Feasibility study on the formulation of air non-point source emission standard in China

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Abstract—Emission standards of air pollutants are the legal basis for environmental management. Compared with the point source emission, the non-point source pollution of the air is mostly unorganized, which has the characteristics of large scope, random, hidden and difficult to control. It is difficult to take effective measures to control pollution, and the emission standard of atmospheric non-point source pollution is basically blank. In order to design a scientific and reasonable standard system, we have summarized the characteristics of atmospheric non-point source pollution, summarized the difficulties that dates back to the atmospheric non-point source emission standard in China, analyses the problems in the process of atmospheric non-point source emissions standards, put forward the principles for atmospheric non-point source emission standards. Finally we present the feasibility of typical atmospheric non-point source emission standards in China.

1. Introduction
Atmospheric pollution usually refers to the phenomenon that a substance enters the atmosphere due to human activities or natural processes, presents a sufficient concentration, reaches enough time and thus affects human comfort, health and welfare, or harm to the environment. When the pollutant contains a sufficient concentration in the atmosphere, and under the condition that the concentration has a sufficient time on the receptor, it harms the receptor and the environment, causing consequences, which is called air pollution. Analysis shows that human activities are the main cause of air pollution.

Atmospheric non-point source pollution has the following characteristics: First, most of the atmospheric non-point source pollution is unorganized emission, and it is difficult to choose the location to control pollutant. Second, non-point source pollution generally has no widely used pollution control technology. Compared with industrial sources, it is generally difficult to take pollution control measures. Third, the number of atmospheric non-point source pollution sources is large and scattered, which may have random, regional and seasonal characteristics at the same time.

Atmospheric non-point source pollution exists in the fields of industry, agriculture, transportation, life and even nature. It can be generally divided into two categories. The first is social life, such as heating boilers, cooking stoves, large landfill sites, construction and road dust commonly used by residents in large areas. The second is rural agriculture, such as farmland and forest farms that release a large amount of ammonia in the process of agricultural production, seasonal large-area crop straw incineration.

From the perspective of administrative management, China's environmental protection authorities divide air pollution control into fixed sources and mobile sources, and do not explicitly regard air non-
point source pollution as a type of control type. Among them, the atmospheric fixed source pollution mainly includes industrial pollution such as steel, electric power, chemical industry, petrochemical, nonferrous metals, cement, glass and coking, as well as domestic pollution such as gas stations, catering industry, boilers and crematoria; Mobile air pollution sources mainly include heavy diesel vehicles, light vehicles, motorcycles, tricycles, agricultural transport vehicles, etc. Among the atmospheric fixed source pollution, such as the unorganized emission of large industrial parks, it is also atmospheric non-point source pollution. The city's catering industry, large-area low-level emissions, also forms a non-point source pollution.

The emission standard of air pollutants is a restrictive provision that based on environmental quality standards, pollution control technology and economic conditions, and the harmful substances into the environment and harmful factors, which directly affects the goals of atmospheric environmental quality. A scientific and reasonable air pollutant emission standard system [1] helps to comprehensively and systematically control air pollution sources, thereby enhancing the effectiveness of atmospheric environmental protection work and improving the overall atmospheric environmental quality.

2. Current Status of China's Air Emission Standards

The air pollutant emission standards are formulated in accordance with the law to achieve the improvement of ambient air quality, combined with technical and economic conditions and environmental characteristics, to limit the types, concentrations or quantities of air pollutants discharged into the environment or other factors that cause harm to the environment, which have mandatory effect. It is the basis for controlling the emission of air pollutants and implementing pollution control design, and it is also the basis for law enforcement by environmental management departments. China emission standards are compulsory technical regulations, and it is also a product of balancing the emission rights of enterprises and the environmental rights of the public. It is controlled by government authorities representing public interests to prevent enterprises from transferring necessary environmental protection costs (internal costs) to the external environment. [2]

In order to control air pollution, it is necessary to formulate emission standards of polluting gases and corresponding regulations as well as monitoring means. However, it is a complicated process to establish the standards, which involves the environmental policies and economic and technological development levels of various countries.

