

Изучение первичной заболеваемости взрослого населения Чашникского района БСК в 2015-2019 годах выявило следующую тенденцию: увеличение в 1,63 раза регистрации ишемической болезни сердца и снижение – первичной заболеваемости цереброваскулярными заболеваниями и артериальной гипертензией. Максимальный прирост первичной заболеваемости БСК у жителей района отмечался в 2017 году, а затем пошел на спад.

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ANALYSIS OF SOIL POLLUTION IN CITIES – TAKE SHANDONG PROVINCE AS AN EXAMPLE

АНАЛИЗ ЗАГРЯЗНЕНИЯ ПОЧВ В ГОРОДАХ НА ПРИМЕРЕ ПРОВИНЦИИ ШАНЬДУН

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The geological environment provides living space and habitat for living things, and the water, air and nutrients needed by living things can be obtained here. The soil environment, on the other hand, provides food and nutrients directly to most organisms. With the continuous improvement of the level of urbanization, the population is concentrated in cities on a large scale, and the development of economy, society and science and technology is getting faster and faster. However, the environmental pollution problem brought by urbanization is becoming more and more prominent. The expansion of urban scale and the discharge of various pollutants caused by urbanization make soil pollution bear the brunt.

Геологическая среда обеспечивает жизненное пространство и среду обитания для живых существ, и здесь можно получить воду, воздух и питательные вещества, необходимые живым организмам. Почвенная среда, с другой стороны, непосредственно обеспечивает пищей и питательными веществами большинство организмов. С постоянным повышением уровня урбанизации население в больших масштабах концентрируется в городах, а развитие экономики, общества, науки и техники становится все быстрее и быстрее. Однако проблема загрязнения окружающей среды, вызванная урбанизацией, становится все более и более заметной. Расширение масштабов городов и выбросы различных загрязняющих веществ, вызванные урбанизацией, приводят к загрязнению почвы.

Keywords: urbanization, soil pollution, ecological protection, Shandong Province.

Ключевые слова: урбанизация, загрязнение почвы, защита окружающей среды, провинция Шаньдун.

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Introduction. No other economic and social process can create as many opportunities as urbanization, which plays an important role in promoting industrial development and employment [1]. Nobel Prize-winning economist and former Vice President of the World Bank Stiglitz once believed that China would face three challenges in the 21st century, the most important of which is China's urbanization, which will bring the most important economic benefits to China, as well as environmental problems. At present, urbanization has become China's new economic growth point after industrialization, and environmental problems do bring pressure to China.

The advantages of living in a big city. In China, urbanization is the only way to achieve modernization. President Xi Jinping has pointed out that we should follow the vision of innovative, coordinated, green, open, and shared development to better promote a new type of people-centered urbanization.

With the rapid development of cities, many people from rural areas and small towns flood into big cities, which also promotes the prosperity and development of urban economy. So why do people prefer to live in big cities? There are three main reasons.

1. Greater development platform and more employment opportunities. There are more jobs and employment opportunities in big cities, and there is more room for self-improvement. Job seekers can quickly find jobs suitable for their development or that match their abilities, and their salaries are relatively higher, which is conducive to the improvement of life quality.

2. More convenient transportation and living conditions. The infrastructure construction of big cities is more perfect, the transportation network is connected in all directions, and the travel is more convenient. Life supplies are abundant, supporting facilities are complete, and environmental sanitation is better.

3. Better education and health care. Many colleges and universities are generally concentrated in and around big cities, and college graduates tend to give priority to employment in big cities, thus providing more top talents for big cities. As a result, educational resources and medical technology will be better than those available elsewhere.

The urbanization process of Shandong Province. Shandong province, as a coastal province in eastern China, belongs to the Bohai Economic Circle, and is close to the Yangtze River Delta economic circle (Fig. 1). Both the number of population and the level of economic development are in the forefront of the country. In 2021, the GDP of Shandong province is about 8,309.59 billion yuan [2], it is about US \$1,319,32 billion, among which the GDP of two cities, Qingdao and Jinan, has exceeded 1 trillion yuan. From 2016 to 2020, the urbanization rate in Shandong province increased from 57.01 percent to 63.05 percent, an average annual increase of 1.2 percentage points. It is expected that the urbanization rate of Shandong will reach about 68 % by 2035 [3].

