

Reviving Erhai Lake: A Socialist Approach to Balancing Human and Ecological Development

On a clear morning in June 2023, we arrived in the city of Dali, located in China's southwestern province of Yunnan.¹ We travelled to the region as part of a research team to learn about the restoration of Erhai Lake, the lifeblood of the region, which had been severely polluted in recent decades. He Licheng, a local resident and farmer from nearby Gusheng Village, received us. Like other elders of the region, He Licheng recalled how, during his childhood in the 1970s and 1980s, the lake's waters were crystal-clear and its surface populated with *Ottelia acuminata*, small three-petal flowers known locally as *haicaihua*. This edible aquatic plant species is unique to southern China, renowned for its beauty, and also used by the Bai people, a local minority ethnic group, to make traditional dishes and in Chinese medicine to treat various ailments.² Because the plant is extremely sensitive to pollution, its presence or absence is considered a biological indicator of water quality in the region. Due to a combination of factors in the reform and opening up period – including economic development, population growth, changes in agricultural production, and increased tourism and migration – water quality within the Erhai basin steadily deteriorated, and the *haicaihua* disappeared for many years.

Looking back at the situation a decade ago, in 2013, Erhai Lake was experiencing large-scale outbreaks of blue-green algae, with the surface appearing as if it had been covered with a layer of green paint. The lake emitted a foul odour and, in some areas, the water quality was deemed unsuitable for human contact.³ In addition to these ecological problems, after three decades of China's rapid economic growth, all 11 counties of the Dali Bai Autonomous Prefecture were still mired in poverty. Dali Prefecture, the capital of the ancient Nanzhou and Dali kingdoms, is one of the country's most ethnically diverse areas, with 52.7% of its people belonging to ethnic minority groups, predominantly the Bai people. However, this was one of the last regions in China to see the benefits of economic growth.

By the time we visited in 2022, Dali Prefecture had been fundamentally transformed. As part of the central government's targeted poverty alleviation campaign, launched in 2013 and completed in 2020, all 11 poverty-stricken counties in the prefecture, comprising 34 townships and 541 villages, were lifted out of extreme poverty.⁴ In total, 413,100 people from Dali Prefecture exited extreme poverty in this campaign, part of the 98.99 million people to do so across the country. All reached the 'one income, two assurances, and three guarantees' standard of living, meaning that (i) their income exceeds a minimum level; (ii) they are assured food and clothing; and (iii) they are guaranteed basic medical services, safe housing with drinking water and electricity, and free education. Alongside the poverty alleviation campaign, intensive environmental protection efforts led to a marked improvement in Erhai Lake's water quality, and the *haicaihua* flower began to bloom once again.

Based on our visits to Dali Prefecture, conversations with the local residents, leaders, and scientists, and a review of the existing literature, this article examines the dramatic changes that have taken place in Erhai Lake and Dali Prefecture in recent years. Looking first at the history of the lake and the factors behind its pollution and environmental degradation, the article then explores the initial environmental protection measures taken and the rise in science-based governance. This is followed by an examination of the impact of tourism-led economic growth in recent years, the environmental challenges that this has posed, and efforts to balance development with environmental restoration. The Erhai Lake experience is a concrete example of China's science-based governance, illustrating the practices, challenges, and innovations that have characterised its pursuit of an 'ecological civilisation'.

How the 'Pearl of the Plateau' Became a Polluted Pond

Erhai Lake derives its name from its ear-like shape, although it has many other monikers. For the Bai people, Erhai is known as the 'Mother Lake', while their ancestors referred to it as the 'Golden Moon'. Due to the lake's scenic beauty, it is also called the 'Pearl of the Plateau'. Erhai is the seventh-largest freshwater lake in China, with a total area of over 250 square kilometres.

Erhai plays vital roles in supplying water, agricultural irrigation, power generation, and climate regulation for the surrounding areas. Local people also engage in fishing, shipping, and tourism activities in the lake. In 1981, the Yunnan provincial government established the Cangshan Mountain and Erhai Lake Nature Reserve, which was upgraded to a national nature reserve in 1994. Covering an area of 79,700 hectares, the reserve's main conservation targets are the plateau freshwater lake and its aquatic flora and fauna, the natural landscape of China's north-south transition zone, and glacial relics.

