in urban areas, especially the energy and steel industries, so the situation of smog in Fangshan cannot be optimistic.

Based on the data from the Beijing Municipal Environmental Protection Bureau, the number of complaints on smog from citizens in Fangshan has been increased monthly, also the increasing value of concentration of PM 2.5 and PM 10, which are the main indices of degree of smog [2] tells the fact that the smog in Fangshan is a quite serious environmental problem. The problem of smog in Fangshan has impacts not only on environment but also on people who live there, including impacts in terms of human health and social development. Next, there is the discovery on how people live in Fangshan have being impacted by the problem of smog.

The data from Fangshan Statistical Information Net (2014) said that in the year the consumption of energy has been increased, of which the consumption of coal increased by 3.7%, the consumption on gas increased by 3.4%, and the use of liquid gas has been increased about 329.7%. And the scales of use of natural gas, electricity, and the heating system have been expanded as well; the utility of cars also has been increased around 15% compared to the year 2013. Due to the increase of energy consumption in 2014, density of PM10 has been raised by 7.5%, and the density of Pm2.5 was 106.8 micrograms per cubic meter, which is excessive to the national standard of China at 75 micrograms per cubic

meter, and far away beyond the standard of WHO at 10 micrograms per cubic meter [7]. According to the information that has been mentioned above, PM₁₀ and PM_{2.5} are the main components of smog, so that the situation of smog has been worsened in Fangshan within the same year. Also the undocumented information said that the illegal production of many firms in Fangshan has energetically contributed to the generation of smog. For example, for saving the costs, big companies always have informal contracts with the illegal firms to production, but the illegal firms have no equipment dispose pollutants correctly, also they do not want to do so, so that there is increasing smog in Fangshan and no company could be responsible for that (Antedotal evidence, 2015/7/16).

Smog is one of the serious environmental pollution that closely related to industrialization and inappropriate urbanization. The harmful components of smog are PM_{2.5} and PM₁₀ are mostly from automobiles and industrial pollutants. Through the instances of globally urbanized cities and what China has experiencing, the causes of smog could be concluded that the modern transportation system, mass and rapid productions generally are the main causes of smog all over the world. And particularly, in areas in China like Fangshan, the massive use of heating system and some illegal production have accelerated the spread of air pollution such as smog. In sum, environmental pollution is inevitable of the process of urbanization [17], but the inappropriate urbanization has made the situation become increasingly serious. In this sense, the causes of smog could be seen that is very closely related to rapid industrialization and the urbanization being burning with ambition.

Based on the official statement from Environmental Protection Bureau [31], the air quality of Fangshan was the worst in Beijing. Besides invisibility, the air was also stinking, especially in cold seasons; many areas in Fangshan are confronting smog issues, the visibility is very low, which can make lives of people inconvenient at the moment, and further impacts have been found related to human health and socio-economic developments. Fangshan is low-lying and surrounded by mountains, which means dusts cannot easily go out from the area. They have mentioned about a environmental expert who did not want his name to be used, the expert indicated that the bad air quality in Fangshan not only caused by the geographic characteristic but also other factors that relate to construction, transportation, and discharge from factories.

2.2. Conceptual Framework

This study was mainly focus on the impacts, especially the impacts on human health and socio-economic development. Besides the particular situation in Fangshan District, some international instances have been considered useful for studying the impacts of smog. Based on the conceptual framework in Figure 2, smog is mainly related to rapid industrialization and urbanization, for achieving goals for economic development, industrialization and urbanization seem to be necessary for many countries. But at the same time, those countries ignore impacts. The major part of this study is looking at the impacts can be caused by the smog, including impacts on human health, and socio-economic development.



Figure 1. Localization of Fangshan District, Beijing (resource from weather-forecast, com)



Figure 2. Conceptual Framework of the Study

3. Findings and Discussion

The increasing consideration of smog in international, national, and local level has been caused by the serious impacts from smog on human beings, for instance, human health and socio-economic development related to human wellbeing.

3.1. Impacts of Smog on Human Health

There are lots of example of impacts of smog on human health internationally, also recently in China, the increasing close attention that governmental institutions pay to those impacts since China has being impacted by smog seriously since its booming in industrialized production and efforts for being urbanized.

