Research on the Issues and Solutions of China's Law of Prevention and Control of Atmospheric Pollution

by

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ABSTRACT

In recent years, the total amount of air pollutant emissions in China was reduced year by year, but pollution is still very serious, especially in some big cities where the environmental pollution has worsened in the last 20 years. The "Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution" (LPCAP) was established in 1987. With the development of industrialization and air pollution changes, it had been revised twice in 1995 and 2000.The third revision of the law began in 2009 which was included in the "Eleventh five-year National People's Congress Standing legislative plan" and the State Council's 2009 legislative program. At present, the third revision of the LPCAP is in progress and MEP has completed the manuscript of the revised draft of the law.

The purpose of this study is to explore the current situation of China's air pollution, as well as history of LPCAP, analysis of amendments in atmospheric legislation and the achievements of the LPCAP. Combined with China current situation, the research exposed some urgent problems of the Chinese atmospheric legislation which are related to:

- The issues of the regional Total Emission Control (TEC) policy and division.
- The issues of allocation of pollutant emission allowances and trade policy
- The issues of improving the pollution emission permit system.
- The issues of the mobile source emissions management.
- The issues of fuel management.

- The issues of the guarantee measures of the implementation of the LPCAP.

In addition, the study compares the LPCAP with the U.S. CAA to offer some solutions for the third revised law and tries to find a fundamental solution for the flaws of China's existing Atmospheric Pollution Prevention legal system to be more Operable. As a result, the gap in air quality in China and the developed countries of the world will be narrowed and China will be better positioned for sustainable development.

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LIST OF ACRONYMS

API.....Air Pollution Index

CAA.....Clean Air Act

CEB.....China's Environmental Bulletin

CSEPA.....China's State Environment Protection Agency

EPA…….....…….Environmental Protection Agency

GDP.....Gross Domestic Product

GNP.....Gross National Product

LPCAP.....Law on Prevention and Control of Atmospheric Pollution

MEP.....Ministry of Environmental Protection

MOA.....Ministry of Agriculture

NISSCAS.....Nanjing Institute of Sciences Soil of the Chinese Academy of Science

PAH.....Polycyclic Aromatic Hydrocarbon

PCVPC..... Professional Committee of Vehicle Pollution Control

SEPAC.....State Environmental Protection Administration of China

TEC.....Total Emission Control

TEC.....Total Emission Control

UNFCCC.....United Nations Framework Convention on Climate Change

WHO.....World Health Organization

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CHAPTER 1

INTRODUCTION

The last six decades have witnessed the unbelievable rapid development of modern Chinese history in the field of industry, agriculture, and economy. The Chinese economy had to start over from the ashes of World War II. The "recovery and development period" was a really hard period because of the war and natural calamities. Tens of millions of people died of cold and hunger (Cehui, 2000), but the new country went though the "reform and opening-up" period within the last 30 years. During that period China turned into a modern agricultural society which also became a commercial society and explored a path of socialist modernization that conforms to China’s conditions and the trend of the times.

China's shift toward a market economy in the past two and a half decades was not taken in isolation from world trends. "When Deng Xiaoping introduced the "open/reform" policies in 1979, toward the end of the Cold War, it was a rational response to a world infatuated with the extravagant promises of neo-liberal free trade. A quarter of a century later, while such open/reform policies have achieved spectacular results in bringing China forward into a modern interdependent world, the glaring resultant imbalances, such as excessive dependence on exports, worsening income disparity, regional development gaps, rampant official corruption, serious environmental crisis and near-total collapse of the social-service network and safety net,

are raising calls for rethinking the wisdom of falling for the empty promises of neo-liberal globalization." (Asia Times. 2006)

Overcoming setbacks and difficulties, Chinese people had advanced with the times, drawn on experience from the development of China itself and other countries, deepened understanding that the law governed the development of human society, and promoted the self-improvement and growth of the socialist system. Through arduous struggle, the Chinese people have succeeded in finding a path of development conforming to China's reality — the path of socialism with Chinese culture.

Socialism is defined as the following:

> Socialism is an economic system characterized by social ownership or control of the means of production and cooperative management of the economy, and a political philosophy advocating such a system. "Social ownership" may refer to any one of, or a combination of, the following: cooperative enterprises, common ownership, direct public ownership or autonomous state enterprises. There are many variations of socialism and as such there is no single definition encapsulating all of socialism. They differ in the type of social ownership they advocate, the degree to which they rely on markets versus planning, how management is to be organized within economic enterprises, and the role of the state in constructing socialism.(Wiki, 2012)

China’s overall strength has grown considerably. Its total economic output reached US $5.88 trillion in 2010, over 16 times that of 1978, rising to 9.3% of the world’s total from 1.8% in 1978. The material basis for China’s modernization drive has become more solid; steady progress has been made in turning China into an industrialized, information-based, urbanized, market-oriented and internationalized country, and the cause of socialist development is being advanced in all respects (Xinhua net, 2012).

The Chinese people, once inadequately fed and clad, are leading a decent life on the whole — a historic breakthrough. China’s per capita income grew from 24.9% of the world average in 2005 to 46.8% in 2010. A historic transformation from a highly centralized planned economy to a dynamic socialist market economy has been achieved in China. "A basic economic system in which public ownership takes the lead and different economic ownerships grow side by side has come into being. The market plays an increasingly important role in allocating resources, and the system of macroeconomic regulation is improving. A social security system covering both urban and rural residents is taking shape, and culture, education, science and technology, health care, sports and other social programs are flourishing. However, owing to the nation's unique process of industrialization, new conflicts and problems have emerged."(GOV. 2011)

As the Chinese industrial economy rapidly increases, pollution has sharply escalated. What's worse, Chinese are insensitive to the pollution which made the

pollution even more serious. In addition, car and motorcycle traffic have filled up the road greatly. The population of China is around 1.3 billion which is more than four times as much as the U.S. China is short of cultivated land. In spite of this, the Chinese government is still developing the private car industry greatly. New highway construction takes up large areas of land and traffic accidents are increasing widely. In 2003, 200,000 people died in traffic accidents in China (Qin, 2004)

Water issue in China

Additionally, China also faces two serious problems regarding water: lack of water and water pollution. The total volumes of water in China is the 6th largest of the world, but the per capita water amount in China is only 25% of the average level in the world (Xinxiang, 2008).

Most of the lakes and rivers in China are polluted to varying degrees. Water pollution is found in many forms. Contamination of water can occur due to city sewage and factory wastes; the runoff of fertilizer and manure from farms and feed lots; sudsy streams; sediment washed from the land as a result of storms, farming, construction and mining; radioactive discharge from nuclear power plants; heated water from power and industrial plants; plastic globules floating in the world's oceans; and female sex hormones entering water supplies through the urine of women taking birth control pills. The eutrophication has occurred in nearly 75% of the lakes, and more than 90% of urban water was polluted. Seven major river basins in the country were polluted; the Tai Lake, Huai River, and Yellow River Basin are more than 70% contaminated; during

certain times of the year, the Hai River and Songliao basin contamination can reach rather severe conditions with more than 60% river pollution (Guilin Xu, 2000).

At present, water pollution has become China's most important environmental issue. Around 60%-70% of the water shortage of the southern cities in China was a consequence of water pollution. The investigation of the underground water in118 large and medium-sized cities, illustrated that 115 of them were polluted and 40% of them were severely polluted areas. In China's forest, 6 billion tons of industrial wastewater and sewage was discharged into the sea every year (Wenhua, 2003).

Soil issues in China

Another source of pollution which is evident in people's daily life is the soil contamination. In recent years, due to the sharp growth of population, the rapid development of industry, solid waste to soil surfaces, wastewater infiltration in soil, the harmful gas in the atmosphere and floating dust combined with rain landing in soil, has led to soil pollution. These factors hinder the normal function of soil and reduce crop yield and quality. The pollution infuses grains, vegetables, and fruits, indirectly affecting human health.

Alone with the aggravating industrial, municipal pollution and the heavy utilization of chemical fertilizers, heavy metal soil pollution gets worse. Pollution levels are intensifying and the areas gradually expand every year. Soil contaminated by heavy metals has long retention time and poorly microbial degradation in soil, but can

go with water and plants into the human body to cause harmful effects (Xiaoshuai, 2009) .

According to the national irrigation survey by China's Ministry of Agriculture (MOA), within about 1.4 million hm^2 of the sewage irrigation area, 64.8% of the area suffered heavy metal pollution, out of which 46.7% experienced slight pollution, 9.7% had moderate pollution, and the heavy pollution was documented as 8.4%. Every year, 10 million tons of failed harvested food directly resulted from heavy metal pollution, and 12 million tons of harvested grain were under the influence of heavy metals (China MOA, 2011)

In addition, organic contamination is also a problem. For example, from 1959, around the middle and lower part of Yangtze River, people used pentachlorophenol sodium to prevent Schistosomiasis, but as a result, one of the by-products of pentachlorophenol is DDT which had polluted this area. High content of dioxin was found at the bottom of Dongting lake and Poyang lake (Chongqing Agriculture Committee. 2006). Although, organic chlorine pesticides had been banned in the past 20 years and remains in the soil had been greatly reduced, the detection rate is still extremely high. 99% of the vegetables from Guangzhou were detected containing benzene hexachloride and 100% of them containing DDT. In some areas the highest residual quantity was still more than 1mg/kg (Ji. 2007).

In the meantime, along with quickening of the process of urbanization and industrialization, soil organic pollution is spread throughout the cities and industrial zones. Nanjing Institute of Sciences Soil of the Chinese Academy of Science (NISSCAS) inspected the soil around an iron and steel plant. The study revealed that in the agricultural soil, the average of the total amount of 15 kinds of PAHs were 4.3mg/kg and also most of them with tetracyclic organics were carcinogenesis, which occupies 85% of the gross. Only 6% of the sample points were still in the safety level. In the industrial soil, the contamination is extreme compared to the agricultural soil contamination. High carcinogenic substances such as PCBs, PAHs, PVCs, herbicides and butachlors, etc were exceedingly difficult to monitor and the concentration of these substances were many times more than the national standard (NISSCAS. 2009).

In this research, I will discuss China's air pollution in Chapter 2 as well as the development of China's atmospheric protection law in Chapter 3. In Chapter 4, I will introduce the achievement of LPCP in the last 25 years. In the background of the revising of the LPCAP by the MEP right now, I try to put forward some issues of the current LPCAP and compare it with the CAA of the U.S to improve the LPCAP in the last two chapters.

CHAPTER 2

AIR POLLUTION STATUS IN CHINA

Air pollution is a global environmental problem which is worth paying attention to (Helmut. 1999). A great deal of energy is required to run the factories of the modern industrial nation as well as automobiles, trains, planes and buses. Nearly all of this energy is generated by burning fuels. The burning produces wastes, some of which remain in the air, causing air pollution. The emission of chemicals from power stations will generate large amounts of pollution which could travel thousands of miles with the wind until falling to the ground in the rain, which is known as acid rain. However this "chemical rain" gradually destroys trees in forests and kills fish in water. In1986, in Germany, over 50% of the country's trees had been damaged by acid rain in just one year (MEP 2009).

In recent years, the prevention and control of air pollution in China has made great accomplishments, but due to various reasons the atmospheric environment in China country is still confronted by dreadfully serious situations. Most cities across the country exceeded the national standards of atmospheric environmental quality. Research on 47 major cities in China, shows that more than 70% of the urban atmospheric environmental quality cannot reach the secondary national standard which is the area used for residential community, business and culture. A total of 338 cities participated in the environmental statistics and out of that total, 137 cites' atmospheric environmental quality were more than the level 3 national standard which is the area

utilized for industrial zones. Severely polluted cities made up more than 40% of the 338 cities. Acid rain pollution has become increasingly prominent. The acid rain zone, which extended from the local area in the southwest in the 1980s to southwest, southern, central, and western China, took up 30% of the total land area (MEP 2009).

