

Promoting the Sustainable Use of Water Resources by Adhering to the Research-based Audit Concept and Systematic Audit Thinking

Water is the source of life, the basic substance for survival, the necessity of production, and the foundation of ecological environment. Water resources serve as a crucial material basis for ensuring human survival, playing a significant role in agricultural irrigation, people's livelihood, industrial development, and ecological environment protection. Their sustainable utilization is pivotal to achieving the United Nations' 2030 Sustainable Development Goals. Asia, as the largest continent in the world with the largest population, boasts a vast and arid Mongolian plateau, humid and pluvial tropical rainforests, cold Siberian tundra, and the torrid Indian subcontinent. The distribution of water resources on this continent is extremely uneven, resulting in structural water resource crises. Meanwhile, it is faced with issues including over-exploitation, uneven allocation, and intensified pollution, posing severe challenges to the sustainable utilization of water resources.

I. China's Practices in the Sustainable Use of Water Resources

Humanity prefers to live near water, and civilization often thrives due to water. China has a long history of water control and flood management, dating back to the Warring States period when the famous water conservancy project, Dujiangyan Irrigation System, was built. In the past three decades, China has also completed the Three Gorges Project on the Yangtze River and the South-to-North Water Diversion Project.

Water resources possess the attributes of both natural resources and environmental factors. The Chinese government has always adhered to a dialectical approach in viewing and addressing the issue of the sustainable use of water resources. On one hand, it has reinforced the constraint of water resources, formulated and implemented the strictest water resource management system, gradually explored the establishment of a market for water use rights, and improved the systems for the control of total water withdrawal from inter-regional rivers, water allocation, and horizontal compensation, emphasizing the management of water as a natural resource. On the other hand, it has taken into full consideration the environmental benefits of water resources, carried out major projects regarding ecological protection and restoration in key river basins like the Yangtze River and the Yellow River, land greening, and soil erosion control, placing greater emphasis on the management of water as an environmental factor and pursuing harmony between humanity and nature. Over the past decade, water resource utilization efficiency has significantly improved. Despite a nearly doubled gross domestic product (GDP), the total water consumption nationwide has achieved zero growth. The water

environment has significantly improved, and the deterioration of water ecosystem has been greatly contained. The support capabilities for flood prevention, drinking water safety, ecological restoration, and environmental improvement have been systematically enhanced, giving a strong impetus to the high-quality development of China's economy and society in the new era.

II. China's Auditing Approach to the Sustainable Use of Water Resources

In recent years, as a supervisor of the Chinese economy, the National Audit Office of the People's Republic of China (CNAO) has been committed to the high-quality development of the audit work under the guidance of the research-based audit concept. We have paid particular attention to key and typical issues in the sustainable use of water resources, and conducted extensive studies on project initiation, problems and suggestions in this regard. In practices, CNAO has taken active measures to align its audit work with the systematic governance of the country's water resources, and carried out in succession special-purpose auditing activities on water pollution prevention and control, ecological protection and high-quality development of major rivers and sea areas including the Yangtze River, the Yellow River, and the Bohai Rim, as well as flood prevention and disaster mitigation. Local audit institutions have also conducted various types of special-purpose audits related to the comprehensive governance of water resources, water ecosystem, and water environment, such as black and odorous water body treatment in cities, drinking water safety in rural areas, and recycling of water resources, all of which have made notable progress.

(I) Conducting audits by emphasizing the integrated protection, governance and restoration of mountains, waters, forests, farmlands, lakes, grasslands and deserts.

The key to the sustainable utilization of water resources lies in water source conservation, water quality improvement, and ecological balance. Integrated protection, governance, and restoration of the entire river basin are crucial. Auditing plays a consistent role in promoting the implementation of major national decisions and governance measures related to the sustainable utilization of water resources, ensuring effective systematic governance. It focuses on the development, utilization, and protection of important water source conservation areas such as plateau glaciers, forest wetlands, and other regions, strengthening the supervision of the effectiveness of water source governance. It also pays attention to the promotion, implementation, and effectiveness of actions including soil erosion control, land greening, forest logging prohibition, and grassland grazing prohibition, ensuring the greatest improvement of the overall water environment. Furthermore, it lays emphasis on the scientific formulation and implementation of water resource allocation policies in key river basins, as well as the rational allocation and use of water resources in agriculture, industry, and daily life, ensuring that the ecological conservation of key rivers and lakes can meet the demand for water usage. For example, in the audit of ecological protection and high-quality development of the Yellow River, CNAO focused on jointly promoting comprehensive protection and collaborative governance, paying attention to the building of

water source conservation capacity in the upstream, the effectiveness of soil and water conservation in the middle reaches, wetland protection and ecological governance in the downstream, as well as the intensive and economical utilization of water resources along the entire river basin.

