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Conservation Practice and Policy

Defining the balance point between conservation and development

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Abstract: *In the face of the current global ecological crisis and the threats it poses to human survival and security, the fundamental solution is to resolve the deep contradiction between conservation and economic development. We considered the 3 key and basic questions of why to protect, how much to protect, and where to protect natural areas. Human survival depends on functioning ecosystems and the ecosystem services they provide. In this regard, conserving core biodiversity conservation priority areas (BCPAs) can provide maximum conservation benefit. The goals of protected area (PA) systems globally and nationally must be clearly defined so as to sustain the survival and development of people and to coordinate and balance other objectives with this goal at the center. There is an urgent need to study, calculate, and define the extent of the natural world to ensure the well-being of people. We call this area over which natural areas of land and sea extend across the world or a country nature proportion (N%). Especially, a minimum area that ensures human survival should be protected, and we suggest that this area should cover core BCPAs so that it can achieve the maximum conservation benefit. These recommendations could be applied at global or national levels. The Chinese government proposes "developing a protected-area system composed mainly of national parks," and it has unified the administration of PAs into a central management authority. At this key time in the reform of the PA system, should this proposal be adopted, conservation will garner the greatest social consensus and support, and planning at the national level for BCPA coverage will be improved. We believe these recommendations are critical for China and other countries and extremely important for the world because they will pave the way toward a balance between nature conservation and human development as the projected human population reaches 10 billion by 2050.*

Keywords: biodiversity conservation priority areas, China, human well-being, minimum protected area, national park, nature proportion, N%, protected area, quantitative link

Definición del Punto de Balance entre la Conservación y el Desarrollo

Resumen: *De frente a la crisis ecológica que existe actualmente en el planeta y a las amenazas que esta presenta para la seguridad y la supervivencia humana, la solución fundamental es la resolución de la profunda contradicción entre la conservación y el desarrollo económico. Consideramos las tres preguntas clave básicas del por qué proteger, cuánto proteger, y en dónde proteger las áreas naturales. La supervivencia humana depende de los ecosistemas funcionales y los servicios ambientales que proporcionan. En este aspecto, la conservación de áreas nucleares de conservación de la biodiversidad (BCPA, en inglés) puede proporcionar un máximo beneficio de conservación. Los objetivos de los sistemas de áreas protegidas (AP) globales y*

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nacionales deben estar definidos claramente para mantener la supervivencia y desarrollo de las personas y para coordinar y balancear otros objetivos con esta meta central. Existe una necesidad urgente por estudiar, calcular, y definir la extensión del mundo natural para asegurar el bienestar de las personas. Llamamos a esta área a lo largo de la cual las áreas naturales terrestres y marinas se extienden sobre el planeta o algún país la proporción de naturaleza *(N%). Se debería proteger especialmente un área mínima que garantice la supervivencia humana, y sugerimos que esta área debería cubrir áreas nucleares de conservación de la biodiversidad (BCPA) de tal manera que pueda alcanzar el máximo beneficio de conservación. Estas recomendaciones podrían aplicarse a niveles mundiales o nacionales. El gobierno de China propone "el desarrollo de un sistema de áreas protegidas compuesto principalmente por parques nacionales", y ya ha unificado la administración de AP dentro de una autoridad central de manejo. En este momento importante dentro de la reforma al sistema de AP, de adoptarse esta propuesta, la conservación acumulará el mayor consenso y apoyo social, y mejorará la planeación a nivel nacional para la cobertura de BCPA. Creemos que estas recomendaciones son de suma importancia para China y otros países, además de ser extremadamente críticas para el planeta, pues trazarán el camino hacia un balance entre la conservación de la naturaleza y el desarrollo humano conforme la población humana proyectada llegue a los 10 mil millones para el año 2050.*

Palabras Clave: área protegida, área protegida mínima, áreas de prioridad para la conservación de la biodiversidad, bienestar humano, China, conexión cuantitativa, N%, parque nacional, proporción de naturaleza

