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Short communication

Current status and recent trends in financing China's nature reserves

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ABSTRACT

Many studies conducted a decade ago indicated that funding shortages were a major constraint on the effective management of China's nature reserves. However, with the rapid growth of China's economy, both the number of reserves and the corresponding financing of reserves have greatly increased. Based on data from a questionnaire survey conducted in 2011 at 47 national-level nature reserves (NNRs), we analyzed the financing of China's NNRs and compared it with six Southeast Asian countries. From secondary data, we also estimated the changes in the financing of NNRs and the changes in the government investment in nature reserves (NRs) at all levels. The findings revealed that operational expenditures in China's NNRs were 5.19 USD/ha in 2009, ranking second among the seven countries in the survey and ranking third after adjustments for per capita gross domestic product. The total investment in NNRs increased by a factor of 2.3 over 1999 levels and reached 5.50 USD/ha in 2009. From 1994 to 2005, government investment in nature reserves at all levels increased by a factor of 1.4. The financing of China's nature reserves has improved in general, and future investment should be more specifically targeted at NRs facing financial hardships.

1. Introduction

The Protected Areas (PAs) strategy has become increasingly common in biodiversity conservation. Global land protection is estimated to reach 15–29% of the Earth's surface by 2030 (McDonald and Boucher, 2011). However, shortages of financing and staff are common constraints compromising the effective management of protected areas in many countries. On a global scale, a study based on data collected in the mid-1990s estimated a shortfall of 2.3 billion USD in the amount needed to effectively protect the world's existing nature reserves (James et al., 2001). Balmford et al. (2002) estimated a need of 45 billion USD per year, over 30 years, to secure an ideal global PA system, while current allocations cover less than one-sixth of the estimated need. While PAs already face a tremendous shortage in funding, their global funding has been declining since the 1990s due to the rapid expansion of the number of PAs and a shift in donors' priorities from biodiversity conservation to poverty alleviation (Emerton et al., 2006). Thus, in order for donors and decision-makers to improve the efficiency of their investments, it is essential for them to understand the status of PA financing to identify investment priorities.

Despite the rapid expansion of PAs, there are limited empirical data regarding their current financing. The most up-to-date PA-based data on PA financing on a global scale were collected by the World Conservation Monitoring Center in the mid-1990s (James et al., 1999), which reported a global average PA financing level of 8.93 USD/ha (in 1996 USD). Subsequent research on PA financing has greatly relied on this data set (James et al., 2001; Emerton et al., 2006). Outdated information hinders a systematic assessment of the adequacy of funding for protected areas and the setting of future investment priorities, especially in places experiencing rapid economic changes, such as China.

China is important with respect to this topic because it plays a significant role in global biodiversity conservation. China is one of the top 17 megadiverse countries in the world (Mittermeier et al., 1997), with 17 of the 233 biogeographic realms identified by World Wide Fund For Nature (WWF) in its territory (Olson and Dinerstein, 1998). Establishing nature reserves (NRs) is the main strategy used for biodiversity conservation in China. The number and total area of NRs are growing rapidly. From 1995 to 2010, the number of NRs increased from 799 to 2588 and the area protected increased from 71.85 million ha to 149.4 million ha (State Environmental Protection Bureau, 1996; MEP, 2011). The expansion of NRs protects additional areas but also demands increasing investment. NRs in China are also facing the problem of funding shortages (Han, 2000; Ouyang et al., 2002; Su, 2006; Wang et al., 2011; Zhu et al., 1995) and a lack of updated information on NR financing. The most recent NR-based data about reserve financing were collected in 2004 (Su, 2006). The last available systematic surveys concerning the funding of NNRs were conducted in 1999 (Han, 2000) and revealed an average investment of 1.13 USD/ha (in 1999 USD). However, China's economy has grown rapidly in recent decades, and the government has had more resources to

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allocate to biodiversity conservation. In fact, since the government launched the "Wildlife Conservation and Nature Reserve Construction Project" and the "Special Fund for Capacity Building of National-level Nature Reserves" in 2001, the total government investment in NRs has increased greatly (Mei and Zhang, 2006). Given these changes, the current financing level per ha for NRs is quite different from the level that it was ten years ago. Thus, it is essential to conduct new surveys to understand current reserve financing.

To accomplish this task and to systemically estimate fiscal gaps in PAs in southeastern Asian countries and China, the Economy and Environment Program for Southeast Asia funded a research project to collect updated data on PA financing. This paper is a result of that project, and it reports the most recent information about NR financing in China. It also provides a comparison of PA financing in China with PA financing in other selected countries and a trend analysis of reserve financing in China.