(II) Conducting audits by focusing on the effectiveness of the action plan for water pollution control.

Water pollution leads to deteriorating water quality and ecological damage, having a serious impact on the sustainable use of water resources. To effectively address water body pollution, CNAO's auditing work follows the concept that "the symptoms are in the water, but the root causes are on the shore". We focus on the effectiveness of comprehensive treatment of agricultural non-point source pollution, industrial pollution, and household pollution, promoting governance at the sources of pollution. This includes the assessment of agricultural wastes such as livestock manure and crop straw, industrial production and household emissions, the construction of harmless treatment facilities for medical wastes, and the promotion and application of clean production technologies such as scientific fertilization, medication safety, farmland water conservation, waste incineration, and ultra-low industrial emissions. Attention is also paid to the implementation of the centralized relocation of high water-consuming and high-pollution enterprises into industrial parks, and the compliance of centralized sewage treatment facilities in the parks with emission standards. The effectiveness of online monitoring systems at all sewage outlets discharging pollutants to rivers and lakes, as well

as the implementation of the strictest sewage discharge system, are also monitored. For example, in the special-purpose audit of ecological protection and high-quality development along the Yangtze River and the Bohai Rim, CNAO comprehensively analyzed the control of pollution at the sources including industry, agriculture, and daily life. We traced the causes of pollution, conducted precise assessment and verification, and systematically revealed issues including excessive emissions from some industrial pollution sources, insufficient control of agricultural non-point source pollution, and the lack of synchronous construction of supporting pipe networks for urban sewage treatment plants.

(III) Conducting audits by continuously following up on water treatment projects and their financial performance.

The key to achieving sustainable utilization of water resources lies in the effective investment of substantial governance funds, projects, and technologies. The auditing work focuses on major projects invested by the government to enhance water resource assurance capacity, improve water environment quality, and strengthen water ecological security. Special attention is paid to the development of major projects such as dike construction, river courses renovation, flood plain areas management, and ecological restoration, ensuring these projects are implemented according to planned objectives and that expected results are achieved. In particular, the negative impacts of construction projects on the water environment and water ecosystem are assessed. Attention is paid to the effectiveness of investment in projects such as urban sewage

treatment facilities, rainwater and sewage diversion drainage facilities, drinking water source protection, and reclaimed water quality improvement, to ensure more perfect and effective water recycling system. Emphasis is also laid on the rationality of the amount of funds earmarked to the sustainable utilization of water resources, the mechanism for the allocation of funds, as well as the authenticity, timeliness, and effectiveness of fund expenditure. The focus of the auditing work is on revealing whether there are cases of withholding, misappropriation, or irregular and inefficient use of special-purpose funds for water governance, thereby comprehensively improving the performance of funds. For example, in the natural resources accountability audit on leading officials, CNAO focused on the construction of environmental protection facilities involving the sustainable utilization of water resources, such as water resource withdrawal, sewage treatment, and ecological restoration, which are closely related to the performance and accountability of local leading officials. By accurately revealing problems and comprehensively evaluating performances, CNAO's auditing work urged local key officials to fulfill their responsibilities for environmental governance.

III. Real Challenges and Future Prospect in the Sustainable Use of Water Resources from the Perspective of Auditing

Currently, the situation facing the sustainable utilization of water resources in China remains severe. There is a significant disparity in the regional distribution of water resources, and climate change further exacerbates regional water shortage or flooding. From an auditing perspective, excessive water withdrawal

and wastage have occurred from time to time in some regions. Water pollution and the deterioration of water ecosystem have not been effectively curbed, and major water pollution incidents have occasionally occurred. All these issues necessitate more scientific planning, more solid implementation, and stronger systematic governance capabilities to truly achieve the sustainable utilization of water resources.

(I) Real challenges.

