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Analysis of Benefits and Recommendations for Ecological Comprehensive Management in the Yuxi Plateau Lake Basin

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ABSTRACT

This study analyzes the practices of ecological comprehensive management in the plateau lake basin of Yuxi City, revealing the operational effectiveness and existing shortcomings of its extra-lake water resource recycling management model. The research identifies issues such as low project funding disbursement rates, fragmented allocation of responsibilities, and low industrial integration. Accordingly, a "legalized pluralistic co-governance" pathway is proposed. This includes establishing a water rights revenue mechanism to address financing difficulties, clarifying community governance rights and responsibilities through virtual equity shares, and constructing an "extra-lake – intra-lake" benefit compensation system to balance protection and development, thereby providing innovative practices for the comprehensive management of plateau lake basins.

KEYWORDS: Ecological Comprehensive Management; Extra-lake Water Resource Recycling; Pluralistic Co-governance

Fuxian Lake, Xingyun Lake, and Qilu Lake (collectively referred to as the "Three Lakes") in Yuxi City, Yunnan Province, serve as crucial water resource carriers and ecological barriers in the central Yunnan region. Their basins are facing complex water ecological challenges. Issues such as imbalance between water supply and demand, high loads of agricultural non-point source pollution, ecosystem degradation, fragmented management, and the compounding effects of climate change create systemic pressure. Confronted with these severe and intertwined challenges, Yuxi City has proposed a "Five-in-One" extra-lake water resource recycling model integrating ecological and environmental infrastructure, agricultural irrigation water, efficient water-saving irrigation, high-standard farmland transformation and water diversion, and water for high-efficiency forestry development. Through five stages–interception, extraction, regulation and storage, irrigation, and management–initial rainwater, agricultural tailwater, and reclaimed water are recycled outside the lakes, establishing a "source-field-lake" whole-chain collaborative governance system. This provides a "Yuxi Practice" for the comprehensive management of plateau lake basins.

1. RESEARCH BACKGROUND AND POLICY FRAMEWORK

1.1 Local Ecological Civilization Policy and Regulatory System

To implement the concept of ecological civilization, foster a new economic development outlook that values lucid waters and lush mountains as invaluable assets, and a new concept of people's livelihood and

performance that regards the environment as fundamental to wellbeing, Yunnan Province has acted as a pioneer in ecological civilization construction. Since 2013, Yunnan has issued policies such as the "Implementation Measures for Ecological Environmental Protection Inspection in Yunnan Province," the "Yunnan Province Work Plan for Strengthening the Supervision of River Outfalls," and the "Implementation Opinions on Deepening the Fight Against Pollution." These policies strengthen source control, process supervision, and end-of-pipe treatment from the perspectives of pollution prevention, environmental inspection, and discharge regulation. Yuxi City, where the "Three Lakes" are located, promulgated the "Delineation Scheme for the Ecological Red Line and Ecological Yellow Line for Fuxian Lake," "Delineation Scheme for the Ecological Red Line and Ecological Yellow Line for Xingyun Lake," and "Delineation Scheme for the Ecological Red Line and Ecological Yellow Line for Qilu Lake" in November 2022. These schemes delineated the ecological red lines, ecological yellow lines, core ecological protection zones, ecological protection buffer zones, and green development areas for the "Three Lakes," further regulating lakeside activities and balancing the relationship between protection and development. In January 2024, the "Yunnan Province Fuxian Lake Protection Regulations," "Yunnan Province Qilu Lake Protection Regulations," and "Yunnan Province Xingyun Lake Protection Regulations" were enacted, further adapting to the current requirements for lake protection and management in Yunnan Province and providing legal safeguards for the "Three Lakes" governance.

