New Trends and Countermeasures for China' s Ecological Security in the New Century: Post-print

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Abstract

[Purpose/Significance] Since entering the new century, sustained high-speed economic growth, rapid urbanization, intensive resource development, and natural disasters such as the Wenchuan earthquake have brought tremendous impacts on ecosystems. Simultaneously, China has implemented a series of ecological protection policies and construction projects during the period of greatest ecological protection and construction efforts, promoting ecosystem restoration. Studying the characteristics and changing trends of ecological issues in the new era, and analyzing the problems facing ecological protection, are of great significance for improving ecological protection policies and measures. [Methods/Process] Analyze the main ecological problems in China from 2000-2010 and their changing trends. [Results/Conclusions] The study found that since the new century, China' s ecological problems have begun to enter a transition period. Ecological problems caused by agriculture remain serious but have started to improve, while ecological problems caused by urbanization have intensified, mainly manifested as: low ecosystem quality and service functions; soil erosion, land desertification, rocky desertification, and other issues remain serious, but with reduced area and decreased severity. Ecological problems caused by urbanization, industrialization, and resource development, such as watershed ecological destruction, deterioration of urban human settlements, loss of natural coastlines, and reduction of natural habitats for wildlife, have intensified. The national ecological security situation remains severe, and the contradiction between development and ecological protection is still acute. To address the transformation of ecological problems and ensure national ecological security, we should adhere to natural restoration, improve ecosystem quality and biodiversity protection; actively promote green urbanization paths to reduce the impact of urbanization on regional environments; strengthen watershed ecological protection and restoration, and improve watershed ecological service functions.

Full Text

Challenges and Strategies for China' s Ecological Security in the New Era

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Abstract

[**Purpose/significance**] In the new century, rapid economic growth, accelerated urbanization, intensive resource exploitation, and natural disasters such as the Wenchuan Earthquake have imposed tremendous impacts on China's ecosystems. Simultaneously, this period has witnessed the most intensive ecological conservation and construction efforts in China, with the implementation of a series of policies and projects that have promoted ecosystem restoration. Studying the characteristics and trends of ecological problems in this new era, and analyzing the challenges facing ecological protection, are crucial for improving conservation policies and measures. [**Method/process**] This study analyzes the major ecological problems in China and their changing trends between 2000 and 2010. [**Result/conclusion**] The findings reveal that China' s ecological problems have entered a transitional period since the new century began. While agriculture-induced ecological problems remain serious, they have begun to improve, whereas urbanization-induced problems have intensified. Specifically, ecosystem quality and service functions are low; soil erosion, land desertification, and rocky desertification remain severe but have decreased in both area and severity. In contrast, problems caused by urbanization, industrialization, and resource development—such as watershed ecological destruction, deterioration of urban living environments, loss of natural coastlines, and reduction of wildlife habitats—have worsened. The national ecological security situation remains grave, with sharp contradictions between development and ecological protection. To address this transformation, China must prioritize natural restoration to improve ecosystem quality and biodiversity conservation, actively promote green urbanization pathways to reduce urbanization' s regional environmental impacts, and strengthen watershed ecological protection and restoration to enhance ecosystem service functions.

Keywords: ecological security; ecological problems; land degradation; habitat loss; watershed ecological degradation; urban environmental deterioration

Since the beginning of the new century, China has maintained sustained high-speed economic growth with accelerating urbanization and intensifying resource development. Concurrently, natural disasters such as the Wenchuan Earthquake, persistent droughts in southwestern China, severe ice and snow disasters in southern regions, and forest fires have occurred frequently, imposing tremendous impacts on ecosystems. This period has also seen the most inten-

sive ecological conservation and construction efforts in China, with the implementation of major projects including the Natural Forest Protection Program, Grain for Green, Lake Restoration, Beijing-Tianjin Sand Source Control, and the Three-River-Source Ecological Construction Project. These initiatives have promoted ecosystem protection and restoration. Research on the characteristics and trends of China' s ecological problems, and analysis of the challenges facing ecological protection, provide the scientific foundation for improving conservation policies and ensuring national ecological security.

