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Author(s)	Sun, Yujie
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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・環境的変化）

Yujie SUN

Background

Mountain areas cover 26.5% of the world's total continental land surface (Rama et al., 2019). Mountains have been indispensable for people as sources of food, valuable minerals, precious stones, and places of great cultural significance (Price, 2015). One of the main ways that governments worldwide have recognized the importance of mountain areas' remarkable biological and cultural heritage is to establish protected areas (PAs), such as national parks (Price, 2015). The increase in tourists to national parks in mountain regions poses opportunities and challenges for sustainable mountain development. To achieve sustainable development in mountain regions, it is critical to examine social and environmental characteristics, such as the landscape, energy use, and population transformation.

Mountains are home to rural and remote communities (Messerli & Ives, 1997). Mountains, characterized by diversity, remoteness, isolation, and difficult accessibility, have been exclusive for nature and culture-based tourism. Many mountainous regions have promoted tourism development to stimulate their economies by providing local residents with direct income and job opportunities (Nepal, 2005). Flourishing mountain tourism has also increased the expansion of built-up areas to contain many tourists, modifying the rural landscape (Nepal, 2007). Studies have examined tourism-led changes in the features and functions of rural settlements (Feng et al., 2020; Lakshmi & Shaji, 2016; Nepal, 2005, 2007; Pop et al., 2017). Yet, these studies provide inadequate examination and analyses about the unrevealed processes and issues of the associated increase of different tourism-related facilities and distribution patterns.

Mountain tourism reflects the interconnection among PAs, local communities, and the environment in the mountains. However, protection work is highly concentrated in the core PAs. Moreover, tourism, tourists, and

their impacts are not equally scattered in space and time (Gorbuntsova et al., 2019). Instead, there are significant differences in various international, regional, and local areas.

Mountain regions that go through seasonal flows of tourists have to deal with a short-term increase in population and growing energy demands (Aubriot et al., 2019). In addition, mountain forest has served as firewood. Although tourism-related energy issues have been examined intensively, most studies pertain to greenhouse gas emissions and global climate change (Adedoyin & Bekun, 2020). Not much research is available on how tourism in rural regions increases the dependency on traditional forms of energy and to what extent it initiates the growth of alternative energy sources (Nepal, 2008). Similarly, published literature on energy consumption patterns in rural tourism destinations is limited (Zhang & Zhang, 2020), especially in local studies. The analysis of local issues is essential because it is place- and context-specific and may have implications at a larger scale (Nepal, 2008). The way how energy is secured, supplied, and consumed is vital to the form and functioning of economies, political systems, built environments, social relations, and livelihoods (Foon & Abosedra, 2014). Also, an examination of how mountain communities influence the use of mountain forests is necessary.

As a mountainous country, Nepal holds 20 PAs, containing 12 national parks. Sagarmatha National Park (SNP) is one of the top trekking destinations. The past few decades have seen a dramatic increase in the number of tourists to the world's highest national park. Research has focused on a variety of issues in SNP. Most of the studies concern changes in historic livelihoods due to a boom in tourism and further integration of local economies and lifestyles into global markets (e.g., Spoon, 2011, 2012); and climate change and its consequences–rising temperatures and melting glaciers that lead to glacial lake outburst floods (e.g., Chand & Watanabe, 2019). In comparison, some studies exacerbate resource conditions in addition to population growth (Aubriot et al., 2019). In fact, the Himalayan Environmental Degradation Theory (Ives & Messerli, 1989) is always controversial, especially for deforestation.

Park regulation, population growth, and tourism development have produced tremendous changes to land use in SNP (Stevens, 2013). Various tourism-related facilities have been constructed or adapted from previous settlements to meet the increasing tourism activities in SNP. Although remote sensing has been progressively

considered as an essential and useful tool for studying land use and land cover change, a spatial analysis alone may sometimes miss some underlying driving processes (e.g., Lambin & Meyfroidt, 2011). Moreover, studies that bring together quantitative and qualitative field surveys and remote sensing analyses are essential. Besides, there are only a few studies about tourism-led social changes in the region, especially in local people's migration. In-migration of the population within different ethnic groups, the influx of people during the peak trekking season, and out-migration during the off-season have profoundly impacted the mountain environment in SNP.