Table 1 Core Policy and Regulatory System for the "Three Lakes" Governance Document

Name	Promulgation Time	Core Content	Legal Significance
Delineation Scheme for the Ecological Red Line and Ecological Yellow Line for Fuxian Lake	2022.11	Establishes a hierarchical control system	Provides basis for spatial governance
Delineation Scheme for the Ecological Red Line and Ecological Yellow Line for Xingyun Lake			
Delineation Scheme for the Ecological Red Line and Ecological Yellow Line for Qilu Lake			
Yunnan Province Fuxian Lake Protection Regulations	2024.01	Designates development prohibited/restricted zones	Clarifies rights and responsibilities boundaries
Yunnan Province Qilu Lake Protection Regulations			
Yunnan Province Xingyun Lake Protection Regulations			
Delineation Scope for Core Ecological Protection Zone, Ecological Protection Buffer Zone, and Green Development			

Zone for Fuxian Lake			
Delineation Scope for Core Ecological Protection Zone, Ecological Protection Buffer Zone, and Green Development Zone for Xingyun Lake	2024.09	Basis for ecological protection, restoration, and various production, living, and development activities	Zonal protection and development
Delineation Scope for Core Ecological Protection Zone, Ecological Protection Buffer Zone, and Green Development Zone for Qilu Lake			

1.2 Evolution of the "Three Lakes" Governance Practice Mechanism

1.2.1 Shifting Governance Mechanisms: From Localized Management to Municipal Coordination

First, management mechanisms were streamlined. In 1993, Yuxi City established the Fuxian Lake Administration Bureau, responsible for coordinating the protection and management of the "Three Lakes." Chengjiang County, Jiangchuan District, Tonghai County, and Huaning County also established corresponding management bureaus, with Jiangchuan District responsible for Xingyun Lake, Tonghai County for Qilu Lake, and Chengjiang County, Jiangchuan District, and Huaning County jointly responsible for Fuxian Lake. Overall, a protection and governance mechanism with municipal coordination and county-led implementation was formed. In December 2015, to resolve the dilemma of "three-county co-governance" of Fuxian Lake, Chengjiang County was made solely responsible for Fuxian Lake's protection and management. Thus, a pattern of municipal coordination, county-led implementation, and "one county, one lake" was established. To strengthen high-level coordination, Yuxi City established the Yuxi City Lakes Administration Bureau in June 2023, responsible for the overall protection, management, development, and law enforcement supervision of the "Three Lakes" basin, forming a protection and governance pattern characterized by municipal coordination, municipal leadership, and county/district support.

Second, governance concepts were updated. Guided by the 16-character water management principle of "Prioritizing Water Conservation, Spatial Equilibrium, Systematic Governance, and Leveraging Both Government and Market Forces," the lake protection and management philosophy for the "Three Lakes" evolved from the "Four Returns and Three Restorations"① to the five-character strategy of "Retreat, Reduce, Adjust, Treat, and Manage," escalated from "Thunder Action"② to the "Lake Revolution"③, expanded from lake-specific management to basin-wide management, and established the governance approach of "treating rivers before treating lakes" and leaders acting as "stewards."

Third, governance measures were optimized. Adhering to the simultaneous treatment of non-point and point sources, addressing both the source and the end, and implementing both engineering and management measures, a series of projects for source interception, mid-process pollution control, and end-of-pipe treatment were intensively implemented. This included relocating 8,350 households and 97 enterprises along the lakeshores, closing 284 catering and accommodation businesses, shutting down 99 sand and gravel quarries, promoting crop transformation (planting 287,900 mu of environmentally friendly

crops), retiring 25,300 mu of farmland, and phasing out 11,449 livestock and poultry farms[1]. It also involved constructing lakeside wetlands, banning crops requiring heavy fertilization and watering, and implementing the "Five-in-One" irrigation area project.

1.2.2 Implementing the River (Lake) Chief System: Leaders as "Stewards"

Since 2017, every river in the "Three Lakes" basin has had a leader serving as the River (Lake) Chief, making leaders "stewards" and ensuring the River (Lake) Chief system is substantive. Institutionally, implementation plans for the River (Lake) Chief system were issued, clarifying responsibilities and establishing regular, routine patrol systems for rivers and lakes, with provincial standing committee members and municipal primary leaders serving as chiefs for the "Three Lakes." Technically, files were created for each lake ("one lake, one file"), strengthening information management and water quality monitoring. Operationally, "River Chief Clean River Actions" were carried out, focusing on cleaning up illegal constructions around lakeside wetlands, inlet rivers/ditches, and reservoirs/ponds within the basin, effectively reducing pollution sources entering the lakes and fulfilling the commitment to "source pollution control."

