

Sixty Years of Paradigm Shift in China (1949-2010): Change of Policies and Practices on Terrestrial Ecosystem Management

Land Revolution



Household Responsibility System



Land Restoration



1949



1978



1998



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Summary

This paper reviews the changes in social and economic policies since 1949 that have significant implications for ecosystem management in China. The major policies relevant to ecosystem management are those related to land tenure, food security, regional development, urbanization, and more recently, a desire for more sustainable development. Three distinctive phases in policy changes are identified. The first phase, 1949-1978, was characterized by the grain production-oriented policies that resulted in ecosystem degradation; and it was marked in 1958 by a land tenure change that brought all land into collective ownership as a central policy intervention. The second phase, 1978-1998, was characterized by the transition from grain production-oriented policy to natural ecosystem conservation; and it was marked in 1978 by the introduction of the open market and reform strategy that enables households to undertake more independent livelihood activities. The third phase, 1998-present, has been characterized by ecosystem management for sustainability; and it was prompted by the severe floods along the Changjiang River and Songhua Rivers in 1998 that led to large ecosystem restoration projects in central and western China in order to reduce the future risks of severe floods. However, sustainable management of cropland, forest, grassland, and wetland ecosystems as well as protected areas and biodiversity more broadly are still facing great challenges. Management of the environment to generate multiple ecosystem services will need to remain a top priority given China's land use and other resource constraints, and pressures from urbanization. This paper concludes that continuous support for ecosystem management policies and household-based economic incentives are critical to maximizing ecosystem health and generating a diverse range of ecosystem services. Ecosystem management, including ecosystem restorations and intensive use to sustain generation of ecosystem services, must be fully integrated into sustainable development policies and strategies.

Introduction

Healthy ecosystems provide vital life-support systems for our human population. All natural, semi-natural, and modified ecosystems—including croplands, forest, grasslands, and wetlands—provide some combination of ecosystem services that support human welfare. Ecosystem management, defined as “an integrated process to conserve and improve ecosystem health that sustains ecosystem services for human well-being” (UNEP 2009), will play an important role in the achievement of the green economy.

Issues of population growth and resource scarcities suggest that human societies are in a crucial period of the 21st century. The nature of human civilization’s future will depend on choices made today about sustainability, equity, and justice.

China is now the second largest economy in the world and, in terms of both its size and achievements, has increasingly strong influence on global socio-economic development and emerging paradigms. Rising wealth sees China facing more and more national and international challenges in ensuring environmental sustainability while sustaining social and economic development. In the context of a changing world, the coming decade will be crucial for China to address the challenges of ensuring sustainable growth while playing a more important role in shaping a global green future.

China was one of the first countries to support the work that led to the publication of *Our Common Future* and then to sign the Rio Declaration and Agenda 21 in 1992. China was the first country to prepare its own strategic plan on how to implement Agenda 21. In 1994 China published *China’s Agenda 21—China White Paper on Population, Environment and Development in the 21st Century*. In 1996, sustainable development was officially adopted as a basic development strategy. The concept of sustainable development has progressed from scientific consensus to become an important part of the government’s work programme as demonstrated by its prominent place in China’s Twelfth Five-year Plan for National Social and Economic Development.

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accounts only for 7% of the arable land, 4% of forests, 14% of grasslands, and 10% of wetland ecosystems in the world, but it supports 1.3 billion people—22% of the world’s population. These ecosystems provide essential services, ranging from food and timber to water, climate regulation, carbon storage, and biodiversity. It is projected that by 2020, as much as 61% of the population in China will live in urban areas (United Nations, 2011), while the gross domestic product (GDP) per capita will be four times greater than that in 2000, and the demand for ecosystem services will increase sharply.

The analysis that follows is mainly based on research undertaken to inform the China Council on International Cooperation on Environment and Development’s Task Force on Ecosystem Services and Management (2008-2010) (Chen et al. 2011). The research involved a review of academic research publications and case studies, as well as selected gray literature from government and scientific institutions. The extents of ecosystems and of ecosystem service supply were compared at different times. This information was then synthesized through group discussions to identify key changes and lessons. This paper focuses on high level, qualitative policy lessons from the analysis of ecosystem services and management in China. The quantitative analysis, entitled *Ecosystem Services and Management Strategy in China*, will be published by Springer in 2012.