Since China's economic reforms began in the late 1970s and 1980s, the rapid development of China's chemical industry led to a significant increase in the use of fertilisers and pesticides in agriculture in Dali Prefecture. While this boosted agricultural production, it also severely polluted the water quality in the basin. Research by Dr. Chen Xiaohua and others from the Shanghai Academy of Environmental Sciences found that from 1988 to 2013, as socioeconomic development in the Erhai basin improved, water quality in the region deteriorated proportionally.⁵ A 2013 monitoring report by the Yunnan provincial government found that for each of the seven main rivers flowing into Erhai Lake, water quality was rated as being unsuitable for human consumption or contact and, for the Luoshijiang, Yong'anjiang, and Baihexi rivers, unsuitable for any use.⁶ The primary pollutants in these rivers were nitrogen and phosphorus from residual agricultural fertilisers, which flowed into the lake year-round, causing continuous eutrophication.⁷

The economic reforms initiated in 1978 gave farmers greater autonomy in agricultural production, allowing them to grow more profitable crops based on market demand, which greatly stimulated their enthusiasm for production. The gradual liberalisation of the production and sale of vegetables grown in China's southern regions to the northern regions, beginning in 1984, spurred shifts in cultivation in Dali Prefecture. Since the 1990s, farmers in Dali Prefecture's Eryuan County (meaning 'source of Erhai') began to extensively cultivate solo garlic, also known as single bulb garlic, a local specialty crop which originates in Yunnan province and is characterised by its purplish-red skin, sweet flavour, and strong aroma. By 2010, the production area of solo garlic in Dali reached 13,300 hectares, with an annual output of about 144,000 tons. The annual per *mu* (a Chinese unit of land measurement corresponding to 1/15 of a hectare) output value could reach 15,000 yuan,

with a net income of 7,000-8,000 yuan, far higher than the income from growing ordinary grains. However, garlic cultivation requires large amounts of water and fertiliser, up to 175 kilograms of fertiliser per mu, half of which is absorbed by the garlic and the other half remaining in the soil. During the rainy season, the fertiliser and pesticide runoff led to serious excesses of nitrogen and phosphorus in Erhai Lake, resulting in eutrophication and blue-green algae blooms.

Another significant source of pollution was cattle raising, which has a long tradition in the Erhai basin due to the area's favourable climate and geography. The proximity of grazing areas to the lake caused cow excrement to wash into the lake and exacerbate eutrophication. In 2007, it was estimated that 140,000 dairy cows were raised in the Erhai basin, with the environmental load of each cow equivalent to that of 23 people. In other words, the dairy farming industry at that time contributed an environmental load equivalent to that of over three million people, effectively duplicating the environmental footprint of the human population of the entire Dali Prefecture.

Finally, the growth of tourism in the region, while increasing the income of local residents, also negatively impacted Erhai Lake's water quality. In recent decades, Dali Prefecture prioritised the development of tourism as a local pillar industry, with the government introducing policies that allowed foreign capital to lease local houses to build homestays. In 2009, the first batch of developers building homestays for tourists arrived in Dali Prefecture, turning the town of Shuanglang, home to the best scenic views along the Erhai shoreline, into the new trendy place to visit. Shuanglang was quickly transformed from a small fishing village into a nationally renowned 'homestay town'. From 2011 to 2017, the number of homestays in Shuanglang increased tenfold, reaching over 600. Although these homestays provided tens of thousands and, in some cases, hundreds of thousands of yuan in annual income to local residents, they also placed a major strain on the domestic water supply. By 2016, the total pollution load discharged in the Erhai basin had increased by more than 50% compared to 2004, with the growth of tourism-related pollution being the most significant factor in this jump. Furthermore, due to a lack of government investment at the time, the lake's sediment had not been dredged for many years, the water had not been cycled and replaced for a long time, and the pollution load was severe, endangering Erhai's aquatic ecosystem. To address these many factors behind Erhai's pollution, the different levels of government took on various strategies over the past two decades based on science and local realities.