摘要: *面对当前全球性生态危机和人类生存安全的严峻形势, 根本出路必须理顺和解决生态保护与社会发展之间的深层矛盾。我们认真反思了" 为什么保护、保护多少、保护哪里?" 这三个关键的基本问题。人类的生存取决于健康的生态系统提供生态系统服务, 保护生物多样性保护优先区可以提供最大的保护效益。我们建议: 全球 (或一国) 的自然保护地体系必须明确把"保障人民生存与发展"作为基本目标, 并以此为中心协调平衡其它目标; 必须尽快研究、计算、确定其目标面积, 以确保人民的福祉。我们称该目标面积占世界或一个国家的自然陆地/ 海洋范围的比例为" 自然比例 (N%) " 。目前最关键的是确保人民生存所需的最低比例; 并应优先覆盖生物多样性保护优先区, 使有限的面积比例能够形成最大的生态保护效益。这些建议适用于全球或每个国家。中国政府设立了"构建以国家公园为主体的自然保护地体系"的重要任务, 并已将各类自然保护地集中到一个机构进行管理, 在这个体系改革关键时期, 如果能够采纳这些建议, 中国的保护工作将获得最高的社会共识和支持, 并在国家层面规划提高对生物多样性保护优先区的保护覆盖。我们相信这些建议不仅对中国非常关键, 同时也对全球或其他国家至关重要, 将极大地缓解当前生态保护与社会发展矛盾、实现更大保护成效, 共同为到2050 年全球100 亿人口的生态安全提供保障。* ***翻译: 田德欣、解焱; 审校: 魏辅文***

关键词: 关键词:自然比例, N%, 人类福祉, 量化连接, 最低自然保护地面积, 自然保护地, 国家公园, 生物多样性保护优先区, 中国

Introduction

Biodiversity is the foundation on which human survival and development depends. However, in recent decades, global biodiversity has been declining rapidly and biodiversity loss has become a major factor threating human well-being (Butchart et al. 2010; Ceballos et al. 2017). From 1970 to 2012, the Living Planet Index showed a 58% overall decline in vertebrate population abundance, and this decline is likely to reach 67% by 2020 (WWF 2016). The Parties to the Convention on Biological Diversity (CBD) have agreed on a strategic plan to conserve biodiversity, the basis of which is the 20 Aichi targets. However, global efforts to address biodiversity loss have not been sufficiently comprehensive because the majority of the Aichi targets are not on track to be met by the 2020 deadline, and the situation likely will have worsened for some problems the targets address (Convention on Biological Diversity 2016; Laurans et al. 2018).

Protected areas (PAs) have long been the cornerstone of biodiversity conservation, but as of April 2016, <15% of the world's terrestrial and inland waters were protected (UNEP-WCMC & IUCN 2016), short of the Aichi target of 17%. In the sea, the Aichi target of protection of 10% of coastal and marine areas within national jurisdictions has been met, but only 4% of the world's oceans are covered by PAs (UNEP-WCMC & IUCN 2016). In China and internationally, a particular problem is that the existing system is based mainly on bottom-up decisions that have led to many gaps in biodiversity protection (Xie & Li 2004; Xie et al. 2014; Yang & Cao 2017). In addition, cross-departmental management (in China, over 10 departments are involved in PA management) has led to decentralization of management goals and law enforcement, insufficient financial and personnel support, and conflicting management objectives. And perhaps more troublesome, PA management is often at odds with local economic development and has been unable to gain support from broad social sectors (Xie & Li 2004; Xie et al. 2014).

Such problems have enabled illegal activities in established PAs throughout the world, including in China

(Watson et al. 2014). For example, many studies based on analysis of satellite images show deforestation within the boundaries of PAs, even in core areas (Mehring & Stoll-Kleemann 2011). A famous protected landscape in China, Jiuzhaigou, has several designations: national scenic and historical area, national nature reserve, national forest park, World Heritage site, and biosphere reserve. The management objectives associated with these designations are overlapping and sometimes conflicting, and it is unclear which set of objectives should take precedence. In some cases, areas that should have been strictly protected have been exploited and damaged (Xie et al. 2014).

Transformation and Opportunities

To address the above global problems, it is urgent to devise a global land-use planning strategy, which can be translated at subglobal and national levels, to coordinate and solve the contradiction between social development and conservation needs and to further strengthen and optimize the PA system. On this basis, further development of PA zonation and management planning should be designed to refine the list of permitted and prohibited activities by mapping "functional zones" in space and time (Geneletti & van Duren 2008; Hull et al. 2011). It is expected that the conservation gains for PA systems will be enhanced by following this improved zonation.

