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# Reclamation and revolt: Social responses in Eastern Inner Mongolia to flood/drought-induced refugees from the North China Plain 1644–1911

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## A R T I C L E I N F O

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## ABSTRACT

In the present study, Eastern Inner Mongolia (EIM) and the North China Plain (NCP) during the Qing Dynasty (1644-1911) were selected as study areas. Based on records of agricultural exploitation, settlement expansion, and revolts obtained from the Veritable Records of the Qing Dynasty (a collection of official records), a collection of proxy data reflecting historical social change in EIM was gathered. The social response in EIM to the immigrants from the NCP, who were mainly destitute and homeless refugees and came into EIM under the acquiescence or even with the encouragement of the government in and after a severe flood or drought, was analysed by comparing the data on climatic factors as well as changes in governmental policy. The results indicated that social response was significantly dependent on phase changes. In the 18th century, immigrants from the NCP promoted the reclamation of EIM, which was a pastoral region throughout the 17th century and displayed agricultural prosperity, settlement expansion, and positive regional interactions. However, from the beginning of the 19th century, agriculture declined and settlement slowed. Immigrants intensified local social contradictions in EIM, which led to a series of armed revolts and collapse in the late 19th century. This transformation was affected by both natural and human factors, especially periodic fluctuations in temperature, which significantly affected land use and environmental capacity in EIM by controlling the location of the agro-pastoral transitional zone, and the implementation and repeal of quarantine policy, which immediately affected the extent of immigration in EIM.

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## 1. Introduction

Climate change-induced migration is an important area in current research on the impact and adaptation of climate change. The IPCC Fourth Assessment Report indicated that extreme weather events (rainstorms, heat waves, hurricanes, droughts, and floods), land degradation, sea level changes, and other problems caused by climate change threaten the adaptation of the local community and may lead to large-scale temporary or permanent migration (IPCC, 2007). In particular, the mass migration of refugees and violent conflicts caused by droughts, water shortage, and land degradation in the Sahel region of Africa (Barrios et al., 2006; Black and Sessay, 1998; Hendrix and Glaser, 2007) and storm surges and floods along the coastal zones of the Gulf of Mexico and the Bay of Bengal (Karim and Mimura, 2008; Smith, 2007) have attracted a considerable amount of attention. Migration tends to be large scale, and regional and national boundaries are often crossed. Thus, migration poses a significant risk to national and international security (Barnett, 2003; Mortreux and Barnett, 2009). Considerable attention has focused on policy due to its important role in the displacement of refugees and its ability to ease conflict between local inhabitants and immigrants (Babu and Hassan, 1995; Barnett and Adger, 2007; Byravan and Rajan, 2005; Döös, 1997; Reuveny, 2007; Warner, 2010).

Eastern China is under the climatic control of the East Asian Monsoon system and displays high climate variability, including frequent and severe meteorological disasters. Due to the large population, low economic level, and complex ecosystem, the region is highly vulnerable to climate change (NDRC, 2007). In the coming decades, it would be one of hotspots in the world where mass migration is likely to occur under scenario of severe floods and droughts, placing pressure on the origin and destination societies (Warner et al., 2010).

The past is the key to the present and future. Due to the frequent recurrence in Chinese history of mass migration triggered by

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climate change (particularly floods and droughts), information on social response and adaptation is plentiful in historical literature. The extraction and use of this information in a historical empirical study is advantageous to Chinese researchers. Until a few years ago, the majority of Chinese migration-related research was conducted by population historians and focused on historical data collation and the qualitative description of migrations (Chi, 2001; Ge, 1997; Jiang and Sun, 2001). In recent years, more factors that immediately affect migration, such as climate and policy, have been introduced into the traditional paradigm and quantitatively analysed. As a result, more precise reconstructions of historical cases and more in-depth investigations on the mechanisms of migration have been conducted (Fang et al., 2007).

In the present study, the North China Plain (NCP) and Eastern Inner Mongolia (EIM) in the Qing Dynasty (1644–1911) were selected as study areas to investigate climate-induced migration between them.

## 2. Background to study area

In modern China, EIM encompasses a portion of five provinces respectively (Inner Mongolia, Heilongjiang, Jilin, Liaoning, and Hebei) and is located at 112.9°–126.4°E, 40.2°–47.4°N. In 1644, EIM was completely under the jurisdiction of Mongol noblemen. As the number of Han immigrants from North China increased, the central government built several administrative units that were subject to surrounding provinces (Niu, 1990; Tan, 1987; Yan, 2006) (Fig. 1).