Science-Based Governance and Development

Governmental efforts to protect Erhai began at the end of the twentieth century as environmental problems became apparent, including severe algal blooms in 1996 and 2003. Some areas of focus for these initial measures included the fishing industry, chemical pollution, and land usage. At the end of 1996, to curtail the harmful impact of large-scale fish farming, Dali Prefecture implemented the 'double cancel' policy, prohibiting the use of all motorised fishing boats and nets within the Erhai area as well as limiting the harvesting of aquatic plants; within a year, 11,187 fishing nets and 2,579 motorised boats were prohibited from use in the lake. Local fishing and shipbuilding industries, which had existed for hundreds of years, were severely hit, and the rural economy fell into a slump. In November 1997, Dali Prefecture prohibited the production, sale, and use of phosphorus-containing detergents in the Erhai basin. Subsequently, in 1999, Dali Prefecture initiated the 'three withdrawals and three returns' policy: withdrawing farmland to return the soil to the forest, withdrawing fish ponds to return the water to the lake, and withdrawing houses to return the ground to the wetlands. Despite some successes, however, these initial measures could not keep pace with the

scale of pollution growth in the Erhai basin.

In 2006, Erhai's environmental governance was elevated to China's national agenda as part of the State Council's national 'special project' for water pollution control. Beginning from the eleventh Five-Year Plan (2006–2010) and implemented across 15 years, the special project focused on developing the key technologies necessary for water pollution control. The special project consisted of six main themes, including 'research and demonstration of technology and governance measures to control lake eutrophication', which focused on identifying representative lake water bodies and key catchment areas across the country to conduct pilot projects in pollution control, providing technological and governance case studies in the large-scale management of eutrophication in a variety of contexts. As implementation of the special project progressed, water pollution control evolved from the efforts of individual teams and units to coordinated national-level efforts. The central government provided important support in terms of policies, mechanisms, funding, and personnel, assisting local lake governance to advance towards sustainable short- and long-term solutions.⁸

Erhai Lake served as a key pilot project, managed by a team consisting of 17 units and led by environmental scientist Kong Hainan of Shanghai Jiao Tong University. The special project team prioritised the most significant source of pollution – solo garlic cultivation. Experts from the Chinese Academy of Agricultural Sciences recommended banning garlic cultivation within 200 metres of the Erhai Lake shoreline, restricting such activities to areas between 200 and 2000 metres from the shoreline, and planting other crops that use less water and fertiliser throughout the Erhai basin. Dali Prefecture called on farmers to stop growing garlic, and party members, civil servants, teachers, doctors, and other public officials led by example by asking their relatives to do the same. Under the government's persuasion and leadership, the people near Erhai quickly stopped planting garlic and switched to growing fruits such as pomegranates, cherries, and blueberries, or engaged in tourism.

To address the pollution caused by dairy farming, experts from Kunming University of Science and Technology, after years of investigation and field research, proposed two main recommendations: first, to properly confine dairy cows and prevent them from grazing too close to the lake and, second, to establish centralised fertiliser factories for processing cow dung. Working with the Chinese Academy of Agricultural Sciences, the experts designed a factory to collect cow dung for the production of organic compound fertilisers. Local entrepreneur Zhong Shunhe built four such factories and set up 25 cow dung collection stations every two kilometres in villages surrounding the Erhai basin. The four factories collected over 1,300 tonnes of cow dung daily and over 400,000 tonnes of cow dung, pig manure, and poultry droppings annually. Dali Prefecture provides an annual subsidy of over 10 million yuan to the fertiliser factories for purchasing cow dung from farmers and pays the factories 40 yuan for each ton of livestock manure collected and transported. The factories use the collected animal manure to produce various specialised organic fertilisers, including for tobacco, pu'er tea, flowers, grapes, walnuts, vegetables, and landscaping. These organic fertilisers are effective and environmentally friendly; they are used not only to control phosphorus and nitrogen levels in the more than two million mu of farmland in Dali Prefecture but are also sold nationwide and across Southeast Asia. Guided by scientific expertise, this initiative has helped control pollution while also generating benefits for enterprises and farmers.

