Perceptions of natural hazards in mountain landscapes; awareness, anticipation and mitigation in post-earthquake Beichuan, China.

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Perceptions of natural hazards in mountain landscapes; awareness, anticipation and mitigation in post-earthquake Beichuan, China.

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The impact of earthquakes in developing countries is widely observed to be increasing. This trend can be seen as a result of a combination of factors, including rising population density, the loss of traditional protective building practices and low levels of hazard education. Rural China is experiencing all of these changes, and was severely impacted upon by the catastrophic May 2008 earthquake. Despite widely acknowledged seismic risk, the social aspects of earthquakes within China have received little attention in academia. This thesis therefore adopts an interdisciplinary approach to investigate and explore the levels of seismic risk awareness and anticipation amongst the Beichuan community within China, which was close to the epicentre of the 2008 Sichuan Earthquake.

This research adopted a bottom-up approach through the use of participatory methods, which investigate the following research questions: (1) How aware are local households of earthquake risk?; (2) To what extent is seismic risk anticipated?; and (3) How prepared are local communities for earthquake events? This study addresses these questions to explore risk perceptions from the perspective of the 'at risk' individuals themselves. An improved understanding of local risk perceptions can then lead to more appropriate hazard management implementation, through involving local populations in the development process.

The findings reveal that a lack of risk awareness inherently leads to low levels of seismic anticipation. This lack of anxiety associated with earthquakes prevents a willingness to adhere to mitigation practices. The experience of a large devastating event can act to raise awareness levels, however this does not necessarily lead to greater prevalence of 'seismic culture', as there are often simply more pressing everyday livelihood concerns that are more significant. The findings additionally suggest that although governments must play a key role in encouraging mitigation, the hands on roles must be at the local level in order to promote sustainability and enhance local capacity. The significance of the findings is related to previous studies, upon which recommendations for future research are made.

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Declaration

I confirm that no part of the material presented in this thesis has previously been submitted by me or any other person for a degree in this or any other university. In all cases, where it is relevant, material from the work of others has been acknowledged.

Harriet Tomlinson

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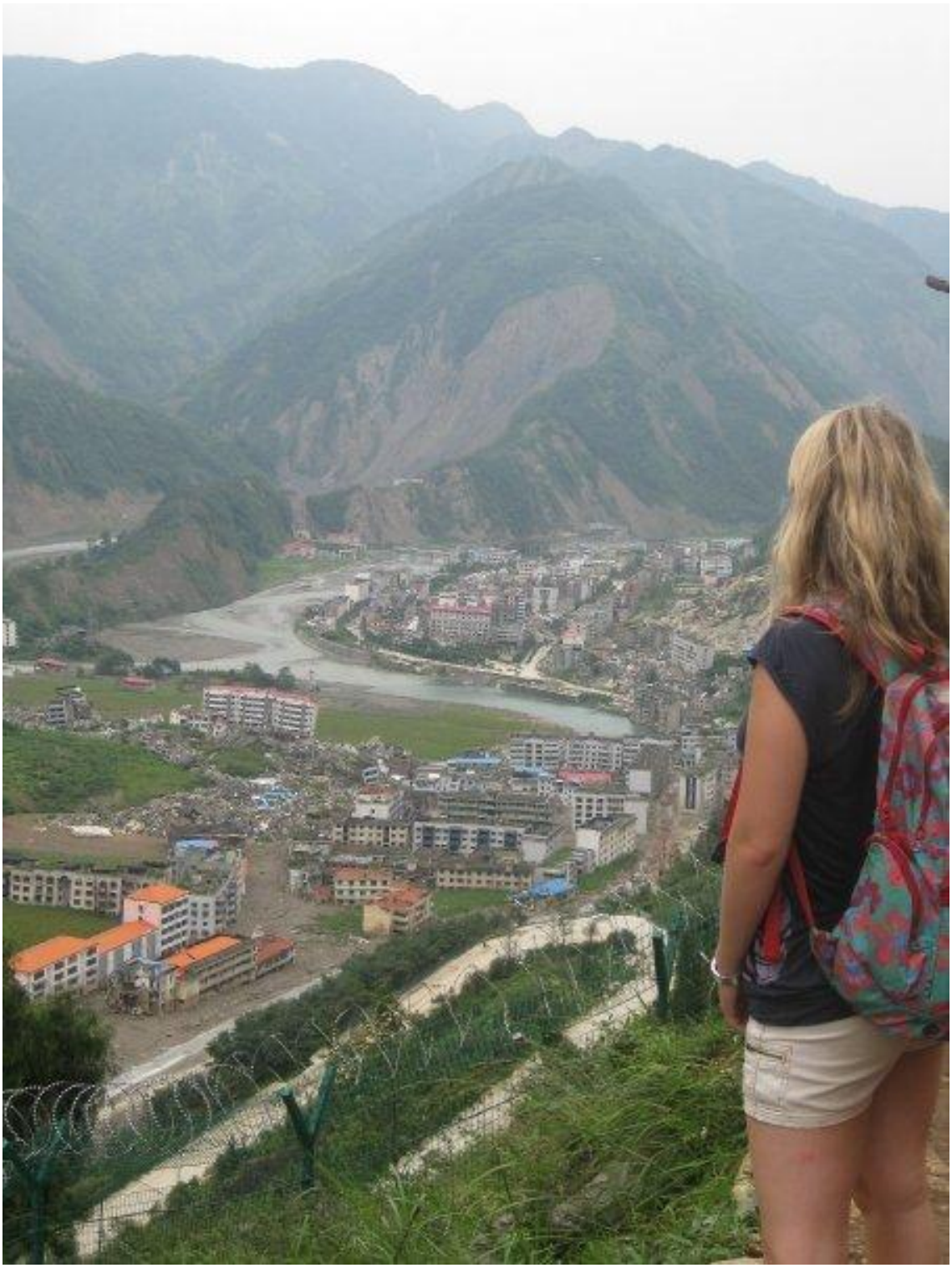
Thank you to you all.

For YaoYao,

and all the women who have been, and will continue to be, affected by natural disasters

Chapter 1

Introduction: Hazards and Risks



My first encounter of the devastation caused by the 2008 Wenchuan Earthquake – a solemn view over the original Beichuan town from the 'viewpoint' created by the displaced population.