Table 1

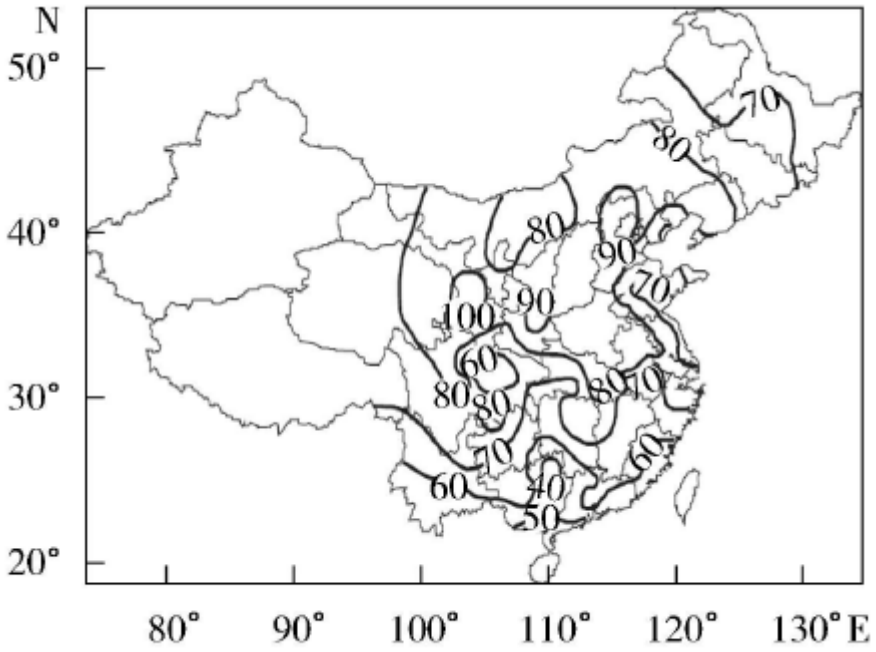
API and Health Implications (Daily Targets) (Hong Kong Environmental Protection Department. 1995)

API	Air Pollution Level	Health Implications
0-25	Low	Not expected
26 -50	Medium	Not expected for the general population.
51-100	High	Acute health effects are not expected but chronic effects may be observed if one is persistently exposed to such levels.
101-200	Very High	People with existing heart or respiratory illnesses may notice mild aggravation of their health conditions. Generally healthy individuals may also notice some discomfort.
201-500	Severe	People with existing heart or respiratory illnesses may experience significant aggravation of their symptoms. There may also be widespread symptoms in the healthy population (e.g. eye irritation, wheezing, coughing, phlegm and sore throats).

Air pollution distribution in China

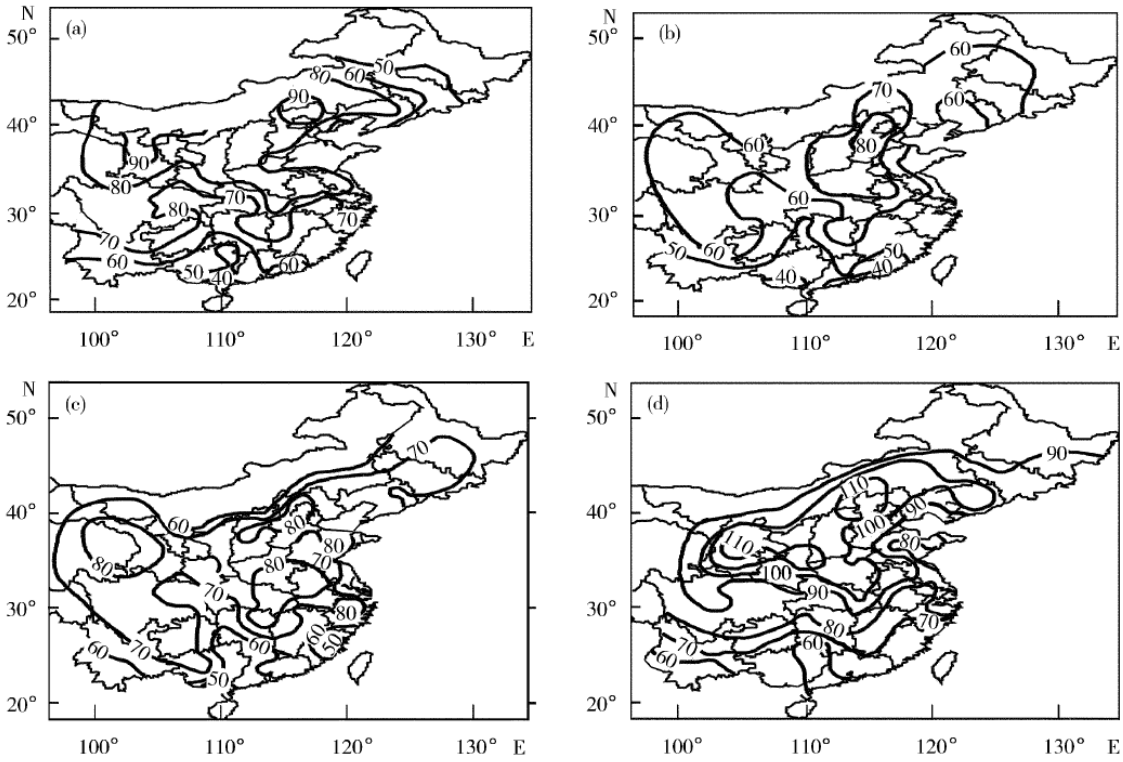
Analyzing 86 cities for Air Pollution Index (API) information from Daily Air Quality Papers, issued by the State Environmental Protection Administration in 2007, China could perceive the temporal and spatial characteristics of air pollution in Chinese cities. According to the API reports on the 86 cities in China, this is the figure created based on the daily mean value of API:

Figure 1. Daily Mean Value of API (Min. 2009)



From the picture we can see that the air pollution had the obvious regional characteristics which revealed a general trend of higher API in the north than the south. In the north, excluding the northeast area, the API was higher than 80 and there were three centers which included: 1) Beijing and Tianjin urban agglomeration, 2) Weinan and Xi'an and 3) Lanzhou, with more than 90 API. According to Figure 1, Chongqing , Hohhot and surrounding cities were in zone 80 and Guilin was in zone 40, which is a major tourist attraction.

Figure 2. Daily Mean Value of API in Each Season



NOTE: (a): Spring; (b): Summer; (c): Autumn (d): Winter.

We could obtain from the picture:

Daily Mean Value of API in Each Season (a). In Spring, most of the cities' API was in excess of 60. In the north, Beijing and Lanzhou appeared to be the two centers where the API was as high as 90 while the API was sustained under 60 in the northeast three provinces. In the Southwest, Chongqing emerged as a center with API 80. Few cities in the south showed excellent levels (API<50).

Daily Mean Value of API in Each Season (b).Comparing with other seasons, summer was the best one because it was lower than others with an API of 50-70 in the majority. The northern area, such as Beijing and around, displayed a clear dwindling of

the API in which 80 was the maximum. Shanxi, Yangquan, Xi'an, Weinan, Zhengzhou, and Henan followed with an API area of 70. The excellent level cities areas in the southern progressively enlarged in summer.

Daily Mean Value of API in Each Season (c).In autumn ,the API of Inner Mongolia was about 60 which was the minimum around north China. Nevertheless, 6 API 80 zones arose in the north. The northwestern centre was Lanzhou and Xining. Beijing as the polluted center in the northern possessed an API of 91. In east and central China, Changsha, Hefei, Wuhan composed the polluted centre, in which Hefei reached an API of 93. In the south, few cities achieved lower than 50 API.

Daily Mean Value of API in Each Season (d). In winter, it could be perceived that the API was rapidly rising all around the county. Most of the API exceeded 70 and the north was worse than the south. In particular, the northwestern centre Lanzhou and northern centre Hohhot appeared in the API 110 pollution zone. At Lanzhou the API peaked at 145. There were no excellent level cities in the south.

The results demonstrated that the temporal and spatial characteristics of air pollution in Chinese cities were noticeable. The most serious air pollution appeared in winter, followed by spring and autumn, and the least amount of air pollution in the summer; air pollution in the north was more serious than in the south.

Air pollution types

China possesses vast land and abundant energy, but it is also a major polluter. According to the World Bank investigation 2009, half of the world's heavily polluted cities are in China, and 2/3 of the SO_2 emission in Asia come from China. In China's energy consumption structure, the proportion of coal consumption remains exorbitant which is the main reason for the air pollution. Most of the SO_2 emissions, suspended particles, and particulate dust in the air derives from burning coal. Along with the development of modern industry, factories and mines released more and more both in quantity and kinds of toxic substances into the atmosphere. At present, there are more than 100 reported air pollutants, and every year 600 million tons of pollution goes into the air (Wenjing. 2009).

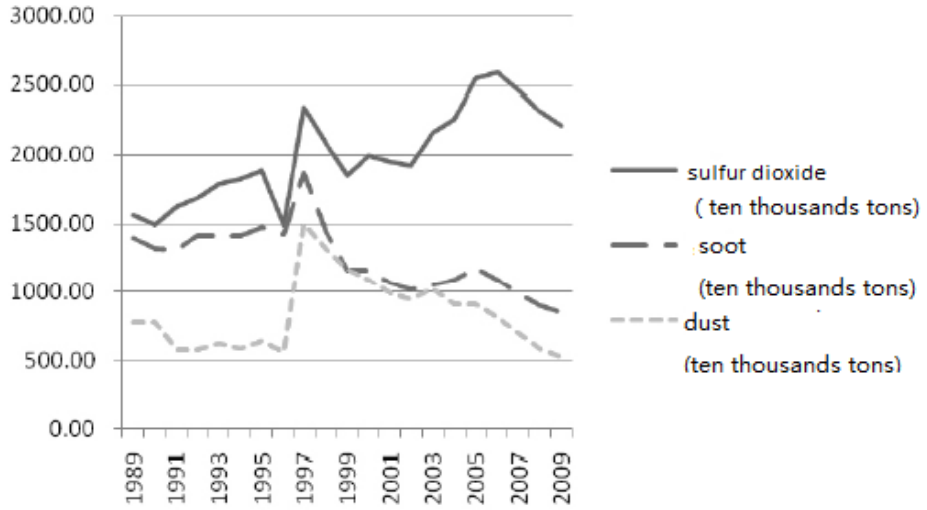
Table 2 The main pollutants in waste gas emissions inter annual variability (SEPAC. 2010)

Item	Sulfur Dioxide Emissions (million tons)			Particulate Emissions (million tons)			Industrial Dust Emissions (million tons)
Year	Total	Industrial	Non-industrial	Total	Industrial	Non-industrial	
2006	25.92	22.37	3.42	10.89	8.65	2.24	8.08
2007	24.71	21.44	3.23	9.87	7.71	2.15	6.99
2008	23.24	19.90	3.30	9.02	6.71	2.31	5.85
2009	22.13	18.68	3.48	8.47	6.04	2.43	5.24
2010	21.96	18.61	3.21	8.29	6.03	2.26	4.49

Particulate and dust emission. Industrial production and daily fuel burning is the greatest source of particulate and dust. Moreover, mining, metal smelting, and solid grinding processing engenders a lot of particulate which is released into the atmosphere. Particles with diameter larger than 10 μm are deposited quickly. Those with the 0.5~5 μm in diameter of particles can be detrimental, because they stay suspended much longer. Inhaling those kind of particles, lungs suffer huge damage by deposited dust causing silicosis or perhaps getting into the blood and spreading throughout the body (Wenjing. 2009). Therefore, particulate and dust removal is an important measure to control the damage. Nonetheless, a lot of dust is emitted into the atmosphere every year. Taking 2008 as an example, 9.02 million tons of particulate was

discharged into the air, a reduction of 8.6% compared to the previous year. Of the 9.02 million tons of particulate, the industrial particulate emissions had 6.71 million tons, accounting for 74.4% of the total, increasing 13.0% since the previous year; Non-industrial particulate emissions had 2.31 million tons, accounting for 25.6% of the total, increasing 7.1% since 2007. Industrial dust emissions reached 5.85million tons, 16.3% less than the previous year. Industrial pollutants are considered a significant factor of environmental pollution in China (Lili. 2011).