1 Status and Trends of Ecological Problems

Due to climatic and geographical conditions, China' s ecological environment is fragile and highly sensitive to human disturbance. Additionally, the long history, large population, and rapid economic development have led to intensive resource exploitation, causing significant impacts on natural ecosystems such as forests, grasslands, and wetlands. This has resulted in a series of serious ecological problems, including low ecosystem quality, soil erosion, desertification, rocky desertification, wildlife habitat destruction, and watershed environmental degradation.

1.1 Ecological Vulnerability and Low Ecosystem Quality and Service Functions

Affected by geographical and climatic conditions, China' s ecological environment is fragile, with vulnerable areas accounting for over 60% of the national territory, particularly in northwestern arid and semi-arid regions, the Loess Plateau, southwestern mountainous areas, and the Qinghai-Tibet cold region. The quality and service functions of national forests, shrublands, and grasslands are low. Low-quality and poor-quality ecosystems account for 43.7%, 60.3%, and 68.2% of the total area of these three types, respectively, while high-quality ecosystems comprise only 5.8%, 11.7%, and 5.4% of the respective totals. In some areas, ecosystem quality and service functions continue to decline, with 17.6% of forests, 14.4% of shrublands, and 34.7% of grasslands experiencing varying degrees of degradation. Forests and shrublands with declining quality are mainly distributed in the Greater Khingan Mountains, the Wenchuan earthquake disaster area, southeastern Yunnan, and parts of southern and eastern Qinghai-Tibet Plateau. Degraded grassland ecosystems are primarily found in central Inner Mongolia, western Qinghai-Tibet Plateau, southern Tianshan Mountains in Xinjiang, and northwestern Sichuan.

1.2 Severe Land Degradation Problems

Land degradation in China is mainly manifested as soil erosion, land desertification, and rocky desertification.

1.2.1 Soil Erosion Soil erosion is widespread across China. In 2010, the total area of water erosion reached 1.6775 million km^2, accounting for 17.8% of the national territory. Extremely severe and severe erosion accounted for 22.5% of the total erosion area, while mild erosion comprised 58.1%. Regions with severe soil erosion are mainly distributed in the Loess Plateau and southwestern China, with extremely severe erosion occurring primarily in the Loess Plateau and parts of Sichuan and Yunnan. Eastern regions show relatively mild erosion intensity. Over the decade, the national soil erosion area decreased from 1.7778 million km^2 to 1.6775 million km^2, a reduction of 5.6%. The proportion of extremely severe erosion areas decreased most significantly, by 16.1% (see Table 1). During this period, erosion intensity generally declined in severely affected areas, though it increased in some southern regions. The Loess Plateau showed large-scale reductions in soil erosion intensity, with decreases also observed in the Qinling-Daba Mountains, Three Gorges Reservoir area, Dalou Mountains, Miaoling Mountains, and Xianxia Mountains. However, erosion intensity increased significantly in the Min Mountains, Qionglai Mountains, southeastern Tibet, central and southern Yunnan, central Guangxi, and northern Guangdong.

1.2.2 Land Desertification China has large areas of desertified land, predominantly in extremely severe and severe categories. In 2010, desertified land covered 1.8235 million km^2, accounting for 19.0% of the national territory. Desert and Gobi areas comprised 51.8% of desertified land, while extremely severe, severe, and moderate desertification accounted for 16.6%, 22.5%, and 7.6%, respectively. Desertified land is mainly distributed in northwestern China and parts of southwestern, northern, and northeastern regions. Xinjiang, Inner Mongolia, and Tibet have the largest desertified areas, together accounting for 82.0% of the national total. Over the decade, the overall desertified area decreased by 116,100 km^2 (6.0%) (Table 2), though local severity increased. Extremely severe desertification areas decreased, while mild desertification increased. Desertification alleviation occurred mainly in northeastern Inner Mongolia, northwestern Loess Plateau, and northern Xinjiang, while aggravation was observed in central Inner Mongolia and western Tibet.