1. Different phases and major policies affecting ecosystem status in China

Since 1949, China has experienced different phases in the evolution of its policies affecting ecosystem status, and the following significant events marked the transition between these periods, notably:

- 1958, marked a land tenure change that brought all land into collective ownership as a central policy intervention;
- 1978, marked the introduction of the open market and reform strategy and the adoption of the household responsibility system, enabling families to undertake more independent livelihood activities;
- 1998, the severe floods along the Changjiang and Songhua Rivers led to large government-run ecosystem restoration projects in central and western China to reduce the future risks of severe floods.

There have been a number of other significant events in the past 60 years:

a selection is depicted in Figure 1 along with some related ecosystem policy changes.

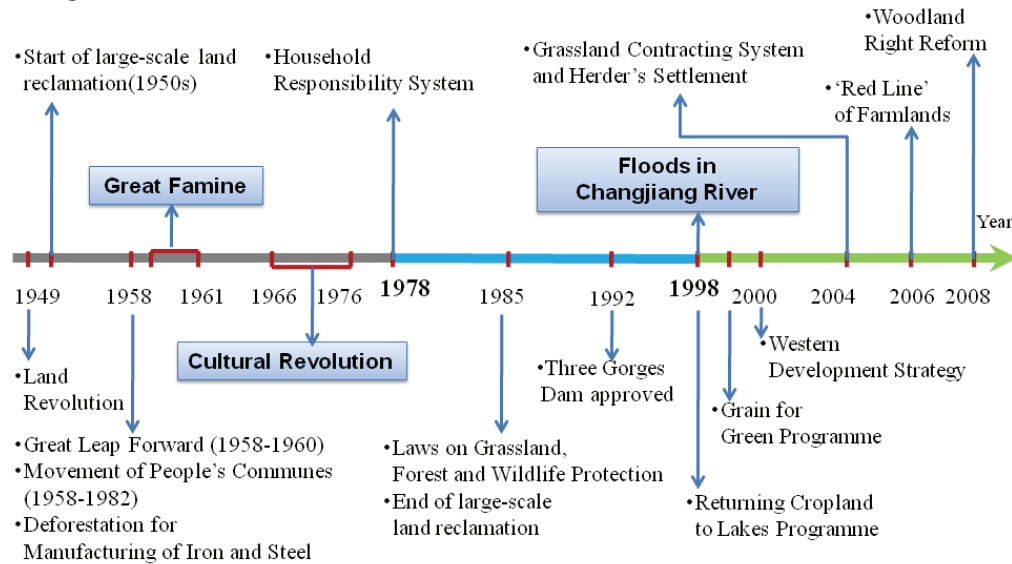


Figure 1. Key events and related ecosystem policy changes since 1949

The three main phases of policy changes affecting ecosystem management can be described as follows:

1.1 Phase I (1949-1978): Grain production-oriented policies resulting in ecosystem degradation

At the founding of the People’s Republic of China, the land revolution reallocated the cropland from landowners to poor farmers. Food security was given top priority at the national and local levels because of the low grain productivity and long-lasting grain shortages. During this phase, large areas of forest, grassland and wetland ecosystems were converted to cropland, particularly in Xinjiang, Heilongjiang, the central and lower Changjiang Basin, and coastal areas. In addition, forest resources were commonly over-exploited under the planned economy. Several policies including those related to the Great Leap Forward (1958-1961), People’s Commune (1958-1982), and Cultural Revolution (1966-1976) deprived farmers of land ownership and implemented collective land ownership, which caused serious ecosystem degradation and loss, as well as reducing human welfare. For example, the Great Leap Forward, while demonstrating industrial and resource development according to selected metrics, led to the Great Famine of

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1959-1961 when more than 30 million people starved to death.