From south-eastern to north-western EIM, the terrain gradually changes from plain (Northeast China Plain) to plateau (Inner Mongolia Plateau), annual rainfall decreases from 600 mm to 400 mm, and the vegetation transitions from forest to steppe (Table 1). The ecosystem is thus varied and diverse. Over the past several thousand years, climate change, especially periodic variations in the East Asian monsoon system, has played an important role in the vicissitudes of the natural landscape and human society in EIM (Fang, 1999; Man et al., 2000; Wulan and Zhang, 2001; Zhang et al., 1997; Zou, 1995), with land use repeatedly alternating in extent between agriculture and pasture. When the summer monsoon is strong, the climate in the EIM becomes warm and humid, and the agricultural zone expanded towards the northwest. In contrast, when the winter monsoon predominates, cold-dry weather is common, and pasture expanded towards the southeast.

The NCP is located at 113.4°–120.2°E, 34.6°–41.4°N and is surrounded by the Yanshan, the Taihang Mountains, the Yellow River,



Fig. 1. General map of the study area (GW: The Great Wall; WFW: The Willow Palisade; units 1: Administrative units set up in 18th century; units 2: Administrative units in the 19th century; units 3: Administrative units in 1900–1911 the map was base on administrative divisions in 1820 and the digital data were from yugong Site. http://yugong.fudan.edu.cn/ lchg/Chgis\_index.asp).

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Climatic conditions in modern Eastern inner Mongolia and the North China Plain."						
Station	Location	Height/m	Annual rainfall/mm	Annual temperatures (Jan., Jul.)/°C	Relative humidity	Vegetation type
Beijing	39.48°N, 116.28°E	31.3	615.8	12.0 (-4.1, 26.1)	57.9	Cultivated vegetation
Jinan	36.36°N, 117.03°E	170.3	671.4	14.5 (-1.0, 27.5)	57.9	Cultivated vegetation
Chengde	40.59°N, 117.57°E	385.9	537.4	9.0 (-9.3, 24.4)	55.1	Deciduous broadleaved
						forest
Chifeng	42.16°N, 118.56°E	568.0	371.3	7.2 (-11.2, 23.5)	49.2	Steppe
Tongliao	43.36°N, 122.16°E	178.7	393.8	6.4 (-13.9, 23.9)	56.1	Steppe

 Table 1

 Climatic conditions in modern Eastern Inner Mongolia and the North China Plain.<sup>a</sup>

<sup>a</sup> The modern meteorological data (1951–2000) are provided by the China National Meteorological Information Center (http://www.nmic.gov.cn).

the Taishan Mountain in Shandong, and the Bohai Sea. In the Qing Dynasty, the NCP was composed of 22 prefectures (Fu) and 189 counties (Xian) and covered most of Zhili Province (south of the Great Wall), northeast Henan, and northwest Shandong (Fig. 1). In modern times, the NCP encompasses Beijing and Tianjin, most of Hebei, and a portion of Henan and Shandong. This area has a long history of agriculture and prominent political and economic status, and Beijing has been the capital of China in most time of the last millennium.

In the Qing Dynasty, unprecedented population growth was the most serious concern for the government. For instance, the population of Zhili (Hebei) province increased from 8 million in 1644 to over 37 million in 1910 (Cao, 2001). Furthermore, due to the variability of the East Asian monsoon system and the uneven distribution of precipitation, severe flooding and droughts were a huge threat to agriculture and social order (Gu, 1991). Even in the 18th century, when famine relief organized by the central government was highly effective (Li, 2007; Will and Wong, 1991), displaced refugees accompanied every disaster. After the government's effectiveness in famine relief diminished in the late Qing Dynasty (19th century), mass migration was more often caused by severe flooding and drought. When a poor farmer in the NCP went into bankruptcy during a famine, an acceptable choice was to move into EIM, which was sparsely populated, and make a living by



Fig. 2. Changes in social response in EIM to immigrants from NCP and climatic background during 1644-1911 (Pd: drought index; Pf: flood index).

reclamation. During the Qing Dynasty, the NCP was the main source of immigrants into EIM (Yan, 2006; Zhu, 2005).