In a major effort to improve effective biodiversity conservation in China, the National Park System was recently expanded (10 new pilot parks were launched [Table 1]) in accordance with the 2017 report to the General Assembly at the 19th National Congress of the Communist Party of China, which specifies developing "a protected area system composed mainly of national parks" (Xi 2017*a*) and it has unified the administration of PAs into a central management authority (CPC Central Committee 2018). This specification creates a major new opportunity to advance conservation in China by applying the principles of conservation science to the design and operation of this system. How can the goal of establishing a PA system composed mainly of national parks (NPs) best be achieved and how can the value and significance of the PA system be maximized? This will also become an important demonstration of conservation in China and the world.

We (the Life Community Task Force) have over 20 years of experience in species and PA conservation in China and relevant international experiences and have been dealing with the practical and political problems of conservation. Our goal has been to identify a balance, even a synergy, between conservation and development, including providing important recommendations for PA law in China (Xie et al. 2014) and mainstreaming the value of biodiversity by promoting a system to support commercial products and services that are PA friendly (Tian et al. 2017). Through in-depth study and thinking beyond traditional conservation theory, we explored the inherent relationship between conservation and development from the perspective of economics, sociology, anthropology, and other interdisciplinary and cross-industry perspectives. Based on our studies, we believe the balance point between conservation and development has to be determined to mitigate the global ecological crisis and ensure human ecological security. Thus, 3 key questions regarding PAs need to be addressed at the global level: why protect, how much to protect, and where to protect. Global society needs to engage firmly in answering these questions so that a strong social-support system (e.g., policy, social, and economic) for global sustainable economic and social development can be achieved.

Why Protect

The IUCN reports that PAs are established to achieve the long-term conservation of nature and its associated ecosystem services and cultural values (Dudley 2008). Beginning with the establishment of Yellowstone National Park in the United Sates in 1872, NPs have been established around the world to protect natural beauty and ecosystems. In the mid-20th century, the conservation of endangered species was added to the goals of most PAs, and by 2000 preservation of ecosystem services and biodiversity was incorporated in PA goals. The goal of Chinese NPs is to protect the authenticity and integrity of the country's key natural ecosystems (General Office of the CPC Central Committee 2017).

Until recently, most goals of PAs in China and elsewhere, including NPs, did not clearly specify guaranteeing human well-being as a direct goal. Instead, multiple mandates, sometimes conflicting, have governed the management of PAs, making it difficult to obtain broad-scale support from society. Considerable research has now documented that functioning ecosystems are required for human well-being (Millennium Ecosystem Assessment 2005; Costanza et al. 2017; Haines-Young & Potschin 2018). Ecosystem services critical to people include provision of clean water and air, production of fertile soils, conservation of plants that sequester carbon, support for pollinators, and a host of other services (Costanza et al. 1997). The value of global ecosystem services is estimated to be US$125 trillion/year (Costanza et al. 2014), and China's giant panda (*Ailuropoda melanoleuca*) and its reserves alone provide ecosystem services worth US$2.6-6.9 billion/year (Wei et al. 2018).

Despite the importance of conserving ecosystem services, the overall global conservation situation is not good. Climate change, ecological degradation, and rapid loss of biodiversity, if continued at their present pace, threaten the survival of humankind (Butchart et al. 2010; Barnosky & Hadly 2014). Because nearly 5 billion more people will join the world in the coming decade (United

Table 1. Ten pilot national parks (NP) and biodiversity conservation priority areas (BCPA) in China.

Code	NP	Province	Area (km^2)	BCPA	Protected area coverage in BCPA (%) (Li. et al. 2016)	NP coverage in BCPA (%)*
1	Sanjiangyuan	Qinghai	123,100	Qiangtang-Sanjiangyuan	73.03	~15.97
2	Giant Panda	Sichuan, Gansu, Shaanxi	27,134	North of Min Mountains and Hengduan Mountains	31.81	~27.34
	Qinling Mountains		12.2	~6.58		
3	Northeast Tiger and Leopard	Jilin, Heilongjiang	14,600	Changbai Mountains	19.98	~19.55
4	Qilian Mountain	Gansu	50,200	Qilian Mountains	46.18	~49.97
5	Shennongjia	Hubei	1170	Daba Mountains	24.83	~3.07
6	Wuyi Mountain	Fujian	982	Wuyi Mountains	7.72	~1.24
7	Nanshan	Hunan	636	Nanling Mountains	9.52	~0.71
8	Putasto	Yunnan	602	South of Hengduan Mountains	26.5	~0.45
9	Qianjiangyuan	Zhejiang	252	Huangshan-Huaiyushan	11.01	~0.74
10	Great Wall	Beijing	60	Taihang Mountains	14.96	~0.10