The special project team also studied the rivers flowing into Erhai Lake upstream to develop a comprehensive basin-wide ecological governance plan. Before the special project, the most important water source for the lake, the Luoshijiang River, discharged 40 million tonnes of wastewater into Erhai annually. Taking into

account the specific conditions of different sections of the Luoshijiang River basin and the overall situation of economic underdevelopment that prevails in Dali Prefecture, the team designed a low-cost plan to clean the waters of the Luoshijiang. In the pristine upstream areas, the plan focused on ‘ecological conservation’ measures; in the middle reaches dominated by farmland and villages, the plan focused on ‘ecological restoration and economic restructuring’, guiding surrounding farmers to grow low-pollution, high-yield cash crops and to construct filtration ditches along the riverbanks to preliminarily purify farmland tailwater and village sewage; in the densely populated downstream areas, the plan focused on ‘pollution control and ecological engineering governance’, building ecological riverbanks and beds with filtration functions and constructing 1,500 acres of artificial wetlands before the river flows into the lake. These wetlands were filled with phosphorus filter materials and featured labyrinth-style aquatic plant walls to help settle pollutants and purify the water. By June 2011, after five years of implementation, water quality at the river mouth where the Luoshijiang flows into the lake had significantly improved, with the water being suitable for human consumption, water transparency reaching a depth of two metres, and artificially planted *Ottelia acuminata* successfully surviving after years of their absence. Owing to the success of this experience, during the twelfth Five-Year Plan period (2011–2015), the Luoshijiang plan was extended to another river flowing into Erhai, the Yong’anjiang River, which accounted for 20% of Erhai’s total pollution.

The Erhai Lake experience and special project for water pollution control came about as the Communist Party of China placed increased emphasis on environmental protection. In 2003, then Chinese President Hu Jintao put forward the concept of a ‘Scientific Outlook on Development’, emphasising ‘harmony between man and nature and the principle of all the people building and sharing a harmonious socialist society’, which was ratified at the 17th Congress of the CPC in 2007.⁹ This reflected the party’s growing recognition of the unsustainability of a development model that focused only on economic growth while neglecting ecological protection. Also in 2003, Pan Yue took office as vice minister of the Ministry of Environmental Protection (then known as the State Environmental Protection Agency), becoming, at the age of 43, one of China’s youngest deputy ministers. The following year, Pan began overseeing the country’s environmental impact assessments (EIAs); one month after he did so, the State Environmental Protection Administration halted 30 large-scale projects due to non-compliance with EIA requirements, including the Jinsha River’s Xiluodu Hydropower Station, the Three Gorges Underground Power Station, and the Three Gorges Project Power Source Station. Pan Yue’s firm stance attracted considerable attention, earning him a reputation for being a ‘tough guy’ and his actions even being described in terms of a traditional Chinese idiom as ‘touching the tiger’s butt’. In 2006 and 2007, Pan Yue launched two consecutive EIA ‘storms’, during which 82 projects with investments totalling 112.3 billion yuan were halted for serious EIA violations, including in steel, power, and metallurgy. This, once again, garnered widespread attention from all sectors of society and decision-makers at the time.¹⁰

In a 2007 speech to a group of young students, Pan Yue candidly stated that ‘our current economic development model is unsustainable’. He added that ‘environmental pollution has severely constrained economic growth’, and that ‘social injustice leads to environmental injustice, which in turn exacerbates social injustice, creating a vicious cycle that brings social disharmony’.¹¹ Meanwhile, two years prior to these comments, Xi Jinping, then Secretary of the Zhejiang Provincial Party Committee, wrote an article in the *Zhejiang Daily*, entitled ‘Green Mountains and Clear Waters are also Gold and Silver Mountains’, in which he emphasised that although economic development is a priority, the environment cannot be sacrificed.¹² The special project for water pollution control and successes in Erhai should be understood in this context, as part

of the CPC's shifting conception of development, with 'harmony between humans and nature' being increasingly viewed as a necessary condition for China's path to modernisation.

