



北京 2022 年冬奥会官方合作伙伴  
Official Partner of the Olympic Winter Games Beijing 2022

# ANNUAL REPORT ON ENVIRONMENTAL PROTECTION 2021

**China Three Gorges Corporation**

# About This Report

## Time Frame

From January 1 to December 31, 2021. Part of the content may exceed the aforementioned time frame.

## Scope

This report covers work on environmental protection related to the main business of CTG.

## Interpretation of Environmental Protection

Environmental protection, as described in this report, covers not only the management of the environmental impacts arising from the Corporation's operations, but also work related to such aspects as soil and water conservation, ecological restoration and energy conservation.

## Note

In this report, the terms "the Group", "the Corporation" and "CTG" all refer to China Three Gorges Corporation.

## Context of the Publication

The Corporation's *Annual Report on Environmental Protection* has been published for 17 consecutive years since 2006. Its electronic versions can be downloaded from the official website of CTG.

## Data in the Report

The data referenced in this report is CTG's final statistical data for 2021.

## Reference Standards

This report mainly refers to the following protocol, standards, guidelines and laws:

- *Environmental Protection Law of the People's Republic of China* (as amended on April 24, 2014)
- *Guidelines for the Preparation of Corporate Environmental Reports (HJ 617-2011)*, a national environmental protection standard of the People's Republic of China
- *Disclosure Mechanism for the Assessment of the Environmental Impact of Construction Projects*, issued by the Ministry of Ecology and Environment of the People's Republic of China
- *GB/T 36000-2015, Guidance on Social Responsibility*, a national standard of the People's Republic of China
- *Global Reporting Initiative Sustainability Reporting Standards (GRI Standards)* issued by the Global Sustainability Standards Board (GSSB)
- *Hydropower Sustainability Assessment Protocol*, issued by the International Hydropower Association (IHA)
- *Hydropower Sustainability Standard*, issued by the International Hydropower Association (IHA)

## Language Versions

This report is available in Chinese and English, and published in both print and electronic formats. The electronic version can be downloaded from CTG's website at <http://www.ctg.com.cn/>. For a print copy, please email [hu\\_jin3@ctg.com.cn](mailto:hu_jin3@ctg.com.cn) or call 86-027-85086289.

## Access to More Content

More content is available on CTG's website at <http://www.ctg.com.cn/>. Other relevant information on environmental protection can be found in the following documents:

- *Bulletin on the Ecological and Environmental Monitoring Results of the Three Gorges Project*
- *CTG Annual Report*
- *CTG Sustainability Report*
- *Social Responsibility Report of China Yangtze Power Co., Ltd.*
- *Social Responsibility Report of Hubei Energy Group Co., Ltd.*

## Future Improvements

CTG plans to prepare and release the *Environmental, Social, and Corporate Governance (ESG) Report* on the basis of periodic release of its *Annual Report on Environmental Protection* to continually improve its ability to create comprehensive values.

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## Message from Top Management



**Lei Mingshan**  
Board Chairman



**Han Jun**  
Board Director and President

The year 2021 was a most extraordinary journey for us. As the world is being shaped by the profound changes never seen in a century, we marched forward regardless of hardships. Facing numerous opportunities and challenges, China Three Gorges Corporation (CTG) has incorporated its philosophy of prioritizing the eco-environment and pursuing green development into every process of clean energy investment, construction, and operation. We strove towards greater progress in our two-tracked approach for advancing clean energy development and the ecological conservation of the Yangtze River, and expedited efforts to build itself as an innovative world-class multinational clean energy enterprise with global competitiveness.

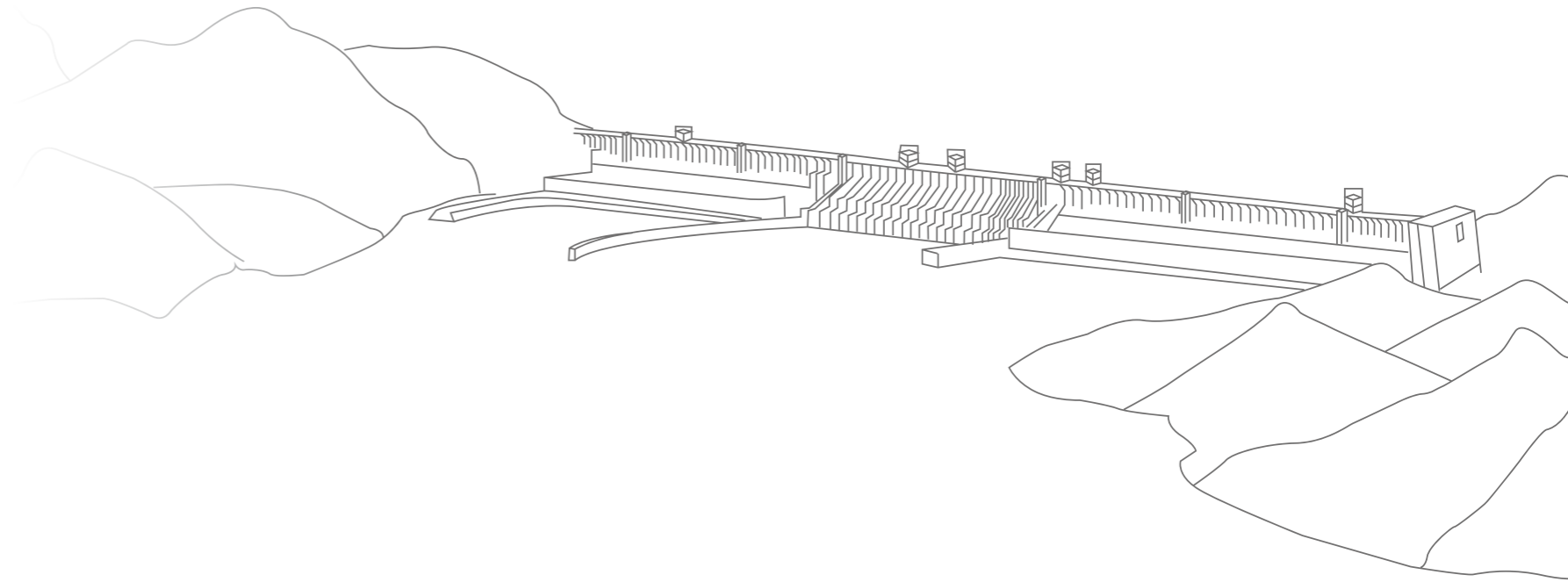
Over the past year, CTG further expanded and strengthened the well-coordinated environmental conservation of the Yangtze River in more fields. We treated and purified water of the rivers and lakes along the Yangtze River, and continued investing more. We formed the management models of "Smart Urban Water Manager" and "Smart Integrated Urban Energy Manager" after carrying out pilot programs. Besides, we completed and put into operation a batch of urban sewage treatment projects, which continuously improved the urban water environment quality. From the pilot projects to the full implementation along the Yangtze River, CTG has turned its blueprint into a sophisticated urban pipeline system strewn with sewage discharge stations in reality, leaving a "Green Bank" of sustainable development for generations to come.

Over the past year, focusing on the carbon peaking and carbon neutrality goals, CTG made notable progress in environmental protection. We fulfilled our dreams to build dams in remote mountains and deep valleys and along the Jinsha River (upper reaches of the Yangtze River). We also reached our targets to put into operation the first batch of generating units of Baihetan Hydropower Station, all generating units of Wudongde Hydropower Station and the first generating unit of Zhejiang Changlongshan Pumped Storage Plant before July of 2021. The world's largest clean energy corridor along the Yangtze River took shape, which can provide an inexhaustible supply of green power for the building of a "low-carbon China". On the vast sea and the Gobi desert, we commenced the construction of some renewable energy bases such as the world's largest single-scale photovoltaic plus sand control project and the world's largest floating photovoltaic power project, and completed some landmark projects including the first domestic gigawatt level offshore wind farm, which helped us to become a stellar provider of wind and solar power. We insisted on the conservation of terrestrial and aquatic biodiversity in the Yangtze River basin, carried out a combined ecological dispatch test of the cascade reservoir system on the main stream of the Yangtze River, constantly improved the full life cycle species protection system, and strove to build a Three Gorges Model featuring harmonious coexistence between man and nature. We remained committed to pursuing our mission in this era to fulfill the goals of peaking carbon dioxide emissions and achieving carbon neutrality. Besides, we formulated our timeline for achieving

carbon neutrality by 2040 and proactively participated in China's carbon trading market, so as to contribute to the attainment of carbon neutrality in 2060.

Over the past year, CTG steadily implemented its "Going Global" policy to provide the world with low-carbon, environmentally friendly and sustainable clean energy. We completed some important international clean energy projects: Nam Kong 1 Hydropower Station in Laos was put into operation for power generation, and the gate of Karot Hydropower Station in Pakistan was closed for water storage. Reports that recorded new victories on multinational merger and acquisition of renewable energy businesses kept pouring in. Our international business showed a sound momentum of complementarity among water, wind and solar energy and of coordinated development of power generation, distribution and sales, which injected a powerful impetus into the development of the Belt and Road Initiative in an environmental-friendly way.

Looking to 2022, CTG will, with a down-to-earth attitude, persevering spirit and a strong sense of responsibility, open a new chapter in our two-tracked approach for advancing clean energy development and the ecological conservation of the Yangtze River. We will pick up the pace in becoming a world-class model enterprise, and strive to make greater contributions to building a great modern socialist country in an all-round way and realizing the Chinese Dream of the great rejuvenation of the Chinese nation.



# About Us



China Three Gorges Corporation (hereinafter referred to as "CTG", "the Group" or "we") is a solely state-owned enterprise headquartered in Wuhan City, Hubei Province. Founded on September 27, 1993, it was formerly known as China Three Gorges Project Corporation, renamed "China Three Gorges Corporation" on September 27, 2009, and then restructured on December 28, 2017.

With over 20 years of steady development, CTG has grown into the largest hydropower development enterprise in the world and the biggest clean energy provider in China. As of the end of 2021, the main business of CTG had extended to engineering construction and consulting, power generation and operation, river basin cascade dispatching and comprehensive management, renewable energy development and operation management, international energy investment and contracting, capital operation and financial services, assets management and base service, ecological protection investment and operation and so on.

CTG performs the role as a pivotal and leading player in the well-coordinated environmental conservation of the Yangtze River. The Group has actively developed its business in ecological protection and established relevant entities, reinforcing its support both in technology and investment. Starting with urban sewage treatment, the Group has carried out a batch of pilot projects in pilot cities. As of the end of 2021, CTG's efforts for the well-coordinated environmental conservation of the Yangtze River basin had been rolled out across the board. Building upon pilot trials in four cities and deeper cooperation with 12 cities along the Yangtze River, it has reached a new, geographically comprehensive stage in the environmental conservation of the Yangtze River that covers all 11 provincial-level administrative divisions in the Yangtze River Economic Belt.

- CTG is in overall charge of the construction and operation of the Three Gorges Project.
- CTG is responsible for the development, construction and operation of the four world-class mega cascade hydropower stations, i.e. Xiluodu, Xiangjiaba, Wudongde and Baihetan, in the lower reaches of the Jinsha River.
- Of the world's top 12 installed hydropower stations, five are operated by CTG.
- Over two-thirds of the world's hydroelectric generating units with an installed capacity greater than 700 MW are operated by CTG.
- CTG actively develops renewable-energy operations, such as wind power and solar power projects, and is committed to becoming a leading player in offshore wind power.
- CTG follows the national Belt and Road Initiative, expedites the efforts to drive the industry to "go global", and to bring the going-global endeavor of China's hydropower industrial chain to a new

level. Overseas business operations have become an important growth driver for CTG's sustainable development.

- The well-coordinated environmental conservation of the Yangtze River basin is a top priority for CTG. To this end, we have fully leveraged our role as a pivotal and leading player to promote the green transformation of economic and social development in the 11 provincial-level administrative divisions in the Yangtze River Economic Belt.

