Geography and Environmental Planning Journal
23rd Year, vol. 48, No.4, Winter 2013
ISSN (Online): 2252-0848
ISSN (Print): 2008-5354
http://uijs.ui.ac.ir/gep

Analysis and Evaluation of Land Use Changes in International Wetlands of Ala-Gol, Alma- Gol & Ajay-Gol In Turkaman Sahra, Using Multi-temporal Satellite Images

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Received: February 22, 2011 / Accepted: December 13, 2011, 47-50 P

Extended Abstract

1-Introduction

According to the Ramsar Convention, wetlands are areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters. According to recent estimations, world wetlands account for 6.2 to 7.6 percent of earth's surface.

Wetlands are considered an integral part of the global ecosystem as they prevent or reduce severity of floods, feed groundwater aquifers and provide a unique habitat for flora and faun and lots of other benefits including water quality maintenance, agricultural production, fisheries, and recreation. loodwater retention, provision of wildlife habitat, soil erosion control, maintaining the diversity of entire landscapes and are among other benefits. In addition, they can form cornerstone elements for regional conservation strategies.

Zhao et al (2010) based on landscape data produced from integrated Landsat MSS/TM/ETM+ images and spatial metrics, presented a survey of wetland landscape changes in the Pearl River estuary from 1979 to 2009, and explored the spatio-temporal characteristics of wetland change.

Yue et al (2003) using three series of satellite images in 1984, 1991 and 1996 studied changes in the landscape of the Yellow River Delta wetland.

Kashaigili et al (2006) focused in their research on human and developmental activities in the study area for the periods 1973 and 1984, and 1984 and 2000. Landsat MSS and Landsat-TM images were used to locate and quantify the changes.

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Gilmore et al (2008) examined the effectiveness of using multi-temporal satellite imagery, and field spectral data to classify and map the common plant communities that may provide coastal resource managers, municipal officials and researchers a set of recommended guidelines for remote sensing data collection for marsh inventory and monitoring.

International Wetlands of Ajay-Gol, Alma-Gol and Ala-Gol are located at, dry steppe and Warm Turkman sahra desert in Turkmenistan, near to the border of Iran and Turkmenistan. They are among unique ecosystems and international wetlands of Iran. In terms of geographic location, Alma gol Wetland is in geographical coordinates 37˚ 25□N to 54˚ 38´E and Aji gol Wetland is in 37˚ 24□N to 54˚ 40´E.

Ala gol wetland is located in geographic coordinate of 37˚ 20´ northern latitude and 54˚ 35□ east. In this research, Changes of three international wetlands, that is Alma gol, Aji gol and Ala gol as globally important ecosystems are investigated using multi temporal images. For monitoring changes in the Wetlands, TM and ETM satellite sensor imagery for 1987, 2000, 2005 and 2010 after atmospheric and geometric correction with maximum likelihood classifier method in six classes of water, saltlands, arid lands, low vegetation density, average and high vegetation were classified. With transfer classification results to the GIS environment and using analytic function of Union Changes occurred in the primary - secondary matrices over the period studied (1987-2010) were evaluated.

2- Methodology

To achieve the main objectives of the study, available TM and ETM satellite sensor imagery for 1987, 2000, 2005 and 2010 Alma gol, Aji gol and Ala gol international wetlands were selected. In preprocessing stage, after preparing the multi temporal images of region, radiometric, Geometric and normalization techniques were applied. In processing stage, the visual interpretation of images related to the study area and the reflective properties of water in the infrared band that is almost zero, the separation of land and water in the wetland area was identified. In addition to the visual methods, other digital image processing techniques like the ratio of bands, bands subtraction, and principal component analysis were used to identify areas of change. In post processing stage, the field survey and using GPS device in the study area with picking up required training samples the Envi software environment was applied to the MLC method.

3– Discussion

In the present study, with field survey and using GPS device and considering to the distribution of land covererage, six classes of usage in the areaof mentioned wetlands were selected as follows: Water, saltlands, arid lands, low vegetation density, average and high vegetation. It was attempted to regard distribution of sample areas in selecting training samples with overlapping training samples and creating false color composite images so that normal distribution of samples is obtained.

After classifying images of 1987, 2000, 2005 and 2010 extracted raster maps were converted to vector format for producing final change detection maps. Spatial distribution changes occurring during 1987 to 2010 could be derived from the change maps. In

these maps using the Union extension, six classified land use layer for the years 1987 - 2000, 2000 - 2005 and 2005-2010 are overlaid on each other and spatial Values changes in primary and secondary matrices were calculated.

