Constructing the Third Pole National Park Cluster is Tibet's Scientific Decision for Implementing the Major Strategy of Main Functional Areas and Pursuing Green Development (Postprint)

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Abstract

Establishing the Third Pole National Park Cluster represents a scientific decision for China' s Tibet Autonomous Region to implement the major functional zoning strategy and pursue a path of green development. Through analysis of the transformation of Tibet' s development drivers, the central government' s developmental positioning of Tibet, and the growth trends in human consumption demand, this study expounds the fundamental understanding that the construction of the Third Pole National Park Cluster conforms to the principles of sustainable development in Tibet. It proposes prioritizing the protection, inheritance, improvement, and optimization of natural and cultural ecosystems within the national park cluster construction, serving as a crucial state-led instrument for enriching Tibet' s people, revitalizing Tibet, and benefiting all humanity, while insisting on a scientific development model grounded in scientific research, planning, and management. Drawing upon domestic and international national park construction experiences and research topics, a research framework for Tibet' s National Park Cluster construction has been established, centering on the planning scheme for the Third Pole National Park Cluster. Forward-looking foundational research preceding the planning phase will investigate the value of natural resources and cultural heritage, tourism environmental capacity, and enhancement potential of the mountain-water-forest-farmland-lake system within the Third Pole National Park Cluster, while post-planning efforts will develop resource monitoring technologies and operation management information platforms, thereby providing systematic scientific and technological support for building the Third Pole National Park Cluster into the world' s most influential and attractive national park cluster.

Full Text

Abstract

Third Pole National Park Group Construction is a Scientific Choice for Implementing the Major Function Zoning Strategy and Pursuing Green Development in Tibet, China

Building the Third Pole National Park Group represents a scientific decision for Tibet Autonomous Region to implement the national major function zoning strategy and pursue a green development pathway. Through analysis of Tibet' s transformation of development drivers, the central government' s positioning of Tibet' s development, and the growing trends in human consumption demand, this study demonstrates that constructing the Third Pole National Park Group aligns with the fundamental principles of sustainable development in Tibet. The paper proposes that protecting, inheriting, and optimizing natural and humanistic ecosystems should be prioritized in the national park group construction, serving as a crucial state-led initiative to bring prosperity to border areas and local people while benefiting all humanity. The development model must adhere to scientific research, scientific planning, and scientific management.

Drawing on domestic and international national park construction experience and research topics, this study establishes a research framework for Tibet' s national park group construction, with the Third Pole National Park Group planning scheme at its core. Forward-looking research should investigate the value of natural resources and cultural heritage, tourism environmental capacity, and the enhancement potential of the mountain-water-forest-farmland-lake system. Backward-looking research should develop resource monitoring technologies and operational management information platforms. This systematic scientific support aims to build the Third Pole National Park Group into the world' s most influential and attractive national park cluster.

Keywords: Third Pole, national park, Tibet, green development, major function zoning strategy

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1. The Third Pole National Park Group as a New Driver for Tibet' s Third Development Stage

Since 1959, Tibet has experienced two critical development phases. The first phase began during the "Eighth Five-Year Plan" period, marked by the development of modern agriculture and animal husbandry in the "One River, Two Tributaries" key base, which elevated Tibet to its first development stage. This fundamentally transformed agricultural and sideline product production and supply, significantly improving basic living standards. Compared with 1990, the largest increases in agricultural output by 2005 were peanuts (1,300% growth), green fodder (448%), vegetables (408%), rapeseed (267%), and fruits (103%),

while major crops like rice, wheat, and highland barley also achieved growth rates of 55-66%.

The second phase emerged during the Western Development Strategy, particularly through new urbanization and new rural construction in recent five-year plans, which lifted Tibet to its second development stage. The proportion of modern industry and service economy increased substantially, with urbanization rates rising from 21.13% in 2006 to 27.74% in 2015, breaking the long-term stagnation of urbanization in Tibet. This enabled Tibetan people to share the fruits of reform and opening-up and achieve synchronized realization of the first centenary goal.