At the beginning of the Qing Dynasty (1644), EIM was a pastoral region under the protection of the quarantine policy, which prohibited immigration and reclamation. The border between EIM and the NCP was the Great Wall, which was built during the Ming Dynasty (1368–1644) to resist the Mongol offensive. In Northeast China, EIM, Jilin, and Shengjing (Liaoning) were demarcated by the Willow Palisade, which was built in 1653–1681 to divide and isolate the Hans (Shengjing), Manchus (Jilin), and Mongols (EIM). In particular, the purpose of the wall was to restrict the immigration of Hans into EIM, Jilin, and Heilongjing, which contained little agriculture, and to protect the local ecological environment and natural resources (Lü, 1990). The Great Wall and Willow Palisade were the symbols of the Qing government's quarantine policy and served as a boundary between pastoral and agricultural regions in the early Qing Dynasty (Fig. 1).

By the end of the 17th century, the ban had been conditionally removed. Thus, when floods and droughts occurred, refugees from the NCP who had become destitute and homeless in disasters could move into EIM and cultivate pasture with official approval. This semi-quarantine policy developed due to population pressure in the NCP and the need for food self-sufficiency in EIM. Over the next two centuries, migration induced by floods and droughts was the most significant factor driving the interaction between the NCP and EIM.

Based on historical documents on agricultural exploitation, settlement expansion, and revolts, the present study reconstructed the social response to immigrants from the NCP to EIM and its variations in different periods and analysed possible factors affecting immigration.

Based on historical documents on agricultural exploitation, settlement expansion and revolts from 1644 to 1911, the present study reconstructed how the social response to immigrants from the NCP into EIM varied over time, and analysed possible natural and human factors.

#### 3. Materials and methods

The main source of historical information in the present study was the *Veritable Records of the Qing Dynasty* (ZBC, 1985–1987). This is a collection of 4433 volumes of official records, edited on a daily basis, which constitutes the most important original document for studying the Qing Dynasty. The raw data extracted from this document include records on agricultural harvest, grain transportation, and revolts, which reflect historical social change spurred by immigrants in EIM, as well as other relevant information, such as population, migration, policy, etc. Climate change data and administrative divisions in EIM and the NCP in the Qing Dynasty were obtained from previous research on historical geography (CMA, 1981; Niu, 1990; Tan, 1987; Wang, 1991).

#### 3.1. Temperature variation in the NCP and EIM

Temperature variability in the study area (NCP and EIM) was analysed using temperature data from North China since 1380, which was reconstructed by Wang (1991). During this time, North China consisted of Beijing, Tianjin, Hebei, Shanxi, Inner Mongolia, Liaoning, northern Henan, and northeast Shandong, which includes NCP and EIM. In the series, the average temperature for 1880–1979 was used as a reference, and the resolution of the data was equal to 10 years (Fig. 2e; the dashed line indicates the average temperature anomaly of 1950–1979).

### 3.2. Floods/droughts in the NCP

Floods and droughts in the NCP in 1644–1911 were identified using the dryness/wetness grade data presented in the Yearly charts of dryness/wetness in China for the last 500-year period (CMA, 1981), which contains abundant climatic descriptions from thousands of historical documents by a number of researchers. The yearly dryness/wetness grades presented in the aforementioned document were obtained from 120 stations (classified into 5 grades: 1very wet, 2-wet, 3-normal, 4-dry, 5-very dry) and have been widely used as proxy data for precipitation in Chinese historical climate change research in the last 30 years.

Using the yearly dryness/wetness grades obtained from 10 stations in the NCP (Fig. 1) during 1644–1911, the yearly drought index (Pd) and flood index (Pf) in the NCP were constructed by determining the weighted average according to the method described by Chen (1989) (the Pd and Pf ranged from 0 to 1; thus, the intensity of the disasters varied from slight to severe).

In the NCP, drought often lasted for more than a year, and the amount of destruction caused by a drought was dependent on its intensity and duration. In the present study, a drought was defined as a single year with  $Pd \ge 0.5$ , two consecutive years with  $Pd \ge 0.4$ , three consecutive years with  $Pd \ge 0.3$ , or four (or more) consecutive years with  $Pd \ge 0.2$ . Using the Pd data, 17 droughts (covering a total of 55 years) were identified (Fig. 2g, shaded). Conversely, the duration of a flood is typically measured in days or months and never exceeds one year. Thus, a flood was defined as a single year with  $Pf \ge 0.6$ . According to the Pf data, flooding occurred 18 times (Fig. 2h, shaded).

