

# Environmental Change and Human Activity at Ejina in the 14<sup>th</sup> century turned out through written historical materials

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## Introduction

Recently, a serious problem occurs in the Heihe 黑河 river basin. Heihe river water does not flow to the downstream, and two lakes in the lowest reaches of the river have disappeared. The shortage of water in the Heihe river basin has an important influence on the life of people who live in this region. The factor that brings the water shortage is various, and is combined. A decrease in precipitation according to global warming and progress of dryness, excessive water usage in the agricultural region in the middle reaches, excessive pasturing in nomadic region in the upper and downstream of the Heihe river, and so on. It is not easy to clarify the causal relation because the environmental change and the human activity is closely related each other. To solve this problem, Chinese government is executing various measures now. However, another new problem is occurring along with it.

A great environmental change occurred in the Ejina 額濟納 oasis in the past. One huge lake that was called Juyanze 居延澤 disappeared, and two lakes, Gashoon nur 嘎順淖兒 and Sogo nur 蘇泊淖兒 appeared newly before. **Plate 1.** is The Map of China and the Barbarian Lands (*Huayitu* 華夷圖) carved in 1136. This map shows that there was only one lake, Juyanze at Ejina. **Plate 2.** is from *Nouvel Atlas de la Chine*, published in France in 1753. At that time, Gashoon nur (indicated as “Souhouc Nor”) and Sogo (Sobo) nur have already appeared, and Juyanze lake has not exist any longer. This phenomenon happened because the amount of water of the Heihe river changed greatly, and the flowing direction of the river came near to the west. Then, when and why did this event happen?

To clarify this problem, we are advancing the decipherment of the written historical materials that has been left now. The main one is the documents written in Chinese

discovered from Khara Khoto 黑城 in 1983, which were recorded in Yuan 元 era, published in 1991, and are called Khara Khoto Document. Besides this, we use recorded information to the history books and the old maps, those were chiefly made in China. In addition, we refer to acquired data from the archeological investigation, the analysis of the satellite photograph, and the investigation of the lake sediments.

### 1. Agriculture and water use at Ejina in the age of Xixia and Yuan

There is some old maps which were drawn the situation of Ejina. **Plate 3.** is the map of the lower Heihe river and Juyanze lake carried by the local gazetteers; *Ganzhenzhi* 甘鎮志 and *Suzhenzhi* 肅鎮志, completed in 1657 of Qing 清 era. But this map is drawing the situation before the 14<sup>th</sup> century. According to this, it turns out that Khara Khoto (Yijinai castle 亦集乃城) was surrounded by branched Heihe river and the river which flowed together in the northeast were flowing into Juyanze lake (Yijinai sea). **Plate 4.** is a satellite photograph which took present Khara Khoto. The relation between the paleo-channel of Heihe river and Khara Khoto are completely in agreement with the situation shown in **Plate 3.** According to the investigation of the lake sediments, it turned out that the large quantities of water flowed into Sogo nor, and its area had expanded rapidly in the 12<sup>th</sup> century.

When this map was drawn first, this region was under the rule of Xixia 西夏 and Yuan Dynasty. Around Khara Khoto and Lucheng 綠城, innumerable irrigation canal was pulled from Heihe river, and vast farming ground extended. It turns out that the many were used from the age of Xixia to Yuan by the investigation.

There are a lot of uncertain points of the situation in the Xixia era. According to historical materials, the peoples of Xixia engaged in irrigation agriculture and stock raising by using the thaw water of Qilian 祁連 Mountains in this region. **Plate 5.** is *Shengli yihai* 聖立義海, vol. 2, "The names and meanings of the mountains", excavated from Khara Khoto. This book is the encyclopedia of Xixia.