Looking ahead toward the second centenary goal, Tibet faces a major strategic question: exploring a competitive modernization path that meets ecological civilization requirements. This new development stage demands new models. While safeguarding ecological red lines and building ecological security barriers, scientific planning of all-for-one tourism will be crucial for Tibet' s next advancement. For vast areas with sparse population, limited conditions for agricultural and pastoral development, but outstanding ecological landscape values, constructing the Third Pole National Park Group represents the centerpiece of Tibet' s all-for-one tourism strategy and a new driver for propelling Tibet onto its third development stage. Tibet' s abundant energy and mineral resources can serve as strategic reserves to be developed when new technologies and processes can minimize disturbance to natural and humanistic ecosystems, creating future opportunities for Tibet' s economic status to rise again and enter a fourth development stage [FIGURE:1].

2. Alignment with Central Government' s Strategic Positioning for Tibet

Since the 18th Party Congress, the Party Central Committee with Comrade Xi Jinping at its core has established Tibet' s strategic positioning: an important national security barrier, strategic resource reserve base, plateau characteristic agricultural product base, protection area for Chinese national culture, and important world tourism destination. This scientific decision paints a grand blueprint for Tibet' s future. The Third Pole National Park Group construction directly supports the world tourism destination goal, contributes to ecological security barrier construction and protection of Chinese national culture, and facilitates national security barrier and strategic resource reserve base development, fully aligning with the central government' s strategic positioning for Tibet.

3. Adaptation to Growing Tourism Consumption Demand

Following the Qinghai-Tibet Railway' s opening in 2006, Tibet' s tourism industry developed rapidly. Within just six years, total tourist arrivals grew

from 929,000 in 2006 to 10.584 million in 2012—a 10.4-fold increase. The ratio of annual tourists to local permanent residents far exceeds that of eastern China, reaching 352.4%. This growth trend has continued, with new tourism formats like self-driving tours developing rapidly and extremely strong potential demand from international visitors. This trend conforms to fundamental human development patterns: as societies become affluent, the proportion of income spent on tourism, sightseeing, and experiences continues to increase. This demand growth inevitably drives appreciation of limited high-quality tourism resources. The development of ecological tourism, educational tourism, and high-end tourism continuously promotes tourism as an important field of green development. Therefore, Tibet' s prompt formulation of a scientific plan for the Third Pole National Park Group is urgently needed to standardize current tourism development toward ecological orientation and guide the creation of educational and high-end tourism.

Tibet' s outstanding advantages for national park construction can be summarized as: concentrated distribution of high-quality national park resources with distinctive features, relative separation between candidate national park areas and population-economic centers, and the fact that Tibet has not yet officially launched national-level national park construction.

4. Basic Principles for Constructing the Third Pole National Park Group

4.1 Prioritizing Protection, Inheritance, and Optimization of Natural and Humanistic Ecosystems

National parks emphasize protection first with development as secondary, allowing moderate development only under the premise of maintaining ecosystem integrity and authenticity. Tibet' s natural environment, dominated by alpine meadows, grasslands, and deserts under cold and arid conditions, exhibits vulnerability and instability. Due to the short development time of plateau ecosystems and harsh cold-arid moisture conditions, once destroyed, they easily degrade into deserts and gobi, making recovery extremely difficult. The vulnerability of the natural environment and irreversibility of ecosystem succession are crucial constraints for plateau national park construction.

As a concentrated settlement area for Tibetan compatriots, Tibet' s cultural history remains complete and unique. The unique Tibetan cultural atmosphere and traditions have created distinctive customs, values, religious beliefs, and artistic culture, forming magnificent human landscapes that constitute Tibet' s most precious spiritual and cultural wealth in the world' s cultural treasury and human development history. Therefore, maintaining the continuity of natural and humanistic ecosystems is the primary task of Tibet' s national park group construction. The Third Pole National Park Group must meet ecological civilization and national ecological security barrier construction requirements, prioritize natural and humanistic ecosystem protection, reasonably explore nat-

ural landscape and ecological experience values, establish national park brands, and achieve win-win outcomes between ecological protection and economic development through development of small areas.

4.2 State-Led Initiative for Prosperity and Human Well-being

Tibet' s fragile ecological environment makes it difficult to achieve prosperity through traditional industrialization and urbanization. Conventional economic growth models cannot achieve leapfrog development, especially under the background of ecological civilization and national ecological security barrier construction. Tibet must seek new economic drivers and innovative modernization models to avoid falling behind in achieving the second centenary goal.