1.2.3 Launching the "Lake Revolution": Resolutely Winning the "Three Lakes" Defense Battle

On August 10, 2021, the Yuxi City "Lake Revolution" Headquarters was established. Following a governance strategy combining unified command and decentralized implementation, it focused on municipal coordination, inter-departmental collaboration, regional coordination, and policy synergy, establishing the concept of "treating water before treating the lake, treating pollution before treating the water" and the five-character strategy of "Retreat, Reduce, Adjust, Treat, and Manage." Action plans for protection and management tailored to each lake ("one lake, one policy") were formulated, the lakeside ecological red lines and lake ecological yellow lines were delineated, and implementation rules for the management and control of core ecological protection zones, ecological protection buffer zones, and green development zones were issued, elevating the governance of the "Three Lakes" from fragmented departmental efforts to unified management by the Party Committee and government.

2. IMPLEMENTATION STATUS AND BENEFIT ASSESSMENT OF ECOLOGICAL COMPREHENSIVE MANAGEMENT IN THE "THREE LAKES" BASIN

2.1 Overall Progress of Extra-Lake Water Resource Recycling Projects

By establishing an extra-lake water resource recycling system using five methods–interception, extraction, regulation and storage, irrigation, and stop sewage from entering the lakes, transformed into nutrient-rich water for irrigating farmland and forest land, thereby enhancing the ecological, social, and economic benefits of the water. The extra-lake water resource recycling projects involve eight categories: water sources, water lifting, water storage, water conveyance, water use, clean water inflow, comprehensive water quality improvement, and drought relief/flood control emergency. The total investment is 3.231 billion yuan. Currently, the "Three Lakes" basin has built regulation and storage belts with a total length of 59.42 km and a capacity of 2.783 million cubic meters, 28 pumping stations, 28 high-level regulation ponds, 13 sewage treatment plants, 552 agricultural irrigation reservoirs/ponds, 413,800 mu of high-standard farmland, and 122,100 mu of high-efficiency water-saving irrigation farmland④. The extra-lake water recycling model has basically taken shape.

Table 2 Implementation Progress of Extra-Lake Water Resource Recycling Projects in the "Three Lakes"

Lake	Regulation Storage Capacity	Recycled Water Volume (10,000 m³)	Pollution Reduction (tons)
Fuxian	453,000 m³	334.21	COD: 119.11
Xingyun	1.13 million m³	796.1	TN: 81.94
Qilu	1.20 million m³	789.5	TP: 6.74

Remarks: Data are for the full year 2023. COD=Chemical Oxygen Demand, TN=Total Nitrogen, TP=Total Phosphorus.

2.2 Implementation Progress of Fuxian Lake Extra-Lake Water Resource Recycling Project

The Fuxian Lake basin plans to construct 31 projects with a total investment of 1,370.7405 million yuan. As of October 2023, 6 projects were under construction, 16 projects were in preliminary stages, and the completed investment was 220.20 million yuan⑤, accounting for 16.05% of the total investment. 26 village groups within the basin have been relocated, and 339 village groups have completed pollution interception and treatment projects. Among them, 271 village groups have sewage piped to treatment plants, 54 village groups use integrated sewage treatment facilities, and 14 mountain village groups use septic tanks for sewage treatment, achieving full coverage of the basin's pollution interception and treatment system.

Table 3 Implementation Progress of Fuxian Lake Extra-Lake Water Resource Recycling Project

Project Category	Estimated Investment (10,000 yuan)	Actual Investment (10,000 yuan)	Completion Rate %
Water Lifting Projects	7,961.67	4,320	54.26%
Water Conveyance Projects	11,052.28	11,670	15.11%
Water Use Projects	33,215.80	4,710	14.18%
Comprehensive Water Quality Improvement Projects	69143.45	6700	9.69%
Clean Water Inflow Projects	10759.20	4620	42.94%
Drought/Flood Emergency Projects	4941.65	0	0%
Total	137074.05	22020	16.5%

2.3 Implementation Progress of Xingyun Lake Extra-Lake Water Resource Recycling Project

The Xingyun Lake extra-lake water resource recycling project is divided into the Xiongguan, Qianwei, Anhua, and Dawa areas, with an actual investment of 145 million yuan, accounting for 68% of the planned investment, primarily for constructing lakeside interception ditches and lakeside regulation and storage belts. Currently, the four regulation and storage belts can basically achieve the in-belt circulation of heavily polluted water bodies such as reclaimed water, ecological return water, and initial rainwater from the southern and northern shores of Xingyun Lake.

