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Perceptions of ecological migration in Inner Mongolia, China: summary of fieldwork and relevance for climate adaptation

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Abstract:

This report documents local perceptions and experiences of environmental migration in Bantanjing village and Luanjingtan town, Alxa League, Inner Mongolia, China and discusses some of the challenges and opportunities for climate change adaptation in the region. The findings draw on 15 household interviews, three group discussions, participant observations, field tours, informal discussions with local officials, and a focus group with local policy makers and practitioners.

Residents of Bantanjing and Luanjingtan have to various extents chosen migration as a way of dealing with vulnerability in their former livelihoods. While many migrants feel that their lives have improved in key areas such as access to healthcare and schooling and access to more goods and services, challenges associated with ensuring that the move is a sustainable one in the longer term remain. Livelihood adaptations resulting from ecological migration, expressed in the transition from herding to farming, raise both new climate adaptation, as well as mitigation issues.

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1 Introduction and Background

This report summarises and discusses preliminary findings from fieldwork carried out in Bantanjing village (Right Banner) and Luanjingtan town (Left Banner) of Alxa League, Inner Mongolia autonomous region, China (see Figure 1), between November 13-19, 2008. The fieldwork documented qualitative perceptions and experiences of ecological migration (*shengtai yimin*) among migrants in Bantanjing and Luanjingtan, in connection with the European 6th Framework project ADAM (Adaptation and Mitigation Strategies: Supporting European Climate Policies: www.adamproject.eu). Inner Mongolia is one of three regional cases in ADAM in which opportunities and challenges for mainstreaming climate adaptation and mitigation strategies in regional land-use and water management policies are being explored. Ecological migration is one such regional policy that was signalled out as having potential connections to climate adaptation (ADAM, 2008).

Ecological migration is a central-government mandated, and regionally implemented, policy that aims to deal with deteriorating ecological, as well as social, conditions connected to serious land degradation and desertification in the Western regions of China (Du, 2006; Dickinson and Webber, 2007). While the causes, rates, and outcomes of degradation and desertification in the region are contested, climate variability and change appears to play a role (Dai et al., 2008). Studying perceptions and experiences of ecological migration was therefore expected to yield insights into some of the local challenges and opportunities for climate change adaptation connected to environmental policies in this rapidly changing region.

1.1 Ecological migration overview

Ecological migration has been formally implemented in Alxa League since 2000. However the government has encouraged resettlement of villages and families located in ecologically fragile areas since at least the early 1980s (Du, 2006). Ecological migration is a government-initiated, permanent resettlement of herders and mixed livestock keepers/farmers away from fragile ecological environments and into new or existing settlements outside of ecologically vulnerable regions. The policy aims to protect and rehabilitate degraded ecosystems by moving people off the land, and aims to reduce poverty and encourage economic development through the creation of new, market-oriented livelihoods for migrated populations in the new eco-migrant settlements (Dickinson and Webber, 2007).

An estimated sixty-five percent of Alxa's rangeland is currently degraded, leading to serious reductions in productivity over the past twenty years (Werners et al., 2009). Desertification in the region has led three previously distinct Badain Jaran, Tengger and Ulan Buh deserts to become connected, causing a major increase in the frequency of sand storms, with economic losses and damage experienced both within and beyond the region itself (ibid.).

Policies for reversing degradation and desertification have focused on rehabilitating the region's ecology as well as enhancing livelihoods of land-dependent populations. Policies that address the ecological rehabilitation of the region include grassland enclosures, grazing bans, and conversion of steeply sloped and marginal agricultural land through the "Grain for Green" policy, while policies addressing livelihoods include general poverty alleviation strategies (for example the "Eight-Seven" Poverty Alleviation Reinforcement Plan (1994-

2000), economic development strategies (the West Development Strategy), and ecological migration, the focus of this study (see Du, 2006 for a general overview of these policies).

Although the reasons for the widespread desertification and degradation in Inner Mongolia are contested, cultivation of lands at the margin of deserts, increasing livestock numbers in the 1980s and 1990s that likely exceeded the natural carrying capacity of rangelands, and conversion of rangeland to farmland due to increasing population and continuing migration of Han Chinese farmers to the region, have all contributed to land degradation (Dickinson and Webber, 2007). However, the high natural climate variability of the region, and an observed increase in temperatures in recent decades make it difficult to disentangle the relative importance and contribution of anthropogenic, climatic, and other (e.g. policy) drivers of landscape degradation (ibid).

1.2 Structure of the report

The report begins by describing the field sites and the methods applied in the fieldwork. A description of livelihoods in the two villages based on the fieldwork is provided, followed by summaries of migrants perceptions and experiences of i) government compensation and incentives provided for resettlement, ii) reasons why they were resettled, iii) experience of climate and environmental changes iv) impacts of policies on livelihoods and new livelihood challenges experienced by migrants. A summary and discussion section follows in which climate change adaptation and sustainability actions, challenges and opportunities that were identified during the fieldwork, are presented and discussed.

2 Methods

2.1 Location of fieldwork

The fieldwork was conducted in Bantanjing village (Right Banner) and Luanjingtan town (Left Banner) in Alxa League, Inner Mongolia (Figure 1). Alxa League is one of the 9 prefectural-level administrative regions of Inner Mongolia, and is further divided into three administrative divisions called banners (Left, Right and Ejin), which are similar to counties. Inner Mongolia was selected as the study area for the regional case in China within the ADAM project because its arid and semi-arid ecosystems are particularly vulnerable to climate variability and change, and aridification and desertification in the region in connection with sandstorms has affected welfare within and beyond the region (ADAM, 2008).

Figure 1: Locations of fieldwork in Alxa League, Inner Mongolia, China (*courtesy of Li Shan at IAP CAS Beijing*).

2.2 Selection of field sites

Villages were selected by the Alxa Foreign Affairs Department in consultation with Professor Dai at the Chinese Academy of Sciences (CAS). The two villages were selected according to both practical feasibility and distances given a short field schedule, and to offer contrasts in terms of population size, location, remoteness and general living conditions.