Constructing the Third Pole National Park Group can effectively handle the relationship between humans and nature, development and protection. Through spatial and institutional integration, it strengthens protection of important ecosystem integrity and authenticity, achieving "large-scale protection, small-scale development."Leveraging national park brand effects promotes natural and cultural capital appreciation, enhances self-development capacity, and improves people' s welfare. Under the national park group framework, it standardizes eco-tourism product construction according to resource-environment carrying capacity and environmental capacity, improves resource utilization efficiency, reduces disorderly and extensive development, and ultimately achieves coordinated economic, social, and environmental development.

Since 2015, Tibet has independently designated three "national parks"—Namtso, Mount Everest, and Yarlung Tsangpo Grand Canyon—to boost tourism. However, their tourism-oriented functional positioning differs significantly from the national-level principle of "protection first with public benefit," even causing problems like tourism overload, livelihood difficulties, poaching, and overgrazing that must be avoided in national park construction.

4.3 Scientific Research-Based Development Model

National park construction complexity, combined with Tibet' s crucial ecological status and cultural background, requires scientific planning and rational implementation. Establishing national parks involves not only engineering technical issues like spatial planning, mountain-water-forest-farmland-lake system protection and restoration, and resource-environment carrying capacity monitoring and early warning, but also management system issues like land rights confirmation and use regulation, central-local fiscal authority division, as well as development mechanisms like concession operations, community development, and brand value enhancement. This complex systematic project requires comprehensive construction solutions.

Without systematic preliminary research and scientific support, blind advancement lacking resource-environment surveys and assessments, spatial layout studies, and environmental capacity calculations could harm the overall brand of the

Third Pole National Park Group. It may exclude important landscape and ecological resources from the national park system or cause irreversible damage or degradation due to development exceeding resource-environment carrying capacity and environmental capacity, leading to tourist overload. Therefore, enhancing scientific content in Third Pole National Park Group construction should focus on: (1) using the Second Tibetan Plateau Scientific Expedition as the foundation, following scientific laws as the basic characteristic; (2) providing complete services from basic demonstration, planning compilation to operation management to guarantee scientific design, construction, and management standards; (3) strengthening information technology and intelligent applications to make the Third Pole National Park Group a global leader in modern management tools.

5. Domestic and International National Park Development Experience

5.1 International National Parks

The United States established the world' s first national park—Yellowstone—in 1872 through congressional legislation and created the National Park Service in 1916, marking the beginning of a standardized national park system. Canada, Australia, New Zealand and other new world countries followed, establishing Banff, Royal, and Tongariro national parks before the 20th century. The national park concept gradually gained acceptance in Western European developed countries, with Sweden, the Netherlands, Spain, Finland and others establishing national parks. By World War II, the concept had spread to most Western developed countries and their colonies. After WWII, newly independent Asian, African, and Latin American countries joined the global national park network. After nearly a century of development, over 200 countries and regions have established more than 5,000 national parks.

International research on national parks continues to grow, focusing on ecosystems, dynamic evolution, nature tourism, impacts, attitudes, perceptions, communities, wildlife, diversity, disturbance, and climate change. Research has evolved from nature protection to interactions between national parks and stakeholders, environmental changes, and from single issues to multi-dimensional comprehensive studies. Main research areas include: (1) resource assessment, monetizing ecosystem service values; (2) environmental impact assessment of human activities and climate change; (3) development models, designing different approaches from management objectives, institutional arrangements, implementation, resource ownership, and funding; (4) planning, clarifying resource conditions, coordinating relationships, and standardizing management actions; (5) operation management, summarizing management experiences, evaluating effectiveness, and designing specialized management plans for visitors, community development, resources, and environment.

5.2 China' s National Park Construction

China' s national parks face characteristics including numerous community residents, complex land rights, multiple protected area affiliations, and departmental cross-management, determining unique features in China's national park system construction. China' s national park development has experienced nearly 10 years from local and ministerial advocacy to central committee resolution to national pilot organization. In 2006, Yunnan Diqing established Shangri-La Potatso National Park through local legislation. In 2008, the Ministry of Environmental Protection and National Tourism Administration designated Tangwanghe as a pilot. In 2013, the Third Plenary Session proposed "strictly promoting development according to major function zoning positioning and establishing a national park system." In 2015, 13 departments including the National Development and Reform Commission determined to select one area in nine provinces and municipalities for national park system piloting.

