

# Study on Constraint Mechanism of Traditional Village Water Resources in Ili River Basin Based on Watershed Division

-- Take Qiongkushtai Village and Yangbulake Village as Examples

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**Abstract:** This paper abandons the inherent cognition of "drought, less rain and windy sand" in Xinjiang, selects the northern Xinjiang area less involved by previous scholars, and selects the Ili River Basin as the research area, based on arcgis10.2 hydrological analysis module, delimit the scope of Ili River Basin, and analyze the overall site selection of settlements in the basin. The analysis shows that there are two types of villages in Ili River Basin: mountain villages and alluvial fan plains. Then qiongkushtai village and yangbulak village are selected as research cases to sort out the surrounding hydrological conditions, residents' production mode, texture characteristics and village evolution, The constraint mechanism of water resources on the overall pattern and evolution of the two villages is obtained from the two aspects of "water saving" and "synergy".

**Keywords:** Watershed Division, Ili River, Traditional Settlement, Water resource constraints.

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## 1. Introduction

In previous academic works, most of the research on Xinjiang villages focused on the southern Xinjiang or Turpan in the eastern Xinjiang [1-3], and few of the literature and works on the northern Xinjiang as the research area, resulting in the lack of widespread recognition of the historical and cultural value of the traditional village space in the northern Xinjiang and the water resource relevance of the spatial form, Inadequate understanding of the psychological structure of the new and old residents reflected in the evolution of the village, and the failure to recognize the diversity of spatial forms in the actual protection planning of the village, even the phenomenon of "mechanically copying the experience of the southern and eastern Xinjiang".

In view of the above problems, this paper selects the representative Ili River basin in northern Xinjiang as the research category, and chooses the representative Qiongkushitai village as the research sample to analyze and summarize the overall pattern of the village, reveal the mechanism of water resource constraints, awaken people's recognition of the previously ignored village space value in northern Xinjiang, and also partially reveal the philosophical connotation of why Ili traditional villages exist here from the perspective of ontology.

## 2. Overview of Water Resources in Yili River Basin

According to the precipitation data of nearly 50 years provided by 9 or 6 stations in the Yili River basin by scholars, the annual precipitation in the Yili River basin has shown a steady wave dynamic trend in the past 50 years. However, since the 1990s, the annual precipitation in the Yili River basin has jumped from a semiarid standard of 200 mm~400 mm to an annual precipitation standard of more than 400 mm

in the semi humid region. The change trend of the annual precipitation is similar to that in the northwest arid region The change trend of annual precipitation in western Tianshan and Xinjiang is consistent. From the perspective of seasonal precipitation, the precipitation of the basin has increased greatly in winter in the past 50 years, followed by summer and autumn, with the smallest increase in spring. It was negative anomaly before the 1990s and changed to positive anomaly after 1990.

According to the relevant research results of basin hydrology, the runoff of the trunk stream of the Ili River has been in a fluctuating and stable state in the past 50 years, and has been more than 20 billion cubic meters. However, the overall trend has continued to decline from the 1960s to the 1980s. Since the 1980s, it has had a sudden upward trend, which is also related to the change trend of the annual precipitation of the Ili River basin. From the monthly distribution of runoff, the inflow of Ili River is mainly concentrated from April to August, that is, from the date of glaciation and snowing to the date of ice sealing, and the annual precipitation from April to September is consistent with the runoff.

## 3. Distribution Characteristics of Village Site Selection in Yili River basin

The Ili River basin is one of the most suitable areas for settlement in Xinjiang because of its abundant water and grass and comfortable climate since ancient times due to the influence of the humid water vapor of the North Atlantic Warm Current. Based on the water resource conditions of the Ili River basin described above, this paper successively picks up the geographical coordinates of villages in the Ili River basin through Google Maps and related yearbooks [4], vectorizes the village coordinates by using the anti climbing

function of Python, and then uses ArcGIS 10.2 to superimpose village point data with water system, landform and other data, and conducts nuclear density analysis and average nearest neighbor index analysis respectively after the superposition of villages with water system and elevation.

Figure 3 shows the analysis results of the average proximity index of village distribution in the Ili River basin. The nearest ratio is 0.552071, the z-score is -41.30, and the probability of random clustering of villages is less than 1%. The results show that the villages in the Ili River basin are extremely cohesive.