1.1 Introduction

During the summer of 2009 I spent 3 weeks travelling around the Sichuan and Yunnan Provinces of China, having graduated from my undergraduate degree. The focus of my third year dissertation had been the distribution of landslides triggered by the 2008 Wenchuan Earthquake, and I had spent months staring at a SPOT image of the area affected by the earthquake. Whilst on holiday in China, I had the opportunity to visit a town called Beichuan, which had been the centre of my computer image. To visit the area I had spent so long staring at back in the UK, was eye-opening. From the viewpoint above Beichuan, scattered with trinket stores and mini-DVD players reliving the atrocious devastation of the 12th May 2008, I was suddenly hit by the scale of disaster. The affected population seemed to have turned the negative impact of the earthquake into a commercial opportunity, selling commemorative books and DVDs, alongside seemingly unrelated products such as traditional handbags, combs and clothing (Figure 1.1). From this distinctly 'tourist' visit, I became set on furthering my dissertation work, in a more social capacity. I was fascinated how women who had lost almost all their family members could stand and talk calmly to us about their experiences of the earthquake. Why were such people

Figure 1.1: *Stalls erected to surround the 'viewpoint' over the devastated Beichuan town. Although some stalls sell products related to the earthquake such as commemorative books and DVDs, many of the stalls sell ordinary items such as clothes, hair accessories and bags. (Source: author's own).*

not devastated by their encounters? How could they want to spend all day working alongside their destroyed hometown? And of most fascination to me, how had their perceptions of earthquakes and other natural hazards altered as a result of the 2008 earthquake?

I had already decided to undertake an MSc course but, following my summer visit to Beichuan, decided to rethink my initial proposal and instead focus my work upon the risk perceptions of an 'at risk' population, choosing the Beichuan community as a case study. As a result this research set out to investigate the risk anticipations of a rural population and how such anticipations had been affected by, or developed as a result of, a large disaster. I wanted to explore the pre-earthquake risk perceptions and then compare these to post-disaster anticipations. In addition, I set out to conduct a 'bottom-up' approach to indentify the level of natural hazards anticipation amongst the Beichuan community, in order to better advise disaster mitigation practices. If a local population are unwilling to attach importance to natural risks, the effectiveness of mitigation and preparation schemes will undoubtedly be limited. In order for hazard management programmes to be successful, local populations must appreciate the risks they face and realise the importance of protecting themselves. Therefore the broad research question I pose is: how might we mitigate the impact of future disasters by learning from local perceptions of hazards before and after a disaster?

Disasters only occur as a result of the interaction between the natural risk and a vulnerable population (Figure 1.2). In the absence of one or other of these factors, there will not be a disaster. My research focuses upon this interaction taking an interdisciplinary approach. It is very important to investigate both the physical and social aspects of natural disasters in turn, however it is only once these approaches are synthesised, that protective measures can be established and implemented to the best of their ability. Without appreciation of the complex interplays between the hazard and the 'at risk' population, it is hard to truly comprehend the impact of disasters, and therefore effective management schemes are limited.

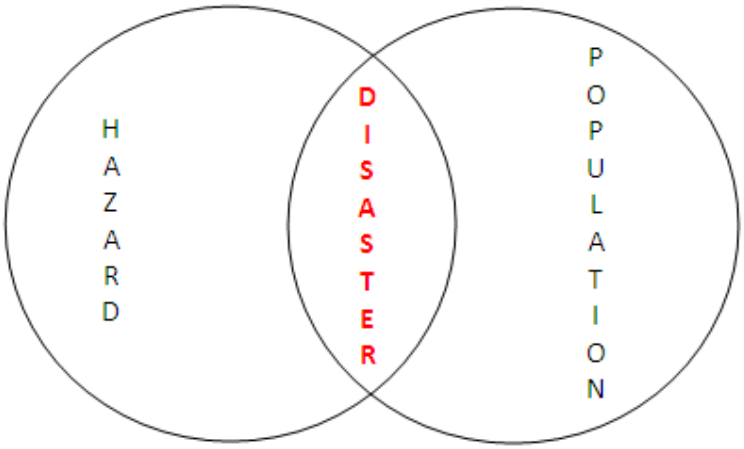


Figure 1.2: *Conceptual diagram reflecting how disasters only occur with the interaction of both a natural hazard and a vulnerable population.*

1.2 Earthquake Hazard in China

Natural hazards are widespread globally, and often the communities affected by such events do not anticipate the risk prior to the impact, but through an increased understanding of risk anticipation it is possible to raise awareness of potential dangers amongst exposed populations. Shaw et al. show from work in Japan that "the major challenge for earthquake disaster is to implement pre-disaster mitigation efforts versus day to day priority of other issues" (2004:45). Commonly, the methodologies used to investigate natural hazards are split into two camps: 1. the physical processes and 2. human perceptions . However in order to increase the effectiveness of emergency procedures, it is critical to create co-production of knowledge; an understanding of anticipation of risks held by local inhabitants alongside the physical dangers. The focus of research into earthquakes has long been focused on more developed countries, despite the event frequency and impacts in these areas being much lower than other regions (Figure 1.3). Investigation into hazards in both N. America and Europe is widespread, but for regions such as South and East Asia, there is a large gap between event fatalities and the amount of research carried out. I hope that this study will help to contribute to an attempt to bridge this gap and promote research in areas that desperately need solutions and mitigation. For China in particular, the ever increasing population density adds to the risk and loss potential during disasters. The 2008 Wenchuan Earthquake provides a valuable opportunity to explore these issues, especially how anticipations amongst lay

people may or may not change in the short-term, as a result of the impact of a powerful earthquake.

