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Abstract

It has been 50 years since UNESCO's Man and the Biosphere (MAB) Programme was launched in 1971. China joined this global inter-governmental scientific program in 1973, and the Chinese National Committee for the UNESCO's Man and the Biosphere Programme (MAB China) was founded in 1978, with the support of Chinese Academy of Sciences (CAS) in collaboration with other ministries engaged in the administration of environmental conservation, forestry, agriculture, education, ocean and atmosphere, and so on. Since then, MAB China has carried out diverse explorations combining the value of UNESCO-MAB and the needs of the natural reserves in China. MAB has played an important role in promoting biodiversity conservation, sustainable use of natural resources, ecological civilization of China. With the approaching of 15th Conference of the Parties (COP15) to the UN Convention on Biological Diversity and the 50th anniversary of MAB, the article reviews the progress of the implementation of MAB in China, analyzes the problems and challenges, and advances proposals in regard of the rising needs of global environmental governance and construction of community of shared life by cooperation within international community.

Keywords

Man and the Biosphere Programme (MAB); biodiversity conservation; sustainable development

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To Harmonize Relationship Between Human and Nature and Achieve Sustainable Development: UNESCO's Man and the Biosphere Programme in China

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Abstract: It has been 50 years since UNESCO's Man and the Biosphere (MAB) Programme was launched in 1971. China joined this global inter-governmental scientific program in 1973, and the Chinese National Committee for the UNESCO's Man and the Biosphere Programme (MAB China) was founded in 1978, with the support of Chinese Academy of Sciences (CAS) in collaboration with other ministries engaged in the administration of environmental conservation, forestry, agriculture, education, ocean and atmosphere, and so on. Since then, MAB China has carried out diverse explorations combining the value of UNESCO-MAB and the needs of the natural reserves in China. MAB has played an important role in promoting biodiversity conservation, sustainable use of natural resources, and construction of ecological civilization of China. With the approaching of 15th Conference of the Parties (COP15) to the UN Convention on Biological Diversity and the 50th anniversary of MAB, the article reviews the progress of the implementation of MAB in China, analyzes the problems and challenges, and advances proposals in regard of the rising needs of global environmental governance and building a community of shared future for all life on Earth by cooperation within international community. **DOI:** 10.16418/j.issn.1000-3045.20210328001-en

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During the 1950s and 1960s, environmental pollution and protection have gradually attracted people's attention. In September 1968, the United Nations Educational, Scientific and Cultural Organization (UNESCO) hosted the World Congress of Biosphere Reserves in Paris, laying a foundation for the launching of Man and the Biosphere (MAB) Programme [1]. In 1971, René Maheu, former Director General of UNESCO, first presented MAB Programme to the world at UNESCO's annual general meeting, and later the first International Coordinating Council of the MAB was held. As UNESCO's first flagship project in biodiversity conservation, cultural diversity conservation, and sustainable use of natural resources, MAB programme aims to integrate the forces of natural and social sciences through interdisciplinary research, training, monitoring, and education to protect and utilize the global biosphere resources in a reasonable and sustainable manner, so as to harmonize the relationship between human and nature.

China for the first time sent a delegation to the International Coordinating Council of the MAB in 1973, which was also the first UNESCO congress on natural sciences China participated in after the restoration of its lawful seat in the UN. In 1978, to further promote the implementation of MAB in China, the State Council, with supports of Deng Xiaoping and other Party and state leaders, officially approved the establishment of Chinese National Committee for Man and the Biosphere Programme (hereinafter referred to as MAB China) led by the Chinese Academy of Sciences (CAS) in collaboration with other ministries engaged in the administration of environmental conservation, forestry, agriculture, education, ocean and atmosphere, and so on.