Green Mountains and Clear Waters Are Also Gold and Silver Mountains

In January 2015, ten years after his article was published, Xi Jinping, now China's president, inspected Dali Prefecture and emphasised the need to protect 'the environment like we would protect something as sensitive as our eyes, and treating it like we would treat something as precious as our lives'.¹³ On the shores of the lake, he affirmed that 'Erhai must be protected' and that he hoped to see cleaner and cleaner waters in the years to come. However, in September of that year, Erhai Lake suffered multiple algae outbreaks, with the lake water in several ancient towns becoming murky and foul-smelling and water quality deteriorating rapidly, mainly due to ecological burdens imposed by the rapidly growing tourism economy.

In recent years, Dali City has attracted many young people from major cities seeking an escape from smog- and traffic-filled urban lifestyles. Many have sold their city homes and moved to Dali City with their families to jointly build homestays with local residents along Erhai Lake. In a 'paradise-like' lifestyle, some young people in IT, design, and art industries have rented houses for long-term stays, working remotely and earning the moniker of 'digital migrants'. From 2014 to 2016, the number of 'new migrants' coming to Erhai from other parts of China increased from 30,000 to nearly 100,000, accounting for nearly 10% of the lake's residents. Furthermore, in 2014, Dali Prefecture received 808,300 overseas tourists and 25.67 million domestic tourists.

While the rapid growth of tourism contributed to the increasing incomes of local residents and anti-poverty efforts, environmental protection measures lagged behind. Prior to the surge in tourism and migration, Dali Prefecture had only a few small sewage treatment plants, and the increased environmental pressure overwhelmed Erhai. The homestays produced large amounts of domestic sewage, restaurant waste, and wastewater. By 2015, residential and tourism-related waste reached over 600 tonnes per day. In response to the deteriorating situation, the local government intervened in Erhai's rapidly developing tourism industry and enacted corresponding environmental protection measures.

As part of these efforts, the Dali Prefecture government advised 2,498 restaurants, inns, and homestays discharging domestic and restaurant wastewater into Erhai to suspend operations. Initially, many owners were highly resistant. Kong Hainan, who led Erhai's special project team, personally communicated with inn owners and media reporters; government officials visited restaurants, inns, and homestays door-to-door, repeatedly informing owners about the pollution threats facing Erhai. The process of convincing local residents and business owners was difficult, but eventually, a consensus was built around the view that focusing only on short-term economic gains was akin to 'killing the goose that lays the golden eggs', thus destroying the whole community's future. Ultimately, all the inn and homestay owners in Shuanglang accepted the government's decision, suspending operations for 18 months to undergo relocation and renovation measures. In 2018, 1,806 households (belonging to 23 villages) within 15 metres of the lake were demolished with the owners' consent, the sites were restored to public space, and 7,270 people moved into newly built residential areas and were compensated by the government. To commemorate the sacrifices made by the 1,806 households for Erhai's environmental protection, the new residential area was named '1806 Town'. On top of this, restaurants, inns, homestays, and villages beyond the 15-metre line also completed sewage system renovations.¹⁴

More broadly, the Dali Prefecture government undertook a significant redrawing of its urban and developmental planning in response to President Xi Jinping's call to use Erhai Lake as the basis of all aspects of the region's economic and social development. For example, the urban-rural development boundary of the prefecture was reduced from 188 square kilometres to 148 square kilometres, the population around the lake decreased from 1.05 million to 860,000, and the core development area of Erhai Lake shrank from 140 square kilometres to 9.6 square kilometres. This promoted the transfer of industries and populations within the basin to outside the basin, completely transforming the development model of 'building a city around the lake'. Industries that did not need to be developed by Erhai Lake were moved out, with development zones being established in several counties surrounding Dali City to accommodate these relocated industries, thus driving economic development in the surrounding areas. The changes in Dali City are in line with a wider trend in the country to relieve pressure on central urban areas. During the same period, around Beijing, similar measures were undertaken to address the problems of urban sprawl, 'big city diseases', and the formation of a 'poverty belt' around the capital. Tongzhou was designated as the city's sub-centre in the east, and the Xiong'an New Area was established in the southwest to relieve non-capital functions from the central areas of Beijing and promote coordinated development in the Beijing-Tianjin-Hebei region.