2.4 Implementation Progress of Qilu Lake Extra-Lake Water Resource Recycling Project

The Qilu Lake extra-lake water resource recycling project includes eight categories: water source projects, water lifting projects, water storage projects, water conveyance projects, water use projects, comprehensive water quality improvement projects, clean water inflow projects, and drought/flood emergency projects, with a total investment of 1,646.6533 million yuan. The current focus is on promoting the extra-lake recycling of agricultural tailwater, initial rainwater, scattered leakage sewage, and reclaimed water to ensure the improvement and stabilization of Qilu Lake's water quality.

Table 4 Implementation Progress of Qilu Lake Extra-Lake Water Resource Recycling Project

Project Category	Estimated Investment (10,000 yuan)	Actual Investment (10,000 yuan)	Completion Rate %
Water Recycling in Regulation Storage Belts	38,020.31	7,500	19.73%
Algae-Water Separation Station Optimization	17,234.29	949	5.51%
Comprehensive Treatment of Inlet Rivers	42,131.96	9,500	22.55%
Agricultural Irrigation Recycling Pipeline Network	19,664.84	0	0%
Clean Water Inflow Projects	19,132.00	0	0%
Reservoir Reinforcement Projects	4,980.17	178	3.57%
Agricultural Irrigation Demo Zone Water Conveyance	17,700.00	0	0%
Reservoir Expansion & Water Lifting	5,801.76	0	0%
Total	164,665.33	18,127	11.01%

2.5 Benefit Assessment of Extra-Lake Water Resource Recycling in the “Three Lakes”

2.5.1 Ecological Benefits: Pollution Reduction and Resource Recycling

By constructing the “Five-in-One” governance model and establishing the extra-lake water resource recycling system, the “Three Lakes” have built a lakeside pollution interception and regulation storage system, achieving the separation of clean and polluted water and the inflow of clean water into the lakes. First, pollution reduction results are significant. In 2023 alone, the total pollutant reduction for the three lakes reached: COD 919.25 tons, Ammonia Nitrogen 42.67 tons, TP 10.37 tons, and TN 328.41 tons. Notably, Qilu Lake's COD reduction exceeded twice that of Fuxian Lake due to stronger control of agricultural non-point source pollution. Second, water resource recycling has been upgraded. The regulation and storage belts enable efficient reuse of low-pollution water resources. The reclaimed water

reuse rate in Fuxian Lake increased from 12% to 32%, covering 42,500 mu of cultivated land. Xingyun Lake's recycled water volume increased by 63% year-on-year, ensuring irrigation for 45,500 mu of farmland. Qilu Lake's recycled water volume surged by 250%, covering 70,000 mu of water-scarce farmland. Third, water resource allocation within the basin has been optimized. By constructing a water resource recycling network, regional water scarcity challenges are being addressed. The Shanchong River irrigation area in Fuxian Lake, covering 15,500 mu, receives water from regulation and pumping stations, providing no less than 20 million cubic meters of irrigation water annually. The Xiongguan area of Xingyun Lake uses pumping stations to lift water to higher elevations, securing water for 12,000 mu of farmland. Arid areas like Hexi Town near Qilu Lake utilize initial rainwater and tailwater for replenishment, gradually alleviating spatiotemporal water distribution conflicts.

2.5.2 Social Benefits: Infrastructure Improvement, Shift in Mindset, and Employment Upgrade

First, infrastructure has been comprehensively upgraded. The “Three Lakes” extra-lake water resource recycling projects have built 59.42 km of regulation and storage belts, 28 pumping stations, and 13 sewage treatment plants, accompanied by 413,800 mu of high-standard farmland and 122,100 mu of water-saving irrigation facilities. Fuxian Lake's No. 1 Pump Station extracts 257,400 cubic meters annually, securing water for 20,700 mu of farmland and forest. Xingyun Lake's 4 pumping stations and 44.5 km of pipelines irrigate 64,000 mu of farmland annually, including solving water scarcity for 12,000 mu in Xiongguan Township, benefiting over 5,000 people. Qilu Lake's 3 pumping stations and 13.4 km of pipelines cover 8,600 mu of farmland[2].