## 3.3. Social response in EIM

Proxy data reflecting historical social change in EIM were based on records of agricultural exploitation, settlement expansion, and social upheaval. By comparing this information to flood/drought data, the social response in EIM to immigrants from the NCP was analysed.

#### 3.3.1. Bumper harvest

The Veritable Records of the Qing Dynasty contains abundant records on agricultural development in EIM. From this document, 15 years were identified in which bumper harvests occurred (1703, 1727, 1738, 1739, 1742, 1746, 1747, 1749, 1751, 1760, 1761, 1771, 1785, 1792, and 1856). With this data, the frequency of bumper harvest years over a 10-year period was determined (Fig. 2b). Due to the high latitude and altitude of the study region, crop planting was apparently restricted by temperature and precipitation in EIM, and bountiful harvests were not a common occurrence. The frequency of bumper harvests in different phases may reflect the level of agricultural development and the suitability of natural conditions.

#### 3.3.2. Grain transportation to the NCP

According to the *Veritable Records of the Qing Dynasty*, an important method of relieving famine in the NCP in some periods of the Qing Dynasty was to obtain a large amount of surplus grain<sup>1</sup> from businessmen (by purchase) from EIM or official granaries (by allocation) located in EIM, which meant that agriculture in EIM had been prosperous enough that the initial expectation of food self-support was exceeded.

In total, records of grain transportation from EIM to the NCP were identified in 7 years (1722, 1738, 1742, 1743, 1744, 1760, and

<sup>&</sup>lt;sup>1</sup> In certain years, such as 1743, the amount of grain transported from EIM to the NCP was thousands of tons.

1762), and the frequency of which were extracted as a proxy index of agricultural prosperity. These data are displayed as a decadal frequency series in Fig. 2c.

## 3.3.3. Administrative division

In the early Qing Dynasty, the inhabitants of EIM were primarily Mongol herdsmen and were loosely administered by Mongol lords in the administrative division system of leagues (Meng) and banners (Qi) (a league consisted of several banners, each of which was dominated by a Mongol lord). By 1644, there were 4 leagues (Chahar, Josotu, Juu Uda, and Jirim) and 30 banners in EIM (Fig. 1). In later centuries, the central government established a number of Fu (equivalent to prefectures), Ting, Zhou, and Xian (equivalent to counties), which were detached from EIM and were subject to the surrounding provinces (Zhili, Shengjing, Jilin), to manage the agricultural settlements of Han immigrants.

During the Qing Dynasty, 37 new administrative units (Fu, Ting, Zhou, and Xian) were established in EIM (Fig. 1) and reformed 15 times (mainly for upgrades). Based on these changes, administrative division data from EIM for 1644–1911 were constructed, and the resolution of the data was set to 10 years (Fig. 2a). Because the establishment and reformation of administrative units in EIM during most of the Qing Dynasty occurred after the Han settlements had increased to a certain scale, the series of administrative divisions reflected the location and rate of expansion of immigrants' settlements. However, at the beginning of the 20th century, many new administrative units were established in EIM and large amounts of uncultivated land was measured and sold publicly with the New Policies of the Qing government, even before the immigrants' arrival. In this period, the administrative divisions reflected the intensity of policy management.

#### 3.3.4. Revolt events

A database of revolts (mass demonstrations, banditry incidents, and armed uprisings) was constructed with the historical information obtained from the *Veritable Records of the Qing Dynasty.*<sup>2</sup> The database included the location of outbreaks, affected regions, duration, and seriousness of the revolts. The frequency of revolts was quantified with a proxy index of unit-time/year (one administrative unit (banner, Fu, Ting, Zhou, or Xian) was affected by a certain number of revolts in one year). In total, 146 unit-time revolts occurred between 1644 and 1911 in EIM. Using the yearly unit-time data, the frequency of revolt events per year/10-year period was established (Fig. 2d and f).

## 4. Results and analysis

With the proxy data and processing methods mentioned above, historical series describing the climatic background in both areas and the social response in EIM during the Qing Dynasty were reconstructed (Fig. 2). The character of the historical series differed significantly over time, with an especially large contrast in social response between the 18th and 19th centuries.

