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Analysis on status quo and improvement measures of quality management of ecological environmental monitoring

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Abstract. As people are constantly improving their awareness of environmental protection, more attention is also paid to environmental quality management. There exist some problems that are not conductive to the smooth development of environmental monitoring in the quality management of environmental monitoring, compared to other monitoring technologies. Therefore, targeted development countermeasures are proposed based on the status quo of the quality management of environmental monitoring, thereby promoting the development of environmental monitoring and China's environmental protection cause. In this paper, study is conducted on the status quo of the quality management of ecological environmental monitoring.

Keywords. Environmental monitoring, quality management, working status, development countermeasures.

The quality of the ecological environment bears on the quality of people's life, and can also be considered the spiritual core of a region's development, which reflects its emphasis on the protection of the natural environment and its pursuit of harmonious coexistence and mutual support between man and nature. In recent years, the construction of an eco-friendly society has been put on the agenda, and environmental monitoring departments are faced with greater working pressure while attaching greater importance to ecological environmental monitoring. Limited by monitoring technologies and systems, the poor management of ecological environmental monitoring quality should be improved accordingly, so that scientific and powerful monitoring data support can be provided for the effective protection of the ecological environment.

1. Overview of environmental monitoring quality

From the current situation of China, the extensive environmental pollution makes economic & social development and ecological environment protection the premise of this country's long-term sustainable development, and an effective collaborative mechanism must be established. The professional and effective environmental monitoring quality control reflects the serious consequences of environmental pollution at all levels. Environmental monitoring not only provides data for environmental protection departments, but also provides basis for environmental protection planning. Thus, environmental quality monitoring is quite important. The status quo and process of environmental monitoring is complex in China, where the weak quality control of environmental monitoring leads to problems and errors in environmental monitoring, which greatly limit the effective implementation of environmental monitoring, environmental development and environmental impacts. Environmental monitoring, as the basis of the coordination between environmental protection and social & economic development, involves a wide range of work and intricate tasks. It refers to the monitoring of various environmental factors, including the environmental quality of the release of water and sewage, environmental air and waste, seawater, soil, sediments, solid waste, organisms, microorganisms and so on, and the chemical and physical pollution, such as pollutants, noise, vibration and radiation. Biological and other technical means are used, and various monitoring tasks, such as field investigation, monitoring planning, site selection, sampling, laboratory analysis, data processing, data analysis and comprehensive analysis, are conducted in the work.

2. Importance of ecological environmental monitoring in serving ecological environment management

Environmental monitoring is one of important ways of environmental management. The concept that "environmental management must rely on environmental monitoring, and environmental monitoring must serve environmental management" was proposed early in the 4th national environmental monitoring working conference. Environmental monitoring is the "ears and eyes" and "ruler" for implementing regulations and standards, the "position" and "basis" of environmental protection, as well as the technical support; environmental management must rely on environmental monitoring, and environmental monitoring must serve environmental management, both of which must be mutually supported and closely cooperated to implement their unified supervision and management function scientifically and effectively. The environmental quality can be accurately reflected and the supervision and management strengthened in a targeted way only by combining monitoring with management. Therefore, the government's administration in accordance with law and law enforcement based on the authority of monitoring data are increasingly important. At present, ecological environmental monitoring has become the "pillar" and "lifeline" of ecological environment protection.

3. Analysis on problems in environmental monitoring management

(1) Lack of professionals

There are inconsistencies between the current level of environmental monitoring and the demand of environmental

management in China due to the late start of environmental monitoring, the unequal development between regions and the constraints of many factors. Environmental monitoring involves a wide range of areas, but the practitioners are of various levels. The quality control of environmental monitoring needs to be supported by a high sense of responsibility and professional technical theories. The low quality and ability of monitoring personnel leads to the improper implementation of their work, which will affect the accuracy of data and the environmental law enforcement, planning and decision-making management. Therefore, enhancing the business capacity of environmental monitoring personnel is an important requirement for promoting the scientific development of environmental management. In particular, higher requirements are made for the working capacity and efficiency of monitoring teams with the wide application of high-tech monitoring methods in ecological environmental monitoring. In the public institutions where the job is steady, there is a lack of competition mechanism and employees are lowly motivated to learn. High-quality monitoring technical professionals are still scarce in contrast to the increasingly heavy monitoring tasks.

(2) Lack of perfect management system and institution

Despite a large number of monitoring institutions in China, their simple work content is not conducive to ensuring the quality of monitoring management. During the implementation of environmental monitoring, staff of low overall quality fail to record relevant data as required or continue outdated working patterns, which, although this does not affect the implementation of environmental monitoring, is not conducive to ensuring the accuracy of environmental monitoring results. In China, the working mechanism of environmental monitoring is imperfect, which affects the quality and efficiency of monitoring work; laws and regulations on environmental monitoring are deficient, which is not conductive to standardizing staff's work behaviors and thus lead to the lack of legal guarantee for environmental monitoring; environmental protection departments have no reference standards in practical work, which not only cannot ensure the effect of environmental monitoring, but also may cause various problems. For lack of a perfect environmental management mechanism in China, there are no scientific industrial standards in the environmental monitoring work, which adversely affects the smooth implementation of environmental monitoring.

