1	Shengtai Anquan: Managing Tourism and Environment in China's Forest Parks					
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Protected area management agencies worldwide face a continuing dilemma over the role of tourism and recreation (1,2). Most parks face external threats from invasive species, illegal use, fire and pollution. Parks agencies need funds to manage these threats, and governments require them to raise part of their revenue from visitors, who also create impacts. Parks agencies therefore balance internal threats from increased recreation, against its role in contributing funds and political capital to counter external threats. Recreation can include commercial tourism operations, and in some public lands this may include large-scale fixed-site facilities, such as ski resorts on US Forests Service land (1, 3).

In recent years, large-scale tourism operations have been developed in many public Forest Parks in China. The political and demographic pressures for this, the environmental impacts it produces, and the approaches used to manage it, have some similarities with those in Western Anglophone nations, but also some significant differences. One approach used by the forest parks management agencies is called shengtai anquan, ecological security. This identifies managers' perceptions of the most urgent issues facing the Forest Park estate, by combining their knowledge of the urgency of threats, the severity of impacts, and the capacity to respond. Shengtai anquan is thus based on a pressure-state-response theoretical framework similar to those used in the West (4); but it considers the three components simultaneously rather than separately.

In the same way that the Chinese concept of shengtai lüyou, ecological tourism, has some critical differences from the Western concept of ecotourism (5), the shengtai anquan approach has some critical differences from the various protocols used for monitoring and managing tourism and recreation in Western parks and other public lands (6). As with shengtai lüyou, approaches in China can inform those in the West as well as the reverse. Here, therefore, we present an analysis using the shengtai anquan approach, for Forest Parks in southern China.

 China has around 1.75 million km² of forest vegetation (7), and about 163,000 km² of this, 11%, lies within forest parks where timber production is no longer permitted and recreation is encouraged. About 700 of these parks, totalling 114,326 km² or about 70% of the total, are managed at a national level. The remainder, more numerous but smaller, are managed at provincial and local levels (7). Forest parks are distributed throughout China, with the largest areas in heavily forested provinces such as Heilongjiang, and the smallest in desert provinces such as Xinjiang and montane provinces such as Qinghai. The first Forest Park at Zhangjiajie was established in 1982, but most are much more recent, since promulgation of Forest Park regulations at national and provincial level in 1994.

Visitation rates and pressures are increasing rapidly, as China's newly wealthy middle class takes the opportunity to escape increasingly polluted cities in search of short rural holidays with clean air and water and forest landscapes (8,9). A total of 274 million tourists visited the various forest parks during 2008, up 11% from 2007. Entry fees totalled 18.7 billion yuan (1.84 billion euro) in 2008, up 18% from 2007, with a total regional economic contribution estimated at >140 billion yuan (7,10,11). Forest Parks, including tourism and conservation aspects, are managed by forestry agencies whose expertise originated in timber production, not environmental design or management. To generate revenue, these agencies developed large-scale tourism

activities, accommodation and infrastructure, and are only now appreciating the environmental consequences.

Here, therefore, we examine agency perceptions of these environmental problems through a survey of staff involved directly in managing tourism and conservation in a set of 10 forest parks in southern China, within the shengtai anquan framework (12). This involved cross-cultural interpretation in language, theoretical concepts, and practical and political contexts; using multiple reciprocal translations, reciprocal international visits, and iterative refinement of mutual understanding (5).

 An aggregate list of relevant environmental management issues was compiled from published academic literature and park management plans, screened by Chinese academic experts in park and recreation management, and trialled using a subset of forest parks staff. This yielded 36 issues, in nine subgroups. Parameters reflecting pressures included: growth in regional development, population, visitation, and tourism employment; intensity of use of areas allocated to tourism; water consumption; atmospheric, waterborne and solid wastes; invasive species, loss of native biodiversity, and encroachment on park boundaries; and the frequencies of fires, extreme weather and natural disasters. Parameters describing the current state of the forest parks included: air and water quality; noise; and measures of biodiversity, ecosystem health, and forest cover. Indicators of response capacity included: average levels of education for residents, tourists and tourism employees; per capita GDP and the proportion contributed by tourism; investment in environmental protection and forest restoration; levels of treatment for exhausts, wastewater and solid wastes; and levels of legislation, legal awareness and law enforcement related to tourism and environment.