2.3 Methods

Fifteen semi-structured interviews and three group discussions (of 4-5 participants each) were conducted, in addition to tours of agricultural facilities and fields in and around the towns and general discussions with village heads and senior officials (the Director of Foreign Affairs for Alxa League and the Director of the Luanjingtan water and electricity department) during the trip. An interview guide (appendix 1) was followed for the household interviews. In group discussions broad discussion topics were introduced that aimed to a) confirm general information about the village or government policies conveyed during household interviews, and b) elicit different views on the process of migration, c) gain new information about livelihoods, village history, and prospects for the future. The topic of follow-up questions and themes discussed in groups followed the general progress of the conversation. Deviations were initiated when needed to follow up or clarify information conveyed during household interviews or by participants during the discussion.

2.4 Field team

The field team consisted of principle investigator Jennifer West (CICERO), interpreter and doctoral candidate Li Shan (Institute of Atmospheric Physics, Chinese Academy of Science (CAS)), Foreign Affairs Minister for Alxa League, Ms. Tuo Ya, and driver Mr. Ba. The fieldwork permissions were arranged and coordinated by Prof. Xingang Dai (CAS) in cooperation with the Alxa Foreign Affairs office, which officially hosted the visit and arranged the logistics and fieldwork itinerary, including the final selection of field sites.

2.5 Household selection and interview setting

Households were selected by village heads in each village according to the researcher's communicated desire to speak with a) both newly established and longer-term residents, b) ethnic Mongolian and Han Chinese respondents, and c) a balance of better-off and poorer households. Given the small sample and non-random selection of households, the findings and conclusions reported here should be interpreted with caution. Interviews took place in respondents' homes, with one or more residents of the household, typically a husband and wife, taking part in the interviews in addition to myself and Li Shan. In some cases other neighbours or family members joined the discussions. Participants in group discussions in the respective villages (between 4 and 5 people) were chosen by the village heads, according to specifications that the groups include both women and ethnic Mongolian households, and a mix of more recent, and established migrants.

We were accompanied to each household interview by the relevant village head (although he did not participate in the actual interviews). In all but two cases, for which we required translation from Mongolian, interviews were conducted by me, with Li Shan translating. The Director of the Alxa Foreign Affairs Office assisted when needed with translation from Mongolian to Chinese, with Li Shan then translating to English. According to the agreed contract with CAS, each household interviewed received 100 Yuan to compensate them for their time. Village heads who assisted with the identification of respondents and guided us through the villages received 200 Yuan each.

2.6 Reflection on methods

The interview guide was designed to gain information about interviewees' qualitative perceptions and experiences of trends and changes in their livelihoods, rather than to try to quantify the effects of the ecological migration policy itself (for a study of the latter see Dickinson and Webber, 2007). Limited time in the field and a small potential sample precluded conducting lengthy surveys. The interview guide was also designed for ease of interpretation and tried to avoid lengthy interviews that might exhaust those being questioned. In general, the household interviews lasted between 45 minutes and 1.5 hours. After interviewing households, on occasion we were given the opportunity to tour interviewees' agricultural fields and livestock holdings. These tours added richness to the interviews, and provided opportunities for more informal discussion.

Group discussions generally seemed to initiate more lively discussion compared to household interviews. However, the quality and usefulness of group discussions varied somewhat according to the diversity of participants and the setting. In the first group discussion in Luanjingtan, participants who had lived in the town for a number of years (i.e. not recent migrants) were specifically targeted for the discussion. This approach worked well, as

participants had a lot in common, and could describe the history of settlement in their village very well. In the group discussion in Bantanjing, the only ethnic Mongolian male present spoke very little during the discussion and I wondered whether the presence of the retired village head and several other outspoken residents, and the fact that the discussion took place in the home of the current village head (though he was not present) may have had something to do with this. In the second group discussion in Luanjingtan, the only male participant hardly managed to get a word in edgewise alongside the four other outspoken female participants.

In all cases, a number of cautions relating to the way in which data was collected warrant mention. These include that 1) the investigator had little control over the towns and villages visited; 2) households were selected by village heads, albeit according to voiced criteria based on known information about the villages; 3) interpretation was a necessity and there is potential for misunderstanding and loss of data and meaning during the translation process; 4) those interviewed received payment for their time. This may have led to a feeling of obligation to give the "right" or "correct" answers to questions; and 5) despite the fact that no names were recorded and that those interviewed were told that their identity would be protected, respondents may nonetheless have been hesitant to respond to questions and refrained from speaking openly due to both the sensitive nature of the topic (government policy) and the fact that they were identified by village heads, and 6) permission to conduct the fieldwork was given on condition that the researcher agreed in writing not to address sensitive national sovereignty issues in Inner Mongolia.

3 Description of villages and livelihoods

Table 1: Overview of villages and respondents

	Bantanjing	**Luanjingtan**
Banner	Right	Left
Established	1983	1993
Population	500	11 000
Services	Tap water and irrigation (ground water), unpaved road, sporadic electricity (solar and oil generators), limited mobile phone coverage	Tap water (ground water), paved highway, electricity (power lines), irrigation (Yellow River transfer), health facilities, internet, mobile phone coverage, numerous shops, school, government offices
Crops grown	Wheat, corn, sunflower, cotton, Suo Sua (medicinal), seed mellon, chillies	Corn, sunflower, watermelon, minor vegetables
Number of interviews conducted and ethnicity of households	5 (2 Han Chinese; 3 ethnic Mongolian)	10 (2 Han Chinese; 1 ethnic Mongolian)
Group discussions and ethnicity of participants	1 (5 participants total, of which 1 was ethnic Mongolian)	2 (10 participants total, of which 3 were ethnic Mongolian)
Number of women participants in group discussions	2	6

3.1 Bantanjing village

Bantanjing is located about a two-and-a-half hour drive from Menggen town[1] and consists of a number of smaller settlements located close to one another. The village is home to 126 families and has a total population of about 500, including 20 ethnic Mongolian families (60-70 people). Remaining inhabitants (140 families) are Han Chinese farmers and herders. The village is serviced with tap water (installed in 1998), which is pumped from the ground, and a road, which is currently under construction. The town bus station was officially opened while we were visiting.

