

中国バリクン高層泥炭湿原の自然環境保全

Research on the ecosystem evaluation of the BALIKUN Wetland—in the span of ten years

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1. Background

The Balikun High Altitude Wetland is a transit point for three major migratory bird migration routes in Xinjiang, Northwest Territories, China. This Balikun Wetland is the second largest wetland in Xinjiang. The wetland consists of lakes, grassland wetlands, rivers formed by meltwater and salt pans. (Fig. 1) High Altitude Wetland such as Balikun Wetland are one of the few high altitude wetlands in the world, and the organic carbon accumulated in the high altitude wetlands can mitigate global warming. (Fig. 2) Although it is necessary to conserve and regenerate such high altitude wetlands, it must be said that effective measures have not been introduced in China until now.

In China, as a wetland conservation policy, we are focusing on avoiding human interference as much as possible. The protected area consists of three concentric areas: a core area, a buffer area, and an experimental area. However, in China today, there are opinions that it is difficult to maintain the local economy at the same time as restoring the wetland environment. In order to protect the rapidly shrinking wetland environment. In 2007, the Hami government began to implement a wetland ecological protection policy centered on the protection of wetland water sources.



Fig 1 Current photo and current location of Balikun Wetland (created by the author, time 2020, shooting time 2016-2018)

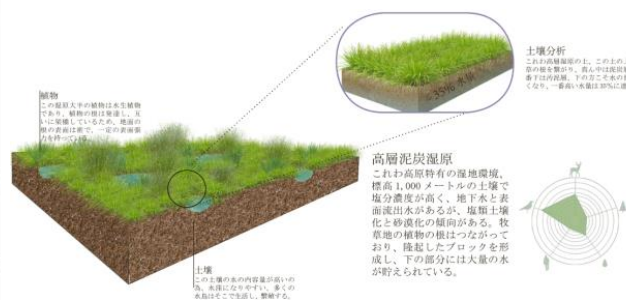


Fig 2 Land analysis map (created by the author 2019)

About the current situation survey of Balikun Wetland. According to the 2017 health examination of the Balikun Wetland Ecosystem at Dalian National University of China, the environment of the Balikun Wetland is said to be deteriorating at a rapid rate between 2012 and 2014. The decrease in the area of the Balikun Wetland (Fig. 3) and the number of migratory birds is evidence of the loss of biodiversity in this wetland. And the policy of creating a protected area in Xinjiang has reduced the contact of each patch corridor matrix, and the protection policy has

destroyed the ecological chain of the place. Now the water area of Lake Balikun has shrunk dramatically, desertification around the lake has become serious, vegetation has deteriorated, the effective development of Balikun Wetland resources has been affected, the use of the ecological environment of the research area and the sustainability of the social economy. Was destroyed. Problems such as desertification of wetland grasslands, low river water volume, loss of biodiversity, and a decrease in migratory birds have arisen. Among them, one of the problems is the rise in the annual average temperature due to global warming, which has many human causes such as mowing frequently, pastoral grazing of sheep and the like, and excess water for agriculture.

Among them, the most important factor of environmental deterioration is artificial environmental development. Specifically, overexploitation of agricultural land has destroyed forests and grasslands over the years. According to the existing research by ZHANG et al., Agricultural water accounts for 94.2%, industrial water accounts for 0.3%, inhabitants' domestic water accounts for 0.4%, and ecological water accounts for 5.1% in the Balikun Wetland area. By using groundwater and make-up water from the upstream to the wetland as agricultural water, and irrigating the farmland, the area of the Balikun Wetland water area will be reduced and the wetland environment will be desertified. Such a situation has been pointed out as a factor of deterioration of the wetland environment.

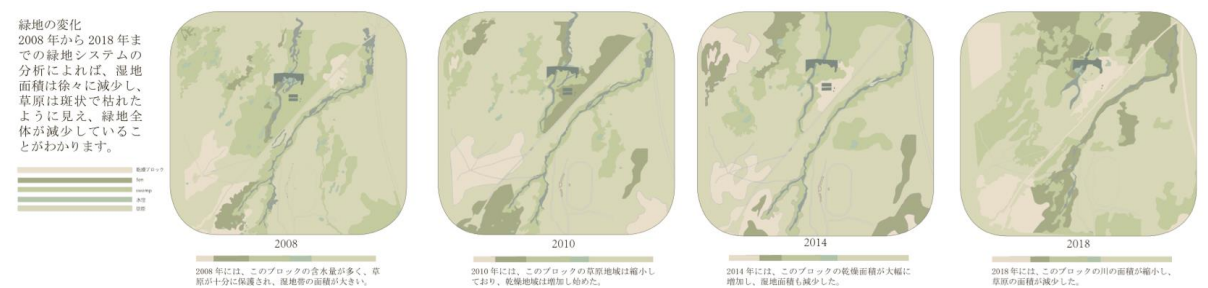


Fig 1 Balikun Grassland Wetland (Eastern Research Area) GIS Simple Analysis Map (Created by the author)