Figure 3. Air emission trend in the last 20 years in China (Zhen. 2011)



Sulfur oxides emissions. Sulfur oxide refers to the sulfur dioxide, sulfur trioxide and sulfuric acid fog products. They mainly originate from burning fossil fuels containing sulfur. In addition, some metal smelters and sulfuric acid plants all make a contribution. Sulfur dioxide is easily oxidized to sulfur trioxide with the coal dust. Sulfur trioxide is soluble in the rain and produces acid rain. It not only does harm to

creatures, but it also destroys buildings and metal equipment due to its corrosive effects. In 2008, the national emissions of sulfur dioxide reached 23.2 million tons, 5.9% less than the previous year, in which the industrial sulfur dioxide emissions were 19.91 million tons, which was 85.8% of the total, and a reduction of 6.9% since the previous year. In the meantime, the non-industrial sulfur dioxide emissions were 3.30 million tons, an increase of 0.5% since the last year, and 14.2% of the total.

In China, the acid rain pollution issue is increasingly prominent. The only acid rain region in the 1980s was in southwestern China, but presently southwestern, south, central and eastern China are the four large areas of acid rain zones. Acid rain covers more than 30% of land area in China. China, following Europe and North America, has become the third largest heavy acid rain region in the world.

Table 3 2010 Segmented statistics of national acid rain frequency (SEPAC. 2010)

The frequency of acid rain	0	0～25%	25%～50%	50%～75%	≥75%
The number of cities	245	89	57	49	54
Percentage	49.6	18.0	11.5	9.9	11.0

Table 4 2010 Average pH value of national precipitation (SEPAC. 2010)

pH range	＜4.5	4.5～5.0	5.0～5.6	5.6～7.0	≥7.0
The number of cities	42	65	69	238	80
Percentage	8.5	13.1	14.0	48.2	16.2

Vehicle Emission. After the 1990s, with the number of automobile rapidly increasing, nitrogen oxide has gradually turned into an important urban air pollutant source. It is reported that in the major cities of China, urban air pollution caused by motor vehicle emissions was more than 60% (Wenning. 2009). In 2009 China became the biggest automobile merchant and producer. China owned 170 million vehicles, increasing 9.3% ownership since 2008 (Lili. 2011). As a consequence of that, nitrogen oxides, carbon monoxide and hydrocarbon emissions increased year by year. For example, in Shanghai, the air pollution share from vehicles was 86% of total CO emissions and 56% of the total NO_x emissions. In Guangzhou the ratios are 89% and 79% respectively (Cuo. 2006).

CHAPTER 3

THE DEVELOPMENT OF LAW OF THE PEOPLE'S REPUBLIC OF CHINA ON THE PREVENTION AND CONTROL OF ATMOSPHERIC POLLUTION

Before 1972, since the new China was born, environmental issues were not prominent. The environmental management agency did not exist independently, but was part of relevant ministries such as the ministry of agriculture, ministry of health, forestry department, administration of aquatic products and relative industrial division etc. Each department was responsible for pollution prevention and resource protection within their jurisdiction. In 1972, the United Nations Conference on the Human Environment, held in Stockholm, published the "Declaration on the Human Environment." In response to the initiative of the United Nations Conference on Human Environment and to strengthen China's environmental protection work, in August 1973, China convened the first national conference on environmental protection (China environment. 2011).

In December 1974, the state council established the State Council Leading Group of Environmental Protection, composed of more than 20 ministries, Which directed and coordinated the state environmental protection policy. The daily work of the leading group office was responsible for the subordinate agencies. Specific environmental protection work was still carried out by each department, but the overall planning, policy and program guidance was unified under the State Council Leading Group of Environmental Protection. In 1979, the country initially established on

Environmental protection law (trial implementation) which specifically provided a chapter on" Environmental Protection Agency and responsibilities", and marked the beginning of the legal structure for China's environmental protection agency.

Along with the continuous deepening of China's "reforming and opening up" the political and economic process, the role of environmental protection in social and economic development was prominently featured. In order to further strengthen the environmental management and adopt rapid development of economic construction under the policy of " reforming and opening up", the State Council decided to divide the state environmental protection agency from the department of Urban and Rural Construction and Environmental Protection, as a vice-ministerial level department directly under the State Council, which unified the supervision and management of the environmental protection work in 1988. In 1998 the state environmental protection agency upgraded to ministerial level which was still directly affiliated with the State Council instead of a department. In 2008, they became a department of the State Council called Ministry of Environmental Protection (MEP) of People's Republic of China. They are still responsible for the formulation and implementation of environmental protection plans, policies and standards, organization and preparation of environmental function divisions, supervision and management of environmental pollution control, the coordination and solving of major environmental issues, and the cooperation of trans-administrative regions' environmental issues (MEP. 2008).

1987, the establishment of LPCAP.

The Law on Prevention and Control of Atmospheric Pollution (LPCAP 1987) was adopted at the 22nd Meeting of the Standing Committee of the Sixth National People's Congress on September 5th,1987. It has since been amended according to the decision on "amending the Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution (LPCAP 1995)," adopted at the 15th Meeting of the Standing Committee of the Eighth National People's Congress on August 29th,1995. The LPCAP 1995 was revised at the 15th Meeting of the Standing Committee of the Ninth National People's Congress on April 29th, 2000.

The atmosphere is one of the essential environmental elements for human survival. Since 1979, the country had developed some necessary policies and regulations. To control atmospheric pollution the local relative departments had also formulated some sectoral and local regulations, which had achieved some success in controlling air pollution in some cities. However, in general, air pollution in China was still serious, and continued to get worse. According to the monitors of the quality of atmospheric environment of some cities, the total amount of atmospheric suspended particles was about 600 mg/ m^3 which was equal to the most serious level for developed countries in the fifties and sixties (Rutang. 1987). In addition to the major air pollution materials such as dust and sulfur dioxide, the emissions included fluorine, chloride, mercury, arsenic, lead, and hydrogen sulfide. These materials are extremely toxic for people's health. Therefore, air pollution was one of the outstanding environmental

protection problems in China and it was necessary to establish an official law to regulate the behavior of the whole society.

As early as 1980, the original leading group of environmental protection under the State Council, relevant ministries of the State Council, local environmental protection agencies, and the relevant research institutes experts took the initiative to form a drafting group called the "Atmospheric Pollution Prevention Act. " (Rutang .1987) The draft consisted of a total of six chapters and 42 articles, including:

I. General provisions;

II. Supervision over the prevention and control of atmospheric pollution,

III. Prevention and control of particulate pollution;

IV. Prevention and treatment of waste, gas, dust and odor pollution;

V. Legal responsibilities;

VI. Supplementary provisions.

The draft had not only taken into consideration the coordination with the relevant laws and policies, but also paid attention to the specifics of air pollution prevention. Therefore, the draft made similar provisions in the formulation of environmental quality standards, authority, and national supervision and management system of pollution prevention and control, with the "Water Pollution Control Act." Compared to water, the atmosphere has a strong self-purification capacity and pollution tends to diffuse and dilute. Hence, the draft stipulated that only when the emissions of

pollutants exceeded the amount established by the local agencies or the state, would the emissions companies pay a fee for excessive discharge. In addition, the low efficiency of China's coal, oil and other sources of energy, was one of the prime causes of air pollution. In order to control pollutant emissions, the draft focused on the relative technological innovations, and efficient energy use and made the corresponding provisions.

The draft treated the prevention of coal burning pollution as the main target. Meanwhile, it also laid emphasis on the prevention of industrial waste gas, dust, odor, and vehicle exhaust pollution. Coal accounted for more than 70% of the country's energy consumption and coal burning emission was the main source of air pollution. The particulate from burning coal emissions in the country was about 17 million tons each year and sulfur dioxide was about 13 million tons, which accounted respectively for emissions of 73% of the total suspended particulates and 90% of the sulfur dioxide. Besides the provision of development of the new energy with less pollution, the draft was limited to aspects of rational usage of coal, vigorously promoted the briquette, and reconstructed low thermal efficiency and serious polluted boiler (Rutang .1987).

The draft made special provisions for the prevention of the coke, sulfur, mercury, and arsenic caused atmospheric pollution. The development of China's township and neighborhood enterprises was responsible for the prosperity of the urban and rural economies, job placement, and enhancing people's overall living. However, some of the township and neighborhood enterprises, especially those that produced

coke, sulfur, mercury, and arsenic, had poor technical equipment and a lack of pollution prevention and control facilities. This allowed for extraordinary pollution of the atmosphere. Therefore, article 30 of the draft said:

> "If the coal mined from an established coal mine is of high-sulfur or high-ash, supporting facilities for the dressing of coal by washing shall, in accordance with the plan approved by the State Council, be installed within a time limit ."

In addition, the increasing using of motor vehicles and ships in the major cities and rivers brought unavoidable issues of air pollution. Motor vehicle and vessel pollution, were related to the public security, transport, railways, and fisheries management. In order to strengthen the supervision and administration of motor vehicles and vessels exhaust pollution, combined with the practice in recent years and reference to the experience of foreign countries, the article 3 of the draft provided:

> "The administrative departments for public security, transportation, railways, and fishery at various levels shall perform their respective functions in conducting supervision over atmospheric pollution caused by motor vehicles and vessels."

This required the cooperation of environmental protection departments within the public security, transportation, railways, and fishery management.

Finally, the draft was adopted and was implemented on June 1st, 1988. The "Law of the People's Republic of China on the Prevention and Control of Atmospheric

Pollution " was composed of six chapters and 41 articles, affording an important legal basis to solve the problems of air pollution (Rutang Ye. 1987).

1995, the first revision of LPCAP.

Seven years from 1988, the LPCAP contributed to reduction of air pollution, improving the living and ecological environment, safeguarding human health, and promoting social and economic sustainable development. The LPCAP reflected the following so as: 1) Promote people's governments at all levels to strengthen the leadership of controlling air pollution; 2) Reinforce the supervision and management of the prevention of atmospheric pollution; 3) Advance research and development of air pollution control technology; 4) Have atmospheric pollution control achieve certain results. In 1986, in the 32 key environmental protection cities, the average total of suspended particulate concentration was 560 mg/m^3, which reduced to 345 mg/m^3 by 38% in 1992. Figures 4, 5, and 6 (listed below) are the TSP, SO_2, and particulate amounts during 1989 to 1994 from China's Environmental Bulletin (CEB). The amount of TSP are decreased by virtually 25% during the six years because coal burning was limited by the LPCAP (1987). The production of steel, cement, electricity, and other considerable TSP emission industries were doubled in the six years. In this case of the doubled output, TSP emissions were still reduced. In addition, the emission of particulate virtually remained the same. However, the emission of SO_2 continued rising by close to 20% and the total amount of pollution still remained high.