Before reporting the research results, this study will briefly introduce the management system of China's NRs. China's NRs are registered as national-, provincial-, municipal-, or county-level reserves according to their significance and representation as conservation targets. National-level NRs (NNRs) have been established to protect the most valuable and unique species, ecosystems, and landscapes in the country. Prior to 2010, 319 NNRs accounted for 62% of the total area of NRs in China (MEP, 2011). A NR is managed by the government on the corresponding organizational level (for example, a provincial-level reserve is managed by provincial government) and supervised by a department of the central government. Departments involved in NR management include the State Forestry Administration (SFA), the Ministry of Environmental Protection (MEP), the Agriculture Ministry (AM), the Ministry of Territory Resources (MTB), the State Oceanic Administration (SOA), and the Ministry of Water Resources (MWRs). As the department with the longest history in NR management, the SFA manages 74% of China's NRs and 77% of the total area of NRs. The MEP manages the second largest number and the second largest area of NRs.

NRs obtain most of their budgets from government appropriation and a smaller portion from ecotourism and donations. Financing levels vary among NRs managed by different departments and among NRs managed at different government organizational levels. NRs managed by the SFA and the MEP generally have better financing systems and thus more funding resources than other NRs because these departments have had a longer history in NR management (Zhu et al., 1995). National-level NRs usually receive more financial resources than NRs managed at local levels of government (Research Team of Financing Mechanisms of Nature Reserves in China, 2000). It is believed that NRs located in western China receive fewer financing resources than those located in middle or eastern China (Jiang et al., 2006) because western China is economically less developed. Local governments have limited budgets to invest in conservation, and fewer opportunities for ecotourism operations in NRs exist in western China. In addition, per-hectare funding generally declines as the size of an NR increases.

2. Methodology

In this survey, we focused on NNRs, as they cover the majority (62%) of the total area of NRs and protect sites with the most significant biodiversity value. We collected NNR financing data from April to September 2011 through a questionnaire survey. We distributed 174 questionnaires, of which 58 were returned. Ultimately, we collected valid financing information for 47 NNRs (see Appendix A for detailed information on each NNR) – 15% of the total number of NNRs, which account for 5% of the total area of NNRs. As mentioned above, the size, location and supervising department influence the financial situations of China's NRs. Table 1 shows the distribution of analyzed NNRs by size, location, and supervising department. The samples were evenly distributed among different categories with respect to these three aspects; thus, the results may represent the general situation of NNRs despite the low survey return rate.

Table 1
Distribution by size, location, and supervising department of the sampling ratio of analyzed NNRs.

	Category	No. of NNRs in China	No. of analyzed reserves	Sampling ratio
Size	<10,000 ha	49	6	12.2%
	10,000–100,000 ha	199	29	14.6%
	⩾100,000 ha	71	12	16.9%
Location	Western area	129	23	17.8%
	Eastern area	97	14	14.4%
	Middle area	93	10	10.8%
Supervising department	SFA	237	35	14.8%
	MEP	46	8	17.4%
	SOA	12	3	25.0%
	AM	9	1	11.1%

Note: SFA – State Forestry Administration; MEP – Ministry of Environmental Protection; SOA – State Oceanic Administration; AM – Agriculture Ministry.

We made geographic and time-based comparisons to examine the status of NR financing. For the geographic assessment, we compared China's level of financing with PA financing data from six Southeast Asian countries obtained from our partners in this cross-country project. There are two bases for the selection of these particular countries. First, PAs in these countries were surveyed with the same methods at the same time and, thus, provided the latest and most consistent data. Second, these countries are all developing countries important to biodiversity conservation (Olson and Dinerstein, 1998), thereby providing a sound basis for comparison. Considering the difference in economic scale, we used the ratio of per-hectare expenditures to per-capita GDP as an indicator in the comparison. For the time-based analysis, we estimated the trends of NR financing since 1994 based on the results of this survey and on secondary data from related articles and governmental reports. Constrained by limited data availability, we compared the change in total expenditures of NNRs and the change in government appropriation of resources at all levels of NRs. The limited availability of data is also the reason that we selected 1994 as the first year of the trend analysis. The historical financial inputs were adjusted to 2009 CNY, using China's consumer price index data published by the International Monetary Fund (IMF) and were then adjusted into 2009 USD to make it reasonable to compare financial inputs between different years. All of the following financing data are expressed in 2009 USD unless otherwise specified.

The inflation rates and exchange rates used in this paper are shown in the following table.

Year	1995	1996	1999	2004	2005	2006	2009	2010
CPI (using 2009 as the base year)	75.95	82.25	82.71	87.24	88.82	90.13	100	100.74
Exchange rate (USD:CNY)	8.278					6.821		