**Estimates because some NPs have not published accurate boundary information. Information is combined from following sources: Li et al. (2016); Ministry of Environmental Protection (2010); General Office of the CPC Central Committee (2017).*

Nations, Department of Economic and Social Affairs, Population Division 2017), there is an urgent need to address these crises to ensure ecosystem function for the security of human beings.

This will require from global society a focus on human ecosecurity, a high degree of consensus, concerted action, and implementation of effective conservation. The unification of basic conservation goals and the recognition of the fundamental place of nature conservation in society are urgently needed. These will result in PAs becoming important natural areas that guarantee human survival and development; will build a direct and strong link between PAs and people; and will balance other objectives related to human well-being. In turn, it will unite government, enterprise, and society in an understanding of the necessity to maintain ecological function and allow more and better investment from all sectors of society into conservation and development of PAs.

This is a new understanding from the perspective of global macroscopic and philosophical aspects rather than conventional conservation science and technology and provides a strong theoretical basis for conservation in China and the world. Clarifying the new positioning and goals of PAs will provide strong theoretical support for actions that address major conservation problems, including the development of PA legislation and compensation policies, cooperation between conservation and development, acknowledgment of biodiversity value, and socioecological development, thereby increasing the likelihood that important natural ecosystems are sufficiently, powerfully, and effectively protected.

How Much to Protect

The basic relationship between PAs and human survival and development has been clarified, but how much natural area needs to be protected to meet human needs? What is the minimum proportion of PAs needed to ensure the basic survival of humankind? Is the amount and quality of existing PAs sufficient? These become important questions the world must study and answer as soon as possible.

At present, there are no well-founded answers to how much to protect. Although the Parties to CBD propose 17% of the land area and 10% of the ocean area (including coastal areas) as global targets, this pertains to only the average level countries can achieve by 2020, not PA coverage that will actually be needed to meet the needs of 10 billion people in the near future (United Nations Department of Economic and Social Affairs, Population Division 2017). Some suggest that 50% of the planet should be protected to meet the needs of biodiversity (Noss & Cooperrider 1994; Locke 2014; Dinerstein et al. 2017), but the data required to determine an objective and science-supported percentage of land to protect are lacking.

Therefore, we propose a novel concept termed *nature proportion* (i.e., N%). The N% is the minimum proportion

of natural areas on Earth or in a country required to meet the basic needs of people at peak human population in the world or a country. We acknowledge the multiple levels of human needs and that determining the N% will need to deal with this variability in needs in different ways. In view of the growing threats to nature and the predicted growth of the human population by 2050, the most critical issue now is to study and immediately guarantee protection of the minimum amount of PAs needed to ensure the survival of people in a country or the world. Thus, we must first specify N% as the clear and primary goal in conservation and PA development in every country and the world. Only in this way, can we establish the most direct and quantitative link between conservation and economic development and form a society-wide consensus to support conservation. Traditional conservation goals (aimed at endangered species, biodiversity, tourism, or ecosystems) within the N% can also be achieved because for the first time direct and quantitative links between these goals and human well-being will be established. A good example is the 120,000 km^2 arable red line in China (minimum arable land to meet basic needs of the Chinese nation). The policies and laws associated with the red line are accepted by all of Chinese society (Xi 2017*b*). Similarly, clear goals are urgently needed for PAs that balance the needs of human well-being and development with the need to secure ecological function.