First, the uneven distribution and inefficient utilization of water resources still persist. China has a vast territory, and the distribution of water resources is extremely uneven, with more in the south and less in the north, which does not match the distribution of population and arable land. At least 81% of water resources are concentrated in the areas south of the Yangtze River, while the cultivated land mainly lies to the north. Nearly two-thirds of cities across the country suffer from varying degrees of water shortage, but the problems of extensive water use, loss, and waste in some areas have not been adequately resolved. The management of water use needs to be refined, scientific and effective water conservation measures need to be enhanced, government incentive policies need to be improved, and supervision efforts still need to be strengthened.

Second, there are still disparities in water governance among regions. Despite the Chinese government's formulation of the national *Action Plan for*

Prevention and Control of Water Pollution and the introduction of the *Regulations on Water Conservation*, as well as the continuous arrangement of special funds for water treatment projects, due to differences in resource endowments, governance capabilities, and technical levels, it is difficult to achieve optimal collaboration in the governance of water resources among regions near key rivers and lakes. A typical feature of "low willingness to govern and strong willingness to demand" is evidently demonstrated, which may lead to such a circumstance where the worst region diminishes the effectiveness of overall governance.

Third, there are still shortcomings in the mechanism for managing and controlling water withdrawal and usage. Economic means are effective measures to manage and control water resources and prevent water pollution. Due to some historical or practical factors, there are still certain shortcomings in the mechanism for water governance and control, which are prominently manifested in the following aspects: the market pricing and trading mechanism for water resources in some areas is not sound, the implementation of the reward and punishment mechanism for water conservation is not in place, there are significant differences in water price management systems between regions, and the control over excessive low-cost water withdrawal and usage is not strict, all of which may affect the effectiveness of integrated governance.

(II) Future prospect.

CNAO will adhere to the research-based audit concept and systematic audit thinking, following the route of "strategy-policy-funds-projects". It will not only focus on discovering problems, but also closely monitor subsequent rectifications. Based on the whole country, CNAO will concentrate its auditing work in key river basins, paying attention to the improvement of institutional mechanisms and policy implementation, investment in and effectiveness of systematic governance, and government control and social guidance, so as to leverage its role as an audit institution in promoting and ensuring the sustainable use of water resources.

First, we will promote the integrated governance of water resources, water environment, and water ecosystem. Water governance requires sustained efforts, and only by integrating it with the goals of economic and social development can sustainable development be achieved. The integration and mutual promotion between the two can effectively advance the unified strategic plan in water governance nationwide, thereby enhancing the overall effectiveness in the governance of water resources, water environment, and water ecosystem, as well as achieving the goals of agricultural water conservation and efficiency improvement, industrial water conservation and emission reduction, and urban water conservation and loss reduction.

Second, we will work to achieve a more balanced investment in water governance across regions. Efficient water governance requires long-term investment of substantial funds, projects, and technologies. Any uneven effort among regions will undermine the overall governance efficiency. Under the

unified planning of the central government, we will implement more efficient and unified regional joint prevention and control measures, with an aim to minimize disparities in governance investment between upstream and downstream areas, as well as between left and right banks of key river basins. This will help improve the optimized allocation system of regional water resources and the protection and governance system of water environment and water ecosystem.

Third, we will establish a more stringent management mechanism for water withdrawal and usage. By fully leveraging the roles of both market and government, we will refine our systems, prioritize implementation, and emphasize the systematic, holistic, and coordinated nature of government control. By establishing a sound and rational water resources trading market, we will support the improvement of the society-wide system and mechanism for intensive and economical water use. We will implement a tiered pricing-oriented water usage control system for industry and agriculture, strictly control excessive groundwater withdrawal, adopt a horizontal ecological compensation mechanism, and promote the establishment of a coordinated river basin management system. This will better facilitate the achievement of the overall strategic goal of sustainable utilization of water resources in China.

IV. Case Study on Performance Audit of Rural Sewage Treatment

In recent years, to further improve the rural environment and accelerate the

integration of urban and rural areas, a new district in Shanghai (hereinafter referred to as the New District) has formulated the *Five-Year Action Plan for Rural Sewage Treatment in the New District* to comprehensively promote rural sewage treatment projects in the New District. By adhering to the research-based audit concept, the Audit Bureau of the New District has organized a performance audit of rural sewage treatment, focusing on the benefits, efficiency, and effectiveness of rural sewage treatment projects, the current status of pollution emissions from enterprises in rural areas, and the establishment and improvement of long-term management systems and mechanisms for rural sewage treatment projects. From an auditing perspective, suggestions have been made to promote rural sewage treatment, and certain audit results have been achieved.