In the age of Yuan Dynasty, a central government strongly initiated immigration, and this policy was executed in the frontier region of China. Ejina was not an exception. In the age of Qubilai, it is recorded that 200-300 soldiers immigrate, and developed 500 hectares or more newly in cooperation with the vicinity resident. After that, when intensive agriculture, Outianfa 區田法 in Chinese, was introduced, the latest agricultural books were distributed to the whole country. The document that shows the state of execution of the intensive agriculture in this place has been excavated from Khara Khoto, with the fragment of an agricultural book's illustration. See **Plate 6.**

Among the main irrigation canals around Khara Khoto, the name of eight places is recorded in the Khara Khoto document. To our regret, the accurate position of them is uncertain now.

In Ejina, under the inspection and the guidance of a senior organization, undersecretaries (tongzhi 同知) of the provincial government (zongguanfu 總管府) had jurisdiction over the irrigation business with subordinates of a special department (hequsi 河渠司), and they presided over the distribution of the agricultural water. Some points artificially modified are confirmed in the paleo-channel of the river around Khara Khoto. They might have initiated such public works. See **Plate 4**.

The residential population of the farm village around Khara Khoto is estimated to be about 4000-5000. They were incorporated to the executive organization "she 社 (society)". In Ejina, some societies of each irrigation canals were organized, the potentate in each society was appointed to "shechang 社長 (president)", and a big authority was given. Moreover, the official position named "biaoshui 俵水 (water distributor)" was appointed. Their important duty was to distribute the water corresponding to the area of each farmland.

The method of distributing water to the farmland and the organization that manages irrigation agriculture was never changed almost in principle in the Hexi corridor 河西走廊 region from the age of Tang Dynasty. There are a lot of uncertain points of a concrete situation of the water management in Khara Khoto. However, it is thought that the same method as other regions; Dunhuang 敦煌, Zhangye 張掖 and Wuwei 武威 etc., was adopted.

Crops such as barley, wheat, millet, and gaoliang were grown in this region. See **Plate 7**. They are the most popular crops in the northwestern region of China. These farm products occupied the main part of a financial income of this place, and supported the life of the stationing army and city people. As for Marco Polo, the occupation of native people in Ejina was farming and stock raising, and nobody was engaged in the trade. It was a blessing of Heihe river water to bring the prosperity of Khara Khoto.

## **2. Shortage of water and change of life environment in the 14<sup>th</sup> century**

The climate of Ejina was extremely severe in those days. The strong seasonal wind from the northwest always blew a large amount of quicksand, and buried the irrigation canal and the farmland. There were a lot of salinities and gravel in the soil, and the cultivation was quite difficult. The drought and the damage by insects that happens frequently have ruined a harvest.

The continuing calamity brought the great famine and war disturbances in

various parts of China. The drought and the famine often happened in Ejina when entering the 14<sup>th</sup> century. It was not easy to rebuild the impoverished farm village though the government tried to relieve the people from the disaster. When a large-scale military campaign happened, the food that had to be supplied to soldiers and horses could not help relying on another region, Zhangye and Jiuquan 酒泉. **Plate 8.** is the document concerning military food written in 1300 excavated from Khara Khoto. Moreover, the appeal of a local government official who seeks a transfer is recorded in the document of the age because of the hard living in Khara Khoto at the last years of Xixia. Circumstances in Khara Khoto were not easy at all.

In the middle of the 14<sup>th</sup> century, the transportation and supply of food from another region was stopped in Khara Khoto, and the stockpile has almost become empty. The bill that circulated on a nationwide scale became the wastepaper in an extreme inflation. Prices were calculated based on the amount of wheat. **Plate 9.** is one of the bill printed in Yuan era excavated from Khara Khoto.

