

Social reconstruction in dam-induced displacement: A case study of four resettlement projects on the
Lancang River, China

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Abstract:

Involuntary movement, also known as forced displacement, has affected millions of people worldwide. At the end of 20th century, approximately 80 million people had been displaced due to hydropower projects, including approximately 22.5 million people in China. Dam-induced migration not only causes material loss, such as loss of homes and agricultural lands, but this migration also causes social capital loss, disrupting individuals' long term sustainable social networks. In order to understand the factors that might affect social reconstruction in resettled communities, this research studies community social environments at four dam sites (Manwan, Dachaoshan, Xiaowan, and Nuozhadu) on the Lancang River in China. Data is drawn from the "Community Environment" section of The Lancang River Dam-induced Resettlement Survey (2010). This survey asked questions about participants' economic health, social networks, and perceived well-being. Chi-square tests were used to compare the differences in survey answers between non-resettled and resettled communities at each dam site. The result indicated that the resettled communities of Manwan, Dachaoshan and Nuozhadu have higher community environment satisfaction than their non-resettled counterparts, while Xiaowan shows the opposite. Factors, like time for adaption, type of relocation compensation, as well as households' income, labor, and other resources, and demographics (ethnicity and age), might affect social reconstruction in resettled communities. Identifying potential relationships among these factors and social capital will help to promote strategies for social reconstruction necessitated by future dam-induced displacement.

Keywords: Yunnan, Resettlement, Community Reconstruction, Social Network, Social Capital

Introduction:

Movement is a common phenomenon in human history and is also one of the five core themes of geographic study.¹ Geographers (and others) study economic, cultural, and social influences that are shaped by a variety of movements (Creswell, 2003). Movement refers to the effects of human travel activities over Earth's surface or how humans and objects change their location from one place to another. Movement manifests in many forms, such as human migration, tangible goods transportation, and idea sharing (Natoli, 1994; Carney, 1999).

Human migration can be divided into voluntary and involuntary movement. Voluntary movement is type of migration where a person chooses to relocate from one place to another by his or her own free will. The reasons might be change in life's course, personal desire to living style, and politics. Involuntary movement is a negative type of migration. Normally, it is caused by violent activities, development, or natural disaster. Dam-induced migration is a large type of involuntary movement²; part of or whole villages are relocated to accommodate flooding and reservoir creation commonly associated with the construction of dams. Approximately 80 million people were displaced due to dam construction in the 20th century, including at least 22.5 million people in China (WCD, 2000; Cernea, 2004).

In order to assist analyses of development-induced forced movements, Michael Cernea (1997) created the impoverishment risks and reconstruction model. This model is designed to help people understand the risks of development-induced forced migration, including dam-induced displacement, and serve as a research tool for reconstruction. He concluded eight major risks arose from development-induced displacement: landlessness, joblessness, homelessness, marginalization, increased morbidity and mortality, food insecurity, loss of access to common property resources, and social disarticulation (Oishi,

¹ Five themes of geography: location, movement, human-environment interaction, regions, and place. (Natoli 1994)

² <https://www.thoughtco.com/voluntary-migration-definition-1435455>

2012). These identified risks are interconnect, interrelate, and interactive. The model has been used in multiple resettlement studies (see Guo et al., 2006).

The risk of social disarticulation is the main focus of this study. Social disarticulation means that a change in physical location disassembles existing social relationships, including kinship, friendship, and business circles. Building social harmony has played a major role in China's long history (Sundararajan, 2015). *Guanxi*, which translates to 'interpersonal connection' in English, is an important step in the construction of social harmony (Tilt, 2015; Rogers and Wang, 2007). The historic social structure in each village provides a sustainable, informal network of mutual benefits and mutual assistance. Establishing "guanxi" with neighbors and local government officials takes a long time and lots of effort. People also build up their social and cultural identity in their villages.³ Forced resettlement disrupts "guanxi" networks because the place where guanxi was built no longer exists. It is difficult to move entire villages to a new location. The disruption of such social relationships leads to insecurity and loss of a sense of cultural identity (Cernea, 1997).

Meanwhile, many Chinese and foreign academics have studied the effects of involuntary displacement, trying to help minimize the negative impacts and providing advice to the Chinese government for future dam-induced resettlement plans. Past research studied dam-induced displacement from multiple angles (Chen,2008; P. Wang, Lassoie, et al.; Oishi, 2012;Wilsmen, 2011;). Some of the variables used in these studies were *material wealth*, *embodied wealth*, and *relational wealth*. Material wealth can be measured in monetary units, such as the economic value of farmland, houses, and livestock. Embodied wealth considers an individual's skills, or ability to make a living. Relational wealth contains two parts: one is the physical components that refer to assets such as transportation, medical availability

³ Guanxi(interpersonal connection): In the book *Social Connections in China: Institutions, Culture, and the Changing Nature of Guanxi*, the authors illustrates the importance of "Guanxi" in civilians' daily life ,and today's China economic and political environment. Gold, Thomas., et al. *Social Connections in China Institutions, Culture, and the Changing Nature of Guanxi*. Cambridge University Press, 2002 ; In the book *Dams and Development in China: The Moral Economy of Water and Power*, Dr. Bryan Tilt emphases that Guanxi is a tool to help one's secure a job, get into the political system and build identity in the society. Tilt, Bryan. *Dams and Development in China : the Moral Economy of Water and Power*. Columbia University Press, 2015.

and education resources; while the other is the social component, indicating the presence of personal social networks, feelings of home, commonalities in language, and ethnic culture, etc. (P. Wang, Lassoie, et al.; Oishi, 2012).

In 2010, Yunnan Normal University conducted a survey to understand the relationship between economic stability and quality of life amongst local residents, categorizing them as “non-resettled”, “not-yet resettled” and “resettled” households from each dam project. Dr. Bryan Tilt from Department of Anthropology at Oregon State University and his colleague, Dr. Drew Gerkey have used the survey data to study factors that affect resettled villagers’ ability to adapt to the new community environment, They stated that inter-household exchange of financial resources and inter-household exchange of agricultural labor are two key indicators to measure social capital in community. To build upon their study, this paper focuses on data from the “community environment” section of the survey: specifically 17 objective questions that cover various dimensions of the community.⁴ The purpose of this section is to learn about the social networks (Guan Xi) of resettled villagers and their personal, subjective feelings toward their new community environments. The objective of this study is to learn whether material wealth, such as compensation and income, embodied wealth, such as labor, and community demographics, including age and ethnicity, affect the reconstruction of social networks in the resettled communities.

The study area for this research is the Lancang River in Yunnan province, specifically considering four dam projects: the Manwan, Dachaoshan, Nuozhadu, and Xiaowan Dams (Figure 1).

⁴ The Lancang River Dam-induced Resettlement Survey(2010). Conducted by Yunnan Normal University.