# 2021 in Numbers



## Well-coordinated environmental conservation of the Yangtze River

By the end of 2021

CTG had invested over **200 billion yuan** in ecological protection

**641** sewage treatment plants (stations), with a total capacity of **4.42 million m<sup>3</sup>/day**, had been built

**32,299.5 km** of stormwater and sewerage piping had been designed

Covering an urban area of about **46,000 km<sup>2</sup>** and **35.64 million** residents



## Total investment in environmental protection (including water and soil conservation) (million)

# 25,900

2021

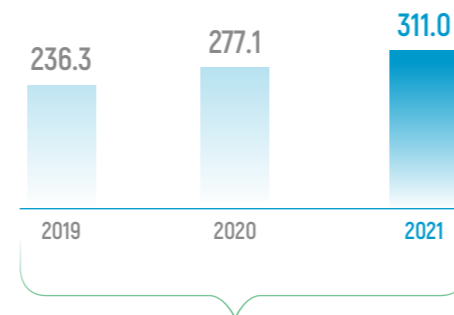
## Implementation of environmental impact assessments for new projects (%)

# 100

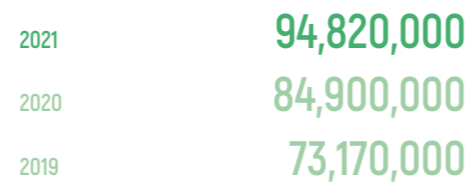
2019, 2020, 2021



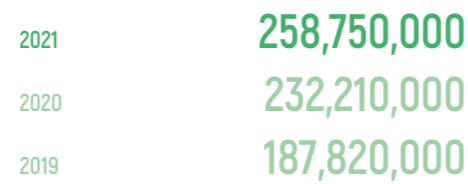
## Total amount of clean electricity generated by CTG (TWh)



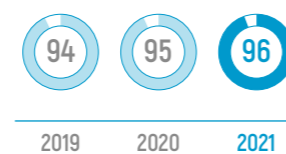
## Savings in standard coal equivalent (tons)



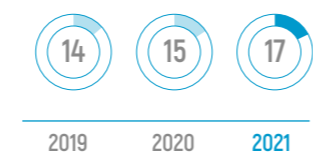
## Equivalent reduction in CO<sub>2</sub> emissions (tons)



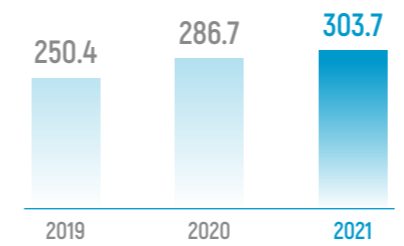
## Proportion of renewables in CTG's total installed capacity (%)



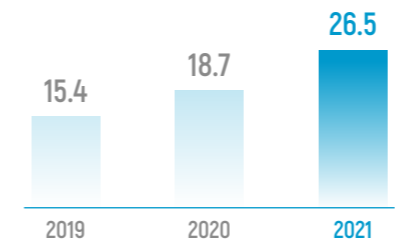
## CTG's share in China's total consolidated installed hydropower capacity (%)



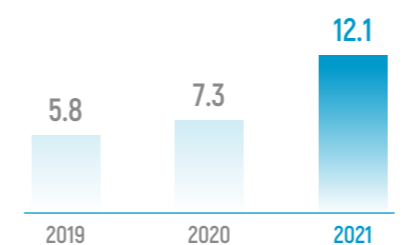
## Global hydropower generated by CTG (TWh)



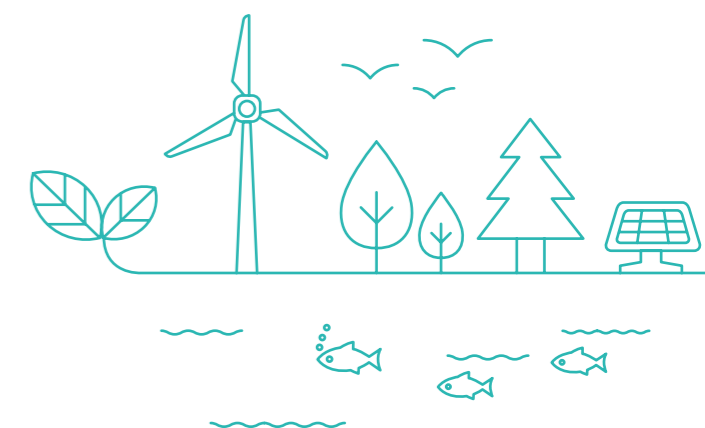
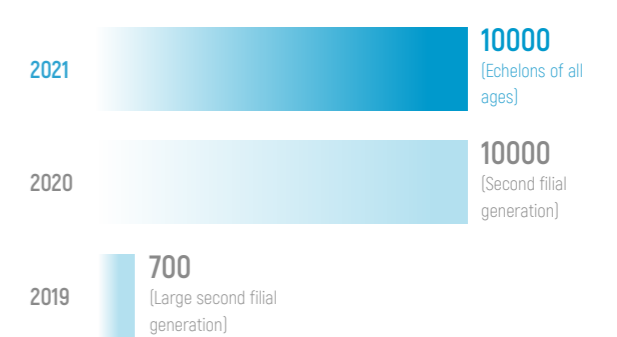
## Global wind power generated by CTG (TWh)



## Global PV power generated by CTG (TWh)



## Annual number of Chinese sturgeons released into the Yangtze River



## Feature Report

# Creating a Stunning Golden Economic Belt

Focusing on the development of the Golden Economic Belt (i.e., Yangtze River Economic Belt) and playing an active role in the environmental conservation of the Yangtze River basin, CTG prepared the business plan for environmental protection during the 14<sup>th</sup> Five-year Plan period, and intensified its efforts to further expand and strengthen the well-coordinated environmental conservation of the Yangtze River basin in more fields, with the aim to creating a stunning Golden Economic Belt.

## Top Level Designs to Consolidate Safeguards

CTG shall devote itself to the development of the Yangtze River Economic Belt without hesitation and actively explore new ways to prioritize eco-environment and green development of the Yangtze River Economic Belt in a coordinated way, vigorously transform the driving force for the development of the Economic Belt, constantly deepen enterprise reform, and develop a new model for green development, so as to make greater and new contributions to the development of the Economic Belt.

CTG works relentlessly to improve relevant systems for the environmental conservation of the Yangtze River basin, and specifies key tasks and supporting measures to boost the ecological environment protection and restoration of the Yangtze River basin.



Bali Lake-Saicheng Lake Control Hub Project in Jiujiang City, Jiangxi Province

## Clean Waters for Generations to Come

In order to better protect the Yangtze River, we need to manage water resources first, while the emphasis of water resource management lies in pollution abatement. Sewage treatment is the number one priority in water environment treatment in the Yangtze River basin. CTG launched innovative models of "Smart Urban Water Manager" and "Smart Integrated Urban Energy Manager". With systemic treatment as a guideline, pipe network as a core, reform of price mechanisms as a breakthrough point, and application of information technology and intelligent technology as a means, CTG constantly focuses on sewage treatment in the townships along the Yangtze River, actively explores new ways for integrated development of clean energy and environmental protection of the Yangtze River, and helps cities along the Yangtze River expand their path for green development with the eco-environment as the priority.

### Innovative Models of "Water Manager"

#### Smart Urban Water Manager

Smart Urban Water Manager is a water system management platform jointly established by CTG and the local government. As a third party, the platform is responsible for unified planning, building, operation, management and dispatching of urban water-related facilities such as facilities for water supply and drainage, pipeline networks, flood control and drainage, rivers and lakes. Through smart technologies specialized management and internal potentiality tapping, it can specify main subjects of responsibility, define specific responsibilities, reduce costs, and improve efficiency, thereby ensuring the long-term, stable, up-to-standard, and continual improvement of the urban water environment.

#### Business model

We cooperated with local government to establish a price adjustment mechanism, in which regulated assets were linked with water prices. We also established a sustainable mechanism by gradually transforming the payment for pipeline network building, and operation and maintenance by governments to the payment by users through cost control and efficiency improvement in the transition period.

#### Full life cycle regulation and control

"Smart Urban Water Manager" can incorporate the conveying of raw water from the water source to the water supply plant, supply of tap water from the water supply plant to users, sewage collection and treatment from users to sewage treatment plant, discharge of up-to-standard tail water, ecological governance of rivers and lakes, and urban flood control and drainage into whole-process and full-cycle management and control.

#### Technological innovation

We developed a smart water affairs management and control platform, and reduced cost and increased efficiency by intelligent provision of power and full tapping of potential; we popularized core technologies such as trenchless restoration of larger pipelines, and used smart detection software and hardware for pipe network detection and restoration; we promoted the building of new-concept water plants, popularized sewage treatment plants plus distributed photovoltaic power projects, and strengthened the disposal and recycling of organic solid waste to propel the use of green energy.

#### Cooperation between two parties

The government department is responsible for the assets verification, cost supervision and audit, and precise assessment of the Water Manager; while the Water Manager is responsible for implementing the government department's requirements and receiving its assessment, as well as the unified management and dispatching of water-related assets. The Water Manager is the major organization responsible for fulfilling water environment objectives.

### Smart Integrated Urban Energy Manager

Following the development philosophy of "clean energy plus environmental protection", it can reduce the unit GDP energy consumption of cities by using integrated smart energy in the whole basin. It is a CTG plan for cities along the Yangtze River to achieve the goals of carbon dioxide peaking and carbon neutrality and accelerate green transformation.

We have signed agreements on Smart Urban Water Manager and agreements on Smart Urban Integrated Energy Manager with governments of

**23** cities (districts, counties) along the Yangtze River, including Yueyang, Yichang, Jiujiang and Wuhu.

### Explorations on Establishing a "Sewage Plus Photovoltaic Power" Coordinated Operation Model

We actively explored the ways to combine clean energy and its environmental protection businesses, and set up the "sewage plus photovoltaic power" coordinated operation model. With a power generation model of "self-sufficiency and diverting surplus to the grid" adopted, we made full use of unoccupied spaces above ponds and roofs of sewage treatment plants to develop distributed photovoltaic power projects and provide clean, safe, convenient and high quality electricity at a low cost, thereby creating a green resource recycling system, promoting diversified development of businesses regarding environmental conservation of the Yangtze River basin, and implementing the new requirements for well-coordinated environmental conservation of the Yangtze River basin under the goals of carbon dioxide peaking and carbon neutrality. At the end of 2021, the "sewage plus photovoltaic power" project was implemented in Wuhu City, Anhui Province, and the project will be popularized to Yueyang City, Hunan Province, and Jiujiang City, Jiangxi Province.



Phase 1 of the Distributed Photovoltaic Power Generation Project at the Zhujiqiao Sewage Treatment Plant was connected to the grid for power generation in September 2020. Since it was put into operation, it has generated an accumulated amount of 900 MWh, equivalent to saving raw coal of 500 tons and reducing carbon dioxide emissions of 900 tons.



The Distributed Photovoltaic Power Generation Project of Wuhu Chengdong Sewage Treatment Plant was put into operation for power generation in September 2021. During the 25-year operation period, it can provide green electric energy of about 29.96 GWh for the environmental conservation project in the Yangtze River basin, save standard coal of about 11,900 tons and water of about 119,800 tons, and reduce carbon dioxide emissions of about 29,800 tons.



The Distributed Photovoltaic Power Generation Project of Gao'an Sewage Treatment Plant in Sanshan District, Wuhu was connected to the grid for power generation in November 2021. After completion, it is expected to provide clean electric energy of about 23 GWh for the power grid on average each year. Compared with a thermal power plant of the same scale, each year, it can save standard coal of 7,200 tons, reduce sulphur dioxide emissions of about 700 tons and carbon dioxide emissions of about 19,700 tons.



## Explorations on New Water Management Methods through the Smart Water Management System

We empowered water pollution control through digital technologies, and established a "114" general framework for smart water management composed of "One Network", "One Map" and "Four Centers" in line with the philosophy of environmental conservation of the Yangtze River basin. We also strive to realize the three-level smart water management (i.e., river basin-city-project) in support of the well-coordinated environmental conservation of the Yangtze River basin, and launched pilot projects of smart water management to achieve harmony between man and water.



### One Network

We established an IOT perception network for smart water affairs to centrally manage the monitoring and perception network for environmental conservation of the Yangtze River basin, covering the unified management of standard perception equipment parameters, information transmission protocols, and monitoring equipment, aiming to provide a data basis for the smart big data analysis of the Yangtze River basin.



### One Map

We established "One Map" of the 3D visual system based on BIM plus GIS. It covers geographic information of the river basin, 3D realistic picture of cities, and 3D project models for environmental conservation of the Yangtze River basin, and displays monitoring data of pipeline networks and facilities in a multidimensional way, to gain a precise grasp of onsite situation and make decisions.



### Four Centers

Four centers, including the Smart Perception Center, Water Affairs Application Center, Decision Support Center, and Display & Publicity Center were established to realize core functions of managing achievements, operation & maintenance, and ecological environment of the smart management and control system in the environmental conservation of the Yangtze River basin. Overall benefits of environmental conservation of the Yangtze River basin were evaluated to provide a decision-making basis for the construction and management of urban smart water affairs.