There has been a slow but continual effort towards increasing global awareness concerning mountain issues. In recent years, mountain issues have come to the forefront in the policy agenda of many national and international agencies and governments. Further, recent discussions facilitate mountain-specific development issues (Rama et al., 2019). Therefore, a tourism perspective on mountain development within the broader framework of human-nature interactions is essential. According to Price & Messerli (2002), SNP was regarded as one of the central points during the process of the evolving place of mountains in the global agenda. In this way, the development issues of SNP are closely connected with the international discourse of sustainable mountain development. Therefore, this study explores the transformation of the tourism-related facilities, changes in forest cover, and trends of local in-migration to SNP, the highest ecological system on the globe, as an example of the Nepal Himalayan region.

Objectives

The starting point for this study was that there was limited comprehensive literature on the facility development and energy use in these facilities. In addition, the effectiveness of establishing a protected core zone and buffer zone in forest conservation in SNP is lacking though forest cover changes have been revealed in the park. Moreover, although some scholars have noticed the internal migration of local people in the park, the migration pattern and the resultant challenges have not been examined.

Therefore, this study aims to examine tourism-led social and environmental changes in SNP. The specific objectives are: (1) to investigate tourism-led facility development in SNP; (2) to figure out tourism-induced

changes in energy consumption patterns of facilities and forest cover and identify the underlying drivers and processes; (3) to analyze tourism-induced in-migration of the local population and the resultant challenges.

The following questions were addressed in the thesis. Firstly, it tries to produce the latest understanding of the development, ownership, energy use of the tourism-related facilities, and the imbalanced development and unequal benefit distribution among villages in SNP by figuring out the following research questions. (1) What is the tourism-related facilities in SNP, and who manage them; (2) How are tourism-related facilities distributed in the park, and what factors influence their distribution; (3) What types of problems have been induced by tourism-related facilities, and what measures could be taken to alleviate these challenges?

Furthermore, it attempts to investigate the energy use and forest cove evolution of SNP in a more complete way by clarifying the following questions: (1) what factors contribute to the energy use transformation and the different rates of forest cover change; (2) what types of problems are SNP facing in energy use and forest protection; and (3) what measures might be exploited to solve these problems?

This study also aims to elucidate (1) what motivates the migrants to migrate away from other rural (or urban) areas towards SNP; (2) what patterns of in-migration and re-settlement occur in SNP; and (3) what positive and negative changes have been brought by local in-migrants? By evaluating the geographic origin, income, and occupational distribution of migrants, this study intends to identify and discuss positive impacts, constraints, and opportunities for sustainable development in the park.

Methodology

SNP is located in the eastern part of Nepal. Founded in 1976, the park was recognized as a World Heritage Site for its distinctive natural and cultural resources in 1979. The national park area (core zone) contains about 1,148 km^2. The buffer zone comprising 275 km^2 was established in 2002 and lies in the south part of the park. The park incorporates mountains, glaciers, and rivers, covering a dramatic elevation range from 2,800 to 8,848 m. Sherpas dominate the local population in the park. The main settlements are Namche Bazaar, Khumjung, Khunde, Phortse, Pangboche, Thame, and Dingboche. Lukla is the entrance village to the park. Namche Bazaar is the park's

administrative, commercial, and tourist center. It was hard to visit the park in the 1950s. The conditions changed greatly with the construction of the Lukla airstrip in 1964. Trekking and mountaineering activities are usually performed in spring and fall. The number of tourists to SNP grew from 5,836 in 1980 to 52,424 in 2019. SNP has been chosen because of the author's familiarity, its difficult accessibility, the importance of tourism in the region, and the rapid increase of tourists visiting the park.

The multidimensional nature of this study has required various methods. Therefore, the datasets in this study were based on extensive fieldwork, questionnaire and semi-structured interview surveys, group discussions, participant observation, and remote sensing data analysis. A total of five periods of field investigations were conducted during the period of 2017–2019. In total, this study investigated 27 villages.

