

# **BUILDING WATER-SAVING UNITS IN PUBLIC INSTITUTIONS IN HUNAN PROVINCE**

## ***Abstract***

The subject research group summarized the experience and practices of building public institutions into water-saving units in Hunan Province since the commencement of this move in 2014, analyzed the main problems, and put forward feasible water-saving strategies and measures from the perspectives of management and public institutions, providing useful insights for further advancing the building of public institutions into water-saving units.

## ***Description***

Water scarcity is a major challenge for China's sustainable economic and social development in the coming decades and beyond. The building of a water-saving society has opened up a new way to fundamentally address this challenge. The building of public institutions into water-saving units, as an important part of the building of a water-saving society, represents a concrete action for strictly implementing the provisions of the *Regulations on Practicing Thrift and Opposing Waste in Party and Government Bodies*, and an important starting point for the in-depth implementation of the policy of water conservation priority. Since the commencement of building of public institutions into water-saving units in 2014, Hunan Province has actively promoted public institutions to take the lead in water conservation in accordance with the principle of "batch establishment and all-round progress", which not only sets a benchmark for water conservation in the whole society and plays a good leading role, but also is of great significance for accelerating the transformation from extensive water use to efficient use and raising the awareness of water conservation in the whole society.

## ***Problems***

China is a country with a shortage of water resources, and the uneven distribution of water resources in time and space, and the prominent contradiction between supply and demand have become the bottlenecks of ecological civilization construction and sustainable economic and social development. In order to ensure safety, the 19th CPC National Congress clearly proposed to implement the nationwide water conservation campaign, making water conservation a commitment of the nation and an action taken by all people. Building public institutions into water-saving units and giving full play to the leading and exemplary role of public institutions are of great significance to promote the building of a water-saving society and the formation of a green development mode and lifestyle.

Since the launch of building of public institutions into water-saving units in our province, although certain results have been achieved, there are still some weaknesses that need to be strengthened, such as the poor quality of the creation results, and the weak leading and exemplary role. The problems are mainly manifested in: a lack of water-saving awareness and enthusiasm of some leaders of public-institution water-saving units, and inadequate water metering facilities, incomplete basic information, insufficient financial investment, and imperfect rewards and penalties mechanism in some public institutions.

## ***Decisions and Actions Taken***

It is of great significance to build public institutions into demonstration units with "strong awareness of water conservation, complete water saving systems, popularization of water-saving equipment, advanced water-saving standards, and strict monitoring and management" to raise the awareness and foster a good atmosphere of water conservation in the whole society, and ensure the sustainable use of water resources to support the sustainable and sound development of the economy and society. In order to further promote the building of public institutions into water-saving units in Hunan Province, the following suggestions are put forward from perspectives of management and public institutions.

## **Management**

It is advised to formulate and implement a system of "water-saving rewards and water-overuse penalties" to change public institutions' attitude toward the building of water-saving units from passive acceptance to positive claim.

First, it is suggested to develop a water use plan and a water quota management system, which requires to strengthen the monitoring of water use units, regularly carry out supervision and inspection, fully explain the reasons for the part of the requirements that exceed the plan and the quota, and issue opinions on rectification within a prescribed time limit by the relevant departments. If the rectification is not made within the time limit, the financial department may reduce the allocation of financial funds for the next year.

Second, it is suggested to explore the establishment of a reward-oriented incentive system of "substituting subsidies with rewards, rewarding after construction, and no rewards for no efforts".

Third, it is suggested to expand the scope of target responsibility assessment. Namely, the building of public institutions into water-saving units should be included in the assessment for the comprehensive performance evaluation of a unit, the standard development of a water-saving society at the county level, and the implementation of the river chief system.

Fourth, it is advised to include the building of public institutions into water-saving units in the evaluation system of provincial civilized units.

Fifth, it is suggested to make full use of the technical strength of scientific research units, colleges and universities, social organizations and other parties. This includes the organization of technical training, the improvement of the competence of management personnel, the presentation for the introduction, creation process, relevant technical solutions and related requirements of water-saving units, and the comprehensive advancement of the building of public institutions into water-saving units.