In the recent 50 years, supported by MAB China and competent authorities, MAB's idea of harmonizing the relationship between human and nature and achieving long-term sustainable development has been deeply integrated with China's practice of building protected natural areas ①, exhibiting great vitality, which, to some extent, leads the construction and development of China's protected natural area system. At present, China has basically built the world's largest biosphere reserves network, and carried out rich natural protection and sustainable development practices based on the network. Relevant scientific research and

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① According to the Guidelines on Establishing a Protected Natural Area System Dominated by National Parks issued by the General Office of the CPC Central Committee and the General Office of the State Council in June 2019, China's protected natural areas include national parks, nature reserves, and natural parks. Biosphere reserve is a protected natural area initiated by UNESCO, which has no strict correspondence with the types of protected natural areas in China. Other UNESCO protected natural areas include the world natural heritage and world geopark.

monitoring projects have profound impacted China's ecological research while supporting the management of reserves. Implementation of MAB in China has stepped up biodiversity conservation and sustainable use of natural resources, as well as the construction of ecological civilization and a beautiful China.

1 China has built the largest biosphere reserves network in the world

At present, 34 protected natural areas, such as Changbaishan, Dinghushan, Wolong, Wuyishan, Fanjingshan, Jiuzhaigou, Qomolangma, Wudalianchi, and Yading nature reserves, have been approved as the world biosphere reserves by UNESCO; 185 protected natural areas have been approved as Chinese biosphere reserves by MAB China. These biosphere reserves have become the places where the idea of MAB is practiced in China and mark that the world's largest biosphere reserves network has been basically built in China.

1.1 Thirty-four protected natural areas have been approved as the world biosphere reserves by UNESCO

In 1976, the World Network of Biosphere Reserves (WNBR) was built by UNESCO as an area to demonstrate and promote the balance between man and the biosphere and to explore the harmony between human and nature. In 1995, UNESCO held the second World Congress of Biosphere Reserves and approved the Statutory Framework of the World Network of Biosphere Reserves, taking the implementation of the Convention on Biological Diversity as one of the main objectives [2]. Moreover, it was emphasized that the three basic, equal and complementary functions of protecting, developing, and supporting (scientific research, monitoring and education) should be realized [3]. With 714 members (including 22 cross-border protected areas) in 129 countries and regions, WNBR has become one of the protected natural area aggregates covering the most types of ecosystems and the largest total area in the world, and also an important window and bridge for member states to exchange the experience in global environmental governance and explore the model of sustainable development.

Since the foundation of MAB China, China has vigorously promoted the application of protected natural areas for joining WNBR. In 1979, the Changbaishan Nature Reserve in Jilin, Dinghushan Nature Reserve in Guangdong, and Wolong Nature Reserve in Sichuan became first batch of China's reserves to join the world-class network. At present, 34 protected natural areas in China have become world biosphere reserves, with the total number ranking the first in Asia. These reserves feature active biodiversity and ecosystem conservation, sustainable use of natural resources, and frontier exploration and international cooperation in common development of protected areas and surrounding communities.

1.2 Chinese Biosphere Reserves Network (CBRN) has supported a wider range of exploration and practice

During the 1980s and 1990s, the nature reserves in China began to develop rapidly. A common problem for new nature reserves was what management idea and model could be used to realize effective protection and coordinated development. In particular, the problem of coordinated development is serious in the nature reserves where local residents are living for generations with natural resources as the main support of livelihood. Although the idea of MAB was gradually accepted by scientists, managers, and government decision-makers engaged in natural conservation after its implementation in China [4,5], only nine protected natural areas had been approved as the world biosphere reserves by UNESCO by the end of 1992. Applications for world biosphere reserves are strict and subjected to certain limits in the number. To make full use of the international exchange platform of MAB and further expand the influence of its idea in China, CBRN was constructed in 1993. In July 1993, the first 45 protected natural areas in China were approved to join the network. By the end of 2020, 185 protected natural areas (including 34 world biosphere reserves) had been included in this network, 80% of which were national nature reserves, accounting for 31% of the total nature reserves in China. This network covers almost all the major ecosystem types and biodiversity protected areas in China (Figure 1). The network holds training seminars and other exchange activities every year, becoming one of the key trans-departmental and inter-disciplinary exchange platforms for protected natural areas.