1.2.3 Rocky Desertification in Southwest China Rocky desertification is distributed across karst regions in eight provinces: Guizhou, Yunnan, Guangxi, Sichuan, Hunan, Guangdong, Chongqing, and Hubei, covering a total area of 95,600 km^2 (17.9% of these provinces' combined area). Moderate and mild desertification dominate, accounting for 27.2% (26,000 km^2) and 62.6% (59,800 km^2) of the total, respectively. Severe rocky desertification covers 9,800 km^2 (10.3%), mainly in Guizhou, Yunnan, and Guangxi. Over the decade, rocky desertification improved overall, particularly in most of Guizhou and southwestern Yunnan, with a 4.7% reduction in area (Table 3), though some local areas experienced deterioration.

1.3 Increasing Ecosystem Artificialization and Declining Wildlife Habitats

Over the decade, artificial forests, reservoir wetlands, and urban areas grew significantly, while natural forests, marsh wetlands, and natural grasslands continued to decline, intensifying ecosystem artificialization. Artificial forests now account for approximately one-third of the total forest ecosystem area, with eucalyptus plantations continuing to expand. For example, in Hainan, pulp and paper forests (mainly eucalyptus) reached 1,941 km^2 in 2010, representing 21.1% of the province' s forest area—a 70.3% increase from 2000. Urban areas increased by 55,600 km^2 (28.0%) over the decade. The country has 87,900 reservoirs covering 52,800 km^2 with a total capacity of 716.2 billion m^3, accounting for 26.1% of total terrestrial water bodies and 23.0% of total river runoff. Reservoir area increased by 3.1% during this period, while the proportion of natural river sections continued to decline. Natural forests, shrublands, grasslands, and marshes all decreased in area, with natural forests declining by 10.3%. Eastern lake areas shrank, natural coastline length decreased by 1,078.5 km (10.7%), and coastal natural wetlands lost 1,800 km^2 (14.9%) (Table 4). Wildlife habitat areas continue to be lost or reduced, with habitat quality declining, remaining the primary challenge for biodiversity conservation.

1.4 Severe Watershed Ecological Destruction and High Ecological Risks

Large-scale water resource and hydropower development has severely impacted river ecosystems, causing river depletion, wetland loss, increased wastewater discharge, severe water pollution, biodiversity decline, and reduced ecological regulation functions. The Yangtze River Basin, Yellow River Basin, and Hai River Basin show particularly significant environmental degradation.

1.4.1 Yangtze River Basin The middle and lower reaches of the Yangtze River have experienced intensive artificial development along riverbanks. In 2010, the proportion of natural ecosystems within 1,000 meters of the riverbank was 80.2% in the upper reaches, 53.6% in the middle reaches, and 45.7% in the lower reaches. Natural wetlands have been severely lost, with marsh wetlands decreasing by 742.1 km^2 and lakes by 220.7 km^2 over the decade. Ecosystem quality remains low, with only 13.6% of forest ecosystems and 52.7% of grassland ecosystems rated as good or excellent. Desertified land accounts for 5.8% of the basin area, and rocky desertification 3.1%. Soil erosion is severe, covering 575,900 km^2 (32.3% of the basin area), with total soil loss reaching 1.018 billion tons in 2010—3.5 times that of the Yellow River Basin. Geological disasters such as landslides and debris flows are serious. Water resource development is intensive, with 46,000 reservoirs built in the basin, totaling over 230.7 billion m^3 in capacity (24.0% of the Yangtze' s average annual flow into the sea). Reservoir construction and operation have severely impacted downstream river and lake ecosystems; for example, after the Three Gorges Project began oper-