Up to now, China's air pollution emission standards are mainly for the industrial field of fixed pollution sources and mobile sources such as vehicles and ships. At present, China has initially established a fixed source air emission standard system, which currently involves more than 40 fixed source emission standards, mainly for petrochemicals, nonferrous metals, building materials, steel, electric power, coal, light industry and other industrial areas. [3, 4] In addition, China has formulated 30 emission standards and testing methods for mobile sources such as automobiles and motorcycles.

3. Problems in the Formulation of Air Non-point Sources Emission Standards

At present, in China's air pollutant emission standards, [5] the emission standard system of fixed source and mobile source has been initially established, [6, 7] but the emission standards of air non-point sources pollution are basically blank. The main reasons for the difficulty in formulating air non-point source emission standards are as follows:

Firstly, air non-point sources pollution is mostly unorganized emission, which generally occurs in a larger area. Gaseous or granular pollutants are released from non-specific sites or multiple specific planar sites, making it difficult to determine the emission sites and unable to implement emission control. For example, the release of ammonia in the planting occurs on a large area of farmland, and the specific emission site cannot be determined. However, typical fixed source such as thermal power plants are generally discharged in an organized manner, and the flue gas is discharged from the exhaust port after collection and treatment.

Secondly, most of the air non-point sources pollution has not taken pollution control measures, let alone mature emission control technology. Compared with industrial sources, it is difficult to carry out
technical feasibility analysis, to select existing and appropriate technologies to reduce the pollution, and
to formulate emission standards according to the level that these technologies can achieve. For example,
for the release of ammonia in the planting industry, it is currently difficult to take physical or chemical
measures for the release of ammonia on such a large area of farmland, and it is even more difficult to
establish emission standards.

Thirdly, air non-point sources pollution mostly occurs in places closely related to personal life, such
as the burning of civil coal, planting or breeding ammonia. Under the current level of economic and
social development in China, the main bodies of responsibility are mostly individuals or self-employed
institutions, and it is difficult to effectively implement standards and compulsory measures.

4. Feasibility of the Formulation of Air Non-point Source Emission Standard

At present, the formulation of emission standards is based on two different ideas:

(1) Based on goals. The idea is to formulate a general goal to reduce the total emission of polluting
gases, and use this as a benchmark to formulate emission standards. Technically, it is necessary to find,
adopt and develop methods that meet the emission standards. This is the technology enforcement law,
which is of high standard, and Germany, Austria and Sweden adopt this principle;

(2) Based on technology. The idea is to choose existing and appropriate technologies to reduce air
pollution, and set emission standards based on what the existing technologies can achieve. This is the
principle adopted in the UK.

The solution between the two is to set a general target for the reduction of pollutant gas emissions
based on the post-discharge situation, and allow the selection of technical measures that actually achieve
the target. This solution is adopted by Denmark and other countries.

4.1. The Core Content of Air Emission Standards

The air emission standard is a mandatory standard, which must be implemented by the relevant
responsible subjects after the implement of the standards. Most countries formulate air pollutant
emission standards according to the current emission reduction control technologies. At the same time,
the cost factor will be considered when selecting technologies, and technical feasibility is the first
priority.

Practice has shown that the formulation of air pollutant emission standards includes 3 basic steps:

Firstly, the pollutants that will be controlled should be selected. The pollutants that affect public
health, ambient air quality and ecological environment should be included in the scope of control. Many
toxic pollutants are not prevalent in the ambient air of the whole country, so they may not need to be
regulated in the air quality standards. However, this does not mean that these pollutants should not be
controlled by the emission standards, and they should be judged according to the impact of specific
characteristics of pollutants on local air quality.

Secondly, determine the standard limit, which mainly depends on the level of pollution control
technology, including the front-end clean production process and the back-end treatment technology.