As a result of this robust environmental governance, Erhai Lake's health has been restored from its previous state of chronic pollution and eutrophication. Since 2016, the lake's water quality has been consistently rated 'fairly good' to 'excellent' by China's Ministry of Ecology and Environment.¹⁵ However, while strong, comprehensive measures have been necessary to protect the environment and the collective commons, they often come with individual sacrifices, and indeed, many people have been personally affected by these measures to protect Erhai Lake.

Balancing Individual, Collective, and Environmental Wellbeing

He Licheng, who received us on our visits to Dali Prefecture, was one of the many people whose lives were directly shaped both by pollution and the waves of environmental measures enacted by the government in recent decades. Growing up by Erhai Lake in Gusheng Village, he earned his income through fishing and fish farming for many years. In 1996, after the government banned motorised fishing boats, he was forced to sell his boat to a scrap metal yard; a few years later, in 2000, he had to look elsewhere for work after the government prohibited self-built fish ponds in the lake. He Licheng eventually returned home and earned a living by opening an inn in 2014 after the government's 'village-to-village' project brought paved roads to He Licheng's doorstep. However, this did not last long. In 2017, his inn was one of the 1,806 houses demolished, and he and his family moved into a newly built 600-square-metre home in the 1806 Town. Finally, in 2021, after all of these ups and downs, He Licheng contracted a piece of land at the entrance of Gusheng Village to pursue green farming of rice and rapeseed under the guidance of the Yunnan Agricultural Reclamation Group.

The Erhai basin has a long history of rice cultivation. However, in the past, farmers used low-quality varieties and excessive pesticides and fertilisers; consequently, the rice not only sold for low prices (less than 5 yuan per kilogram) but also polluted Erhai. During the environmental governance period, Yunnan Agricultural Reclamation Group carried out large-scale green, organic, and high-quality rice planting in the Erhai basin. The group developed an 'Erhai Fragrant' specialty organic rice that is fragrant and soft, with over 10% higher protein content than ordinary rice, and that, when cooked into porridge, forms a thick layer of rice oil that is popular among middle-class urban consumers. Green farming reduces agricultural non-point source pollution

and the agricultural products fetch higher prices, with Erhai Fragrant rice being sold for more than 30 yuan per kilogram. The group utilised precise fertilisation, organic fertilisers, crop rotation, manual weeding, and biological pest control to ensure that rice production was green and organic from the source. Meanwhile, through internet e-commerce, the group directly connected with urban consumers and organisations in economically developed coastal areas before harvest, eliminating farmers' concerns about sales. The group planted over 10,000 mu of rice around Erhai, with households able to lease their land to the group for an annual rental fee of 2,000 yuan per mu (with households earning 5,500 yuan per year on average) and farmers able to earn incomes by directly contracting land from the group.

For He Licheng, green farming has provided a crucial source of supplementary income and greater overall economic security. While still earning most of his income from a new guesthouse that he opened beyond the 15-metre boundary, he makes 100,000 to 150,000 yuan annually from green farming (though he told us that there have been some difficulties in ensuring that farmers receive their payments in a timely manner).¹⁶ In 2022, He Licheng applied to join the CPC and is currently going through the admission process.