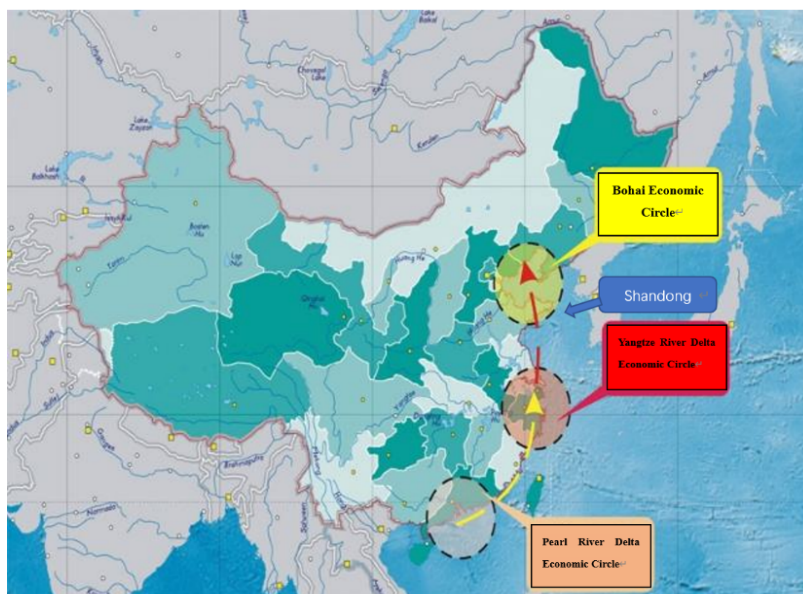


Figure 1 – Shandong Province and east China coastal economic circle

Jinan and Qingdao belong to the serious advance of urbanization, but as the leading cities of Shandong province, the development is reasonable. The relationship between urbanization and economic development in other regions presents obvious east-west differences, and the urbanization level decreases from east to west [4].

Negative effects of urban environments on human health. Urbanization has brought great material wealth and comfortable and convenient life to human beings, but it has caused unprecedented pollution to the environment. Modern epidemiological studies have confirmed that 70 % ~ 90 % of human diseases are related to environmental pollution [5].

Since the 1970s, the problem of urban environmental pollution has attracted the attention of many countries in the world, especially developed countries. They have increased investment in environmental protection, and the environmental situation has been controlled and improved correspondingly. However, the social factors and weak environment that led to environmental pollution still exist. People living in cities still must face all kinds of environmental pollution, which may cause respiratory diseases, cardiovascular diseases, blood system diseases, cancer and other diseases that seriously affect human health.

Soil pollution in cities. Soil environment is related to the quality of cultivated land and the safety of agricultural products, and the use of urban land has a direct impact on the economic and social development of the city and the construction of human settlement environment, because of the particularity and complexity of urban soil use, its ecological service function is also changing.

Soil environment is an open system, and its environmental quality is influenced by multiple factors. In the local area, the influence of human activities is more prominent [6].

Soil pollution in China. Between April 2005 and December 2013, China for the first time in China (except for Hong Kong, Macao and Taiwan) of about 630 square kilometers of land soil pollution condition were investigated, the results show that the national soil environmental condition overall is not optimistic, in some parts of the soil pollution is heavier, the soil environmental quality, mineral industry remnant soil environmental problems. The Yangtze River Delta, The Pearl River Delta and the old industrial base in northeast China are among the most serious soil pollution problems, while heavy metals in the soils of southwest and south-central China exceed the standard [7].

According to the report on China's Ecological and Environmental Conditions released in 2021, China's ecological and environmental quality continued to improve in 2020, with the total emission of major pollutants significantly reduced. Soil pollution shows that the soil environment of agricultural land in China is generally stable. The main pollutant affecting the soil environmental quality of agricultural land is heavy metal, among which cadmium is the primary pollutant.

Sources of soil pollutants. From the current urban construction and management process, urban soil pollution mainly includes heavy metal pollution, organic pollution, and pathogenic microbial pollution [8].

The main sources of urban soil pollutants are as follows:

1. **Industrial pollution** mainly comes from wastewater, waste gas and solid wastes produced by mining and production enterprises, such as smelting, chemical, non-ferrous metals, pharmaceutical and other industries. Part of the production enterprises emissions falls below contains a lot of heavy metal wastewater and waste residues, these substances will go deep into the soil, some heavy metals cannot be microbial degradation, and long-term accumulation, very unfavorable influence on the use of urban land, so the heavy metal pollution has become one of the most serious pollution sources of soil pollution in city.