### **Public Institutions**

First, it is suggested to carry out the assessment of responsibility for water-saving targets. The leaders in charge of water-saving work, the heads of relevant divisions and offices, and the work contacts should earnestly assume the responsibility for water-saving construction, and it is recommended to strengthen the inspection of water conservation, and regularly inspect and report the inspection results every year. It is also suggested to include the results of water conservation into the year-end performance appraisal, and the departments should be rewarded for completing the task, and be criticized or financially punished for exceeding the water-saving target.

Second, it is suggested to improve the measurement system. According to the actual situation of public institutions, the secondary measurement system should be guaranteed and a three-level measurement system should be established.

Third, it is suggested to strengthen daily management. A water-saving file management system should be developed to archive the water supply and drainage drawings, measurement drawings, construction drawings, water use plans, and management systems of the unit. Meanwhile, it is necessary to establish complete and standardized original records and statistical ledgers.

Fourth, it is suggested to expand the channels of funding sources. Active efforts should be made for the support of leaders at all levels, and for more policy and financial support. Security funds of various channels such as energy-saving funds are available with the transformation of "three supplies and one industry", and the water-saving project funds should be included in the unit budget to ensure the daily management and maintenance of water-saving.

Fifth, it is suggested to strengthen publicity. Popular science education and publicity activities should be actively carried out to publicize the significance, benefits and experience of water conservation in public institutions, improve their employees' awareness of saving water and building water-saving units, and form a good atmosphere for every employee to participate in such building, so as to spread

the social culture of water conservation and raise the awareness of water conservation in the whole society.

## ***Results***

The public institutions of Hunan Province should bravely carry out self-targeted reform, face the root cause of the problem, build themselves into a "water-saving model", promote the formation of an atmosphere of water conservation, water cherishing and water protection in the whole society, and concretely push forward the building of Hunan into an affluent, beautiful and happy province with unimpeded rivers, clear water, green banks and beautiful scenery. As of November 2023, there were a total of 2,388 public-institution water-saving units in Hunan Province.

## ***Typical Cases***

### **Basic Information of the Units**

#### **(I) Basic Information and Scale of the Units**

The office compound of Chenzhou Municipal Water Conservancy Bureau is located at No. 75, Wuling Avenue, Beihu District, Chenzhou City, Hunan Province, covering an area of 17,393 square meters, with 1 seven-story office building, 5 family residential buildings, a total of 116 households, and a green area of about 4,000 square meters. There is a canteen in the annex building of the office building which is operated by external contractors.

The office building is a joint office of 3 units, with the 1st to 4th floors used by the Chenzhou Municipal Water Conservancy Bureau, the 5th floor used by the Chenzhou Municipal Rectification Office for Deep-seated Traffic Problems, and the 6th floor used by the Immigration Affairs Center of the Chenzhou Municipal Reservoir Area, and the 7th floor used for meeting room and storage room in common.

In 2020, the three units had a total of 151 employees, 116 permanent office personnel, 12 property service personnel, and a total of 128 water users.

In 2021, the three units had a total of 151 employees, 116 permanent office personnel, 12 property service personnel, and a total of 128 water users.