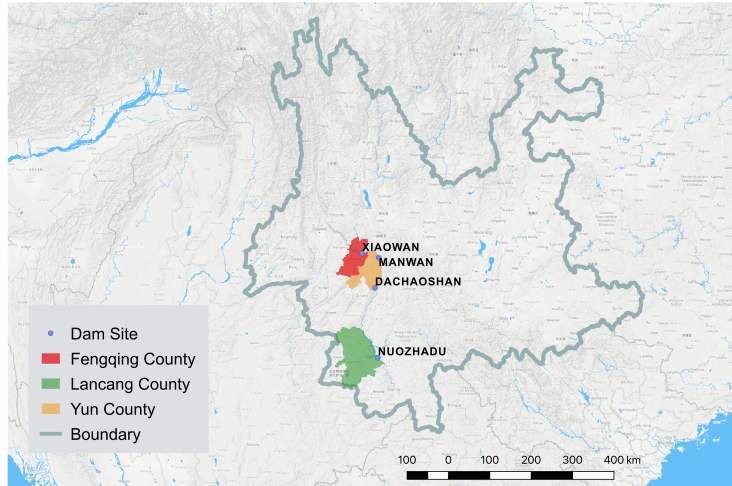


Figure 1 Location of four dam sites (Map created by Yingqi Tang)

This study found that resettled people from Manwan, Dachaoshan, and Nuozhadu showed a higher satisfaction with their new communities in multiple questions, while the Xiaowan resettled people showed the opposite results. This indicates that most resettled villagers found ways to bond with new neighbors, received support from their new social networks, and rebuilt their social relationships in their new communities. The differences across the four dam sites' communities might be caused by time since resettlement, financial resources, such as compensation and income sources, labor resources, and demographics in the communities. This finding connects to Dr. Tilt and Dr. Gerkey's study.

The demand for hydropower development in China

In the second half of the 20th century, the Chinese government directed programs that relocated people due to economic needs. This “development-induced migration” was massive. Hundreds of millions of people were involuntarily moved due to urban expansions, hydropower or infrastructure development projects. The most famous example is the resettlement caused by the Three Gorges Dam construction, which forced over one million people to leave their homes and resettle in new areas (Xi and Hwang, 2011).

Worldwide, nearly 50,000 large dams have been built by the end of the 20th century (Nguyen, Pham, and Lobry de Bruyn, 2017). Currently, almost half of the world’s large dams are built in China (Wilmsen, 2011)(Figure2). The International Commission on Large Dams states that a large dam either is at least 15 meters tall from its lowest foundation to its crest, or it stores more than 3 million cubic meters of water with a height between 5 meters and 15 meters. The Chinese government has constructed multiple large hydropower dams in southwest China and has more planned.



Figure 2. Large Dams in China, including planned, unreconstructed and existed. (Created by Yingqi Tang)

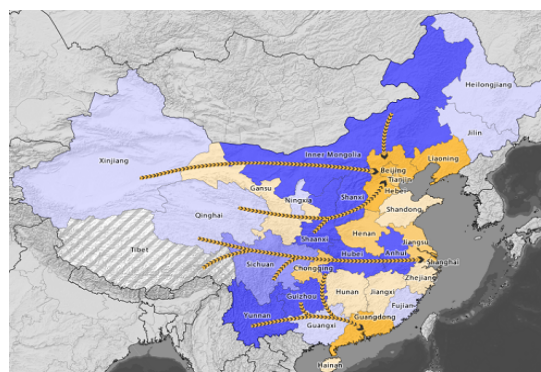


Figure 3. China's West-East Electricity Transfer (Created by David Tyler Gibson and James Conkling)

Driven by economic reform in 1980, population growth, and high electricity demand, the Chinese government proposed the “West-East electricity transmission project” (Ioanides and Tilt, 2015; Magee, 2012) (Figure3). This project is incredibly important to China’s desire to boost economic development in the western part of the country and drive demand for clean energy. And the construction of dams inevitably displaces millions of people (Chang et al., 2010).

Hydropower dams fulfill the high demand for electricity in southeastern China. However, they also present environmental, cultural and social problems. One of these problems is development-forced displacement and resettlement (DFDR)⁵. Groups of people affected by dam displacement are generally from low socioeconomic backgrounds (Aiken and Leigh, 2015; Wilmsen and Webber, 2015). Before water fills a dam, villagers are involuntarily moved to a new area due to the future inundation of villages

⁵ Development-forced displacement and resettlement: Now, people generally use this term to refer development-induced involuntary movement(Individuals or community). <http://www.unhcr.org/en-us/news/editorial/2012/12/55535d6a9/migration-displacement-planned-relocation.html>

within a reservoir. This is considered a tradeoff of for the potential of hydroelectric dam projects. The United Nations High Commissioner for Refugees (2012) indicated that even though the World Bank and multilateral banks gave guidelines for the resettlement process and aimed to ensure displaced population could start over with sufficient resources, a majority of resettlements proved that the displaced population is impoverished.

Resettlement should not be considered simply as a problem of planning compensation for material loss. It should be treated as a complex process (Wilmsen and Webber, 2015). Many resettled communities faced social problems. Due to the involuntarily nature and the uprooting of villagers' social relationships, displacement and resettlement disrupts individuals' familial and commercial networks, possibly for generations (Tilt and Gerkey, 2016). Involuntary displacement has become a stressor for many resettled individuals (Xi and Hwang, 2011). However, future dam construction is unavoidable, and resettlement will take place when newly created reservoirs inundate villages. More considerations on resettlement plan are needed.

Hydropower Development and Resettlement in Yunnan, China

Yunnan province is located in the southwestern corner of China, neighboring Vietnam, Burma, and Laos. Southwest China has rich water resources from melting glaciers, snow, and ice on the Tibetan Plateau. Also, the deep gorges between Tibet and Yunnan have a large elevation gradient, which provides prime conditions for hydropower projects (Galipeau, Ingman, and Tilt, 2013). Before the hydropower development projects took place in Yunnan province, the regional economy was underdeveloped. Additionally, 25 out of China's 55 ethnic minority populations live in the region, and 14 ethnic minorities live exclusively in the province (Ioanides and Tilt, 2015). Ethnic minority communities maintain a stable and peaceful social network around village life (citation). Yet compared to eastern China, especially the coastal areas, ethnic minority communities in Yunnan province have a relatively low standard of living (Ioanides and Tilt, 2015). Farming and fishing are the most popular ways to make a living. When the dams were built, arable farmland was inundated and the aquatic environment changed

(Tilt and Gerkey, 2016; Ioanides and Tilt, 2015). The involuntary resettlements along the river not only disrupted people's income, but also destroyed people's stable social networks.

Government compensation is the main source of support for displaced people as they adapt to their new lives. Two such compensation methods are 1) to develop a new village for a displaced population, or 2) to move displaced people to another, pre-existing village. In some cases, the new, resettled village combines people from two or more displaced villages, and, sometimes, large families cannot be relocated to the same village. Thus, social relationships change in a new community. Families may not know each other well, and it may be difficult to meet with other family members and old friends without extensive transportation and significant time (Yao, 2013). Also, some displaced people choose to relocate elsewhere, to a location of their choice, such as migrating to a city or other villages to live with relatives or friends rather than conform to the relocation plan.

With the mountainous landscape and fragile environment in Yunnan province, the possible locations for resettled villages are limited. 10% of the provincial total land is plateau, and about 6% of it is plains. About 14% of cultivated land provides a stable high yield production (Chen, 2008). With the inundation of arable farmland, however, that area is likely to decrease. The resettled villages may not have enough arable farmland for each relocated household, in which case many people will need to seek other income sources.

Besides developing the resettled villages, the Chinese government also provides a monetary subsidy. Even if the Chinese government enacted laws and policies as a standard for compensation package designers, the methods of measuring compensation vary between dam projects. Compensation recipients have different perceptions of the contents of settlement packages, and it is difficult to satisfy everyone. Since some resettled people do not receive their resettlement packages on time, or the actual amount of the package is not enough to help them adapt to a new life, they face the risk of poverty and may have negative subjective feelings toward their new community environments. Thus, social disarticulation is one of risks that those displaced people need to deal with (Cernea, 1997; Yan and Shi, 2016).

