Land Use and Cover Change of the south-western Mountain Regions of China during the Last 300 Years:
A Case Study about the Zhangjiu River Basin in Luquan District, Yunnan

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Abstract
This study mainly focuses on the development processes as well as on land use and cover changes in the south-western mountain regions of China on a basin scale over the last 300 years. The key time nodes and driving factors of land use and cover change will be discussed. The study also tries to quantify the land use and cover during different time periods.

Background
With the development of science and technology, the increase of the population, the influence of human activity on the environment is becoming increasingly significant, global changes are more rapid and profound than in the past millennia and this trend is likely to continue for at least the next century. Land use and cover change are among the most important driving factors of global change. Mountain regions experience the impacts of the rapidly changing global environment more strongly with the character of vertical difference. Additionally, such changes in mountain regions often transfer or intensify environmental impacts to the surrounding lowlands. The research on mountain regions is thus an essential component of studying global environment change. Due to this particular importance, the Global Change and Mountains Region Research Initiative is endorsed by three international global environment change organizations— the International Geosphere-Biosphere Programme (IGBP), the International Human Dimensions Programme on Global Environmental Change (IHDP), and the Global Terrestrial Observing System (GTOS).

In China, mountain regions occupy about 33% of the earth surface. The
Yunnan-Guizhou Plateau is one typical example. In the recent 300 years, along with large-scale immigration, the expansion of agriculture and mining, the mountain regions were developed, land use and cover changed rapidly. This change greatly influenced the regional climate, the biodiversity and many other aspects of the environment. The research on land use and cover change in the mountain regions of south-western China in history is an essential component of the global environmental change research.

State of the field

To the present day, much research has been undertaken on the topic of land use and cover change in mountain regions both inside of China and internationally. Most studies are mainly focused on the relationship between population, resource exploitation and land use and cover change of a mountain region. For example, Ge Quansheng (2008) studied the land use change over the recent 300 years, Mark Elvin (2002) the environment change of the Erhai area in the entire historical period, Yang Weibing (2008)’s research mainly addressed the land use and environment changes of the Yunnan-Guizhou Plateau during the Ming and Qing Dynasties (1368-1911), Yang Yuda (2004) analysed the relation between mining and environment change in the mountain regions of south-eastern Yunnan. Besides, ecological anthropologists also have made many of achievements, such as Fei Xiaotong and Zhang Zhiyi (1990) which between 1938 and 1942 compiled their work about the traditional agriculture of Yunnan including vast amounts of field research. In the recent years, Japanese scholars have contributed to the field, too, such as Adachi Shipei (2007) who also used the method of field work to study the development of the terraces at Ailao Mountain. Hans Ulrich Vogel has established a research group with the title “Monies, Markets, and Finance in China and East Asia (1600-1900)”, within which for example Hans-Joachim Rosner’s research (2010) on the landscape dynamics during the Qing period, is an innovative contribution.

However, most of the achievements concerning the environment of this mountain region in the historical period mainly focus on the process of change and the driving
factors, only very few studies concentrate on quantitative changes and influence mechanisms. The lack of related historical materials can be regarded as the main reason for this and makes it become the bottleneck of any closer understanding of land use and cover change in Chinese mountain regions.

**Research Methods**

1. Literature research. Historical materials, local gazetteers and archive data form the foundation of this research. Furthermore, by using a compilation of historical geographical names (*Diming zhi* 地名志) a time series of settlement can be rebuilt.

2. Field research: Observation of the geographical environment, in-depth interviews on settlements' growing processes, acquisition of tablet inscriptions and other types of local sources as well as the measurement of latitude, slope gradient and cultivated area.

3. Data modelling: Construction of a dynamic model to reflect the interactions between a land use type and its driving factors within the study area.

4. GIS (Geographic Information System): Application of GIS for the analysis of DEM data and a dynamic model to improve the accuracy of research on the land use type and to do quantitative research to a certain degree.

**Research Contents**

1. Through long-term field work in three selected typical villages in a middle catchment, the change process of the upper, middle and lower reaches of the study area is represented. The mutual relationship between the land use type and the landform, longitude, population, irrigation, water conservancy, farming technique, social system and mining development is discussed so that the more accurate parameters of the model can be determined. For this research, the Zhangjiu River in Luquan District in Yunnan is chosen as the study area. Long-term field work (four times, altogether five months) has been carried out in the selected two villages in this catchment in anthropological, historical and geographical perspectives. Now plenty of reliable data have been obtained, and the paper “Immigration and
Development of the Southwest Mountain Regions during the Last 300 Years: A Case Study on Duoyishu Village in Luquan District of Yunnan Province” has been finished. Thus, the study approach has been proved feasible.

2. A combination of historical geographical names data (地名志) with this field work can provide information about the number and distribution of villages in different time periods. Firstly, a database is built containing data such as formation time, population and ethnic composition of a settlement in the catchment scattered in historical geographical names data. Secondly, field work is used as a method to investigate settlements in different time periods. In this way, the number and distribution of the settlements in this catchment in different time periods can be known.

3. A dynamic model to reflect the interactions between the physical geography and social and cultural environment is constructed. Therefore the data obtained above to build a dynamic land use model are utilized.

4. To combine this model with DEM data through a GIS, a corresponding program is written to calculate the land use situation in the catchment on a different spatial and temporal scale. The temporal resolution will be 50-100 years during the Qing Dynasty, 20 years during the Republic of China and 10-20 years after 1949.

5. The influencing factors on land use types under different time periods and temporal scales are analysed. For example, how political institutions, population and farming techniques affected the choice of a land use type and to which degree these factors can make a difference.

**Expected Targets**

1. To establish a set of effective and predominantly quantitative study methods to study the spatial and temporal variation of land use over the last 300 years.

2. To accomplish a reliable case study of the land use and cover change in one particular catchment over the last 300 years.
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