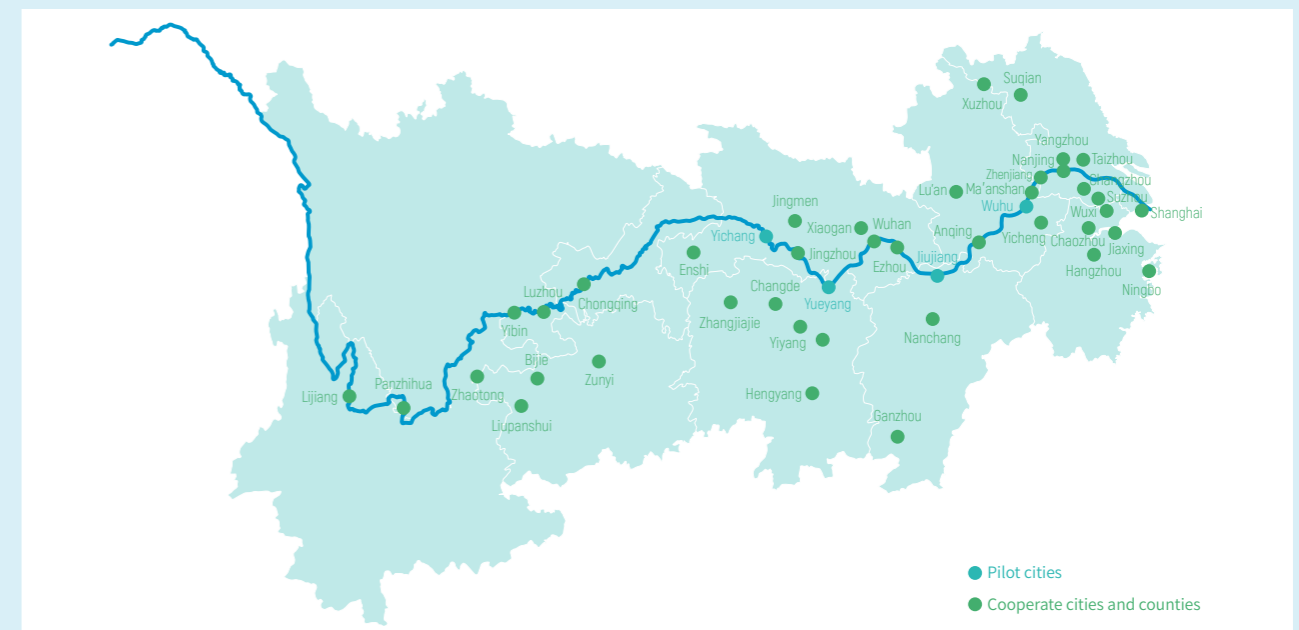
## Prominent Achievements of the Three Gorges Model

Teaming up with local governments, CTG has built upon an integrated system of sewerage pipeline networks and wastewater treatment plants, a business model focusing on price mechanisms, mutually beneficial cooperation with government agencies, and the "Three Gorges Model" based on industry alliances for urban sewage treatment in the Yangtze River Economic Belt, working relentlessly to put forth new ideas for better development. Therefore, they have scored impressive achievements in the well-coordinated environmental conservation of the Yangtze River basin by "launching a model within one year, achieving initial results within two years, and making great progress within three years."

### Business Layout: Full Implementation in the Provinces and Cities Along the Yangtze River

Starting from the cooperation with four pilot cities, i.e. Jiujiang in Jiangxi, Wuhu in Anhui, Yueyang in Hunan, and Yichang in Hubei, we have expanded our businesses to 11 provinces and cities in the Yangtze River Economic Belt, covering Shanghai, Jiangsu, Zhejiang, Anhui, Jiangxi, Hubei, Hunan, Chongqing, Sichuan, Yunnan, and Guizhou, and signed about 130 cooperation agreements with government departments of these counties, cities (districts) and provinces for the well-coordinated environmental conservation of the Yangtze River basin.

Footprints of CTG in the journey of environmental conservation of the Yangtze River basin



### Investment and financing channels: Prominent achievements of "Capital Plus"

#### Capital plus industry leaders



The equity bond was consolidated continually, and the double-platform model was implemented.

#### Capital plus local platforms



With Chengdu-Chongqing in the upper reaches of the Yangtze River, Wuhan-Changsha in the middle reaches, and Shanghai-Nanjing-Zhenjiang in the lower reaches as axes, we carried out equity cooperation with local platforms and established 10 cooperation platforms in 7 cities.

#### Capital plus technology enterprises



We found high-quality target enterprises in fields of pipeline repair, sludge treatment and disposal, and advanced wastewater treatment to provide support for projects and develop core capabilities.

## Notable results in key cities

### "Integrated system of sewerage pipeline networks and wastewater treatment plants" in Wuhu

We treated wastewater following the principle of "integrating sewerage pipeline networks with wastewater treatment plants". We built wastewater treatment plants and new sewerage pipeline networks while repairing and improving the existing one. After completion, we operated wastewater treatment plants, sewerage pipeline networks, and pumping stations in an integrated way.



Wuhu Jiangdong Water Ecology Park

*"Great changes have taken place in recent years. Before this park was built, I remember that it was a sludge beach here. Now, the water is clean, and the banks are green. It's very beautiful. Since I live nearby, in my spare time, I often have a walk here with my friends."*

—A tourist in Wuhu Jiangdong Water Ecology Park

### Integrated system of wastewater treatment plants, sewerage pipeline networks, and rivers in Jiujiang (plant-network-river system)

With water environment pollution treatment as a priority, we coordinated the treatment of water environment, water ecology, water resources, water safety and water culture and river bank line governance, and established a sound water circulation system through source governance and ecological restoration.



Shilihe River in Jiujiang

*"In the past, the river water smelt bad. We had to close our windows when wind blew and had to bypass it when we went out... Now, the water is clean, more flowers and trees are planted, and the wetland park is completed and open to the public. Our house has become one with a garden view envied by our relatives."*

—A resident near Shilihe River

## Full implementation in the cities along the Yangtze River

### In Chongqing:

We participated in the ecological protection and building of ecological facilities on Guanyang Island, committed to building Guanyang Island into an innovative experimental area for ecological progress in the Yangtze River basin. Phase I of the Ecological Restoration Project of Guanyang Ecological Island was completed, while Phase II is in process now. After its completion, we will realize 100 percent utilization of clean energy and zero wastes and discharge of sewage on the island.

### Integrated system of wastewater treatment plants, sewerage pipeline networks, and lakes in Yueyang (plant-network-lake system)

The focus of pollution treatment has transformed from the mere construction of sewerage pipeline networks or wastewater treatment plants to the unified design, construction and operation and maintenance of wastewater treatment plants and sewerage pipeline networks. Taking Dongfeng Lake as an example, we adopted four technical measures, including source control and pollution interception, internal source treatment, ecological restoration, and flowing water circulation, together with the building of a sponge city and waterfront ecological parks to solve water pollution problems fundamentally.

*"Years ago, this lake was once the biggest black and odorous water body in Yueyang. Now, it has become a bright pearl near the Dongting Lake."*

—A young student near Dongfeng Lake



Dongfeng Lake in Yueyang

### Integrated system of wastewater treatment plants, sewerage pipeline networks, rivers, lakes, and banks in Wuhan (plant-network-river-lake-bank system)

In the implementation of Wuhan Hongqi Lake Ecological Purification Project, an underwater "green forest" covering more than 110 hectares has been created to effectively purify water. An ecological corridor incorporating mountains, waters, forests, fields, lakes, and lawns has been built in the Optics Valley, providing a natural and green recreation and living space for more than 800,000 residents in the surrounding areas.

*"We can then finish planting aquatic plants in Hongqi Lake, which covers more than 110 hectares. It is like a green forest underwater. It's the key of water purification in Hongqi Lake."*

—A managing staff of Hongqi Lake Ecological Purification Project



Wuhan Hongqi Lake Ecological Purification Project

### In Zhenjiang and Lu'an:

We explored new models, including integrated cooperation, "Four Integrations" (integration of construction, management and transportation, integration of sewerage pipeline networks and wastewater treatment plants, integration of supply and discharge, and integration of urban and rural areas), the comprehensive governance of river basins.

### In Yichang:

We implemented several projects such as the wastewater treatment plants and networks and ecological water networks. Those solved water shortage problems of the 478 km<sup>2</sup> ecological base flow in the Bailin River Basin, and formed a pattern of environmental conservation of the Yangtze River basin where the development of main urban area of Yichang as a center drives the development of surrounding cities and counties.



# 01

## Environmental Management

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As the world's largest hydropower developer and operator and China's largest clean energy group, CTG has incorporated the philosophy of prioritizing ecological conservation and green development into the whole process of clean energy investment, development, and operation following the two-tracked approach where clean energy development and ecological conservation of the Yangtze River go hand in hand. By consolidating the organizational and institutional safeguards for environmental protection, we are working perseveringly to improve our scientific research and innovation capability for environmental protection, and have formed an environmental protection and management pattern that is open, shared and driven by technological innovation throughout the full life cycle of all projects in the Yangtze River basin.

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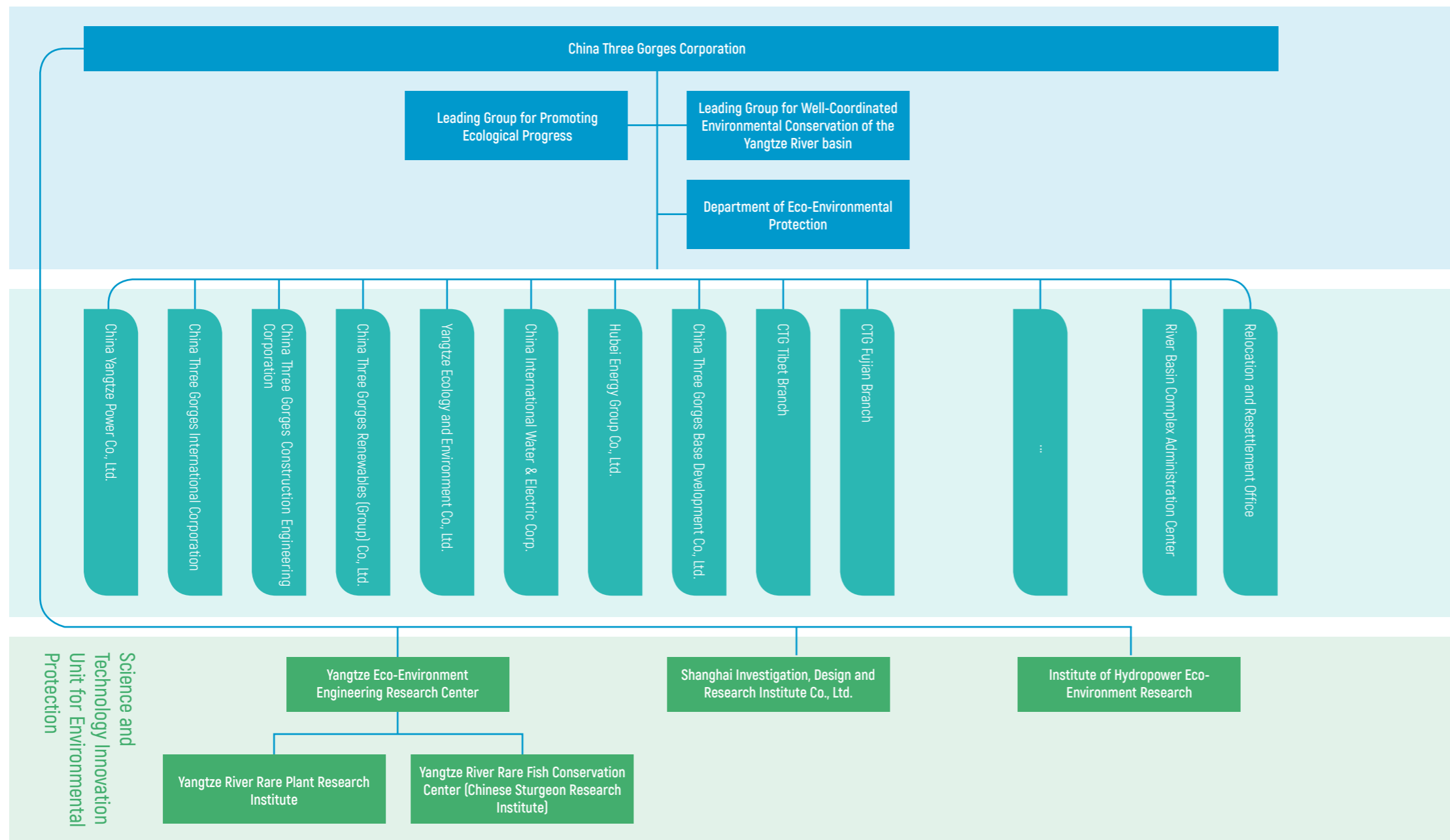
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## Organizational Structure

CTG has established a sound organizational system for environmental management, and exercised a management system, in which functional departments for environmental protection are responsible for centralized management, and other departments are responsible for the management in accordance with the division of duties. The headquarters and affiliated companies are responsible for hierarchical management & control according to their different authorities, and can realize whole-process environmental management in the entire basin covering all businesses.

Organizational system for CTG environmental protection and management



## Management System

CTG has continued to improve its environmental management system, which coordinates "QEOMS" system (Quality, Environment, Occupational Health & Safety), environmental management mechanism, comprehensive risk management system, internal control system and environmental emergency management system, to manage environmental protection throughout the full life cycle of all its business activities.

### Environmental Management System

CTG has established a sound environmental management system, and constantly improved and refined it and its working process through inspections and timely rectification to dynamically improve environmental protection. In 2021, CTG passed internal and external audits of its environmental management system between 2020 and 2021, and was awarded the GB/T 24001-2016/ISO 14001-2015 Environmental Management System certification.



### Environmental Management Regulation

The environmental protection management system of CTG covers many aspects, including environmental management in the early stages and construction period of projects, acceptance management of environmental protection facilities, environmental protection management in the river basin complex administration and power generation, environmental protection research, monitoring and data collection, and oversight management. We have established the *Special Management Measures for Hydropower and Ecological Environment Protection of the Yangtze River* and *Management Measures for Ecological Environment Protection in Overseas Businesses*, which have standardized our management of ecological environment protection.

### Emergency Management System

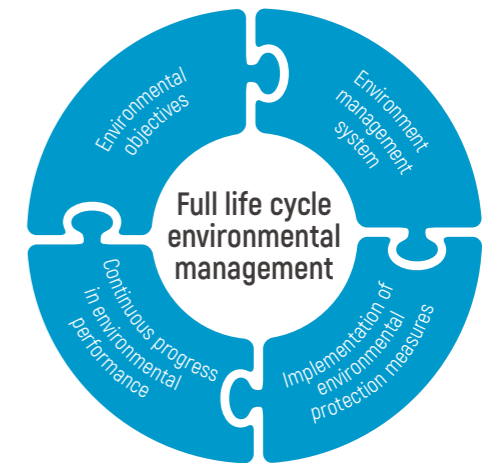
CTG has improved its emergency management system with a well-balanced and coordinated structure that reaches every corner of its business, and enhanced its ability for handling major environmental emergencies. All affiliated companies of CTG organize emergency training and drills on a regular basis, and prepare their own comprehensive emergency plans, special emergency plans, and on-site response plans according to CTG's emergency management system to ensure appropriate management & control of environmental risks.