ation in 2003, Poyang Lake' s dry season water surface shrank by 25% during 2004-2010. Intensive hydropower development in upper tributaries has caused widespread river depletion. Wastewater discharge has increased significantly, with industrial and domestic water use reaching 101.51 billion m^3 and wastewater discharge totaling 44.49 billion tons in 2010—up 43.7% and 47.5% from 2000, respectively, with increasing proportions from the middle and upper reaches. While water quality in the main stream and major tributaries has improved, quality in third-level and smaller tributaries has deteriorated. Among 51 major lakes in the basin, 16 (31.4%) are moderately or heavily eutrophic, with pollution and eutrophication in Dianchi, Chaohu, and Taihu lakes becoming major obstacles to regional economic and social development. Biodiversity has declined severely due to river depletion, pollution, and dam construction, which have caused river fragmentation, disconnection between rivers and lakes, and habitat degradation. The Yangtze' s aquatic biodiversity has suffered greatly, with the Baiji dolphin functionally extinct and populations of finless porpoises and Chinese sturgeon declining toward extinction.

1.4.2 Yellow River Basin Ecosystem quality is low, and soil erosion remains severe. Only 7.4% of forest ecosystems and 30.0% of grassland ecosystems are rated good or excellent. Soil erosion affects 63.7% of the basin area, and desertified land accounts for 9.0%. Water resources are overexploited, causing severe river depletion. Increasing water resource development has led to more rivers drying up, longer dry river sections, and extended dry periods. Among 27 major tributaries of the Yellow River, 11 are perennially dry, and the lower main stream has become an artificially controlled "water channel." Pollutant discharge has intensified, with average annual wastewater discharge reaching 4.216 billion tons during 2000-2010—double the 2.17 billion tons in the 1980s and nearly 30% higher than the 3.26 billion tons in the early 1990s. Water pollution is severe; in 2009, 45.3% of the main stream and 75.5% of tributaries had water quality worse than Class III, increasing to 56.0% of the main stream in 2010.

1.4.3 Hai River Basin Ecosystem quality is low, with only 4.6% of forest ecosystems and 44.4% of grassland ecosystems rated good or excellent. Soil erosion affects 30.7% of the basin area. Water resources are overexploited, with total development reaching 98% and shallow groundwater overexploitation reaching 110.4%—far exceeding internationally recognized reasonable (30%) and limit (40%) thresholds. By 2011, shallow groundwater overexploitation areas covered 58,300 km^2 (45.54% of the basin area), forming 11 large groundwater funnels covering 1.82 km^2 in Tangshan, Beijing' s Shunyi-Tongzhou, and Beijing' s Fangshan areas. River depletion is severe, with 60% of rivers showing declining runoff and over 50% showing significantly increasing dry days during 1990-2010. Water pollution is serious, with 63.8% of river sections worse than Class III water quality, and 76.45% of plain area groundwater contaminated.

1.5 Uncontrolled Urban Expansion and Deteriorating Living Environments

Urban sprawl is widespread across China. Over the decade, among 17 major cities in six key urbanization regions, the main urban areas expanded substantially—Chongqing, Suzhou, Wuxi, and Changzhou increased 2-4 fold, while Beijing, Tianjin, Chengdu, Wuhan, and others exhibited sprawling, single-center expansion patterns. Ecological regulation functions continue to decline, with all major cities experiencing intensifying heat island effects. For example, the proportion of "high-temperature areas" in Shanghai's main urban zone increased from 9.2% in 2000 to 47.7% in 2010. Urban waterlogging disasters are frequent, with 62% of cities experiencing waterlogging in recent years, 74.6% of which had maximum water depths exceeding 50 cm, seriously affecting residents' lives. Urban air pollution is severe, increasing health risks. Urban green spaces have simple structures with high proportions of exotic plants—for instance, exotic species account for 52.7% of plant species in Beijing' s urban area—resulting in low wildlife diversity and populations.

1.6 Dramatic Coastal Zone Changes and Continuous Loss of Natural Shorelines and Coastal Wetlands

Natural shorelines have decreased significantly. Over the decade, industrial development, urban construction, and aquaculture reduced natural shoreline length from 8,933.6 km to 7,680.3 km, with the proportion dropping from 54.6% to 44.1%, while artificial shorelines increased from 45.4% to 55.9%. Natural wetland area decreased from 11,923.5 km^2 to 10,148.9 km^2 (14.9% reduction), while artificial wetland area increased from 11,817.3 km^2 to 14,805.1 km^2 (25.3% increase). The continuous loss of natural shorelines and coastal wetlands has degraded beach ecological service functions, caused wildlife habitat loss, and reduced nearshore pollution purification and disaster prevention capacities.