Outside of He Licheng's contracted rice fields resides a research team from China Agricultural University. Since 2009, China Agricultural University has been exploring a 'Science and Technology Courtyard' model, where agricultural graduate students mainly coming from cities in China's eastern region are stationed at the frontlines of agricultural production to study and solve practical issues in agricultural and rural development at the grassroots level.¹⁷ This initiative simultaneously helps to cultivate high-level agricultural talents and advance agricultural modernisation in rural areas. In Gusheng Village, the Science and Technology Courtyard aims to thoroughly eliminate Erhai's non-point source pollution – that is, pollution that does not originate from a single source but is accumulated over a large area. In collaboration with a team of national experts, the courtyard is developing a 'six vertical and seven horizontal' precise monitoring system in the Gusheng area and a comprehensive and spatiotemporal technological model for the prevention and control of agricultural and rural non-point source pollution. Experts conducted detailed surveys of soil, farmland, villages, and water systems in the Gusheng area, deploying over 1,000 personnel in 2022 for synchronised water quantity and quality monitoring, obtaining over 20,000 relevant indicators. According to Xu Wen, associate professor at China Agricultural University, the Science and Technology Courtyard in Gusheng identified the main agricultural source pollution discharge characteristics, regional non-point source pollution discharge loads and contributions, and preliminarily revealed the impact of non-point source pollution on surface water quality. Based on the precise monitoring of non-point source pollution, experts from China Agricultural University and Yunnan Agricultural Reclamation Group jointly optimised precise fertilisation for rice, reducing phosphorus, chemical oxygen demand, and other pollution indicators by about half.¹⁸

Beyond Erhai Lake

The environmental challenges that Dali Prefecture has faced and the government's restoration efforts provide some lessons beyond the region. For example, in the process of restoring Erhai Lake, the China Water Environment Group developed the 'distributed subsurface water reclamation ecosystem technology system', which is a management approach for large lakes over 200 square kilometres in size that has not been used anywhere else in the world. According to Dr. Feng Hou, chairman of the China Water Environment Group, the distributed subsurface water reclamation ecosystem is a groundbreaking new approach that changes the century-old water management model worldwide, proposing an innovative idea of treating urban wastewater

and treatment plants as a stable second water resource, second green energy, and second land resource, reducing investment by 20-50% compared to traditional solutions and saving about one-fourth of operating costs on average.¹⁹

In September 2022, the ‘Erhai Lake Basin Pollution Control Innovation and Regional Development Project’ won the silver award in the ‘Excellent Project Execution and Delivery’ category at the International Water Association (IWA) World Water Congress & Exhibition in Copenhagen, Denmark. The IWA expert review panel evaluated the project, jointly submitted by the China Water Environment Group, Shanghai Jiao Tong University, and the Dali Prefecture government, for aspects of innovation, major achievements, project design environment, and potential for broader impact. IWA President Tom Mollenkopf stated that the comprehensive management of Erhai Lake, integrating the improvement of Erhai’s water ecological environment with the social and economic development model of the basin, provides significant insights for the development of the global water environment field.²⁰

The restoration of Erhai Lake is a story of coming to terms with the environmental devastation that came with a certain model of development, which did not adequately address the social needs of the poorest regions nor the environmental costs. Through the leadership of the government to chart a new course towards an ecological civilisation and through the dedicated work of local residents like He Licheng, professors such as Kong Hainan, private entrepreneurs like Zhong Shunhe, and countless party cadres, university students, and peasant farmers, Erhai Lake has gone from an environmental crisis to an example of ecological restoration. Walking by the lake today, you can see the clean and transparent water, *haicaihua* flowers have begun to bloom again, and the ‘Pearl of the Plateau’ is glimmering once more.

Notes

¹This article refers to both Dali City and Dali Bai Autonomous Prefecture. These terms are not synonymous. Dali City is a county-level city within Dali Bai Autonomous Prefecture.

²The Bai people are one of 56 ethnic groups officially recognised by China, with a population of roughly 1.9 million people mainly concentrated in Yunnan province.

³China measures water quality using a six-tier classification system: Grades I, II, and III are considered ‘good quality’ and suitable for human consumption; Grades IV and V are considered ‘poor quality’, suitable for certain industrial, agricultural, and recreational uses but unsuitable for human consumption or contact; Grade V+ or ‘below Grade V’ is the lowest tier and considered unsuitable for any use.