## 4.1. Climate change: temperature and floods/droughts

From 1644 to 1911, the NCP and EIM fell in the latter half of the Little Ice Age (Wang et al., 1998). On average, the temperature was colder than in modern times and fluctuated periodically. As indicated in Fig. 2e, the late 17th century was the coldest period of the

Qing Dynasty. In the 18th century, a warming period was observed, and the average temperature was similar to that of the 1950s—1970s. However, the climate became cold at the turn of the 18th century. Throughout the 19th century, the temperature was relatively cold, and minor fluctuations were observed.

The frequency and intensity of floods and droughts in the NCP also varied in stages. According to the results shown in Fig. 2g and h, disasters occurred more frequently and severely in the late 17th and 19th century. In contrast, the 18th century was a relatively moderate period. In the 18th century, there are only 19 years of floods/droughts, with a disaster occurring every 5.3 years, while in the late 17th (from 1644 to 1699) and 19th centuries, there were 18 and 36 years of disaster respectively, which meant every 2.9 and 2.8 years a disaster occurred, respectively. Many extreme floods/ droughts with long durations and high Pf/Pd values occurred in the 17th and 19th century. These events typically occurred repeatedly in a very short period of time. For instance, the floods in 1652 and 1653, the droughts in 1678-1683, 1856-1862, 1875-1878, and the floods in the late 19th century (1883, 1886, 1890, and 1894) are examples of repeated events. In contrast, significantly less extreme events occurred in the 18th century. Notably, between 1730 and 1770, the most peaceful period of the Qing Dynasty occurred, with only 5 years of disaster.

## 4.2. From reclamation to revolt: social response in EIM

The social response in EIM to immigration induced by floods/ droughts in the NCP during 1644–1911 was measured by determining proxy index data on agricultural development, settlement expansion, and the occurrence of revolts (Figs. 2a–d and f). The results suggest that social response was related to climate change, especially the remarkable transformation from reclamation in the 18th century to revolt in the 19th century.

## 1) The 17th century (1644-1699): Lack of social response

Significant social responses were not identified in the data during this period.

### 2) The 18th century (1700s-1790s): Prosperity

Almost all of the bumper harvest years (14 of 15) in EIM occurred in the 18th century, with only one observed in the 19th century (Fig. 2a). All of the records regarding grain transportation from EIM to the NCP were spread between the 1720s and the 1760s (Fig. 2c). As described in historical documents, the districts around Chengde were a major output region for grain production in North China in this period (Deng, 2005; Xiao et al., 2011). The first peak of administrative division in EIM was observed in the 1720s-1770s. During this time frame, 10 new administrative units were established and reformed 9 times (Fig. 2b). The location of the 10 units (Fig. 1) suggests that agricultural settlements expanded northward. In particular, the northernmost unit was 170 km from the Great Wall, which was the southern boundary of the Mongols' pasture in the late 17th century. In the same period, violent conflict rarely occurred (2 unit-times of revolt events i.e., two administrative units were affected, in 100 years).

#### 3) 1800s-1850s: Upheaval

Based on the lack of records on bumper harvests and grain transportation (Fig. 2a and c), agriculture in EIM likely declined during this period. Only 2 administrative units were established (in the 1800s) in 60 years (Fig. 2b). The suggestion that Han immigrants increased more slowly than in the 18th century may be

<sup>&</sup>lt;sup>2</sup> Because the *Actual Annals of Qing Dynasty* contains a lack of information on the Boxers during 1899–1901, the records on the Boxer revolts were obtained from Li's research (1986).

supported by existing research on migration (Cao, 1997). From the 1810s to the 1850s, a continuous increase in the frequency of revolts reflected the tension in EIM.

#### 4) 1860-1900: Collapse

In the 1860s–1880s, 5 new administrative units were established and 3 reforms occurred, indicating that migration from the NCP to EIM increased. As indicated by the location of the 5 new administrative units as well as the 2 administrative units established in the 1800s (Fig. 1), most agricultural settlements (6 of 7) in the 19th century were distributed along the Willow Palisade. During these 41 years, the most notable social change in EIM was the significant increase in large-scale armed revolts in 1865, 1891, and 1900, which propelled society into complete disorder.

#### 5) 1901-1911: Revival

An unprecedented administrative expansion was observed in EIM. Twenty administrative units were established and were reformed 3 times. Compared to the units established in the 18th and 19th century, the new units were located towards the northwest.

