

# Impact of Water Quality Sampling Process on Environmental Monitoring Results

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**Abstract** The sampling of environmental water should ensure the representativeness and integrity of the sampled water body, which has an important impact on the monitoring results. The sampling of different water bodies sampling will result in different monitoring results. Based on the study on the problems and influencing factors in the sampling process of environmental water quality, improvement measures during the sampling process were elaborated in the paper, with the aim to strengthen on-site control of water sampling, and reduce adverse effects on monitoring results.

**Key words** Water quality sampling; Influencing factors; Improvement measures

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The current environmental protection issues in society have attracted widespread attention, and environmental protection has penetrated into all aspects of the social environment. In environmental protection, water quality is not only related to human health, but also determine the operational and development status of various fields of society and economy. Among them, water quality monitoring is one of the important contents in environmental protection.

The goal of water environmental monitoring should be to comprehensively obtain test samples of water pollution, and then determine the level of water pollution by implementing targeted water sample testing and treatment methods. From a macro perspective, water quality monitoring can clarify the content of related pollutants and their changes in water bodies. Based on this, it is possible to analyze and study the potential hazards caused by water pollutants, take targeted measures to deal with them, and avoid the impact of water pollution on the ecological environment and people's health. From a micro level perspective, water quality monitoring is to monitor the changes in the content of different types of pollutants in water bodies, and take corresponding measures to ensure the health and safety of water bodies, so as to ensure the natural environmental safety of the affected areas<sup>[1]</sup>.

In the process of ecological water quality monitoring, the quality of sampling directly affects the accuracy and reliability of water quality monitoring data results. Therefore, efforts should be made to eliminate and avoid various unfavorable factors in the water quality sampling process, and use various measures to solve and improve them to ensure the accuracy and reliability of water quality monitoring analysis.

Water quality monitoring plays a crucial role in ensuring the health of water bodies, and it is necessary to analyze and solve the existing problems, which has practical significance for further

improving the natural environment and human health.

## Content of Water Quality Monitoring

Water quality monitoring is the process of evaluating the quality of water environment by monitoring the content and variation trend of pollutants in water bodies. Water quality environmental monitoring covers great range of water bodies, including domestic water, industrial wastewater, unpolluted water bodies, as well as polluted rivers, lakes and groundwater. In recent years, due to the increasingly severe situation of environmental pollution, water quality monitoring has received much attention, which has also become a key content of environmental protection research. Because of various factors, there are still many problems in China's water quality environment, which makes water quality monitoring difficult and incomplete. Therefore, it is necessary to continuously optimize and improve water quality monitoring work, seek more effective monitoring methods, strengthen water quality and environmental protection supervision, and continuously improve the quality of water quality monitoring<sup>[2]</sup>.

## Factors Influencing Water Quality Monitoring Results

### Rationality of point location

Before conducting water quality sampling work, it is necessary to reasonably determine the sampling plan, including determining the sampling points and sampling cross-section. Reasonable determination of sampling points can effectively improve sampling efficiency; Sampling personnel should actively and comprehensively collect relevant data before sampling, and pay attention to the following points before sampling: (1) the geological, hydrological, climate, environmental resources, and other conditions of the location where the sampling water body is located; (2) the distribution of water bodies and the environmental conditions around them; (3) the status of water bodies and their surrounding pollution sources; (4) the distribution and pollution status of industrial enterprises around the water body; (5) the traffic conditions at

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the survey site, and setting up corresponding investigation cross-sections for sampling and analysis on the river sections.

### **Sampling tools**

After determining the sampling sites for water quality, it is necessary to choose reasonable sampling tools. The selected sampling container must meet the technical specifications of the sampling work. The material of the sampling container has a significant impact on the storage of the sample. If the material used to make the container is dissolved in the water sample, it can affect the authenticity of the sample monitoring results. For example, when using plastic containers, the organic matter in the plastic containers will dissolve in the water; when using glass containers to store samples, a certain amount of sodium and silicon elements will be dissolved from the glass containers, resulting in errors in water quality monitoring results. Thus, in the process of container selection, it is necessary to consider the dissolvability of the container material. Sample storage containers may also adsorb substances from water. Glass containers have strong adsorption for trace metals, while plastic containers have strong adsorption for organic substances in the samples. At the same time, the sample storage container may also have chemical reactions with the samples. If there is a high fluoride content in the monitored water, the fluoride will have a certain chemical reaction with the glass container, which will seriously damage the quality of sample collection. Therefore, sampling containers are generally made of polyethylene and glass. During water sampling, containers should be selected according to the requirements of different water quality and monitoring items. For example, glass sampling containers must be selected for monitoring chemical oxygen demand and permanganate index items; glass or polyethylene sampling containers can be selected for monitoring ammonia nitrogen items; brown glass bottles are preferred for monitoring petroleum in water bodies; and polyethylene plastic bottles can be used to monitor the total phosphorus and nitrogen in water bodies. In this way, it can effectively avoid the impact of sampling container materials on water quality monitoring results.

## **Effective Measures to Eliminate Influencing Factors in Water Quality Monitoring**

### **Preliminary sampling preparation**

For specific sampling points, water quality sampling should be prepared in advance. The specific measures are as follows: before sampling, the cross-section of the monitoring water sample should be appropriately arranged; due to the different shapes of monitoring sections, the corresponding monitoring information will also have differences. Therefore, in order to obtain high-precision values during water quality sampling, it is necessary to select appropriate monitoring cross-sections to reflect the typicality and objectivity of water quality sampling. After arranging the cross-section for water quality monitoring, it is necessary to verify and calibrate the various equipment and sampling equipment on site to ensure correct sampling indicators. Meanwhile, the preservation

agents and fixing agents for water samples shall be verified strictly. The preservation agent and fixing agent should be accurately prepared according to different project indicators, and no random preparation should be allowed. Moreover, the shelf life of the fixing agents and preservation agents should be checked on a regular basis, and efforts should be made to ensure that all agents are with the current use and appropriate preparation.