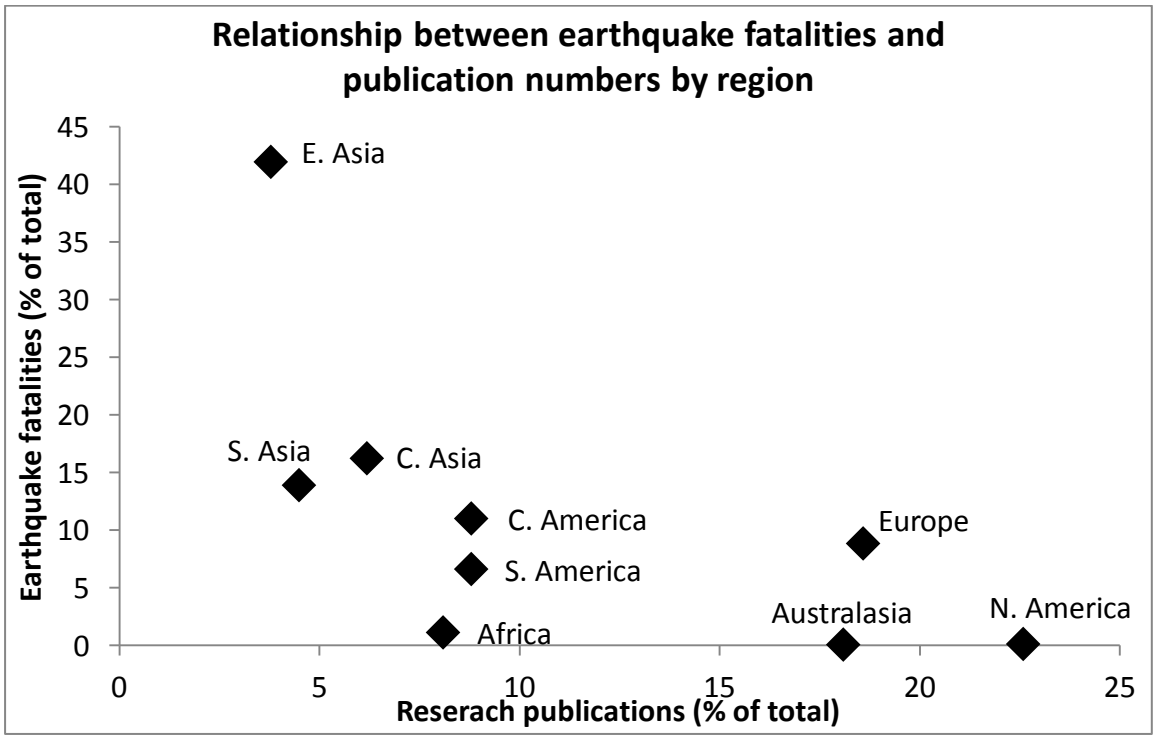


Figure 1.3: *The amount of research focused upon earthquake investigation is currently out of balance with the country's most affected by devastating earthquakes. The above graph shows how East Asia experiences far worst fatality rates than any other region, but receives the least attention from research projects. North America is at the other end of the scale, with few seismic events but high levels of earthquake research. (Sources: USGS Online for fatality figures, ISI Web of Knowledge for publication numbers).*

There is a long history of seismicity in China with many of the country's provinces experiencing heavy impacts from large earthquakes (Table 1.1). Sichuan alone has been hit by four earthquakes of > 7.2 magnitude in the last 100 years. The largest of these, both in terms of magnitude and fatalities, is that of the 12th May 2008, which forms the focus of this study. At 14:28, the Wenchuan area of Sichuan Province was struck by a magnitude 7.9 earthquake (Wang 2008), affecting an area estimated to be more than 260,000 square kilometres. The death toll to date exceeds 87,587 (USGS 2010), but this number could rise further due to the added threat posed by post-seismic landslides, which can remain high for up to a decade after the earthquake (see Dadson et al. 2004; Khazai and Sitar 2004; Lin et al 2006,). The focus area of this study is the town of Beichuan, situated within Sichuan Province in the Longmen Shan region (Figure 1.4). This region has distinctly high-relief, with a steep margin on the eastern side adjacent to the Tibetan Plateau, where elevations rise above 5,000 m (Burchfiel et

al. 2008) with more gentle slopes characterising the western side. The 5.12[1] Earthquake (2008) ruptured along the Longmen Shan fault at the eastern margin of the Tibetan plateau.

Location	*Date*	*Magnitude*	*Fatalities*
Shanxi	**25/09/1303**	8.0	200,000
Shaanxi	**23/01/1556**	8.0	830,000
Kangding-Luding	**01/06/1786**	7.8	100,000
Yunnan	**13/07/1917**	7.5	1,800
Guangdong	**13/02/1918**	7.3	1,000
Haiyuan	**16/12/1920**	7.8	200,000
Sichuan	**24/03/1923**	7.3	3,500
Yunnan	**16/03/1925**	7.1	5,800
Gulang	**21/05/1927**	7.6	40,900
Xinjiang	**10/08/1931**	8.0	10,000
Gansu	**25/12/1932**	7.6	275
Sichuan	**25/08/1933**	7.4	9,300
Sichuan	**25/05/1948**	7.3	800
Hebei	**07/03/1966**	7.0	1,000
Hebei	**22/03/1966**	6.9	1,000
Guangdong	**25/07/1969**	5.9	3,000
Yunnan	**04/01/1970**	7.5	10,000
Yunnan	**10/05/1974**	6.8	20,000
Haicheng	**04/02/1975**	7.0	2,000
Tangshan	**27/07/1976**	7.5	255,000
Southern Xinjiang	**24/02/2003**	6.3	261

***Table 1.1**: Data to show the historic earthquakes experienced by China. (Source: USGS Online).*

[1]512" refers to the 2008 Wenchuan Earthquake which hit Sichuan Province, China.