Many approaches to ecosystem services valuation have been developed (Costanza et al. 2017; Mancini et al. 2018). For instance, Common International Classification of Ecosystem Services classifies the contributions ecosystems make to human well-being that arise from living processes (Haines-Young & Potschin 2018). However, identifying a coherent and quantitative link between human needs and different PA ecosystem types in different regions requires considerable research. We recommend carrying out research for calculating the N% for the world and every country and clearly stating the N% in relevant international conventions and global action plans. Success in this endeavor will be critical to ensure social consensus on the basic relationship between conservation and human survival and development. Such a link also provides a platform nationally and internationally for further interdisciplinary and cross-disciplinary research.

Where to Protect

Based on results of research and calculations of N%, every country should designate N% as PA to ensure their population's survival and development. The ecological-production capacity provided by an area should become the primary indicator of site selection. Relative to other types of PAs, biodiversity conservation priority areas (BCPAs) can provide vital ecosystem services; the rich biodiversity they harbor is the primary element in the production and delivery of these services. Therefore, these areas should be prioritized in the selection of PA sites. This new model will help BCPAs be effectively protected.

In 2006, the China Biodiversity Conservation Blueprint identified BCPAs throughout China by identifying key national conservation targets (species, communities, and ecosystem), analyzing their distributions and conditions, consulting experts, and setting quantitative conservation targets (Ministry of Environmental Protection 2010; Wu et al. 2011; Li et al. 2016). The BCPAs were identified based on species and ecosystems (i.e., species richness, rarity, endemism, conservation status, and ecosystem processes and functions). Thirty-five BCPAs (32 terrestrial and 3 coastal and marine) were recognized formally in the China National Biodiversity Conservation Strategy and Action Plan (2011–2030) (Ministry of Environmental Protection 2010). The scope of terrestrial BCPAs has been revised (Li et al. 2016), and a detailed analysis of their coverage of species and ecosystem factors has been conducted (Fig. 1). Due to lack of data, the analysis of marine priority areas (including coastal ecosystems) is not as far along, but it should be accelerated.

The ecosystem-service functions of these priority areas are of national and global importance, and their functional impact goes far beyond a local extent. However, in most parts of the world, the majority of PAs are in areas of relatively low productivity and often underrepresent or miss sites of high conservation value. Protected areas in China cover <30% of most BCPAs (only 7 out of 32 PCBAs have >30% protection). The BCPAs with little protection are located mostly in areas with large human populations, highlighting the need to balance conservation goals with the needs of people. At present, all pilot NPs are in BCPAs. However, more research is needed in the BCPAs where pilot NPs are located, as is further review of the location, extent, and zonation of the pilot NPs and their relationship with surrounding PAs in order to conserve the authenticity and integrity of biodiversity and ecosystems in those BCPAs. The last column in Table 1 (NP Coverage in BCPA) clearly shows that some NP pilots are doing well in conserving the authenticity and integrity of biodiversity and ecosystems in the BCPAs where they are located (e.g., Sanjiangyan, Giant Panda, Qilian Mountain, and Tiger and Leopard National Parks). However, all other pilots cover only a very low percentage (<4% and mostly <1%) of the BPCAs in which they are located.

The ongoing development of the Chinese PA system, composed mainly of NPs, is a unique opportunity to use modern conservation planning tools, spatial biodiversity data, and models of ecosystem services. Based on our above analysis, if NPs and other types of PAs are clearly positioned to ensure the survival and development of the Chinese nation, Chinese society as a whole will reach the consensus that PAs are a necessity. This will enable research to be conducted to define and ensure protection