Figure 4. The total amount of TSP from 1989 -1994 (CEB. 1994)

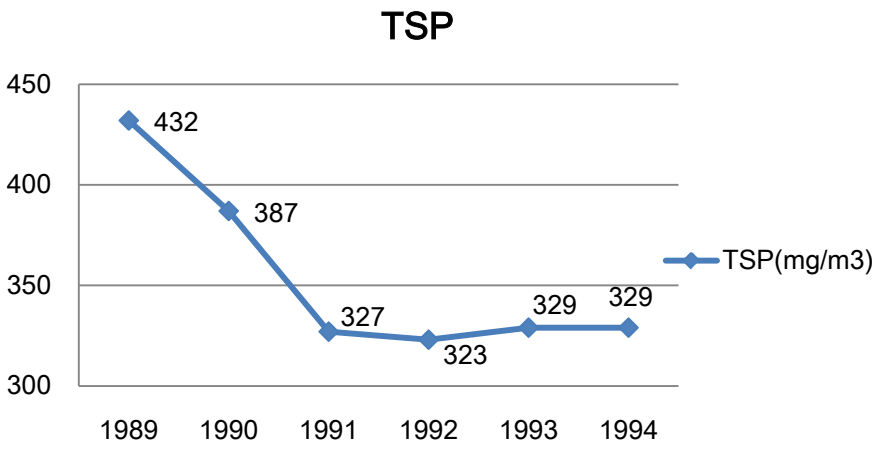


Figure 5. The total amount of SO_2 from 1989-1994 (CEB. 1994)

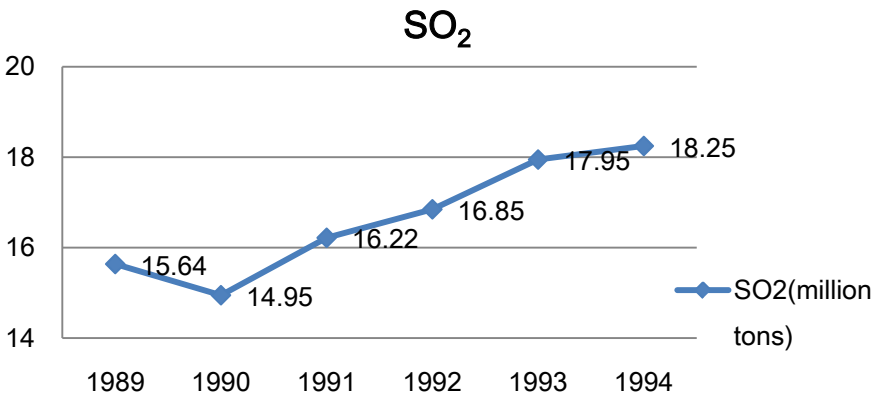
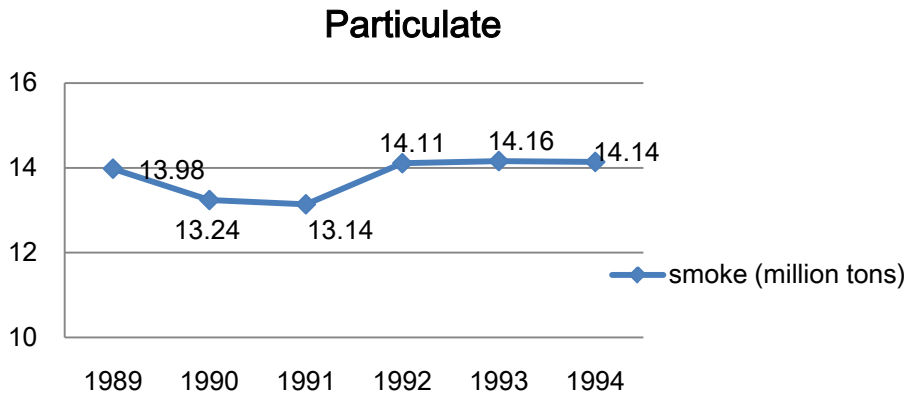


Figure 6. The total amount of particulate from 1989-1994 (CEB. 1994)



Under the new situation of China's deepening sustained rapid economical growth and restructuring, the existing LPCAP gradually exposed its own weaknesses. Firstly, China's air pollution, from the overall perspective, is still exceedingly serious and the current LPCAP(1987) was apparently not enough to solve these problems. The actual situation illustrated that: for a long time, particulate and dust pollution were the most hazardous overall and incredibly serious, while sulfur dioxide pollution caused by motor vehicle exhaust was rapidly growing and coal burnning. Regarding urban particulate and dust monitoring reports from five major cities Beijing, Shenyang, Xi'an, Shanghai and Guangzhou, the concentration of the suspension particle in the atmosphere was respectively three to nine times that of the World Health Organization (WHO) standard level. All of the five cities were in the top ten polluted major cities of the world. However, the five cities belonged to medium level pollution within China (Rutang. 1987).

Up to 1994, within 500 municipal cities, less than 1% met the national primary air pollution standard and there were not any acid rain control measures. Formed by the most parts of Guangdong, Guangxi, Sichuan Basin, and Guizhou, in south China had become one of the world's top three acid rain areas in addition to Europe and North America. Except those area, in recent years, more and more acid rain areas were formed by Changsha as the center of central China, Xiamen, Shanghai in the east China coastal area, and Qingdao in northern China. It was estimated that in only southwest

and south China had economic losses from forest decay, agricultural product reduction, and metal corrosion caused by acid rain, amounting to 14 billion Yuan per year (CEB.1994).

With the increase of motor vehicles and the poor technology of domestic automobile manufacturing, the amount of every Chinese automobile exhaust was about ten times or even more than the United States and Japan. So, in a number of large and medium-sized China cities, motor vehicle pollution sharply increased. Taking Beijing as an example, the number of car ownership was 770, 000 which was only 10% of Tokyo and Los Angeles in 1995. But the pollution caused by Beijing automobiles, including carbon monoxide, hydrocarbons and nitrogen oxide emissions, were higher than in Tokyo and Los Angeles. In many of China's cities, motor vehicle pollution had posed serious risks to human health (Zongtang. 1994).

Secondly, in the process of the transition from a planned economy to a socialist market economic system and the renovation of all levels of governmental function, some rules in the LPCAP (1987) with planned economic features did not accommodate to the developing socialist market economy. Simultaneously, the current LPCAP (1987) was weak in the aspect of strengthening the responsibilities of all levels of governments to protect the interest of the public environment. At that time, all levels of government did not have either adequate legal or administrative means to force polluters to comply with environmental standards, nor a more effective mechanism of funding flow and allocation to guide all sectors of society to control pollution. Due to

lack of funds, some of the public environmental programs could not carry out to programs to protect the public interests. Only 0.7% of the Gross National Product (GNP) during 1987 to 1994 was invested in environment protection (Zongtang. 1994).

Finally, since the implementation of LCPAC (1987), China had successively participated in the Vienna Convention for the protection of the ozone layer, the Montreal Protocol about depleting the ozone layer, as well as the United Nations Framework Convention on Climate Change (UNFCCC) and other international conventions for protection of the global atmospheric environment. At the United Nations Conference on Environment and Development in 1992, the Chinese government put forward the idea of both environmental protection and economic development, and made the commitment to contribute the positive efforts. After that, the State Council formulated "China's Agenda 21"and their goal of achieving sustainable development.. Moreover, the international society pushed China to take further action in preventing pollution (Zongtang. 1994). China should make provisions in the LPCAP in order to ensure the effective implementation of our international obligations. Thus, in the current situation, it was necessary to modify the LPCAP (1987). The following changing in LPCAP was instituted in 1995 :

The air pollutant emission permit system. The pollutant emission permit system is a relatively common implementation of developed countries as one of the main legal measures for governments to control polluters. At the beginning of the 1990s, 16 Chinese cities were treated as the pilot cities to operate the pollutant emission

permit system and the results illustrated the combination of control concentration and the total amount of the air pollution should be used as a standard. The 15th article of LPCAP(1995) said:

> "The enterprises and institutions that undertake to control their total amounts of atmospheric pollutant emissions shall discharge pollutants in conformity with the checked and fixed total amounts of the main atmospheric pollutants to be discharged and the requirements in respect of their discharge prescribed by the permits."

This required all the companies discharging air pollutants to apply for permits and allowed them to discharge emissions in accordance with the relevant provisions and standards for emissions of pollutants.

The air pollution emission fees system. The amended LPCAP(1995) made an advanced reform on the air pollution emission fees system. On the basis of the article that the amount of air pollutant emissions cannot exceed the state standard, LPCAP(1995) required companies to pay emission fees. The law established the "pollution undertaker" as the world's common environmental principle : "who made it, pays for it." It was an imperative economic method to promote companies to gradually reduce pollution, and the fees were the source of funding for local government to prevent pollution .

Undertake treatment within a prescribed limit of time. According to the LPCAP (1987), for seriously polluting companies, the decision should be made by the People's Government to treat the pollution. However, in practice, this regulation exposed many problems. First, the main pollution in China was dominated by the wide numbers of small and middle size pollution sources and was almost impossible for the government to make a decision in time. Secondly, China lacked the administrative review system and the administrative litigation system, as well as other relevant systems.

The classification of air quality control in cities. In order to control deterioration of the quality of the urban atmospheric environment, and promote the government to take effective measures to improve the quality of atmospheric environment as soon as possible, the LPCAP (1995) classified cities into three levels. The first level cities were municipalities, the province capitols, and autonomous regions' government. The second level cities were national-level historical and cultural cities, the national main tourist cities, and special economic zone cities. The third level cities were the cities with mining raw materials, and industry as well as some seriously polluted cities. In addition, the first level cities need to observe the primary ambient air quality standards but the mining regions could comply with secondary ambient air quality standards. The cities belonging to the second level need to achieve the secondary ambient air quality standards except for the cultural, educational and residential areas which needed to meet the primary ambient air quality standards. At

last cities in the third level need to abide by tertiary ambient air quality standards. Such division was to facilitate the local government in taking responsibility for the quality of atmospheric environment in this area, and impel comprehensive improvement of urban atmospheric environmental quality .

Coal burning pollution control. The emissions from burning coal were one of the major pollution sources. With the aim of efficient use of energy and reducing emissions of coal burning, relative limitations were needed in coal mining, washing and combusting processes. So the LPCAP regulated these in article 24:

> "The State promotes the dressing of coal by washing to reduce the sulfur and ash in coal, and restricts the mining of high-sulfur of high-ash coal. If the coal mined from a newly-built coal mine is of high-sulfur or high-ash, supporting facilities for the dressing of coal by washing shall be installed to keep the sulfur and ash in coal within the limits prescribed."

Article 28 explains:

> Urban construction shall be conducted on the basis of over-all planning. In areas of coal heating, unified provision of heat sources shall be practiced and central heating developed. In areas covered by central heating pipelines or networks, no coal heating boilers may be installed.

Acid rain and sulfur dioxide pollution control. China's sulfur dioxide emissions were increasing year by year, and the resulting acid rain was incredibly harmful. Nonetheless, the LPCAP (1987) did not provide for the control of sulfur dioxide from burning coal, and it was essential to manage sulfur dioxide pollution problems in the law. Whereas, considering their current economic situation, China was not able to completely control the emission as other developed countries could. What they could do was adopt control measures in relatively serious acid rain areas and sulfur dioxide hazard regions. The environment protection administration designated the acid rain control zone according to climate, topography, soil and other natural conditions. They also required power station and other large and medium-sized factories in the acid rain control zone to install supporting facilities for desulphurization to reduce the sulfur dioxide emissions.

The management of motor vehicles and vessels' emissions. In China's large and medium-sized cities, motor vehicles and vessels, particularly the automotive and motorcycle, exhaust gas pollution was aggravated. The LPCAP (1995) augmented four provisions to control exhaust, as follows:

- Motor-driven vehicles and vessels shall not be permitted to discharge atmospheric pollutants in excess of the prescribed discharge standards.
- No motor vehicles in use that do not meet the prescribe norms at the time of their manufacture can be driven on the road.
- No companies or individual could manufacture, sell or import motor vehicles or vessels that discharge pollutants in excess of the prescribed discharge

norms.

- Motor-vehicle repair companies shall make repairs to ensure that the motor vehicles in use meet the prescribed norms for pollutants discharged.

Nitrogen oxides pollution control. The emission standards for oxides of nitrogen in the LPCAP(1987) only existed in the standard that "motor vehicles and vessels [that] discharge atmospheric pollutants shall not exceed the emission standards." There was no unambiguous control regulation of the combusted and industrial production emissions of nitrogen oxides. With the increasing coal burning and motor vehicle ownership, emissions of nitrogen oxide pollution had gradually increased. In 1995 the annual emissions amount of nitrogen oxides in China had reached 7.26 million tons, in which the amount of coal emissions was 6.16 million tons and the industrial was 1.1 million tons. In accordance with monitoring data from 1991to1993, China's urban nitrogen oxides concentration increased year by year and the average concentration of nitrogen oxides in the northern cities failed to meet the national secondary standard. Nitrogen oxides can cause respiratory disease, affecting higher nervous activity of humans and plants, at the same time, acting with hydrocarbons and sunlight, nitrogen oxides produce ozone and photochemical smoge. Within the economic capacity, it was necessary to issue legal provisions to control nitrogen oxide emissions. So, the LPCAP (1995) established "The proper regional and enterprises should take control or reduction measures of nitrogen oxides from burning coal." (Zongtang. 1994)

The revised LPCAP (2000).