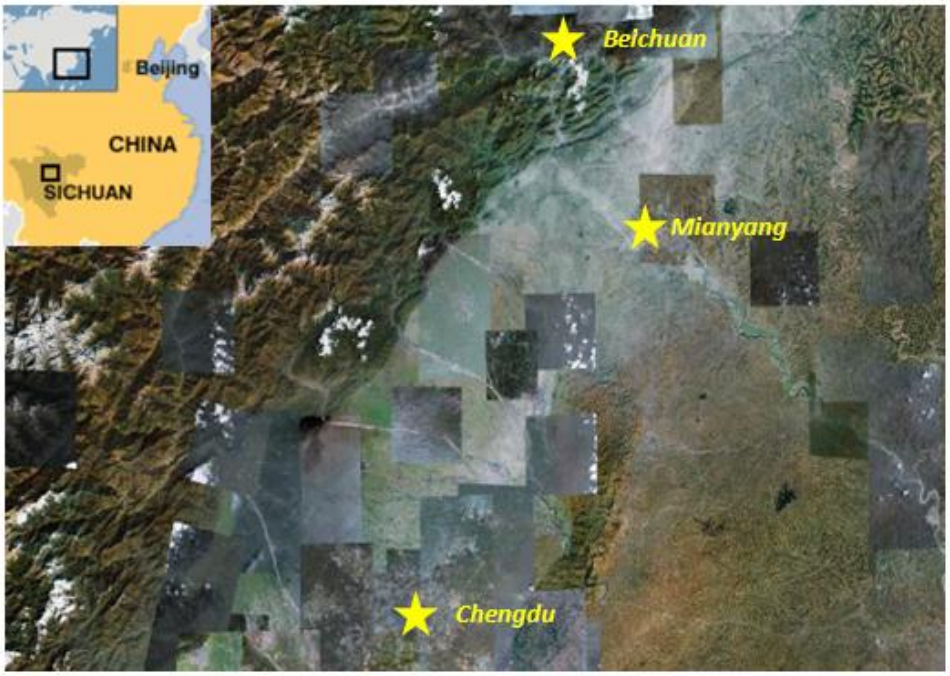


Figure 1.4: Map to show the location of Beichuan. Inset shows the location of Sichuan in relation to China and, the location of China in relation to Asia.

1.3 Research Questions

This research will concentrate upon one event in one fixed location which will allow the production of an in-depth understanding of how people anticipate disasters both before and after such an event. The first few days and hours are the most critical in terms of effective response before relief arrives, and therefore it is in this timescale - both before and after the event - that anticipations are important. Current research into the social aspects of natural hazards in China is limited and therefore this study attempts to fill this gap to some extent. The primary aim was to investigate the pre- and post-earthquake anticipations held by the residents of Beichuan and to address this, the following research questions were indentified:

1. To what extent did the Beichuan population anticipate natural hazards pre-5.12?
    a. How aware were individuals that there was a serious seismic threat in the area?
    b. To what extent did local households possess knowledge about earthquakes?
2. How does this pre-5.12 anticipation differ in the post-earthquake household?
    a. How have rankings of risk been affected by experience of the 5.12 event?

   b. To what extent has knowledge and awareness of natural hazards increased within the post-5.12 Beichuan community?
3. How have levels of mitigation changed in the post-earthquake household in relation to lifestyle modifications?
   a. What, if any, methods of preparation and mitigation were in place within Beichuan pre-5.12 both at the household and government level?
   b. How have these levels of preparation and mitigation changed post-5.12?

1.4 Thesis Structure

The thesis is broadly split into four sections. Section one acts as an introduction to the topic (including this chapter) providing the rationale, research aims and review of the relevant literature (Chapters 1 and 2). The second section details the methods used to facilitate fieldwork and reviews the challenges posed by conducting research in China (Chapter 3). The penultimate section draws together the findings from fieldwork, investigating levels of awareness, anticipation and mitigation in both pre- and post-5.12 Beichuan (Chapters 4, 5 and 6). Finally, section four synthesises the material presented to provide conclusions and recommendations for future research (Chapters 7 and 8):

Section 1:

Chapter 1 – "Introduction: Hazards and Risks" – this chapter provides the rationale, Fieldsite location and research questions.

Chapter 2 – "Literature Review" – indentifies the relevant literature to provide context for my research. This chapter includes background surrounding factors affecting awareness and anticipation of natural disasters, as well as providing a comparison of 'top-down' with 'bottom-up' approaches to hazard management.

Section 2:

Chapter 3 – "Methodology" – a review of the methods employed within this study. Within this chapter I detail the methods of data collection, as well as providing a review of the challenges faced and how these challenges were overcome.

Section 3:

Chapter 4 – "Risk Awareness" – is based upon the findings of interview and focus group sessions. This chapter investigates the levels of knowledge in pre-5.12 Beichuan and to what extent this knowledge led to increased awareness levels. An examination of how the 5.12 event affected post-earthquake awareness is also presented.

Chapter 5 – "Risk Anticipation" – focuses upon the findings from interview and focus group sessions, alongside diary methods. The chapter asks which risks are of primary concern for the Beichuan population and how these risks differ to pre-5.12 concerns. The factors behind risk anticipations are explored with focus given to the affect of disaster experience.

Chapter 6 – "Preparation and Mitigation" – focuses upon the data collected in interview and focus group sessions. This chapter aims to investigate the levels of both household and government preparation and mitigation pre-5.12, before comparing these levels to post-5.12 practices.

Section 4:

Chapter 7 – "Discussion" – synthesises the findings presented in section 3 and provides recommendations for future hazard management practices based on these findings.

Chapter 8 – "Conclusion" – a review of all the points covered in the thesis with an outline of the main findings and areas of future research.

Chapter 2

Literature Review:

Risk perceptions and hazard management

Within this section I hope to provide a synthesis of relevant literature in order to set the scene for this investigation. I aim firstly to define the important terms used throughout this project to facilitate an appropriate interpretation of the results presented. A discussion of previous research into risk awareness and risk anticipation will be covered to explore the potential outcomes for this study. The effect of the 2008 Sichuan earthquake upon risk awareness and anticipation is a key focus of my study, and as a result it is crucial to consider the findings of previous studies concerned with disaster experience as an influential factor affecting risk anticipation. Finally, I hope to explore the different forms and sources of knowledge to establish how it is possible to increase local communities' awareness and anticipation of natural risks and in turn promote more widespread mitigation practices at all levels.

2.1 Overview

The focus upon both individual and community-level risk awareness and anticipation is set within the much broader context of the 'everyday'. Households situated within regions at risk from natural disasters are living alongside such threats, which therefore are fundamental in determining everyday living. When living in hazardous areas, rather than an absence of negative conditions, there is a constant threat from natural risks, and as a result there is much greater importance attached to adjustment and adaptation. Without awareness or anticipation of potential events, it becomes highly unlikely that individuals and communities will posses either the information, or desire to implement adaptation and mitigation practices. As a result populations become more vulnerable and have lower levels of well-being. Investigation into whether or not anticipations of risk change between pre- and post-earthquake communities, could be linked to the impact that vulnerability to disasters can have upon well-being; the well-being of a household as well as the individuals within that household is likely to shift negatively in response to a natural disaster (Wisner et al. 2004). If initial levels of well-being are low, and vulnerability high, the further negative impact of a large disaster will devastate communities. For the Beichuan community, if levels of awareness and anticipation were low pre-5.12, levels of vulnerability would have been high.

