

Natural resource use in soil-eroded area under semi-arid climate, central Kenya

*Yoshinori OTSUKI¹, Akihiko SASAKI², Gen UEDA³, Matheaus K. KAUTI⁴, Tatsuki YUZAWA¹, Sakiko YANASE⁵, Asaka KONNO¹

1.Graduate School of Science, Tohoku Univ., 2.Faculty of Science, Shinshu Univ., 3.Graduate School of Social Sciences, Hitotsubashi Univ., 4.South Eastern Kenya Univ., Kenya, 5.Nippon Koei Co., Ltd.

We aim at clarifying landform changes and people's natural resource use under physical environmental condition, driving such short/long term landform changes in the semi-arid pastoral area, Laikipia North sub-county. The investigated area, the Il Polei sub-location (N 0°21'56", E 37°04'32"), has an altitude of 1,750 to 1,850 m. According to previous literatures, a mean annual rainfall at the Mukogodo Station, close to the study area, is 362 and/or 371 mm; tree coverage is extremely low, which comprises sparse woods and shrub consisting mainly of Acacia genus. The area is underlain by Proterozoic gneiss, migmatite, quartzite, and schist, belonging to the Mozambique Belt, and geomorphologically, inselberg-pediment systems are regionally identifiable with widespread distribution of pediplain.

Below piedmont angle of the system, near the central settlement, 1.5- to 2-km long gullies exist on the pediment. On the upper part of the pediment, specific sections of gully are present, where the ratio of depth to topmost width of the gully is relatively high (maximum depth: 10 m, topmost width: 1.5 m), although the ratio is much lower than 1.0 in the many of remaining sections, which correspond to general tendency of gully morphology. It is inferred that active gully erosion continues to dominate especially in and around the high ratio sections, because in those sections several knick points are apparently observable on the gully floor and the channels and deposits indicating rill wash occurring are frequently discernible close to the gully head. Bedrocks on the pediment slope are overlain by about 5-m thick sheetwash deposits which intercalate several buried humic layers. The conventional radiocarbon ages of the humic soils in the lowermost part of the deposits are 1,440±20 BP (602-641 cal AD, IAAA-143886) and 1,690±20 BP (338-393 cal AD, IAAA-143887). In order to make clear the erosional rate of gullies, we started to conduct topographic measurements of gully wall; however, significant amounts of gully wall retreat during 6 months (March-September 2015) could not be observed.

It was reported that 2,850 people and 275 households inhabited the Il Polei sub-location in 2005, where most inhabitants were pastoral Maasai peoples, except a minority of Kikuyu who engaged in store management in the central settlement. On the basis of hearing survey, people recognized eroding landscape including gullies in the whole area as a threat to livestock's survival when heavy rain occurring. This is also considered to be due to heavy downpour happening in 2005, when human lives lost by intense flush from the gully. It is said that the entire area had no gullies when residents began to settle in the mid-1980s and that the gullies rapidly became more widespread in early 1990s and have extended since then.

Domestic water in the settlement is distributed with pipes from a borehole of 1.5 km east, and the cost of Kshs 10 per 20 liters is significantly higher. The water supply system was completed in 1994 and currently has relative vulnerability from the viewpoints of system trouble frequency, seasonality of pump discharge, and occurrence of drought. Recently sand harvesting for construction material gradually becomes active in the regional area including the sub-location, in order that people earn cash income more easily. Harvesting targets are mainly obtained by excavation of the river bed, gully floor, and sheetwash deposits. At present, it can be considered that sand harvest still does not promote gully erosion remarkably in the study area. In 2007, however, Kenyan government enforced "National Sand Harvesting Guidelines", since the harvesting became

environmental problem in the whole semi-arid and arid areas. Also in the study area, we need to pay further attention to whether sand harvest will be connected with land degradation in future, under the condition which securing water is severe environmentally and economically.