During this phase, the overall exploitation of land and other natural resources for food security in the planned economy led to deforestation, reclamation of grassland and wetlands, and impaired ecosystem services. The capacity of ecosystems to limit flooding, desertification, and soil erosion was particularly affected. This period's land use changes destroyed habitats and impaired ecosystem services, putting humanity at greater risk over the long term with effects such as diminished flood retention capacity in wetlands. The social and environmental costs likely exceeded any short term economic development gains. Tragically, a focus on land-use changes to enhance supply of ecosystem services in the short term – in this case as agricultural provisioning – often reduces other ecosystem services, thus incurring great costs to future generations (Daily et al. 1997).

1.2 Phase II (1978-1998): Transition from grain production-oriented policy to natural ecosystem conservation

It was not until 1978 when the household contract responsibility system was adopted that the land rights of farmers were defined, with the result that grain production rose significantly. Officially, conversion of wetlands, forests, and grassland to cropland was prohibited by the central government to stop further ecosystem degradation—but conversion continued at the local level.

During this phase the government had to meet the basic needs of the general public for food supply while beginning to rectify the past damage to natural ecosystems. In terms of ecosystem management, great attention was given to supplying provisioning ecosystem services once again. However, the central government also stepped up its effort to control water and soil loss to improve the regulating services of ecosystems. The most important ecosystem restoration project in the period was the Three-North and Changjiang River Shelterbelt Protection Forest Programme, which started in 1978 and is planned to continue until 2050 (Figure 2).

In the transition from three decades of planned economy to a socialist market economy, a series of policies on natural resource use were implemented for quick economic returns that had perverse impacts on ecosystems. These included the auction of land use rights to 'waste hilly areas, barren slopes, and desolated lands', and 'accelerating the exploitation of local mineral resources'. The short-

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term nature of these contracts provided no incentives for long-term management and saw further degradation of natural ecosystems and their services. They also facilitated ill-planned reforestation interventions that were not sustained.

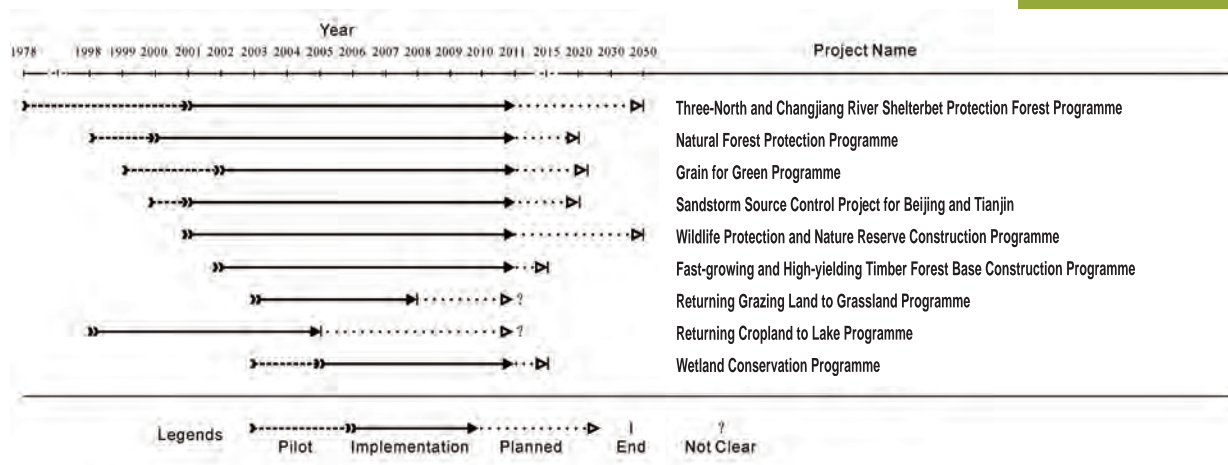


Figure 2. Timeframe of national ecological programmes since 1978

1.3 Phase III (1998-present): Ecosystem management for sustainability

In 1998 the catastrophic floods in the Changjiang and Songhua River basins caused huge loss of lives and properties in China. The scientific community, represented by members of the Chinese Academy of Sciences, proposed that the government should adopt a nature-oriented strategy. This became a major turning point for the management of ecosystems, with a shift from land for food and cash to land for sustainability. A series of programmes on ecological protection and development supported this policy shift including the Grain for Green Programme; the Natural Forest Protection Programme; and the Returning Farmland to Lake Programme (Figure 2). Land tenure reform of grassland and woodlands was also implemented in the pasture regions and the vast collectively owned forest regions.