Although China' s national park system pilots have made progress in protected area integration, collective land use mechanisms, community development mechanisms, and management system construction, overall progress has lagged due to insufficient top-level design, weak theoretical foundations, and complex stakeholder relationships. Ten national park pilots have been established, including Great Wall, Qianjiangyuan, Wuyishan, Shennongjia, Nanshan, Shangri-La Potatso, Sanjiangyuan, Northeast Tiger and Leopard, Giant Panda, and Qilian Mountain, covering nature reserves, forest parks, geological parks, wetland parks, and scenic areas across 12 provinces and municipalities, totaling 188,000 km^2 (about 1.95% of national territory).

Research on China' s national parks has increased, focusing on concepts, nature and functions, management models, development processes, international experience comparison, and pilot problems, seeking suitable development models. However, current research still cannot scientifically support rational construction of a national park system with Chinese characteristics, particularly lacking in overall layout, construction procedures, selection criteria, human-park relationships, and planning and systematic management. For Third Pole National Park Group construction, only media reports exist without systematic scientific research. Urgent scientific and technical support is needed in feasibility, natural and humanistic baseline assessment, regional selection and spatial layout, planning design, community development, and management systems.

6. Research Framework for Tibet National Park Construction

6.1 Forward-Looking Research

6.1.1 Natural-Human Ecosystems and Landscape Values Using GIS, ecosystem structure and function, and regional socio-economic and cultural analysis, this research will identify the layout status and development needs of dif-

ferent types of protected areas in the Third Pole region, analyze natural-human ecological characteristics and layout features of important protected areas, construct a Third Pole protected area database and value assessment indicator system, scientifically evaluate natural-human ecological resources and landscape values, and determine the superiority ranking of national park resources. By comparing biodiversity and ecosystem service correspondence and identifying mismatches between protected area layout and ecological function gaps, it will propose an optimization construction timeline for the Third Pole National Park Group.

6.1.2 Resource-Environment Carrying Capacity and Vulnerability Assessment This research will analyze the natural ecological environment status of the Third Pole region, construct technical processes and evaluation systems for resource-environment carrying capacity and ecological vulnerability assessment and early warning, reveal variation patterns of carrying capacity and vulnerability components and their combinations, and enhance resource-environment carrying capacity. It will systematically review international national park construction models and management mechanisms for fragile ecosystems, summarize selection mechanisms, establishment procedures, and planning experiences. It will establish an eco-environmental capacity evaluation indicator system for protected areas including population capacity, land capacity, resource capacity, tourist capacity, and waste assimilation capacity, using comprehensive indicators like ecological footprint, ecological carrying capacity, and ecological deficit to determine environmental capacity thresholds after national park establishment based on dominant function positioning.

6.1.3 Life Community Capacity Enhancement for Ecological Restoration Based on resource-environment carrying capacity and vulnerability assessment, this research aims to enhance the comprehensive carrying capacity and environmental capacity of the Third Pole National Park Group. Targeting key carrying capacity and vulnerability weaknesses and combining overall objectives of national ecological security and major function zoning, it will design life community construction projects, implement systematic protection and restoration of mountain-water-forest-farmland-lake systems, explore integrated governance systems for natural resource property rights, territorial space development protection, watershed management, and ecological protection and restoration, optimize Third Pole National Park Group territorial ecological security and spatial development patterns, improve ecological protection compensation mechanisms, and enhance system adaptability and risk resistance.

6.2 Planning Development

6.2.1 Feasibility Study Compilation Through field investigations, data compilation, expert consultation, and case study analysis, this research will summarize characteristics, models, and lessons from international developed countries' national park systems, establish adaptive scenario simulation and

matching evaluation systems for multiple national park development models, study coordination and stress mechanisms between national park construction and natural-human ecology and regional socio-economic development, and propose optimization pathways. It will develop multi-level, multi-type national park development models for different zones, compile feasibility study reports for Third Pole National Park Group construction, and provide decision-making support.