It is noteworthy that CBRN is the first national network corresponding to the world biosphere reserves, and this pioneering work has been highly appraised by the representative in Beijing Office of UNESCO [6]. The initiative promoted UNESCO to build the regional network and thematic network of world biosphere reserves, which, to some extent, disseminated the Chinese wisdom to the world. In 1996, MAB China was granted the Fred M. Packard Award (one of the most important international awards in natural conservation) by International Union for Conservation of Nature (IUCN), and the primary reason for the award was the founding of CBRN to promote the wider practice of MAB.

2 Rich sustainable development practices have been carried out in biosphere reserves

2.1 Relationship between reserves and surrounding communities has been improved to promote sustainable development

MAB emphasizes both conservation and development, advocating the idea of combining conservation with development, and requiring building biosphere reserves as the

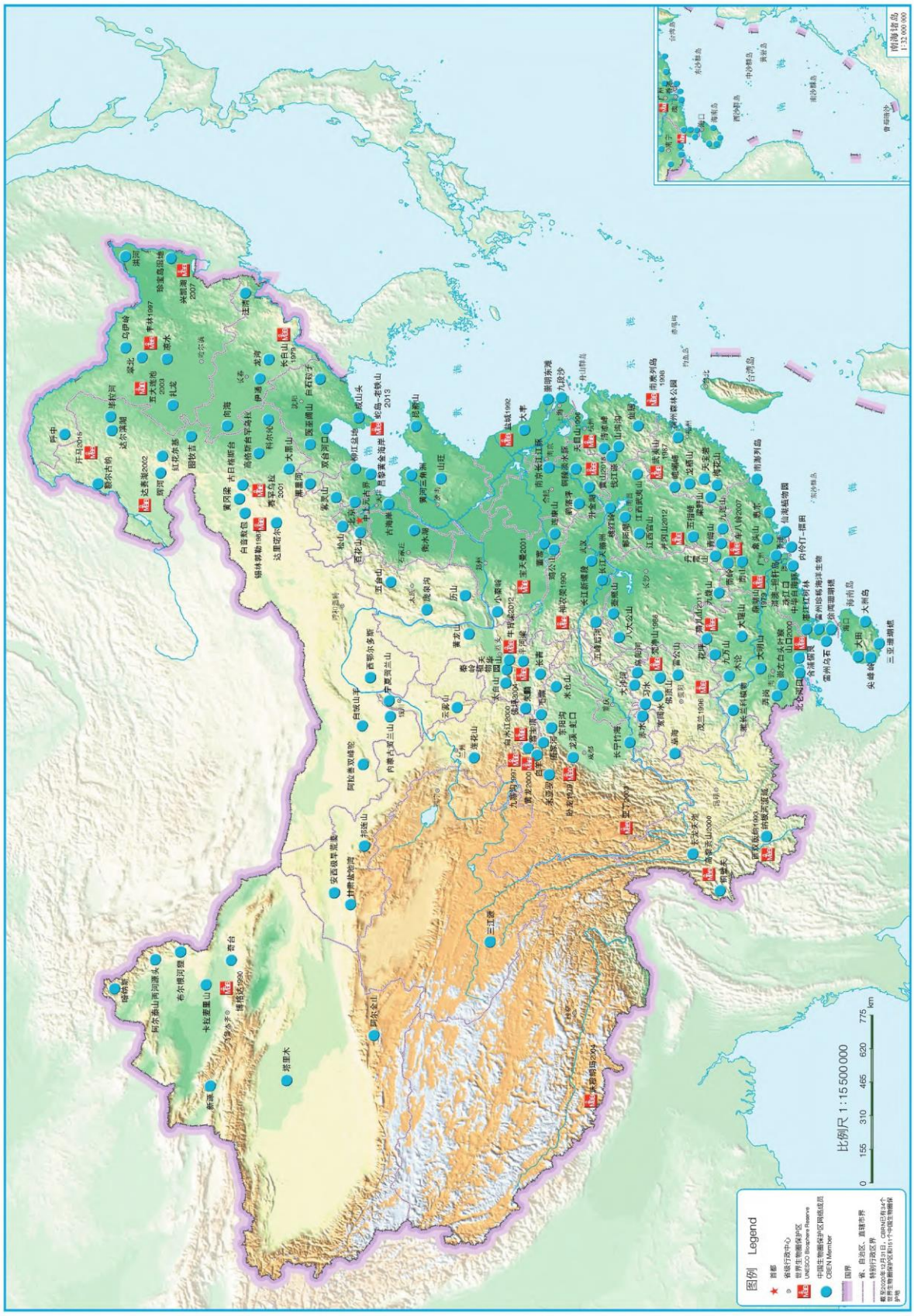

Figure 1 Distribution of members of Chinese Biosphere Reserves Network (CBRN)

places for learning sustainable development. This programme specifies the role of government in solving eco-environmental problems and the importance of participation of local producers and decision-makers. It requires an analysis of how interested parties participate in decision management and benefit from the construction of biosphere reserves in the formulation of Biosphere Reserves Management Programme. Emphasizing the relationship with surrounding communities and promoting the co-construction and co-development of reserves and communities have thus become one of the most distinctive characteristics which make biosphere reserves different from nature reserves in China.

Under the guidance of this idea, surrounding communities are allowed to participate in the management of Chinese biosphere reserves. Specifically, the surrounding residents are invited to serve as forest rangers and guided to develop characteristic ecological products and under-forest alternative economy. These measures can increase the economic income through reserve construction and are conductive to the benign interaction between conservation and development. For example, Gaoligongshan in Yunnan Province is currently one of the areas harboring the most diverse birds in China. Since the first bird-watching pond was built in Baihualing Village