

OPTIMIZATION OF AIR POLLUTION IN BEIJING FROM MOBILE SOURCES

ОПТИМИЗАЦИЯ ЗАГРЯЗНЕНИЯ ВОЗДУХА В ПЕКИНЕ ОТ МОБИЛЬНЫХ ИСТОЧНИКОВ

*Zhang E, Gao Shuai, Zhao Xiaofeng, Xu Shiyi, Hu Xinyue, Fang Jun, Luo Lantianzi,
Dong Wenwen, Pang Yuting, U. Kapitsa**

*Чжан Э, Гао Шуай, Чжао Сюафен, Сюй Шиуи, Ху Синьюэ, Фан Цзюнь, Ло
Ланьяньцзы, Дун Вэньвэнь, Пан Юйтин, В. Копиця**

*Белорусский государственный университет, МГЭИ им. А.Д. Сахарова БГУ,
г. Минск, Республика Беларусь
v_kapitsa@iseu.by

Belarusian State University, ISEI BSU, Minsk, Republic of Belarus

In recent years, due to active economic development, the growth in the number of vehicles, China has faced serious environmental pollution, especially the problem of air pollution in cities is becoming more and more serious. Air quality in many large cities has deteriorated due to emissions of NO_x, SO_x and CO_x from vehicle exhaust gases and the subsequent formation of photochemical smog. Urban air pollution affects urban health and urban development. With regard to air protection, the Chinese government is implementing many programs. Using the example of Beijing, this article proposes a method for optimizing urban air protection.

В последние годы в связи с активным экономическим развитием, ростом количества автотранспорта Китай столкнулся с серьезным загрязнением окружающей среды, особенно проблема загрязнения воздуха в городах становится все более серьезной. Качество воздуха во многих крупных городах ухудшилось из-за выбросов NO_x, SO_x и CO_x из автомобильных выхлопных газов и последующим образованием фотохимического смога. Загрязнение воздуха в городах влияет на здоровье городских жителей и развитие городов. В отношении защиты воздушной среды правительство Китая реализует множество программ. На примере Пекина в этой статье предлагается метод оптимизации защиты городского воздуха.

Key words: China; city; urban air quality; air pollutants; mobile sources; air pollution; vehicle exhaust gases.

Ключевые слова: Китай; город; качество городского воздуха; загрязнители воздуха; мобильные источники загрязнения; загрязнение воздуха; автомобильные выхлопные газы.

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Introduction

China's rapid economic growth, industrialization, urbanization and development of China's annual GDP growth rate of 8 to 9% [1]. Since the reform and opening up, China has made rapid progress in urbanization. With the rapid increase of automobile consumption and the average annual increase of fuel consumption of 6%, the concentration of SO_x, CO and related pollutants in urban air has increased [2]. Increasing energy consumption and motor vehicles have increased the burden of Beijing's atmospheric environment, and urban air pollution is rapidly emerging as a major environmental problem.

Analysis environmental problems air pollution and protection for Beijing

Beijing is the center of international exchanges of political and cultural interests, and also a famous historical and cultural city in the world. The environmental situation of Beijing is the focus of people at the China and abroad. The quality of Beijing urban environment directly reflects the importance of the state on urban environmental problems and the efforts to solve it. At present, the urban environmental problems in Beijing mainly exist in the following aspects: urban soil pollution, urban waste, air pollution, water pollution and other aspects. Among various environmental factors, the air pollution is particularly prominent.

The main causes of air pollution in Beijing are as follows:

1. With the rapid development of economy and society, the total amount of air pollutants is increasing

The important indicators of economic and social development, such as population, motor vehicles, energy consumption and construction, are closely related to air pollution.

In terms of population, Beijing has a large base and a rapid growth rate. To 2021, the permanent population of the city reached 21.54 million, and there were also 4 or 5 million floating population. So many people are mainly concentrated in the plain area of more than 6000 square kilometers, and the population density is too high. According to the outline of the Beijing Tianjin Hebei coordinated development plan, Beijing will strictly control the new population and drive population control with functional dissolution.

Beijing has a large number of vehicles and their quantity has grown rapidly. According to the statistical bulletin of national economic and social development in 2020, by the end of 2020, the number of motor vehicles in Beijing has exceeded 6.57 million, an increase of 25000 over the end of last year. The consumption of gasoline and diesel fuel also increased rapidly.