2. **Domestic pollution** mainly includes household garbage, human and animal excrement and domestic sewage. Urban soil is affected by pathogenic microorganisms and viruses of sewage, unreasonable or not thorough life sewage purification to leach into the soil, causing soil subjected to viruses and pathogenic microorganisms [8], these emissions into the water and the soil, to produce a serious health threat to the human body.

3. **Agricultural soil pollution** mainly comes from the use of pesticides and fertilizers. The use of organochlorine and organophosphorus pesticides will lead to serious organic pollution in urban soil. Organic pollution not only damages the urban soil environment and water environment, but also damages the ecological service function of urban soil. The heavy use of chemical fertilizer will cause the accumulation of nitrite ammonia and nitrite nitrogen in soil and groundwater and poison the terrestrial ecosystem.

Shandong is a major agricultural province in China. In 2021, Shandong's grain output reached 110.01 billion kilograms, ranking the third in the country, and the output of vegetables and fruits ranked the first in the country. Therefore, Shandong's agricultural pollution problem is more prominent than other provinces. In addition, there is also pollution caused by straw burning emissions in Shandong. The particulate matter and various gaseous pollutants released by open burning of straw settle into soil and become one of the sources of soil pollution such as polycyclic aromatic hydrocarbons [6]. But straw burning has been banned in most cities in recent years.

4. **Traffic pollution.** Many harmful substances discharged from automobile exhaust will enter the soil environment through atmospheric deposition, such as lead, cadmium and other heavy metals will be deposited in the soil on both sides of urban roads.

Urban soil environmental protection measures. The urban ecological environment is an interactive whole. Soil, air, and water are circulating and interacting with each other. No matter which link is polluted, it will affect the entire urban ecological environment. In view of the problem of urban soil pollution, effective measures must be taken to control and protect the urban soil and ecological environment.

Urban green space improvement. According to the actual situation of urban development, rationalize the allocation of land resources, improve the utilization rate of land resources, reduce the pollution and waste of urban soil resources. We should also do a good job in urban land planning, improve the efficiency of urban land use in a more scientific and reasonable way, and put an end to blind urban expansion and the destruction of land and forests.

At the same time, according to the characteristics of urban soil and the actual situation of the selection of suitable greening plants, and rational use of organic fertilizer, to promote the benign cycle of urban soil and ecological system.

For example, The Jining City government of Shandong Province issued the Three-year Urban Greening Construction Plan of Jining City Central District (2017-2019). Combining the construction of shanty towns and the reconstruction of villages in the city, the government vigorously implemented the demolition of urban green space for urban construction to create a «big garden» of the city and built more than 40 small parks in the urban area to improve the city image and greening level. At the same time, emphasis should be placed on plant diversity based on beautification. Choose plants with strong resistance to dust, harmful gases and pollution in industrial areas. Peripheral scenic spots are mainly mixed forests,

focusing on color matching and ecological balance [9], promoting urban beautification and restoration and virtuous cycle of ecological environment system.

Adjust the urban industrial structure. There is a relationship between urbanization, industrial structure, and environmental pollution (Fig. 2). The increase of population, the number of cities and the change of production and lifestyle caused by urbanization will cause environmental pollution. The technological progress, structural upgrading and quality improvement caused by industrial structure adjustment can alleviate and control environmental pollution.

In the process of development, big cities can actively adjust their industrial layout, optimize their industrial structure, eliminate industries with serious pollution and backward technology, vigorously develop high-tech industries, and form a green, low-carbon and circular development mode. For example, some cities in Shandong can adjust their industrial structure by strengthening foreign trade, maritime trade, developing Marine resources, introducing high-tech industries, and developing ecological agriculture.