### Environmental Risk Management

CTG carries out identification and analysis of environmental risk factors on a regular basis in multiple respects, including power generation methods, energy resource management and pollutant discharge management. CTG singles out key environmental risk factors and formulates risk management strategies in accordance with the enforcement of environmental protection laws and regulations, pollutant volumes and impacts, as well as energy resource consumption and conservation. In 2021, no major environmental pollution incidents occurred within CTG, and environmental risks were under control.

## Process Management

To achieve closed-loop management and continuous improvement in environmental management, CTG has established an environmental management process through the full life cycle, covering aspects such as setting of environmental objectives, establishment of sound environmental management systems, implementation of environmental protection measures and continuous progress in environmental performance.

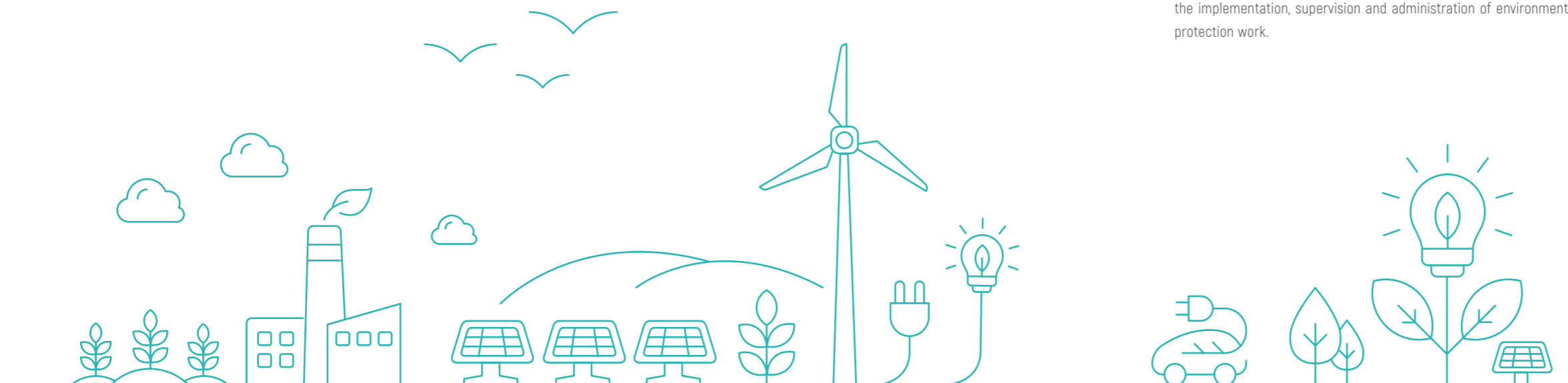


### Strategies and Plans

In 2021, CTG remained closely aligned with national strategies and plans including carbon peaking and carbon neutrality goals, and development of the Yangtze River Economic Belt. We prepared and issued the *Business Plan for Environmental Protection in the 14<sup>th</sup> Five-year Plan Period* based on the requirements for coordinated development of clean energy and environmental conservation of the Yangtze River during the 14<sup>th</sup> Five-year Plan period. The business plan specifies key tasks in environmental protection during the 14<sup>th</sup> Five-year Plan period, including the use of Smart Urban Water Manager and Smart Urban Integrated Energy Manager, ecological protection and restoration in the river basin, and reduction of pollution and carbon emission. Based on plans for environmental protection in the 14<sup>th</sup> Five-year Plan period, we have prepared environmental protection plans, tracked and managed the plans dynamically, and promoted the implementation, supervision and administration of environmental protection work.

### Supervision and Inspection

CTG has established the *Management Measures for Supervision on Ecological Environment Protection*, according to which, it carries out whole-process supervision and inspection on the ecological environment protection work of the production and construction projects under its administration. Through the combination of administrative supervision and technical supervision, we have formed an effective and well-functioning ecological environment supervision and management system with a well-balanced and coordinated structure, which can ensure the smooth implementation of state environmental protection laws, regulations and standards, and our environmental protection rules, systems and standards. We have actively accepted oversight and inspections by environmental protection authorities at various levels, and placed our work under public supervision by setting up a platform on our official website for public feedback regarding environmental protection.



#### Fulfilling our commitment to environmental protection at the project location, and receiving supervision from the public

Chaglla Hydropower Plant, operated by CTG in Peru, subjects itself to the environmental monitoring by local community supervision committee every three months according to the requirements of the environmental assessment report and relevant commitments, so as to ensure water, soil, noise and radiation are up to standard, and reassure the surrounding residents.

## Scientific and Technological Innovation

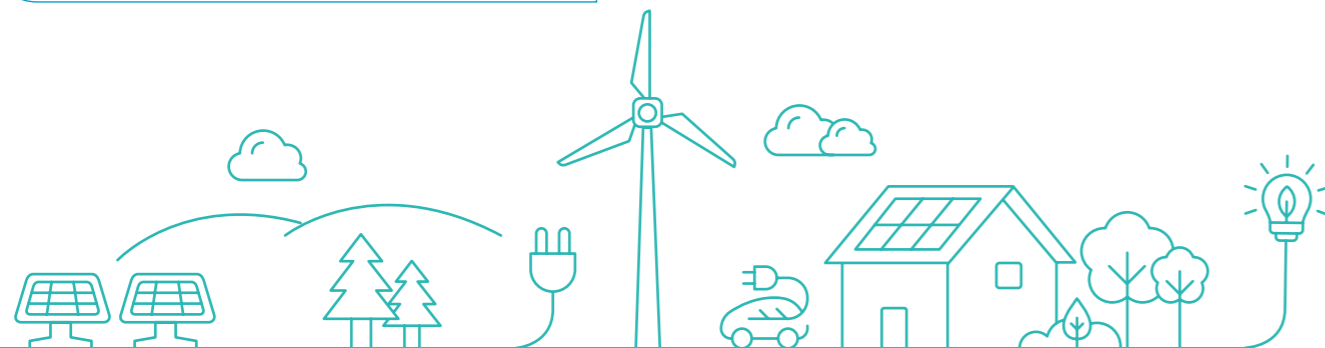
CTG has made progress in environmental protection and continuously improved management abilities through innovation. It has accelerated the building of independent scientific & technological innovation platforms, increased investment in science and technology for environmental protection and intensified efforts in research & development, and constantly enhanced the innovation capabilities of research institutes for environmental protection, such as Yangtze Eco-Environment Engineering Research Center, Yangtze River Rare Fish Conservation Center, and Yangtze River Rare Plant Research Institute.

### CTG's first national scientific & technological innovation platform approved

On November 29, 2021, National Ecological Environment Engineering Research Center of Yangtze River Economic Belt, which was initiated by Yangtze Eco-Environment Engineering Research Center, was officially approved by National Development and Reform Commission. The center is CTG's first national scientific & technological innovation platform that has been approved. To resolve major issues relating to water environment protection and water ecology restoration in the Yangtze River Economic Belt, the center will carry out R&D of key technologies and equipment for comprehensive treatment of urban water environment based on plant-network-river-lake-bank system, pollution treatment and ecological restoration of industrial mines, ecological water conservancy regulation and control, intelligent sensing and decision support, and protection and restoration of river and lake ecosystems. This will promote integration and collaborative innovation of enterprises, universities and research institutes, form systematic solutions integrating water pollution treatment, water ecosystem restoration, and water resources protection in the Yangtze River basin, build comprehensive abilities for ecological environment protection in the entire industry chain, and effectively strengthen the capability for ecological environment protection in the Yangtze River Economic Belt.

### Breakthroughs made in the study on large-scale breeding technology system of Chinese sturgeon

In 2021, Yangtze River Rare Fish Conservation Center (Chinese Sturgeon Research Institute) under the Ecological Engineering Center cultivated 41 mature Chinese sturgeons (8 females, 28 first-generation males, and 5 second-generation males), and hatched more than 600,000 larvae of Chinese sturgeons through the study and application of the artificial breeding technology. By the end of 2021, 250,000 larvae of Chinese sturgeons with a size over 10 cm had been cultivated, and the center had an abundant reserve of nearly mature second-generation Chinese sturgeons over 8 years old. The proportion of artificially bred Chinese sturgeons had exceeded 60 percent of the total at home, a record high in history. It has preliminarily realized the large-scale artificial propagation of Chinese sturgeons, providing a solid foundation for its protection and reproduction.



## Cooperation and Exchange

Taking advantage of various high-end international exchange and communication platforms, CTG actively shares its opinions on environmental protection, good practices in environmental protection, and excellent cases with fellow organizations, to contribute to carbon peaking and carbon neutrality goals and sustainable development of the clean energy industry.

### China's Progress Report on Implementation of the 2030 Agenda for Sustainable Development



Many cases of CTG including biodiversity conservation of the Yangtze River basin, Karot HPP (Pakistan), and Kaleta Hydraulic Complex Project (Guinea) have been included in the case library of *China's Progress Report on Implementation of the 2030 Agenda for Sustainable Development* and *Global Sustainable Development Report 2023* (a United Nations publication).



Release of rare and endemic fish in the Yangtze River

### Popularizing CTG's achievements in ecological protection

Protection of aquatic lives has significantly built up the reputation of CTG in environmental protection. In 2021, CTG carried out three events in cities and provinces along the Yangtze River to release rare and endemic fish such as Chinese sturgeon into the Yangtze River. The World Wildlife Fund, the Nature Conservancy, Global Environmental Institute, Center for International Knowledge on Development, EDF France, and International Association for Hydro-Environment Engineering and Research all endorsed the events as nominal supporters or through joint publicity, video recording, or on-site presence to safeguard river health and encourage public participation.



# 02

## Green and Low Carbon Endeavor

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CTG, with great potential for green development, is speeding up the building of a clean energy corridor along the main stream of the Yangtze River and coastal areas by making good use of the power of nature as well as its overall strength in the development of clean energy. With great efforts, it has become a powerful driving force to the development of a low-carbon China with a continuous supply of green electricity.

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## Building a Clean Energy Corridor

CTG is expediting its effort to build the world's largest clean energy corridor along the Yangtze River. The installed capacity of 6 cascade hydropower plants (Gezhouba, Three Gorges, Xiangjiaba, Xiluodu, Baihetan and Wudongde hydropower plants) on the mainstream of the Yangtze River is about triple that of the Three Gorges Project (about 72 GW). The continuous supply of hydropower resources from these plants has made an important contribution to China's green development.

The installed capacity has reached

**110** GW

Among the top 12 large-scale hydropower plants in the world,

**5** are built, operated and managed by CTG.

The proportion of installed capacity of renewable clean energy has exceeded

**96%**



By the end of 2021

The consolidated installed capacity of hydropower had reached

**67.21** GW at home

**9.19** GW abroad

In 2021

the total hydropower generation was

**275.7** TWh at home

**28** TWh abroad

By the end of 2021



The accumulative production of clean electric energy by CTG had reached

**2,946.9** TWh

Which was equivalent to a reduction of carbon dioxide emissions by

**2.45** billion tons

\*According to the Annual Report on Development of China Power Industry 2021 released by China Electricity Council, in 2020, the standard coal consumption for power supply of thermal plants with a capacity of 6,000 kW and above was 304.9 g/kWh, and the carbon dioxide emission per unit of thermal power generation was about 832 g/kWh. Therefore, the generation of 100 GWh clean hydropower is equivalent to the reduction of carbon dioxide emissions by 83,200 tons.

About **150** kWh of electricity can be generated when a runner of the generating unit in Baihetan HPP rotates one circle.



That's as much electricity as an average household consumes in a month.

The total generation of Wudongde HPP was

**38.97** TWh in 2021.



The total output of Wudongde HPP in 1 day can satisfy the demand of 300,000 people for electricity consumption in 1 year.



Baihetan HPP in construction

### First batch of generating units of the world's largest hydropower project under construction are connected to the grid

Baihetan HPP is the world's largest hydropower project under construction, with a gross installed capacity of 16 GW. A total of eight hydro-generating units with full proprietary intellectual property rights and unit capacity of 1 GW were installed respectively in the underground powerhouses on both the right and left banks. The unit capacity ranks 1<sup>st</sup> in the world. On November 19, 2021, No. 4 generating unit of Baihetan HPP was formally connected to the grid. This unit is the 6<sup>th</sup> generating unit put into operation by Baihetan HPP, as well as the 100<sup>th</sup> hydro-generating unit put into operation by CTG on the mainstream of the Yangtze River, marking that the mainstream of the Yangtze River has become the world's largest clean energy corridor. With Three Gorges Project as a highlight project, the clean energy corridor has become a template of China in its endeavor to propel green and high-quality development.



# Propelling the Development of Renewable Energy

While continuously enhancing its core capability for hydropower businesses and its industry influence, CTG staunchly implements the strategy of playing a leading role in the offshore wind power industry and optimizing onshore renewable energy businesses to establish a clean, low-carbon, safe and efficient energy system. It promotes harmonious development across regions with a "renewable energy plus agriculture, forest, animal husbandry, fishing and tourism" model, and underpins China's efforts to achieve carbon peaking and carbon neutrality goals.