of Gaoligongshan World Biosphere Reserve for the development of the bird-watching economy in 2010, there have been 47 bird-watching ponds up to now. In addition to the revenue brought by bird-watching tickets, rural tourism activities such as homestay and agritainment have also been promoted, which improved the living standards of local villagers and waked the awareness and enthusiasm of surrounding residents in ecological conservation. To promote the sustainable development, villagers have set up a bird-watching council to unify the service standards and avoid vicious competition. In addition, a Bird-Watching Festival has been organized every year since 2016, which has become the "ecological name card" of Gaoligongshan.

2.2 Standardized ecotourism has been advocated to promote sustainable development

Nature reserves have favorable conditions to support the development of tourism. In the 1990s, ecotourism has been rising in nature reserves in China, and yet it is also facing risks and controversies as a new thing. For example, it is widely concerned that there may be new threats to the biodiversity and eco-environment of the reserves as the number of visitors increases in the absence of sound management system and supporting measures, which, instead of promoting the development of protected areas, may cause destruction of natural resources. CBRN, since its foundation, has organized several ecotourism seminars and training classes, and carried out ecotourism case studies in collaboration with universities and colleges.

Based on relevant theoretical and practical studies, MAB China put forward the policy and technological guidance for the ecotourism development in Chinese biosphere reserves in 1998 [7]. Under this guidance, the ecotourism in world biosphere reserves such as Jiuzhaigou, Changbaishan and Fanjingshan enjoys good momentum of development, which supports the sustainable development of local economy and has produced a demonstration effect at home and abroad. In 2011, MAB China, based on new situation, guided biosphere reserves to publish the Libo Statement of Ecotourism in Chinese Biosphere Reserves and propose four principles of ecotourism: priority to environmental and ecological conservation; protection of cultural diversity; implementation of ecological education; encouragement of participation of communities and protection of local public interests. These principles have become the guidance of ecotourism development in biosphere reserves.