6.2.2 Planning Scheme and Technical System Development This research will systematically review international national park planning techniques, propose functional zoning technology, protection levels, and control technology classification systems and standards for the Third Pole National Park Group, explore dynamic planning and fuzzy zoning theories compatible with protected area functional zoning, and develop dynamic planning technologies integrating multi-disciplinary techniques, multiple protection needs, and various ecological evolution models. Combining experiences from different protected area planning technologies in the Third Pole region, it will propose planning methods and system frameworks suitable for the Qinghai-Tibet Plateau context, establishing systematic planning content including resource classification and evaluation, functional zoning, zoning patterns, and management mechanisms based on natural resource distribution, environmental characteristics, and management needs, forming planning compilation technical guidelines for replicable and scalable experience in the Pan-Third Pole region.

6.2.3 Implementation Plans and Guidelines Using integrated technical methods combining indicator system construction, quantitative calculation, and spatial analysis, this research will study selection indicator systems and evaluation methods for the Third Pole National Park Group from perspectives of natural ecological resource types, human cultural heritage values, ecosystem integrity, and key biological protection objects, determine entry threshold conditions, and select candidate areas. Drawing on global national park development models, construction laws, and successful experiences, combined with assessment of China' s 10 national park pilot areas, it will analyze matching relationships between natural-human ecological subsystems, human activity subsystems, and development environment subsystems to determine optimized layout construction plans based on regional conditions and differentiated resource-environment characteristics [FIGURE:3]. It will establish systematic content including resource classification evaluation, functional zoning, land resource ownership, zoning patterns, management systems, and operational mechanisms oriented by dominant functions, forming implementation plans and standard guidelines.

6.3 Backward-Looking Research

6.3.1 Management System and Integrated Management Platform Through extensive investigation of global national park management mecha-

nisms and models and drawing on existing management experiences of different protected area types in the Third Pole region, this research will construct national park policy management mechanisms suitable for China' s national conditions with ecological protection and socio-economic coordinated development as objectives. It will study national park access and exit systems, management planning systems, park protection systems, and public participation systems. It will explore operational mechanisms covering standards, planning design, operation management, funding mechanisms, supervision mechanisms, community co-construction, and tourism utilization. For the high-cold, high-altitude geographical environment and human activity characteristics of the Third Pole region, it will develop zoned, classified, and optimized integrated management service platforms with intelligent modules for cultural protection, visitor monitoring, real-time monitoring, emergency rescue, and promotion. It will implement technical training programs for national park management personnel and propose implementation plans for follow-up consultation, training, and management technical support.

6.3.2 Automated Online Monitoring of Key Protection Objects and Ecosystem Services Based on ecological status diagnosis, ecological asset assessment, and resource-environment carrying capacity evaluation results, this research will identify important protection objects and key ecosystem services. By delineating monitoring scope, refining monitoring content, constructing monitoring indicators, determining monitoring methods, and developing monitoring data collection and management methods, it will develop monitoring technologies for important protection objects and key ecosystem services, forming disaster early warning and human stress management technologies and natural-cultural asset protection and control technology systems. It will build a national park resource-environment monitoring and management information platform, formulate zoned and classified management plans meeting national ecological security and regional ecosystem health requirements, and develop comprehensive management and control technical standards. Based on whole-process risk control and priority management principles, it will establish disaster early warning technologies, simulate system response mechanisms under multiple scenarios, and propose dynamic and adaptable control technologies.

6.3.3 Construction and Operation Evaluation Tracking the construction and operation management process of the Third Pole National Park Group, this research will design evaluation guidelines and standards for national park construction and operation. It will conduct natural asset zoning management, environmental stress classification management, public participation grading management, and coordinated development staging management, as well as research on relevant policies, regulations, and supervision platform development.

7. Research Value and Innovation Prospects

7.1 Scientific Value

7.1.1 Exploring Green Development Patterns in Natural-Human Ecologically Sensitive Areas The Third Pole region possesses abundant natural and human tourism resources but fragile and sensitive ecosystems. Developing scientific plans for national parks in such areas and constructing industrial economic development models with regional cultural characteristics will help explore green development patterns in natural-human ecologically sensitive areas, providing scientific foundations for national park construction and sustainable development in similar regions.

7.1.2 Developing Human-Nature Coordinated Development Models Through Third Pole National Park Group construction research, this study will explore regionally integrated planning and construction approaches led by national park planning in the Qinghai-Tibet region, and coordinated development models for human-land regional systems in ecologically fragile areas guided by national park construction. It will develop demonstration technologies including reasonable environmental capacity measurement methods and ecological protection-restoration engineering designs for enhancing resource-environment carrying capacity, promoting local green development and providing models for other ecologically fragile areas in China.