Second, agricultural green transformation has accelerated. Relying on extra-lake recycled water, the “Three Lakes” have cumulatively established 597 agricultural bases, added 806 agricultural enterprises, 314 cooperatives, and 198 family farms, planting 287,900 mu of environmentally friendly crops. Fuxian Lake nurtured 739 new types of business entities, Xingyun Lake promoted 110,000 mu of ecological planting, and Qilu Lake achieved green transformation for 112,700 mu⑧of agricultural planting.

Third, environmental awareness has significantly increased. Through project implementation and long-term publicity and education, residents' awareness rate of lake protection system reached 92%, with clear understanding of prohibited and restricted activities, forming a consensus that “protecting the lake is protecting our home.”

Fourth, employment models have innovated and diversified. The projects created diverse employment opportunities. During construction, surrounding residents were engaged in dredging, greening, etc. Land transfers gave rise to a group of professional farmers. After planting structure adjustment, the Samadu Village blueberry base in Chengjiang City adopted a “finance + company + cooperative” model, providing 200 permanent positions and 30,000 person-times of seasonal employment.

2.5.3 Economic Benefits: Industry Drive and Resource Value Highlighted

First, agricultural production value surged. Fuxian Lake's regulation and storage belts irrigate 76,100 mu of farmland and 71,200 mu of forest land annually, directly creating economic benefits, including 176 million yuan from add cultivated land quota revenue and 1.179 billion yuan from increased crop yield benefits[3].

Second, characteristic industrial clusters emerged. Leveraging water resource advantages, Chengjiang City developed the blueberry industry, leading to the establishment of 71 modern bases with a planting area of 12,000 mu, achieving an output value of 926 million yuan. Among them, the 675-mu Samadu Village blueberry base, using selected high-density planting techniques, increased the number of plants per mu to 800-1000, yielding 80% more than traditional models, recouping investment within the year, with an annual output value of 200 million yuan⑨.

Third, diversified income generation effects were significant. Villagers in Samadu Village, Chengjiang City, through fixed employment and temporary work, achieved an average annual income of 40,000-50,000 yuan per worker, with the village's total annual income increase reaching 12.5-14.5 million yuan⑩ Through modern agricultural bases linking farmers, villagers secured triple guarantees: employment income, land transfer revenue, and industry dividends.

3. CHALLENGES IN PROMOTING EXTRA-LAKE WATER RESOURCE RECYCLING PROJECTS

3.1 Funding Guarantee Challenges: Low Disbursement Rates and Insufficient Sustainability

Some scholars point out that "in the protection and management of the 'hree Lakes,' fundraising is difficult, channels are singular, and a long-term mechanism for funding guarantee has not yet been formed"[4]. Funds for initiated projects are insufficient, projects not yet started lack preliminary funding, fiscal pressure and policy coordination issues are intertwined, leading to slow project progress.

3.1.1 Prominent Funding Gap and Expenditure Contradictions

As of December 2023, the Fuxian Lake extra-lake water resource recycling project had received 305.43 million yuan in funds (project funds: 177.43 million yuan; financing loans: 128 million yuan), with a fund disbursement rate of 22.28%. The Xingyun Lake project received 227 million yuan (project funds: 102 million yuan; financing loans: 125 million yuan), but only 5.3758 million yuan of project funds were actually expended, with the remaining funds being reallocated due to fiscal difficulties. The Qilu Lake project received 46.38 million yuan, with a disbursement rate of 2.80%.

3.1.2 Fiscal Pressure and Advance Payment Risks Compound

Chengjiang City, Jiangchuan District, and Tonghai County generally lack the fiscal capacity to bear project costs, requiring contractors to advance substantial funds, hindering project progress. For example, the Qilu Lake project expended 170 million yuan, but only received 46.38 million yuan in funds, forcing contractors to advance 123.62 million yuan.

Table 5 Statistics on Funds Received for Ongoing Extra-lake Water Resource Recycling Projects in the "Three Lakes"

name item	Total Investment (10,000 yuan)	Funds Received (10,000 yuan)	Receipt Rate %
Fuxian	137,074.05	30,543	22.28%
Xingyun	32,973.34	22,665	68.74%
Qilu	165,665.33	4,638	2.80%

Remarks: Data as of end of December 2023.