4– Conclusion

Results show that during the research period (1987-2010) many changes in land use area has occurred which these changes include reduction in wetlands area from 2591.8 hectares in 1987 to 1280.6 hectares in 2010, reduction of salt lands, reduction in vegetation with high density, increase in vegetation with low/average density, and finally stability of thearid land area. The main causes of these changes should be explored in issues such as droughts, dam construction, extra wetlands water consumption in agriculture, fish farming and construction of canals and roads.

Key words: Ala-Gol, Alma-Gol & Ajay-Gol International Wetlands, multi temporal Satellite images, Change detection

References

Consulting Engineers Sabz Andish Payesh_SAP_,(2008); Prone areas of the tourism master plan: Tourism infrastructure in international wetlands of Ajigol, Alagol and Almagol; Cultural Heritage , Handicrafts and Tourism Organization of Golestan province,July.

Farhat jah, B; (2002); Remote Sensing and Geographic Information System; National Geographic Organization publication; 278p.

Gilmore, M; Wilson, E; Barrett, N; Civco, D; Prisloe, S; Hurd, J; Chadwick, C (2008); Integrating multi-temporal spectral and structural information to map wetland vegetation in a lower Connecticut River tidal marsh; Remote Sensing of Environment; 112, 4048-4060.

http://www.earthwatchers.org

http://www.ramsar.org

http://www.wnkh.ir/R_dmas.aspx

Kaboli, M; Karami, M; Hassanzadeh Kiabi, B (2006); Examine factors affecting the success rate of wetland falcon chicks(Circus aeruginosus) raised As an species in the international wetlands of Ajigol, Alagol and Almagol in the Plain Turkmensahra; Journal of Natural Resources; 59, 680-669.

Kashaigili, J; Mbilinyi, B; Mccartney, M; Mwanuzi , F (2006); Dynamics of Usangu plains wetlands: Use of remote sensing and GIS as management decision tools; Physics and Chemistry of the Earth; 31, 967-975.

Kiabi, B; Ghaemi R; Abdoli, A (1999); Wetland and river ecosystems of Golestan Province; Department of Environmental Protection Golestan; Winter.

Laba, M; Downs, R; Smith, S; Welsh, S; Neider, C; White, S; Richmond, M; Philpot, W; Baveye, P (2008); Mapping invasive wetland plants in the Hudson River National Estuarine Research Reserve using quickbird satellite imagery; Remote Sensing of Environment; 112, 286-300.

Macleod,R.S; Congalton R.G (1998); A Quantitative Comparison of Change Detection Algorithms for Monitoring Eelegrass from Remotely.

Melendez-Pastor, I; Navarro-Pedreno, J; Gomez, I; Koch, M (2010); Detecting drought induced environmental changes in a Mediterranean wetland by remote sensing; Applied Geography; 30, 254-262.

Najafi Disfani, M; (1998); Computer processing of remote sensing images; Samt Publication; 473p.

Rasouli, A.A; Mahmoudzadeh, H (2010); Fundamental of Object Oriented Remote Sensing; elmiran publication; 192p.

Schmid, T; Koch, M; Gumuzzio, J (2005); Multisensor Approach to Determine Changes of Wetland Characteristics in Semiarid Environments (Central Spain); Geoscience And Remote sensing; Vol. 43, No. 11, November; 2516-2525.

Tahekia, H; (1996); Principles and application of remote sensing Jihad, Tehran University

Xiang Yue, T; Yuan Liu, J; Jørgensen, S; Hua Ye, Q (2003); Landscape change detection of the newly created wetland in Yellow River Delta; Ecological Modelling; 164, 21-31.

Yuan,D. and C.Elvidge.(1998).NALC Land Cover Change Detection Pilot Study:Washington D.C Area Experiments.Remote Sensing of Environment,66:166-178.

Zhao, B; Yan, Y; Guo, H; He, M; Gu,Y; Li, B (2009); Monitoring rapid vegetation succession in estuarine wetland using time series MODIS-based indicators: An application in the Yangtze River Delta area; ecological indicators; 9. 346-356.

Zhao, H; Cui, B; Zhang, H; Fan, X; Zhang, Z; Lei, X (2010); A landscape approach for wetland change detection (1979-2009) in the Pearl River Estuary; Procedia Environmental Sciences; 2, 1265-1278.