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Protected area-people connectivity in Qinling Zhongnanshan UNESCO Global Geopark, China

(中国，秦嶺・終南山ユネスコ世界ジオパークにおける
保護地域と人の結合性)

Chang Liang

Background

It has been widely considered that protected areas (PAs) serve as the first line of the effort of protecting global biodiversity. Protected areas (PAs), crucial parts needed by all global conservation strategy increased on our planet from less than 1 million km² in 1970 to 12.2 million km² by 1997. Based on this growth rate, Vedeld predicted that the PAs areas were going to increase to 17 million km² (10% of the earth's terrestrial environment), spreading out more than 100,000 areas. Mitchell pointed out that nowadays one-tenth of the surface of our planet is protected area under some certain. Nowadays, quite many people would like to enjoy taking a vacation (an example of recreational use of PAs) or some recreational activities in nature, which is located away from urban areas. The potential of impacts on the environment also grows while the recreational use of PAs increases. This turns into a concern, because an increasing visitation may cause negative impacts on environment in PAs, especially the areas which bare high value of conservation, and are very sensitive to disturbance and take long time to recover.

Even though some PAs including natural parks are located in remote wilderness, many rural communities either had been living there well before the establishment of these PAs or have resettled due to the designation. Additional population also could be attracted to move to those PAs. For example, in Africa and Latin America, it may not be surprising to notice that high population growth has happened along PA' borders. This can be explained by the park-focused integrated conservation and investment made by international donor agencies for rural development. Many local people depend on natural resources such as forest in PAs, which plays a significant role in their livelihood, rural areas in particular. In Lao People's Democratic Republic, there are approximately

80% people living in rural areas who are dependent heavily on natural resources for their basic needs and subsistence. Geoparks are regarded as an innovation for the protection of nature and geoheritages, and the pioneers in the development of geotourism by Farsani et al. They also stated geoparks not only help develop geotourism but also create job opportunities, economic activities and bring especially rural regions additional sources of income. This is because both European Geoparks Network (EGN) charter and Global Geopark Network (GGN) regulations require all geoparks to be established in rural areas.

China is a large country with a vast territory and broad sea area. Within China's domain, a vast range of plant, animal, and micro-organism species, and diverse ecological complexes can be found. Thus, China is regarded as one of twelve "mega-diversity" countries. It is important not only for China but also for the entire world to conserve China's biodiversity. However, China's biodiversity is under severe threats because of its huge population and rapid and ongoing economic growth. China's PA area takes up 21.02% of its territory by 2018. Many researchers have paid their attentions to China's PAs. Xu et al. pointed out that because of China's environmental impacts on national and international rate and scale, the unique characteristics of environmental values and policy should be understood. Zhou et al. revealed coniferous forest area had an increase of 214.3 ha in Donghai National Nature Reserve indicating the positive effect of reforestation. China has made great progress in nature conservation by having a national biodiversity strategy and action plan developed and implemented. However, negative effects of China's PAs have been indicated as well. Negative impacts of the current management systems on certain pheasant species conservation have been revealed by Zhou et al. Based on the analysis and comparison of pre- and post-establishment of Wolong Giant Pandas Reserve, Liu concluded that high-quality habitat lost in a higher rate after the establishment; habitat fragmentation inside the reserve was also facing a worse situation than that outside.

In China, as many as 60 million people are living in or around PAs and they depend on the resources for their livelihoods. It is important to explore PAs-people connectivity in China. This part, the present research will examine various relationships among PA's stakeholders, including PAs-management agencies, PAs-state, PAs-local government, PAs-local residents and PAs-visitors. By doing so, a framework for the connectivity is organized. The term 'connectivity' is not new in scientific disciplines. For example, the term 'connectivity' has been used in ecology, landscape research, hydrology, sediment connectivity, climate change research, and geomorphology. Furthermore, 'connectivity' is also well defined in the study of the governance for PAs. In the foregoing literature review on PAs, it can be seen that much of the scholarship focuses on only one or several of the relationships. For example, Lockwood focused on the connectivity among governing bodies at different levels, but not among other stakeholders such as tourists and local residents. Therefore, research dealing with all these relationships within one study is important.