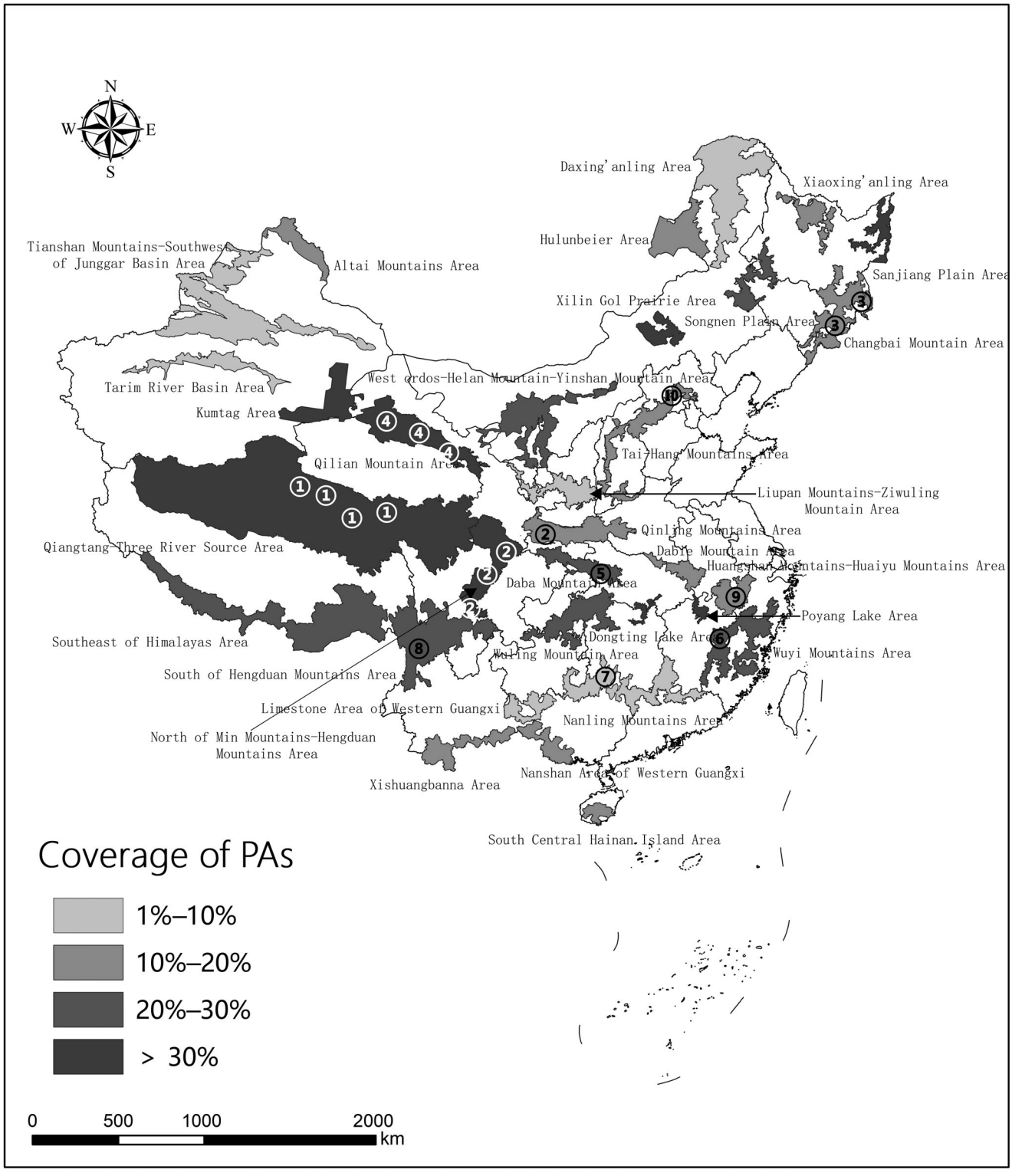

Figure 1. Location of pilot national parks in biodiversity conservation priority areas (BCPAs) (reproduced with the help from the Research Group on Protected Area Conservation and Management, Chinese Academy of Environmental Sciences [Li et al. 2016]) (circled numbers, defined in Table 1 [code]; PAs, protected areas; coverage, percentage of each BCPA protected).

of the minimal proportion of PAs at the national level and unify overall planning and design, giving priority coverage to BCPAs as much as possible. Through nationally led, cross-administrative-region, and cross-departmental management and large-scale coordinated conservation, the overall level of conservation will increase greatly and will achieve the maximum effectiveness of conservation for the entire country.

So, if the N% concept is applied and effectively balances the PA system with the needs of human survival and development at the national level, this will provide an opportunity for China to develop an effective PA system and an example for other countries. Further N% research is expected to optimize and expand new and existing PA systems worldwide. Furthermore, application of the N% concept and model will contribute to global and national conservation and sustainable-development goals and to the development of active and effective strategies for the future of humanity and the life systems that support it. Laurens et al. (2018) note that international governance of biodiversity requires ambitious initiatives from a few highly determined countries and civil-society actors. We look forward to the launch of highly committed and ambitious conservation plans and initiatives at the global level and cooperation with global scientific and conservation institutions to make the best contributions to protect the future of all life on the planet.

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