The area that is now Bantanjing village was once a natural oasis, described by villagers as "flowing grassland". The first residents arrived in 1983 during a severe dry spell in 1983-84 during which no rain fell for two consecutive years. Twelve families (around 40 people) migrated from Xilinbuluge, a village located at a distance of about 75 km from Bantanjing.

In 1998, the government made a new policy of developing the area around Bantanjing economically, and in 2002, Bantanjing was labelled a "model village" by the government. The major emigration of people to Bantanjing occurred after 1998. The unpaved road connecting the town to the main highway was constructed in 2000, and cell phone coverage was gained in the same year. Electricity provided by solar panels that were installed under a Japanese bilateral aid project in 2002 were not working at the time of our visit and residents complained of electricity shortages. Some, but not all, residents have oil generators to provide for household electricity needs. Piped drinking water, pumped from the ground, was completed in 2002 and now services all households.

Although all respondents had herded camels, and in most cases also goats and sheep, before relocating to Bantanjing, the major economic activity in the village is irrigated farming of wheat, corn, sunflower, and cotton. Many households keep several goats and sheep, as well as chickens, for household consumption. Livestock (excluding chickens) are stall-fed with corn and vegetables. Chillies, seed melons, watermelons and vegetables are grown for household consumption as well as sale. The government has constructed greenhouses inside the town for residents as part of the relocation compensation. Some residents who were interviewed have additional non-farm income either seasonally or throughout the year. Examples given among those interviewed were long-haul truck driver, local nurse/doctor, agricultural supplier/stockist for the village, and cook for government officials. Several of those interviewed also rent out, or rent in, additional land for growing agricultural produce. Cultivation of traditional Chinese medicinal plants, mainly *Suo Sua* (a local shrub) and *Cong Rong* (Chinese, or red, Wolfberry), a rhizaphilous sub-species of Suo Sua, is undertaken by some households. These high-value plants have been promoted by the government, and provide some residents with a good source of non-farm income. According to one man who was interviewed, the government provides quotas to individual people for growing the medicinal plants, and subsidised the initial cost of the planting seed as well as providing training. *Suo Sua* is grown on non-agricultural land and takes three years from planting until the first harvest. Medicinal plants are also sown as part of re-vegetation efforts around the town, according to the head of the village.

An example of livestock entrepreneurship is one family that is keeping 200 pigs, and receives free government veterinary services and pig stalls. The government recently introduced a policy whereby farmers receive 100 Yuan for every pig they raise on top of sales. The policy

[1] The unpaved road was under heavy construction at the time of the fieldwork. It is slated to become a paved highway.

aims to increase the supply of pork to the domestic market to combat the steep rise in pork prices experienced in China over the last several years (*Dai, X. Pers. comm., 2008*).

Free-range grazing of goats and sheep in the surrounding grassland and desert is strictly forbidden. This policy does not apply to camels, however, because they must be allowed to graze in the open and cannot be stall-fed. For those residents still owning camels, camel milk and wool can provide an additional source of income.

Outlying fields surrounding the village are bunded on the perimeters to prevent erosion, and are connected to irrigation facilities. There are about 150 bore wells in and around the village, the first of which was dug in the 1970s. Irrigation water is used for both agricultural crops and for watering trees, shrubs, and other vegetation that has been planted to reduce erosion and desertification under the governments' "grain for green" and grassland rehabilitation policies. According to the village head the ground water table is not being depleted, and the chosen non-agricultural vegetation has low water needs, is based on local varieties, and is effective at stabilising the shifting sand. Perennial bushes planted around the village include desert cistache, red Wolfberry, willow, and *Suo Sua*, as well as a type of long, red-coloured grass that has been introduced to the area. These have been planted over large areas, mainly since 2005, and are maintained by villagers who are compensated under the government's grassland rehabilitation programmes.

3.2 Luanjingtan town

Luanjingtan town is located in the Left Banner of Alxa League. The government designated this area as an ecological and immigration demonstration village 17 years ago. The town is made up of 10 agricultural villages and 10 animal husbandry villages. The population is 11,000 and comprises 120,000 mu[2] of cultivated land, 6667 ha of forest, and 220,000 livestock. Irrigation water for farming is pumped from the Yellow River, nearly 50 km away. The project draws water from the north main canal at Ningxia Zhong Wei County. Water arrives at the irrigation area via four levels of pumping stations. The water canal length is 43.5 km, with a water height/total height of 208/228 meters, an annual water index of 50 million steres[3], and a designed water capacity/flow of 5-6 cubic meters/second. The main canal was completed in 1994, and the first migrants arrived to Luanjingtan shortly after that. According to our driver, the area in which Luanjingtan town is located was once used for grazing.

Today the town is home to more than 6000 ecological migrants from 87 different villages and smaller locations, some of them having moved from a distance of more than 700 kilometres away. About 15-16 per cent of herders in the Alxa region were relocated to Luanjingtan. Although the majority of residents are ecological migrants, some have been resettled from the nearby Helan Mountains by the government to make way for a dam project, and a small number are so-called "economic" migrants from Gansu and Ningxia provinces who have bought farmland in Luanjingtan and remained.

While the Yellow River supplies water for farming, groundwater is the source of the local drinking water. The town is serviced by an all-season paved road, and many residents have

[2] 1 mu = 666,67 m^2

[3] 1 stere = 1000 liters.

internet access. In addition the town offers a healthcare facility, a school, numerous shops, several restaurants, a government department, and a hotel. Some residents have two homes, one located on or close to their farmland, and a smaller apartment or home in the center of the town. The main crops sown are corn, sunflower and water melon. Most families also keep several goats and/or sheep as well as chickens for own consumption, and plant vegetables, including tomatoes and chillies, also for household consumption. Several of the interviewed households also raise livestock for the market under controlled grazing and feeding schemes. As in Bantanjing, goats and sheep for private consumption are stall-fed. Agricultural fields are bunded on all sides and many are planted with poplar trees to lessen erosion and wind damage. The majority of trees were planted along the borders of farmers' fields between 1993 and 1997.

Residents of Luanjingtan pay a fee for irrigation water. The fee includes a small unit price for the water, and a larger unit price for the electricity needed to pump the water from the canals into individual farmers' fields. Before 2003, the total unit price was .193 Yuan per cubic meter. After 2003, the price has been around .264 Yuan per cubic meter.