The serious change happened when Khara Khoto fell into a critical situation. According to the local gazetteers, in the 14<sup>th</sup> century, Juyanze which had been one vast lake was “divided into three small lakes”, and “these three lakes were so small that they were not equal to the small lake in the China mainland.” It is not clear that these three lakes are equivalent to the present lakes, such as Gashoon nur or Sugo nur. However, it is clear that the amount of water of Heihe river and Juyanze lake had been decreasing sharply at that time. **Plate 10.** is the Map of the Nine Frontiers of Imperial Ming (*Huang Ming jiu bian tu* 皇明九邊圖) and The Research on Rule of Frontier (*Bian zheng kao* 邊政考), printed or drawn in the middle of the 16<sup>th</sup> century. According to them, Khara Khoto is surrounded by Heihe river and three small lakes.

It is thought that these problems are closely related to the climate change that happened globally at that time. What causal relation exists between a lot of disasters that attacked Khara Khoto and the shift to the Little Ice Age? It is a problem that requires the progress of a further research. However, it is necessary to have thrown a dark shadow on people's livings at that time. And it has already become impossible to support the situation in the will and the power of the government.

### **3. Abandonment of Khara Khoto castle and situation of Ejina after 15<sup>th</sup> century**

The expedition army of Ming 明 battled three times in 1372, 1380, and 1384, and expelled Yuan power from Khara Khoto. However, did Ming really change Heihe river's flow, and cut off the water supply as talked to the legend in that case? Nothing is

recorded in historical materials. In the southwest of the Ejina, there is a large dune that runs north and south. According to the investigation, it is said that the structure that the flow of the river was artificially dammed up exists here by two places. After the 15<sup>th</sup> century, the reconnaissance troop was sent to the ruin of Khara Khoto several times. According to their reports, the palaces and temples that had been decorated with beautifully colored construction materials and colorful roof tiles stood like old times. The castle was abandoned after the end of the 14<sup>th</sup> century, but was not destroyed.

On the other hand, Ejina region never fell into the desolate wilderness after the 15<sup>th</sup> century. At the beginning of the 16<sup>th</sup> century, it is recorded that more than 1000 Chinese people get across the desert and back to the town in suburbs of Wuwei. They lived in Ejina, and were engaged in farming and stock raising. But they rioted by some reasons, and returned to their hometown. According to the survey, there are some ruins of the farmlands and the irrigation canals used after the 15<sup>th</sup> century around Khara Khoto. Ejina disappears from historical materials in the age of Ming Dynasty, and there are a lot of uncertain points of detailed circumstances. However, many people had existed here before the Torguut people came back to Ejina in the 18<sup>th</sup> century.

## **Conclusion**

In the age of Xixia and Yuan, Heihe river flowed in the direction of Khara Khoto and was flowing into the Juyan lake which was in the northeast of Juyan oasis. Many irrigation canals and vast farmlands were extended to the near region of Khara Khoto.

In the 14<sup>th</sup> century, the amount of water of Heihe river and Juyan lake decreased sharply, and the direction of the main stream of the river also changed northwardly along with it. Agriculture has declined because the climate becomes cold, and the disaster happened frequently.

The irrigation farmland was developed on a large scale also in middle reaches of the Heihe river in this age. It is not made clear whether this development related to the shortage of water in the downstream. This is a problem to be made clear from now on.

The map of China and the Barbarian Lands (*Huayitu* 華夷圖) (below)



Plate 1.



Ink-line sketch of *Huayitu* (Northwest part) (upper)

Plate 2.

Occupé par une partie du Cobi ou Cha-mo desert sablonneux, jusques à la Ville de Hami (eastern part) (below)

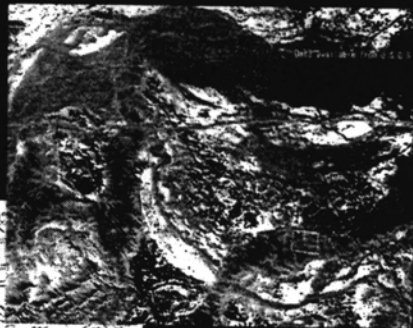


Carte Generale de la Tartane Chinoise (western part) (upper)



Plate 3. & 4.