3.2 Lack of Economic Benefit Assessment and Conversion Mechanisms

3.2.1 Incomplete Benefit Assessment System

First, the scope of economic benefit calculation is limited. Currently, only direct benefits from agricultural irrigation water use are counted, lacking systematic assessment of the asset appreciation potential of regulation storage belts, inlet rivers, and high-level reservoirs/ponds.

Second, data support is insufficient. Most projects are in the exploratory stage regarding market-oriented utilization after completion, lacking quantifiable calculations of economic returns.

3.2.2 Triple Barriers in Conversion Mechanisms

First, policy orientation bias. With ecological protection as the core goal, market-oriented development is marginalized; departments focus more on ecological benefits and shy away from resource assetization reforms.

Second, institutional gaps in cohesion. The transformation path from resource to asset to capital is constrained by compartmentalization; cross-department collaboration mechanisms are missing; market-based trading of factors like land and water rights is restricted.

Third, weak capacity of entities. Project management departments lack market-oriented operational thinking, enterprise participation is low, and channels for introducing social capital are not smooth.

3.3 Unclear Governance Responsibilities and Poor Coordination Mechanisms

3.3.1 Triple Contradictions in the Responsibility System

First, vertical hierarchical fragmentation. Municipal and county "Lake Revolution" headquarters bear coordination functions, water resources, and agriculture departments are responsible for implementation, while townships (sub-districts) and villages (communities), as local entities, ambiguous rights and responsibilities, limited participation channels, and become passive executors.

Second, vague definition of property rights. The five core rights – ownership, management rights, operation rights, profit rights, and use rights–lack clear attribution. A benefit-sharing mechanism based on property rights among multiple stakeholders like county governments, grassroots organizations, enterprises, and residents is absent, leading to insufficient support willingness at the grassroots level.

Third, imbalance in government-society collaborative governance. The top-down bureaucratic promotion model reinforces "line management," neglecting "block governance" needs. Mechanisms for expressing grassroots interests and benefit distribution are absent, and the mass line is not fully implemented.

3.3.2 Operational Obstructions in Coordination Mechanisms

First, Ineffective institutional coordination. Coexistence of overlapping responsibilities and gaps between departments; a cross-administrative water resource allocation mechanism has not been established; the fragmented governance pattern of "multiple dragons governing water, each managing their own part" persists.

Second, insufficient grassroots motivation. Due to unclear property rights and benefits, village (community) collectives lack initiative, and the endogenous motivation for residents to participate in project maintenance and ecological management is difficult to activate.

Third, virtualization of the mass line. Project implementation over-relies on administrative orders, neglecting the substantive participation of grassroots subjects in decision-making consultation, interest coordination, and supervision evaluation, hindering the obstruction of governance effectiveness to the grassroots level.

3.4 Insufficient Efficiency in Comprehensive Resource Development and Value Transformation

3.4.1 Quadruple Limitations in Development Dimensions

First, narrow industrial integration. Development is limited to agricultural irrigation and under-forest economy. Some research finds that "due to complex land characteristics in the 'Three Lakes' basin, the 'agriculture+tourism' development model remains in the planning stage, with a significant gap between the vision and reality of integrated primary-tertiary industry development"[5]. The expansion of composite business formats like eco-tourism and health & leisure is slow.

Second, insufficient cultural empowerment. Local characteristic cultures are not deeply explored, lacking the creation of a "Three Lakes IP" and innovation in cultural-tourism integration.

Third, lack of landscape value. Engineering facilities like regulation storage belts and inlet rivers lack landscape design, and their ecological aesthetic function remains unactivated.

Fourth, weak governance synergy. Linkage mechanisms with rural collective economic organizations and grassroots governance systems have not been established, and benefit-linking mechanisms are absent.

3.4.2 Triple Contradictions in Mechanism Obstacles

First, collaboration between departments and regions is dysfunctional. The habitual thinking of administrative departments "discussing projects only as projects" leads to weak cross-departmental resource integration capability; the fragmented pattern of "multiple dragons governing water" is not fundamentally resolved.

Second, weak financial support. Local fiscal constraints restrict investment in comprehensive development; market-based financing channels are limited; social capital participation is low.