According to the analysis of PM_{2.5} source in Beijing, the air pollution in Beijing is composed of 31.1% of motor vehicles, 22.4% of coal, 18.1% of industrial production, 14.3% of dust, 14.1% of catering, automobile maintenance, animal husbandry and architectural coating. The main source of air pollution in Beijing is the mobile source emission represented by motor vehicles, while in the mobile source emissions, heavy diesel vehicles are the highest.

2. Pollution transmission in surrounding areas has a great impact

The surrounding areas of Beijing are in the period of accelerating industrialization and urbanization. Beijing, Tianjin and Hebei and its surrounding areas are highly concentrated in heavy chemical industry. The energy utilization mode mainly based on coal and the freight transportation mode mainly by road in the region lead to the high emission of main air pollutants in the region. The discharge of major pollutants per unit land area is 2-5 times of the national average level, and different pollutant discharge multiple is different. Except for sulfur dioxide, the emission of major pollutants in the region exceeds more than 50% of the environmental capacity, and in some cities, it even exceeds 80% - 150%. In addition, the main pollutants emissions in autumn and winter are increased by about 30% more than usual due to heating.

3. The geographical and meteorological conditions are not conducive to the diffusion of pollutants.

Beijing is located in the northwest end of North China Plain, surrounded by mountains on three sides. Only in the southeast is plain, the terrain is typical “dustpan” and the air pollutants are not well distributed. At the same time, Beijing is an inland megacity, not coastal, semi humid and semi-arid climate, with less precipitation and annual average annual precipitation of less than 450 mm, which is not conducive to the settlement of air pollutants. The number of days of extreme adverse weather conditions such as high temperature, high humidity, static wind inversion and so on, accounts for about 20% of the total year. Especially in autumn and winter, it is easy to appear continuous static and stable fog weather. PM_{2.5} in air accumulates rapidly, and the concentration rises sharply, which causes heavy air pollution. Beijing’s air pollution has a great impact on Beijing’s climate. The pollutants emitted by air pollution will have a certain impact on the local and global climate, especially on the global climate. In the long run, the consequences of this impact will be very serious.

The first is an increase in the amount of carbon dioxide in the atmosphere. Fuel contains all kinds of complex components, which produce all kinds of harmful substances after combustion. Even if the fuel without impurities is completely burned, it will also produce water and carbon dioxide. It is precisely because fuel combustion increases the concentration of carbon dioxide in the atmosphere, destroys the balance of carbon dioxide in nature, and may even lead to the “greenhouse effect”, causing the earth’s temperature to rise.

Harmful substances in the atmosphere can also invade the human body and cause harm, mainly through the following three ways: entering the human body through direct breathing; attaching to food or dissolving in water, making it invade the human body with diet; entering the human body through contacting or stimulating the skin. Among them, the main way is to invade the human body through breathing, and the harm is also the biggest. The harm of air pollution to people can be roughly divided into acute poisoning, chronic poisoning and carcinogenesis.

In the past 2020, Beijing has achieved good results in air pollution control. In 2020, PM_{2.5} and other four major pollutants in Beijing’s atmospheric environment were significantly improved over the same period of the previous year. The average annual concentration of PM_{2.5} was 38 $\mu\text{g} / \text{m}^3$, reaching the “30 +” level for the first time, with a year-on-year decrease of 9.5%; the inhalable particulate matter (PM₁₀) and nitrogen dioxide (NO₂) reached the national secondary standard for two consecutive years; the average annual concentration of sulfur dioxide (SO₂) reached the national standard and maintained single digit water level Flat.

The improvement of air quality in Beijing has made a landmark and historic breakthrough. The average annual concentration of fine particulate matter (PM_{2.5}) in the atmospheric environment has achieved “30 +” for the first time, reaching 38 $\mu\text{g} / \text{m}^3$, achieving the goal of the 13th five year plan, and the three-year action plan of the blue sky battle has been successfully concluded. Beijing’s air pollution control experience has been included in the “practice case” of the United Nations Environment Program, which provides reference for other cities in the world, especially for cities in developing countries.