Objectives

According to the previous introduction, there are no studies presenting a whole picture of QZUGG. Therefore, it is of great significance to first deliver a panoramic description, including:

- (1) What are the advantages and disadvantages as a UNESCO Global Geopark?
- (2) What problems are there in this area?
- (3) Why do visitors come here?
- (4) What are the characteristics of the visitors to this area?

Then, this study also fills a research gap in the study discipline that to the current knowledge no studies have been conducted on perception perspectives of local residents and visitors towards this geopark. No research existed on exploring and understanding the people-park connectivity. It is hoped that some questions be addressed:

- (1) How do local residents view this geopark?
- (2) In visitors' eyes, how satisfied they are with this geopark?

- (3) Do professionals and experts hold the same idea with residents and visitors?
- (4) How about point of views from management officials?
- (5) Any differences could be detected among those different users?
- (6) How is people-park connectivity going on here?

As a UNESCO Global Geopark containing some China's National Geoparks and National Forest Parks, it is assumed that there should not be large-scale deforestation. However, it should be noticed that there still could have been vegetation cover change due to the construction of the facilities such as visitor center and parking lots. Therefore, a Geographic Information System (GIS) approach is intended to be applied to the detection. This part investigates into:

- (1) Vegetation change before and after the designation of the geopark;
- (2) Any difference in change trend among different scenic areas; and,
- (3) The reason why those changes happened.

This study aims at exploring the connectivity among different stakeholders of China's PAs, their perceptions towards PAs and the forest cover change.

Methodology

Qinling Zhongnanshan UNESCO Global Geopark was firstly designated a member of the Global Geopark Network (GGN) in 2009, and further named Qinling Zhongnanshan UNESCO Global Geopark after the validation. Located in the south of Xi'an, QZUGG which is usually regarded as "Chinese Central National Park" covers an area of 1074.85 km². It is the nearest one to a metropolis among all the world's geoparks, only 25 km away from Xi'an city. The eight scenic spots are located from west to east of the geopark ranging from 435-3740 m in elevation, in which each set of the following spots is adjacent with each another: Taiping and Zhuque, Cuihuashan and Nanwutai, and Wangshunshan and Lantian, leaving Heihe and Lishan standing alone.

Questionnaire survey was adopted to collect users' information data. In the present study, "users" takes a generalized definition as it includes both local residents and on-

site visitors. Questionnaire survey was conducted with local residents using a face-to-face fashion, which can ensure a 100% collection rate. Only one representative was selected to be interviewed from each single household in order to avoid getting too much information from one single family. After a thorough explanation of the purpose of the present study, questions were read one by one to respondents and answers were recorded faithfully. As for the number of individual households, a carpet-method was used because the number of the local people who were allowed to live within the park or do a business within or near the parks was so limited. Finally, this study collected 164 questionnaires from 4 spots. For visitor part, holidays and weekends were chosen as this study needed a large number and different types of respondents. This study also used face-to-face way to read each question and record their answers. In total, 640 answers were collected. Online survey was mainly done with the students from the universities and colleges which were located in the areas adjacent to Qinling Zhongnanshan UNESCO Global Geopark; another targeted group was citizens of Xi'an city who had visited the study site. This study used a professional online survey service provider website, Wenjuanxing (<https://www.wjx.cn/>). Questionnaires were uploaded to this website and a link was produced for respondents to finish and submit all answers. This study set the submitting condition as "You have to finish all questions before you can successfully submit them" to avoid invalid questionnaires. When this section finished, a set of reports and datasets were downloaded from the website to be converted into required data type (sav file) for next-step analysis. This part was conducted from 5th June to 10th July 2017 and 349 questionnaires were collected totally. With the same procedure used in the questionnaire survey, a semi-conducted survey was developed for management officials, in which 33 questions were included. Several aspects were examined, including management's opinion and perception towards the study site. A face-to-face in-depth interview method was employed with four management officials from the management agency. Everything was recorded with a voice recorder and a notebook. It took 9-43 minutes each and 164 minutes in total. They were also invited to do the visitor version questionnaire to serve as a test standard.

