

Executive Summary
The Impact of Urban Development on Groundwater, Soil Heavy Metal Content and
Heavy Metal Pollutant Management Policies in Shenzhen City, China

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Figure 1. The Location of Shenzhen

Background on the environmental issue and location:

I completed an internship at the Centre Testing International Group Co., Ltd (CTI) in Baoan District, Shenzhen City, Guangdong Province. 518055. China. Shenzhen, located in the southern part of Guangdong Province, is a typical southern coastal hilly and low mountain zone (Figure 1). The southeast is higher in elevation, and the northwest is lower and mostly coastal plains, with a regional area of 1996.85 km² and a population of 10,777,900. The territory has a subtropical maritime climate, with an average annual temperature of 22.4 °C and sufficient average annual rainfall of 193.3 mm. Heavy metal pollution is one of the environmental issues in Shenzhen. As an industrial area, Shenzhen has built some heavy metal enterprises in recent years, such as electroplating plants, paper mills, printing plants, dyeing plants, and other high-emission polluting enterprises. These enterprises contribute significantly to the economic development of Shenzhen but also contribute to the pollution of soil and

water.

Key highlights of the scientific report:

During my internship, I collected a total of 20 water samples from four rivers, 7 forest soil samples, and 10 industrial soil samples. After pre-treatment, data collection, data analysis, and discussion of the risks to ecological and human health, I summarized the following results:

1. The interannual variation of heavy metal elements in each river is great and shows an increasing trend year by year.
2. Longgang River and Buji River have the most serious potential risk hazard, and Maozhou River has the lowest potential risk hazard.
3. Heavy metal pollution in the soil of industrial areas is relatively low.
4. The potential risk of heavy metal concentration to the ecosystem and human health in industrial areas is relatively low.

After analysis of the soil and water samples, I attended a government meeting to discuss creating and adjusting policies to address the impacts of heavy metal pollution. During the meeting, experts analyzed the number and types of existing factories in Shenzhen and pointed out that the reasons for heavy metal pollution are insufficient supervision and an imperfect pollutant discharge system. At the meeting, government officials proposed measures to strictly control the environmental protection approval process for enterprises that use heavy metals and to improve the pollutant discharge permitting process.

Additional methods to control the emission of heavy metal pollutants include the following:

1. Change the total discharge standard of pollutants.
2. Base the total emissions reduction calculation and assessment methods on the

administrative region alone.

3. Implement the pollutant discharge permit system for enterprises and institutions to comply with pollutant emission control requirements.

4. Gradually realize the control of pollutants from the administrative region by monitoring results on a regular schedule.

Key highlights of the business report:

Through this internship, I found that the government has decentralized the responsibilities of the environmental protection department. For example, when it comes to water resources, some business needs to be handled by the water conservancy department, and some business needs to be handled by the environmental protection department. Such division will lead to inefficiency and instead should be combined into a coordinated effort in order to help to handle environmental issues more smoothly.

In CTI, different fields are managed by different departments and leaders. My water sample analysis project and soil analysis project belong to independent departments. My group consisted of interns from different universities, and this project has also received help from some universities, which can also enhance the image of CTI in the minds of college students and help CTI become the first choice of employment for college graduates. Both capital development and talent attraction can be improved, which are helpful to the development of CTI.

Contributions to the project, organization, and body of knowledge:

In this internship, I not only participated in every process, but also shared the knowledge I learned in graduate school and the experience learned from the previous internship laboratory experience with my team members to help everyone better complete sample analysis. For example, I have learned the use of experimental

equipment and what kind of chemical reactions occur when various reagents are mixed in school. These experiences have helped me to adapt to the sample test experiments and pre-processing experiments conducted during the internship more quickly. In addition, learning to cooperate with people in different fields through a course in interdisciplinary teams helped me integrate into the group faster and improve work efficiency. The knowledge I have learned also helped the team analyze the potential harm of heavy metals to the ecosystem.

Next steps:

1. This internship is one of my graduation requirements toward completing my master's degree in environmental sciences.
2. The internship transforms the theoretical knowledge I have learned in school textbooks into practice and helps me to master professional knowledge more proficiently.
3. This internship has allowed me to meet many friends and leaders in the same profession who will help me in my future work life. Because of this internship, I had contact with government personnel, and it also made me interested in the operation and system of the government. Therefore, I started to submit my resume to the government within a month before graduation, and finally got the position of environmental consulting engineer in the Eco-Environmental Protection Bureau. I hope to start with this position to understand the government's environmental protection management measures and whether it has followed the new environmental protection monitoring policy proposed in my meetings.
4. This internship also gave me a clearer understanding of my hometown's environmental conditions and existing problems. After discovering these problems, I am motivated to find solutions around these problem areas in my future career.