LAND DEGRADATION ANALYSIS IN THE ONGI RIVER BASIN

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ABSTRACT:

During Mongolia's transition to the free market, socio-economic factors such as poverty and profit-seeking have greatly increased small to large-scale mining, as well as illicit activity resulting in the exploitation of the country's mineral resources. This has subsequently contributed to the deterioration and loss of regional biodiversity and increased levels land degradation. This study aims to monitor land degradation processes in the study area of the Ongi River Basin. This area is affected by mining activities and desertification processes. The vegetation indexes MSAVI2 and NDVI from SPOT data were applied in this area in order to determine vegetation cover change in the time period of 1998 to 2006.The result from both vegetation indexes described that there is a vegetation decrease due to mining activities in the study area.

1 INTRODUCTION

There are a limited research works in Mongolia particularly developing the necessary facilities and science for monitoring the socio-economic change and environmental impact derived from country's mining sector. During Mongolia's transition to the free market, socio-economic factors such as poverty and profit-seeking have greatly increased small to large-scale mining, as well as illicit activity resulting in exploitation of country's mineral resources. Thus, the society and environment problems in Mongolia interact in such a way where poor environmental policy and regulation is linked to land degradation and environmental contamination, which therefore increases the society's vulnerability. Lake, river and pond in Mongolia is dried up and lost ecological balance caused by human wrong activities and mineral extraction. Furthermore, it is caused damage on environment and people's lifestyle in Mongolia.

This study aims to determine vegetation condition in Ongi river basin. A great concern for the environmental officers Ongi river basin is mining. Mining is done legally by companies that have large concessions, but also illegally by so called "Ninjas", individuals and families that literally dig for gold without a license. The mining companies use heavy equipment to remove the top layer and vegetation. Vegetation and pasture land most important for the nomadic people living in the river basin. Therefore this study is analyzing vegetation change in the river basin in last years between 1998-2007.

2 APPROACHES

2.1 Study area

The study are is, Ongi River basin is situated in the central part of Mongolia, is located on E101^{0}44'24''-E104^{0}30'00" and N44^{0}22'48"-N46^{0}41'24" (Figure 1). The Ongi river is one of the world bigger fresh watershed point and starts form Khangai Range then crossed 3 kinds of areas which are Mountain & Wooded area, steering plain area, gobi desert area. It is one of the important rivers in the area for the lifestock breeding for the local people ("Ongi" movement). Main environment concern is the river is drying up and starting to interrupt since 1998 (Figure 2).
The length of the river is 437km, site is 175 square km and 1000-3000m above the sea level. The main reason of drying up Ongi river is to the mining of gold placer deposit and never making technical and biological reclamation (Mijiddorj.R, Bayasgalan.Sh, 2006).

2.2 Data used

VEGETATION SPOT 4 1km data from April to October 1998-2006**,** LANDSAT ETM+ data for 23 July, 1999 and 20 September, 2000 were used in this research. Two kinds of vegetation indexes NDVI and MSAVI 2 were used for the monitoring vegetation change in the study area.

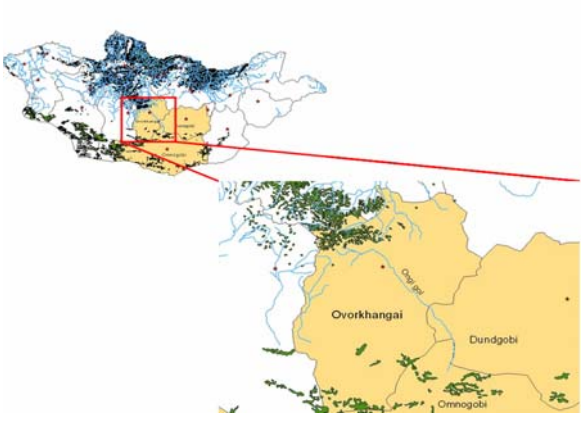
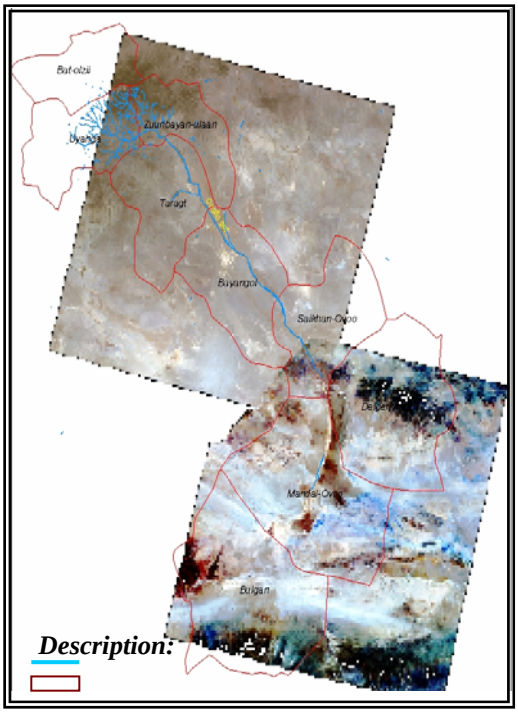


Figure1. Study area : Ongi river basin

[*] corresponding author



(Ongi river interruption in south part: from imagery LANDSAT ETM+ data for 23 July, 1999 and 20 September, 2000)

Figure 2. Location of the Ongi river

2.3 Method

Vegetation indices NVI and MSAVI 2 from the SPOT satellite for vegetation period from April to October 1998-2006 years used in the study area. Spectral bands Near Infrared 0.78-0.89 μm, Short wave Infrared1.58-1.75 μ m were selected for the analysis.