After four years of implementation of LPCAP (1995), the revised law fulfilled an important function of air pollution control, promoting the clean use of coal and accelerated the pace of eliminating backward technology and equipment. Acid rain and sulfur dioxide pollution control were performed in the some major regions. Nonetheless, due to the lack of recognizing the severe conditions and trends of air pollution, the revised law could not meet the goal of clean air. In 1998 the gross emission of sulfur dioxide was up to 21 million tons; particulate ,14 million tons; and industrial dust, 13 million tons. China was one of the most seriously polluted countries. An Evaluation by the World Health Organization published in 1998, based on the results of 272 cities in 54 countries, illustrated that 7 of the most 10 serious air polluted cities were in China. With the rapid increasing in the number of motor vehicles, the proportion of motor vehicle emissions, such as hydrocarbons, carbon monoxide, and nitrogen oxides in the air, pollution rose dramatically. So the LPCAP (2000) made the following changes:(Geping. 1999)

To concentrate efforts of air pollution control in major cities. China has 668 major cities, with an urban population of approximately 400 million. Among more than 300 surveyed cities, 70% of the them were in or beyond tertiary ambient air quality standards. In this condition, urban air pollution was a fairly serious and common phenomenon and significantly improving air quality in the short term for so many cities was unrealistic to achieve.

The new LPCAP not only had made provisions for all the cities' control of atmospheric pollution but also focused on a number of key cities to make a schedule and deadline for those cities to improve air quality. The State Council had defined 47 cities for key environmental protection early in the 1980s which were municipalities, provincial capitals, special economic zones cities, open coastal cities and main tourist cities. The State Council also required them to meet the standards by in 2000. For this purpose, the LPCAP (2000) stated in article 17:

> "The State Council shall, in accordance with the general plan for urban development, the target of the environment protection plan and the quality of the urban atmospheric environment, designate some cities as key cities for the control of air pollution. Where key cities for the control of air pollution do not meet the standards for the quality of the atmospheric environment, they shall endeavor to meet such standards within the time limit prescribed by the State Council or the administrative department of environmental protection under the State Council. The people's government of such a city shall make plans to meet the standards within the time limit, and may, in line with the authorization or relevant regulations of the State Council, adopt even more stringent measures to realize such plans."(LPCAP. 2000)

Those key cities covering large areas of China, were treated as the identified work priority areas for the control of air pollution.

First, they focused on the highly populated cities to let them meet the regulations, and then gradually expanded the control range to the surrounding cities. Therefore, the LPCAP (2000) provided that in the key air pollution control cities, local government could ban coal based on the actual situation of this area, and set a deadline by the environmental protection department to discontinue the direct burning of coal, and switch to natural gas, liquefied petroleum gas, coal gas, electricity or other clean energy.

Motor vehicle exhaust pollution control. In recent years, nitrogen oxides emissions showed an upward trend in Beijing, Guangzhou, Shanghai, Wuhan and other key cities and motor vehicles had grown to be a major source of the city's pollution (Geping. 1999). In order to fortify the vehicle exhaust pollution, the revised law treated the prevention and control of pollutants discharge by motor-driven vehicles and vessels as a separate chapter. In the aspect of motor vehicle manufacturing, utilization, maintenance, fuel quality, and inspection, the revised law made detailed provisions. This was an attempt to close the gap between Chinese automobile industries and advanced international technology.

Control of urban fugitive dust. In 1999, half of the TSP came from dust in the northern city of China, in which construction areas were a chief source of dust. Beijing was one of the most prominent cities for the dust pollution, with 60% of the atmospheric total suspended particles from the dust, even getting up to 68% during non-coal-heating periods (Geping. 1999). Dust pollution was mainly due to the poor

urban greening and weak management of construction areas. For this reason, the revised law included article 43:

> "The municipal people's government shall take measures such as the responsibility for afforestation, strengthening administration of construction operation, expanding the area of the paved ground, control of the heaping up of debris and waste and using clean transportation measures to increase the per capita possession of green land, reduce the size of bare land and surface dirt, and prevent and control the dust pollution in the urban areas. Units that conduct construction operation or other activities that generate dust pollution in the city's urban areas must take measures to prevent and control the dust pollution in accordance with the local regulations on environmental protection."

It is agreed that the construction dust was a management issue, and if industries complied with the law, and improved construction management, the dust would decline substantially.

Taking measures to control total amount of atmospheric pollutants. According to the concentration of pollutant emissions meeting the standards the LPCAP (1995) was unsuitable for the current situation in various populations and industry concentrated areas and the air quality had been dreadful around 1999. Even if the source of pollution achieved the emission standards, we could not prevent the air quality from deteriorating. Therefore, the implementation of total emission control was

imperative. Total Emission Control (TEC) policy is defined as: According to the investigation of one regional atmospheric environment quality and environmental capacity, calculate allowable atmospheric pollutant emission amounts in the region, and assigns them to each emission sources in the region, which was only used in China around the world.

Over the years, the State Council and a few local governments had commenced to implement the control of total pollutant emissions, and in 1996 the total emission control of major pollutant emissions in the "Ninth Five-Year Plan" period was approved. Hence the LPCAP(2000) formulated:

> With regard to the regions not meeting the prescribed standards for the quality of atmospheric environment and the acid rain control areas and the sulfur dioxide pollution control areas designated as such with the approval of the State Council, the State Council or the people's government of provinces, autonomous regions and municipalities directly under the Central Government may delimit them as the key cities for the total emission control of air pollutants . The concrete measures for the State Council shall prescribe the total emission control of major air pollutants. (Article 15, LPCAP 2000)

The local government concerned in the areas for the control of total emission of air pollutants should confirm and approve the total emission of major air pollutants by companies and institutions and issue them licenses for emission of major air

pollutants. It should be in accordance with the conditions and procedures provided by the State Council and in line with the principles of openness, fairness and impartiality.

Implementing a system of collecting fees for discharging pollutants. From the enforced perspective of the existing excessive emission charging system, due to the low charging of the existing system, plenty of companies preferred paying a fine to controlling the pollution. In fact, the excessive emission charge system had become the legalized way of preventing excess discharge. At the same time, because the LPCAP did not allow excessive emissions, the excessive charging system no longer existed. As a result, the existing excessive charging system needed reform urgently. The direction of reform should be in accordance with the total amount of emissions charges, and gradually advance to the environmental tax. This was not only a kind of compensation for damage of atmospheric environment, but also could drive the enterprises gradually to reduce pollutant emissions. Consequently, the revised law ruled:

> "The State implements a system of collecting fees for discharging pollutants on the basis of the categories and quantities of the atmospheric pollutants discharged, and establishing reasonable standards for collecting the fees therefore according to the needs of strengthening prevention and control of atmospheric pollution and the State's economic and technological conditions.(Article 14. LPCAP 2000)"

To strengthen the legal responsibility. Environmental protection laws in China are often called "soft laws"--laws with poor legal authority. One of the most crucial reasons was that the law set forth provisions, but what happened by violation of these provisions, was lack of clear penalties, resulting in the law enforcement agencies being powerless. In accordance with the principle of legal responsibility corresponding to the code of conduct, the LPCAP (2000) made additions to the liability section and modifications to maintain the authority of the law to effectively carry out the work.

The expected effects and economic costs of LPCAP (2000)

The relevant State Council departments and experts, made some preliminary estimates on the expected effects and economic costs of the revised law. After the publication of the new law, achievements and costs were expected based on the following four aspects:

On the basis of controlling the total amount of the major pollutant emissions, the total amount of allowable the emissions are reduced year by year. According to the estimates by the State Environmental Protection Administration, up to the year 2000 , the total amount of the major pollutant emissions could be virtually the same level as in 1995. The analysis on the programming of 175 cities in the national acid rain and sulfur dioxide pollution control zones showed that the reduced amount of sulfur dioxide emissions reached 4.32 million tons after implementing the total sulfur dioxide control by year 2000. From 2001 to 2005 it would be cut by 4.9 million tons, and from 2006 to 2010 it would decrease by 4.16 million tons in order to achieve the

environmental quality standards of sulfur dioxide concentrations and to obviously delay the acid rain pollution in the control zones. To achieve the goals of sulfur dioxide emissions of about 10 million tons, it was expected to cost about 180 billion Yuan to invest until 2010, with an average annual investment of 18 billion Yuan. The estimated Gross Domestic Product (GDP) of the control zones was 3.6 trillion Yuan in 1995, which accounted for 0.5% of the GDP and was considered and acceptable (Geping. 1999).

Perceptibly improve the air quality in the key cities. Within the perspective of the designated 47 key cities, 13 of them had already achieved the atmospheric environment quality standards. After the adoption of the revised law, the other 34 cities were projected to reach the secondary atmospheric environment quality standards within the prescribed time. Urban air quality, especially in the downtown areas would noticeably improve, and the residents would be satisfied. The 34 key cities could be divided into three categories: the first category was the opened coastal cities such as Fuzhou, Shantou, Suzhou, and Zhanjiang which possessed a better economic and environmental foundation, and did not need much more investment to meet the atmospheric quality standards. It was appraised to be about an average of 600 to 800 million Yuan per year. The second category was the mega-cities, such as Beijing and Shanghai. The economic conditions were excellent, but it was more difficult to achieve air pollution standards and required a larger input, estimated at an average of 25 to 30 billion Yuan per year. The third category included the other cities such as Zhengzhou,

Hangzhou, Qingdao, and Guilin which were evaluated to invest an average of 1.5 to 2 billion Yuan to carry out the goals. To sum up, if the 34 key cities achieved the goals, it would cost 120 to 150 billion Yuan which accounted for 1.5% of the GDP. This proportion was comparatively affordable.

Motor vehicle exhaust pollution under control. The study on motor vehicle exhaust pollution at Beijing and Guangzhou illustrated after introducing new vehicle emission standards, that emissions from a single car would be significantly reduced in conformity with standards of the revised law. In the case of a significant rising number of motor vehicles, emissions of carbon monoxide and nitrogen oxides were still able to be effectively controlled and reduced and greatly narrowed the gap between China's technology standards and the international advanced levels. If the motor vehicle pollution control achieves the emission standards of the country's new regulations, the required control costs would account for about 0.3to 0.7% of the GDP. However, the vehicle industry using the advanced control technology will contribute 3% to GDP. So comparing with the costs, it is really worth using advanced control technology (Geping. 1999).

City dust will be effectively controlled. The revised law made more stringent requirements to control dust. If these regulations were strictly implemented, the urban dust could be substantially reduced. According to the estimation of Beijing, 70% of the

construction dust could be reduced. Comparing with the industrial dust, the dust from the construction area was easy to control by strengthening management and invested less. To prevent construction dust, it is estimated to take up 0.15% to 0.35% of a construction budget (Geping . 1999).

In summary, the amendments made on the LPCAP (1995), was not only conducive to the improvement of the environmental quality, but also to the development of the national economy. The amendments had characteristics of the time-period which focused on the coordinated development of the economy and environment. However, we have to admit that China was far behind the developed countries in the aspect of the quality of atmospheric environment. Looking forward to the 21st century, dramatically revolutionizing the existing coal burned energy structure, and pursuing clean energy could make a fundamental change in the atmospheric environment.

CHAPTER 4

THE MAIN ACHIEVEMENTS OF THE CURRENT LPCAP

The current LPCAP had been revised in 2000 and contained 66 articles in seven chapters as follows:

I. General provisions;

II. Supervision and management of the prevention and control of atmospheric pollution

III. Prevention and control of atmospheric pollution by the burning of coal

IV. Prevention and control of pollutants discharge by motor-driven vehicles and vessels

V. Prevention and control of pollution by waste gas, dust and fetor

VI. Legal liability

VII. Supplementary provisions.

The crucial systems of the current LPCAP includes: first, the atmospheric pollutant total emission control and permit system, the legal system of managing excessive atmospheric emissions, and the collecting fee system for discharging pollutant emissions. Besides that, the new LPCAP also provided construction project environmental impact assessment, pollution control facilities acceptance, special areas protection, key cities delimitation for air pollution control, acid rain control areas and sulfur dioxide pollution control zones delimitation, backward production technique and

device elimination, and on-site inspection. In short, the LPCAP has made great contribution to protect human health, ecological environment as well as sustainable development.

The total amount of major atmospheric pollutants have been effectively controlled.