Interviews in Luanjingtan took place in two smaller villages (gacha) within Luanjingtan. The first village, called *Taatu*, is home to 128 families, of which about 10 are ethnic Mongolian. We were not able to interview any of the Mongolian households however as we were told that most of them do not work in the village and on that particular day they were looking for off-farm jobs outside of Luanjingtan town. The second village is called *Hubuqi* (pronounced Hubutsi), and is home to 110 families, 11 of which are Mongolian. The first emigrants in both villages arrived 14 years ago, right after the canal system bringing water from the Yellow River was completed. Construction of the canal system lasted from 1991-1993/4. Hubuqi village was established in 1994. At that time, 87 families moved to Luan Jing Tan. About 55 of these were from the same village in the Tengger desert. Approximately 15 of these families subsequently moved away. An additional 23 families moved from the neighbouring provinces of Ningxia and Gansu. These 23 families were not ecological migrants, but people who decided to move in, bought farmland, and settled down (so-called "economic migrants"). According to the village head these migrants arrived gradually, at a pace of about 2-3 families per year after 1994. About 10 per cent of the village population is Mongolian.

4 Government compensation, assistance and incentives

4.1 Bantanjing

The original migrants to Bantanjing did not benefit from the services and compensation afforded to later waves of migrants. They received little government support, and according to long-time residents life was very hard as there were few services in the village at that time. They built their homes themselves, and there was no road, telecommunications, medical facilities, or electricity. Migrants who resettled after 2000 receive compensation under additional government policies connected to conversion of marginal farmland to grassland and forest under the government's Grain for Green programme (Brogaard and Seaquist, 2005; Du, 2006) that compensates migrants with food grain in exchange for conversion of their original farmland to grassland through natural re-vegetation), or "forest/shrub land" (assisted land conversion)[4]. The compensation received varies according to the policies in the regions

[4] For a description of these policies see Du, 2006, Dickinson and Webber, 2007 and Runhong, 2001.

from which migrants moved, and the rules governing the type of land they occupied. For example, families who moved to Bantanjing after 1998 were contracted free land for personal use, or leasing to others, received free or subsidised housing, government-financed paddocks for livestock, and technical training in agricultural and livestock rearing methods. An old-age supplement is also provided by the government to households with women of 50 years or older and men of 55 and older.

4.2 Luanjingtan

Government assistance for migrants who moved in 1994 when the town was first established was more limited back then than it is today. Those interviewed who moved to Luanjingtan at that time did not receive a free house or financial compensation, but they were given farm land for free (a total of 12 mu) per person for families of 5 or less, and 60 mu total for families of more than 5). People paid between 30 and 50 Yuan per mu to have the land cleared and ploughed for farming by the government. Although they did not receive compensation for their original land from the government, the village from which they moved had some money that was held collectively, and some of this money was divided up among the migrants, with each receiving between 200 and 400 Yuan as a one-time payment for moving.

Village residents lived in tents or in simple earth dugouts when they first arrived. They built everything (houses and stalls for their animals) themselves with help from one another. The road was not properly constructed. During group discussions in Taatu and Hubuqi, people often noted that the compensation for later waves of migrants had improved compared to when they moved. This was regardless of when they moved: those who moved in 1994 noted that those who moved after 1998 received more compensation. However those who had moved to the village in 2000 also said that later migrants received better housing, and better compensation.

Agricultural training – including in crop production and small livestock breeding – is provided to all residents. Villagers in Hubuqi notes that training provided when they first moved was very simple, but it is now offered on a yearly basis. Several households in Hubuqi mentioned that they had learned farming techniques from their neighbours who included economic migrants from Gansu and Ningxia provinces. Residents of Hubuqi also noted that government agricultural assistance such as subsidies on seeds and diesel for tractors had improved in recent years.

Electricity is now provided to all households. However, in 1994 the only option was wind power, and only wealthier families were able to invest in wind turbines to produce electricity for their own needs.

In general, most households that were interviewed were happy with the assistance provided by the government. However, a number of concerns connected to the policy and the compensation provided were raised. These are summarised briefly below:

1. The policy has changed over time and become more comprehensive with more lucrative compensation (free farmland, housing, and shelters for livestock, in addition to monetary compensation) given to the most recent migrants, compared to those who migrated earlier. Unequal compensation is viewed to be unfair to those who were the first to move to the new settlements and who faced harsh and demanding living conditions with few services and little, if any, government compensation.

Implementation of current compensation schemes also varies according to local criteria and where migrants moved from.

2. Ecological migration is closely connected to government policies of grassland rehabilitation and to payments for land reclamation and forest plantations. There is a possibility that local people may not have been properly informed of the goal of government grassland, ecological migration, and forest policies, which have been conceived, implemented and scaled up rapidly over a very short period of time (see e.g. Runhong, 2001). The fact that these policies are not easily distinguished from one another in peoples' minds may make it difficult to understand why some people receive different compensation than others.
3. Migrants' expectations of the outcome of the policy for their livelihoods were not always fulfilled. Several households mentioned that they "thought they would get rich" as a result of migrating. However, many people reported that their income had not changed since moving; while at the same time they had become 'busier'. A number of households mentioned limited non-farm income earning opportunities. Some people also mentioned that living and farming in the new villages was more expensive due to high costs of water and electricity for farming, and the high cost of store-bought food and household goods and supplies. Several of those interviewed in Luanjingtan lamented the dependence on middle men for selling agricultural produce.
4. Several households noted that the grazing areas from which they had moved had improved considerably, and said that they would like to be able to graze animals again, if the vegetation continued to recover.
5. Several households mentioned loss of freedom over decisions about their lives and income as being of concern, raising concerns about the degree to which migration was actually voluntary.
6. Several key services in the villages were considered to be sub-standard and of need of improvement. In Bantanjing the main concern was inadequate provision of, and high costs of, electricity for household and farming needs. In Luanjingtan a lack of irrigation water was a key concern. The problem was attributed to the uncontrolled influx of migrants and expansion of farmland in recent years coinciding with a hot, dry summer and reduced rainfall in 2007, and poorly dimensioned irrigation canals. The quality of drinking water (sourced from groundwater) in the village was another key concern. It was said to contain too much fluoride, have a sour taste, and contain residues.
7. Several households voiced concern about the ability of the government to continue to finance the various forms of compensation provided to residents, and a few indicated that they would leave the villages if compensation was discontinued. Most however said that they had no land to return to in any case and that they had family and friends in the village now. Elderly households noted their poor health and aging as a barrier to moving again and "starting all over".