The London Smoke Disaster in 1952, within five days, there were more than five thousands people died because of the impacts from smog in London, and it influenced health condition of more than 100 thousands people. There were around seven hundred people died for bronchitis, more than 5 hundred people died for cardiovascular diseases, and about 1 hundred people died for pulmonary tuberculosis. The impacts from smog led people who had suffering from the illness above to flare up of the diseases and eventually become dead; on the other hand, the impacts also made people who had been healthy to be riskier for having cancers, cardiovascular diseases, and bronchitis, during the months after the London Smoke Disaster, there have been more than 8 thousand of people who subsequently died [23]. Then looking at the smog impacted on human health in United State in the past decades, Twice of smog disasters in Los Angeles, United States have caused deaths of 800 people respectively in 1952 and 1955 and later Los Angeles has being called the Smog City of United States and since then many people have getting cardiovascular diseases, respiratory diseases, and lung cancer [22]. In Japan, not only many people have getting higher risk of being sick, but also the situation for people who already have above diseases become dead or more seriously sick [12]. In 2013, the organization International Agency for Research on Cancer (IARC) [18] has classified air pollution like smog into the main environmental causes of cancers. Also there is impact on psychological health of human beings that caused by smog [19].

In the past three decades, the lung cancer patients in China has been the four-fold compared to 30 years ago even though the population of people who smoke has been reduced. And people who died because of cardiovascular, respiratory diseases and lung cancer have increasing [24]. More than 50

percent of recorded deaths caused by sickness were coming from the diseases related to smog, including cardiovascular diseases, diseases of respiratory system, and lung cancer, and the proportion of these types of diseases of the medical record was quite large. Also the population of people who have being suffering from the diseases has been increased compared to decades ago and the life expectancy of both males and females in the district has been reduced around 3-5 years from the acceleration of industrialization and urbanization [14].

On the other hand, smog causes depression and psychological diseases like seasonal affective diseases (SAD) to people who live in Fangshan in a relatively long period, since there will be less sunlight during the smog season, people will feel depression [10].

In sum, smog impacts on human health not only during the period that smog is appearing, but also the later periods. And smog causes people who have cardiovascular, respiratory and lung cancer to be more seriously sick or even die, it also makes healthy people to be risky to get these diseases and some psychological diseases.

3.2. Impacts of Smog on Socio-economic Development

Smog does not only impact on human health, but also has impacts on socio-economic development that closely related to economic and social wellbeing of people. Above the impacts of smog on human health are directly linked with the physical wellbeing of human, and the socio-economic development seems to be indirectly related to human wellbeing in terms of economy and social activities [17].

Generally, smog impacts on socio-economic perspective of human life through two basic dimensions, the first one is the direct socio-economic loss and the other one is the indirect socio-economic loss. The direct socio-economic loss is easier to be observed and defined, for example, the loss on transportation activities during smog days, the investment of recovery of pollution, and some other aspects of capital input that could be measured by monetary measurements. But the indirect socio-economic loss is always linked to the decrease of labor productivity, the multiplier effects from the direct socio-economic loss [27]. The Buford Report (1954. Cited in [5]) said that air pollution includes smog caused the United Kingdom suffered from the annual economic loss around two hundred and fifty million ponds, and the later technological and economic research program on air pollution has increased the number to four hundred million ponds annually. In the past decades, many countries include United States; have implementing policies like economic incentives or some taxation on environmental pollution, especially on air pollution. The economic incentives require the increasing amount of governmental expenditure on environmental control; and the taxation policies sometimes cause impacts on industrial productivity and economic growth [17]. As most people know that the marketable pollution permit is the significant of strategy that created for controlling environmental pollution, which has been

categorized into the realm of economic incentives, the idea is based on target pollution level and distribution of pollution permit, which has made the amount of pollution become tradable, and firms could consume or sell the permit. Although the methods of pollute permits runs well, sometimes it discourages the development of small-scale firms [16].

The social economic loss that caused by smog are generally divided into two categories, they are direct socio-economic loss and indirect socio-economic loss. Direct economic loss includes transportation loss, health care loss, and expenditures on objectives replacement and cleansing. The decrease of visibility during smog days directly pause the transportation by roads, sea, and air. The increase of demand on cleansing and replacement of objectives that have been corroded by the chemical matters from smog substantially increase the expenditure of society. And people will experience other indirect loss in long term like food security problems and international responsibility; also it could be seen as the extension of direct socio-economic loss [32].