3 A large number of scientific research/monitoring projects have boosted ecological research and development of protected areas in China

Eco-environmental problems involve many factors and are difficult to be solved, which needs to be supported by interdisciplinary research. As a global intergovernmental science programme, MAB has supported a large number of research projects. Since the 1980s, China has organized and implemented a number of research and monitoring projects in collaboration with some authoritative organizations at home and abroad, which not only accelerate the development of ecological research in China but also support the development of reserves.

In 1987–1995, CAS, German Federal Ministry of Education and Technology, and UNESCO launched Cooperative Ecological Research Programme, which was one of the largest funded (involving 3.8 million dollars) research projects by UNESCO and the largest research project in ecology in China. The project consists of 8 topics which involve forest ecosystem, aquatic ecosystem, urban ecosystem, ecological treatment of urban sewage and other serious problems in environmental protection and economic development in China. Various cooperative forms, such as studies, exchange visits, seminars, and provision of instruments and equipment, are adopted to produce results which provide feasible solutions to related problems. Moreover, the implementation of these projects not only promotes the internationalization of ecological research in China, but also fosters a large number of talents who adapt to international research cooperation. Many of them have become the leaders and backbone of ecological research in urban ecology, forest ecology, lake ecology, and pollution ecology in China [8,9], and left far-reaching impact on the beginning and development of ecological research in China.

In 2013–2015, MAB China, Institute of Zoology of CAS, and International Society of Zoological Sciences (ISZS) carried out the research project of Cross-Border Protection of

Amur Tigers with the support of CAS. The project has promoted the cooperation between Chinese and Russian governments as well as between protected areas, provided talents and data support for the recovery of wild populations of Amur tigers, and driven the implementation of the program of recovering wild populations of Amur tigers. In view of the demand of biosphere reserves, China has initiated comprehensive wildlife monitoring program with the support of ISZS since 2015. Backed up by modern information technology, the program has developed a comprehensive wildlife monitoring scheme for Chinese biosphere reserves and taken pilot studies in 7 reserves, which has made progress in stages. In the future, the program aims to achieve system integration and optimization for convenience and intelligence and meet the requirements of frontline management and monitoring of protected natural areas.

In addition, CBRN set up the Youth Science Award in 2016 to attract and encourage youth in organizations of biosphere reserves to carry out research based on the actual situation of reserves, thus improving the research capacity and the function of ecological research in serving the reserves. By the end of 2020, 14 young research workers from 12 biosphere reserves had carried out the research with the support of the award, providing a new force for the development of natural conservation.

4 Publicity activities and capacity building have driven the idea transformation and capacity improvement of protected areas

4.1 The idea of harmony between human and nature has been transmitted by traditional and new media

According to UNESCO, biodiversity conservation should follow an inclusive approach that is accessible to all and enables participation of everyone. Biodiversity conservation should be advocated by languages and methods suitable for different age groups and social groups [10]. As a major developing country, China has been facing the huge challenges of strengthening eco-environmental protection and building ecological civilization during the modernization. This requires the whole society to vigorously spread the idea of harmony between human and nature in an innovative manner. Only with the public awareness of respecting, confirming to and protecting nature, can all people participate in the protection.

In 1994, MAB China founded the in-house periodical *Chinese Biosphere Reserves* (Quarterly) to meet the needs of experience exchange among members of CBRN. In 1999, the periodical was revised to *Man and the Biosphere* (Bimonthly) and released to the public. This is currently the mainstream popular science periodical publicizing the idea of MAB in the world. With the purposes of telling China's frontline ecological stories, exchanging the world's frontier green thought, advocating the harmony between human and nature, and exploring a win-win path for protection and development, the periodical provides in-depth analysis and science communication on the hotspots and difficult problems in natural conservation and social and economic development [11]. By the end of 2020, 126 issues of *Man and the Biosphere* had been published, exerting profound effect on the eco-environmental protection.