⁴For more about the targeted poverty alleviation campaign, see Tricontinental: Institute for Social Research, *Serve the People: The Eradication of Extreme Poverty in China*, Studies in Socialist Construction no. 1, July 2021, <https://dev.thetricontinental.org/studies-1-socialist-construction/>.

⁵Chen Xiaohua, Qian Xiaoyong, Li Xiaoping, Wei Zhihong, and Hu Shuangqing, ‘Long-Term Trend of Eutrophication State of Lake Erhai in 1988-2013 and Analyses of Its Socio-Economic Drivers’, *Journal of Lake Sciences* 30, no. 1 (2018): 70–78.

⁶ ‘九大高原湖泊水质监测状况月报（2013年6月）’ [Monthly Report on Water Quality Monitoring Status of the Nine Highland Lakes (June 2013)], Department of Ecology and Environment of Yunnan Province of the People’s Republic of China, 29 August 2013.

⁷Eutrophication refers to a process that can occur in bodies of water, in which excessive nutrients lead to excessive plant and algal growth, the depletion of oxygen, and the creation of low-oxygen ‘dead zones’ causing harm to many aquatic organisms.

⁸Zhu Dajian, 海藻花开 [*Ottelia Acuminata* Blossoms] (Shanghai Jiaotong University Publishing House, 2023), 75–76, <https://book.douban.com/subject/36432761/>.

⁹‘Full Text of Hu Jintao’s Report at 17th Party Congress’, *China Daily*, 24 October 2007, https://www.chinadaily.com.cn/china/2007-10/24/content_6204564_4.htm.

¹⁰ ‘潘岳的12年环保印记’ [Pan Yue’s 12-Year Environmental Imprint], *China Economic Weekly*, 18 August 2015, <https://www.chinanews.com.cn/m/gn/2015/08-18/7473027.shtml>.

¹¹Pan Yue, ‘Green China and Young China (Part One)’, *Dialogue Earth*, 17 July 2007, <https://dialogue.earth/en/pollution/1167-green-china-and-young-china-part-one/>.

¹² ‘幸福就在绿水青山间 ——习近平总书记和安吉县余村的故事’ [Happiness Lies in the Green Water and Green Mountains – The Story of General Secretary Xi Jinping and Yu Village in Anji County], Xi Jinping Economic Thought Research Center, 16 January 2024, https://www.ndrc.gov.cn/xwdt/ztl/NEW_srxxgcjppjjsx/jjsxyjqk/sxzt/202401/t20240116_1364169.html.

¹³Yuan Lihui, Wang Wenting, and Zhao Mengjie, ‘Erhai Lake Must Be Protected’, *Qiushi*, 14 January 2021, http://en.qstheory.cn/2021-01/14/c_582438.htm.

¹⁴Zhu, 海藻花开 [*Ottelia Acuminata* Blossoms], 188–190.

¹⁵The annual ‘Report on the State of the Ecology and Environment in China’ by the Ministry of Ecology and Environment of the People’s Republic of China, can be accessed here: <https://english.mee.gov.cn/Resources/Reports/>.

¹⁶Long Huirui, ‘留住洱海边的最美乡愁 ——重访云南大理市古生村’ [Retaining the Most Beautiful Nostalgia by the Erhai – Revisiting Gusheng Village in Dali City, Yunnan Province], *中国民族* [China Nationality], 8 October 2017, <https://www.neac.gov.cn/seac/c100475/201710/1083779.shtml>.

¹⁷Party Committee of China Agricultural University, ‘解民生、治学问、育英才的科技小院’ [Science and Technology Courtyards for Solving People’s Livelihoods, Managing Learning, and Nurturing Talents], *Qiushi*, 16 August 2024, http://www.qstheory.cn/dukan/qs/2024-04/16/c_1130109150.htm.

¹⁸ ‘洱海边上的科技小院’ [Science and Technology Courtyard by the Erhai Lake], *Qiusi*, 6 May 2023, http://www.qsttheory.cn/laigao/ycjx/2023-05/06/c_1129592968.htm.

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