Since 1998, China has invested over 700 billion Chinese Yuan (CNY) in ecological conservation and restoration programmes that cover extensive areas; and the funding for these projects come mainly from the central government (Lü et al. 2011). There have been some positive results from key programmes for better forest, grassland, and wetland ecosystem management.

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Nevertheless, in the course of implementing these programmes, some "information failures" have emerged that have an adverse effect on their efficiency including: 1) poor preliminary verification and planning; 2) difficulties in consolidating the ecological benefits, establishing follow-up industries, and securing ongoing financial support for implementation; and 3) lack of long-term supervision, monitoring and assessment mechanisms (Chen et al. 2011). One outcome of this information failure is that some of the replanted forests are of low ecological and timber production quality.

2. The major drivers of ecosystem management policy changes since 1978

China's rural economic reform, widely regarded as one of the most successful in the world, was initiated in 1978 with the reform of the country's institutional framework for agricultural land and particularly with the introduction of the household responsibility system. Over the last 30 years the market-oriented economic reforms have increasingly influenced every aspect of ecosystem management policies, such as those for land tenure, food security, regional development, urbanization, and rural development. The steady economic growth of the last 30 years has provided China with adequate finances to support ecological conservation and restoration.

2.1 Land tenure reforms

As property rights and land tenure policies are the core of the reform, policies related to ecosystem management are characterized by changes in land tenure. The household responsibility system saw China's agriculture shift from a collective-

based production system to a family-based one in 1978 (Brandt et al. 2002). The 2002 “Rural Land Contract Law” states that farmland tenure security must be maintained for at least 30 years from the last nationwide reallocation in 1998 (Wang et al. 2011). At the 3rd plenary meeting of the 17th Party Congress held in 2008, the Chinese Communist Party further extended the land tenure contracts from 30 years to an unspecified ‘long term’ that can be interpreted as permanent tenure.

As with the land tenure policy for cropland, the central government has reformed the grassland and forest tenure systems. The 2002 revisions to the Grassland Law introduced contracts that gave herders grassland or pastureland use and management rights. In 2008 the government started to reform forest property rights and planned to allocate all the collective-owned forest and woodland to local farmers for periods as long as 70 years according to forest law.

The reforms to the land tenure systems for cropland, forest, and grassland providing individuals with longer-term rights have increased incentives for the local farmers to improve management for sustainability of the ecosystems. However, problems remain. For example, overfishing is still a threat to the wetlands and lakes that are owned by provincial and local governments. Furthermore, the tenure for production forests is 70 years while a forest rotation for timber production could be as long as 100 or 150 years: this could be a disincentive for farmers who might be interested in sustainable forest management.

2.2 Food security policy

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Grain production has directly affected the conversion of natural ecosystems into farmland or the restoration of forest, grassland and wetland ecosystems from cropland. During 1996-1999, grain production per capita exceeded 400 kg, and storage of the surplus grain production exerted a heavy financial burden on central governments for subsidy. The improved food security situation provided greater opportunities for large-scale ecological restoration projects, including the Grain for Green Programme and large conversions of cropland to forest, grassland, and wetlands. However, when the grain production per capita fell to 330 kg in 2003, the restoration programmes did not expand to new regions as government policies focused on food production while the existing regions and subsidies extended to the next term of the programme for another 8 years from 2009.

Studies on the impact of China's Grain for Green Programme of converting steep slopes of cultivated land to forest and grassland in the upper reaches of the Changjiang River and the upper and middle reaches of the Yellow River show that the policy/project did not significantly decrease food security and national grain production increased by only 2-3% (Feng et al. 2005).

Similar to grain production, timber production, the major provisioning services of forests, was affected by the institutional failure of the Great-Leap Forward during 1958-1961 and the Cultural Revolution during 1966-1976 (Figure 3). Timber production decreased during 1999-2004 as a result of the central government's Natural Forest Protection Project that banned logging to reduce erosion and flooding.

