

Grassroots Environmental Monitoring in China: Challenges to Data Accuracy and Effectiveness in Environmental Governance and Ecological Protection

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Abstract: *With the enhancement of environmental protection awareness and the advancement of ecological civilization construction, grassroots environmental monitoring has assumed an increasingly prominent role in China's environmental management system. Nevertheless, in actual monitoring practice, numerous persistent problems directly compromise the accuracy and effectiveness of environmental monitoring data, thereby posing considerable challenges to environmental governance and ecological protection. Addressing these issues is therefore essential for improving monitoring quality and strengthening ecological protection.*

Keywords: Grassroots Environmental Monitoring, Environmental Management System, Monitoring Data Accuracy, Monitoring Data Effectiveness.

1. ANALYSIS OF PROBLEMS IN GRASSROOTS ENVIRONMENTAL MONITORING WORK

With the improvement of environmental protection awareness and the promotion of ecological civilization construction, grassroots environmental monitoring work plays an increasingly important role in China's environmental management system. However, in actual monitoring work, there are still many problems that directly affect the accuracy and effectiveness of environmental monitoring data, posing challenges to environmental governance and ecological protection.

1.1 Over-reliance on traditional monitoring methods

In grassroots environmental monitoring, many places still rely too much on traditional monitoring means and methods, failing to give full play to the advantages of emerging technologies. Traditional monitoring methods mainly include manual sampling and laboratory analysis. Although these methods have played an important role in the past, some of their inherent flaws have gradually become apparent. Since traditional monitoring mostly relies on manual operations, the monitoring efficiency is low and the cycle is long, often failing to respond to environmental changes in a timely manner. In addition, the shortage of personnel with traditional skills further affects the timeliness and accuracy of monitoring results. At the same time, emerging technologies such as remote sensing monitoring, big data analysis, and Internet of Things technology are effective ways to solve the limitations of traditional methods. Through these new technologies, monitoring data can be collected and analyzed in real time, enabling more rapid reflection of environmental changes. However, some grassroots units still hold a conservative attitude towards these technologies and fail to fully integrate their applications, which limits the improvement of monitoring capabilities. This over-reliance on traditional methods not only reduces the efficiency of environmental monitoring but also affects the in-depth analysis and response capabilities to environmental issues.

1.2 Inaccurate Data Collection

The accuracy of data collection in grassroots environmental monitoring is an important prerequisite for ensuring environmental quality assessment. However, due to the influence of various factors, the accuracy of data collection in actual monitoring processes is often challenged. First, environmental monitoring is interfered by multiple factors such as weather, geographical location, and human activities, which may lead to deviations in monitoring data. For example, changes in meteorological conditions directly affect air quality monitoring, and rainy or snowy weather may adversely affect pollutant concentrations, thereby influencing monitoring results. In specific monitoring operations, the selection of pollution sources, sample collection methods, and sample processing

procedures also affect the overall accuracy of monitoring data. Non-standard operating procedures and methods, especially in towns and remote areas, often lead to distortion of monitoring data. In addition, old or malfunctioning monitoring equipment makes data collection more difficult, thereby reducing the reliability of environmental monitoring data. More notably, due to the lack of systematic training and standardized guidance, many grassroots monitoring personnel struggle to achieve standardization and accuracy in the data collection process, resulting in reduced repeatability and comparability of monitoring results. The combined effect of these issues leads to serious distortion of monitoring results, ultimately affecting policy decisions and even leading to the incorrect implementation of environmental governance plans.

1.3 Uneven Personnel Quality

Grassroots environmental monitoring work not only relies on advanced technologies and equipment but also on high-quality monitoring personnel. However, at present, the phenomenon of uneven personnel quality is very common in grassroots environmental monitoring teams. This imbalance is mainly reflected in several aspects: first, insufficient professional knowledge. Many grassroots monitoring personnel have relatively weak knowledge in professional fields such as environmental science and chemical analysis, making them unable to fully understand and apply relevant monitoring standards and technical specifications. This directly leads to misoperations in monitoring activities, thereby affecting the accuracy of monitoring results.

The lack of continuous training and development opportunities makes it difficult for monitoring personnel with a certain knowledge background to further improve their skills. To a certain extent, this situation limits the overall strength of grassroots monitoring teams and also leads to a decline in the standardization of monitoring. In addition, in the actual operation of environmental monitoring, there may be obvious human errors between different monitoring points. These errors not only stem from differences in the understanding and implementation of standards but are also affected by personal work attitudes and sense of responsibility. Irresponsible behaviors of individual monitoring personnel, such as data fraud and plagiarism, also seriously affect the objectivity and fairness of monitoring work.