## 4.3. Climate change and social response in EIM

Changes in social response in EIM appear to be closely related to climate change in the corresponding period. The number of immigrants in EIM was dependent on the frequency and intensity of floods/droughts in the NCP as well as periodic temperature fluctuations, which controlled the location of the agro-pastoral transitional zone and affected land use and the environmental capacity of EIM.

The lack of social response in the late 17th century may be related to the cold climate, which caused the pastoral region to expand and the agricultural region to shrink. The 17th century was the coldest period of the Qing Dynasty, and the Great Wall and Willow Palisade served as a boundary between agricultural and pastoral land (Fig. 1). Agricultural development rarely occurred in EIM, and immigration to EIM was not considered by refugees from the NCP during this period.

The prosperity of EIM in the 18th century was probably due to a warmer climate. In particular, temperature and precipitation made the region more amenable for cultivation, and greater agricultural exploitation and environmental capacity were achieved. At the same time, less frequent and severe floods/droughts in the NCP set an effective limit on the number of refugees. Consequently, a positive interaction between the NCP and EIM was observed. Moderate immigration met EIM's need for labour and the development of agriculture, allowing EIM to contribute to the displacement of refugees from the NCP. Furthermore, frequent rich harvests enabled EIM to provide the NCP with surplus grain for famine relief, such as during the droughts of 1720–1723 and 1743–1745 and the flood of 1761.

In the 19th century, the boundary between agricultural and pastoral land was moved towards the southeast due to the colder climate, as indicated by the location of new administrative units, which were closer to the Great Wall and the Willow Palisade than in the 18th century (Fig. 1). As agriculture in EIM declined (Fig. 2a and c), more refugees were forced to migrate due to a succession of extreme flood/drought events in the NCP. The competition between migrants and local inhabitants for scarce social and economic resources intensified continuously, resulting in violent conflicts. During the 19th century, revolts occurred in waves, and most of the crest points can be correlated to years when floods/droughts

occurred in the NCP (Figs. 2f-h). The primary social response in EIM changed from reclamation to revolt.

In the first decade of the 20th century, no severe disasters occurred in the NCP, and the unprecedented mass migration into EIM was primarily driven by human factors. However, the expansion of agriculture occurred when the Little Ice Age ended and the climate warmed rapidly (Wang et al., 2004). This era was the prelude to large-scale agricultural exploitation during the following 100 years (Ye and Fang, 2009), which was a significantly warm period in human history.

## 5. Discussion

In addition to climate change, the interaction between the NCP and EIM during the Qing Dynasty was affected by human factors, such as policy management and traffic accessibility.

#### 5.1. Policy

Compared with climate, policy is a more immediate factor that affected emigration from the NCP and immigration into EIM, especially the formulation, reformation, and implementation of the quarantine policy.

At the beginning of the Qing Dynasty, the central government applied a quarantine policy to isolate Hans and Mongols with the Great Wall and the Willow Palisade, which was built in 1653–1681. Shengjing (Liaoning) was opened to the Han for a short period of time for the development of local agriculture (terminated in 1668) (Fang et al., 2007). Thus, in the mid- and late-17th century, EIM was not the first choice for refugees from the NCP. Furthermore, as pointed out by Zou (1995), the significant results of the quarantine policy in EIM (very few Han immigrants) may be partly attributed to the cold climate.

Since the end of the 17th century, the government conditionally removed the ban and gradually developed a so-called semi-quarantine (restrictive immigration) policy to meet the need for food self-sufficiency in EIM and to apply an alternative livelihood strategy for the refugees of floods/droughts in the NCP (Shengjing had been guarantined in 1668). The policy of semi-guarantine meant that in years of flood/drought (such as 1720-1723, 1743-1745, 1792, and 1801), refugees from the NCP who had become destitute and homeless could move into EIM and cultivate pasture with official approval, while in normal years, the ban was strictly enforced, and no one could enter EIM through the tollgates along the Great Wall. Although quarantine was tightened in 1749 (by the Qianlong emperor) and 1803 (by the Jiaqing emperor) because of a significant increase in immigrants, it was not strictly implemented for many years. When natural disasters occurred, the semi-quarantine policy was enacted again (Sun, 1998). This reformation was supported by the Mongol princes because they could make a profit by selling or lending their pasture to the Han immigrants, and in the late 18th and early 19th century, some of them living along the Willow Palisade even ignored the ban of the court to accept the immigrants because of their personal debts (Edmonds, 1985).