Senior staff at these 10 forest parks, 60 respondents in all, assessed the importance of each issue for parks throughout their region, using a seven-point scale for each item. Responses were internally consistent within subgroups (Cronbach's alpha 0.69-0.77; internal correlation coefficients 0.49-0.93.) Bartlett's measure was significant at p<0.001 for all nine subgroups, but KMO coefficients were >0.7 for only four: pressure on environmental resources, risk of natural disasters, technological investment capacity, and legal support capability. For each of these four, the group submatrix was then subject to principal components analysis (PCA) with varimax orthogonal rotation. For the two largest of these groups, namely pressure on environmental resources and technological investment capacities, factors with eigenvalues >1.0 are shown in Table 1.

In the perceptions of managers for the forest parks of southern China, the single most significant pressure on natural resources is encroachment by invasive species and loss of native plant diversity associated with the intensity of tourism development. Air, water and solid waste pollution are also all important in perceptions of these Forest Park managers, but water pollution is independent from air pollution and solid waste, and they are all independent from tourism and invasive species. This reflects the situation, in southern China as indeed worldwide, that: water pollution in parks is often due to sources upstream; air pollution in parks is due partly to neighbouring cities and partly to heavy internal vehicle traffic; and solid waste pollution in parks is commonly a function of litter management practices. In addition, it reinforces the

strong link between tourism and invasive species, which is characteristic worldwide (13).

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Forest park managers' perceptions of investment capacity also indicate that treatment of atmospheric emissions, waste water and solid wastes are largely independent. Interestingly, wastewater treatment is linked to *per capita* GDP: water pollution abatement is seen as more important in more wealthy areas. This may reflect differential social concerns over sewage treatment, or the higher effluent discharges from pulp mills, brickworks, and manufacturing plants. Forest park managers also perceive a link between the contribution of tourism to the regional economy, and investment in environmental protection measures and technologies. Either, areas which protect their natural environment can attract more tourism; or areas which depend on tourism take more steps to protect their natural environment; or both. Investment in environmental protection technology, however, is not correlated with investment in ecological restoration through reforestation and replanting.

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Even though China's Forest Parks have a different history and context from their Western counterparts, managers' perceptions of critical environmental issues associated with tourism are not dissimilar. The key difference in the shengtai anguan management philosophy is the formal consideration of response capability in conjunction with threats and impacts. Internationally, this happens in day-to-day management practices, but not in formal visitor management protocols (4,14). Shengtai anguan, however, is a principle, not necessarily a practice. It is needed now because forest park managers ignored ecological security during earlier tourism development. An improved conceptual basis will not necessarily influence on-ground management, since forest parks now have a legacy of tourism development and rely In other countries, parks agencies which have permitted on tourism revenue. large-scale commercial tourism development have found themselves subject to political and financial capture by the industry. In China's Forest Parks, the tourism operations are run by the forestry agencies themselves. Even so, these agencies face the same dilemma as their Western counterparts, namely whether to accept an increase in internal environmental threats through tourism, in order to raise funds to counter external environmental threats from other industry sectors.

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Table 1. **Principal Components Analysis of Key Subgroups**

Parameter	Rotated Factor Loadings				
Resource pressure	1	2	3	4	5
air pollution	0.04	0.02	0.04	0.10	0.97
water pollution	0.39	0.24	0.25	0.82	0.17
solid waste	0.31	0.40	0.36	0.24	0.72
tourism use of natural environment	0.88	0.79	0.13	0.06	0.14
loss in plant diversity	0.77	0.23	0.50	0.17	0.13
invasive species	0.86	0.16	0.13	0.24	0.28
tourism land use	0.04	0.83	0.34	0.37	0.25
Investment capacity	1	2	3	4	5
per capita GDP	0.08	0.84	0.01	0.14	0.20
tourism as % GDP	0.08	0.02	0.99	-0.08	0.03
investment in environmental protection	0.15	0.14	0.90	-0.08	0.07
investment in forest restoration	0.22	0.21	0.04	0.07	0.95
atmospheric exhaust treatment	0.98	0.41	0.08	0.08	0.08
wastewater treatment	-0.01	0.95	0.03	0.13	0.11
solid waste disposal	0.06	-0.02	0.05	0.92	0.17

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