On the environmental management aspects, the State Council set up the leading group to address climate change and energy conservation, and elected Premier Wen Jiabao as chair. The leading group approved the "Eleventh Five-Year period, control the emissions of major pollutants plan" and "Eleventh Five-Year period, national acid rain and sulfur dioxide pollutants prevention plan. " Entrusted by the state council, the Ministry of Environmental Protection (MEP), relative local agencies and the five major power companies signed an agreement of the responsibilities of the emission reduction targets (MEP.2009).

Up to the end of 2008, the country had built an accumulated installed-capacity of 363 million kilowatts of thermal power desulfurated facilities, and formed a desulfurated capacity of about 10 million tons of coal per year (CEB. 2008). Compared with 2005, the desulfurated facilities accounted for 60.4% of the total installed thermal power. 9.02 million tons of particulate was discharged into the air, a reduction of 8.6% compared to 2007. Within the 9.02 million tons of particulate, the industrial particulate emissions occupied 6.71 million tons, accounting for 74.4% of the total, increasing 13.0% since 2007; Non-industrial particulate emissions occupied 2.31 million tons,

accounting for 25.6% of the total, increasing 7.1% since 2007. Industrial dust emissions reached 5.85million tons, 16.3% less than the previous year. Comparing the data of 2000 and 2008,the amount of sulfur dioxide emissions in 2008 increased by approximately 16.3% more than that in 2000 and particulate emissions and industrial dust emissions decreased respectively by about 22.6% and 46.4% of those in 2000 (CEB 2000).

Comprehensive improvement of urban atmospheric environment.

A large number of heavily polluting enterprises had been relocated and upgraded. The coal-fired boilers were actively upgraded by clean energy. The development of cogeneration and central heating were encouraged to address the non-point source pollution problems.

In 2008, the central heating area covered 3 billion square meters around the country. To vigorously develop public transportation, a lot of large and medium-sized cities generally set up public transportation systems. Rail transit construction had made great progress in Beijing, Shanghai and Guangzhou. The state had promulgated 83 motor vehicle environmental standards, introduced the subsidy policy for accelerating retirement of old vehicles, and completely banned leaded gasoline from July 1st 2000. Pollutant emissions amount of the new domestic light vehicles declined by more than 90% since 2000. Urban greening had also made some progress. Public green land area per capita amplified to 8.98 square meters from 6.5 square meters in 2005 which could effectively restrain the urban dust pollution. To solve the air pollution problems close to

people's daily life, the authorities introduced regulations and emission standards for cooking fume management in the catering industry and began to control the oil gas from the gas stations including 1976 gas stations around the Beijing area. The annual average concentration in 2008 of sulfur dioxide, inhaled particles and nitrogen dioxide decreased respectively by 28.5%, 33.3% and 31.5% and the proportion of cities, which achieved the secondary ambient air quality standards, increased from 35.6% to 76.8% since 2000 (Shengxian. 2009).

Deepening industrial restructuring.

The authorities had introduced "Industrial Restructuring Interim Provisions" and "Industrial Restructuring Catalog" to limit the expansion of high-emission and high energy-consuming industries and established more strict environmental law for iron alloy, coking, calcium carbide, and the other heavy metal industries. The "Industrial Restructuring Interim Provisions" and "Industrial Restructuring Catalog" established the elimination of backward technology and the economic compensation mechanism to further increasing the elimination of backward produced capacity technology. Within 2007 and 2008, a total elimination of backward production capacity included 105 million tons of cement, 60 million tons of iron-smelting, 43 million tons of steel making, 64.45 million tons of coking, 47 million tons of indigenous coke and the thermal power installed capacity of 31.07 million kilowatts , all of which effectively resulted the industrial structural optimization and caused industrial air pollutant

emissions to decline. The total amount of emissions of sulfur dioxide, particulate and industrial dust per unit GDP had decreased by 57%, 76% and 82.8% respectively.(Shengxian. 2009)

Propelling clean energy utilization and energy conservation.

China had formulated a renewable energy long-term development plan, introduced a renewable energy tariff subsidies and allowance trading scheme, implemented "West-East natural gas transmission project", "West-East electricity transmission project" and other clean energy key projects, and encouraged the development of nuclear power. Comparing to 2005, the total usage amount of hydro, nuclear and wind power grew by 37.2% in 2008; approximately 110 million tons of standard coal had been replaced by the new incremental clean energy. Per unit of GDP, energy consumption decreased by 10.08% which equaled a saving of about 290 million tons of coal and reduced of sulfur dioxide emissions by 3.29 million tons. Since 2006, the state had provided 17 billion Yuan to support rural biogas construction, and built up to 30.5 million household biogas in rural areas to improve living environments.

Perfecting the law system and stepping up law enforcement.

Since 1987, the national people's congress had adopted the Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution and revised it twice in 1995 and 2000. The State Council and relevant departments had formulated a series of supporting regulations and more than 200 ambient air standards, and initially formed a complete set of standard systems for prevention and control of atmospheric

pollution. The concerned departments had abolished illegal pollutant discharge enterprises and guaranteed special actions of public health and environmental protection for 5 years straight. The relative department investigated and prosecuted more than 120,000 illegal pollution discharges and shut down more than 20,000 illegal enterprises.

Environmental prevention and control infrastructure of construction.

In 2007, pollution control investments reached 338.76 billion Yuan, an increase of 32 percent over the previous year, accounting for 1.36 percent of the GDP. In 2008 and 2009, the environmental protection infrastructure of construction investment exceeded 15 billion Yuan. The national air quality monitoring network consisted of 911 sets of air quality automatic monitoring systems equipped with the 45,000 sets of environmental monitoring instruments. 648 environmental monitoring agencies passed the acceptance of standardized construction, and more than 3,000 prime enterprises installed the on-line automatic monitoring equipment. The sandstorm monitoring network was initially built to forecast real-time sandstorms. In 2008, China had successfully launched two environment and disaster monitoring satellites to lay the foundation for large area and high-precision atmospheric environmental monitoring. (Shengxian. 2009)

CHAPTER 5

THE EXISTING ISSUES OF THE CURRENT LPCAP

Through the previous two modifications of the LPCAP, atmospheric legislation in China had made great progress. From 1987, the beginning of LPCAP, LPCAP had promoted prevention and control of atmospheric pollution, and sustainable economic and social development. However, the unprecedented economic developing and expanding energy consumption, created lots of environmental problems. In other developed countries these problem evolved over 100 years but showed up in China in only two decades. Especially since 2009, lead, cadmium and other heavy metal pollution issues has become increasingly prominent even after affecting social stability. Facing the grim situation of atmospheric pollution, it has been difficult to meet the objective requirements of the atmospheric environmental management and the needs of public, and the existing law is in urgent need of amendment. The amendment of "Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution" has been included in the program of the five-year plan of the Eleventh National People's Congress Standing Committee and the State Council legislative plan in 2009. Right now the modified work of LPCAP (2000) is in progress.

The issues of the regional Total Emission Control (TEC) policy and division.

Total Emission Control (TEC) policy means: According to the investigation of atmospheric environment quality and environmental capacity in one region, to calculates the allowable atmospheric environmental carrying capacity in this region,

and assigns allowable emission allowance to each pollution sources (SO_X, NO_x, TPS in this region. The total allowances in this region should less than the atmospheric environmental carrying capacity.

Lack of supporting procedures of TEC. This is the only provision about the total emission control in the LPCAP. Obviously, the single article cannot set up an integrated system of TEC. A complete total emission control system, in addition to the provisions of the substantive content, should also possess supporting procedural and operational requirements to match with the total emission control system such as: total emission control amount distribution procedures, total emission control amount trade procedures, and fulfillment of the total emission control monitoring procedures. Otherwise, the system of TEC is difficult to form, and the objectives of control cannot be achieved.

No cross-border pollution prevention. In December 23th 2009, Nanjing began to experience consecutive haze pollution which lasted for 9 days. Except for the local pollution sources, the continuous cold air transferred from northern China sulfur dioxide, nitrogen oxides and particle pollutants from coal heating. In Nanjing, large scale regional pollution transmission and local atmospheric pollution accumulation was more and more obvious. The Yangtze River Delta, Pearl River Delta and Beijing-Tianjin-Hebei accounted for 6.3% of the country's total land area, but

consumed 40% of the nation's total coal and produced 50% of the total iron and steel. As a result of that, those regions presented an accumulation of air pollutant emissions; a wide range of seriously heavy pollution occurring at the same time, as an obvious regional characteristic (Meiying. 2010). The same situation also appeared in the central cities of Liaoning, Hunan Xiangtan, and Chongqing areas because of highly urban density and energy consumption in the region. However, urban air pollution control was independent for each city and prevented effective regional joint air prevention and control mechanisms. Therefore it is difficult to fundamentally solve the problems of regional and urban atmospheric environments. The current LPCAP has not set up the scope of total emission control systems on the issue of prevention of cross-border pollution (Jian. 2005).

New pollutants not in TEC. Finally, the target of total emission control has changed. In November 26th 2009, Guangzhou suffered the worst gray haze weather of the year, with air pollution index as high as 129 which is uncomfortable to human living (Meiying. 2010). The weather had been caused by the ultrafine particle $PM_{2.5}$ which is not monitored within the LPCAP requirements. Absorbed into human body, $PM_{2.5}$ will directly go into the bronchus, interfere with gas exchange in the lungs and trigger health risks involving: lung disease, decreased lung function, asthma attacks, and certain cardiovascular problems such as heart attacks and cardiac arrhythmia (Christian, 1999). The ozone in the troposphere is in contact with animals and plants and creates health effects as well as other chemical reactions such as the production of

grey haze and photochemical smog. The haze and ozone pollution monitoring stations proved that the smog and ozone pollution had become an outstanding air pollution problem in the eastern cities. In Shanghai, Guangzhou, Tianjin, Shenzhen and other cities, the haze days accounted for 30% - 50% of the whole year. China's current air quality evaluation standard just included sulfur dioxide, nitrogen dioxide and respirable particulate matter, which still was not able to fully reflect the actual situation of air pollution.

Issues of allocation of pollutant emission allowances and trade policy

The LPCAP does not have detailed provisions of allocation of pollutant emission allowances, but in the "Eleventh Five-Year" period, the major pollutant emissions total amount control plan made a principal provision to ensure the realization of the national total amount control goal. Comprehensively considering local environmental quality, capacity, emission status, and economic position, the eastern, central and western regions are treated differently (State Council, 2006). Specifically, China's current allocation of emission allowances is still based on the present situation of pollutant emissions to apportion the total amount of emissions. The disadvantages are: first, focusing on the national total amount control, the policy's lack of appropriate incentives and flexible operation mechanism. Second, this method is not considered scientific because the emission allowances are allocated according to each city's situation. For the emission trading program, because of the unbalance of regional

economic development situations, the emission allowances trading system should be established.

Issues of the air pollutant emission permit system

The permit system is the most widely used system in China's environment management. The permit system in the LPCAP is described in the 15th article (B, C parts):

> The local people's government concerned in the areas for the control of total emission of air pollutants shall check and approve the total emission of major air pollutants by enterprises and institutions and issue them permits for emission of major air pollutants. It shall do this in accordance with the conditions and procedures provided by the State Council and in line with the principles of openness, fairness and impartiality.
>
> The enterprises and institutions obliged to control their total emission of air pollutants must emit their pollutants according to the checked and approved standards for the total emission of major air pollutants and the conditions of emission provided by the permit.

Those terms make the atmospheric pollutants emission permit system included in LPCAP as a formal law. However, due to the imperfect implementation of the existing law, the permit system failed to show its proper role as an important environmental protection system. In addition, in compliance with LPCAP (2000):

> The local people's government concerned in the areas for the control of total emission of air pollutants shall check and approve the total emission of major air pollutants by enterprises and institutions and issue them permits for emission of major air pollutants.