2 . Research method

1. Data collection

First, while researching the literature on the Balikun Wetland, the local government will collect data on the wetland. Then, GIS data of the wetland is collected and analyzed.(Fig.4)

In the GIS analysis, the data of Landsat5, Landsat8OLI and Landsat7 were used for analysis, and the ecological environment of the area was analyzed in units of ten years (1990-2000-2010-2021). By comparing the changes in ecological evaluation before and after the government implemented the policy, the effect of the ecological environmental protection policy in the region was evaluated.

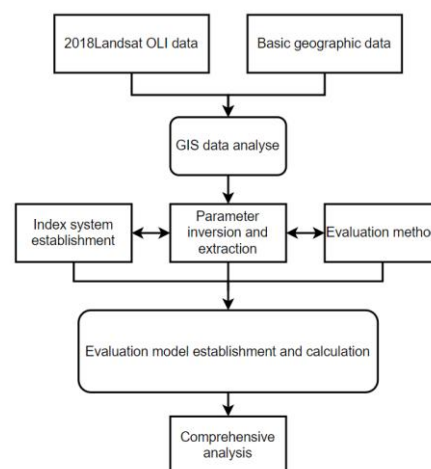


Fig 4 Research flow chart (Created by the author, 2021)

Referring to the <Convention on Wetlands> and <Technical Requirements for Comprehensive Survey of National Natural Resources Remote Sensing> (first draft), and considering the distribution status of wetlands in Xinjiang, Balikpapan wetlands are divided into river wetlands, lake wetlands and swamp wetlands. Ponds, freshwater farms and irrigation ditches are combined into constructed wetlands.

When analyzing the data, refer to the International Convention on Wetlands to classify wetlands into wetland types (highland herbaceous marshes, inland salt marshes): water bodies, grasslands, swamps, artificial lakes, salt lakes Non-wetland types: cultivated land, artificial structures, roads.

Use ENVI to perform radiometric calibration, atmospheric correction, and geometric correction on the data, and divide the study area on the corrected datum. Then use ArcGIS to carry out NDVI and NDWI analysis of the map data. In GIS data analysis, Fragstats is used to analyze three groups of landscape indicators: patch, class and landscape.

* Data used in wetland analysis: 1990-2021 (Landsat 5-TM, Landsat 7-ETM+, Landsat 8-OLI), remote sensing images.

2. Model building

Wetland ecosystem assessment is mainly carried out through the following four aspects. Productivity, Organizational Structure, Elasticity, Functionality.

Productivity: NDVI vegetation cover

Organizational Structure: (using multiple data for analysis)

LDI Landscape Diversity Index

LSI Landscape Shape Index

PDI Plaque Density Index

AI Aggregation Index

Elasticity: AE Average Elasticity

Functionality: WA Water Area

There are three manifestations of wetland function, namely water area, water storage capacity and pollutant removal capacity. In this study, the water area was selected to evaluate wetland function.

In this research, the relative evaluation method was used for the evaluation and analysis of ecological health. According to the relative pros and cons of each region, the weight value of each index was determined, and then the weighted sum was obtained to obtain the comprehensive evaluation value.

For its comprehensive evaluation criteria, this research refers to a few similar wetland environmental evaluation indicators for graded evaluation.

3 . Prediction results

Through the data analysis of the 30-year span of Balikpapan Wetland, during 1990-2010, the ecological health level of Balikpapan Wetland showed a downward trend; during 2010-2021, the ecological health level of Balikpapan Wetland showed a slow upward trend.

The purpose of this study is to analyze the results of the local government's wetland protection strategy and its influencing factors through the assessment of the ecological health level of the Balikpapan wetland, to provide direction for the restoration of the local wetland.

4 . Schedule

【Dec-May 2022】 Information gathering and research area survey- **【May-Sep】** Research model construction and data analysis- **【Sep-Oct】** Interim report and reexamination of research methods- **【Oct- Dec】** Promotion and writing of research- **【Dec】** Submission of master's thesis

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