Third, broken industrial chains. Regional industrial chains are incomplete, deep processing links are missing, local market capacity is small, and high development costs dampen the enthusiasm of market participants.

4. RECOMMENDATIONS FOR ENHANCING THE BENEFITS OF EXTRA-LAKE WATER RESOURCE RECYCLING PROJECTS FROM A LEGALIZATION PERSPECTIVE

4.1 Constructing a Diversified, Legalized Funding Guarantee System

4.1.1 Strive for Upper-level Funding Support through Multiple Channels

First, strengthen policy alignment. Coordinate with departments like water resources, agriculture, and environmental protection, dynamically optimize project packaging and policy alignment, and precisely strive for central and provincial special transfer payments and ecological function zone transfer payment funds.

Second, innovate financing models. Explore issuing special bonds to open new government financing paths and alleviate construction funding pressure.

4.1.2 Deepen Water Price Reform and Resource Value Transformation

First, promote market-oriented development. Through industrial integration and resource economic development, endow extra-lake water resource recycling projects with revenue-generating capacity to attract social capital investment and operation, forming a virtuous cycle of "using revenue to support construction."

Second, activate the land value-added income. Relying on high-level water lifting projects and projects like "paddy fields on mountains," transform drylands and wastelands in mountainous areas into cultivated land and paddy fields. Through the market-based exchange of newly added cultivated land quotas and paddy field quotas, feed a proportion of the value-added earnings back into project construction.

Third, establish a water rights trading mechanism. Grant farmers a certain free water quota, charging for excess usage. Establish irrigation district water banks, allowing farmers to trade saved water within their free quota on the market, with revenue shared.

4.2 Improve a Pluralistic Collaborative Governance Mechanism of Co-construction, Co-governance, and Shared Benefits

4.2.1 Promote Market-oriented Operation and Strengthen Grassroots Participation

According to local governance theory, "establishing a pluralistic governance mechanism requires devolving resources and power, emphasizing the participation of community residents and local market entities, and allocating resources and power to them"[6]. In practice, first, prioritize grassroots entities in government procurement of services. In areas like river cleaning, dredging, and ecological management, prioritize entrusting tasks to communities (villages) and village collective economic organizations through bidding, with the government responsible for supervision and assessment, achieving resource devolution and grassroots empowerment. Second, establish long-term benefit mechanisms. Upgrade labor participation to economic co-construction, forming a virtuous cycle of "input-benefit-reinvestment" through paths like land consolidation quota appreciatio and ecological product trading.

4.2.2 Innovate the "River Chief System +" Co-governance and Shared Benefits Model

First, incentivize grassroots governance with virtual shares. Based on the existing River Chief System, partially transfer the management and operation rights of inlet rivers, reservoirs, and ponds to community (village) collectives. Quantify management and protection tasks into virtual shares, distributing dividends based on annual assessment results, achieving unity of rights, responsibilities, and benefits.

Second, promote separation of construction and management. Clarify the boundaries of responsibility: government leads construction, grassroots co-manage, and benefits are shared, solving the institutional problem of "who manages, how to manage."

4.2.3 Introduce Third-party Forces to Fill Governance Vacuums

According to third-party governance theory, "the government has the responsibility to provide public services, but does not have to produce them itself; it can commission social organizations for production, with the government only needing to provide policies and funds"[7]. In the governance of the "Three Lakes" extra-lake water resource recycling projects: first, build a volunteer service network. Rely on local public welfare organizations to form volunteer teams for the "Three Lakes" governance, participating in project planning, ecological publicity, environmental supervision, etc., enhancing project social awareness. Second, improve the third-party governance mechanism. Operate through the dual tracks of government procurement of services and volunteer services, compensating for government and market failures, forming a collaborative system of "government building the stage, society performing the opera."

4.3 Deepen Institutional Innovation for Industrial Integration and Resource Economic Development

4.3.1 Innovate Industrial Integration Development Paths

First, expand composite business formats. Deeply integrate facilities like regulation storage belts and reservoirs with industries such as ecological agriculture (water-saving agriculture, under-forest economy), cultural tourism (outdoor sports, study tours), and sports events (fishing, paddleboarding), developing a "project +" economic model.

Second, activate resource economic potential. Develop scenarios like micro-vacations and event hosting through supporting ancillary facilities, promoting the transformation of ecological resources into economic benefits, forming an integrated "construction-management-use" model.