Questionnaire surveys were conducted face-to-face with the owners/managers of tourism-related facilities and local people. This study exploited three types of questionnaire surveys: one for lodges, one for other tourism-related facilities, and one for local people (excluding facility owners and managers). A pilot survey was carried out after the questionnaire was translated into Nepali with the help of two Nepalese researchers during the first fieldwork in March 2017. After the pilot survey, a final improved version of the questionnaire was prepared. Information on tourism-related facilities, household, personal, and tourism-related information had been collected. Totally, 888 sets of answer sheets were acquired through the questionnaire surveys. Among the respondents, 563 were facility owners and managers, and 586 were in-migrants.

Semi-structured interviews were conducted either in Nepali or English with 12 local community leaders, six members of community organizations, five national-park officials, two school principals, two experienced trekking guides, one public hydropower staff, and one private hydropower plant owner. The obtained information concerned the history of tourism development, firewood collection rules, energy sources history in the park, tourism-and environment-related activities conducted in the park, national-park management policies and plans, attitudes toward current tourism development and migrants, and perceived benefits and costs in the park.

Two group discussions were conducted with two local communities. One group discussion was done with Namche Bazaar Women’s Group on March 16, 2017. Another group discussion was carried out with the Benkar

community on April 29, 2019. Across the group discussions, information on attitudes toward tourism development, perceived benefits and costs, tourism promotion activities, perceived land use and land cover (LULC) changes, and the factors contributing to the LULC changes in SNP had gained.

Further, 1989, 2002, and 2015 remote sensing data have been classified to detect the forest cover change in the park. The classification was done in ArcGIS by using Maximum Likelihood classification. Four types of land use and land cover classes have been classified: glacier lake, forest, glacier, and others (including agriculture, settlement, grazing land, bare rock/soil, and shrubland). The overall accuracy for the 2015 Landsat 8 classified image is 77%.

This study distinguished respondents' origin based on two categories: locals and migrants. This study defines the two as locals are original residents in SNP, while migrants are from outside the park.

Results

The results show that the types, distribution, ownership, and capacity 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 (39.0%) have been substantially involved in managing the facilities, although local Sherpas (50.0%) have been key players to lead the tourism business in the area. The main factors driving the transformation are the increase in the number of tourists, improvement of conditions of porters' accommodation, and in-migrant labor.

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. The result of the satellite image classification revealed that forest cover decreased from 1989 to 2015. However, the decreasing rate had slowed down between 2002 and 2015. Several factors lead to this transformation. First, only using firewood cannot meet an excellent cooking demand of a rising number of tourists. Then, this transformation is connected to the strict

national park regulations in tree felling and firewood collection and community forest management systems. Thirdly, LPG became more accessible with the enhancement of transportation.

The in-migration of local people to SNP has been separated 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. In contrast, long-term in-migrants take up 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.

Discussion

Tourism development has brought remarkable economic benefits to the locals and posed problems and challenges to the local environment and sustainable development in SNP. The social survey results showed that the development of facilities is imbalanced, and the direct impact of tourism benefits among villages in SNP is unequal. Most respondents indicated that villages along the main trekking routes benefited more than those located away from the main trekking routes. Therefore, these developed villages accommodate more tourists, resulting in more economic benefits than the less developed villages in the park. In general, with the most significant number of facilities in the park, Namche Bazaar was regarded to have more business and developed much more than other villages. The factors contributing to this mainly lie in that Namche Bazaar is the center of this park on the administrative and geographical sides. There are also more entertainment activities in Namche Bazaar, which adds the advantage of attracting tourists.

Further, the uneven altitudinal distribution of facilities has influenced the energy sources used in the facilities. Namely, at high altitudes, particularly above 4,000 m, the proportion of facilities with access to electricity decreases considerably due to the unavailability of hydropower plants. Nevertheless, the buffer zone's firewood

consumption is higher due to limited access to firewood at high altitudes, which is substituted by kerosene and animal dung at high altitudes.