Figures 3 and 4 show the results of the nuclear density analysis of villages in the Ili River basin and the superposition with the water system and elevation. The figure intuitively shows the site selection and distribution characteristics of villages in the Ili River basin. Except for the villages in cities and counties that have not yet been transformed, most traditional villages in the Ili River basin are distributed linearly along the main rivers in the flow domain and the cohesion characteristics are very obvious, mainly in its main tributaries Tekes River, Gongnaisi River Kashi River and Horgos River basins form a south and north distribution, and the basin forms two horizontal herringbone axes. The villages in the basin are mainly distributed in Tekes County, Xinyuan County, Gongliu County and Huocheng County. The traditional villages in Tekes River basin (mainly flowing through Tekes County) have relatively low reliability of cohesion (z value is -7.41), and the villages in the basin are relatively scattered and free, In addition to showing the main characteristics of linear distribution along the river (Tekes River), a considerable number of scattered villages are distributed in valleys or mountain depressions. According to the survey, many of these scattered villages use traditional well dry houses made of fir as the main living space for residents; However, the villages in the three counties in the Gongnaisi River, Kashi River and Horgos River basins are mostly distributed linearly along the river or alluvial fan plain at the foot of the mountain, and the characteristics of cohesion are very obvious (z values are less than -45). The proportion of native soil and brick concrete residents in the region is large. To sum up, the villages in the Ili River basin are generally characterized by dense linear distribution and scattered points in some mountain areas, while in terms of residential buildings, they are characterized by the selection of materials and structural types of well dry wooden residential buildings, raw soil residential buildings and brick concrete residential buildings.

## **4. Analysis of the Overall Pattern of Villages in the Yili River basin**

The Ili River basin, which has the most abundant water resources in Xinjiang, has an annual runoff and precipitation that meet the semi humid climate standard because it is the end of the North Atlantic Warm Current, so its villages are unique to other regions in the overall pattern, texture characteristics and development and evolution.

### **4.1. Qiongkushitai Village**

#### **4.1.1. Micro hydrological environment characteristics of the village area**

The hydrological characteristics of Qiongkushitai village's micro watershed were obtained through visit and research: Qiongkushitai village is located in the deep valley, with flat

valley terrain (Kushitai means platform and flat land in Kazakh). The village's micro watershed is extremely rich in water resources, among which the main river Kurdai River runs through the whole village from south to north, with sufficient water. In addition, There are also three water sources near the village: the creek formed by melting water from icebergs in the south of the village flows into the Kurdai River, which is the main drinking and living water source of the village. At the same time, local villagers also use the gravity potential energy of the water flow to make simple power generation equipment to make up for the village's embarrassment of not being connected to the national grid; On the west and north sides of the village, there are sporadic springs flowing in along the two banks of the river. The density of spruce is negatively correlated with the distance between the river and the creek and the altitude. Therefore, the distance shows great heterogeneity and differentiation in terms of river and vertical scale [5-7].

#### **4.1.2. Production and life style of residents**

The aquatic environment around Qiongkushitai Village determines that the local residents form a nomadic and semi nomadic traditional production mode. With the development of the times, the requirements of the Kazakh residents on the quality of life are rising, and the herdsmen engaged in traditional nomadic industry are rare, but the number of semi nomadic herdsmen with settlement sites is still considerable. Such herdsmen generally have two residences - simple yurts for grazing in summer and winter pastures and fixed residences for grazing in spring and autumn. Qiongkushitai Village was originally selected as a designated residence for the local ethnic minorities [7]. As the residents settled down from wandering, they became a characteristic fixed village of the local Kazakh people. In the family where the traditional production mode is reserved, the men are responsible for herding by water and grass, leaving early and returning late. Women and the elderly are more engaged in the processing and production of handicrafts, food and agricultural and sideline products.

With the change of the times and the improvement of the popularity of the village, more and more villagers begin to choose tourism as the family pillar industry to improve their own economic conditions. Due to the rapid seasonal climate change in the village and the long closing date in winter, the tourism industry in the village is mainly concentrated in May to August of each year. The tourism project mainly provides tourism home stay, catering and nomadic experience. According to the interview, these residents have often purchased houses in Tekes County, abandoned the original residence, and built simple wooden houses for tourists to board and sleep in spring and summer, It is in sharp contrast to the traditional residential houses for animal husbandry all the year round.