Relevant Analysis

Researchers have used different sections of The Lancang River Dam-induced Resettlement Survey (2010) to study resettlement in the area. Dr. Bryan Tilt and Dr. Drew Gerkey from Oregon State University have analyzed how financial resources and agricultural labor in displaced communities affect the social environment. A total of 472 households, from Manwan, Dachaoshan, Xiaowan, and Nuozhadu, participated in this section of study. Because of their interest in agricultural events, Tilt and Gerkey removed households who did not practice agricultural production and households who did not have labor exchange activities during the previous 12 months. As a result, they stated that the inter-household exchange of financial resources and of agricultural labor are two key indicators to understand the social networks and measure resilience of community's social reconstruction. The inter-household exchange of financial resources refers to loans that individual households may borrow or lend, and the number of households that participate in the event, while the inter-household exchange of agricultural labor refers to the number of labor that borrow and lend by each household and the number of households that participate in the event. (Tilt and Gerkey, 2016).

Study Dam Sites

Manwan Dam

The Manwan Dam was the first dam built on the mainstream of the Lancang River and was completed in 1995. A total of 114 villages in eight townships and four counties were displaced. At the beginning of the project, the government estimated 3052 people would be displaced, but the size of the displaced population doubled to 7260 by the end of the project. The data used for this study is from a survey conducted in Yun county, of eight non-resettled villages and three resettled villages. The three resettled villages are Yakouerzu, Yakouzu, and Majindianzu. As the first completed dam in this study, the displaced population from Manwan faced the greatest effects on financial status and labor exchange. In general, the households borrowed large amounts of money and lent less money to other households. Also, the Manwan resettled communities have a relatively lower labor exchange than villagers displaced by the

other three dam projects (Tilt and Gerkey, 2016). Despite the fact that Manwan Dam was completed more than twenty years ago, the resettled people still suffer from their resettlement. The cost of building material increased dramatically in China in the 1990s, but the government did not adjust the subsidy for resettled compensation. Thus, many resettled households had difficulties purchasing materials and finishing construction of their new homes. The financial pressure of these extra financial costs have created a burden to social reconstruction in affected villages.

Dachaoshan Dam

Dachaoshan dam was the second dam built on the mainstream of the Lancang River and was completed in 2003. The displaced population totaled 6363 people and resettlement was completed in 2001. The survey used in this research was also conducted in Yun County across six non-resettled villages and three resettled villages. The resettled villages are Wayaoxincun, Wayaoerzu, and Hongdouqingzu. Resettled households from the Dachaoshan Dam project gave more in loans than the non-resettled households, but there is no significantly difference in the number of households that gave loans among the two groups. Meanwhile, the amount of labor given in the resettled households is less than that in the non-resettled households. The compensation package for Dachaoshan resettled people did not match to the needs of community reconstruction. The level of subsidy was well below that given to people displaced by more recently completed projects (Galipeau, Ingman, and Tilt 2013).

Xiaowan Dam

Xiaowan Dam is currently the world's second tallest dam. It is located in the middle reach of the Lancang River and was completed in 2010. The estimated displaced population is over 42,000. The displacement process has not been not completed at this time. There are seven non-resettled villages and three resettled villages in the survey used for this research. The three resettled villages are Xingfazu, Daxingdierzu, and Yingpanjieerzu. Like the Manwan Dam case, resettled households in Xiaowan also borrowed a large amount of money and lent less money to others. The amount of borrowed money is

much greater than resettled households from Manwan Dam. However, the resettled households from Xiaoman do not have a great amount of agricultural labor exchange with neighboring households like those households from Manwan dam.

Nuozhadu Dam

The Nuozhadu hydropower project is one of the largest dam construction projects on the mainstream of the Lancang River. It is located in the downstream of the Lancang River and was completed in 2012. Approximately 40,000 people were resettled. Half of the displaced population was from Lancang County. In the survey used in this study, there are six non-resettled villages and one resettled village, Longtan. The elevation of Lancang County ranges from 578m a.s.l.(meter above sea level) to 2516m a.s.l. The change of elevation results in a change of climate, from a tropical zone at lower elevation to a subtropical zone higher up. The types of arable agricultural products change with elevation and climate, so resettled farmers need to adjust their farming plans and prepare for a potential income drop because they are not familiar with the new farming environment. Resettled households do not show a significantly difference in labor exchange. Compared to the non-resettled households in Nuozhadu, resettled households took out smaller loans to fewer households and there was not enough evidence to study the labor exchange (Tilt and Gerkey, 2016).

Data

The ideal method to understand the effects of resettlement is to collect data from the pre-settlement community and then do follow-up surveys during the process of resettlement and in the years after resettlement is completed. This method would provide a comprehensive image of effects of resettlement. However, most resettlements take a long time to complete. They could last from several years to over a decade. Thus, this method is not practical for many researchers. Some studies used pre- and post-survey methods to understand the influence of resettlement instead (Xi and Hwang, 2011; Brooke et al, 2011).

The survey used in this study had a cross-sectional structure: local, non-resettled communities are the control variable, chosen specifically because the non-resettled communities shared features, economic, demographic, etc., with the other resettled villages included in the survey. This study used this control to compare resettled communities at four dam sites.

This survey data was obtained from Dr. Bryan Tilt and researchers at Yunnan Normal University in Kunming City, China (2010). The data covers households from more than 30 villages in Fengqing, Yun and Lancang counties. The data was collected following a one-week training workshop, and the research team ensured the accuracy of the data by running quality control checks (Tilt and Gerkey 2016). The survey questionnaire covered different aspects of the resettled communities, including household demographics, income, education, health, and social capital.

The survey contains answers from 843 households, including resettled, not-yet-resettled and non-resettled. Since “not yet resettled” households still remain at their original village, they were analyzed as part of the non-resettled group. 69 households were removed because they were not resettled as part of the four dam projects in this study. In total, there 774 households were included in this study.(Table 1)

	Resettled(household)	Non-resettled (household)	Total(household)
Manwan	61	156	217
Dachaoshan	63	122	185
Nuozhadu	60	113	173
Xiaowan	62	137	199

The data was obtained from the “community environment” section of the survey because the focus of this study is the subjective well being⁶ of community environment.

⁶ Subjective well being: the subjective evaluation of one’s life as a whole. The term often used to indicate personal life satisfaction, or how well an individual thinks his/her life is going. Oishi, Shigehiro. *The Psychological Wealth of Nations : Do Happy People Make a Happy Society?* Wiley-Blackwell, 2012.

The “community environment” section contains 17 objective questions (See Appendix A). Interviewees answered the question with options of agree, neutral, and disagree, which is in a qualitative format. The design of this portion of questions was based on standardized and validated measurements about the sense of community. The questions were modified to fit the local situation in Yunnan (Tilt, 2015). Although the survey is based on households, the answer is done by the head of household, which, normally, is a male figure in the family.

A chi-square statistical test was used to determine whether non-resettled and resettled villagers have a statistically significant difference (p-value less than 0.05) for their answers to each question. Because the chi-square test is only valid when the expected frequency in each tested variable is no less than 5, this study focuses on the agreement rate of each question between resettled and non-resettled group, which tells their satisfaction about community environment. The answers of neutral and disagree were combined into new categories – Not Agree in order to maintain the needed frequency. Since the design and time of resettlements are different among each of the four projects, the comparison between non-resettled and resettled groups was only tested within the same dam project.