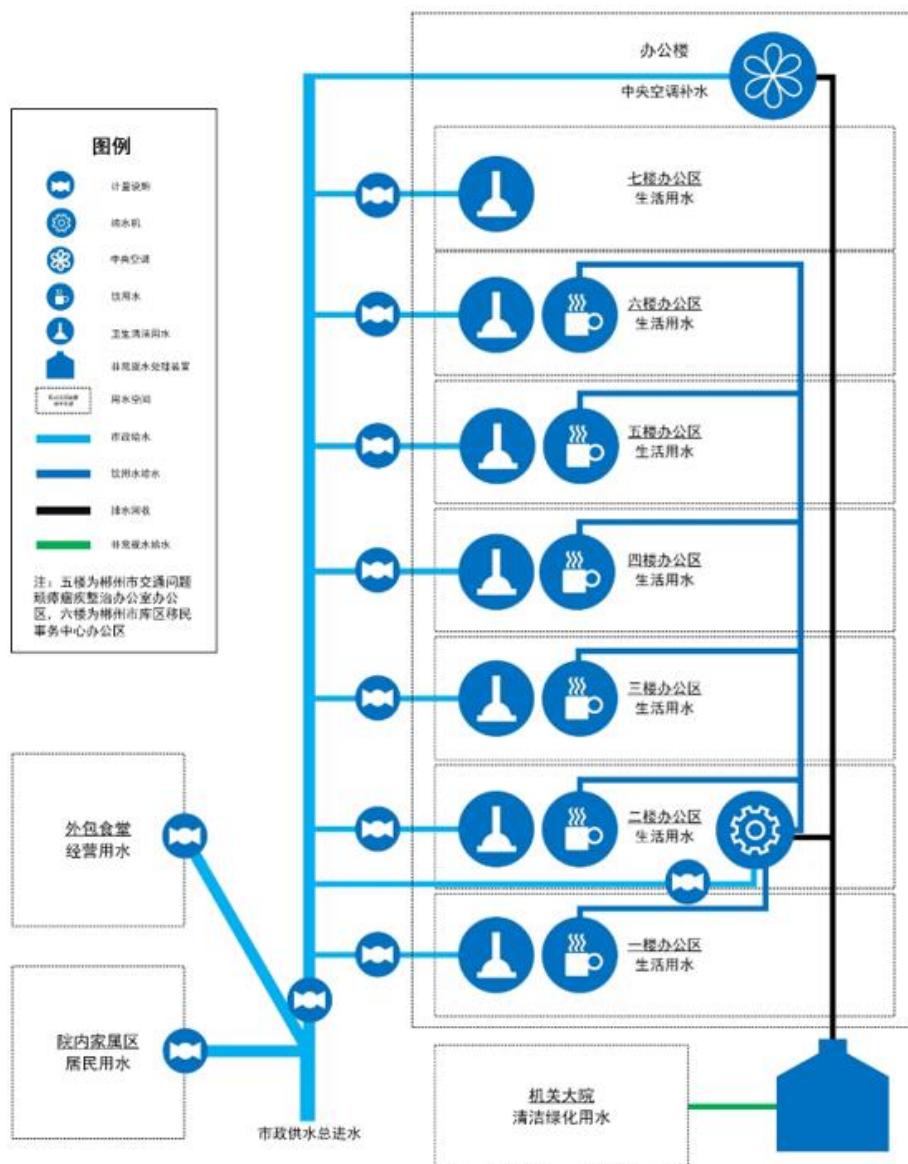
In 2022, the three units had a total of 157 employees, 122 permanent office personnel, 12 property service personnel, and a total of 134 water users.

### **Water Consumption of the Units**

The water consumption of the family residential buildings and the canteen operated by external contractors in the office compound of the Chenzhou Municipal Water Conservancy Bureau was measured separately. The water consumption includes drinking water for office and water for toilet, cleaning, and greening. Among them, the water used for greening is recycled unconventional water, and the water for the rest is municipal water supply provided by Chenzhou Water Supply Co., Ltd.

Chenzhou Water Supply Co., Ltd. has installed a remote electronic water meter at the water inlet end of the office building of the Chenzhou Municipal Water Conservancy Bureau. Since the Chenzhou Municipal Office for Centralized Rectification of Deep-seated Problems and the Immigration Affairs Center of the Chenzhou Municipal Reservoir Area were located on the 5th and 6th floors of the office building, after consultation, an electronic water meter has been installed at the end of the water distribution tube of the 5th and 6th floors respectively. Chenzhou Municipal Water Conservancy Bureau pays the water fee of the whole building to Chenzhou Water Supply Co., Ltd. and then collects the water costs of the 5th and 6th floors respectively from the other two units, so as to realize the separate metering of water consumption by users. Electronic water meters are installed at the water inlet end of the toilet on the 1st, 2nd, 3rd and 4th floors, the water tube of the direct drinking water mechanism on the 2nd floor, the water supply tube of the central air-conditioning cooling tower on the 7th floor to realize the separate metering of water consumption by areas. The equipping rate of water measuring instruments has reached 100%.

The annual water consumption was 1611.52 m<sup>3</sup>, 1586.20 m<sup>3</sup>, and 1439.36 m<sup>3</sup> respectively in 2020, 2021, and 2022.



**Figure 1 Schematic Diagram of Pipe Network and Metering Implementation Arrangement**

### Water Conservation

In 2015, the Chenzhou Municipal Water Conservancy Bureau launched the building of water-saving units. The Chenzhou Municipal Water Conservancy Bureau has continuously established and improved the water-saving system, strengthened the daily management of water-saving, and jointly implemented benefit-sharing contractual water conservation with property service companies. With extensive water-saving publicity, it gives full play to the water-saving demonstration and driving effect of the water conservancy industry. Besides, the Bureau has actively implemented water-saving technological transformation, adopted water-saving appliances in all water-using scenarios, conducted water metering by areas and tiers, and built a green sprinkler irrigation system and an unconventional water collection and utilization system according to local conditions.