Thirdly, economic demonstration or analysis for the control technology. It is necessary to
comprehensively consider the cost of technology implementation, and the selected control technology
and the standard limit value should be economically affordable. In combination, it is necessary to make
the control technology feasible, can support the implementation of standards, and make the economic
cost in a reasonable and appropriate range. Conventional pollutant control requires more consideration
of technology cost; for the control of characteristic toxic pollutants, more consideration is given to the
technical effectiveness, which can reduce pollutant emissions to the maximum extent possible, and less
consideration is given to the cost factor, which is the loose and strict judgment criterion of the standard
limit value.

Generally in the process of formulating emission standards for air non-point sources pollution, the
core technology content is consistent with the emission standards for fixed sources, mainly including
the following three points:
(1) Determine which pollutants need to be controlled from the emissions of a specific pollution source?
(2) What emission indexes are used to control the selected pollutants?
(3) How to determine emission limits for selected pollutants?

4.2. Prerequisites for the Formulation of Air Non-point Sources Emission Standards
The air non-point sources pollution is mostly disorganized, large in quantity and dispersed, and may have random, regional and seasonal characteristics at the same time. It is difficult to select the controlled location and lack of mature pollution control technology and means when formulating emission standards. The formulation and implementation of air pollution emission standards are based on actual environmental protection work. The meaningful emission standards must be able to be implemented to the specific pollution emission responsibility subjects, have a clear monitoring location, and have mature and commonly used pollution treatment technology as well, which enables the index value of pollution emission control to be achieved. Therefore, among various air non-point sources pollutants, most of the pollution types are not suitable for setting emission standards under the current management and technical level.

To establish emission standards for air non-point sources pollution, the following prerequisites should be met:
1. This type of air non-point sources pollution has a prominent impact on air quality, and the administrative cost of supervision by environmental authorities is affordable.
2. This type of non-point source pollution has a clear responsibility subject, and the responsibility subject should have the ability to take effective pollution control measures and conduct effective management under current economic and social conditions.
3. Currently, a relatively mature and widely adopted pollution control technology has been formed, and the cost of pollution control is within the affordable range.
4. This type of non-point source pollution can be collected through pollutants to form an organized discharge, or stable and accurate monitoring can be carried out at a specific boundary, which is convenient for follow-up supervision and pollutant control.

According to the above-mentioned principles, we analysed whether common air non-point sources pollution is suitable for formulating national mandatory emission standards, as shown in Table 1.

| Number | Non-point Source Types | Subject of Liability | Whether it can be effectively monitored and supervised | Whether it has mature pollution control technology | Administrative supervision | Is the time to formulate mandatory national emission standards? |
|--------|------------------------|----------------------|------------------------------------------------------|-------------------------------------------------|---------------------------|--------------------------------------------------|
| 1      | Civil coal combustion  | Rural area families, suburban residents: not capable | Hard | Not yet, mostly used in industrial fields, with extremely high cost | Extremely costly | No |
| 2      | Gas station            | Gas station          | Achievable | Yes | Can achieve | Yes |
| 3      | Food and beverage      | Catering company     | Achievable | Yes | High cost | Yes |
| 4      | Auto Repair Industry   | Auto repair company  | Achievable | Yes | Can achieve | No |
| 5      | The Construction       | Hard | There are | Higher cost | No |
| 5. Conclusion |

Based on the above analysis, it can be seen that under the current conditions of economic and social development, the main body of air non-point sources pollution that is suitable for formulating emission standards should be the enterprise, which has the ability to take pollution control measures; meanwhile, the collection of gaseous pollutants should also be transformed into organized emissions with more mature technical means.

For most of the typical air non-point sources, it is not suitable to develop mandatory emission standards. In addition, due to the wide range, random, and scattered air non-point sources pollution, a considerable number of types do not have a typical controlled location and do not have mature pollution control technologies to reduce emissions. For this part of air non-point sources pollution, technical standards can be formulated, and specific control measures can be put forward to reduce pollutant generation or control pollutant emission. For example, for personal direct burning fuel (which cannot be installed processing equipment), and directly use solvent activities (buildings and municipal engineering coating, consumer products), it is currently difficult to control pollutants emission. It is necessary to formulate the corresponding products of hazardous substance content limits, from the source to control the fuel, coatings and other products.

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