(3) Weak emergency monitoring capacity

Environmental emergency monitoring is special monitoring, which cannot be achieved by general environmental monitoring technologies, and relevant equipment is required for the emergency environmental monitoring system. Compared with that in developed countries, China's emergency monitoring equipment is outdated. Although we have, at present, rules on emergency monitoring, they mainly apply to industrial pollution sources, and this narrow scope of application cannot meet the needs of emergency monitoring in the new era. For primary environmental monitoring stations, many of them are provided with less emergency monitoring equipment for lack of funds to introduce new technologies and equipment. Emergency monitoring programs are impertinent, emergency drills in many monitoring stations are formalistic, and emergency monitoring ability is weak. Once pollution accidents occur and are monitored in time, the best opportunity of emergency monitoring will be lost, causing decision-makers to make a wrong decision.

(4) Lack of funds for environmental monitoring

At present, the public attaches great importance to environmental protection, and the government has increased efforts to support environmental protection and monitoring. However, due to the uniqueness of environmental monitoring and the high cost of relevant monitoring equipment and maintenance, relying solely on funds from the government is neither favorable for the operation of the environmental monitoring system nor timely repairing and maintenance of most monitoring equipment, making it hard to smoothly conduct environmental monitoring. Meanwhile, this also affects the reliability and accuracy of collected data, which is not conductive to researchers' exploration and analysis of data information.

4. Effective countermeasures to improve the quality management of environmental monitoring

(1) Strengthening the talent training and team quality construction in environmental monitoring

As the public awareness of environmental protection and the national environmental management level are gradually enhanced, the work of environmental monitoring is subjected to increasingly stringent requirements. Cultivating professional technicists and improving the overall business quality of environmental monitoring teams are the basic support and guarantee for the demanding quality management of environmental monitoring. (1) The training system is improved. The work of emergency monitoring is investigated based on the current epidemic status, online and offline training and exchanges of professional monitoring technologies of various forms and rich contents are carried out, and technological competitions and training are organized in the ecological environmental monitoring system to improve the professional quality of environmental monitoring personnel. (2) A cooperative system is established. Studies on environmental monitoring projects and scientific research technologies are carried out in cooperation with universities and scientific research units to make environmental monitoring talents go out and bring them in. (3) An incentive mechanism is developed. Efforts are made to break equalitarianism and adopt distribution according to labor to mobilize the enthusiasm of environmental monitoring personnel, and to improve their working treatment to attract and retain talents.

(2) Developing measures of quality management

To improve the quality of environmental monitoring laboratories, efforts can be made to develop relevant regulations, and conduct the work of laboratory quality management and optimize the internal environment based on them, so as to guarantee the quality of the management work and technical operation and to ensure the effective control of quality in each link of the monitoring work. Not only should various quality control measures be properly utilized during environmental monitoring, but also the basic knowledge, laws and regulations, evaluation standards, monitoring standards or technical specification, and quality control requirements of environmental protection related to the position, as well as the knowledge of chemical, biological, radiation and other safety protection should be utilized during personnel supervision. Personnel should be trained in the basic theory, basic skills, sample analysis and other contents and assessed in time before the ecological environmental monitoring work. Environmental monitoring is the main work of ecological environmental monitoring institutions, and must be recorded according to the monitoring standards, and environmental monitoring data should be recorded after sampling; the experiment should be properly partitioned, specific function of each partition should be clearly shown, independent sample preparation area should be set normally, and samples should be prepared and stored normally based on the monitoring standards; during work, relevant equipment, such as exhaust equipment and dust equipment, should be provided based on regional functions to ensure that the monitoring results are not affected and avoid pollution, and safety protection facilities should also be prepared in places to be monitored and regularly checked to ensure their effectiveness, and marked with safety warming identifiers. The monitoring results are recorded and summarized by ecological environmental monitoring institutions, and samples should be collected in time to ensure the accuracy of the field monitoring; analytical tests should be made to ensure the effectiveness of the entire monitoring process; monitoring data should be adequate and original, and more importantly, normative. Data and images from monitoring instruments should be kept in paper or in electronic form, ensuring their integrity; backups should be well done for data, especially for electronic data, to prevent them to be lost or tampered; when the output data are printed on a medium with a short shelf life, such as heat-sensitive paper or light-sensitive paper, copies or scanned copies of records should also be kept.

(3) Increasing fund input

Plenty of manpower and resources from primary environmental monitoring stations are required for the application of ecological environmental monitoring technology. During the application, some equipment and facilities will be used, and thus primary environmental monitoring stations should be provided with perfect equipment and facilities. Besides, some advanced ecological environmental monitoring equipment needs to be introduced from abroad, so relevant governments should strengthen financial support for primary environmental monitoring stations and set up special fund guarantee for them in terms of ecological environmental monitoring. Relevant policies should also be formulated to further promote the ecological environment protection by the public. Enterprises can be encouraged by relief of part of the tax to actively use environmental protection equipment in their work and enhance their innovation in ecological environmental monitoring technologies; for example, financial support can be provided for some university research laboratories to encourage them carry out research on ecological environmental monitoring and technologies in terms of solving the treatment of environmental pollution and other aspects. Moreover, primary environmental monitoring stations can also absorb social and private funds in ecological environmental monitoring and environmental protection work.