1.7 Severe Ecological Destruction from Mineral Resource Development and High Environmental Risks

Mineral resource development expanded rapidly over the decade. In 2010, there were 52,566 mining sites covering over 5 hectares, distributed across 1,774 counties. Newly added mining areas totaled 2,285.17 km^2, accounting for 32.26% of the 2010 total mining area, with 55% of new areas in western regions. Among 25 national key ecological function zones, 24 have mining activities, accounting for 15.5% of the national mining area. Mineral development has caused severe ecological destruction and environmental pollution, with frequent secondary geological disasters including land subsidence, landslides, ground fissures, and dam failures causing major losses. For example, a tailings dam failure in Xiangfen County, Shanxi Province on September 8, 2008 killed 277 people. On July 3, 2010, a sewage leakage at Zijin Mining in Shanghang County, Fujian Province poisoned thousands of tons of fish in the Tingjiang River. Unregulated rare

earth mining in Ganzhou, Jiangxi caused severe ecological damage requiring 38 billion RMB for restoration.

2 Challenges in the Ecological Protection Management System and Mechanisms

China' s ecological and environmental problems stem from natural and historical factors but are mainly caused by blind, unregulated, and excessive resource development. Deep-seated factors include imperfect institutions, unsound mechanisms, unfulfilled responsibilities, and inadequate reforms.

2.1 Imperfect Top-Level Design and Unfulfilled Responsibilities

China' s current ecological protection system is based on separate management of ecological types (forests, grasslands, lakes, rivers, oceans) and elements (meteorology, land, water resources), lacking a unified ecosystem protection and regulatory agency. This fragmented management leads to unclear responsibilities and low efficiency. Moreover, regulatory departments often serve as both "athletes and referees," with resource development, protection, and supervision functions undifferentiated, making effective ecosystem protection difficult. Government and enterprise responsibilities for ecological protection are unclear and unfulfilled.

2.2 Outdated Conservation Concepts Overemphasizing Artificial Construction

Practice shows that artificial ecosystems provide far lower service functions and ecological benefits than natural ecosystems. In China' s ecological protection and construction, inadequate planning and evaluation precede projects, with emphasis on construction over management. Ecological restoration does not follow ecological principles, overemphasizing artificial measures such as afforestation, grass planting, and site modification while neglecting natural protection and recovery. Large-scale planting of commercial forests and plantations (eucalyptus, poplar, slash pine, Japanese larch) has resulted in high costs, intensified ecosystem artificialization, declining ecosystem quality, natural habitat loss, degraded service functions, and reduced capacity to provide ecological products.

2.3 Strategic Planning Without Implementation Mechanisms

Major Function Oriented Zoning and ecological function zoning are strategic plans that cannot implement conservation requirements at specific land parcels. China' s current land use planning classification system is based on socioeconomic attributes, categorizing land only as agricultural, construction, or unused, without considering ecological service functions. The absence of an "ecological land" category means water bodies, beaches, marshes, and natural reserves are classified as unused land, preventing land providing ecosystem services from

being protected in planning and management. This hinders the implementation of ecological security patterns at specific locations and the integration of conservation requirements in agricultural development, urban construction, and resource exploitation.

2.4 Fragmented Management and Low Efficiency of Conservation Projects

China lacks unified planning for national ecological protection and restoration, with multiple project types, management departments, and dispersed funds leading to redundant projects. Implementation lacks scientific rigor, emphasizing construction over management, lacking long-term mechanisms, and resulting in low cost-effectiveness. Ecological compensation lacks systematic institutional design, with blurred connotations leading to numerous compensation categories, multiple management departments, and inadequate supervision mechanisms. Confusion between ecological compensation and social development support, ecological damage compensation, and construction projects disperses funds and yields unclear policy effects.