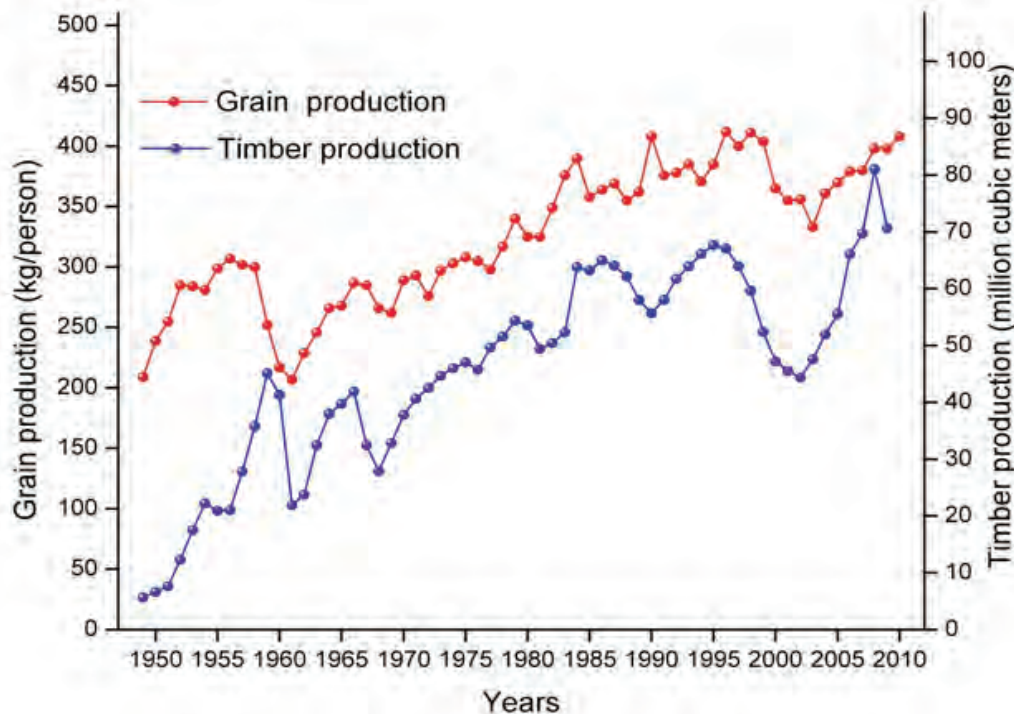


Figure 3. The grain production per capital and timber production during 1949-2010

Up to 2009, the central government invested 2,500 billion CNY, including 1,000 billion CNY for infrastructure, 550 billion CNY for construction and 750 billion CNY in financial transfers, and 310 billion CNY for long-term loans for capital investments.

2.3 Regional development policy

The Western China Development Strategy (WCDS) was launched in 2000 as an important response to the Asian financial crisis started in 1997, and it was renewed in 2010 for another 10 years until 2020 as the most important regional policy to promote social and economic development. According to NDRC (2010), the WCDS covered 12 provinces and autonomous regions with an area of 685 million hectares (71.4% of China's land area), with a population of 367 million in 2002 (28.8% of China's population), and a GDP of 2,266 billion CNY in 2003 (16.8% of national GDP). Up to 2009, the central government invested 2,500 billion CNY, including 1,000 billion CNY for infrastructure, 550 billion CNY for construction and 750 billion CNY in financial transfers, and 310 billion CNY for long-term loans for capital investments.

Ecological conservation and restoration was one of four major tasks of the WCDS. Some ecological projects, especially the Green for Grain Programme, Natural Forest Protection Project, and Grazing ban were mainly implemented in western China. During 2000-2010 the Grain for Green Project returned 1.58 million

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hectares of sloping cropland to forest or woodland, conserved 6 million hectares of natural and secondary forest and 3.24 million hectares of grassland, established 395 new nature reserves, and increased protected area coverage to 18% of western China (NDRC 2010).