Results

The results from the chi-square tests and the agreement percentage of each group for all dam sites are shown in Appendix B. Results with color highlights indicate that there is a statistically significant difference between the non-resettled and resettled groups for that specific question at the related dam site. The green color means that the resettled group had a higher agreement rate than the non-resettled group on the question. The red color means that the resettled group had a lower agreement rate than the non-resettled group on the question. Surprisingly, resettled communities at three dam sites, Manwan, Dachaoshan, and Nuozhadu, showed a relatively higher agreement rate for most questions, while the resettled communities of Xiaowan dam site showed lower agreement rates for most questions.

Two questions in this study showed that resettled and non-resettled communities from the four dam sites have significant association between two study groups. For Question 8 “In general, I am happy,” all

dam sites showed a statistically significant difference between non-resettled and resettled groups. Resettled communities from Manwan, Dachaoshan, and Nuozhadu had a higher agreement rate compared to non-resettled groups from the same area. Resettled communities from the Xiaowan site showed the opposite. Meanwhile, for Question 15 “Compared to other villages, this village does not have many problems”, all dam sites also had statistically significantly different answers between the two groups and the agreement rate of responses was same as Question 8’s. Next, for Question 14, “ In the past five years, loyalty has improved in this villages” and Question 17, “Individuals in this village can solve their own problems,” three dams sites showed statistically significant differences between the two study groups. There were only three dam sites considered for each of these two questions because Xiaowan was excluded from Question 14 and Manwan dam was excluded from Question 17.

Although not all the questions showed statistically significant differences between resettled and non-resettled communities, it is worth analyzing the percentage difference of all questions between the two groups. The statistical analysis showed that there is suggestive/significant evidence to indicate the association between the two groups. However, questions with P-value greater than 0.05 in the analysis does not mean there is no difference between the two groups but that the difference is not large enough to be statistically significant, which means that the difference may be due to random chance. Thus, the main focus is on the test results with significantly difference but not to neglect the others.

In general, resettled people from Manwan, Dachaoshan, and Nuozhadu reported higher satisfaction on loyalty (Questions 1, 13, and 14), trust (Question 3), happiness (Question 8), problems in the villages (Question 15) and ability to solve problems (Question 17). The percentages of neighbor relationships (Questions 4, 9, 10 and 11) are relatively high at the four sites. It seems that villagers from both groups established a good “guanxi” with neighbors. They maintain the “guanxi” by greeting neighbors and visiting their homes. When they need help, neighbors are likely to help each other and borrow resources. However, it seems a few resettled people in Manwan, Dachaoshan, and Nuozhadu said that the people in the village will not pay back their loans. This might be evidence that some villagers still have conflicts over financial resources.

Questions seven and eight show that nearly half of people from both groups want to move, though more people in the villages claimed that they love the village. The reasons why people want to move may or may not relate to their resettlement. Most villagers have faith in government projects, even if the project does not bring benefit to their families (Question 16).

Discussion

The study provides evidence to indicate that resettled villagers' satisfaction about community environment are different across the four dam study sites. It appears that the resettled communities formed because of the newly completed Xiaowan Dam have the opposite pattern than the other three resettled communities. Due to the cross-sectional study design, resettlement is not the cause of the differences across the four dam sites, but it might be one of the reasons for difference. Variation in time since resettlement, compensation package, income and resources, and demographics might be other reasons why resettled people feel differently about their community environments.

In general, literature that uses pre- and post- survey methods states that displaced populations experience impoverishment after relocation in a given time. Nonetheless, some resettled communities demonstrate that displaced villagers can improve their well-being after relocation (Randell, 2016). Although the term "adaptive resilience" is often used in ecological systems, the concept also could be applied to social systems. Adaptive resilience of resettled communities could explain the difference in community reconstruction. Support from external financial capital is a key tool to strengthen community resilience (Singer, Hoang, and Ochiai, 2015). Tilt and Gerkey (2016) used the same survey data to conduct their research, which showed that the four dam sites had different financial exchange patterns. Resettled communities from Manwan Dam had fewer households in financial exchange with fewer loans, compared to its non-resettled communities. Meanwhile, Xiaowan Dam showed the opposite. Resettled households borrowed a larger amount of loans across a greater number of households, compared to households in non-resettled communities. For the labor exchange situation, all four dam sites showed that resettled communities both gave and received less labor by household for fewer days. Due to the diversity

of ethnic groups in Yunnan and their cultural differences, demographics, such as age and ethnicity, might help to explain the variation in the results of resettled communities across the four dam sites. These patterns might help explain resettled villagers' responses about the community environment.

Time of adaptation

There is no doubt that resettled communities face certain socioeconomic shocks when the reconstruction process starts. When home villages are uprooted due to dam-induced displacement, the level of strength of adaptive resilience determines the reconstruction process. Weak human and financial resources limit displaced villagers' ability to adapt their new life in the resettled village (Singer, Hoang, and Ochiai, 2015). However, the concern about community resilience in Yunnan's resettled villages is limited. In this section of study, the results clearly indicate that, after a period of time, resettled communities from Manwan and Dachaoshan have found ways to solve problems and strengthen their adaptive resilience to reconstruct their communities. Resettled communities from Nuozhadu were relatively new but, clearly, show a similar pattern of community environment to Manwan and Dachaoshan. However, literature published after the survey was conducted indicated some resettled communities also underwent impoverishment (Zhang et al., 2013). Resettled communities from Xiaowan are relatively recent, so it is likely that problems in the community may have just started. People tried to solve their own problem in new ways so that they can cope with their new social networks.

Displaced people use different coping strategies to adapt their environments. Xi and Hwang (2011) have conducted a coping strategy analysis based on communities displaced from around the Three Gorges Dam. They stated that problem-focused coping and emotion-focused coping are two popular strategies. Problem-focused coping aims to let people earned back a sense of control by solving conflicts through negotiation, while emotion-focused coping aims to let people view their failure and turn it into an opportunity to improve the situation. Based on Questions 15 and 17, it is clear that all surveyed villages have problems. Villagers from the Manwan, Dachaoshan and Nuozhadu resettled communities have more faith in their ability to solve problems by themselves. Tilt (2015) also reported that after facing income

reductions due to failure of agriculture production, people switched their income sources from agriculture to small business, industrial sectors, or movement to urban areas. Due to the limited sources available to discuss the adaptive resilience of resettled villages, more research into this issue should be done in the future.

Compensation

Compensation is a key financial tool for resettlements. The purpose of compensation is to improve wealth for resettled people and decrease inequality caused by displacement. Compensation aims to cover the material losses after relocation (Zhang et al., 2013). In China, the central government provides laws and policies as a standard for compensation designers but the methods of measuring compensation vary between projects. After years of reform, the land management law and compensation policy added more details to the compensation design. Resettled villagers from the four dams considered in this study received different levels of compensation. The difference in compensation affects resettled villagers' financial resource for adaptation in the new community environment. Without sufficient and stable financial supports, resettled villagers are more likely to suffer in a certain level of depression (Wilmsen et al., 2011).

Relocated villagers from the Manwan project suffered the greatest material loss, including loss of home and arable agricultural land (Xi and Hwang, 2011). However, the compensation they received was insufficient. The compensation design was based on the economic conditions in late 1980s, but the Chinese economy boomed in the early 1990s. Because of this, resettled groups were not able to buy construction materials to build their new homes and adjust to their new environments. Meanwhile, some families had to relocate again due to landslides and poor quality of new home construction (Ioanides and Tilt, 2015).

In this survey, the resettled communities were relocated to a far-distant town, while the non-resettled communities remained close to the dam project. Literature indicates that, in general, villagers at far-distant relocation sites received a relatively better compensation package and better transportation

services than those that stayed nearby (Ioanides and Tilt, 2015). Also, non-resettled communities did not receive compensation, but their life conditions were also affected by the dam project. For example, the raised water from the reservoir affected the agricultural land nearest to the water. The Chinese government provided new agricultural land, but the quality and quantity decreased due to the limited amount. Some farmers had to spend more time to their fields as a result (Ioanides and Tilt, 2017).

