Understanding Driving Forces and Implications Associated with the Land Use/Cover Change in Arid Region: Kashgar, Central Asia

*Ayisulitan Maimaitiaili[1], Akihiko Kondoh[2]

1. Graduate school of science, Chiba University, 2. Center for environmental remote sensing, Chiba University

In arid regions, oases are the mid-and small-scale non zonal landscapes with high primary productivity within a desert environment. Oasis ecosystems are fragile and sensitive to climate changes due to the physical geography (which dominated mountain-alluvial plain-desert ecosystems). Oasis expansion is controlled by factors or variables that strongly affect oasis distributions and forms. These variables include biophysical variables, such as climate, distance to water, drainage patterns and topography. Socio-economic variables, such as population, gross domestic product, land use policy and distance to road or highway. Understanding the effect of these variables on oasis is critical because their effect food security, water distribution and sustainable development of arid regions. Therefore, the Kashgar Region is the key research area, where a typical mountain-alluvial plain-oasis-desert ecosystems in an arid region, Central Asia, and is an important cotton and grain production area of Northwest China. The water resources from the mountain area snow/ice melt water, play a key role due to the extremely arid climate of lowlands. The demographic development and socio-economic changes has led to a rapid change of land use systems in the Kashgar Region over the recent decades and has substantially affected the quantity and quality of bare soil, surface water and groundwater. Knowledge of quantifying land use/cover changes and its driving forces including natural and social drivers determined by anthropogenic and climate change are essential for sustainable development in this region. Therefore, main objectives of this study are to quantify predominant LUCCs and identify their driving forces, based on the integration of multiple remote sensors (Landsat and SPOT VGT) and applications of environmental and socioeconomic data during the last 42 years (1972-2014). In order to get land cover map and high classification accuracy, the classification was carried out using object-based image segmentation and maximum likelihood classification method to create land cover maps.
Results showed that LUCCs have been significant in the Kashgar Region during the last 42 years. Cultivated land and urban/built-up lands were the most changed land cover (LC), by 3.6% and 0.4% from 1972 to 10.2% and 3% in 2014, respectively. By contrast, water and forest areas declined. Grassland and snow-covered areas have fluctuated along with climate and human activities. Bare land was changed slightly from 1972 to 2014. According to the land use transfer matrix, cultivated land replaced grass- and forestland. Urban/built-up land mainly expanded over cultivated and bare land. LUCCs were triggered by the interplay of natural and social drivers. Increasing runoff, caused by regional climate changes in seasonal variation, and snow melt water, have provided water resources for LC changes. In the same way, population growth, changes in land use policy, distance to major highways and socio-economic development also induced LUCCs. However, expansion of cultivated land and urban/built-up land led to increased water consumption and stressed fragile water systems during on-going climate changes. Therefore, the selection of adaption strategies relating to climate change and oasis development is very important for sustainable development in the Kashgar Region.

Keywords: Arid Region, LUCC, Driving forces

- HCG22-11 -