Analysis of spatiotemporal patterns and driving forces for land degradation and restoration in Mongolia from 1990 to 2015

Juanle Wang[1], Haishuo Wei[2], Jinyi Yao[3], Yating Shao[4], Xiya Liang[5], Sonomdagva Chonokhuu[6], Altansukh Ochir[7], and Davaadorj Davaasuren[8]

[1]State Key Laboratory of Resources and Environmental Information System, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing, China (wangjl@igsnrr.ac.cn)

[2]State Key Laboratory of Resources and Environmental Information System, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing, China (weihs@lreis.ac.cn)

[3]State Key Laboratory of Resources and Environmental Information System, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing, China (yaojy@lreis.ac.cn)

[4]State Key Laboratory of Resources and Environmental Information System, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing, China (shaoyt@lreis.ac.cn)

[5]State Key Laboratory of Resources and Environmental Information System, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing, China (liangxy@lreis.ac.cn)

[6]Department of Environment and Forest Engineering, National University of Mongolia, Ulaanbaatar City , Mongolia (altansukh@seas.num.edu.mn)

[7]Department of Environment and Forest Engineering, National University of Mongolia, Ulaanbaatar City , Mongolia (sonomdagva@seas.num.edu.mn)

[8]Department of Geography, National University of Mongolia, Ulaanbaatar City, Mongolia (davaadorj@num.edu.mn)

Land degradation is an important ecological and environmental problem facing the world. "Land Degradation Neutrality" is one of the core indicators in the United Nations Sustainable Development Goals for 2030. However, achieving this is a serious challenge in Mongolia where land degradation continues. The increasingly serious land degradation in Mongolia has had a direct impact on the ecology of the entire Mongolian plateau and adjacent regions. Land degradation and restoration in this region fluctuate spatially and temporally because of the impacts of global climate change and human activity.

We obtained land cover data for Mongolia for 1990, 2000, 2010, and 2015 with a resolution of 30 m using the object-oriented remote sensing image interpretation method.Land cover types include forest, real steppe, meadow steppe, desert steppe, cropland, built area, water, sand, and barren land. Based on a spatial analysis module in a geographic information system, the multi-period land cover data were superimposed and calculated. We defined the land degradation cover types and restoration cover types in the processing. Thus, a serials of high-resolution distribution maps of land degradation and restoration for fixed monitoring time intervals were obtained for first time.

We analyzed trends in land degradation and restoration and estimated the typical areas of each in Mongolia. We specifically analyzed the process of land cover change in these areas,

comprehensively considered natural factors and human activities driving this change. Finally, we proposed targeted strategies to control the land degradation and promote land restoration in different regions in Mongolia.