In China, smog impacts mostly on transportation system and industrial sectors. On December 4, 2013, the efficiency of solar electricity generation has been reduced about 20%; also it impacts much on animal cultivations in China. Because the productivity of many industries, especially energy industries has been reduced, the prices of energy has been increased, also the prices of food has been increased since the reduction of animal cultivations. From 2010 China's economy has been slowed down for 13 percent, eventually, the stock market has been shocked by the impact [19]. And based on the idea of Jian Zhuang (Cited in [30]), who is an economist and economic adviser in Asian Development Bank, the impacts on China's economy from smog will finally influence the economy of the whole world. Annually, the socio-economic loss caused by air pollution in China equal to 3.8% of China's GDP. The smog disaster in January 2013 has caused the direct socio-economic loss around 23 billion Chinese Yuan, and indirect socio-economic loss based on health services was about 22 billion Chinese Yuan [19].

The impacts from smog to socio-economic development are also enormous. In 2014, although the energy consumption has been increased, the contradiction of industrial output value happened. The output value decreased about 4%, and the profit that made from industry was even negative 2.7 billion Chinese Yuan, which is valued more than 0.4 billion US dollars, which has been caused by the governmental limitation on the firms for reducing smog. And the governmental expenditure on eliminating smog has been raised by 27% compared to the year 2013 [15]. Then there are impacts on transportation system as well, for example, the Fangshan Transportation Bureau has stopped 60% of cars from using during the smog days in 2015 [13], which means there was economic loss from less ability for transportation of goods, also it brings people inconvenience on journey. So smog has bringing socio-economic loss on

industry, governmental expenditure, and transportation related activities.

In conclusion, smog impacts on human beings basically on human health and socio-economic development. From the global and local experiences of places where smog has appeared or has appearing, people who live in smog have higher rate of getting diseases such as cardiovascular disease, bronchitis, and lung cancer, this statement has been shown from some medical reports. And for people who already got those diseases, they have increasing mortality rate related to the diseases. The other type of impacts from smog on human beings is the socio-economic impacts. This kind of impacts could be categorized into two sub-types, the direct socio-economic impacts and the indirect socio-economic impacts. The direct impacts refer to loss of capital directly caused by smog, and the indirect impacts mean the follow-up loss related to the direct impacts, for instance, the abatement costs and increasing public health expenditure. More importantly, the impacts do not only refer to monetary loss, but also refer to emotional impacts such as people's feeling about the impacts since there have been a lot of people got mental diseases because of the smog, directly and indirectly. The impacts of smog are more than what the report has stated, but here the focusing point is only the impacts of smog on people. People lose health and economic development because of the impacts of smog. Recently, some international organizations such as United Nations, they are concerning on the issue and have publishing academic reports looking for the solution of smog and other environmental pollution, also some goals have been made for reducing the impacts of the problem.

4. Conclusions

Smog is a kind of air pollution that caused by inappropriate industrialization, and industrialization is an important process of urbanization towards the urbanism. According to the past experiences and recent situation of some urban cities, that are closely related to industrialization. Based on the general knowledge of chemical analysis and experiences of some issues, smog impacts on not only human health but also socio-economic development. This report has introduced either the impacts on human health and the impacts on socio-economic development based on three perspectives. From the chemical analysis, we could see that the components of smog have strong impacts on human health, those particulate matters could eventually cause people's death, also they increase the rate of suffering from illness such as cardiovascular disease and disease of respiratory tract. Also from the past experiences of worldwide famous urban cities like London and Los Angeles, large amount of people who with those diseases died and more people have gotten the diseases during the period of time. The experiences could explain about the impacts of smog on socio-economic development, for example, the direct loss related to transportation; and the indirect loss such as the loss of production that related to the loss of

transportation, and decreased labour productivity. Specifically in Fangshan, where is a district could be seen as one of the industrial centers in Beijing, recently is experiencing the serious impacts of smog.

The impacts of smog on human health and socio-economic development nowadays are addressing increasing concern over the world. Here the report did the research on causes and impacts of smog on human health and socio-economic development generally and specifically Fangshan district in Beijing, which could call for attention of people to care about environmental issues caused by urbanization. This study could contribute to environmental conservation in urban areas such as Fangshan based on the anthropological perspective. Furthermore, the study on impacts of smog on other aspects, for instance, the impacts on ecological system should be taken into account as well, since for many deep ecologists, environmental pollution eventually causes circulate environmental degradation.

Understanding the causes and impacts of smog could help people to build the awareness of how serious the situation is and the situation in future can be more terrible if the smog cannot be reduced. Development in the present time should not be at the cost of future, especially when how enormous the price will be is not predicted.

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