By the end of 2021  
CTG's renewable energy business had been extended to 31 provinces, autonomous regions and municipalities directly under the Central Government across the country

Its installed capacity of renewable energy had reached

**26.22** GW at home

Its installed capacity of wind power had reached

**15.14** GW

Its installed capacity of photovoltaic generation had reached

**11.08** GW

In 2021

CTG's wind power generation reached

**24.4** TWh

Its photovoltaic power generation reached

**10.9** TWh

## Offshore Wind Power

CTG unwaveringly implements the strategy of becoming a leading player in the offshore wind power industry, and focuses on the large-scale development of offshore wind power to accelerate the establishment of the largest offshore wind power corridor. By the end of 2021, the installed capacity had exceeded 4.5 GW.



CTG Rudong Offshore Wind Power Project

### CTG Rudong VSC-HVDC Project rises high offshore

In August 2021, the world's largest and Asia's first offshore converter station, the offshore converter station of CTG Rudong VSC-HVDC Project, completed its installation. Currently, this converter station stands as the offshore converter station with the largest capacity, the highest voltage level, and the largest scale in the world. In this project, "high-rises" are built on the sea by means of the innovative float mounting method, through clever leverage of the tidal force. After completion, the project will collect and export the electric energy generated by a total of 1.1GW of capacity, which can effectively satisfy the demand of offshore wind farms for large-capacity and long-distance power transmission, and boost the function of offshore wind farms in generating clean energy.

## Onshore Wind Power

Focusing on UHV transmission facilities and large-scale base projects in central, eastern and southern China, CTG has put into operation onshore wind power projects in 26 provinces and regions, including Inner Mongolia, Xinjiang, and Gansu, with an installed capacity exceeding 10.5 GW.



Wind power in Zhangjiakou lightens lamps in Beijing

### Wind power of Zhangjiakou contributes to "delivering green Winter Olympics"

"Going green and environmental protection" is one of the highlights of Beijing 2022 Olympic and Paralympic Winter Games (Beijing 2022). As an official partner that supplies electricity to Beijing 2022, CTG reached an agreement on supplying 51 GWh of green electric energy to Beijing 2022 venues by the wind farm in Zhangjiakou City, Hebei Province. CTG donated 200,000 tons of certified emission reductions under the national voluntary emission scheme to Beijing 2022 Organizing Committee, helping Beijing 2022 become the first Olympic event that achieves carbon neutrality in real sense, and contributing to "delivering green Winter Olympics" with concrete actions.

## Photovoltaic Power Generation

CTG promotes large-scale centralized photovoltaic power generation in an orderly manner, explores business development models such as "PV Plus", and forms a photovoltaic power development pattern from pilot cities to the entire country. It has put into operation photovoltaic power projects in 25 provinces and districts such as Qinghai, Shanxi, and Shaanxi, with a total installed capacity exceeding 11 GW.



Wind and photovoltaic power project in southern Fuyang

### Floating photovoltaic power stations promote the complementarity between photovoltaic power, fishing, and agriculture

On October 22, 2021, Fuyang City, Anhui Province witnessed the commencement of construction of the floating photovoltaic power station featuring the largest single scale of the unit project in the world and the most comprehensive utilization of unused waters in coal mining subsidence areas. This station, as one of the 1.2 GW wind and photovoltaic power projects in southern Fuyang, is a large-scale wind and photovoltaic power base project featuring renewable energy in the Yangtze River Delta. The station is built on unused waters in coal mining subsidence areas with two models, namely, complementarity between fishing and photovoltaic power, and complementarity between agriculture and photovoltaic power, with the simultaneous integrated treatment of coal mining subsidence areas. Therefore, it plays a significant demonstration role and bears huge promotional values to the comprehensive treatment of ecosystems in resource-based cities in China.

After its completion, annually, the project is expected to save standard coal by about 630,000 tons, and reduce emissions of sulphur dioxide, nitrogen oxide, and carbon dioxide by about 5,400 tons, 4,700 tons and 1,660,000 tons respectively, equivalent to the planting of a 6,100-hectare broad-leaf forest.

## Contributing to Low-Carbon Development of the International Community

CTG gives full play to its own strength to accelerate the cooperation with Belt and Road countries and regions in the energy field. Steadily implementing its "Going Global" strategy with a business layout composed of green industry, green equipment, green technologies and green standards in the field of clean energy, CTG provides the world with low-carbon, environmental-friendly, and sustainable clean energy. It also works hard to establish the international clean energy corridor of the Belt and Road Initiative so as to contribute to creating and sharing a low-carbon future for the community of shared future for mankind.



By the end of 2021

CTG had established business presence in more than

**40** countries and regions in the world



Karot Hydropower Station under construction

### Gate of the first large-scale hydropower investment and construction project of the Belt and Road Initiative is closed for water impoundment

On November 20, 2021, the first large-scale hydropower investment and construction project of the Belt and Road Initiative, i.e., Karot Hydropower Station (Pakistan) built and owned by CTG, achieved its goal of water impoundment according to schedule, which laid a firm foundation for all generating units to be put into operation for power generation in 2022. The annual average power generation of Karot Hydropower Station, when completed, can reach 3.2 TWh, which will provide about 5 million people in Pakistan with stable and clean energy at a low price. After all generating units are put into operation for power generation, it's expected that, each year, it can save standard coal by about 1.4 million tons, and reduce carbon dioxide emissions by about 3.5 million tons. The project will thus further optimize the energy supply structure of Pakistan, help Pakistan realize sustainable development and help the world achieve the carbon neutrality goal.

### China's hydropower boosts the green development in African countries

In Africa, China International Water & Electric Corp., a CTG's subordinate company, participated in the construction of Merowe Hydropower Station (Sudan), Upper Atbara Hydropower Project (Sudan), Lom Pangar Hydropower Station (Cameroon), Isimba Hydropower Station (Uganda), etc. Meanwhile, the company also participated in the construction of Kaleta Hydropower Station and Suapiti Hydropower Station in Guinea through PPP investment. These two hydropower projects have doubled Guinea's gross installed capacity twice in succession from 240 MW in 2015 to 1 GW in 2021, and transformed Guinea from a country short of power to a power export country. With Guinea changing from a water tower in west Africa to an electric tower in west Africa, it can not only provide household electricity for more than 10 million Guinean people, but also provide stable and clean power for the development of Guinea's industry and mining, promote the economic development and economic integration in Africa, and enable more Africans to have clean, economical and stable power supply.

## Setting an Example of Green and Low Carbon Development

"Green and low carbon" is the inherent gene of CTG. CTG actively responds to the goals of carbon dioxide peaking and carbon neutrality, and works hard to achieve the goal of carbon neutrality in 2040. We implement our two-tracked approach for advancing clean energy development and the Yangtze River conservation, and spare no efforts to establish four corridors, namely, the largest clean energy corridor along the Yangtze River, the largest green ecology corridor along the Yangtze River, the largest offshore wind power corridor, and the international clean energy corridor of the Belt and Road Initiative, so as to contribute to the establishment of a low-carbon future for mankind.

### Timeline of CTG's carbon neutrality goal

CTG strives to be among the first to achieve the goal of carbon peaking in 2023, and carbon neutrality in 2040, which is 20 years earlier than the 2060 carbon neutrality as proposed by the State.

- **2021–2023** CTG will make a reasonable strategic layout for emerging businesses, actively cultivate core abilities, and strive to achieve the goal of carbon peaking around 2023.
- **2023–2030** CTG will, in an orderly manner, carry out the work relating to carbon emission reduction, carbon absorption, and value-added services, continuously strengthen pollution and carbon emission reduction, and make preparations for carbon neutrality.
- **2030–2040** CTG will spearhead advocacy and action on carbon emission reduction, carbon absorption, and value-added services, and achieve the carbon neutrality goal in 2040 in an all-around way.
- **2040–2060** CTG will maintain the steady state of carbon neutrality, and continue making greater contributions to the national carbon neutrality goal.



### CTG Brasil has achieved 100% carbon neutrality for two consecutive years

According to the carbon emission inventory, CTG Brasil's direct carbon emissions, and indirect carbon emissions relating to power consumption amounted to 1,332.84 tons in 2020. In cooperation with EDP Brasil, an offset of 1,332.84 tons of CO<sub>2</sub> was achieved via the Jari Amapá REDD plus Project. It was the second year for CTG Brasil to achieve 100% carbon neutrality in succession since 2019.



# 03

## Clean Production

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In the process of establishing a clean, low-carbon, safe and efficient energy system, CTG has incorporated the clean production philosophy into the whole process of business operation, and made every effort to protect the clean nature.

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## Reducing Wastewater Contamination

In strict observance of the "Three Simultaneities" environmental protection system, CTG has made great effort to improve the project sewage treatment facilities, innovate sewage treatment technologies, and strengthen the recycling of polluted water and wastewater to minimize the sewage discharge.

- **Sewage from office areas and living quarters:** Sewage is discharged up to standard after being treated by the integrated domestic sewage processing equipment and septic tanks.
- **Industrial wastewater from project construction and the construction department:** Industrial wastewater from sandstone processing system and concrete mixing system areas is subject to treatment in settlement reservoirs. Industrial wastewater from the construction department is discharged up to standard after being precipitated in settlement reservoirs built near the exit of the construction site.
- **Wastewater from processing plant areas and repair shop areas:** Complete discharge and precipitation facilities should be installed.

## Addressing Air Pollution

CTG strictly implements air pollution prevention and control measures, and ensures the proper collection and treatment of fugitive emissions of exhaust gas. It also reduces dust through road sprinkling, and set sprinkler systems to continuously control and reduce air pollutants such as wind-borne dust under construction, flue gas. In addition, it strengthens online data monitoring of flue gas to ensure the up-to-standard emission of flue gas and reduce air pollutants.

Since the construction of Baihetan Hydropower Station was started in 2017, it has maintained steady ambient air quality all the time, and

**100%** met standards for atmosphere quality.



## Preventing and Controlling Noise Pollution

CTG enhances the whole-process management of acoustic environments, and strengthens the operation and maintenance management of heat rejection and noise reduction equipment in unit operation to evade the risk of out-of-standard noise. By installing noise reduction facilities, keeping an effective distance from sensitive objectives, and setting green belts, it can keep the noise controlled within the specified range. Besides, it adopts the low noise construction machinery or that with noise elimination and reduction equipment, and monitor noise at the construction site to minimize impacts of noise on the surrounding environment.

## Cleaning Floating Debris

CTG actively cleans floating debris near hydraulic complexes and dams to prevent adverse impacts of floating debris on the operation of hydropower stations, navigation locks and ship lifts. It also explores the intelligent and systematic methods for cleaning floating debris to ensure water quality in front of the dam.

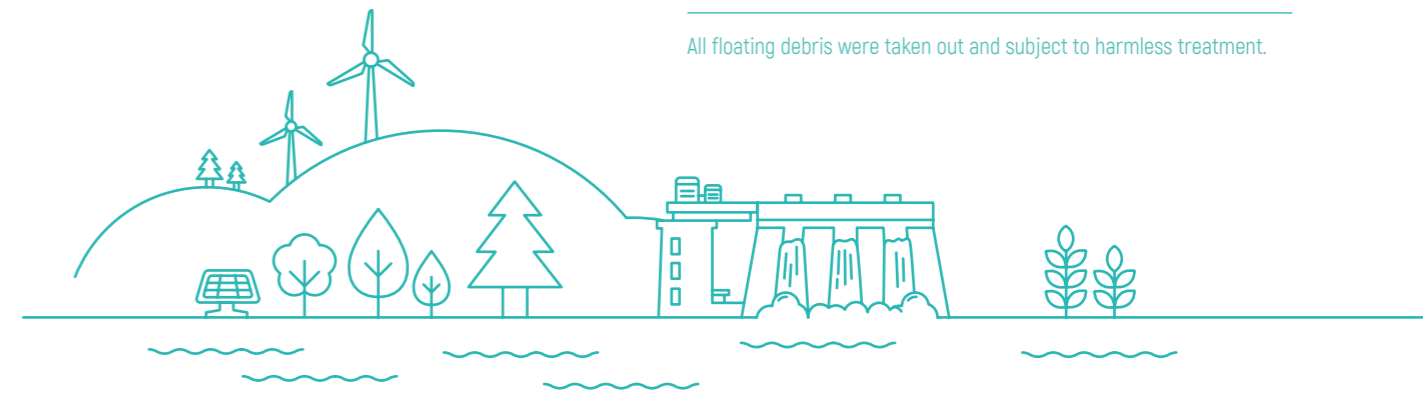
In 2021, we cleaned floating debris

Within **136,000** m<sup>3</sup>  
from upstream face of the Three Gorges Dam

Within about **2,200** m<sup>3</sup> near Xiangjiaba dam

Within about **1,200** m<sup>3</sup> near Xiluodu dam

All floating debris were taken out and subject to harmless treatment.



Floating debris cleaning robot



# 04

## Resource Conservation and Recycling

CTG actively practices the philosophy of circular economy, constantly optimizes lean production, and innovates energy-saving technologies to maximize the resource use efficiency.