(I) Audit objectives.

First, the Audit Bureau aims to understand the overall situation of sewage treatment projects in the New District over the past three years, including whether the project planning is sound and rational, whether it is aligned with the industrial restructuring plan (objective) of the New District, and whether the project construction management is standardized. The purpose is to reveal problems, analyze reasons, and offer advice and suggestions on project improvement.

Second, the aim is to identify prominent issues affecting the benefits of sewage

treatment projects (including institutional barriers, and defects in policies and systems), make objective evaluations of project performance, provide audit opinions and suggestions, and promote the improvement of economic and environmental benefits of sewage treatment projects.

Third, the Audit Bureau aims to investigate the establishment and improvement of long-term management mechanisms for sewage treatment projects, identify existing problems, promote the establishment and improvement of long-term management mechanisms, and enhance the operational efficiency of the projects.

(II) Audit methods.

1. Focusing on the people's demand for a high-quality ecological environment, we delve into the rural areas to understand the actual effects and existing problems of sewage treatment projects. Auditors conduct on-site surveys using questionnaires to investigate the effectiveness of rural sewage treatment. For example, based on villagers' reports during on-site interactions about sewage back-flow into their houses in rainstorms, auditors carried out further investigations and collected relevant evidence, finding that the sewage treatment of enterprises in a certain town did not advance simultaneously with the construction of major municipal sewage pipelines, leading to the issue that the rural sewage treatment project could not be put into use as planned.

2. We strengthen communication and cooperation with relevant authorities, and conduct on-site inspections based on comprehensive analysis results of river water quality monitoring indicators. For example, in a town with numerous rivers, a large number of enterprises, and significant water usage, auditors investigated the pollution discharge of enterprises along the main rivers in the town, and discovered the issue of illegal sewage discharge by a few enterprises.

3. We bolster support for data analysis, and assess actual operations of on-site sewage treatment facilities by verifying their electricity usage. For example, auditors retrieved electricity usage data of on-site sewage treatment facilities from the power company, and after sorting and analysis, discovered that the electricity usage data of multiple sets of on-site treatment facilities had been zero or nearly zero for several consecutive months, indicating that some of these facilities were not functioning properly.

4. Focusing on whether a project has achieved expected results, we launch specific investigations for the long-term management of sewage treatment projects. For example, auditors comprehensively and accurately grasped the long-term management situation of sewage treatment projects in various towns through the following three steps: designing and distributing survey forms, holding panel discussions with functional departments, and conducting spot checks on maintenance management sites. It was found that several towns had not established a long-term management system for rural sewage treatment, the assessment standards for maintenance management work needed to be further refined, and some projects lacked daily maintenance.

(III) Audit conclusion.

The rural sewage treatment projects in the New District play a crucial role in improving the living environment of the residents in the New District, and have received widespread attention and support from the local residents. Although initial progress has been made in rural sewage treatment, the task of sewage treatment for enterprises in rural areas remains arduous. The failure to synchronize the sewage treatment projects for enterprises with the construction of large municipal sewage pipelines has resulted in some rural sewage treatment projects not being put into use as planned, impairing the overall effectiveness of the rural sewage treatment projects. The long-term idleness of some on-site sewage treatment facilities for domestic sewage in rural areas and the lack of a long-term mechanism for rural sewage treatment have also hindered the projects from achieving expected economic and environmental benefits.

(IV) Audit Outcomes.

Since the audit identified some issues, the government of the New District has attached great importance to these issues, and, in conjunction with the deployment of the Three-Year Environmental Protection Plan, has accelerated the promotion of sewage treatment for enterprises in rural areas as a central task. Meanwhile, the district government required relevant departments to effectively carry out rectification work. Relevant departments of the New District and town

governments held work meetings to analyze the issues reflected in the audit one by one. Focusing on the core issue of improving the performance of rural sewage treatment projects, they studied rectification plans to adopt concrete measures. The competent sewage treatment engineering department began to establish a feasibility study meeting system for engineering design programs to ensure sound and rational project planning. Relevant town governments and civil administration departments of the New District worked together to promote the connection of rural sewage pipelines with the municipal pipe network, and some idle facilities have been put into operations again. Furthermore, each town has introduced a long-term management system, aiming to establish maintenance management institutions and expand funding sources.