Since the Chinese government issued the first national resettlement policy, the Land Acquisition Compensation and Resettlement Regulations for Large and Medium Water Resources and Hydropower Projects and enacted the Land Management Law, the practice of compensation has improved by considering more detailed conditions (Chen, 2008; Yan et al, 2018.). The compensation for Dachaoshan was designed after this change. Displaced populations from Dachaoshan considered in this study were relocated far from their home villages. In general, they received better housing accommodations and almost equal sized, but lower quality, farmland (P. Wang, Lassoie, et al., 2013). The average compensation amount for Manwan and Dachaoshan was 4,957 Chinese yuan, after adjustment for inflation (Tilt, 2015)

Even though the resettlement policy continued to improve and more conditions were added, the compensation of Xiaowan was designed poorly. The overall displaced population is greater than that of either of the previous two dams. The actual compensation did not cover people's losses of homes and land (P. Wang, Lassoie, et al., 2013). The housing condition were better but not everyone received the same quality of house. The loss of farmland was compensated but the government only provided a limited amount of new agricultural land to displaced people. The average compensated amount was 11,280 Chinese yuan (Tilt, 2015). Even though resettled populations from Xiaowan received better compensation than the previous two dams, they experienced the most strong dissatisfaction (P. Wang, Lassoie, et al, 2013.).

On the other hand, resettled villagers from Nuozhadu (a project still under construction) received the greatest amount of money of the four dam projects considered in this study. The average compensated amount was 31,420 yuan. The level of compensation is the highest of the four dam projects (Tilt, 2015).

Because resettlement was still underway at the time of this study, there is limited information about compensation, which discussed later in the limitation section.

Income, labor and resources

As Cernea (1997) mentioned in the risk and reconstruction model, impoverishment often becomes a problem for resettled villagers, even though they receive compensation. Almost 75% of the population in Yunnan are farmers, so arable agricultural land is a key resource to keep income stable. Historically, people settled this area because it was easy to irrigate, had fertile soil, and a suitable climate for agriculture. However, when hydropower development rushed into the Lancang River Basin, these agricultural areas also became good locations for hydropower projects. As a result, it is difficult to find new, equally good agricultural areas for relocation (Chen, 2008). Manwan, Dachaoshan and Xiaowan reported a certain level of impoverishment in the resettled communities. Nuozhadu was under construction, so no report is associated with the issue.

Resettled villagers from Manwan experienced a dramatic change at the beginning of resettlement. Some families received less land when they resettled. Because they now owned less land, these farmers were not able to protect their families from hunger, thus, they had to borrow money. Meanwhile, farmers were looking for new income sources, switching their jobs to fishing, transportation services, or wage labors in Yunnan's urban areas (Matthews and Kim, 2015).

From the IDMC report on the Manwan Dam, the resettled communities furthest from their original villages gained more income than the people who remained near the same location. They diversified their income sources into non-agricultural sectors. Tilt and Gerkey's research (2016) indicated that resettled and non-resettled communities have statistically significant differences in the number of households participating in labor exchange at Manwan. More households in non-resettled community need laborers to help with their agricultural production than in the resettled community. After nearly 20 years of resettlement, studies still found that labor and financial resource were depressed. The finding proved that the far-distant resettled communities were forced to change and adapt to new income sources due to their

lack of financial resources and labor. Like the population resettled from Manwan, some people had to switch their income sources from agricultural sectors to industrial sectors. The government tried to teach Xiaowan farmers to plant tobacco but the time to market is relatively longer than their former products (P. Wang, Wolf, et al., 2013). With a more stable income source, the displaced villagers might rebuild their social network and social capital in a better environment.

Resettled people from the other three dams received better compensation for their houses. However, like the villagers resettled from Manwan dam, they were poorly compensated for their agricultural land. Some people received the same area of agricultural land, but of lower quality, while other people did not even get the same size plot of land as the compensation promised (Yan et al., 2018). These resettled communities' agricultural production and income remarkably decreased due to the unjust compensation packages (Chen, 2008). For Dachaoshan, the government helped clear the land but the new irrigation system provided limited water resources. The lower quality of farmland forced some farmers to quit their original agricultural plants (P. Wang, Lassoie, et al., 2013). The number of displaced people from Xiaowan and Nuozhadu increased the difficulty of land allocation. Some resettled villagers from Xiaowan started their new life in the new communities around the time when the survey was conducted (2010), while others were resettled in 2002.

Looking into the financial exchange, resettled people from the Xiaowan dam borrowed more money and a greater number of households took out loans than the non-resettled communities. In contrast, non-resettled people from Manwan and Dachaoshan received more loans. The Nuozhadu non-resettled villagers gave more loans to others than the resettled villagers (Tilt and Gerkey, 2016). These findings indicate Xiaowan resettled people suffered greater losses to their income sources, which, in turn, might affect their ability to rebuild their social networks. The Nuozhadu resettled people felt less stress borrowing money and the non-resettled people had extra money to lend.

Demographics – Age and Ethnicity

Displacement plans normally ignore cultural elements. Cultural diversity increased the negative impact to resettled communities (Chen, 2008). The major ethnic groups in this study include Han, Yi, and Lahu populations, as well as small populations of Bulang, Dai, Hui, Jingpo, Hani, Wa and Yao people(See Appendix C). Different ethnic identities lead to different choices in terms of styles of houses, agricultural products, clothes, customs, and social values. Most people have established their “guanxi” by looking for people with familiar culture. Meanwhile, older people spent most of their lives practicing traditional agricultural production. It is more difficult for them to adjust than the young people.

In this study, Manwan, Dachaoshan and Xiaowan have similar ethnicity demographics. The Han people are the dominant ethnic group and the second largest population is Yi. However, in the resettled communities of Manwan and Dachaoshan, Han and Yi are the only ethnic group, while Xiaowan contains a small portion of Yao and Hui people as well. The non-resettled villages of these three dam sites are home to a greater diversity of ethnic groups than the new, resettled villages. The Nuozhadu site shows a different pattern. Lahu people are the dominant ethnic group, Yi is the second largest population, and Han is the third. In the resettled village, Yi made up the biggest group, while Lahu became the third most represented ethnicity. In the non-resettled group, Lahu group represented 80% of the population. The differences of ethnicity component at Nuozhadu site might affect individuals’ subjective well-being toward the community environment. For example, in question 15, about 30% of non-resettled villagers from Nuozhadu thought the village does not have many problems, while 70% of resettled villagers agreed on the question.

The lower diversity of ethnicity in Manwan and Dachaoshan resettled groups might reduce the chance of cultural conflict as people there were easier to settle, so they had higher satisfaction with their community environments in most questions. The diversity of ethnicity in Xiaowan might increase conflict between neighbors in the new, resettled community. The Nuozhadu site also shows that the resettled people have a higher satisfaction in many questions but sometimes it is the opposite. Also, the

resettlement is new and people have less financial stress, which might ease some of the conflict in the resettled communities.

Rural agriculture is an important source of income for all villagers. The change of demographics closely connect to and affect working age labor (18 to 60). (Anriquez and Stloukal, 2008) Comparing the age/gender pyramids (Appendix D), non-resettled and resettled communities in Manwan and Nuozhadu have similar demographic trends. However, in the Dachaoshan site, the resettled group has a large portion of people are missing from between age 31 to 40. Xiaowan shows a similar pattern but with a smaller portion of the population in the missing age group (31 to 40). Also, compared to the other communities, the Dachaoshan resettled communities have a relatively small portion of youth (the 0 to 18 demographic category). The results indicate that the Dachaoshan resettled communities might face problems of labor shortages but the influence remains unknown due to limited evidence.