Over the next 100 years (until the 1850s), the policy eased the pressure of famine relief in the NCP, limited the number of immigrants into EIM, and protected the vulnerable local ecosystem. The 18th century saw an extended state of prosperity and peace in EIM. In the first half of the 19th century, although agriculture declined, the frequency and intensity of revolt events were limited.

In the 1860s, compelled by political crisis in the Northeastern border area caused by Russia, the central government lifted the ban and approved unlimited migration between the NCP and EIM, as well as Northeast China, which was so-called "the migration for strengthening the border area" (Cheng, 2002; Yan, 2006). Due to frequent and extreme flood/drought events and social upheaval in the NCP during the same period (Ye et al., 2004), the virtual termination of the quarantine policy inevitably led to an explosion of immigration to EIM, which was evidenced in the establishment of new administrative units in the 1860s–1880s. The three largescale armed revolts in the late 19th century and the collapse of society in EIM were likely triggered by policy reform. For example, the "Jindandao" uprising, which broke out in EIM in 1891, might largely be related to the conflict between Han immigrants and local Mongols (Borjigin, 2004).

Comprehensive agricultural exploitation in EIM was an important component of the New Policies, which was established at the beginning of the 20th century and was the most important factor in the significant increase in the number of new administrative units. The central government wanted to solve the economic and population crisis caused by large-scale immigration and reclamation in the former pastoral region. However, the policy was met fierce resistance from local Mongol herdsmen, and negative effects on the ecosystem accompanied social development in later years.

In summary, policy was undoubtedly one of the most important factors in population migration between the NCP and EIM, and it affected the subsequent social response in the Qing Dynasty. Additionally, the formulation, reformation, and implementation of the quarantine policy in EIM were partly affected by climate, which was different from quarantine policies towards other frontier regions like Taiwan (Shepherd, 1993). For example, the semi-quarantine policy was established under flood/drought pressure in the NCP. The similar reformation of quarantine policy can be found in Northeast China (Ye et al., 2011). In different climate periods, such as the colder 19th century and the warmer 18th century, the effectiveness of policy implementation could also differ.

#### 5.2. Accessibility

All of the new administrative units established in the 18th century were distributed in districts around Chengde (currently subject to Hebei province) (Fig. 1) due to the area's proximity to the NCP and favourable road conditions. Road construction and maintenance in Chengde took priority over other districts in EIM during the Qing Dynasty because the royal Summer Palace was located in Chengde, and most emperors resided in the palace for several months every year.

Once settlements around Chengde were saturated, new immigrants had to migrate along the Post Road, which was parallel to the Willow Palisade. Due to the inaccessibility of traffic, the immigrants could not immediately settle in the hinterlands of EIM but gradually diffused from the Willow Palisade Corridor. As a result, administrative units established in the 19th century were distributed linearly along the Willow Palisade.

In the 1900s, the implementation of the New Policies improved transportation conditions in EIM. During the same period, a series of railways became open to traffic in neighbouring provinces, such as Zhili (Hebei) and Shengjing (Liaoning), which was the technological basis of an unprecedented migration.

## 6. Conclusion

From the late 17th century, the immigration and reclamation of refugees from the NCP to EIM due to the occurrence of floods and droughts lasted for more than 200 years and produced a comprehensive social response. When interregional interaction was positive (in the 18th century), immigrants from the NCP provided EIM with a labour force and promoted local agriculture. In addition, agricultural prosperity in EIM allowed the influx of more immigrants and provided surplus grain for famine relief in the NCP. However, when interactions were negative (in the 19th century) due to agricultural decline in EIM, immigrants intensified local social tensions and triggered violent conflicts and even armed revolts.

The change in social response in EIM (from reclamation to revolt) was affected by natural and human factors, such as climate, policy, and technology. Among these variables, periodic fluctuations in the temperature, which controlled the location of the agropastoral transitional zone, significantly affected land use and environmental capacity in EIM. The repeal of the semi-quarantine policy, which was developed during the end of the 17th century and early 18th century, caused explosive growth in immigration and the collapse of EIM in the late 19th century.

Similar to the Qing Dynasty, the North China Plain is currently a political and economic powerhouse with high population density, and the area is threatened by frequent and severe floods and droughts. Moreover, the ecosystem of Eastern Inner Mongolia remains highly vulnerable to climate change. How will future climate change and extreme flood/drought events impact human society? How can we predict the responses of governments and civilians to possible scenarios such as mass migration? Historical experience can help us to answer these questions.

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