#### (1) Strengthen organizational leadership and improve the management system

In 2015, the Chenzhou Municipal Water Conservancy Bureau launched the building of water-saving units, established a water conservation office within the Bureau, designated a water-saving

commissioner, implemented the water-saving post responsibility system, and formulated a water-saving management system. In 2019, the Chenzhou Municipal Water Conservancy Bureau revised the *Water-saving Management System of the Chenzhou Municipal Water Conservancy Bureau* in accordance with the requirements for the building of water-saving units in the water conservancy industry. In 2021, the Bureau further improved the water-saving management system and mechanism, and formulated a range of systems including *Water-saving Work Conference System, Water Metering Management System, Water-saving Statistics System, Daily Inspection and Regular Maintenance System of Water Facilities, Planned Water Consumption and Quota Management System, and Water Conservation Reward and Punishment System*.

## (2) Implement water-saving transformation and strengthen daily management

Since 2018, the Chenzhou Municipal Water Conservancy Bureau has invested RMB 1.467 million in the water-saving transformation of central air conditioning, the procurement of water-saving and water purification systems, and the water-saving technical transformation of office buildings. All water-using appliances and equipment have been updated to water-saving appliances and equipment to save water from the source. An unconventional water storage and utilization system has been established to collect rainwater from the roof of the office building of the Water Conservancy Bureau, wastewater from pure water purifiers, and condensate from air conditioners for greening and cleaning. The online water metering system has been introduced, with 10 electronic water meters installed in the secondary water consumption units and main water use areas, realizing remote meter reading and valve control. The Bureau has also carried out the inspection and repair of pipeline leakage, and repaired 2 historical leakage points.

## (3) Increase publicity and education to create a water-saving atmosphere

The Chenzhou Municipal Water Conservancy Bureau has compiled and printed the *Water Conservation Behavior Manual for Water Conservancy Staff, Water Conservation Proposal and Water Conservation Knowledge Manual*, which are distributed to the employees of the units and the residents of the office compound. The Bureau has organized special lectures on water conservation knowledge, inviting the legal counsel of the Bureau to interpret the *Hunan Provincial Water Conservation Management Measures* for cadres and employees. Water-saving slogans are pasted next to the faucets in the toilets, water-saving posters are hung on each working floor and in front of the water conservancy restaurant, a series of themed publicity boards of "Family Water-saving Tips" are placed in the lobby of the office building, two new LED display boards are erected in front of the office building for rolling display of water-saving propaganda slogans, and public service videos and documentaries about water-saving knowledge are played every month in the lobby on the first floor, to convey the concept of water-saving to employees and publicize water-saving knowledge in multiple dimensions.

## (4) Utilization of unconventional water sources

First, an unconventional water storage and utilization system has been established to collect rainwater from the roof of the office building of the Water Conservancy Bureau, wastewater from pure water purifiers, and condensate from air conditioners, which are stored to a 300 m<sup>3</sup> storage tank after precipitation, filtration and disinfection and used for greening and cleaning in the office compound of the Water Conservancy Bureau, with a designed annual available rainwater volume of 1225 m<sup>3</sup>. When the water storage is enriched in rainy season, the excess water is discharged into the municipal pipe network through the overflow holes.

Rainwater collection: 753.48m<sup>2</sup> of rainfall from the roof of the office building of the Water Resources Bureau is collected through the system, which is channeled into the reservoir through 3 rainwater pipes. The average rainfall in Beihu District of Chenzhou City, where the office building is located, is 1520 mm, and the designed annual rainwater collection volume is 1145 m<sup>3</sup>.

Wastewater collection of water purifier: The wastewater of the water purifier generated during the water purification process is collected through the system, and introduced into the reservoir through

the wastewater pipe on each floor. The water purifier is labeled Grade II in water efficiency, with a purified water production rate of 55%. The annual raw water volume is 123.36 m<sup>3</sup> and the estimated annual wastewater collection is 55.51 m<sup>3</sup>.