Limitations

There are some limitations that need to be considered in this study. First, due to the cross-sectional design of the 2010 Lancang River Dam-induced Resettlement Survey, causal inferences should be avoided. Secondly, when the survey was conducted, some resettled communities finished longer ago, like Manwan and Dachaoshan, were more likely to experience population change. Some people might not stay in the resettled communities, choosing to resettle to urban areas or other villages, so they were excluded from this survey. However, the reasons why people chose to leave resettled communities remains unknown, thus, it can be said that they may have left because of unsatisfied compensation, increased demand in urban labor, better income opportunity in other areas, a poor new community environment or because they couldn't gain control of their social life. Also, some villagers might have left the resettled villages because they cannot cope with the new social networks. In this case, it might help to explain why resettled villagers from Manwan have a better community environment, even though other reports indicated resettled villagers went improvement after displacement(Ioanides and Tilt, 2015).

Thirdly, it is difficult to use quantitative methods to measure subjective feelings about a community environment. Due to cultural and age differences, people value their social relationships and subjective well-beings in different ways. For example, people feel happy in different ways. A farmer might feel happy because he earned money from his agricultural production and was able to feed his family. A fisherman might feel happy when he caught a sufficient amount of fish. A mushroom gatherer might feel happy if the rainy season brought a good amount of precipitation to feed the next year's mushroom growth. Thus, this section in the survey cannot provide details about people's choices of answers.

For the discussion part, although there is sufficient information about compensation of at the four dam sites, some uncertainties remain. It is still unknown why people received different compensation packages from the same dam projects. For example, the government built new brick houses for the Xiaowan displaced villages, but not all villagers received the same type of house. Also, the survey could not ask how people spent their compensation subsidy. Thus, it is hard to determine whether or not resettled villagers spent their subsidy to help adapt to their new life. Another limitation of comparing compensation is that not all compensation packages were delivered at the same time and it is unknown why. This time difference might cause some difficulty for resettled villagers to adjust to new community environments. Meanwhile, for the demographic information, a few people did not provide full information about their ethnicity or other family members' ethnicity but this should not make a significant difference. Due to the one child policy in China, some home owners might not willing to put all family members in the survey but there is no evidence to support this assumption.

Conclusion

The process of dam-induced migration is not a simply a solution for material loss. Based on the impoverishment risk and reconstruction model for development induced migration by Dr. Michael Cernea, all the risks caused by dam-induced migration can be controlled by an integrated problem solving strategy. Social disarticulation, in most cases, is the risk that is least addressed in the process of dam-induced displacement (Cernea, 1997). However, the risk of social capital loss exists when people move

away from their original home village. Relocated populations must reshape their lives as relatives and friends, who originally lived close by, are resettled far away. They also need to establish a connection with new neighbors who are now involved in their livelihood and daily life.

Although many reports indicate that the resettled communities experienced a certain level of social capital loss at resettled villages due to hydropower projects, this study showed that at three of four dam sites (Manwan, Dachaoshan, and Nuozhadu), resettled communities have a higher community environment satisfaction on many of surveyed questions. Resettled villagers reported higher levels of trust and happiness. The villagers think the resettled villages have changed in positive ways. Also, although there are problems, they think they can handle their own problems. In contrast, villagers resettled from Xiaowan Dam expressed the opposite sentiments.

The cross-sectional design of this study prevents casual inferences, thus, the study did not prove that resettlement caused the differences between the four dam sites. However, based on the results of other studies on these issues, differences detected in this study in adaptive resilience of villagers, compensation packages, financial and human resources, and demographics of the villages might help explain the variation across the four dam sites. Meanwhile, this study also draws a picture of non-resettled communities near dam sites. Those communities might also experience negative effects from dam-construction.

All in all, the issue of dam-induced displacement is complicated. Researchers and the National Council have made efforts to improve the experience of displaced villages but negative impacts to resettled villagers still occur. This study shows that future research is needed to learn more about how adaptive resilience of resettled villages affects community reconstruction, how financial and human resources play a role in it, and what can be done to help resettled people from different ethnic groups to adapt their new lives and cope with people from different cultures.

Appendix A - Survey Questions

	English	Chinese
1	I feel loyal to other villagers	我对这个村子的人感到忠诚
2	I am the same as other villagers	我和住这个村子的人一样
3	If I need advice, I will ask other villagers	如果我需要建议, 我会询问这个村子的人
4	I believe that my neighbors will help me under urgent circumstances	我相信紧急情况下我的邻居会帮助我
5	I would like to improve my village with other people	我会和其他人一起合作来改善这个村子
6	I won't move out from the village	我不会搬离这里
7	In general, I love to live in the village	总体来说, 我喜欢住在这里
8	In general, I am happy	总体来说, 我很快乐
9	I often stop on the way and greet other villagers	我经常在路上停下和这个村子的人闲聊
10	My neighbors often come over to my home	邻居经常来我家拜访
11	My neighbors and I often borrow from and help each other	我和邻居之间经常互借东西和互相帮忙
12	Individuals in this village will pay back the money	这个村里的人借钱会还的
13	In general, I can believe most individuals in this village	总体来说, 我可以相信大多数村里的
14	In the past five years, loyalty has improved in this village	在过去的 5 年中, 村里人的可信度有所提高
15	Compared to other villages, this village does not have many problems.	和别的村庄比, 这个村庄没什么问题
16	Would you like to support a government project that does not benefit to your family but is good for the whole village?	现在有一个政府项目, 这个项目对您家没有好处, 但是对整个村子有好处, 您是否还会支持
17	Individuals in this village can solve their own problems	村里的人可以自己解决矛盾