That is to say the permit only applies to pollution sources within the areas for the control of total emission of air pollutants. For the outside areas, there is no limitation at all. The results inevitably leads to the same enterprises in different regions being treated differently by the permit system and, what's worse, some small and medium-sized pollutants emission enterprises outside the control areas will lose the enthusiasm to reduce air pollutant emissions. Environmental protection departments, with genuine auditing capabilities, have no right to issue the permit and instead, it is decided by the local government. Nevertheless, the local government may consider the local economic benefits and impede the effectiveness of the air pollutant emission permit system.

Issues of the mobile atmospheric pollutant emission sources management

Mobile air pollution emission sources mainly refers to motor vehicles, vessels, aircraft and other transportation tools. Motor vehicles are the largest proportion of them. However, because of incomplete management systems, Chinese vehicles' emission levels have a large gap compared with the developed countries. China's mobile source emission control is based on the European standardization system. The "car emission limits and measuring methods (China III, IV stage)," was enacted on July 1st, 2007 which is roughly equal to Euro III and Euro IV stage standards (PCVPC. 2007).

The emission standards of China are not backward, but there are no accompanying implementation measures which is one of the main factors to restrict effective management of mobile pollutant emission sources. Furthermore, the management measures in the LPCAP are confined to the vehicles and vessels without any administrative regulations of the nonroad traffic pollution which produce 42.6% of the total nitric oxides pollution and 60.1% of the total particle pollution and they are almost equal to the emission amount of vehicles and vessels (Weiyuan, 2007).

About testing institutions, the article 35 B states:

> Government may authorize the annual testing of pollution by motor-vehicle's exhaust fume in accordance with the relevant regulations. The Central Government may authorize the units undertaking annual test of motor-vehicles whose qualifications have been recognized by the public security authorities to conduct these tests.

That is to say the annual vehicle exhaust pollution testing unit is commissioned by the administrative department of environmental protection, and accredited by the public security organ, to assume the responsibilities of motor vehicle annual inspection. The provision of the commission cannot constrain all the commissioned units to unify the test procedures. This term obviously was developed for the use of motor vehicles instead of in the design process and the production

process of motor vehicles. The LPCAP also did not give procedures and contents for the testing of pollution by motor-vehicle's exhaust fumes (Wang. 2001).

Issues of fuel management.

The mobile pollutant emission sources and their fuel are inextricably linked. Even if each emission source has met the emission standards, without the strict management of fuel, the ultimate goal of reducing air pollution still would not be reached. The LPCAP(2000) article 34 B states:

> The State encourages and supports the production and consumption of superior fuel oil, and takes measures to reduce the pollution of atmospheric environment by harmful substances in the fuel oil. Units and individuals shall, according to the time limit prescribed by the State Council, stop the production, import and marketing of leaded gasoline.

According to the understanding of the law, we could see the LPCAP has an enlightened attitude toward the use of high-quality fuel oil which is good; however there is also a lack of management efforts and has only banned the leaded gasoline instead of mentioning any other pollutions such as heavy metals, PAHs which are also harmful for the environment.

Issues of the guarantee measures of the implementation

Insufficient fine measures. Illegal emissions behaviors are sanctioned by the administrative punishment measures within LPCAP, which includes warnings, fines,

confiscation of illegal income, confiscation of illegal property, temporary suspension of production, and suspension or revocation of licenses. The LPCAP article 48 and 59 states:

> Whoever, in violation of the provisions of this Law, discharges pollutants to the atmosphere in excess of the national or local discharge standards shall make treatment thereof within a time limit, and shall also be imposed upon a fine of not less than 10,000 Yuan but not more than 100,000 Yuan by the administrative department of environmental protection under the local people's government at or above the county level. The power to decide on the treatment within a time limit and the administrative penalty for violation of the requirements for treatment within a time limit shall be prescribed by the State Council.
>
> Whoever, in violation of the provisions of the second paragraph of Article 45 of this Law, produces or imports ozone-layer-depleting substances in excess of the quotas approved by the competent administrative department under the State Council within the time limit prescribed by the State shall be fined not less than 20,000 Yuan but not more than 200,000 Yuan. Fines shall be administered by the competent administrative departments under the people's governments of provinces, autonomous regions and municipalities directly under the Central Government in the place the violator is located. If the circumstances are serious, the production or import quotas may be revoked by the competent administrative department under the State Council.

For illegal discharge of air pollutant behavior, the maximum fine is only 200,000 Yuan which is clearly not enough to deter polluting industries to consciously abide by the provisions of the legal system. The majority of polluting industries are even likely to pay the lower fines and get huge economic benefits from the unscrupulous excessive pollutant emissions. So re-adjusting and increasing the penalty as soon as possible, should be imperative.

Insufficient criminal sanctions. The LPCAP has only made provisions in principle for the criminal behavior of releasing excess emissions which are punished in accordance with relevant regulations of the Criminal Law. Causing serious environmental pollution accidents, significant public property losses or injury to people will lead to prosecution for one's criminal liability. This means that only the people who are in the process of pollution could be punished, but the potential and dangerous pollution producers have no regulations to punish them. Both the law enforcement and preventive effects are obviously lagging behind. Another problem is that the executive assessment of a local government performance is based on the increasing of GDP. Some local governments, in order to obtain political achievements and economic benefit, do not interfere with the polluters. Nearly all the pollution is related to simply pursuing the figure growth of GDP and local economic growth. This short-sighted and one-sided view of political achievements, leads to pollution emission, pollution control, and then pollution emission again---the vicious cycle of pollution, and also proved to be ineffective against the polluter criminal action (Chunyan. 2007).

CHAPTER 6

COMPARING WITH THE CAA OF THE U.S TO FIND SOLUTIONS FOR LPCAP

In the legislative concept, the current LPCAP still pays great attention to the law norms, but lacks the articulation with relevant laws and some concepts of control air pollution from the source, and the operating process. Up to now, the third revision of the LPCAP has been in progress for more than two years, and is estimated to be submitted to the National People's Congress Standing Committee at the end of 2012 (China Daily, 2011). In this chapter, we look to the Clean Air Act (CAA) in the United States to find some solutions for the issues in the previous LPCAP.

In 1955, the United States set up the first national air quality regulation, but as early as 1881, air quality improvement programs had been already implemented in Chicago and Cincinnati. The air quality legislation begin in 1955 and 1963, when CAA was enacted, and it has been amended in 1970, 1977, 1990. The CAA aimed to enhance air quality, protect public health and welfare, and augment productivity. The major principles of the CAA are National Ambient Air Quality Standards Principle, State Implementation Principle, New Source Review Principle, and Visibility Protection Principle. National Ambient Air Quality Standards are divided into Primary National Ambient Air Quality Standards and Secondary National Ambient Air Quality Standards. State governments are rendered tremendous power to implement

all those standards but must be in compliance federal law. Prevention before pollution is the main purpose of the Clean Air Act. The CAA, as an advanced and scientific law, would be a great enlightenment for China's atmospheric legislation.

The solutions of the regional Total Emission Control (TEC) policy and division.

In the CAA, solving the problems of cross boundary air pollution, the allocation of pollutant emission allowance system is the similar to the TEC in the LPCAL. Learning from this policy in the U.S. CAA, China could do as followed to perfect TEC in LPCAP:

Establishment the proper regional TEC planning system. The setting of the TEC system is aimed at improving the environmental quality of a region and accomplishing certain environmental quality standards. Two of the pacing factors for an area's environmental quality is the amount of pollutant emissions, and environmental capacity. An analysis of air environmental capacity, in the geographical continuity areas, is used to stabilize and equalize air environmental capacity where geographical continuity areas do not necessarily completely coincide with the administrative regions. On the contrary, a relatively stable geographic area usually involves a number of administrative regions with the similar environmental characteristics. The current LPCAP divided the TEC area in accordance with the provinces, municipalities and other local administrative areas which demonstrates an obviously lack of science and flexibility.

Therefore the LPCAP imitates the CAA to set up across state air quality controlled areas, which breaks down the boundaries of the administrative regions and unifies total emission control according to replanning the TEC areas and redistributing the allocation of pollutant emission allowances to deal with the cross areas environmental air pollution. For air pollutants crossing provincial borders, the national environmental agency is in charge of managing and undertaking the TEC. For the cross-municipal boundaries air pollutants, the redesignated TEC areas by the provincial government takes the responsibility of guiding the TEC of the municipalities within the pollutant emission allowances. For the national widely distributed stationary pollution sources belonging to the same enterprise, the "bubble" policy in the CAA could be used as a reference, which requires the large emission enterprise to be treated as a total control unit and incorporates relevant state authorities to unify management. EPA policy allows a plant composited by several facilities to reduce pollution from some facilities while rising it in others, so long as the total amount is equal to or better than previous limits. Facilities where this is done are treated as if they exist in a bubble in which total emissions are averagely discharged (EPA, 2012) .

Improving the allocation of pollutant emission allowances and trade policy. In the CAA, the emission allowances are distributed by unified standards to polluting enterprises. The local administrative government is not involved in the process, therefore, they do not have any targeting responsibilities other than ensuring

local air quality management of the TEC. The allocation of pollutant emission allowances is divided into two Phases by CAA. In Phase I, the allocated allowances for every enterprise depended on the quantity and rate of air pollutant emissions on the basis of uniform fuel consumption standards, which were recorded in the appendix of the Clean Air Act. During Phase I, the newly built air pollutant emission enterprises could not obtain any emission allowances, and the only approach was to buy the allowances from other enterprises which actually improved the environmental requirements of the new enterprises and was conducive to prevent air pollution. In Phase II, the CAA authorized EPA to comprehensively consider the enterprises energy saving technology application, Phase I completion status, environmental air quality improvement, and the stage objectives implementation in order to allocate the emission allowances and also reserve a considerable number of allowances to reward and trading. Profiting from the CAA regulation, China should:

1. ***Establish a scientific allocated allowance system.*** When the LPCAP allocates the emission allowances, all the allowances could be distributed collectively to the local governments. Instead, they shall make some detailed changes in the national total control target and the actual allocated emission allowances shall be less than the target. The rest of the allowances will be reserved for the reward policy. All the actively explicated and utilized biological, solar, wind, and other renewable energy enterprises should be allocated the corresponding number of additional allowances to encourage

them to unceasingly promote environmental technology as well as directing the entire industry to higher efficiency and less emissions.

2. ***Establish a flexible and operable allowance trading system.*** At present, China's allowances policy is closed to emissions limitation which is applied to set up the emission cap for enterprises. In this case, the allocation of allowances is not able to express eliminate the flexibility and operability. Comparatively, the CAA contains a detailed allowance trading system, after years of accumulated experience, which has combined stability with the flexibility of the allowance trading system to ensure balanced development of all enterprises. For China, because of the unbalanced regional economic development, the thorough trading system is even more urgently needed. The government should adopt a more generous attitude to the macro regulation of allowance trading. As soon as any enterprise obtains the same amount of allowances as their emission amount by trading measures, they should be affirmed to achieve their TEC target. Certainly, in my opinion,the generous regulatory strategy is definitely not laissez-faire but the national and local MEP must be strict to supervise the emission allowance transfers and trading processes to ensure the legitimacy of the trading activities. So as to achieve the standardization of the emission allowances trading market, the policy not only guarantees rationality and flexibility of the individual enterprise's developing strategies in a specific period, but also ensures the stability and operability of the national TEC system.

The solutions of improving the pollution emission permit system.

Expand the scope of the air pollutant emission permit system application. The permit system in the CAA s CAA applies to the entire country, which means any existing or newly built companies need to apply for the emission permit from EPA before production, without exception. The LPCAP should conform to the requirements of social development to establish the widespread implemented principle of the of air pollutant emission permit system. Considering the unbalance of regional economic development, after all the air pollution enterprises are brought into the scope of air pollutant emission permit system based on the diversity between the regions, the LPCAP adjusts separate approval systems for each region. To meet the TEC targets, the LPCAP shall establish different kinds air pollutant emission permits and approval systems for different regions based on: comprehensive analysis' of the natural and geographical conditions, the degree of harm caused by the pollution, the characteristics of pollutants and other relative factors of each region.