7.1.3 Advancing Landscape Spatial Organization Theory at Large Scales The Qinghai-Tibet Plateau exhibits outstanding large-scale landscape values with significant ecological capital appreciation potential. Exploring effective pathways to achieve regional ecological capital appreciation, green development, and ecological poverty alleviation integration through national park system construction at large scales, and summarizing theoretical foundations and optimization mechanisms for ecological capital appreciation, will provide strong momentum for building a beautiful and prosperous homeland in the Qinghai-Tibet region.

7.1.4 Exploring Modern Management Models Under Big Data and Intelligent Conditions Conducting feasibility and scientific scheme research for the Third Pole National Park Group will help explore effective models for national park construction and operation management in regions with high-cold, high-altitude, ecologically fragile and sensitive conditions and relatively sparse populations, providing important reference and demonstration for establishing similar national parks in China' s vast western regions.

7.2 Innovation Prospects

7.2.1 Constructing Natural-Human Ecosystem Capacity Enhancement Based on the unique natural-human resource ecological characteristics

of the Third Pole region, this research will construct evaluation methods for the Third Pole National Park Group' s resource ecological value, conduct objective assessments, identify and screen candidate national parks, analyze stress impact mechanisms of human activities, and propose life community engineering projects to enhance ecosystem service functions.

7.2.2 Developing Spatial Planning Technical Systems Under Carrying Capacity Constraints Oriented by coordinating various protected area plans and resolving spatial element conflicts, this research will overlay ecological protection, comprehensive land use, industrial development, public services, community development, and infrastructure construction layers under preset resource-environment carrying capacity thresholds. This will form an integrated layout master plan achieving "one plan, one blueprint" for national parks, implementing use control and transforming from multiple plans to unified planning, separate approvals to unified approval, and blueprint guidance to actual implementation.

7.2.3 Building Comprehensive Management and Control Technologies Based on structure and function analysis, ecological protection and economic development coordination, and unified management model research, this research will formulate zoned and classified management plans meeting Third Pole ecological security and regional ecosystem health requirements. Integrating key ecosystem service monitoring, disaster early warning, and human stress management methods, it will develop comprehensive management and control technical standards and an optimized integrated management platform with information storage, risk analysis, and trend prediction functions.

References

1. Chen Deliang, Xu Baiqing, Yao Tandong, et al. Scientific assessment of environmental changes on the Tibetan Plateau: past, present, and future. *Chinese Science Bulletin*, 2015, 60(32): 3025-3035.
2. Fan Jie, Xu Yong, Wang Chuansheng, et al. Ecological environmental effects of human activities in Tibet over the past half-century. *Chinese Science Bulletin*, 2015, 60(32): 3057-3066.
3. Yao Tandong, Yu Wusheng, Yang Wei, et al. Third Pole glacier changes and Earth system processes. *Science Focus*, 2016, 11(6): 55-57.
4. Zhang Xinshi. Establishing the alpine grassland national park on the Tibetan Plateau and developing plateau wildlife breeding industry. *Science China: Life Sciences*, 2014, 44(3): 289-290.
5. Zhang Yili, Wu Xue, Qi Wei. Analysis of characteristics and conservation effectiveness of nature reserves on the Tibetan Plateau. *Resources Science*, 2015, 37(7): 1455-1464.
6. Fan Jie, Wang Hai. Spatial analysis of population development and sustainable urbanization in Tibet. *Scientia Geographica Sinica*, 2005, 25(4): 385-392.

7. Fan J, Wang H Y, Chen D, et al. Discussion on sustainable urbanization in Tibet. *Chinese Geographical Science*, 2010, 20(3): 13-22.
8. Zhang J, et al. Monitoring the condition of natural resources in US national parks. *Environmental Monitoring and Assessment*, 2009, 151(1-4): 161-174.
9. Schwartz Z, Lin L C. The impact of fees on visitation of national parks. *Tourism Management*, 2006, 27(6): 1386-1396.
10. Southworth J, Nagendra H, Carlson L A, et al. Assessing the impact of Celaque National Park on forest fragmentation in western Honduras. *Applied Geography*, 2004, 24(4): 303-322.