### **Standardizing water sampling process**

During the entire process of collecting on-site water samples, sampling personnel should strictly follow the current technical processes and standardize their operations. In the actual operation process, on-site sampling points should be arranged in advance with precise positioning. During monitoring sampling, the sampling personnel shall accurately record the pH value, dissolved oxygen, oxidation reduction potential, conductivity, turbidity, water temperature and other indicators of the water sample. When filling out the sampling record form, sampling personnel should ensure that the handwriting is clear, correct, and free from stains, and that accurate descriptions are used to describe the characteristics of the water sample. In some cases, there may be errors in the equipment or instruments required for on-site sampling, so it is necessary to clean the instruments before sampling to reduce system errors.

In general, on-site water quality sampling involves various personnel involved. If the operator responsible for water quality sampling does not have excellent comprehensive literacy, there may be errors in water samples. If serious, neglecting a certain sampling operation can reduce the accuracy of the entire sampling process. Water quality sampling involves multiple specialized techniques, and specific measurement indicators can also be classified into many types. Only after comprehensive evaluation can sampling operators truly implement water quality sampling. Once certain errors in the sampling process are identified, they must be immediately corrected to prevent frequent sampling errors<sup>[3]</sup>.

### **Setting appropriate sampling frequency**

Regular water sample collection can increase the accuracy of water quality monitoring results. For example, the monitoring of drinking water can increase the frequency, such as twice during the sampling period, with an interval of at least 10 d. If the situation is special, the frequency of sampling and monitoring can be reasonably increased to maintain the stability of water monitoring.

## **Quality Control during Water Quality Sample Collection**

The collection, storage, and transportation of water samples should be strictly carried out in accordance with monitoring technical specifications. It is required to fill out the sampling location, sampling time, environmental conditions, sampler, recorder, and verifier as required, and provide additional explanations and records in case of any abnormalities. Meanwhile, quality control is carried out for on-site sampling: first, full program blank test is required, and after completing the full program blank test, the

relative deviation value between the results of the full program blank test and the laboratory blank test is calculated to determine whether there is a significant difference between the two; if there are significant differences, the sampling method should be checked for rationality and standardization. Second, the on-site parallel water samples are collected separately according to the sampling items and selected projects, and the parallel results should meet the technical requirements and not exceed the tolerance range. Third, for some testing items with special requirements, such as heavy metals, chemical oxygen demand, cyanide and other items, the water sample needs to be fixed with special acid and alkali. Fourth, the collection of water samples should be carried out uniformly by the testing unit, and the sampling record form should be carefully filled out during collection. Fifth, it is necessary to refrigerate the water samples at low temperatures during the transportation, and if necessary, a transportation blank must be set<sup>[4]</sup>.

During the transportation process of water samples after collection, changes in environmental conditions, such as microbial metabolism and chemical reactions, can cause changes in certain physical parameters and chemical components. Therefore, appropriate storage measures should be taken according to the requirements of different monitoring items, such as using insulation boxes and ice bags for low-temperature refrigerated transportation.

## Discussion

Water quality monitoring is mainly aimed at detecting the pollutants contained in water bodies, effectively reflecting the degree of pollution in water bodies. By monitoring the degree of water pollution, corresponding policies and methods can be adopted to treat water pollution, thereby achieving the goal of improving the water environment. Meanwhile, the main body of water quality monitoring work is the monitoring personnel, so the professional level of the monitoring personnel and their work literacy and sense of responsibility during the sampling process have a certain impact on the monitoring results. Therefore, it is necessary to attach importance to the professional literacy and quality of water quality monitoring personnel, and provide them with regular professional training to continuously improve their overall level.

In the process of water monitoring and collection, there are many new monitoring devices, such as Bluetooth keys and other information devices, which have played an important role, especially in the application of groundwater monitoring and logging. The use of Bluetooth keys and other information devices can effectively supervise the water sampling process and frequency of water sampling, and can effectively control groundwater monitoring. However, there are still some risk issues. As for the newly applied information equipment, the long-term exposure in the wild and long-term exposure to wind and sun, even with protective measures, still affects its effectiveness, especially for long-distance

sampling work. After the monitoring and sampling personnel arrive at the sampling site, there are frequent events that cause sampling difficulties due to the inability to open the monitoring well, which affects sampling efficiency and is not conducive to the progress of sampling work. Therefore, it is necessary for relevant monitoring and regulatory departments to optimize the configuration reasonably and combine new information equipment with traditional equipment to jointly improve the efficiency of sampling.

## Conclusion

Overall, water environment monitoring is an important measure to clarify the quality of water bodies, and is also the foundation for improving water quality, which is of great significance for further enhancing the quality of water resources. The accuracy of the final data of water environment monitoring is directly related to various factors such as environmental factors, human factors, and instruments in the laboratory. In the current practical work of water quality monitoring, factors such as the professional literacy of water quality environmental monitoring personnel, existing regulatory systems, monitoring instruments and equipment still need to be improved. Personnel in various business fields of water quality monitoring should engage in close interaction and cooperation, reasonably expand the coverage of existing monitoring business, and jointly promote the improvement of the quality of water environment monitoring work.

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