Keywords: semi-arid area, soil erosion, gully, sheetwash, sand harvest, Kenya

Distribution of ground water quality and its environmental risk assessment observed in Inner Mongolia

*Koyomi Nakazawa¹, Osamu Nagafuchi¹, . Wuqiriletu², Ji-qun Chen³, Yi Jin³

1.Division of Environmental Science, University of Shiga prefecture, 2.National University of Australia, 3.Echoing Steppe NGO

Mongolian plateau is famous for nomadic life, however, in these days, their lifestyle has been changed. Focused on Inner Mongolia region, governments prevent them to move everywhere for seeking better grass or drinking water in this region. The land has been separated with the fence. Therefore people who living in this region only use the resources which is located in their own land. Beginning of this political measurement, people has been trying to dig the well and they use the grand water for drinking water.

In our research, we sampled the river water, and grand water were sampled more than 60 sampling point with the nomad. Major ion and heavy metal concentration were analyzed. Based on these data, we assessed the human health risk who drink these groundwater in this area.

Keywords: Heavy metal , Human health risk asesment, Groundwater pollution

Heavy metal pollution in river originated from the mine developing in Mongolia

*Osamu Nagafuchi¹, Koyomi Nakazawa¹, Chojil Javzan², Jamsran Tsogtbaatar², Akifumi Yoshida¹, Kanji Okano¹

1.Department of Environmental Science, University of Shiga Prefecture, 2.Institute of Geography, Mongolian Academy of Sciences

Increasing large-scale and rampant small-scale mining activity in Mongolia is raising fears about the possibility of regional environmental pollution. To characterize the level of surface water pollution related to large- and small-scale

, we analyzed about 50 river water samples collected from three areas: Boroo mining area, Zaamal area and Uyanga-gaas area. The samples were collected between 26 August and 7 September 2014. Measurements parameters included pH, EC, major ion and trace metal. Principal component analyses, Piper diagrams and enrichment were applied to a set of hydrochemical data. Water samples were analyzed to identify components that may adversely affect the regional environment and human health. Analytical measurements showed that the studies sites were highly affected by trace elements derived from anthropogenic activity. Especially, mercury concentration was very high in the village of NINJA, that is illegal gold mining.

Keywords: mercury, NINJA, illegal small-scale gold mining, major ion, heavy metal

Utilization of Water System of Hulun Lake Nature Reserve (in Inner Mongolia, China) and Relevant Protection Policies

*Guorong Han¹, Katsunori FURUYA¹

1. Graduate School of Horticulture, Chiba University

Lake and river are important components of prairie landscape. Historical changes of water systems and changes of use pattern have an enormous impact on the ecosystem and the life of aborigines. In particular, there are many protection policies for water systems in nature reserves, which have many limitations over residences in nature reserves. Hulun Lake National Nature Reserve is located in Hulunbeier City, Inner Mongolia, China. Hulun Lake water system inside the nature reserve belongs to Ergun River water system, including Khalkhyn River, Buir Lake, Urson River, Wulannuoer, Kherlen River, Dalaneluomuhe and other main tributaries, among which there are 3 rivers more than 100 km in length, 13 rivers within 20-100km and totally 64 rivers below 20km. There are totally 80 rivers and streams in the whole basin, with an overall length of 2374.9km and a total basin area of 3721400 hectare (domestic). Due to the continuous drought in Mongolian Plateau and Hulunbuir Pasture Land, Kerulen River and Urson River and other several main tributaries have got insufficient water recharge since 2000, which results in continual decline in water level of Hulun Lake and thus the ecological environment is facing a crisis. To fundamentally solve a series of problems in Hulun Lake, such as problems on ecological protection, comprehensive treatment and system establishment and the like, Integrated Management Organization of Hulun Lake Nature Reserve has devoted greater effort on ecological protection and comprehensive treatment around Hulun Lake. Focusing on the above problems, in this research, a field investigation was conducted to Hulun Lake National Nature Reserve from the beginning of January to the middle of February 2016, which has cleared up the utilization status of Hulun Lake water system and relevant protection policies.

Keywords: Nature Reserve, Water System, Protection , Policies