The map of the lower Heihe river and Juyanze lake from the local gazetteer of Suzhou (Suzhenzhi 蘇鎮志) (below)



A satellite photograph which took present Khara Khoto (upper)

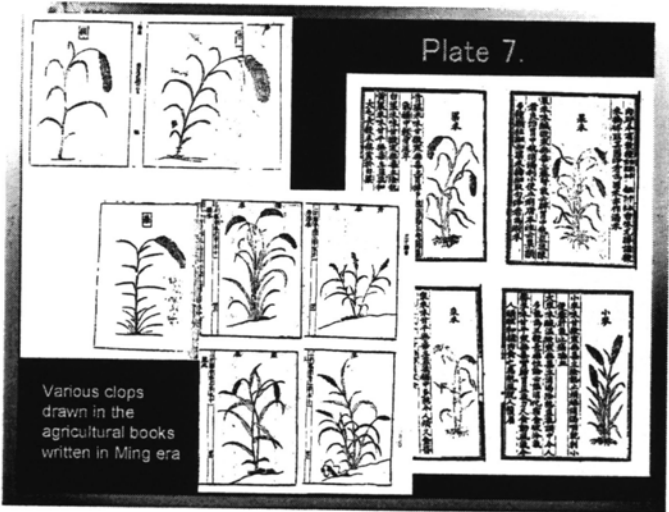
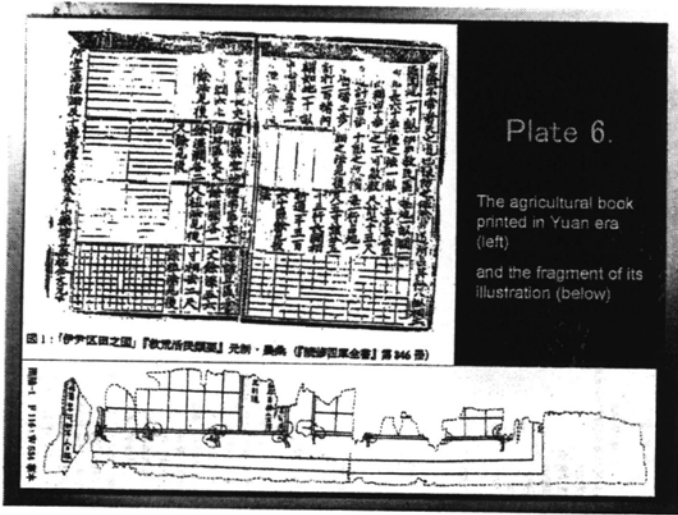
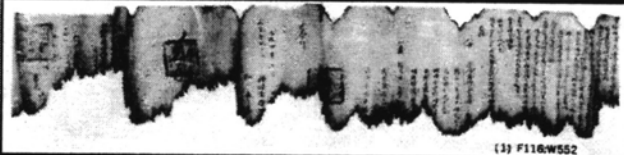


Plate 8.



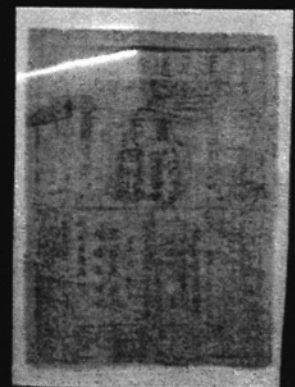
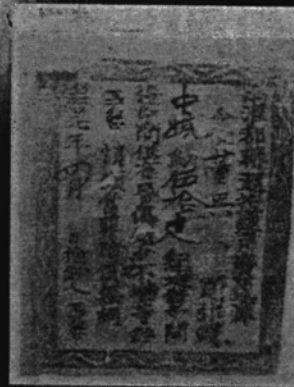
(2) F116/W553



(3) F116/W552

The document concerning military food written in 1300 (Dade 4 nian junliang wenquan 大德四年军粮文卷)

Plate 9.



Bills printed in Yuan era

Plate 10.

Various maps made in Ming era, 16<sup>th</sup> century