2. FORMULATING COUNTERMEASURES FOR GRASSROOTS ENVIRONMENTAL MONITORING WORK

In the process of achieving sustainable development and ecological civilization construction goals, grassroots environmental monitoring work plays a crucial role in the environmental protection system. With the increasing complexity and diversity of environmental problems, traditional monitoring means and methods are obviously no longer adapted to the needs of the new era. Therefore, it is necessary to formulate practical and feasible countermeasures for grassroots environmental monitoring work to improve its efficiency and accuracy and ensure the smooth progress of environmental governance work.

2.1 Adopting Diversified Monitoring Methods

To address evolving environmental issues, grassroots environmental monitoring efforts need to adopt diversified monitoring methods. A single monitoring approach often fails to comprehensively and accurately reflect complex environmental conditions, thus requiring comprehensive assessment from multiple perspectives and levels. By introducing various monitoring means, the limitations of a single method in data collection, analysis, and application can be overcome. A combination of quantitative and qualitative monitoring methods should be adopted; when conducting air and water quality monitoring, multiple detection methods such as physical, chemical, and biological ones should be integrated to achieve comprehensive identification of environmental pollutants. This multi-dimensional monitoring method helps study the impact of different factors on environmental quality and assists in formulating more effective environmental governance measures. Strengthen monitoring efforts for key regions and major pollution sources; due to differences in ecological environment characteristics and economic development levels across regions, environmental monitoring should be tailored to local conditions, focusing on environmental risks in specific areas. Allocate resources reasonably, ensure monitoring frequency in high-risk areas, and improve monitoring effectiveness. At the same time, pay attention to hot issues and revise monitoring plans in a timely manner to adapt to new environmental changes and policy requirements. Establish a rich monitoring network, integrating various sensors, monitoring equipment, and community participation. Relying on an intelligent data collection network, realize real-time data transmission and sharing, making environmental monitoring more dynamic and interactive. This networked and intelligent monitoring model can improve the

response speed and processing capacity of grassroots environmental monitoring work, thereby more effectively identifying and addressing environmental problems.

2.2 Rational Use of Advanced Technologies

The application of sensing technology can provide high-altitude perspective data support for environmental monitoring; through remote sensing technology, environmental changes can be monitored over a wide area, especially for air pollution, water resource management, etc., enabling efficient monitoring of minor changes. This technology has significantly enhanced the timeliness and scope of environmental monitoring, providing strong support for decision-making. The integration of big data technology provides more precise environmental analysis methods; by collecting and analyzing massive environmental data, potential environmental risks and trends can be identified, helping relevant departments adjust monitoring strategies in a timely manner. Data mining and pattern recognition technologies can effectively process complex environmental data, providing real-time references for policy formulation and implementation, making environmental management more scientific and intelligent.

The application of Internet of Things technology enables interconnection of monitoring devices, integrating various monitoring devices with the Internet to form a unified data platform, ensuring timely data updates and sharing. This technology helps improve the real-time monitoring capability of environmental monitoring, allowing grassroots monitoring personnel to access the latest environmental information at any time and thus respond quickly. In general, the rational use of advanced technologies can not only improve the efficiency of environmental monitoring but also enhance the accuracy and authenticity of data, providing a solid data foundation for subsequent environmental governance.

2.3 Strengthen Talent Cultivation and Management

At the same time, introduce and provide application training on emerging technologies to make monitoring personnel familiar with the latest monitoring tools and methods, ensuring they can flexibly respond to various challenges in practical work. Establish an effective incentive mechanism to improve personnel's work enthusiasm. Through a reasonable performance appraisal system, encourage monitoring personnel to think proactively and innovate continuously in their work. At the same time, evaluation can be conducted in combination with social services, public participation, etc., to enhance the sense of mission and responsibility of monitoring personnel and improve their initiative in participating in environmental monitoring work. Strengthen team building to promote teamwork and information sharing. Environmental monitoring often involves multiple disciplines and specialties, so collaboration between teams is particularly important. Encourage personnel with different professional backgrounds to learn from each other and share experiences together to achieve effective knowledge dissemination and innovative application of technologies. Pay attention to the mental health and career development of monitoring personnel, and provide them with a good working environment and development space. Establish a sound career promotion channel to promote the long-term cultivation and development of talents, thereby improving the stability and professionalism of the overall monitoring team.

3. CONCLUSION

To sum up, with the continuous advancement of industrialization, the environment in which people live is facing increasing pressure and challenges, which also serves as a reminder for grassroots environmental monitoring work to always pay attention to environmental issues and make practical contributions to environmental protection. Over time, people's ideological awareness is also constantly increasing. Therefore, grassroots environmental monitoring work must keep pace with the times, continuously solve existing problems, and find more appropriate solutions.

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