5 Reasons cited by migrants for migrating

The main reasons given by those interviewed for why they migrated were 1) the government policies, including the ban on grazing, as well as incentives and compensation offered by the government for moving, such as free housing and agricultural land for those who chose to

move, 2) degraded grasslands and, 3) reduced incomes and/or poverty connected to degrading grasslands. For almost all migrants who moved to Bantanjing before 2001, the move seems to have been immediately precipitated by a drought event. Those who moved after 2001 tend to have been those who also benefited from the Grain for Green policy. In Luanjingtan migrants moved for a variety of reasons including land degradation in their home regions, resettlement to make way for a dam project in the Helan mountains, and for economic reasons.

It is therefore difficult to draw generalisations about migrants' motivations for moving from their homes. Migrations in Bantanjing span nearly 3 decades, and in Luanjingtan, 15 years, and policies and compensation schemes have evolved and changed over the years. There are also clear indications of local variations in the ways in which the policy was implemented even for migrants who moved at the same time. Moreover, different waves of migrants came from different areas, and were affected to varying degrees by environmental degradation depending on the location of their original homelands.

Motivations, expectations, and the freedom to choose whether or not to migrate seem also to have varied according to whether one migrated several decades ago, or more recently. Peoples' expectations for what is needed for a "good life" has also changed, concomitant it seems with the move into larger villages that has led to better connectivity with the outside world and markets, and more convenient access to greater diversity of services and goods for migrants, as well as new ideas and training.

While some households that were interviewed clearly felt that they had no other option than to move due to the severe environmental degradation and their own poverty, others simply said that they moved because "that is the government policy". Others still – typically younger migrants – said that they were motivated by curiosity about "life outside the desert", and a desire to do something new.

6 Perceptions of environmental and climate variability and change

6.1 Bantanjing

According to long-time residents and migrants from nearby villages, up until the 1970s, the climate in the Bantanjing region was stable, and there was enough rain and good quality grassland to enable grazing by many livestock. Residents explained that there was a severe drought in 1983-84 during which time almost no rain fell. Many animals died during that period and herders' livelihoods were strained. A prolonged dry spell occurred again in 1998, lasting for several years. After this second dry spell, many herders were no longer able to continue their traditional livelihoods, and migrated into government sponsored townships.

Residents noted that sand storms have become stronger in intensity in recent years, especially since 1998. The sand that is deposited on cropland ruins its texture and makes it unsuitable for growing crops. Some people noted that there is generally less precipitation, and others noted that the winters are becoming warmer. 2007 was, however, an anomalous cold year during which residents noted that the town water pipes froze and burst. According to the retired village head, 2007 was the coldest winter he can remember.

6.2 Luanjingtan

According to local officials, before the 1950s, vegetation in the Luanjingtan region was very good, but after the 1950's it gradually became degraded due to decreasing rainfall and increasing livestock numbers. A local official told us that the growing season for Malian (a purple flower that is native to the Alxa region) starts 2 weeks earlier than it used to, and certain plants grow only about a third as tall as they once did. Many people felt that the local environment in and around Luanjingtan had been much improved as a result of the irrigation from the canal system and extensive efforts at planting trees. Some also noted that the vegetation in the surrounding countryside had recovered to an extent and that the government had started enacting private grazing rights to certain households. People who had moved from far away and near the deserts said that the climate in Luanjingtan (near the foot of the Helan mountains), was better suited for agriculture than where they used to live. Others who had been relocated from the Helan Mountains due to a planned dam project lamented the more lush vegetation, better climate and clean water that characterised their former homes.

Residents of Taatu noted that there were no trees in the town when people first began to move, and according to local people, there were a lot of sandstorms and strong winds back then. One woman from Taatu joked that the kitchen was outside at that time, so when you drank a cup of tea, half of it was sand. The winds have reduced in frequency and severity in recent years, and residents felt it was because of the planting efforts (in particular tree planting) around the town.

Last summer (2007) was particularly dry, and there were serious water shortages for irrigation in the town. Normally during the summer (from June until August) crops are irrigated every 15 days. However, due to shortages last summer farmers went up to 30 days without irrigating their crops. The reason for the shortages was contested. The main reason cited was that more and more people are living in the town due to uncontrolled population growth. There has been a subsequent increase in agricultural area, with no change in the dimensions of the irrigation facilities. Several people also mentioned that there was less water in the Yellow River due to lack of rain; that the distributing channels for irrigation are too narrow, and that water may have been diverted to Ningxia for other purposes, reducing the total volume supplied.

6.3 Reasons cited for environmental degradation

When asked about the reasons for degradation of grasslands in their homelands, migrants cited climatic variation (reduced precipitation and warmer winters, combined with more and/or worsening sand storms and stronger winds), as well as increasing stock numbers due to general government reforms implemented after 1978 that encouraged private livestock ownership (see Brogaard and Seaquist, 2005, for a discussion of these reforms).

7 Livelihood impacts of ecological migration and new livelihood challenges in migrant towns

7.1 Livelihood impacts

General livelihood improvements reported across the villages included better access to healthcare (Bantanjing and Luanjingtan), and electricity and education (Luanjingtan), more friends and neighbours (both villages), more diverse diets due to cultivation of vegetables (both places), and better connectivity due to mobile phone coverage and roads (both places). While some residents noted that their incomes had improved, others maintained that they were about the same as before. However, a number of former herders commented that they were "busier" than before, which could mean that the proportional effort required to earn an income equal to herding as a farmer is greater. The increased effort could also be related to some villagers' commitments to plant and maintain non-agricultural vegetation on lands falling under the Grain for Green policy.