Linkages with other government policies, such as the poverty reduction policy, helped to increase farmers' incomes in western China. The subsidies provided by the government projects for ecosystem conservation and restoration were also a source of income that benefited farmers' livelihoods. Yet the same survey showed that the Grain for Green Programme has not improved the transfer of labour toward non-farming activities, contrary to what authorities expected (Li et al. 2011).

2.4 Urbanization and rural development policy

Urbanization has been a driving force for the economic and social development of China since 1978. Principles were developed in 1980 "to control the size of large cities, to promote appropriate development of medium-sized cities, and actively promote the small cities". Since then, urbanization has increased with the number of city dwellers grown from 185 million in 1978 to 671 million in 2010, with the portion of urban residents in the national population increasing from 19% in 1978 to 50% in 2010 (National Bureau of Statistics of China 2011). More and more farmers have left the countryside to work and live in cities and towns. Further, 140 million rural people worked in urban areas. Consequently, the built up area increased from 0.74 million hectares in 1980 to 3.81 million hectares in 2009 (State Statistics Bureau 2011), resulting in the proportion of China's lands occupied by cities rising from less than 1% in 1981 to 4% in 2009 (Figure 4).

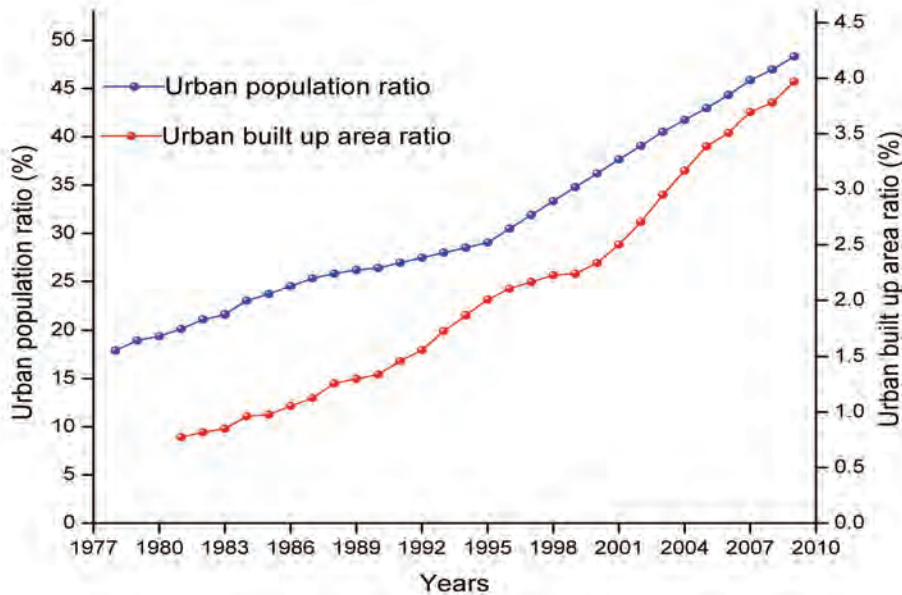


Figure 4. Urbanization ratio during 1978-2010

A number of positive effects of urbanization are evident. In the rural areas, the pressure on forest and cropland ecosystems decreased. Government projects supported some migration by farmers from these ecosystems, such as the Daxinganling Forest Region. The vegetation cover of natural ecosystem increased due to the increase of farmer's income from off-farm employment. Financial input for ecosystem conservation and restoration in rural areas to maintain or improve ecosystem services for the urban areas increased, for example the Sandstorm Source Control Programme for Beijing and Tianjin and various water catchment conservation projects near the cities.

There are also negative effects of urbanization, including the net loss of cropland, forest, or wetland ecosystems due to the encroachment of urbanization, a transition from fuel wood to coal and gas consumption in the cities, and the net loss of labour in rural areas has increased the cost of ecosystem conservation and restoration projects. At the same time, in some rural communities only the women, children, and the elderly remain to work the fields and manage the livestock.