Following the devastation caused by the earthquake these levels will have plummeted dramatically, raising levels of vulnerability even further. If this is the case, the population's well-being will have considerably reduced. In contrast, if levels of awareness and knowledge are found to be high, the well-being of Beichuan residents will be higher.

There exists a large literature surrounding vulnerability to disasters, including a number of influential factors which can act to increase or decrease an individual's vulnerability to natural hazards. "By vulnerability we mean the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard (an extreme natural event or process)." (Wisner et al 2004: 11). Cutter et al. (2003) explore 'social vulnerability' and determine a number of factors which act to influence an individual's social vulnerability (Table 2.1).

For an earthquake, one of the key determining factors which affects impact devastation levels, could for example be building structure and quality of design. Alongside patterns of rent, home ownership, population density and levels of income distribution, these characteristics can interact to pre-determine where individuals live, and as a result the level of associated hazards which can affect their well-being. This is an interesting concept to address, as for the Wenchuan Earthquake distinct zones can be identified post-earthquake with regards to building collapse (see fig 2.1). Following data collection it is confirmed that the area labelled as 'A' on figure 2.1 was much more densely populated, lacking proper streets with only dirt paths instead. The households residing in this area were also mostly migrant families, not originally from Beichuan. However the men in the families had then migrated for a second time to large cities such as Chengdu, to find work, leaving the women alone to take control of domestic responsibilities. Section 'B' on figure 2.1 was the newer part of town, with wider streets and higher levels of home-ownership. If table A is consulted, it would appear that for

	Description	Affect upon vulnerability	Literature	Chinese context
Socio-economic status	Capacity to withstand losses/protect against disaster impact. Higher incomes often enable quicker recovery.	High status both increases and decreases vulnerability, Low status increases vulnerability.	Cutter et al. (2003), Cutter et al. (2000) Burton et al. (1993) Wisner et al. (2004), Peacock et al. (1997,2000), Hewitt (1997), Puente (1999), Platt (1999), Chou (2004), Wood et al. (2010)	Hukou status affects access to aid in post-disaster period – rural hukou households are more vulnerable than urban hukou households.
Gender	Women often struggle more to recover than men mainly due to employment type, lower incomes and household duties.	Women experience higher levels of vulnerability than men.	Wisner et al. (2004), Enarson and Morrow (1998), Enarson and Scanlon (1999), Morrow and Phillips (1999), Morrow (1999), Fothergill (1996), Peacock et al. (1997, 2000), Hewitt (1997), Cutter (1996), Wood et al. (2010)	The traditional role of women as domestic ally responsible often leads to male outmigration leaving women alone when facing and recovering from disasters.
Race/ ethnicity	Cultural and language barriers limit access to information. Minorities often reside in high-risk areas	Minorities not local to an area experience higher levels of vulnerability.	Pulido (2000), Peacock et al. (1997, 2000), Bolin and Stanford (1998), Bolin (1993), Morrow (1999), Wood et al. (2010)	Chinese minorities aren't privy to benefits available to the Han population. Migrants work and live illegally increasing vulnerable.
Age	Children/ elderly experience greater difficulty evacuating. Post-disaster childcare impacts upon income if institutions are damaged.	Elderly and children experience a higher level of vulnerability.	Cutter et al. (2000), O'Brien and Mileti (1992), Hewitt (1997), Ngo (2001), Wood et al. (2010).	Due to the one-child policy, households often have both sets of grandparents to care for, increasing the strain during and post-disaster.
Residential Property	The quality, density and value of residential buildings influences potential loss and recovery.	Temporary housing residents experience higher levels of vulnerability.	Cutter et al. (2000), Bolin and Stanford (1991), Chou et al. (2004), Wood et al. (2010), Green (2008), Halvorson and Hamilton (2009), Paul and Bhuiyan (2009)	Pre-5.12, building regulation enforcement was poor within China, especially in remote poorer regions.
Renters	Renters are unsettled/ have limited access to	Renters are more	Morrow (1999), Wood et al. (2010) This view of renters as more	In Beichuan, the opposite is true - owners faced greater challenges

	information/ resources/state aid in the recovery stage.	vulnerable.	vulnerable is challenged by Paul and Bhuiyan (2009).	due to lack of insurance and therefore a great economic loss.
Occupation	The self-employed are greatly affected if their resources are damaged, for e.g. shopkeepers, farmers and fishermen.	Professional/high income jobs are less vulnerable, self-employed/labourers /low income jobs are more vulnerable.	Hewitt (1997), Puente (1999), Green (2008)	Many women in China own small businesses which were destroyed by the earthquake. Farming is also a common occupation within Sichuan Province.
Family structure	Large families/single-parent households are dependent upon lower resources, affecting their resilience.	Large families and single-parent households experience higher levels of vulnerability.	Wisner et al. (2004), Morrow (1999), Puente (1999)	Caring for both sets of grandparents due to the one-child policy increases the strain on household economics.
Population growth	Rapid population growth often lead to unstable housing and infrastructure being stretched.	Rapid population growth increases vulnerability.	Cutter et al. (2000), Morrow (1999), Puente (1999), Paul and Bhuiyan (2009), Green (2008), Halvorson and Hamilton (2009)	China has the world's largest population and Sichuan is the most populous province within China.
Deforestation	In mountainous regions, slope clearing greatly increases the risk of disaster.	Populations living in deforested areas are more vulnerable.	Halvorson and Hamilton (2009)	Due to high population density, deforestation in Sichuan is common.

Table 2.1: *Source - adapted from Cutter et al. (2003) to include additional references and information more specifically related to this research.*

Beichuan, those living within section 'A' were much more vulnerable to hazards than those living within section 'B'. It will be interesting to note whether or not the data confirms or contradicts this suggestion.