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## Conservation of Water Resources

CTG gives full play to the strength of large-scale cascade hydropower stations, ensures integrated operation of cascade reservoirs in a scientific way, and makes efficient use of hydropower resources of the Yangtze River. It continues improving the water/rainfall regimen monitoring system and hydrological forecast system in the upper reaches of the Yangtze River. Besides, it impounds water from autumn floods for energy storage to ensure efficient use of hydropower resources.

### Giving full play to the value of hydropower as clean energy

Against the background of insufficient inflow from the Yangtze River and the large storage capacity of the newly built reservoir in the upstream, CYPG ensures integrated operation of cascade reservoirs in a scientific way as well as rational operation and maintenance of generating units and equipment, so that the hydropower stations that have been put into operation can generate more power as required. Having given full play to the role as a stabilizer and anchor of energy supply, it has maximized the value of hydropower as clean energy. In 2021, four cascade hydropower stations increased power generation by 9.214 TWh through water conservation, with an annual surplus water rate of only 0.016%, the lowest in history.



In 2021, four cascade hydropower stations increased the power generation by

**9.22** TWh through water conservation

Equivalent to saving standard coal by

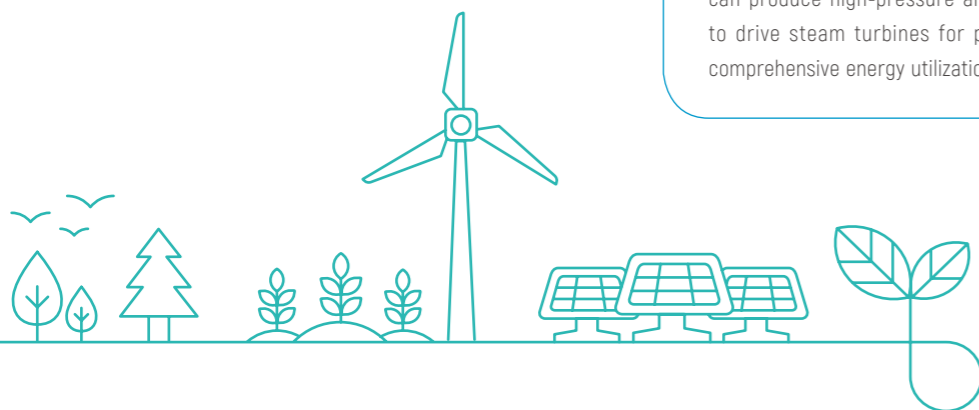
**2,809,300** tons

Reducing carbon dioxide emissions by

**7,666,000** tons

## Recycling and Reuse

CTG has been engaged in recycling and reuse of major resources, works hard to improve the resource utilization rate, and constantly increases circular utilization of waste. It popularizes distributed photovoltaic power projects and co-processing of multi-source solid waste in the cities along the Yangtze River to improve the reuse of resources and recycling efficiency of wastes.



### Donghu Combustion Engine Co., Ltd. recycles exhausted air from gas turbines

Donghu Combustion Engine Co., Ltd., which is subordinate to Hubei Energy Group Co., Ltd, adopts the PG9171E gas-steam combined cycle cogeneration unit of General Electric to introduce exhausted air from gas turbines into waste heat boilers for recycling and reuse. The boilers can produce high-pressure and high-temperature steam to drive steam turbines for power generation, with the comprehensive energy utilization efficiency exceeding 60%.

## Conservation of Energy

In 2021, CTG, with benchmarking management, gave priority to energy-saving technologies and technical measures to continually improve its energy efficiency. As a result, its standard coal consumption for thermal power supply steadily declined, and its discharge of major pollutants was also greatly reduced. CTG's capacity of flue gas desulfurization and denitration units accounted for 100% of that of coal-burning units. Its flue gas emission from per unit power generation was significantly reduced, which was better than the average level among counterparts.



Xinjiang Chuxing fuel electric plant steam

### Construction of the first project of power generation from waste-to-energy incineration commences

In 2021, the Group's first solid waste treatment project, Yichang power generation project from incineration of domestic garbage, formally started construction. After the project is completed, the total garbage treatment capacity will be 2,250 tons/day. The electric energy generated by the project using waste heat from garbage incineration not only can meet the self-demand, but also can be supplied to the local power grid by about 171 GWh each year, equivalent to saving 69,080 tons of standard coal each year. This means that the project will make great contribution to the power supply, energy conservation and emission reduction.



The total garbage treatment capacity will be

**2,250** tons/day

Can be supplied to the local power grid by about

**171** GWh each year



Equivalent to saving

**69,080** tons of

standard coal each year

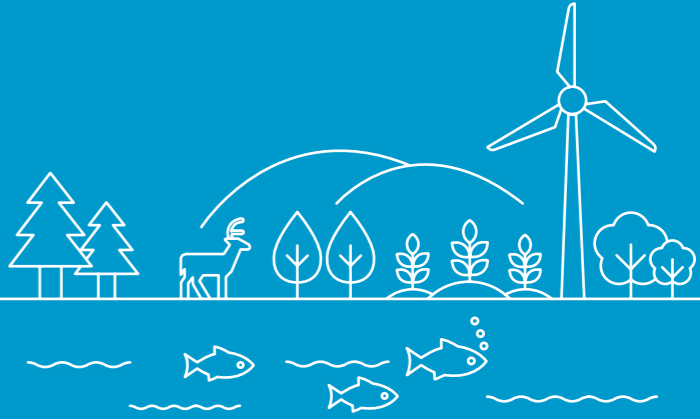


# 05

## Ecological Protection

CTG lays stress on biodiversity conservation. We have delineated ecological restoration areas, taken multiple measures to protect terrestrial and aquatic animals and plants, and provided a CTG plan for biodiversity conservation along the Yangtze River. CTG's *Yangtze River Protection: An important pillar to biodiversity protection* has been included in *China's Progress Report on Implementation of the 2030 Agenda for Sustainable Development* (2021).

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## Species Protection

In October 2021, the 15<sup>th</sup> Meeting of the Conference of the Parties to the *Convention on Biological Diversity* (COP15) was inaugurated in Kunming, Yunnan Province. New progress has been made in global biodiversity governance. CTG has for years insisted on conservation of terrestrial and aquatic biodiversity in the Yangtze River basin, and actively carried out combined ecological dispatch test of the cascade reservoir system on the mainstream of the Yangtze River to protect biodiversity of the Yangtze River. It has preserved and researched various germplasm resources, and continuously improved the full life cycle species protection system. In 2021, CTG's Chinese sturgeon protection expert was included in the expert panel for biodiversity conservation of International Chamber of Commerce as the only expert recommended by China Chamber of International Commerce.

*"Ecological civilization represents the development trend of human civilization. Let us join hands, follow the philosophy of ecological civilization and shoulder our responsibility for future generations. Let us make joint efforts to build a community of all life on Earth, and a clean and beautiful world for us all!"*

—Chinese President Xi Jinping's keynote speech at the Leaders' Summit of the 15<sup>th</sup> Meeting of the Conference of the Parties to the *Convention on Biological Diversity*

In 2021

We released

**10,000** Chinese sturgeons of various ages in total

We released

**50,000** Yangtze sturgeons with a size over 30 cm

We protected

**1,200** rare plants via off-site conservation in the whole year

We cultivated

**30,000** rare plant seedlings in total

### Cherishing rare plants

For a long term, CTG has insisted on the protection and research of terrestrial plants in the Three Gorges Reservoir Area, mostly rare plants and national key protected wild plants. Through years of effort, the protected plants have expanded from the original 560 species to 1,181 species. In 2021, CTG continued establishing Three Branches, Multiple Areas, and One Base to further protect extremely small wild populations having difficulties in surviving in the wild and plant resources affected by engineering construction.

### Conducting the ecological dispatch test for natural propagation of four major Chinese carps for 11 consecutive years

Since 2011, CTG has carried out the ecological dispatch test and monitoring to promote natural propagation of four major Chinese carps in the Three Gorges Reservoir for 11 consecutive years, and therefore gradually formed the Three Gorges Model for ecological dispatch. The monitoring results in previous years show that ecological dispatch has played a positive role in promoting the propagation of four major Chinese carps. During the ecological dispatch in 2021, more than 300 million viscid eggs were produced in the Three Gorges Reservoir Area, and more than 8.4 billion eggs of four major Chinese carps were produced in the downstream of Gezhouba Dam. The ecological dispatch of Three Gorges Project was included in *Listen to the River* of World Wildlife Fund (WWF) as a successful case, and was published at the 20<sup>th</sup> International River Symposium.



Dove trees in the Three Gorges Dam Area

### Artificially cultivated dove trees, Giant Panda in the Plant Kingdom, bloom and bear fruits for the first time in the Three Gorges Dam Area

Dove trees are national first-class protected wild plant unique to China. They are endangered because of their strict requirements for growth conditions and a long period of dormancy, so they are described as the Giant Panda in the Plant Kingdom. In 2007, Yangtze River Rare Plant Research Institute of CTG transferred 10 dove trees under protection to the Three Gorges Reservoir Area. The institute promoted the germination and sprouting of the dove trees through strict simulation of their original habitat and manual intervention, and a scientific and effective fine management plan was in form. In March 2021, more than 20,000 artificially cultivated dove trees bloomed and bore fruits for the first time in the Three Gorges Dam Area, proving success of the dove tree off-site conservation technology.





## Ecological Restoration

CTG attaches high priority to ecological protection and restoration. Following the philosophy of prioritizing the natural ecosystem and green development, we continued with the ecological restoration projects in Wudongde Hydropower Station and Baihetan Hydropower Station, and have built the demonstration drawdown zone for ecological restoration in the Three Gorges Reservoir Area to promote the ecological environment restoration in the Yangtze River basin.

CTG attaches high priority to ecological protection and restoration. We actively follow the philosophy of prioritizing the natural ecosystem and green development, make a coordinated effort to carry out ecological restoration in the hydraulic complex and reservoir areas through scientific designs, and work tirelessly for building a beautiful Wudongde, Baihetan, and Jinsha River.

### Making green mountains and rivers a prominent feature of Wudongde and Baihetan

By growing more plants on hard grounds and in narrow places for ecological greening in Wudongde and Baihetan hydraulic complex areas, CTG keeps working on green engineering and attaches high priority to the protection of animal and plant resources. It promotes effective ecological restoration through phenological observations and transplantation of old trees. Meanwhile, it chooses 28 drought-resistant and flood-resistant amphibious plants such as pond cypress and *Xanthium strumarium* and lined out a 43.69-hectare drawdown zone in Wudongde and Baihetan reservoir areas for restoration experiments. Now, in the experiment zone, plants are growing well. Restoration experiments can effectively promote vegetation recovery in the reservoir area, and play an important role in solving the worldwide problem of ecological restoration in drawdown zones in dry-hot valleys.



Experimental belt for ecological restoration in Baihetan drawdown zone

By building ecological facilities and carrying out ecological restoration with measures including mountain protection, water management, forest planting, field dredging, lake cleaning, grass growing, and ecological restoration in drawdown zones, CTG has made Guangyang Island a scenery spot in the Yangtze River and an ecological island in Chongqing.



Chongqing Guangyang Island

### Building a scenery spot in the Yangtze River and an ecological island in Chongqing

Guangyang Island project is one of the major projects in CTG's moves for well-coordinated environmental conservation of the Yangtze River. The Group and Chongqing Municipal People's Government worked together to promote ecological restoration on Guangyang Island. Following the rules of the ecosystem, CTG carried out a coordinated effort to strengthen ecological restoration and management along the Yangtze River, on its banks, in the mountainous areas, wetlands, and drawdown zones by means of mountain protection, water management, forest planting, field dredging, lake cleaning, grass growing, and ecological restoration in drawdown zones. A life community of mountains, waters, forests, fields, lakes, and grass has been established. Now, this place has become a beautiful place with clean rivers and luxuriant forest, with various birds such as wild ducks and egrets attracted to inhabit here. The island has become a vacation-land attracting numerous citizens.

CTG has implemented Phase I of the Comprehensive Treatment Project for Tangxun Lake Basin in Wuhan. Through the sewage interception engineering at drain outlets of lakes, and establishment of an ecosystem, CTG has purified a wetland area of 137 hectares, and planted vegetation of 21 hectares along the lakeshore. The lake now boasts about clear water, beautiful lakeshore covered with green plants, and ecological effects and landscape benefits are gradually emerging.



Wuhan Tangxun Lake

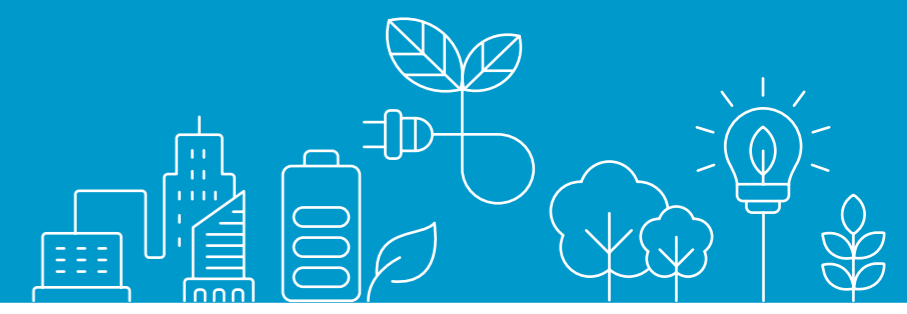


# 06

## Publicity and Implementation of Environmental Protection Concepts

While developing and growing, CTG also insists on the philosophy of prioritizing the natural ecosystem and green development. It strengthens internal and external publicity and implementation to spread the philosophy of environmental protection, and shares experience regarding environmental protection with stakeholders to raise the public's environmental awareness.