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but in the 1990s labour migration proceeded freely. The inconsistencies among various aspects of urbanization policies cause some problems for the ecosystem management. For example, the rural areas are provisioning the ecosystems services, such as freshwater and climate moderation, however, there is inadequate payment of ecosystem services from urban communities to rural communities

3. Ecosystem status and challenges for better ecosystem management

The total area of cropland, forest, grassland, and wetland is about 76% of China's land area. The remaining 24% is built-up and unused land. There is no doubt that the built-up area will increase with rapid urbanization. However, China has adopted a strict policy to protect farmland to ensure food security. As for the unused area, almost half is not suitable for agriculture, including the alpine Tibet Plateau, high mountains, glaciers and deserts such as the Taklimakan and Gobi and other deserts in northwest China. Mountains and glaciers are already providing services as water recharge areas, water delivery control, monsoon moderators and concentrators, erosion management, soil mineral supply, and acting as passes and barriers for biological diffusion and invasion, and they also act as refuges for species as lowlands warm. Only 11% of the unused land has potential for conversion to new uses. This will require large investments to restore their capacity for generating services such as biodiversity habitat and watershed protection.

3.1 Current ecosystem status

The current status of cropland, forest, grassland, and wetland ecosystems—and the cross-cutting issues of protected area management and biodiversity conservation can be summarized as follows:

(1) Forest ecosystems: The Seventh National Forest Resources Inventory (2004-2008) reports that 20.36% of China has forest coverage with a total timber volume of 11.4 billion m³. The area of forests in China declined during the 300 years before 1960. Since then, the area of forests has expanded mainly due to the regeneration of woodland, shrubland, and man-made forests. However, old growth natural forests are still in decline (Lu et al., 2011).

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(2) Grassland ecosystems: Grasslands cover 41.7% of China and 84.4% of which is located in the west of the country. The most valuable grassland areas are found in northern Xinjiang, Tibet, and Qinghai, as well as in eastern and northeastern Inner Mongolia. Grassland products account for 22.3% of grassland ecosystem services' total value (Xie et al. 2001). Even though grazing is prohibited, suspended, or rotated in some selected areas with ecological restoration projects, the grasslands as a whole are still threatened by loss or degradation from mining, conversion to forest or cropland, and climate change.

(3) Wetland ecosystems: In China, wetlands cover an area of 38 million hectares, excluding paddy fields that are considered cropland, and 94% of which is natural (State Forest Administration, 2005). Research from various regions reports isolated examples of wetland expansion but there remains a net loss of wetlands. Some of the most serious degradation is at the sources of Changjiang River and Yellow River, and at the Ruorgai marshes in north central Sichuan. The lakes are profoundly affected by human activities, including overfishing; conversion to cropland; construction of water infrastructure such as levees; disruption of natural water flows by dams and other barriers; and pollution from domestic, agricultural, and industrial sources.

(4) Cropland ecosystems: Politically, cropland ecosystems play the most important role as China feeds 22% of the world's human population with just 7% of the world's cropland with a very small proportion imported. According to the land use survey of the Ministry of Land Resources, the total cropland area in China was 130.04 million hectares in 1996, and declined steadily to 121.72 million hectares in 2008 (National Bureau of Statistics of China 2011).

(5) Protected areas and biodiversity: China has made progress towards the Convention on Biological Diversity's 2010 target of significantly reducing the rate of loss of biodiversity: Forest resources have increased steadily since 1989, water quality has remained stable, and desertification is less extensive than it was, as a result of various conservation initiatives (Xu et al. 2009). By the end of 2008, China had established 2,538 nature reserves, covering 15.5% of China's area and including half the country's natural wetlands—and many important habitats and threatened species are now under special state protection (Ministry of Environment Protection 2010).

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The Chinese Government needs to develop a national strategy for sustainable ecosystem management that merits equivalent stature, and is complementary, to high-status national strategies on family planning and science and technology.

3.2 Challenges for future ecosystem management in China

China is still a developing country with a large population of 1.33 billion. A Business-As-Usual (BAU) development mode will obviously impose heavy pressures on ecosystems; in particular, China has ambitious plans for economic growth including a quadrupling of GDP between 2000 and 2020. Therefore, an alternative development path must be in place to meet the targets of sustainable development. Green economy in which ecosystem management is an important pillar will help realize social, economic and environmental goals for a sustainable future for China.