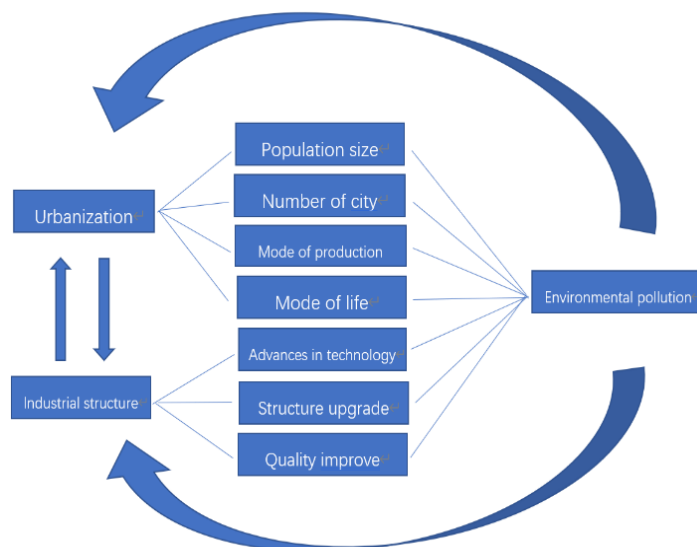


Figure 2 – The internal relationship between industrial structure, urbanization, and environmental pollution

Control pollution sources and repair contaminated soil. Urban management and environmental protection departments should strengthen control of pollution sources and strengthen monitoring and treatment of pollutants from (non-ferrous metal smelting) factories. Improving the utilization of resources and waste. Actively promote unleaded gasoline. Carry out atmospheric environment control measures, separate and treat garbage with heavy metal elements and other polluting elements from ordinary garbage. We will strengthen environmental oversight of agricultural production.

At the same time, the use of modern scientific and technological means to transfer, absorption, degradation and transformation of pollutants in the soil, scientific restoration of soil, so that its concentration is reduced to or the toxic and harmful pollutants into harmless substances, so as to achieve the purpose of effective control of soil pollution.

Improve laws and regulations on soil protection. China has a vast territory, and the level of urban development varies greatly among different regions. However, the protection of urban ecological environment is a long-term task that requires our common attention. The Law of the People's Republic of China on the Prevention and Control of Soil Pollution took effect on January 1, 2019, which has also provided a legislative basis and guidance for soil environmental protection across the country.

In addition, in the aspect of ecological environment protection, the active guidance of government departments and public opinion propaganda is also essential, improving the environmental awareness of the whole people is more conducive to the sustainable development of ecological environment.

Conclusions. City is a highly concentrated area of population density; soil is the foundation of urban development. Soil destruction and pollution not only restrict the construction and development of cities, but also threaten the life safety of urban organisms. As the main body of urban life, we must pay attention to the protection of ecological environment and geological environment, so as to protect our living home, so that our city truly achieves green, healthy and sustainable development.

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ПЛЕНКИ НА ОСНОВЕ ПОЛИВИНИЛОВОГО СПИРТА И КУРКУМИНА FILMS BASED ON POLYVINYL ALCOHOL AND CURCUMIN

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В работе получены пленки на основе поливинилового спирта (ПВС) и куркумина, которые перспективны в качестве упаковочных и перевязочных материалов.

In the work, films based on polyvinyl alcohol (PVA) and curcumin were obtained which are perspective as packaging and dressing materials.

Ключевые слова: поливиниловый спирт, куркумин, спектры поглощения, упаковочные и перевязочные материалы.

Keywords: *polyvinyl alcohol, curcumin, absorption spectra, packaging and dressing materials.*

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Пленки на основе поливинилового спирта (ПВС) находят применение в качестве биodeградируемых упаковочных материалов. Эти пленочные материалы обладают высокими барьерными свойствами и могут использоваться в пищевой отрасли, медицине, химической промышленности. С целью улучшения функциональных характеристик и расширения областей применения разрабатываются разнообразные композитные материалы на основе ПВС. Перспективными направлениями исследований являются поиски экологических пленочных материалов с бактерицидными свойствами. Поливиниловый спирт разрешен к использованию в пищевой отрасли как добавка Е 1203 поскольку не оказывает неблагоприятного влияния на организм человека. В пищевой промышленности ПВС применяют для связывания воды, как глазирующий агент, как основа съедобных упаковочных пленок [1]. Создан антибактериальный композит на основе ПВС, содержащий пектин, глицерин и TiO₂ и пленка, которая предложена для предотвращения микробиологической порчи пищевых продуктов, в частности хлебобулочных изделий. Такая упаковка кроме антибактериальных имеет хорошие механические свойства и способна к биodeградации [1].