#### **4.1.3. Relationship between village pattern evolution and hydrological environment**

Qiongkushitai Village is the earliest settlement of Kazakh herdsmen in the region, with the best preservation of the traditional pattern and historical features of the village. The site selection and settlement of the village can be traced back to the end of the 19th century. Therefore, it is located in a valley with flat terrain and rich arbor resources, which is convenient for building wooden houses. It is also located in the middle of Kalajun Prairie (summer pasture) and winter pasture, which is convenient for herdsmen to transfer. Therefore, it became an important transfer station for many

Kazakh herdsmen at the beginning of the 20th century. In addition, it has rich water resources, and it is convenient to draw domestic water. This has led to an increase in the number of industrial edge residents over time. The village established the 1000 head of household system in the 1920s, becoming the earliest management organization of the village. In 1935, the then thousand head of household initially introduced modern education into the village, established a new primary school, recruited local herdsmen's children to receive new education, and promoted the development of the village from another aspect.

Before liberation, the scale of Qiongkushitai Village was relatively slow to develop (Figure 9). During the decades from the end of the 19th century to the 1940s, the scattered and wandering of the Kazakh compatriots caused by the political turmoil caused many Kazakh compatriots to leave Ili Prefecture, which was originally their place of residence, but also led to a sharp reduction in the number of nomadic residents in Ili Prefecture. In addition, due to the restrictions of technical conditions at that time, the total number of residents in Qiongkushitai Village was less than 20 at the beginning of liberation. Although the development was slow, the overall spatial pattern of Qiongkushitai Village had been established before liberation.

As far as the residential buildings are concerned, the number of residential buildings in Qiongkushitai Village has increased slightly in the past 30 years from the eve of liberation to the 1970s, and the residential buildings are scattered along streams and rivers. The reasons are as follows: 1. In terms of the use of buildings, most of the Kazakh villagers lived on traditional nomadic farming in the s, while the traditional nomads tended to herd on water and grass, and simple yurts were the main form of local residents' houses; 2. In terms of grassland living habits and grassland culture formed by long-term nomadism, herdsmen in this period still regarded the fixed wooden houses in Qiongkushitai Village as a transit place for winter and summer pastures, with little idea of settlement; 3. In this period, although there were Kazakh compatriots who wandered back to their hometown, due to the previous population base and other reasons, the number of herdsmen who grazed on the grassland near the village was not large, so that the water resources near the village would not be stretched with the increase of age. Therefore, the micro water resources of the village in this period had little effect on the formation of residential buildings.

After the 1990s, the scale of Qiongkushitai Village's dwellings has increased significantly. The reason is not only the increase of the population base, but also the pressure on the natural environment caused by the Kazakh herdsmen's pursuit of a better quality of life and more people's traditional extensive grazing. This should be a period of hesitation and confusion for the village residents. At this time, the impact of water resources on the residential pattern is mainly reflected in the decrease of grassland area per capita due to the increase of population. In order to survive or pursue a better quality of life, herdsmen began to engage in designated life and production work, such as the sewing of carpets and other handicrafts, food processing, etc. Because the physical consumption of this work is relatively small, women and the

elderly in the family have turned to this work to expand the family's economic resources. These fixed-point production methods inevitably require considerable fixed housing, so there are more residential houses in villages. For the convenience of domestic water use and transportation, the newly built Muleng residential buildings are mostly located near the intersection of Kurdai River (straight distance is not more than 20 m) and village roads.

Since the beginning of the new century, especially since the village was included in the list of famous historical and cultural villages in China in 2010, the improvement of village popularity has led to the gradual development of tourism. In order to increase economic income, the original villagers of the village have set up a characteristic home stay and catering industry in the south of the village (near the intersection), and also carried out grassland herders' experience activities in the village. However, since the development of tourism only focuses on the summer from May to August each year, the B&B rooms are usually used only in summer, with only round logs lapped and no soil covered surface. With the increase of homestay houses, the houses in Qiongkushitai Village began to be divided into permanent wooden houses for permanent residents and simple wooden houses for tourist homestays. In terms of the overall pattern of the houses, the permanent wooden houses are mostly concentrated in the north of the village, which is closer to the river for convenient water intake. The houses in the north of the village are mostly scattered due to the spontaneous establishment of residents. Due to the intervention of human planning in recent years, most of the southern dwellings are combined along the village roads. Simple wooden houses are mainly set at road intersections to attract tourists, showing a centralized combination.

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