Three cloud-free satellite images downloaded from Landsat 5 and 8 via United States Geological Survey (USGS) server were adopted to conduct land cover maps. Based on the quality, availability and even time intervals, these images were chosen to be downloaded and analyzed. Maximum Likelihood Classification (Supervised Classification) was employed to do forest cover change detection. Then, forest-cover maps were analyzed to conduct forest cover changer from 2003 to 2016. When conducting visual presentation classification of forest and non-forest areas, this study referred to randomly chosen GPS data as ground truth control points (100 in number). This study also used Google Earth, site photographs and Global PALSAR-2/PALSAR/JERS-1 Mosaic and Forest/Non-Forest map as references. This study achieved an overall accuracy of 0.90 both in 2003 and 2006, 0.95 in 2016.

Results

Results on the satellite image analysis showed the QZUGG experienced a forest cover decrease from 2189 km² in 2009 to 2096 km² in 2016. Statistical differences have been found between management officials and other respondents towards entrance fee, parking fee, resource abundance and resource appreciation at a significant level of 0.000, showing that management officials were more satisfied. This study also has found significant differences about perceptions towards the following aspects: opinions on trekking trails construction and planning, on guide maps, on educational service, on nature protection and on the quantity of artificial constructions (p-value ranges from 0.000 to 0.009).

Results of the questionnaire survey showed that most local residents living in or around the QZUGG are engaged in their full-time jobs for the geopark and more than 33% of the respondents' all family members are involved in the jobs there. The respondents reported that more than 60% of their household's total income was generated from the QZUGG. All the respondents in the Wangshunshan scenic spot whose farmland was requisitioned had received some financial compensation; however, none of the Zhuque

respondents had been compensated. Some of the respondents from Taiping (26.3%) and a few Cuihuashan respondents (4.7%) reported that they had received financial compensation.

Discussion

It can be indicated that the current connectivity among stakeholders of the QZUGG shows weakness to different degree. Based on the results of gap analysis, the connectivity between the officials and local residents showed the highest degree of weakness. People (local residents and visitors) and the QZUGG also showed a weak connectivity due to their different perceptions towards fees issues, transportation, resource abundance and appreciation. However, this was not as drastic as local residents' livelihood and income issues, therefore, this connectivity is less weak. The least weak connectivity was identified between the local residents and visitors. No significant differences were identified towards fees and resources issues between those two groups of stakeholders. However, it is still worth noticing that those dissatisfied local people are not expected to provide visitors with high quality services, which could further lead to dissatisfaction of visitors, hence a weak connectivity.

It is very important to understand the points of view of different stakeholders in order to help decision makers and officials to achieve a consensus between people and conservation policies. For a scenario in the future to strengthen the current connectivity of QZUGG, stakeholders from every party should be involved in to the connection. Due to China's unique official management systems and notions, it seems very hard to start a change from the officials of every level. Maybe, it will produce a good result to enhance visitors and local residents' education in order to equip them with the proper way to perceive the nature and right notion to protect environment. When more people develop more scientific knowledge, there is a possibility that the officials would change their way to manage the geoparks and visitors. This will surely lead to a bright future in China's geoparks and nature conservations.

From the perspective of the eight scenic spots, it might be very difficult or even impossible to make a total reformation to the current management systems and methods, but they should firstly build up an effective connection to one another, which could benefit them all by sharing information, resources and customers. They can also jointly deal with local residents' issues, for instance, more job opportunities and posts information. The geopark should also try to provide more high-quality tourism resources and geo-educational service to visitors. Introducing new notions of nature conservation to both local residents and visitors also should be done by the management. Local residents would be able to generate more income if they can manage to provide visitors with better hotel and food experiences. With more visitors, more job opportunities will naturally be produced. It is possible for the officials to provide more job positions, because China's geoparks are developing very rapidly and creating many job opportunities. For example, until 2017, 20,500 Geopark managers and administrative staff were created and indirect positions created by associated activities and events of geopark and geotourism counted 2.6 million.