Condensate from central air conditioning: Central air conditioning will produce condensate in refrigeration. According to the *Design Code for Heating Ventilation and Air Conditioning of Civil Buildings* (GB50736-2012), 1kW cooling load will produce about 0.4~0.8kg of condensate per hour. Taking the estimated value as 0.6kg/h and the use length as 7.5h/d and 100d/y, according to the central air conditioning inspection report, the cooling load is 18kW, and the annual condensate of the air conditioner is about 24.3 m<sup>3</sup>.

Second, the use of "gray water buckets" has been promoted. Buckets were placed in various offices for the collection of waste tea. In the toilets on each floor, gray water collection buckets with filter baskets are placed, and the waste tea collected by the staff is poured into the gray water collection buckets, with the filtered tea residue dumped into the garbage can, and the filtered waste tea water used for flushing the toilet. It not only improves the efficiency of hygienic cleaning, but also makes full use of gray water.

### Water Conservation Effectiveness

With the development of water conservation, the per capita water consumption has decreased year by year, which performs better than the advanced value of 15 m<sup>3</sup>/person in the *Hunan Province Water Quota* (DB43/T 388-2020), and decreased by 37.4% in 2022 when compared with that at the commencement of building of water-saving units (in 2015), showing remarkable water conservation results. The Chenzhou Municipal Water Conservancy Bureau was awarded a series of honorary titles as a water-saving unit, such as the "Provincial Water-saving Unit", "Hunan Provincial Water-saving Institution in Water Conservancy Industry", and "Hunan Provincial Water-saving Benchmarking Unit". Besides, the Bureau has published its publicity report summary about water-saving construction, *Hunan Chenzhou Municipal Water Conservancy Bureau: Building a Water-saving Carrier and Water Conservancy Model*, on the official website of the National Office of Water Conservation, providing a water-saving model for public institutions to build a national innovation demonstration zone with the theme of "sustainable use and green development of water resources" in Chenzhou City.

### Main Water Indicators for the Past Three Years

Item	2020	2021	2022
Main water sources	Municipal water supply, Unconventional water	Municipal water supply, Unconventional water	Municipal water supply, Unconventional water
Water withdrawal (tons)	1611.52 (including 1295.99 of municipal water supply, and 315.53 of unconventional water)	1586.20 (including 1272.12 of municipal water supply, and 314.08 of unconventional water)	1439.36 (including 1122.59 of municipal water supply, and 316.77 of unconventional water)
Annual water consumption per capita	12.59	12.39	10.74
Equipping rate of water measuring	100%	100%	100%
Popularity rate of water-saving	100%	100%	100%

### Lessons Learned and Replicability

Active efforts should be made to promote the good experience and practices of the building of public institutions into water-saving units, give full play to the vanguard role of public institutions in water

conservation, lead and drive the water conservation in all localities, industries and units, strive to improve water efficiency, form a water-saving concept and water-saving atmosphere in the whole society, and contribute to building a water-saving society in all aspects.

Experience summary: First, water-saving transformation should be carried out to stop the "leakage" and achieve targeted water-saving. Second, unconventional water should be well used to generate "living water" with "wastewater". Third, a long-term mechanism should be established to build consensus on fine water management.

### ***Lessons Learned***

- Install water metering facilities;
- Conduct water balance tests;
- Promote water-saving technologies and facilities;
- Conduct water-saving publicity and education activities;
- Strengthen the basic water-saving management.

### ***Case Importance to IWRM***

This case demonstrates the initial success in building public institutions into water-saving units, which provides useful insights for further advancement of such a move and is of great significance to raise the awareness of water conservation in the whole society. In addition to improving the overall utilization of water resources and the harmonious coexistence of man and nature, it can also strengthen the protection of water resources and promote economic and social development.

### ***Tools Used***

### ***Keywords***

Water-saving units, public institutions, countermeasures

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### ***References and Websites***

- *Thoughts on Current Situation and Relevant Work of Building Public Institutions into Water-saving Units in Hunan Province* by Xu Xingyi, Hu Chunyan, et al.;
- *Water Consumption of Public Institutions and Building of Them into Water-saving Units* in by Yin Yajun;
- *Analysis of the Current Situation and Water-saving Potential of Public Institutions in Jiangxi Province* by Xia Li, Zhang Dan, et al.