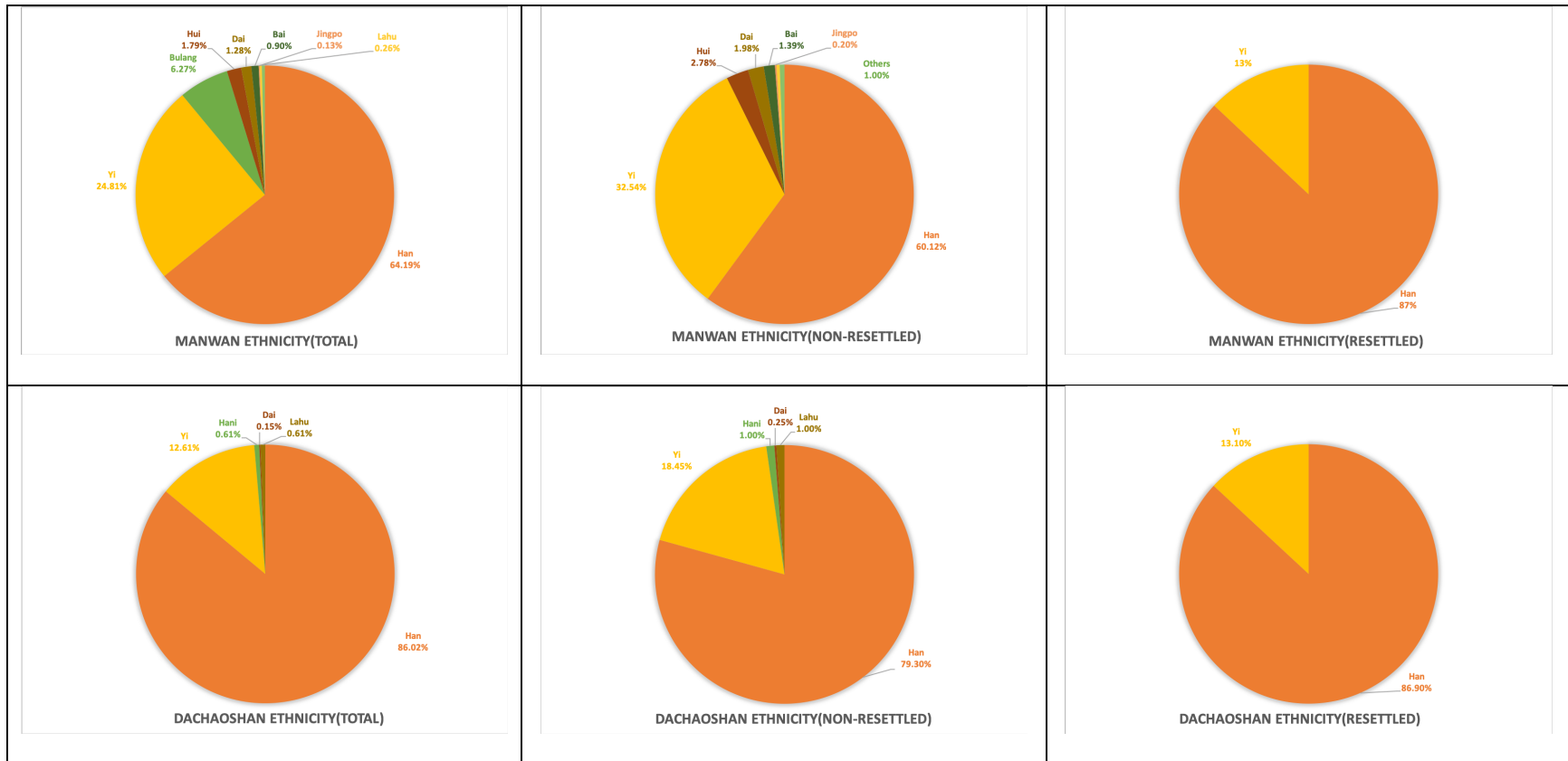
Note: Questions are from the “community environment” section of the Lancang River Dam-induced Resettlement Survey(2010)