This study focused on a geopark as one of the PAs because China is a world's leading country of geoparks and because China's geoparks are internationally criticized. As discussed above, people of different background could be different in attitudes and behavior when they visit PAs. This means that that the approach of this study can be applicable to other PAs (geoparks) in China, and to those in some other developing countries with strong governmental control similar to China, but probably not to those in most developed countries. As described in Chapter 1.2, the term 'connectivity' is not new. There are studies on park-people connectivity, but most of them focus only on a part of the relationship: i.e., conflict between PAs and local residents. Studies on the connectivity in PAs means that all stakeholders should be discussed together. Independent studies on parts of stakeholders would not be effective to solve or mitigate the issues especially in Chinese geoparks. In other words, it will be difficult to improve the current status in China's PAs if only government officers are concerned because

they have less flexibility and less chance to be changed as this study found.

Although there has been already a lot of relevant research around the world, especially western part, there is limited number of studies discussing the problems of PAs in China. By analyzing the differences existing, more about the connectivity of PAs and people could be well understood. When the entire connectivity among all stakeholders is discussed, it will be able to understand which parts can be improved or strengthened immediately, and which parts cannot. The approach by the connectivity study will find out the priority to be improved. For the future development and management of China's PAs, the concept of "Connectivity" has a potential to serve as a reference. At least, it can be a possibility for policy makers and management officials to consider the connectivity among different stakeholders related to PAs.

Conclusions

This research has focused on the investigation into protected areas (PAs) and people connectivity in the Qinling Zhongnanshan UNESCO Global Geopark. This study introduced a new theory frame "connectivity" in the research discipline of PAs, (geopark as an example). By analyzing a combination of relationships between PAs and people (local residents and visitors), protected areas and state/ local government, this study provided the comparisons among different stakeholders. Similar to elsewhere in China, the QZUGG is suffering from the complex managerial agencies. This makes the geopark find itself in a dilemma because of different conservation priorities determined by more than one agency. This structural problem cannot be solved soon enough. However, negotiation of deciding the priority can contribute to figuring out this issue. The management officials are self-confident about their work. However, the forest cover had decreased after the opening of the Geopark and people are less satisfied with the fees and tourism resource quality. This study has found that many local residents are actually highly dependent on the geopark. Most of the local residents living in or around the QZUGG are engaged in their full-time jobs there and more than one-third

of the respondents' all family member is involved in the jobs related to the Geopark. It is a major source of their income. These jobs are mostly to provide food and accommodations to visitors. Only two respondents are currently being employed by the park management company itself. Fifty respondents reported that their land had been requisitioned during the preparation of the QZUGG. However, not all of them received compensation, and the compensation was unevenly conducted taking different forms.

At the present stage, there is a lack of effective communication and cooperation among eight scenic spots, which could probably lead to negative impacts on the geopark. Moreover, belonging to different management agencies inevitably lead to low efficiency and dilemma. It is suggested that profit-sharing scheme should be extended to more local people to make them percept positive aspects of the geopark, which is of great significance to the future development and success of the QZUGG. Also, a communication platform should be set up for those eight scenic spots. Further, a unified and more direct management system would be beneficial to not only the geopark itself but also the local residents. The geopark should take into consideration providing more job positions to the local people to raise their participation rate. This can help to do the management job more easily and improve satisfaction of the local residents. This study contributes to the analysis and understanding of PAs and people connectivity. Using this frame to investigate into the complex relationships between different stakeholders coexisting in a single geopark can be helpful for management even governance, which is of great significance to the efficacy and success of PAs.