Propose methods for optimization air protection in the city (industrial, transport, city planning optimization)

Through multiple analyses, it is concluded that the main factors affecting Beijing’s air quality are excessive emissions from coal burning, motor vehicles, industry and dust. In 2013, the coal is an important part of Beijing’s energy, accounts for 23.3% of the total primary energy consumption, such as power generation is given priority to with coal, there are a lots of coal-fired boiler outer suburbs, residents generally used coal heating, sulfide, nitrogen oxides and particulate matter from the burning of coal soot pollution had a great influence on air quality. Motor vehicle emissions are the main source of primary pollutants such as CO and NO₂ and secondary pollutants such as PM_{2.5} and O₃. In 2013, the number of motor vehicles in the city was 5.437 million, and there were tens of millions of vehicles (sub-vehicles) outside the city. In the face of a large number of fuel vehicles, there is also the problem of insufficient regulation of vehicle pollution emissions. In terms of industrial structure, the output value of the secondary industry in Beijing accounted for 21.7% of the total GDP in 2013.

Since 2013, Beijing has implemented the Clean Air Action Plan, and the air pollution control strategy has gradually shifted from terminal control to whole-process control. From concentration control to concentration and total. Turn from paying attention to enterprise management to pay equal attention to enterprise management and area and industry management. The focus has shifted from government control to social co-governance, sticking to the problem-oriented approach, focusing on reducing coal burning, controlling vehicles and reducing fuel, reducing pollution, cleaning and dust. Through systematic planning, regional coordinated governance, energy and industrial restructuring, and public participation, we have taken extraordinary measures to promote air pollution prevention and control. As a result, the pace of air pollution control has been accelerated, and remarkable results have been achieved in improving air quality.

The methods for optimization air protection in the city transport

The principles “Control cars and reduce fuel” leads the country to strategy of improving vehicle, oil, road as the guide. Using “public transport the first, strict standards, control the total amount, structural adjustment” as the principle, optimize the city’s vehicle structure. The Beijing has the leader position in the country in implementation vehicle emissions standards, innovating to control the total number of motor vehicles, accelerating the promotion and use of new-energy vehicles. In the 12th Five-Year Plan period, a total of 1.832 million old motor vehicles were eliminated and taking the lead in phasing out yellow-label vehicles.

Starting Feb. 15, 2017, Beijing has begun restricted light gasoline vehicles with China I and II emission standards from the city and other cities from driving within the Fifth Ring Road on weekdays, a move that will effectively reduce emissions of nitrogen oxides and volatile organic compounds (VOCs) from vehicles, in another step in the capital’s efforts to clean up air pollution. Beijing has also introduced subsidies to encourage car owners to replace old, high-emission vehicles [4].

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МОНИТОРИНГ ГЕЛЬМИНТОФАУНЫ МЕЛКИХ ГРЫЗУНОВ, НАСЕЛЯЮЩИХ БЕРЕГА МЕЛИОРАТИВНЫХ КАНАЛОВ В СМЕШАННЫХ ЛЕСАХ БЕЛОРУССКОГО ПОЛЕСЬЯ

MONITORING OF HELMINTH FAUNA OF SMALL RODENTS LIVING ON THE BANKS OF MELIORATIVE CHANNELS IN MIXED FOREST OF BELORUSSIAN POLESIE

В. В. Шумалов

V. V. Shimalov

Брестский государственный университет имени А.С. Пушкина,

г. Брест, Республика Беларусь

Полесский аграрно-экологический институт НАН Беларуси,

г. Брест, Республика Беларусь

shimalov@rambler.ru

Brest State University named after A.S. Pushkin, Brest, the Republic of Belarus,

The Polesie Agrarian Ecological Institute of the NAS of Belarus, Brest, the Republic of Belarus

Представлены результаты проведенного в 2015–2016 гг. мониторинга гельминтофауны мелких грызунов, населяющих берега мелиоративных каналов в смешанных лесах западной части Белорусского Полесья (Брестское Полесье). Было поймано 117 экземпляров зверьков 3-х видов. Заражены гельминтами 72,3 % рыжих полевок и 60,0 % желтогорлых мышей. Всего обнаружено 17 видов гельминтов (2 вида трематод, 7 видов цестод, 8 видов нематод). У рыжих полевок было найдено 12 видов гельминтов, у желтогорлых мышей – 9 видов гельминтов. В заражении первых доминировала нематода *Heligmosomum mixtum* Schulz, 1954, а в заражении вторых – цестода *Skrjabinotaenia lobata* (Baer, 1925) и нематода *Syphacia frederici* Roman, 1945. У мелких грызунов выявлено 4 вида гельминтов, имеющих медико-ветеринарное значение.