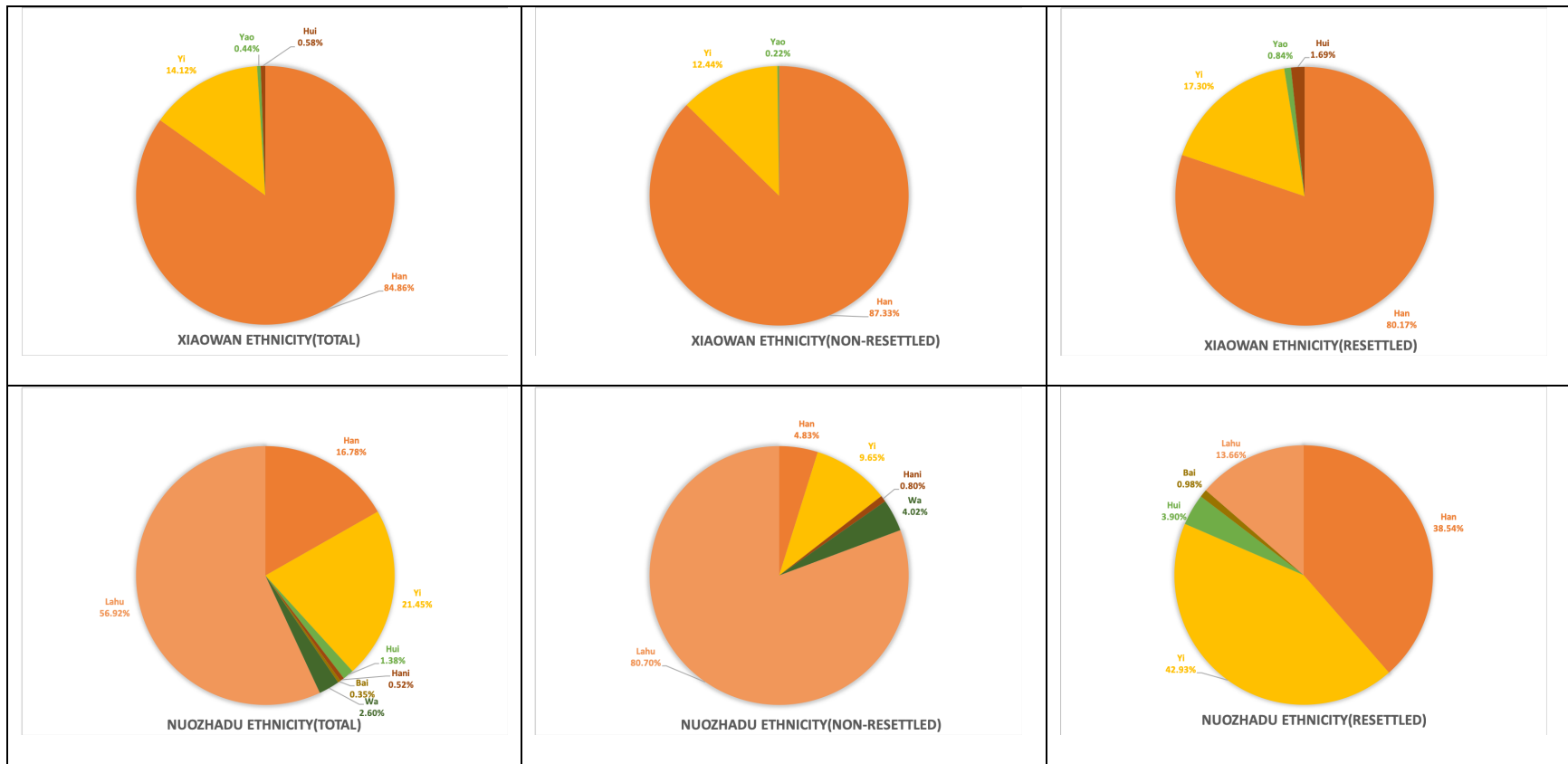
Appendix B - Results

Question		Manwan(1995)		Dachaoshan(2003)		Xiaowan(2010)		Nuozhadu(2012)	
		Non-resettled	Resettled	Non-resettled	Resettled	Non-resettled	Resettled	Non-resettled	Resettled
1	I feel loyal to other villagers	80.77%	91.80%	73.77%	95.24%	92.70%	91.94%	84.98%	90.00%
2	I am the same as other villagers	75.64%	78.69%	80.33%	95.24%	86.13%	70.97%	83.19%	86.67%
3	If I need advice, I will ask other villagers	79.49%	72.13%	86.07%	93.65%	70.07%	58.07%	80.53%	58.33%
4	I believe that my neighbors will help me under urgent circumstances	83.33%	88.53%	74.59%	100%	86.13%	93.55%	81.42%	86.67%
5	I would like to improve my village with other people	94.23%	91.80%	97.54%	96.83%	88.32%	95.16%	89.38%	98.33%
6	I won't move out from the village	49.36%	59.02%	47.75%	47.62%	50.37%	64.52%	49.56%	66.67%
7	In general, I love to live in the village	62.82%	63.93%	67.21%	90.48%	78.10%	67.74%	60.18%	83.33%
8	In general, I am happy	51.92%	70.49%	75.41%	87.30%	83.94%	67.74%	52.12%	86.67%
9	I often stop on the way and greet other villagers	89.10%	88.53%	87.71%	95.24%	79.56%	75.81%	87.66%	68.33%
10	My neighbors often come over to my home	72.88%	85.25%	90.16%	96.83%	75.18%	77.42%	70.80%	81.67%
11	My neighbors and I often borrow from and help each other	95.51%	88.53%	98.36%	100%	85.40%	90.32%	100%	86.67%
12	Individuals in this village will pay back the money	93.59%	86.89%	91.80%	80.95%	75.18%	87.10%	95.58%	93.33%
13	In general, I can believe most individuals in this village	80.13%	78.69%	72.13%	87.30%	84.67%	82.26%	72.57%	95.00%
14	In the past five years, loyalty has improved in this village	48.08%	67.21%	58.20%	79.37%	74.45%	61.29%	30.97%	66.67%
15	Compared to other villages, this village does not have many problems.	42.31%	59.02%	45.90%	77.78%	80.29%	48.39%	30.97%	70.00%
16	Would you like to support a government project that does not benefit to your family but is good for the whole village?	95.51%	86.89%	100%	100%	93.43%	91.94%	96.46%	98.33%
17	Individuals in this village can solve their own problems	58.33%	65.57%	65.57%	87.3%	70.07%	48.39%	42.48%	75%

Note: Numbers with colors indicate the results from chi-square tests have significantly difference between resettled and non-resettled villagers. Red indicates the non-resettled people have a relatively higher positive feedback(Higher agreement); Green indicates the resettled people have a relatively higher positive feedback

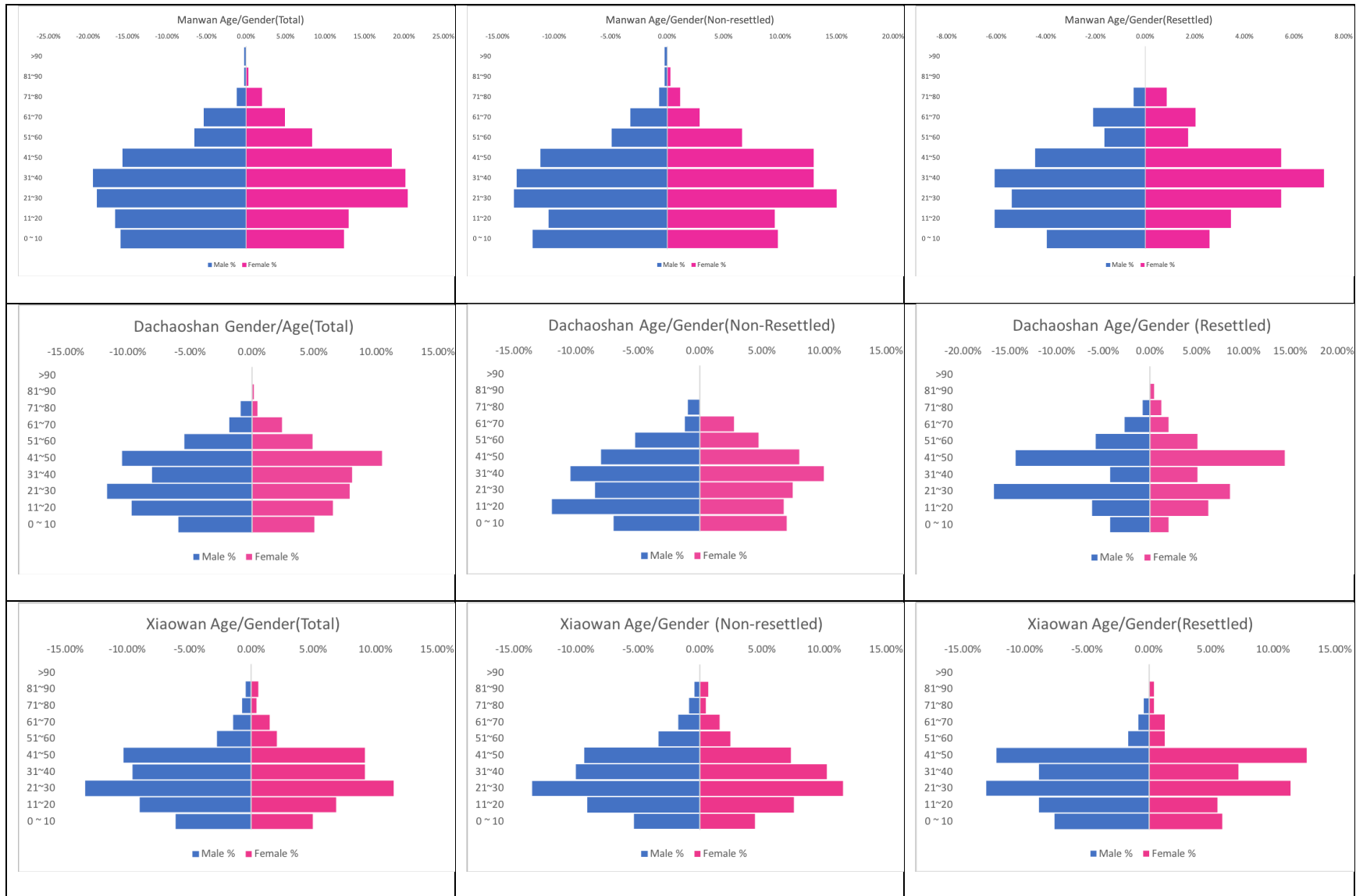
Appendix C – Ethnicity

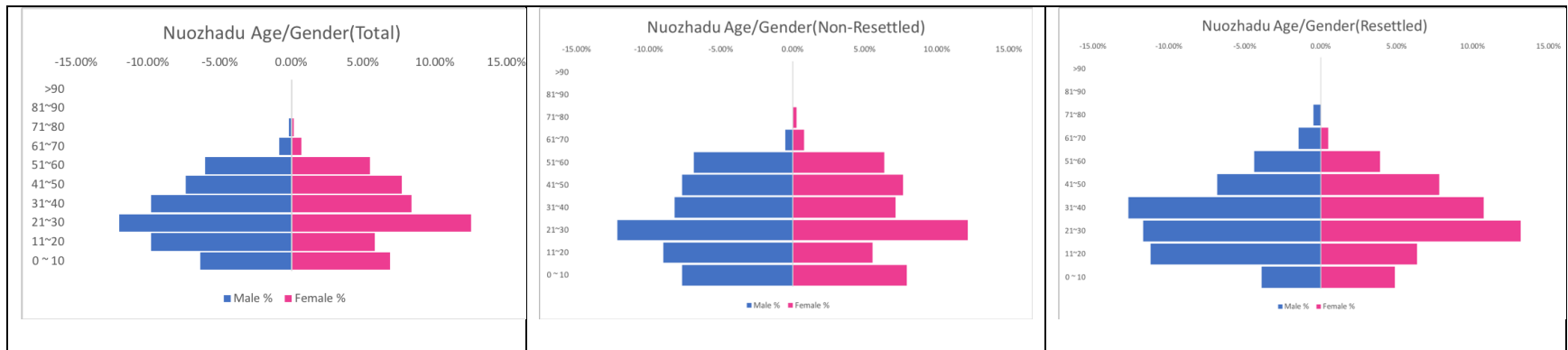




Note: Information of the ethnicity graphics are from The Lancang River Dam-induced Resettlement Survey(2010)

Appendix D – Age





Note: information of the age graphics are from The Lancang River Dam-induced Resettlement Survey(2010)

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