7.1.1 Bantanjing

Almost all respondents noted that their lives have improved in several ways since moving to Bantanjing. The most consistently reported improvements were in access to healthcare, roads and services, and more vegetables in the family diet. Long-time residents reported the greatest improvements in their living conditions. Villagers explained that the services and infrastructure in the village had improved over the years as more migrants settled and government investments were intensified, particularly after 1998 when the village was designated as a model demonstration area by the government. The high cost of operating oil generators for household use and to fuel bore well pumps for irrigation, and lack of universal electricity access among households was the main concern highlighted over and over by residents during interviews and in the group discussion. Some residents mentioned that they pool their resources to buy diesel and transport it back to the village from larger centres. But the added cost of transport makes this even more expensive. The lack of a school in the village was mentioned as a concern for households with children of school age.

7.1.2 Luanjingtan

According to the host of our visit, a local official, residents enjoy living in Luanjingtan because people who were once isolated and living far from hospitals, medical services, schools, and roads, now have access to all of these services, and can even connect on the internet and chat to the wider world. All of the people who we interviewed noted improvements in their lives since moving to Luanjingtan, including access to a wider variety of goods and services, proximity to markets, a good road, healthcare services and schooling, and more friends and neighbours.

7.2 Livelihood concerns

Not all of those interviewed reported improvements in all aspects of their livelihoods. Perceptions were especially ambiguous when it came to income. While people of poorer households said that their income had not changed since moving to the villages and lamented a combination of high costs of farming, poor health, and/or a lack of economic opportunities,

wealthier households usually said that their incomes had improved. These households typically had diversified from farming, to farming in combination with growing medicinal plants (Bantanjing), or purchasing farming equipment and enlarging their land holdings (Luanjingtan). Households also depended to different degrees on non-farm income. Several households had become indebted by either renting or purchasing additional land to try to increase their income, and subsequently suffered poor harvests and health care obligations that made it difficult to pay back the debt. This was the case in two interviews with elderly households where the principle residents were age 55 and over (one in Bantanjing and one in Luanjingtan).

Most residents of the village were herders, or herders and farmers, by tradition, before moving to Bantanjing, and for some, the transition to farming has not been as straightforward as for others. Ethnic Mongolian migrants raised specific concerns about the difficulty in adjusting to a new way of life as farmers due to a lack of farming skills. Comments such as "farming is based on experience", "we are bad farmers" and "we know only herding", though communicated in a jovial way often accompanied by laughter, seemed to underscore the fact that the transition from herding to farming was not an easy one for people whose identities and culture are closely tied up with herding animals, and highlighted that some residents feel "out of place" as farmers. Some respondents noted that they missed eating goat meat, that it was easier to get, keep and eat livestock before, and that they would like to be able to graze their animals again in the future if the grassland continued to improve and the climate was not too bad, government policy permitting. Comments were also made about missing one's home, the wide open space, quiet, and "freedom" to choose one's activities before as compared to in the villages.

Agricultural training provided by the government aims to minimize the challenges that migrants face. However, a lively discussion in one household revealed that the government agricultural training was offered in Chinese, with no translation or instruction available in the Mongolian language. According to respondents, this language difficulty made it more difficult for herders to understand the farming instruction and demonstrations. In addition, one Mongolian household raised concerns about uneven economic development and opportunities in the village due to different levels of government compensation and access to off- and non-farm income.

During interviews in Luanjingtan, several households noted that it was more expensive to farm in the town compared to the place they had moved from due to the high cost of the water, fertilisers, and pesticides. According to other residents, the price of water paid by farmers is not a concern, but rather it is the total available amount of irrigation water and its timing that is of importance for farmers. In Luanjingtan several migrants noted that they have no choice but to sell to the middlemen from Ningxia who come to buy up their produce. The suggestion was made to build a mill to add value to the town's agricultural produce so as to cut out the middle men and increase farmers' income. In discussions with our host later during lunch we were told that this possibility was being discussed at higher levels of government. It has therefore likely been a topic of local meetings and discussions.

8 Climate adaptation perceptions, actions and challenges

Table 1 summarises some of the salient climatic changes observed locally in Bantanjing and Luanjingtan with relevance for agriculture, the adaptations implemented to deal with changes, and some of the outcomes of these measures, as described by respondents.

Table 2: Climate adaptation challenges, responses and outcomes with respect to agriculture

	Bantanjing	**Luanjingtan**
Climatic changes experienced or observed	Stronger winds and more frequent sand storms since 1998	Dry summers contributing to irrigation water shortage (e.g. 2007)
Adaptations employed	i) Construct live wind barriers by planting trees; Erect "wind fences" ahead of forecasted wind/sand storms ii) Rely on government compensation for food crops damaged by extreme weather iii) Switch to crops that can tolerate more sand – such as wheat, and less water, such as *Suo Sua* iv) Diversify livelihoods	i) Plant more watermelon (less water demanding) ii) Rely on weather reports for planting iii) Call on government to increase dimensions of the irrigation channels, limit expansion of farm land and introduced water-saving techniques
Outcomes and implications	i) Reduced erosion of top soil and reduced deposition of sand on agricultural land ii) Cash crops such as sunflower and cotton are not covered by compensation iii) Wheat not planted on a large scale. iv) Growing medicinal plants (*Suo Sua*) increases HH income for some. Labour shortages for agricultural work in other households where members migrate seasonally for non-farm work	i) Planting winter wheat no longer possible due to lack of irrigation water in Winter. All crops must be planted in the Summer. ii) These are short-term (i.e. not climate forecasts) and are not always accurate. If you make the wrong choice in terms of crops sown, and the rains fail, you will be in trouble. iii) The government is working on solving these challenges. Ban on emigration recently introduced, distribution channels are being improved (from mud to concrete) to limit leakages, and drip irrigation techniques are being piloted.

8.1 Climate adaptation challenges

8.1.1 Bantanjing

As mentioned previously, the source of irrigation water for farmland in Bantanjing village is groundwater accessed via bore wells. Although irrigated agriculture is certainly an adaptation to an arid climate, the pumps for the bore wells run on diesel, and residents noted that the high price of oil had increased farming costs, rendering agricultural incomes more vulnerable to crop failure. It is possible that groundwater tables could also be depleted in the future if water extraction for agriculture, shelterbelts, and household use in the village exceeds natural regeneration rates. Increasing temperatures may increase irrigation water needs of different crops, leading to more rapid depletion of ground water. This would introduce additional limits on agricultural production and incomes.