(4) Digital empowerment to build a whole-process quality management system

Using advanced digital and information technologies can greatly improve the whole process monitoring level and efficiency. The functional modules of the whole-process quality management system are clearly defined based on the actual regional situation, and can cover such aspects as “air quality”, “water quality of main rivers”, “real-time data of road traffic noise”. An efficient system architecture is set up based on the basic perception layer, data support layer and smart application layer, with structures of different layers corresponding to different functional sections. At the basic perception layer, ecological environmental monitoring information can be comprehensively collected, monitoring stations and equipment can be set taking rivers and lakes, main urban rainwater pipes, industrial parks, noise and other pollution sources as nodes, so as to achieve grid monitoring of the ecological environment and primarily form an environmental monitoring perception system covering the whole region. Relying on the data support layer, cloud storage resources and security services are provided, various data resources are integrated based on the multi-source heterogeneous big data integration and storage system platform software, and correlation analysis is conducted on ecological environment big data by means of big data analysis technologies, such as cloud computing, Internet of Things and AI algorithm, so as to deeply mine the value and give full play to the value of data. The smart application layer focuses mainly on the application of valuable data, providing important data information for atmospheric pollution prevention, water pollution prevention, comprehensive application of acoustic environment, and environment emergency response and risk control. In this system architecture, invalid inspecting and monitoring can be effectively reduced, and problems that occur during monitoring can be found in time by whole-process and fine monitoring. According to the development trend of ecological environmental monitoring management, in the application of modern information technologies, efforts should be made to break isolated islands of information and fully integrate information technologies with various social governance fields, such as urban construction, urban management and social development; the all-round collaborative supervision of the monitoring work should be achieved with the support of remote sensing monitoring, mobile monitoring and other

technologies; key polluted areas should be monitored on a real-time basis to ensure that the whole-process quality management effect can be improved comprehensively on the basis of data sharing and system interconnection.

(5) Inspecting the field quality control

Before sampling, the quality of the equipment used is checked to ensure that the functions are intact, and the equipment should be replaced in time if there is any problem; fixatives are provided to ensure that there are enough of them; to prevent cross contamination of sample bottles, containers should be inspected as required to ensure they are qualified before use; enough ice bags are provided and stored at a low temperature. After collection and handover of samples, symbolic information, such as sample number, should be treated, and labels should be kept integrated and prevented from being dirty during the sample transportation. Samples should be transported in special storage boxes and by special personal and vehicle to ensure that they meet the transportation requirements, and should be handed over in the designated place. During sample loading and packing, foam materials should be used to improve the shakeproof capacity, and samples should be placed in ice bags and kept at a low temperature. During the transportation, samples should be maintained at a low temperature, protected from sunlight, and prevented from being affected by polluted air in the vehicle. During the handover, personnel is required to check the samples face to face and sign after confirmation. After samples are sent to the laboratory, a specially-assigned person is responsible for receiving and check them. Special storage rooms should be set up for storage of various samples used for environmental monitoring, and be partitioned according to different samples to avoid confusion. Waterproof, cleaning and other measures should be taken for sample storage rooms. Samples should be kept in a ventilated and pollution-free environment. For laboratory parallel samples, two of them should be extracted consecutively for testing. The accuracy of the test results should be confirmed according to the results of the same period; for field parallel samples, samples are collected in the same environment, and test points are selected for making parallel samples, and samples at the same test point should be tested to improve the accuracy of the test; for code parallel samples, after samples collected by monitoring personnel are studied, a small number of them are coded and mixed in other samples for testing, and the test results of the coded samples are checked after the completion of all tests; spiked samples are divided into field blank spiked samples and field spiked samples; for the former the standard solution is extracted from the sample and processed, and the analysis results are compared with those of the blank samples to test whether the actual results are interfered by the environment; for the latter, two copies of samples of certain volumes are prepared in advance, one of them added with the standard solution, and both copies are tested and observed for their changes.

5. Conclusion

Ecological environment protection is the premise of social development and is related to the long-term development benefits of the society and people's physical and psychological health. During the social development, ecological environmental monitoring is an important job, and we should, based on the actual demand of urban development and ecological environment construction, construct a systematic ecological environmental monitoring whole-process management & control model, improve the mechanism, and further optimize the management idea and innovate management technology, and improve the management effect by digital empowerment. Monitoring and management personnel, on the other hand, should raise their sense of responsibility and establish an awareness of lifelong learning, so that talent support is provided to the whole-process quality management of ecological environmental monitoring to promote the benign development of China's ecological environmental monitoring cause.

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