4.3.2 Empower Ecological Revitalization with Culture

First, create cultural IP carriers. Integrate intangible cultural heritage, fishing culture, and plateau water town characteristics into project landscape design, building "culture + ecology" display spaces to support cultural-tourism integrated product development.

Second, strengthen culture-economy linkage. Expand cultural consumption scenes through festival activities (e.g., kite festivals, fishing opening festivals), study base construction, etc., driving employment and community income generation.

4.3.3 Combine Landscape Design with Market Mechanisms

First, enhance ecological aesthetic value. Introduce market-oriented design forces to implement landscape-oriented renovations of rivers and ponds, creating ecological corridors with both ecological functions and ornamental value.

Second, establish resource value-added mechanisms. Form channels for transforming ecological value into economic value through paths like land consolidation quota trading and ecological product value realization.

4.4 Improve the Legal Safeguard Mechanism for Coordinated Lake Basin Governance

4.4.1 Restructure the Hierarchical Collaborative Management System

First, rationalize responsibility boundaries. Devolve micro-level functions of the municipal Lakes Administration Bureau, such as water abstraction permits, fishery resource fee collection, and water safety supervision, to county-level Lakes Administration Bureaus, promoting a shift from municipality manages the lake, county manages the shore to municipal-county linkage, lake-shore coordination.

Second, Second, resolve the barriers of compartmentalization. Establish a cross-administrative level lake protection joint meeting mechanism, bridging the management connection between ecological protection buffer zones and extra-lake water resource recycling projects, eliminating grassroots cognitive obstacles regarding cross-cutting responsibilities.

4.4.2 Build Market-oriented Operation Platforms

First, develop through government-enterprise cooperation. Led by the municipal government, jointly establish a “Three Lakes” Ecological Development Company with counties, townships, village collectives, and market entities, responsible for the overall planning of irrigation district projects and intra-lake resource development, undertaking full-chain responsibilities for investment, financing, construction, and operation.

Second, implement a “Lake-Supplements-Irrigation” mechanism. Plan projects like fishing competitions, water sports, and leisure vacations within the core ecological protection zone, forming a mutual nourishment model of “intra-lake revenue feeding extra-lake projects.” Fuxian Lake can develop high-end leisure resorts, water recreation, and ecological studies; Xingyun Lake can build fishing competition bases and water sports centers; Qilu Lake can layou a marathon track and a cycling track around the lake.

Third, strengthen benefit distribution. Regulate development projects through a “positive list” system, ensuring shared ecological, social, and economic benefits, promoting the transition of extra-lake water resource recycling projects from “blood transfusion” to “blood generation.”

Notes

①Refers to implementing the retreat of people, houses, farmland, and ponds, and the restoration of lakes, water bodies, and wetlands within the 100-meter primary protection zone outside the lakes.

②Refers to the period from June 12, 2019, to December 31, 2019, targeting the long-term stable maintenance of excellent water quality in Fuxian Lake, the improvement of Xingyun Lake's water quality by year-end, and the sustained improvement of Qilu Lake's water quality. Problem-oriented, it included 40 issues related to spatial control in the "Three Lakes" basin, promoting the “Four Returns and Three Restorations,” preventing non-point source pollution, accelerating pollution interception and treatment, and conducting river channel remediation into the rectify activities for "Three Lakes" protection and management.

③On August 10, 2021, Yuxi City made source governance the core task in “Three Lakes” governance, promoting a shift in lake protection and management from “end-of-pipe treatment” to “source reduction, source control, and source interception.” This shift in governance approach is termed the “Lake Revolution.”

④Data compiled from research materials collected between July-October 2024.

⑤Data provided by Yuxi City Lakes Administration Bureau.

⑥Data provided by Chengjiang City Fuxian Lake Administration Bureau.

⑦Data provided by Tonghai County Qilu Lake Administration Bureau. The actual funds received for Qilu Lake governance were 43.68 million yuan; part of the actual expenditure was advanced by the contractor.

⑧Data compiled from research materials collected between July-October 2024.

⑨Data is sourced from field investigation in Chengjiang City, October 2024.

⑩Datais sourced from field investigations in Chengjiang City, Jiangchuan District, and Tonghai County, October 2024.

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