To meet the gap between the supply and demand of ecosystem services, ecosystems must be managed in a more sustainable way. The Chinese Government needs to develop a national strategy for sustainable ecosystem management that merits equivalent stature, and is complementary, to high-status national strategies on family planning and science and technology.

The Chinese Government's sector-based plans for ecological conservation and restoration include targets for increasing the nation's forest coverage by 40 million hectares by 2020 and maintaining the current natural wetland area. However, it is difficult to expand one ecosystem without reducing the areas of other ecosystems. There are extensive and growing threats to grassland and wetlands, including ongoing reclamation of high value grasslands for croplands and urban development. Consequently, the management targets for cropland, forest, grassland, and wetland ecosystems should be changed from expanding areas to enhancing the capacity to generate multiple ecosystem services from a given area. One strategy for doing this involves restoring ecosystems on a landscape scale so that they may generate a broader and synergistic range of services. A second strategy involves investments of energy and labor for more intensive use of small areas of the most appropriate lands, such as croplands, for provisioning ecosystem services, to reduce pressure on other parts of the landscape that may generate other ecosystem services.

3.3 Guiding principles for the future ecosystem management in China

In its assessment, the Ecosystem Services and Management Task Force of China Council of International Cooperation on Environment and Development (CCICED)

proposed the following principles for future ecosystem management in China:

- (1) Developing management goals. To understand the structure, function and dynamic features of the ecosystem, the local site conditions, as well as the ecological, social and economic needs.
- (2) Defining the temporal and spatial scales. Changing the temporal and spatial scales often leads to alternative management options and actions. Ecosystem management goals provide the basis for defining appropriate temporal and spatial scales.
- (3) Selecting the appropriate ecosystem structure. Knowledge of the biological and ecological features of the target species and ecosystems is needed to inform decisions on appropriate management actions.
- (4) Balancing different ecosystem services. By understanding the trade-offs between ecosystems services, multi-purpose management strategies can be applied to maximize the provision of a range of services to better meet human needs.
- (5) Monitoring and assessing the performance of management actions. Regular monitoring and assessment of management activities' performance are helpful to enable ecosystem managers to make necessary adjustments for better outcomes in changing environments, an approach called adaptive management.
- (6) Public participation in ecosystem management. The concept of ecosystem services recognizes that people are intimately linked with ecosystems and that successful ecosystem management is only possible with public participation. This allows for communication of the purpose and long-term objectives of ecosystem management, as well as for establishing the local buy in and stakeholder commitment necessary for sustainable development and ecosystem management to work.

In addition, it is worth examining the effectiveness of Compensation for Ecosystem Services schemes to support the contributions of rural populations in conservation and sustainable management (Zhen and Zhang 2011).

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4. Lessons learned from ecosystem management and policy changes in China

China's national policies on social and economic development changed greatly in 1949, 1978 and 1998, marking the turning point of the ecosystem changes. The major drivers of pressures on ecosystems have been policies on land tenure, food security, regional development, urbanization, and rural development. Currently cropland, forest, grassland, and wetland ecosystems—and the cross-cutting issues of protected area management and biodiversity conservation—are still facing great challenges.

In reviewing ecosystem management and policy changes in China we draw the following major lessons that may have relevance to other developing countries:

(1) Leadership, political commitment, and institutions are important for achieving positive land use change and sustainable ecosystem management. Full ecological benefits including ecosystem services cannot be achieved by short term programmes: long-term policies and investments are required, as provided in the Twelfth Five-Year Plan for National and Economic Development.

(2) Household-based policies, including land tenure and market-based incentives, such as appropriate subsidies of grain and cash payments to farmers, can be effective tools for ecosystem management. Longer tenure and subsidy arrangements may be needed to sustain ecological benefits. Ecosystems cannot be well managed if other related policies—including land tenure, food security, regional development, and urbanization policies—are not supportive, and if enabling environment is not conducive to implementing such policies.

(3) A full integration of ecosystem management into the sustainable development policies and strategies and the provision of ecosystem services must be the top priority for future ecosystem management. Different ecosystem services are closely interrelated and there may be significant trade-offs, but benefits can also be attained through good planning and recognition of the opportunity for synergies.

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