The advent of the new media age in the 21st century provides opportunities for the wider communication of MAB idea. With the brand advantage of MAB, China's mainstream media, such as Xinhuanet, Public Opinion Survey Center of Global Times, China Agriculture Film & Television Center, and CCTV, have explored new modes of MAB communication. In 2020, MAB China and CCTV launched the Internet broadcast of A Tour of Beautiful China in Guangxi, Hubei and Tianjin with 79.781 million of views and A Tour of Biosphere Reserves with 16.828 million of views. The two activities attracted nearly 100 million views and spread the core idea of MAB in the whole society.

4.2 A series of training activities have improved the capacity building of reserves

For a long time, MAB China has carried out many training and exchange activities, including irregularly inviting foreign experts to China for guidance and exchanges, organizing Chinese experts to CBRN member organizations to give lectures, and organizing Chinese WNBR members to foreign countries for international investigation and exchange. Meanwhile, thematic training activities, such as transmissibility, leadership, wildlife monitoring, plant classification, application of geographic information system, and realization of ecological product value, have been carried out according to the actual needs, and 1 000 students have been trained since 2014, which has played a positive role in improving the ability of students. In addition, 5 CBRN training bases, including Shennongjia, Fanjingshan, Wufenghouhe, Hanma, and Sanya coral reef, have been established, forming a strong support for the capacity building of biosphere reserves.

5 Conclusions and prospects

Since China joined UNESCO-MAB, especially the foundation of MAB China, MAB has been smoothly implemented in China, which plays a positive role in the biodiversity conservation, sustainable use of natural resources, the building of ecological civilization and a beautiful China, and the development of ecological research in China. Moreover, it to some extent introduces to the international community China's experience in natural conservation and eco-environmental management. However, there are still also some challenges in implementing the programme in China. In particular, it will be a major task for China to give full play to the advantages and make up for deficiencies in the

post-pandemic era and the construction of protected natural area system dominated by national parks. Solutions to these problems will support the construction of ecological civilization and help China to participate in the global environmental governance and the building of a beautiful China and a community of shared future for all life on Earth. On the basis of the experience from the past decades, MAB China will make efforts to promote the better development of UNESCO-MAB in China from three aspects.

(1) Strengthening the leading role of sciences. The integrity and complexity of eco-environmental problems determine the necessity of sciences for relevant solutions. MAB is a global intergovernmental scientific programme involving multiple disciplines. Therefore, it is necessary to further play the leading and supporting role of science and technology as well as the advantages of organizational talent team of CAS. It is recommended to integrate scientific and technological resources centering on construction of national parks, biodiversity conservation, ecosystem protection and restoration, and intelligent management of reserves, so as to support the construction of biosphere reserves and green development by science and technology.

(2) Reinforcing the role of MAB as a bridge. Since its foundation, MAB China has played its role as a bridge in promoting the smooth implementation of MAB in China. At present, the awareness of eco-environmental protection of the whole society has been significantly strengthened, creating good external conditions. Meanwhile, the attention and positive evaluation of international media on China's ecological civilization and related policies of protected natural areas have significantly increased in recent years [12]. In this context, it is suggested to strengthen the international cooperation to promote the exchanges between China and the world. On one hand, we will continue to transmit the international advanced idea on ecological management to China; on the other hand, we will disseminate China's experience in recent ecological civilization construction and Chinese wisdom to the world. Importance should be attached to the power of international communication and international influence of China can be built with successful Chinese cases [13].

(3) Enhancing the role of science and technology think tank. General Secretary Xi Jinping has pointed out that clear waters and green mountains are by no means opposed to mountains of gold and silver, and the key to development is the people and idea. During the nearly 50 years of MAB implementation in China, a large number of leaders and outstanding researchers with international vision and familiar with China's natural conservation have been cultivated and attracted, who play an important role in breaking the bottlenecks restricting China's natural conservation and even global sustainable development. In the future, we should actively seize the opportunity of building a beautiful China and building a community of shared future for all life on Earth and give play to the strength of experts to solve the bottlenecks.

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