2.5 Lack of Ecological Concepts in Urban Construction and Management

Urban construction focuses excessively on roads, buildings, and infrastructure, with rapid, uncontrolled, sprawling development being common. Urban form, land use layout, and green space construction neglect the protection and enhancement of ecological regulation functions, causing intensified heat island effects, aggravated waterlogging, and biodiversity loss, while worsening urban environmental pollution and living conditions. Urban development lacks coordinated ecological concepts between cities and regions, ignoring urbanization' s environmental impacts and regional ecological support functions. Blind, unregulated, and excessive resource development is widespread and serious, causing natural ecosystem and wildlife habitat loss, declining regional ecological carrying capacity, river depletion and pollution, natural wetland loss, lake eutrophication, and acid rain, which have become major obstacles to sustainable urbanization and economic development.

2.6 Lack of Scientific Evaluation and Performance Assessment Mechanisms

China has not established scientific, independent environmental evaluation mechanisms or unified survey and assessment platforms and teams. For a long time, conservation effectiveness assessment has focused only on single ecological elements, with self-evaluation of construction projects being common. Assessment indicators and mechanisms are not designed from the perspective of ensuring national and regional ecological security, resulting in the simplistic equation of artificial afforestation and grass planting with ecological protection and restoration, which intensifies ecosystem artificialization.

3 Countermeasures and Recommendations

Based on the ecological civilization deployment of the 18th Party Congress and the Third Plenary Session of the 18th Central Committee, and focusing on building a beautiful China, deepening ecological civilization system reform, accelerating ecological civilization institution building, strengthening ecological and environmental protection, and ensuring national and regional ecological security, the following countermeasures and recommendations are proposed.

3.1 Implement New Conservation Concepts and Improve National Strategies

Implement the new concept that "protecting the ecological environment protects productivity, and improving the ecological environment develops productivity." Adhere to principles of respecting and conforming to nature, prioritizing protection, and focusing on natural restoration. Implement the strictest environmental protection systems. Formulate national and regional economic and social development plans, regional development strategies, industrial layouts, and urban plans based on resource and environmental carrying capacity to foster production and lifestyles compatible with ecological protection, fundamentally reversing environmental degradation trends. Seize opportunities from urbanization and industrialization to adjust urban household registration, rural land transfer, agricultural industrialization, and conservation funding allocation policies to reduce rural populations' economic dependence on ecosystems and guide population concentration in cities, thereby promoting ecological protection and restoration.

3.2 Reform the Environmental Management System and Establish Institutional Frameworks

Adopt integrated ecosystem management concepts, reform and rationalize environmental management mechanisms, and replace the current fragmented system based on types and elements with strengthened comprehensive ecosystem protection and management. Enhance the ecological protection supervision functions of environmental protection authorities and establish a unified ecological and environmental protection supervision mechanism. Establish ecological protection systems for territorial space development to optimize ecological spatial patterns. Create ecological asset and ecosystem production value accounting mechanisms, integrating ecological assets, damage, and benefits into economic and social development evaluation systems to form target systems, assessment methods, and incentive mechanisms reflecting conservation requirements. Establish resource 有偿 use systems and a unified national ecological compensation mechanism that reflect ecological value and intergenerational equity, coordinating compensation funds and clarifying compensation scope, standards, and recipient responsibilities. Improve ecological protection accountability and ecosystem damage compensation systems. Actively pilot ecological product and service trading to promote mutually beneficial cooperation between service providers

and beneficiaries and develop market-based conservation mechanisms. Advance the formulation of an Ecological Protection Law.

3.3 Define "Ecological Land," Delineate and Strictly Enforce Conservation Red Lines, and Build Scientific Ecological Security Patterns

To ensure national and regional ecological security, China should promptly define "ecological land"types, which should account for over 55% of total terrestrial area, and designate areas with extremely important ecosystem service functions as ecological conservation red lines, covering over 35% of terrestrial area. Municipal and county governments should integrate red line ranges into land use planning and establish unified ecological compensation mechanisms based on them. The State Council should promptly formulate and promulgate ecological red line management measures to clarify and standardize delineation procedures, management measures, assessment mechanisms, and supporting policies.