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## Environmental Protection Training

CTG actively organizes and launches diversified training and education activities on environmental protection, with an aim to raise all its employees' sense of responsibility to promote ecological progress, and continuously improve its influence in environmental protection through capacity building.



Training on environmental protection organized in San Gabán III Hydropower Station (Peru)

## Public Benefits of Environmental Protection

CTG actively carries out public benefit activities in terms of environmental protection, and spreads the philosophy of ecological progress featuring growing, cherishing and protecting plants to the society with concrete actions.

### Launching water conservation themed publicity and education activities

In 2021, Hubei Regional Company of Yangtze Ecology and Environment Co., Ltd. organized water conservation themed classes in Siweilu Primary School in Wuhan, with an aim to raise the awareness on environmental philosophy of saving and cherishing water to children, encourage the public to cherish water resources, and create a good atmosphere in which all the people love, protect and save water.



Tree planting activities on Buerjin Wind Farm



Tree planting activity of young volunteers

### Organizing volunteer tree planting activities to add more green to Three Gorges

On March 12, 2021, the Group launched the themed activity of "CTG youths in action for environmental conservation of the Yangtze River" in the Three Gorges Dam Area. Over 60 young volunteers planted trees. Specifically, they planted more than 100 rare plants, including *Taxus chinensis* and dove trees under national first-class protection cultivated by Yangtze River Rare Plant Research Institute. They have spread the philosophy of ecological progress featuring growing, cherishing and protecting plants with concrete actions, and added more green to the Three Gorges.



Scan the QR code to watch the video: CTG youths plant an exuberant forest

## Publicity of Environmental Protection Concepts

Being an exponent of green and low carbon development, CTG actively organizes environmental protection events on the World Environment Day and World Water Day, and in China Water Week, and Energy Conservation and Emission Reduction Week, integrating the low-carbon philosophy into the work and life of employees.

### Organizing publicity campaign of World Water Day

March 22, 2021 is the 29<sup>th</sup> World Water Day, and March 22-28 is the 34<sup>th</sup> China Water Week. CTG conducted a series of activities to publicize the World Water Day and China Water Week, spread the philosophy of saving and cherishing water among community citizens and students, and made contribution to the intensive and safe use of water resources.



World Water Day activities in communities



# 07

## Environmental Protection Monitoring

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Focusing on "promoting green development, making targeted breakthroughs, improving systems and standardizing management", CTG fully implements the green development philosophy, and has made notable progresses in the protection of water environment and water ecology with comprehensive and whole-process environmental protection actions.

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Ecological Protection Performance	56



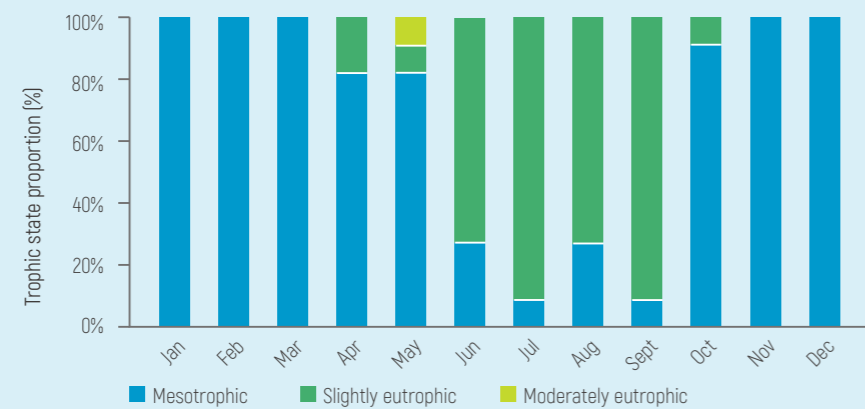
# Environmental Monitoring

## Water Environment Monitoring

### Water Quality and Environment Conditions in the Three Gorges Reservoir Area

From January to December 2021, water quality of the mainstream in the Three Gorges Reservoir Area was generally graded as Good. Water quality in all monitored sections was mostly Level II, accounting for 78.7 percent. In 2021, water quality of the mainstream section of the Yangtze River near the dam was graded as Good. Water quality of 5 monitored sections (sampling points) was 100 percent in compliance with or better than grade III water, and 96.3 percent reached grade II.

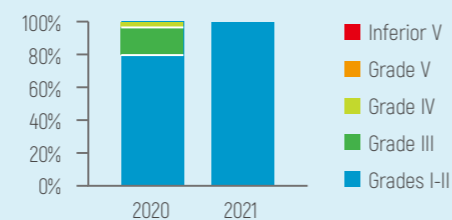
Proportional distribution histogram of water trophic status of key tributaries in the Three Gorges Reservoir Area in 2021



### Water Quality State in the Reservoir Area of the Jinsha River

In 2021, among the 22 monitored sections of the mainstream in the reservoir area of Jinsha River, the sections with grades I-III water quality accounted for 100 percent, which was the same as that in the previous year. Among the 16 monitored sections of its tributary, the sections with grades I-III water quality accounted for 100 percent, which was better than that in the previous year.

Comparison between the mainstream water quality in the Jinsha River reservoir area and that in the previous year



## Aquatic Ecosystem Monitoring

### Rare and Endemic Fish

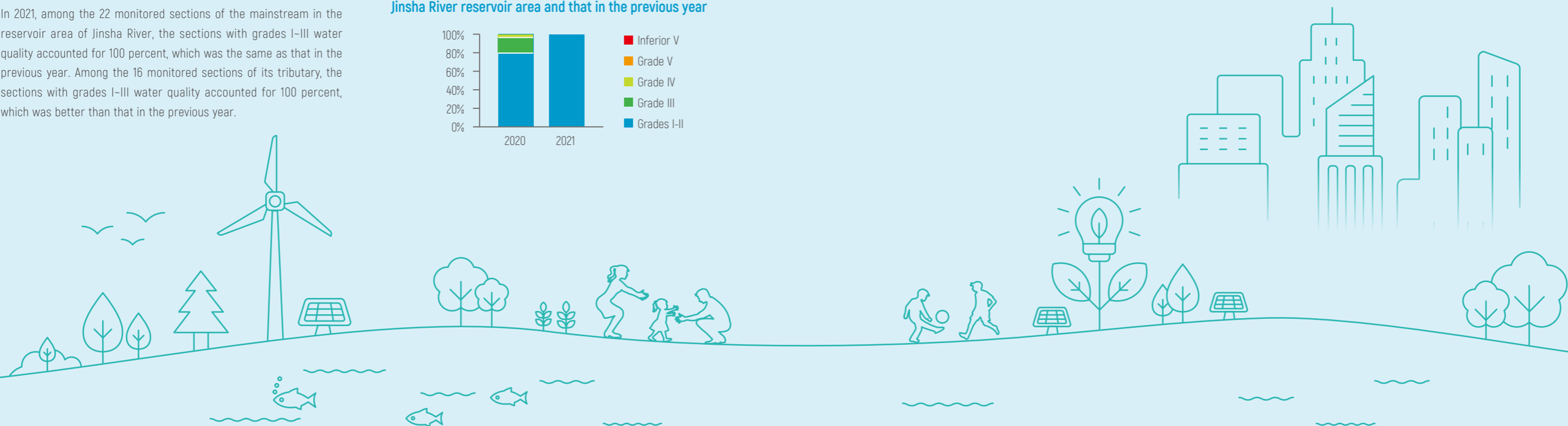
In 2021, stations in the lower reaches of the Jinsha River monitored 108 fishes of 2 rare fish species and 1,482 endemic fishes of 22 fish species in the upper reaches of the Yangtze River. Among 20 monitored river sections, fishes endemic in the upper reaches of the Yangtze River were monitored in 17 sections, and were not found in river sections of Jiaopingdu, Fotan Village and Suijiang. The Yalung River and Pudu River estuaries had the most endemic fish species, which reached 9.

### Important Commercial Fishes

In 2021, 106 fish species were monitored in the lower reaches of the Jinsha River, and 78 fish species were monitored in the conservation area. Major fish catches in the whole river section included 17 species, including carp, *Coreius guichenoti*, *Schizothorax prenati*, *Pelteobagrus vachelli*, golden carp, grass carp, bighead carp, *Rhinogobio cylindricus*, *Rhinogobio typus*, silver carp, *H. leucisculus*, *Culter alburnus*, catfish, *Spinibarbus sinensis*, *Acipenser dabryanus*, *Coreius heterodon*, and *Percocypris pingi*.

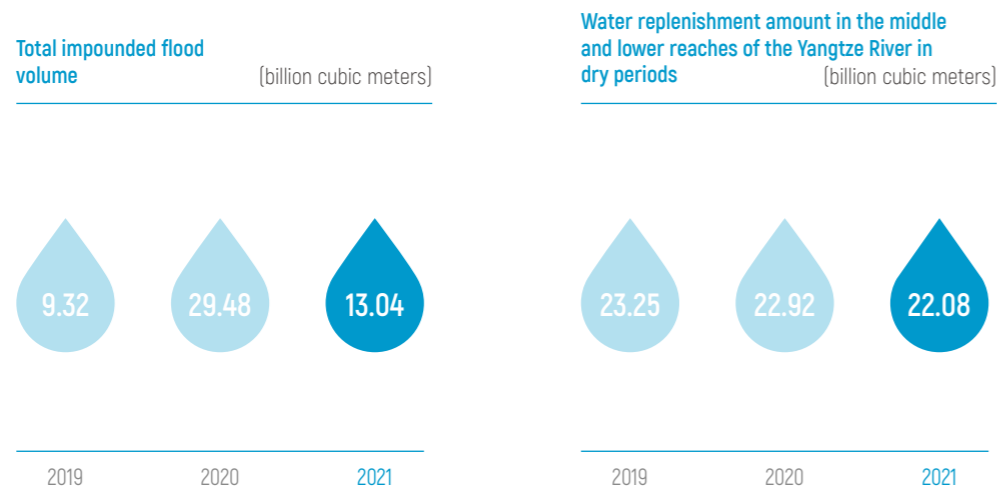
### Water Temperature

From March to April, 2021, the discharged water temperature during the multi-level intake experiment period of Xiluodu HPP was raised by about 0.1°C.



# Ecological Protection Performance

## Flood Control and Water Replenishment\*



Data with \* mark indicate the statistical data of Three Gorges Reservoir.

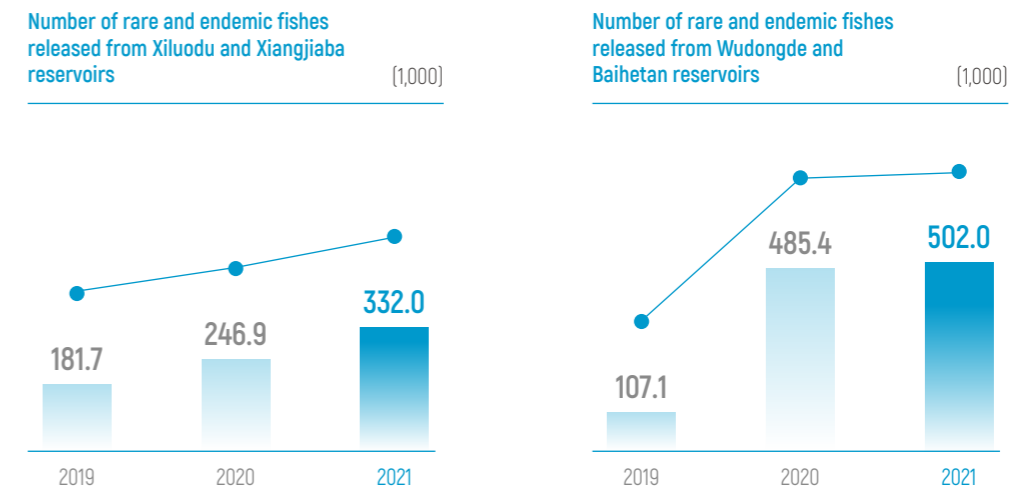
## Water and Soil Conservation

	Soil Erosion Improvement (%)	Soil Erosion Control Ratio (%)	Vegetation Restoration (%)	Vegetation Coverage (%)	Floating Debris Clearance (%)	Topsoil Conservation (%)
Wudongde Hydropower Project	90.14	1.01	59.79	18.37	97.16	93.40
Baihetan Hydropower Project	79.72	1.02	73.18	23.18	99.45	87.04



## Propagation and Release

In the year of 2021, 834,000 of rare and endemic fish species were released from propagation and release stations at the Xiluodu, Xiangjiaba, Baihetan and Wudongde reservoirs.