NDVI is normalizad ratio of the NIR and RED bands (1).

$$NDVI = \frac{NIR - RED}{NIR + RED} \qquad (1)$$

Huete (1998) suggested a new vegetation index, which was designed to minimize the effect of the soil background, which he called the soil-adjusted vegetation index (SAVI) (2) developed of an iterated version of this vegetation, which is called MSAVI2 (3)

$$SAVI = \frac{NIR - RED}{NIR + RED + L} * (1 + L) \qquad (2)$$

$$MSAVI\,2 = \left[2NIR + 1 - \sqrt{(2NIR + 1)^2 - 8(NIR - RED)} \right] / 2 \qquad (3)$$

MSAVI varies from 0.022675 to 0.633800 while NDVI values for vegetation is from 0.01 to 0.89. There is less greenness in south part area where is interruption river and mining activities (Figure 3 and 4).

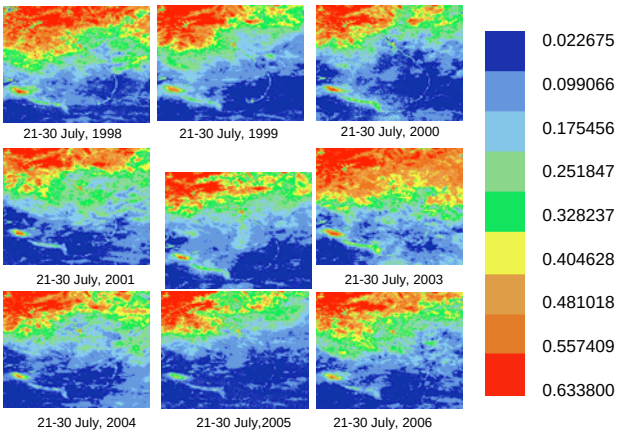


Figure 3. Change of vegetation using MSAVI2 index between years 1998-2006 in the study area

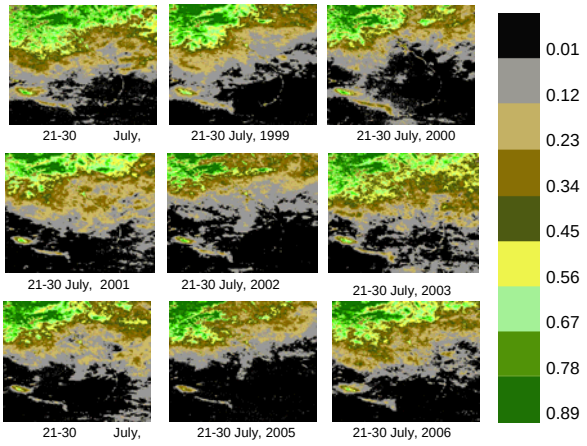


Figure 4. Change of vegetation using NDVI index between years 1998-2006 in the study area

3 RESULTS AND DISCUSSION

We made vegetation change analysis on for identifying of land degradation using remote sensing tools in Ongi river basin in Mongolia.

As a results from the figure 5 and 6 of Onggi River basin's vegetation loss has been increasingly 12000 square km. (since 1998 year). Vegetation has a decreasing trend from both vegetation indexes MSAVI and NDVI (figure 5 and 6). This analyzes was compared with the results from the "NGO Ongiinhon" (www.onggiriver.com) research team which used ground truth data in recent years.

Concluding that this number will be keeping to increase in the future. Future study should be focused not only on vegetation condition but should take analysis connected with socio economic data.

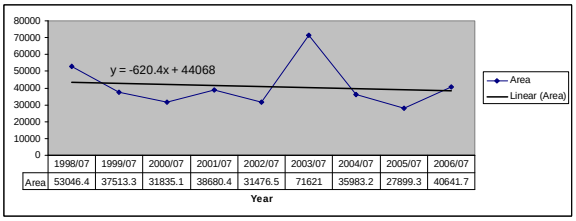


Figure 5. Change of vegetation area between years 1998-2006 in the
Onggi river basin /MSAVI/.

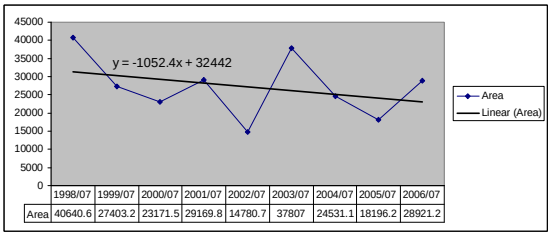


Figure 6. Change of vegetation area between years 1998-2006 in the
Onggi river basin /NDVI/.

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"NGO ONGIINHON": http://www.onggiriver.com/

SPOT-VEGETATION: http://www.free.vgt.vito.be/

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