In terms of mitigation and local energy solutions, solar panels were constructed and installed under a Japanese bilateral aid project between 2002 and 2007. They were designed to supply electricity to the entire town. However, during interviews I was told that the panels do not work properly, break down frequently, and require expensive repairs and replacement parts. Maintaining the panels is difficult since replacement parts must be obtained and transported from far away. Local generators owned by some private households, as well as irrigation pumps in the village, run on diesel, and concerns about the cost of electricity generation and lack of electricity in the village were repeatedly raised during interviews and group discussions.

The community's peripheral location and distance from markets can be seen as obstacles to adaptation in the sense that goods and services are more difficult and costly to obtain, and people must travel far to obtain alternative employment and to sell their agricultural produce and purchase inputs and supplies. However, as mentioned, the main road to the village is currently being upgraded and is designated to become a paved highway, which should lessen these challenges to a degree.

The climatic and other challenges associated with farming in Luanjingtan have led some families to abandon agriculture to find another living in the strongly developing industries or in larger urban centres as a type of livelihood adaptation. Luanjingtan is relatively close to Ningxia province and is connected to the capital, Yinchuan, by all-season, paved roads.

8.1.2 Luanjingtan

A main concern among all people interviewed was with water for both farmland and household use. The quantity of water coming from the river is not enough to meet the demands of all the farmland in the village and has gradually become a bigger problem as more and more people have moved to the region. Water supply from the Yellow River may be further reduced in the future due to rising temperatures and increasing incidence and duration of droughts, in combination from growing demands for water upstream for rapidly developing industries and agriculture in Ningxia.

A second concern raised by respondents is the quality of the groundwater, which is used for household use. According to local officials and residents, the groundwater table in the Luanjingtan area is actually rising due to infiltration (leakage) from the canal systems and excess irrigation in farmers' fields. This could be contributing to some of the quality problems.

Thirdly, a number of residents highlighted the need for more varied livelihood and income opportunities. This would enhance their well-being and flexibility to cope with shocks such as

extreme weather and drought that affect crop production. One suggestion was to construct a mill or factory for processing agricultural products in the town. This would cut out the middle men who buy up farmers' products and give farmers a better price for their produce, and create additional income and employment possibilities for residents.

8.2 Policy and practitioner perspectives

During a focus group discussion on ecological migration at a stakeholder workshop in Alxa League in 2009, representatives of the Alxa Association of Science and Technology, the Society of Entrepreneurs and Ecology (SEE), a local NGO, and the Helan Mountain Natural Resource Management Bureau of the local government agreed that is difficult to balance ecosystem protection and restoration in Alxa with social and economic development (ADAM, 2009). Participants voiced the need to learn from the successes and challenges of the policy, and suggested that a more nuanced and flexible policy – in both social and ecological terms - may be needed. For example, the possibilities of allowing controlled grazing in recovered areas, and of offering a wider range of non-farm livelihoods for former herders, were raised.

When participants were asked to discuss how they are dealing with the new sustainability challenges in ecological migrant villages (such as electricity and water shortages), several potential climate change adaptation and mitigation technologies were mentioned. Projects such as drip irrigation, and small-scale biomass, wind and solar energy projects, as well as reforestation, are being piloted in some migrant villages to deal with new challenges arising from the transition from extensive herding to intensive farming in oasis regions. Income diversification through milk cow promotion is one example of a livelihood adaptation piloted by SEE. According to participants, partnerships between the local government and SEE have supported training, capacity-building and livelihood interventions in several eco-migrant villages, with financing from governments, private sector, international donors, and communities themselves. Several of these initiatives involve south-south learning through exchanges of villagers to learn from successful projects (ADAM, 2009).

Participants felt that interventions, training and technology can be disseminated more rapidly, at lower cost, and at greater scale in migrant villages compared to when herders were living on the land and harder to reach, and that ecological and social problems are generally easier to address in the villages. According to one participant, living in migrant villages and farming is far more sustainable than herding, because herders operate beyond the government's control and may destroy large tracts of land. On the other hand in the villages, environmental problems are noticed and can be addressed. Participants also noted that education and awareness-raising about climate and environmental changes is much easier when people are living in the villages (ibid).

8.3 Responsibility for adaptation

When asked about what was being done to reduce their vulnerability to climate variations, events and impacts, most people, implicitly or explicitly referred to government policies, support and compensation. For example, in 2007, the government introduced a compensation plan for residents of Bantanjing for agricultural crops damaged or destroyed due to land

degradation and severe weather, especially sand storms. The policy compensates villagers for loss of or damage to food crops, such as maize, but so far it does not apply to cash crops such as cotton and sunflower. Villagers are also encouraged to plant trees on the boundaries of their farmland, in addition to bunding, to prevent erosion, and they explained that they have learned to erect temporary grass/stick fences ahead of storms to shield their crops from wind and sand, to lessen damages.

Other comments such as "We can't foresee the weather, we hope it will be okay" and "It's the responsibility of the government to make the correct policies" suggest that respondents feel they have little control over or ability to control their vulnerability to climate change. This seems to parallel the lack of control over their own lives and livelihood decisions that migrants experienced during the transition from herding, to farming.

In Luanjingtan, when asked what could be done to solve the problem of irrigation water shortage such as that experienced in the Summer of 2007, residents said that there is only so much farmers can do to conserve water, but that the main responsibility for dealing with shortages rests with government policies and development, and dissemination of technological innovations.

When asked who should have the main role for adaptation to climate change, government and NGO stakeholders agreed that civil society (including local communities), NGOs, the Chinese government, and the international community all have roles to play. The fact that the government has given strong financial and policy support to dealing with climate change, and that the Alxa government cooperates with NGOs such as SEE, who have legitimacy in communities and pursue a bottom-up approach, was seen to set a promising stage for dealing with climate change challenges in the future (ADAM, 2009). Nevertheless, policy-makers expressed the need for strong, central decision-making and policy coordination on issues such as ecosystem restoration, and wider social and economic development in Alxa. Technology development and application (both for adaptation and mitigation) was seen by government officials as one of the most promising ways of dealing with climate change in Alxa.