*Figure 2.1: Photograph showing the differential impact upon the level of building collapse between two different areas of Beichuan Town. **A** shows an area where almost all buildings collapsed, whereas **B** shows a different area where most buildings remained standing.*

Within this broader context of well-being, it is important to define the term 'risk' as this is the concept I am trying to explore. Definitions for 'risk' are wide ranging within the literature, often dependent upon the nature of work being carried out (see for e.g. Fischhoff et al. 1984, Slovic et al. 1981, Slovic et al. 1985). For this project, a definition of risk can be taken as factors which individuals view as a threat to their well-being, in any form from natural disasters to crop failures, from unemployment to health problems.

2.2 Awareness of natural hazards

The focus of this research is upon 'anticipation' of risks at the local level, however before assessing levels of anticipation is it interesting to first address levels of 'awareness'; if the people living in Beichuan were unaware of the seismic threat,

they would have had no reason to expect it to happen, or fear disaster. There is no targeted definition of 'awareness' in the literature, however it is important to delimit its meaning within this study. I will use 'awareness' to describe whether or not the population of Beichuan were familiar with the possible seismic threat in the area. 'Awareness' is not just knowledge of the event, but also the recognition that there is a chance the area could experience a large earthquake, and associated secondary hazards, at some point within their lifetime. Knowledge therefore can be defined as an understanding that earthquakes happen (within China), but the acknowledgement that Beichuan itself could be affected by earthquakes, turns knowledge into awareness. It is possible to say therefore, that a person cannot be aware without knowledge, but can possess knowledge without being aware. A good example of having knowledge but not awareness, is presented by Solana and Kilburn (2003) in their study of landslide awareness on Gran Canaria. In this instance, a lack of awareness was a result of over-confidence in the local authorities. The population at risk living on the mountain-sides knew that landslides were a threat to their settlements, but assumed that protective measures were in place and therefore were not aware that they themselves could be affected by landslide events. It is also useful to consider an example of how a lack of knowledge leads to a lack of awareness, and one can clearly be drawn from Halvorson and Hamilton (2009). During their research in Pakistan following the 2005 Kashmir Earthquake, the authors discovered that much of the devastation could be attributed to a distinct lack of knowledge, and therefore *un*awareness. Within their study, Halvorson and Hamilton interviewed 40 people, and not one had considered the possibility of earthquakes prior to the 2007-event. For the authors, this lack of awareness was attributed to no previous seismic experience amongst the population, combined with a serious shortage of information supplied to the community. Therefore in this example, the residents did not have the knowledge that earthquakes occurred in the region, and as a result they were not aware that they themselves were at risk from seismic activity. However many communities exposed to potential disasters have both knowledge and awareness of the hazards posing a threat to their community, but the next stage and the key concept to the

present study is the level of 'anticipation' that these populations attach to such hazards.

2.3 Anticipation of Natural Hazards

Again, definitions of 'anticipation' are wide ranging depending upon the context of the research. It is important for me to attach clarity to the concept however to prevent ambiguity. For the purposes of this study therefore, I take 'anticipation' to be a continuation of 'awareness', where not only are people aware of the threat, but they are also anxious that such an event will occur within their community and affect themselves in a potentially negative manner. A community who were aware of a seismic threat but did not worry about the potential earthquake experience would therefore not anticipate seismicity as a threat. Therefore the Beichuan population may well have been aware of the seismic potential in the area, however this would not necessarily had lead them to anticipate a large earthquake. To exemplify this definition, it is possible to draw upon work by Paul and Bhuiyan (2009) who researched seismic risk perception in Dhaka, Bangladesh. From their sample, 86% of participants were aware of the potentially damaging earthquake forecasted to hit the city in the next 10 years. However despite this high level of awareness, almost all these people also believed that they themselves would not experience much loss. They were not worried about seismic events therefore, and as a result levels of seismic anticipation were low. A further example can be drawn from Jackson (1981) who conducted a similar study into seismic risk perception amongst the San Francisco population in the USA. As Paul and Bhuiyan (2009) found in Dhaka, Jackson discovers that seismic awareness in the city is high, with 96% of participants sure that an earthquake would occur in the future. However again, this proportion of people also believed that their own households would not sustain any damage from such an event; they were not worried about the seismic threat, their levels of anticipation were low. From the literature it is clear that this pattern is a common one, with many different studies finding that natural hazards are not primary concerns for many people. In order to improve hazard management schemes, it is important that disaster threats are acknowledged and anticipated by the local community, to encourage individuals to prepare for, and

respond to, times of disaster, and as a result it is important to explore risk anticipation further.

Although this study is not concerned with the psychology of disasters, an assessment of the relevant literature focused upon ways in which people rank risks is important, as this affects the level of anticipation associated with the different potential threats to a society. Sloivc et al. (1981) explored the 'availability heuristic' as a factor influencing risk, where the familiarity and direct experience of a hazard can increase one's anticipation. As such, this 'availability heuristic' is particularly relevant for risk anticipation, as more frequently occurring, or more recent events, are easier to remember than more sporadic hazards, and as a result are perceived as more 'risky'. This idea is supported by Paul and Bhuiyan (2009). The authors found that the majority of Dhaka's residents who were surveyed, believed that the likelihood of a forthcoming damaging earthquake was almost zero, despite expert predictions of a large devastating earthquake for the Bangladeshi capital. According to the population, this conclusion was founded on the lack of occurrence of similar hazards in the past. This link between risk perception and seismic inactivity is also presented by Jackson (1981), in his work focused within San Francisco, USA. He too, finds that a lack of recent earthquake activity leads the majority of respondents to believe themselves to be at a low risk from seismic destruction.

The availability of information can play a crucial part in influencing the 'availability heuristic', but the accessibility of such information is often questionable. Work by Halvorson and Hamilton (2009) on the 2005 Kashmir Earthquake revealed that local populations were completely unaware that such a destructive earthquake was possible. In hindsight it was apparent that the inhabitants were lacking in the fundamental basic knowledge of earthquake science, a factor which could have lead to their lack of anticipation of the event. Increased provision of information in risky areas can have a positive effect on precautionary behaviour and therefore increase recognition of potential disasters (Siegrist and Gutscher 2006). However the reliability of such information is crucial; misinformation can result in a 'false sense of security' (Jackson 1981). Jackson (1981) shows that a false sense of

confidence in inadequate protective measures, such as earthquake resistant buildings, can lead residents to become over confident in their ability to resist damaging earthquakes.