Improve the environmental protection department of approval responsibilities. The permit system should be a macroscopic control measure of the environmental administrative authorities, which is reviewed by the environmental protection department to evaluate the specific conditions and qualifications of the applicant and decide whether to engage in particular emission activities (Zhenni, 2008). The administrative government should not be regarded as the agency to issue emission permits, but environmental protection departments should take the

responsibility to undertake the professional and scientific review and ultimately determine whether the permit application is eligible. In the CAA, the EPA is responsible for issuing air pollutant emissions permits. Pollutant discharging enterprises across the country must accept the review of the EPA. The United States has unified and granted rights to the EPA, because air pollutant emitting facilities of the U.S. are huge but in limited quantities. The realities of China are quite distinctive from the U.S.; in addition to the large-scale air pollutant emission enterprises, there are a large number of small and medium-sized enterprises which are distributed in various regions of the country. In this case, the LPCAP could establish a grading division system of air pollutant emission permits issued based on the enterprise scale, especially the expected total emission amount. To audit permits, the pollution enterprises could be divided by large scale to small scale, into three levels, and treated separately by the national provincial and municipal environmental protection departments. In my opinion the division of air pollutant emission permits, not only achieves the effect of prevention in advance but also ensures the efficiency of the audit work to accomplish the original purpose of the emission permit system.

The solutions for management of the mobile atmospheric pollutant emission sources

Expand the application scope of the mobile source emission system. Besides the regulations of motor vehicles and vessels, non-road traffic with engines, which includes cranes and excavators, tractors, lawn mowers, electric saws,

removable engine blocks, motor boats, ships, locomotives, airport mobile facilities, etc., should be classified to the mobile source emission system. In the Clean Air Act Amendments of 1990, the non-road traffic with engines was first included and the CAA authorized EPA to classify and formulate a series of emission standards which included spark ignition engines under 25 horsepower; spark ignition engines for maritime use; locomotive engines; compression-ignition engines for land and maritime use under 50 horsepower; compression-ignition engines for maritime above 50 horsepower; and large steamship spark ignition engines under 25 horsepower (EPA, 2003). The aim of the classification by the EPA is to manage non-road engines. The LPCAP could refer to the CAA of the United States to make strict rules of the non-road engines. According to China's existing situation, the LPCAP should classify and establish diverse emission standards and management projects to achieve the overall management of mobile source emissions.

Implement and improve the mobile source emission management system. In the LPCAP, most of the articles only contain principles, which is short of setting specific operating standards. In the vehicle inspecting system, the process is undertaken by the public security organs instead of the environmental protection department which is clearly unreasonable, because the public security organs do not possess environmental expertise to assert the potential environmental hazards of the vehicle. In addition, the LPCAP only formulates annual and sampling inspections of motor vehicles which is far away from meeting the exhaust emissions targets. In

contrast, the CAA has set detailed certification systems including: production inspection system, market monitoring system, and the process of design, production, and final use implementation and monitoring systems. In the CAA, before auto manufacturers meet the certification standards, any new models vehicles cannot be into commerce. (CAA. 42 USC § 7522) The auto manufacturers will do a series of tests and the data is then submitted to the EPA to examine. Only when car manufacturers obtain standard certification, identical cars are allowed to volume production and also need to meet the production inspection system. In the CAA Sec. 206 (b), the EPA is authorized to selectively examine volume production cars in the sample to decide if they can pass the inspection process. Furthermore the CAA also rules the non-road engines to abide by the same implementing measures as the motor vehicles. The LPCAP should learn from the CAA to formulate comprehensive mobile source emission management and implement regulations and supervise both road and non-road mobile source emissions consistent with the law. As a result, China' s MEP could not only comprehensively manage the mobile source emissions but also led the manufacturers to self-check to control the pollution from the beginning.

The solutions for the fuel management.

For the existing issues in the LPCAP about fuel management, they could be improved from the following three points:

Provision of mandatory production standards. The LPCAP should modify the incentive regulations into mandatory requirements and based on China's environmental prevention situations, implement strict production standards of the harmful materials in the fuel. Actually, besides the lead, the fuel still contains a lot of other chemicals, which are enough to cause ecological and human damage such as heavy metals and Polycyclic Aromatic Hydrocarbon (PAHs). The LPCAP should define all the pollutants about the content standards and implementation measures and at the same time, establish supporting quality certification systems to ensure the production of qualified fuel.

Establish scientific inspection system. China established a comprehensive detection system in the aspects of production, transportation, trade, and usage to meet the fuel standards. In my opinion the environmental protection department shall have the right to test the fuel at any time during the production, transportation, and usage processes. Once the sampling fails to meet the fuel quality standards, the fuel manufacturers instantly lose the original certification and production is forbidden. The fuel manufacturers must reapply to the MEP for the fuel quality certification and only if the fuel production has meet the national mandatory standards, the MEP could issue the new fuel quality certification.

Improve fuel management, to prevent abuse of the additives causing new pollution. The CAA article 211 makes comprehensive and detailed regulations on the motor vehicle fuel management approach in which Section (k) "Reformulated

Gasoline for Conventional Vehicles," creates the most profound influences to cut contained volatile organic chemicals and other air pollutants in the gasoline. Congress finds that if organic compounds contained oxygen called oxidants as a gasoline additive alternative, the air pollutant emissions of burning fuel would be greatly reduced. For the cold regions, the incomplete combustion of motor vehicle fuel could produce a large amount of carbon monoxide, and the oxidizer which adds to the fuel could improve the full combustion of fuel and greatly reduce the production of carbon monoxide. For this case, the 211th article of CAA Section (m) found "Oxygenated Fuels" which exhaustively sets out specific measures for implementation, such as measurements of oxygen content, project implementation schedules, and the conditions of the exemption from the provisions, for the reference of the EPA and state governments. Although China's LPCAP is not required to entirely model the CAA of the U.S. to set up all of the previous management projects, the LPCAP should rely on the situation of China to formulate specific mandatory composition standards of all the pollutants in the fuel contained mobile source emissions and norms on improved fuel management to prevent abuse of the additive. The poor quality of fuel used for mobile source emissions seriously restricts the improvement of China's mobile source emission level and China should strive to meet fuel production and emission standards for mobile sources.

The solutions for the guarantee measures of the implementation of the LPCAP.

The U.S. Clean Air Act punishes illegal emissions of air pollutants with huge fines, day by day, which will prolong until they meet the emission target. Furthermore, enterprises must take the initiative to report emission data. In my opinion, if an enterprise makes a false statement, the responsible person will be subject to the criminal sanctions. It can be said the illegal emission cost of U.S. polluting industries has been increased to reach an unbearable level which effectively limits the occurrence of illegal emission behaviors. Moreover, in LPCAP the form of civil proceedings to protect implementation of laws is incomplete and the current provisions still remain in environmental tort litigation. However, there are no regulations about the public suit system which is a large deletion for the LPCAP.

Enhance the punishment of economic sanctions. Because of the lower amount of fines in the LPCAP, numbers of the enterprises prefer to emit illegally and bear relatively minor legal responsibility, rather than abide by the law because the fines cost less than pollution control (Chunyan, 2007). Such a simple and minimal amount of punishment is fully not able to meet the goal of preventive measures by the economic sanctions, but it unfortunately plays a disguised encouragement for the polluters. On the other hand, in the CAA, when the EPA can prove that the enterprise is illegally emitting, they will send a punishment notice to the emission enterprise and allow the enterprise to apply for a convening hearing to give the emission enterprises the rights of suit. Under the determination of illegal emission behavior, the EPA will

punish the enterprise from the day of the determinate illegal pollution emission to the day of the suit. The CAA does not set a maximum of the economic sanctions on illegal emissions and the specific amount mainly depends on the severity of violations and the number of illegal economic benefits. The specific amount is determined based on the days, and a total amount up to $ 27,500 per day. In addition, the punishment from the EPA does not represent the ultimate punishment of illegal enterprises, and therefore in accordance with the Clean Air Act and other laws or regional regulations, other civil sanctions and criminal sanctions on illegal enterprises could occur simultaneously. The LPCAP of China should improve the system of penalties for illegal emission behavior, and a substantial increase in the maximum amount of punishment or even cancel the limitation of the maximum amount. Depending on the level of illegal pollution discharge behavior, the MEP gives the economic sanctions for the illegal enterprise. A dynamic method of calculating the penalty amount should be applied to avoid the rigidity of the existing legislation which means for the illegal enterprise, from the confirmed date of the illegal pollution discharge behavior, the fines would be superimposed day by day instead of the one-time economic penalties. Although this dynamic superposition of penalties may lead to a huge amount of the ultimate fine sentence, by making the fines higher than the cost of environmental protection, enterprises will be forced to consciously abide by the law to fundamentally ensure the improvement of the atmospheric environmental quality (China Youth Daily. 2010)

Strengthen the criminal sanctions of illegal emission behavior. The most prominent feature of U.S. environmental criminal punishment is that criminals must be held accountable for making false statements. In the CAA article 113 (c) (2), if any one makes any false material statement, maintains any notice or tampers with documents, they shall be punished by a fine or by imprisonment. In addition, if anyone fails to install any monitoring device or record the data pursuant to the relative requirement, they shall be punished also. The LPCAP should also establish a system of criminal sanctions for illegal pollution emission behavior. In fact, the most effective approach of criminal sanctions is not just by warning, deterrence and prevention, but rather through punishment. Therefore, the negligent illegal pollution behavior may be punished in the form of fines, but the intentional illegal pollution behavior causing certain serious consequences must be severely punished by means of huge fines and imprisonment. In order to express the guidance, education, and deterrence performance of the LPCAP, polluters are able to understand the serious consequences of their pollution behavior by the influence of the large fines and weigh the pros and cons. This will allow facilities to correctly handle the pollution problems, thereby achieving the practical effect of preventive measures.

CHAPTER 7

CONCLUSION

The atmosphere is one of the most basic human survival factors and any living creature, from its birth, needs to sustain life through breathing, and when the breathing stops, that means the end of life. With the development of human life and production activities, when the impact of atmosphere is larger than its self-purification capacity, it will cause pollution of the atmosphere. Since the "reform and opening up", China's economy has experienced a considerable development as well as dramatically increased productivity. However, the traditional mode of productivity improvement of economic growth has driven China to become overwhelmed and riddled with problems.

In recent years, with the rapid development of industrialization and energy consumption, air pollution is increasingly serious and air quality further deteriorates, which is not only harmful to people's daily lives, but also threatens people's physical and mental health. In the 1970s, coal particulate pollution emission was one of the most remarkable characteristics of the Chinese industry; in the 1980s, many southern cities suffered from serious acid rain hazards; in the 1990s, vehicle exhaust emissions of NOx, CO, and the subsequent photochemical smog presented deteriorating air quality to many major cities; recently, there has been serious suspended particles in the atmosphere and $PM_{2.5}$ haze pollution. All of this affects the health of residents and society development. To control the air pollution and protect the quality of

atmospheric environment, China's government has implemented a lot of measures.

The "Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution" was enacted in 1987. Because of the changing situation of China's air pollution control, it had been revised twice in 1995 and 2000. The third revision of the law started in 2009, which was included in the "Eleventh five-year National People's Congress Standing legislative plan" and the State Council's 2009 legislative program. At present, the third revision of the LPCAP is in progress and MEP has completed the manuscript of the revised draft of the law, while the NPC Environmental and Resources Protection Committee carries out the associated drafting work.

In my research, in the case of analysis of the air pollution statues and the history of LPCAP, I have proposed some issues of the LPCAP (2000) and also put forward some viable solutions referenced from the CAA, which are :

1. The solutions for the regional Total Emission Control (TEC) policy and division.
2. The solutions for improving the pollution emission permit system.
3. The solutions for management of the mobile source emissions.
4. The solutions for fuel management.
5. The solutions for the guarantee measures of the implementation of LPCAP.

All of these try to perfect the air pollution legal regulations of China. Furthermore the participation and cooperation of various government departments and

non-governmental organizations achieve the diversification of the air pollution control management. In addition, the LPCAP could promote the research of air pollution assessment techniques, and achieve the targets of air pollution impact assessments included in the environmental impact evaluation system. Popularity of the atmospheric protection law and relative regulations continuously expand the public awareness of legal atmospheric management to mobilize the conscious protection of the atmosphere, which is conducive to achieving sustainable development of the atmospheric environment and realize the harmony between humans and nature.

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