9 Conclusions

To various extents, migrants in Bantanjing and Luanjingtan see the policy of ecological migration as an adaptation to a situation in which vegetation and grasslands had degraded to a point beyond which land-based livelihoods could no longer be sustained. Reasons given by those interviewed for migrating to these settlements had to do with both environmental conditions (limiting, or "push" factors), and in the case of more recent migrants, the existence of attractive government assistance and compensation for families willing to move, through policies and programmes connected to both ecological migration (free housing, farmland and training), and compensation provided under the "grain for green" and forest and grassland rehabilitation projects, as well as general economic development and poverty alleviation strategies (what can collectively be called "pull factors" or incentives).

However, it is difficult to generalise from the data about the relative importance of factors contributing to households' migration, or the degree of control and choice they had over the process of ecological migration. This is because of the long time period over which migrations to Bantanjing and Luanjingtan have occurred and the evolution of government policies over this time, the difference in the geographic locations of migrants' original homes (ranging from 10 to 700 km away), and the relative environmental degradation experienced in

those locations, as well as local variations in the ways in which current policies have been implemented.

While many interviewees who migrated or were resettled into ecological migrant towns feel that their lives have improved in key areas such as access to healthcare and schooling for their children and access to more goods and services, challenges associated with ensuring that the move is a sustainable one in the longer term remain. These include ensuring adequate and inexpensive access to clean forms of electricity, providing adequate water for irrigation, ensuring adequate quality of water for drinking and household use, ensuring a range of employment and income activities, and providing culturally appropriate training to facilitate sustainable transitions from livelihoods based on herding, to those based primarily on farming. Several of the households that were interviewed noted that some families who originally migrated together with them (from the same village or region) had left the new settlements. This indicates that there has also been dissatisfaction and unmet expectations during the process of ecological migration for some households. Indeed, although many people noted that there lives had improved in terms of access to services, few reported that there incomes had improved, and many emphasised that they were 'busier' than before, which can be taken to mean that more effort is required to obtain the same income in farming compared to herding.

Residents of ecological migrant towns have to various extents chosen migration as a way of dealing with vulnerability in their former livelihoods caused by among other factors, climate variability and desertification, rapid economic and social changes, and evolving government policies for rehabilitating degraded grasslands. Livelihood adaptations resulting from ecological migration, expressed in the transition from herding to farming, raise both new climate adaptation, as well as mitigation issues. An example of the former is irrigation water shortages during droughts in Luanjingtan, and reliance on expensive oil and partially functioning wind-based electricity generators to fuel bore well pumps for irrigation and household drinking water in Bantanjing. Climate change adaptation concerns for agriculture in the new villages include whether crops and irrigation systems are sufficiently adaptive to withstand projected climate variations and extremes, including whether the extraction of groundwater for irrigation and household use in the new villages is sustainable.

Perhaps the most pervasive constraint to successful adaptation in the new villages in the long run is related to local people's perceptions of the government and its policies as offering the main and most important solutions to the problems associated with ecological degradation, poverty reduction and climate change adaptation. While government policies are certainly important and can arguably provide stimulus and support for successful adaptation at the local level, there was very little awareness among those interviewed about what they themselves, either as individuals or communities, could do to adapt to long-term climate and environmental change, government policies and support not withstanding, despite high awareness and much personal experience of the effects of desertification and degradation in their homelands. This complacency must certainly be understood within the wider context of rapid livelihood transitions from herding livestock on grasslands, to farming in government-sponsored migrant villages, during which migrants experienced a certain loss of control over decision-making, a loss that many exchanged for promises of a better life, and a brighter future in the migrant villages.

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11 Appendices

11.1 Appendix 1: Interview Guide – Alxa League field visit

Introduce myself, Li Shan and explain the goals of the fieldwork and what the information will be used for. Explain that respondents' names will neither be recorded nor used in any written material. Explain the fee that we will pay them to thank them for their time (100 Yuan).

General questions

1. How old are you?

2. How many people live in your household, and what are the ages of the family members who live with you?

3. From where did you move? How far away? When? For how long did you live in that place (before?)

4. For how long have you lived here?

5. What did you and your family do to earn a living before you moved?

6. What do you and your family do to earn a living now?

	Person interviewed	Husband/wife	Other
Jobs/ income where they live now			
Jobs/income where the lived before			

7a. Why did you move (spend some time on this question)?

8a. Did you get help to move?

8b. If yes, what kind of help did you get?

8c. If yes, where you happy with the help you received?

Changes experienced by the interviewee

9a. What was life like for you (and your family) where you lived before (focus on social, economic, and environmental aspects)

9b. Were there any good things about where you lived before?

9c. Were there any bad things/things you didn't like about where you lived before?

Since you moved

10. Has your life changed since you moved? If yes, how?

11. Are there things that are better now for you and your family? What things? Are the changes because of moving, or other reasons?

12. Are there things that are worse (better translated as 'didn't meet your expectations') now for you and your family? Are the changes because of moving or other reasons?

Changes in (please tick and mark 'better', 'same' or 'worse')

	Health	Food	Income	Water	Economic activities/ income	Education	Social life	Other
Interviewee								
Family								

Comments:

Views on policy of ecological migration

14. Is it a good policy? Why or why not?

15. Overall, are you glad you moved? Please explain

16. Could the policy be improved? How? (*this question was later supplemented with ' How can your life be improved here?*)

17. If government support was discontinued, would you still choose to live here (*asked to about half of respondents*)

Climate variability and change

18. What was the climate/weather like where you lived before?

19. Did you notice any changes in the climate/weather before you moved?

20. Have you noticed any changes in the climate/weather since you moved here?

Explain/discuss (*e.g. more/less rain? More/less sandstorms? Other?)*

Group discussions *(in addition to questions above)*:

21. Tell me a bit about the history of this village/town (*e.g. when did people move here, crops grown, infrastructure, changes experienced, and other follow-up questions*)

22. What can or is being done to adapt to climate variability/ unpredictability?

23. What kind of changes could improve the lives of local people/residents?

24. Various other questions according to the situation