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Author(s)	Sun, Yujie
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# 学 位 論 文 審 査 の 要 旨

博士(環境科学)

氏 名 Yujie Sun

審査委員 主査	教 授	渡 邊 悌 二
副査	教 授	山 中 康 裕
副査	准教授	白 岩 孝 行
副査	准教授	早 川 裕 弼
副査	教 授	韓 志 昊

(立教大学観光学部)

## 学 位 論 文 題 名

Tourism-led socioenvironmental changes in Sagarmatha National Park, Nepal Himalaya  
(ネパール・ヒマラヤ, サガルマータ国立公園における観光がもたらした社会的・環境的变化)

Protected areas (PAs) throughout the world are vital for conserving natural and cultural resources, enhancing livelihoods, and stimulating sustainable development. As one type of PAs, national parks are essential in developing nature-based tourism destinations that promote efficient management of natural resources and socio-economic development. Mountains, characterized by diversity, remoteness, isolation, and difficult accessibility, have been exclusive for nature and culture-based tourism. The increase in tourists to national parks in mountain regions poses both opportunities and challenges for sustainable mountain development. In order to achieve sustainable development in mountain regions, it is crucial to examine social and environmental characteristics, such as the landscape, energy use, and population transformation.

This study explores the transformation of the tourism-related facilities, changes in forest cover, and trends of local in-migration to Sagarmatha National Park (SNP), Nepal, the highest ecological system on the globe, as an example of the Himalayan region. The selected study area includes a protected core zone and a buffer zone. A total of five periods of field investigations were conducted. Questionnaire surveys targeting the owners/managers of tourism-related facilities and local people and interview surveys with various community leaders, officials, and school principals were conducted in the park during the period of 2017–2019. In total, 888 sets of answer sheets were obtained through the questionnaire surveys. Among the respondents, 563 were facility owners and managers, and 586 were in-migrants. Further, 1989, 2002, and 2015 remote sensing data have been classified to detect the forest cover change in the park. In addition, group discussions and participant observation were conducted in the field.

The results show that the types, distribution, ownership, capacity, and energy use of tourism-related facilities in the park have been transformed. The proliferation of tourists visiting the park has increased and diversified the tourism-related facilities. The number of lodges has grown more in the buffer zone area. Migrant non-Sherpas (39%) have been substantially involved in managing the facilities, although local Sherpas (50%) have been key players to lead the tourism business in the area.

This study also revealed a significant transformation of energy sources used in the facilities. The facilities now commonly use liquefied petroleum gas (LPG) and electricity. Diverse energy sources are exploited in the facilities. About one-third of the investigated facilities did not use firewood. However, the uneven distribution of the facilities constrains the spatial use of energy sources. The main factors driving the transformation are the increase in the number of tourists, improvement of conditions of porters' accommodation, and in-migrant labor.

The result of the satellite image classification revealed that forest cover decreased from 1989 to 2015. The decreasing rate had slowed down between 2002 and 2015. Several factors contributed to this change: firstly, the strict practice of national park regulations in tree felling and firewood collection; secondly, the effective implementation of community forest management systems; thirdly, a wide use of alternative energy sources, such as LPG and electricity; and finally, the provision of porterhouses since 2004.

Moreover, the in-migration of local people to SNP has been divided into two patterns: seasonal migration and long-term migration. The seasonal in-migrants are mainly porters and trekking guides. They stay less than six months in the park per year and tend to take low-income jobs. Besides, their movement pattern is arbitrary. On the other hand, long-term in-migrants occupy high-income positions such as facility managers, owners, and staff, who remain more than six months in the park per year. In general, tourism is the leading factor for the in-migration of local people to SNP. These in-migrants have contributed to the economic development in the park. At the same time, however, they have also brought potential challenges to the area.

The topographic barrier greatly hinders tourism-related mobility in SNP. The movement of tourists, local people, and cash brought by tourism has far-reaching impacts on the local society and environment. Policymakers should consider these impacts brought by the increased human activities. Strategies to involve locals, in-migrants, and tourists to alleviate further challenges need to be developed for sustainable national park development.

In addition to the excellent academic knowledge in the research, her academic records throughout the Ph.D. course are outstanding. Based on these pieces of evidence, the committee concluded that Yujie Sun deserves to become a Doctor of Environmental Science.