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Figures

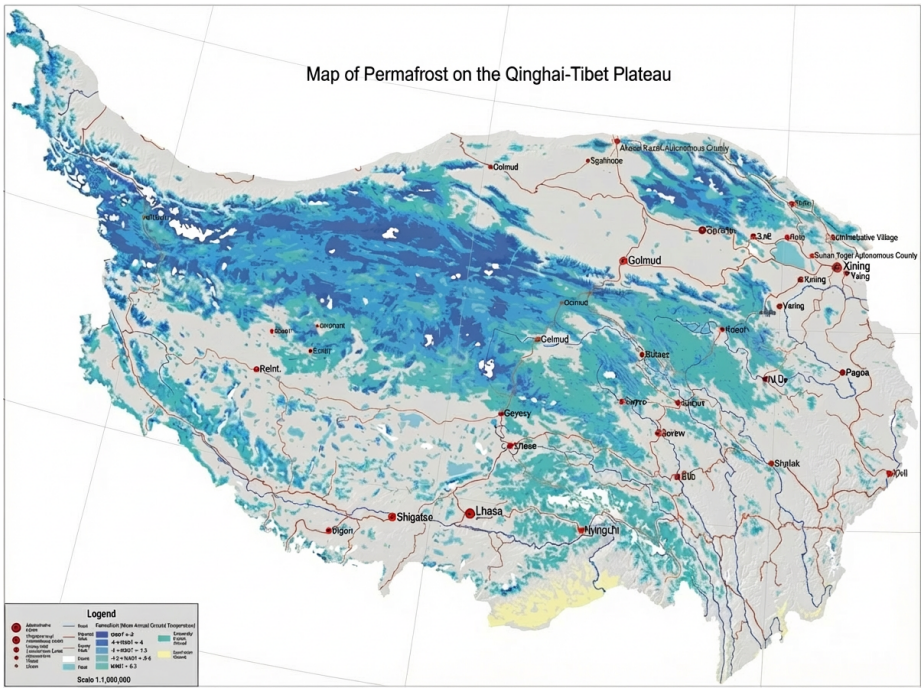

Figure 1: Figure 4

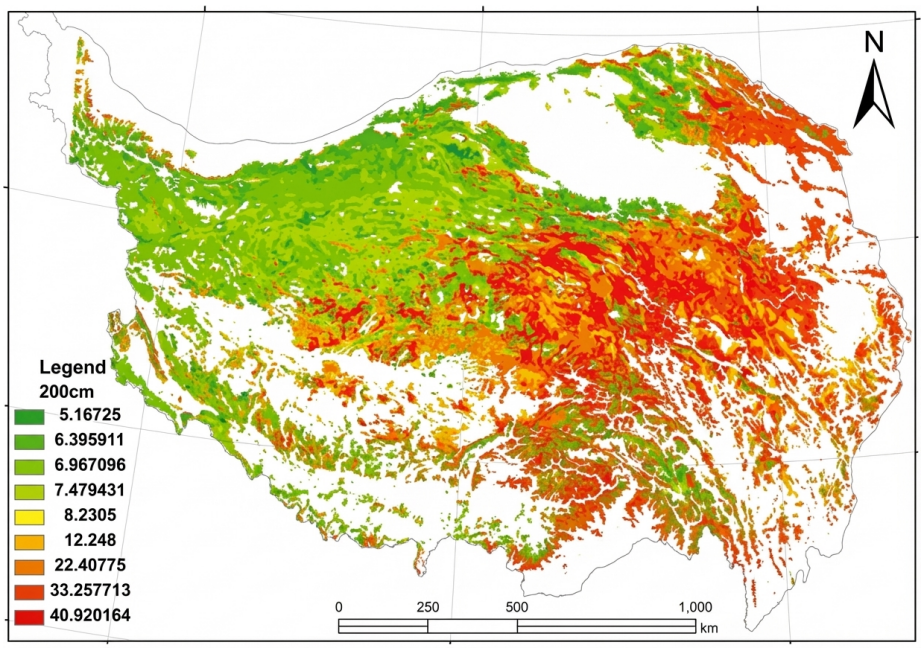

Figure 2: Figure 5