3.4 Prioritize Protection, Improve Policies, and Promote Natural Recovery

Ecological protection and management should aim to enhance ecosystem service functions and improve the capacity to provide products and services. Prioritize protection and natural recovery, scientifically standardize ecological construction and restoration, and conduct scientific evaluation and restriction of artificial afforestation and grass planting projects, following the principle of "appropriate forest where suitable for forest, grass where suitable for grass, and wilderness where suitable for wilderness." Implement "returning artificial commercial and economic forests to ecological forests" in important ecological function zones. Improve ecological construction policies by increasing economic subsidies for closed forest and grassland restoration to promote natural recovery.

3.5 Coordinate Regional Conservation Projects and Promote Regional Protection and Restoration

Focus on nationally important ecological function zones and ecological security barrier zones to enhance ecosystem service functions. Formulate a unified national ecological protection and construction plan to coordinate major regional projects, changing the current fragmented management situation. Mobilize both central and local governments to promote cooperation between ecological function beneficiaries and providers, diversify conservation funding, and advance major ecological protection and restoration projects in central and eastern regions, particularly in important water source areas and biodiversity conservation priority zones in southeastern China and the middle route of the South-to-North Water Transfer Project. In major project areas, vigorously develop basic and vocational education to drive ecological migration through educational migration, change rural energy structures, improve ecological compensation policies, and reduce local farmers' and herders' utilization and economic dependence on ecosystems.

3.6 Enhance Urban and Urban Agglomeration Ecological Functions to Promote Healthy Urbanization

In national urbanization strategies, strengthen urban ecological security awareness and requirements, strictly control uncontrolled urban expansion and scale, improve land and resource use efficiency, prevent ecological damage from urbanization, avoid the "destroy first, restore later" path, and promote healthy urbanization development. In urban agglomeration planning, prioritize ecological principles by determining ecological land before planning construction land. Strengthen urban ecological protection and construction in planning, development, and management, determining urban development scale, direction, and spatial structure based on regional ecological carrying capacity. Add special ecological environment planning in urban master plans, promote ecological building and community construction, and establish mechanisms and policies for resource conservation, renewable resource utilization, and recycling.

3.7 Promote Integrated Watershed Management to Ensure Sustainable Socioeconomic Development

Addressing severe watershed ecological degradation and security challenges requires comprehensive coordination among watershed resource and environmental carrying capacity, industrial layout, urbanization patterns, and ecological protection. Promote integrated watershed ecological management. Promptly launch ecological security strategy studies for key basins including the Yangtze (Yangtze Economic Belt), Yellow River, and Hai River (Beijing-Tianjin-Hebei), focusing on watershed ecological surveys, risk assessment, and protection measures to formulate watershed ecological restoration and comprehensive management plans for sustainable socioeconomic development.

3.8 Strengthen Resource Development Supervision and Implement Conservation Responsibilities

Change the current fragmented supervision of resource development by establishing a unified supervision mechanism. Strictly prohibit all resource development, prospecting, and mining activities in ecological red line zones. Establish an integrated space-ground resource development supervision platform for all-weather monitoring to promptly detect and handle violations. Incorporate resource development environmental protection into local government environmental protection target responsibility systems, regularly evaluate responsible persons, and include results in their performance assessments. Conduct quantitative assessments of ecological damage caused by resource development.

3.9 Enhance Scientific and Technological Support and Establish Long-Term Ecological Survey and Assessment Mechanisms

Increase national investment in ecological protection and restoration technology to enhance scientific support capacity. Build a national ecosystem survey

and assessment system, forming an integrated space-ground national ecological environment survey and assessment network to conduct national ecological status and change surveys every five years, providing basic data for planning and government assessment.

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Note: Figure translations are in progress. See original paper for figures.