Tourism product diversification is of great importance for a particular destination's competitiveness and sustainable development (Benur & Bramwell, 2015). Caroli et al. (2013) and Pandey (1994) found that tourists were often interested in cultural activities and ecological attractions, including wildlife and bird watching, in addition to trekking in SNP. Therefore, incorporating cultural activities and wildlife-related trekking routes may provide alternative attractions and maximize tourist experiences (Caroli et al., 2013). Moreover, in the surveyed 27 villages, 33% of them did not have attached rooms in lodges. As a result, these villages should facilitate comfortability to attract tourists. Additionally, Caroli et al. (2013), Musa et al. (2004), and Pandey (1994) indicated that diarrhea was a common problem that tourists encountered during trekking in SNP. Therefore, clean drinking water, well-maintained toilets, and good hygiene in the park are top priorities that tourists want to be improved. Hence, less developed villages should consider improving facility and service quality to attract more overnight tourists.

Conclusions

Tourism has promoted the rapid development of facilities in SNP. The results show that with the growth of the number of tourists, tourism-related facilities have increased and diversified to accommodate and meet the various needs of tourists. The questionnaire survey results reveal that the buffer zone area experiences more increase in the number of lodges. Most facilities are owned. Besides, the ownership and management patterns of facilities have also been diversified. Migrant non-Sherpas have been significantly engaged in managing the facilities, although local Sherpas dominate the management of facilities in the park. With the most significant number of facilities in the park, Namche Bazaar is considered developing much more than other villages.

Energy sources used in the facilities have been transformed. Facilities have access to diverse energy sources. As a result, facilities now commonly use LPG and electricity. Meanwhile, about one-third of the surveyed facilities did not use firewood. In the facilities which used firewood, the percentage of the used firewood mainly was less than 30%. However, altitudinal distribution of facilities has confined and brought uneven exploitation of energy

sources. Forest cover had decreased from1989 to 2015, but the decrease rate in the second period (2002–2015) slowed down. The widespread use of LPG and electricity in SNP shows the critical roles of government administration in achieving sustainable development in rural areas. Also, the detailed analyses of the reasons for the transformation of the use of energy sources in the facilities can provide valuable insights for tourism development in rural areas.

In terms of migration patterns and employment opportunities, local in-migrants to SNP are heavily influenced by tourism. Also, as more lowlanders migrate to the park, their occupations, mostly tourism-related jobs as their primary household income source, have been diversified. The seasonal in-migrants are largely porters and trekking guides. Long-term in-migrants are mainly doing lodge-and shop-related jobs. These in-migrants have filled the labor gap and stimulated the local economy.

The topographic barrier in the park essentially constrains tourism-related mobility in the region. The movement of tourists, local people, and cash brought by tourism has produced extensive impacts on the local landscape, society, and imbalanced development and unequal benefits among villages. The increase in the number of tourists, improved porter accommodation conditions, and higher levels of migrant labor have contributed to the transformation. To enhance the development and benefits of tourism in the park, stakeholders, such as park managers, trekking agencies, and local organizations should consider diversifying trekking routes to integrate less developed villages. The diversified routes should consider residents' preferences, tourists' travel interests, and tourists' prior trekking experience. Although the diversification of the trekking routes may increase human imprint on the local landscapes and waste accumulation in the region, the increase in the human imprint is beyond the focus of this study. However, national park authorities and policymakers may consider the potential environmental and social issues to be brought by expanded human activities when route diversification is developed. The recommendations proposed in this study are primarily based on the social survey results. The feasibility should be further reviewed as the situation changes. Strategies to engage locals, in-migrants, and tourists to alleviate further challenges are necessary to achieve sustainable national park development.

This study advances a step further from previous studies that investigated the impact of tourism on changes in settlements by extending the research to the transformation of the social and environmental dimensions in rural communities. Moreover, it also contributes to practical and detailed recommendations on how development endeavors could mitigate uneven development and unequal benefits in mountain regions and isolated islands. However, the surveys were conducted before the COVID-19 pandemic; therefore, issues related to expanding tourism-related facilities in the park need to be re-examined. Further research on restoring tourism activities in the park is also necessary.