### Number of rare and endemic fishes released at rare and endemic fish proliferation and release stations of Xiluodu Hydropower Station and Xiangjiaba Hydropower Station on the Jinsha River

Species	Number of fish released in 2021	Total number of fish released
Acipenser dabryanus	50,010	136,575
Myxocyprinus asiaticus	30,872	244,244
Procypris rabaudi	97,888	824,117
Megalobrama pellegrini	118,858	973,633
Leptobotia elongata	10,560	88,082
Onychostoma sima	0	10,770
Spinibarbus sinensis	0	25,610
Coreius guichenoti	23,775	28,043
Rhinogobio ventralis	0	10,787
Total	331,963	2,341,861

### Number of rare and endemic fish released at rare and endemic fish proliferation and release stations of Baihetan Hydropower Station and Wudongde Hydropower Station on the Jinsha River

Species	Number of fish released in 2021	Total number of fish released
Schizothorax prenati	210,300	759,132
Percocypris pingi	291,261	516,545
Rhinogobio ventralis	230	230
Coreius guichenoti	200	200
Leptobotia elongata	230	6,730
Onychostoma sima	0	7,150
Total	502,221	1,289,987

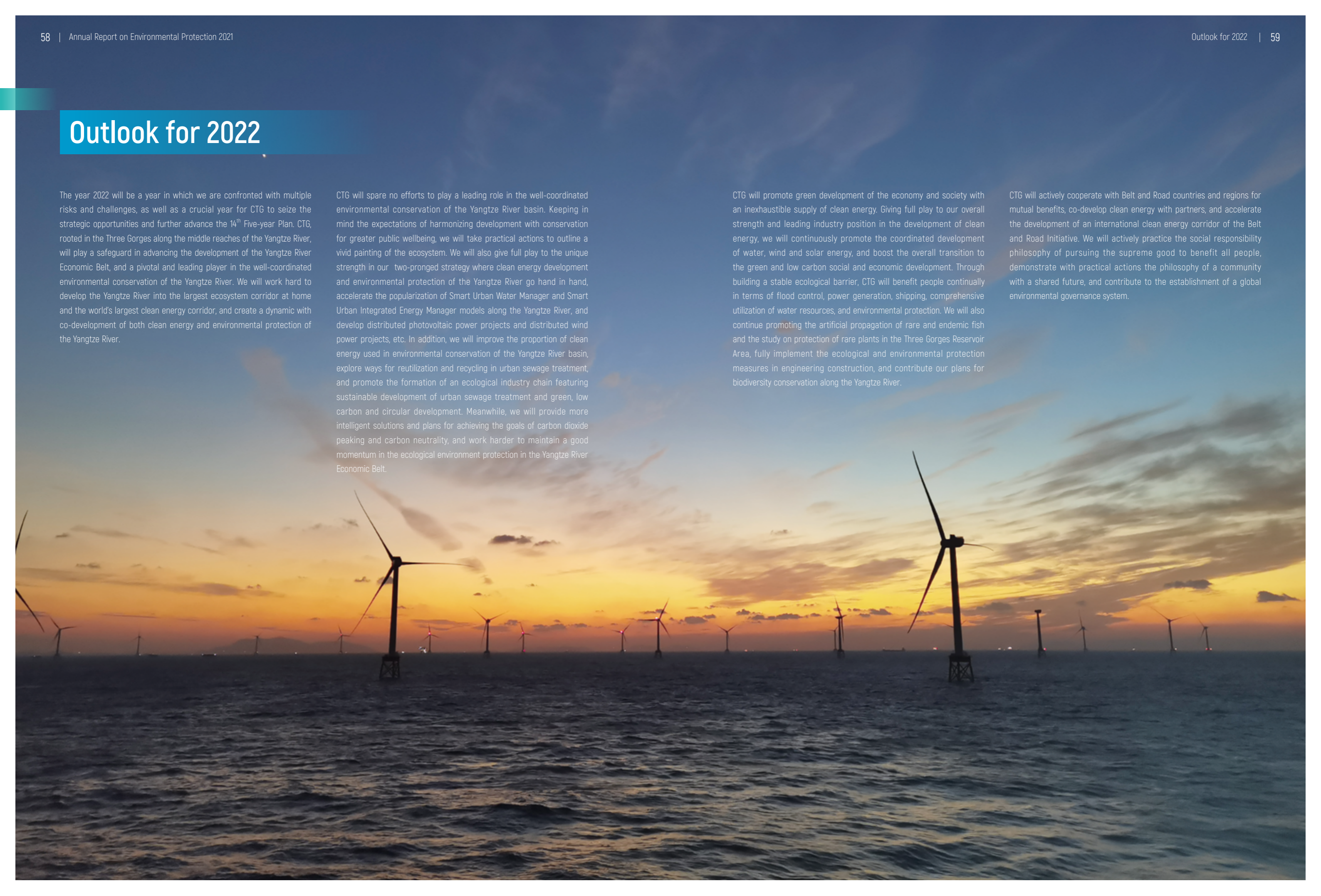
## Outlook for 2022

The year 2022 will be a year in which we are confronted with multiple risks and challenges, as well as a crucial year for CTG to seize the strategic opportunities and further advance the 14<sup>th</sup> Five-year Plan. CTG, rooted in the Three Gorges along the middle reaches of the Yangtze River, will play a safeguard in advancing the development of the Yangtze River Economic Belt, and a pivotal and leading player in the well-coordinated environmental conservation of the Yangtze River. We will work hard to develop the Yangtze River into the largest ecosystem corridor at home and the world's largest clean energy corridor, and create a dynamic with co-development of both clean energy and environmental protection of the Yangtze River.

CTG will spare no efforts to play a leading role in the well-coordinated environmental conservation of the Yangtze River basin. Keeping in mind the expectations of harmonizing development with conservation for greater public wellbeing, we will take practical actions to outline a vivid painting of the ecosystem. We will also give full play to the unique strength in our two-pronged strategy where clean energy development and environmental protection of the Yangtze River go hand in hand, accelerate the popularization of Smart Urban Water Manager and Smart Urban Integrated Energy Manager models along the Yangtze River, and develop distributed photovoltaic power projects and distributed wind power projects, etc. In addition, we will improve the proportion of clean energy used in environmental conservation of the Yangtze River basin, explore ways for reutilization and recycling in urban sewage treatment, and promote the formation of an ecological industry chain featuring sustainable development of urban sewage treatment and green, low carbon and circular development. Meanwhile, we will provide more intelligent solutions and plans for achieving the goals of carbon dioxide peaking and carbon neutrality, and work harder to maintain a good momentum in the ecological environment protection in the Yangtze River Economic Belt.

CTG will promote green development of the economy and society with an inexhaustible supply of clean energy. Giving full play to our overall strength and leading industry position in the development of clean energy, we will continuously promote the coordinated development of water, wind and solar energy, and boost the overall transition to the green and low carbon social and economic development. Through building a stable ecological barrier, CTG will benefit people continually in terms of flood control, power generation, shipping, comprehensive utilization of water resources, and environmental protection. We will also continue promoting the artificial propagation of rare and endemic fish and the study on protection of rare plants in the Three Gorges Reservoir Area, fully implement the ecological and environmental protection measures in engineering construction, and contribute our plans for biodiversity conservation along the Yangtze River.

CTG will actively cooperate with Belt and Road countries and regions for mutual benefits, co-develop clean energy with partners, and accelerate the development of an international clean energy corridor of the Belt and Road Initiative. We will actively practice the social responsibility philosophy of pursuing the supreme good to benefit all people, demonstrate with practical actions the philosophy of a community with a shared future, and contribute to the establishment of a global environmental governance system.



## Expert Comments

This is the 17<sup>th</sup> annual report on environmental protection released by CTG. The report presents the prominent practice and performance of CTG in environmental protection systematically and comprehensively, and fully demonstrates CTG's outstanding contributions and exemplary & leading roles in promoting sustainable development of the economy and society. This report, as a high-quality annual report on environmental protection, has the following characteristics:

**The report remains closely aligned with the hot issues in the era, and embodies the overarching thoughts on green development.** Focusing on the hot issues in this era such as well-coordinated environmental conservation of the Yangtze River basin, the goal of carbon peaking before 2030 and carbon neutrality before 2060, and biodiversity conservation, the report has fully disclosed CTG's efforts and actions in promoting the all-around and green transformation of the economy and society in 11 provinces and cities in the Yangtze River Economic Belt, which demonstrates the strong sense of responsibility of CTG, as a supplier of clean energy, for promoting green development of China.

**The report is equipped with rich and diversified contents which demonstrate CTG's great contributions to sustainable development.** The report covers the environmental protection issues highly concerned by stakeholders such as green and low carbon development, clean production, conservation & recycling, and ecological protection. With diversified data, typical cases, and representative pictures, it has vividly and comprehensively demonstrated CTG's practice and performance in environmental protection as well as its contributions to green development of the economy and society, and highlighted its leadership and actions in green development.

**The report features precise and extraordinary data which show CTG's excellent management ability for sustainable development.** Cases in the report cover CTG's domestic and overseas businesses, involving more business types and subsidiaries, which fully demonstrates its environmental philosophies of entire Yangtze River basin and full life cycle. In addition, all its data in 2021 show better performance than those in previous years, which has reflected the solid foundation and progress of CTG in sustainable development.

In the new development stage, CTG is expected to make steady and sustained progress in becoming a world first class multinational clean energy group, and greater contributions together with stakeholders to the low-carbon and sustainable development of China and the world.

After reading the *Annual Report on Environmental Protection 2021 of China Three Gorges Corporation*, I had a clearer understanding of the beautiful visions, insistent efforts and strong determination of CTG to make good use of the power of nature to produce clean energy, and promote harmonious co-existence of human and nature.

**Serving the national strategy, and promoting high-quality development.** Staying true to the original aspiration of serving the nation and benefiting the people, CTG has kept the way for prioritizing the natural ecosystem and green development, and continuously improved its ability for supplying clean energy and high quality ecological products. We stick to the philosophy of "well-coordinated environmental conservation of the Yangtze River without over development", and promote the models of Smart Urban Water Manager and Smart Urban Integrated Energy Manager. Notable progress has been made by CTG in the environmental protection along the Yangtze River basin, which provides a powerful guarantee for China to achieve the goals of carbon dioxide peaking and carbon neutrality.

**Improving environmental governance, and forging a powerful defense for green ecology.** CTG continuously consolidates its environmental management system and improves its environmental governance, and therefore has established a whole-process environmental management system for all businesses in the entire Yangtze River basin. As an implementer of the full life cycle environmental management, we have realized closed-loop management of environmental management performance from setting of environmental objectives to establishment of an environmental management system, implementation of environmental protection measures, and continuous improvement of environmental performance. These embody CTG's efforts to strengthen environmental management through practical, hard and specific work, and its contributions to ecological restoration and environmental protection in the Yangtze River Economic Belt.

**Continuing the gene for environmental protection, and empowering a greener world.** With the framework of previous reports adopted, this report discloses the specific practices and achievements of CTG in empowering a greener world for the people in 2021 in detail from the aspects of green and low carbon development, clean production, conservation & recycling, ecological protection, and publicity & implementation of philosophies. The report design also continues with the blue pattern in previous years, with a simple, precise format, and elegant, neat colors harmonious with the text, which has greatly improved the overall quality of the report.

In the future, it is hoped that CTG will continue to make steady progress with the two-tracked approach where clean energy development and environmental conservation of the Yangtze River go hand in hand, to build a world first class clean energy group and a leading ecological conservation enterprise in China, and to make greater contributions to the global environmental governance.

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### Xue Dayuan

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## Indexes for Corporate Environmental Report (HJ 617-2011)

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1.1	Speech by CEO or other senior executives	✓		P4-P5
<b>2. Company overview and compilation notes</b>				
<b>Company overview</b>				
2.1	Company name, headquarters address, time of founding	✓		P6-P7
2.2	Total assets, sales revenue and employees	✓		
2.3	Industry, main products or services		✓	P6-P7
2.4	Management philosophy and culture		✓	P6-P7
2.5	Management framework and related policies		✓	P20
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2.7	Major changes in corporate scale or structure	✓		P20
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2.9	Time frame of the report	✓		P1
2.10	Measures and commitments to ensure and improve the accuracy and reliability of the Corporate Environment Report	✓		P1
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Post-completion project information	Measures for environmental protection proposed in construction projects' environmental impact assessment and their implementation	
	The monitoring and survey result for the final acceptance for environmental protection	P54-P57
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## Readers' Feedback

In order to improve CTG's environmental protection work and enhance the corporation's capacity and standard in green development, your comments and suggestions would be greatly appreciated. We thank you for your time and valuable input.

1. How would you evaluate the Annual Report on Environmental Protection of CTG in general?

Great  Good  Average

2. How well do you think CTG has been doing in proactively serving government and customers?

Great  Good  Average  Bad  I don't know

3. How well do you think CTG has been doing in protecting the environment and promoting sustainable development?

Great  Good  Average  Bad  I don't know

4. How well do you think CTG has been doing in communicating with stakeholders?

Great  Good  Average  Bad  I don't know

5. Do you think that the Report is able to reflect the major environmental influences CTG has had?

Yes  Maybe  No

6. What do you think of the clarity, accuracy and completeness of the data and indices disclosed by the Report?

Very High  High  Average  Low  Very Low

7. How the layout of the Report help your reading?

Greatly  Okay  Badly

8. You are welcome to give your opinions and suggestions about environmental protection work of CTG and the Report here:

Note: Please tick [\*√\*] the corresponding circles [\*○\*] and mail this page to the following address:

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No. 1 Liuhe Road, Jiang'an District, Wuhan City, Hubei Province, P.R.China. Zip code: 430014

You can also send your feedback to [hu\\_jin3@ctg.com.cn](mailto:hu_jin3@ctg.com.cn), or visit the official website of CTG at <http://www.ctg.com.cn/hjnbdc/index.php>.



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