Regardless of the level of information availability, there is often an underlying notion of “it won’t happen to me”. Burger and Palmer (1992) term this as ‘positive illusions’; individuals take the view that they themselves are less likely than others to experience disasters. This concept was outlined by Finlay and Fell (1997) in their work investigating landslide risk perception in Australia and Hong Kong. Here they found that despite recognition by local residents of the threat posed by landslides, the majority seldom considered the possibility of such events affecting their life. Paul and Bhuiyan (2009) also support this theory and coin this behaviour as ‘optimistic bias’. They showed through their study in Dhaka, that despite specific efforts to educate populations about the potentially fatal seismic hazard anticipated, an overwhelming proportion of survey participants still did not consider such an event as likely.

There also exists the common acknowledgement that often, there are simply more pressing concerns than natural hazards. Alexander (2000) terms this the ‘prison of experience’ and more specifically identifies that poorer people see natural hazards as much less salient than other concerns such as social factors including lack of education or poor sanitation. During his research in Nepal, Pilgrim (1999) observed locals rushing onto a landslide minutes after the event, to collect debris for use as firewood or building materials. It became apparent that for these Nepalese villagers, the threat of mere survival was more important than the threat posed by the landslide itself. However it is not purely less developed countries that have more pressing concerns; Jackson (1981) found in his study of San Francisco that residents’ explanations for ranking earthquakes as lower risk were due to the fact that more immediate social concerns, such as a steady income and personal security, took precedence over earthquake propensity. Sichuan Province is one of the poorest regions in China, and as a result the Beichuan population will no doubt have been faced with everyday challenges (as seen in Table 2.1) which could have occupied their risk anticipations more readily than natural disasters. In addition,

pre-5.12 there had been a distinct lack of significant seismic history in the region, suggesting that earthquake anticipations within the town are quite likely to have been low prior to the 2008 earthquake. It will be interesting to discover whether or not there was readily accessible information regarding the potential seismicity, as again the literature suggests that this can have a considerable influence upon risk anticipations.

2.4 Importance of earthquake experience

The 'availability heuristic' has a big role to play in affecting post-earthquake anticipation. The anticipation of events is often based on past experience and memory, and therefore occurrence of an event alters perceptions and changes behaviour and attitudes (Paul and Bhuiyan 2009). How the 'availability heuristic' manifests itself in a more practical manner is shown by Siegrist and Gutscher (2006), who suggest that those who have helped with hands-on clean up operations are expected to have an increased anticipation of future events than those who have not. Through their research in Switzerland, it became evident that rather than purely experiencing an earthquake, the more crucial influencing factor was experiencing *damage*. This notion is reiterated by Johnston et al. (1999) who, through a comparative study of two New Zealand towns, showed how loss as a result of a disaster, is a critical factor which influences future anticipations of similar events. The research investigated two communities before and after a volcanic eruption; one of the towns was directly impacted upon by the eruption and experienced losses as a result of volcanic ash fallout, however the other town, despite witnessing the eruption, was not affected or damaged by the event. The results clearly showed that the town with direct experience of damage increased their anticipations of future eruptions; however the town which remained unscathed upheld their positive outlook following the eruption. This is an important issue for seismic risk anticipations, as many locations at risk of large earthquakes experience regular small events which rarely cause major damage. As a result, if the populations base their risk anticipations upon these experiences, their preparedness and willingness to learn more is likely to be low. However, studies have also revealed that the occurrence of a sudden, unexpected large event can lead to the opposite effect on anticipation, where in fact local residents consider a

repeat occurrence even less likely. Alexander (2000) has termed this the 'gambler's fallacy', where individuals believe that the incidence of an event one year, drastically reduces the possibility of recurrence soon afterwards, even if physically this has no basis. Such a notion is supported by Jackson (1981), who recognises that in the aftermath of a disaster, any recurrence potential may be denied with the common thought of "we've had ours now". There is some physical basis for this viewpoint concerning earthquakes, as many seismic studies have shown that the release of stress from a fault reduces the potential for an imminent recurrence in the same location (see for e.g. Bolt 1999, Parsons and Kirby 2008). This may however, be significantly contrary to seismic geophysics, in which stress transfer from an earthquake rupture may load neighbouring faults, increasing the probably of future earthquakes. However, critically, this does not stretch to neighbouring areas, where the stress is likely to have moved to, but often this important second point is often unacknowledged by communities.

From the literature there are several good examples of how a large event can alter perception and anticipation of future events. In addition to the example from Johnston et al. (1999), this change in order of hazards is further highlighted by Burger and Palmer (1992), who use the Chernobyl incident to show that students used information about the disaster to change their perceptions of the relevant hazards. Studies of the Kashmir Earthquake of 2005 also produced findings that those directly affected by a disaster have increased concern for the danger post-impact than beforehand (Naeem and Okazaki 2009). Halvorson and Hamilton (2009) reiterated this point, demonstrating that the affected Pakistani population wished to vacate the impacted area which they deemed unsafe, in favour of relocating structures to a new site. This suggests that post-disaster communities re-assess their anticipations in relation to the event encountered.

From investigating both pre- and post-earthquake anticipations of risk within Beichuan, I hope to reveal whether or not rankings have changed within households, and how (if at all) they have adapted their everyday life to encompass these new risk anticipations. With a relative lack of seismic history in the area, and the sudden occurrence of a hugely damaging earthquake, it will be very interesting

to explore the questions raised through the literature about how such factors influence risk anticipations. Through an increased understanding of how such an event can affect anticipation of risks, especially anticipation of natural hazards, I hope to show how this in turn can impact upon individual and household well-being, and therefore why it is important to include local populations into future risk research.

2.5 Lay anticipations vs. 'expert' knowledge

According to Alexander (2000), it is possible to identify startling differences between lay and expert attitudes of potential hazards. This view that expert and lay anticipations differ is supported by Siegrist and Gutscher (2006), Ho et al. (2008) and Halvorson and Hamilton (2007) who all concur with Alexander. For a more in-depth overview of studies which have found differences between expert and lay judgements of risk see Rowe and Wright (2001). However, despite the mass of literature which seeks to demonstrate the differences between the two groups, there exists evidence to the contrary. Work by Cronin et al. (2004) for example, reveals that although the stages through which perceptions are formed may differ, the overall outcome of hazard ranking can be the same. In their study investigating the perception of volcanic hazard on Ambae Island, Vanuatu, they found that differences between the two groups were concerning how potential dangers should be represented on a hazard map, and not, as suggested by Slovic and many others, due to differences in hazard perception. This notion has also been found in the developed world, through work carried out in Switzerland by Siegrist and Gutscher (2006) with regards to flood perception. Through their work it is demonstrated that areas identified as 'low risk' by an expert hazard map, were areas where residents had a lower anticipation of potential disaster, and likewise with areas designated as 'high risk'. Cronin's work on Vanuatu suggests that prior to participation, rural communities are not likely to understand any potentially available scientific information, although perhaps this is a developed vs. developing country issue, concerned with the level of education given about surrounding natural hazards.

For Beichuan then, it will be interesting to note whether or not there exist differences between what the local population anticipate as the most likely risks, in comparison with the scientific community. In terms of information accessibility, I hope to explore whether or not the respondents were aware of the possible means of learning about seismic potential. Through an internet literature search titled "Sichuan Earthquake", 42 academic papers were identified, ranging from 1982-2010, suggesting that there has been a substantial body of scientific information circulating, even before the 2008 event. However as shown by Cronin et al. (2004), this is not always presented in a comprehendible format, and in fact may not have filtered down to the Beichuan population at all. It is important to investigate this potential 'lay/expert divide' to promote knowledge, awareness and mitigation; the body of literature itself has limited benefit without the implication of practices to avoid losses. It will be interesting to establish whether any of the scientific information had reached the Beichuan community pre-5.12, as this will no doubt impact upon levels of knowledge, awareness and anticipation.

2.6 Different types of knowledge

Traditionally, hazard management and mitigation practices have adopted a hierarchical, top-down approach with science at the 'top' and the lay public at the 'bottom' (Foster 1980). This system is advantageous to some level, as it acts as a robust system where authority and responsibility is clearly defined and avoids duplicated decisions (Alexander 2000). Slovic (1981) supports this system due to his conclusion that science makes 'rational' decisions, whereas lay people rely upon emotions which lead to 'irrational' rankings of risk. However more recent research has shown the value of lay knowledge, and I hope to show in the next section how incorporating local beliefs and understanding of hazards can lead to more successful and effective management practices. As a starting point, Wisner et al. (2004) state that in the absence of integrating lay knowledge into hazard management and mitigation schemes, there is often a lack of engagement in active learning. If a population does not share the same thoughts and anticipations as the people devising the preparation practices, they are unlikely to take a keen involvement in the processes. Patterns of vulnerability are fundamentally local and

as such, mitigation practices should mimic this locality and start at the community scale (Wisner et al. 2004).

Halvorson and Hamilton (2009) unearthed through their research, that the building structure of most of the dwellings which crumbled during the 2005 Kashmir Earthquake had not been constructed according to traditional practices. Colloquial designs have petered out over the past couple of decades, in favour of more 'modern' styles. However this shift from 'old' to modern, has also been a shift from seismically resistant, to more vulnerable designs (Dekens 2007, Nash and Spence 1984, Spence and Coburn 1984, Hughes 2000). Due to a web of interlocking factors such as migration, the traditional knowledge to protect from earthquakes has been eroded, and as a result, the communities have become more vulnerable to seismic threats (Halvorson and Hamilton 2007). In this region, the understanding behind what causes an earthquake is almost unanimously "a result of God". The 2005 event was seen as God punishing the local community for bad behaviour, and as such, no forecasting ability is believed to be possible, earthquakes simply occur 'at God's will'. Such a strong religious belief is hard to argue against, however if traditional building practices could be reintroduced and a 'seismic culture' (Halvorson and Hamilton 2007; 2009) recreated, the population would be less vulnerable in future events.

Arguably, local residents are far more in touch with their own environment than an outside 'expert' deployed to define zones of high and low risk. A scientific map is often alien to communities, but instead local practices of hazard mitigation can often be seen. A common method used in rural communities at risk from earthquakes is precursory animal behaviour. This technique is often shunned by the scientific communities, but there is increasing evidence to support this as a viable local-scale method of seismic early warning (see for e.g. Buskirk et al. 1981, Rikitake 1981, Grant and Halliday 2010). If communities can be warned by their animals in the days or hours leading up to an event, it allows them to gather their precious belongings and evacuate to safety until the disaster has struck.

There is a substantial body of literature that supports the idea that animals can act as precursors to seismic events, however most of this work relies solely upon hindsight analysis (for e.g. Buskirk et al. 1981; Rikitake 1981). Interviews are conducted amongst populations impacted upon by a large earthquake and ask about anything they thought was strange before the event. However, little research has been fortunate enough to have a reliable before and after data set, which provides the 'scientific' community with more reason to dismiss their findings as unreliable and inconclusive. However following the L'Aquila earthquake which hit Italy in 2009, Grant and Halliday (2010) published a paper which presented strong evidence to suggest that certain animals have the ability to detect seismic waves before the human population. Originally, the authors were not interested in earthquake precursors and were in fact, conducting research into the reproductive activities of the common toad. However in the weeks leading up to the 2009 earthquake, their behaviour became very unusual. Under normal circumstances, the breeding period for the common toad occurs over a short period of time, therefore it would be expected that during this time, a large number of toads would be present within the breeding site. However 5 days before the earthquake, the population of male toads had decreased by 96% (Grant and Halliday 2010: 266). This number continued to decrease until there were no toads present from 3 days before the earthquake, until after the earthquake and aftershocks had petered out (Grant and Halliday 2010). The authors have attributed this highly unusual behaviour to perturbations in the ionosphere, and state that the results from their study support the idea that the common toad "is able to predict large seismic events and adjust its behaviour accordingly" (Grant and Halliday 2010: 269). Through the in-depth interview sessions with the Beichuan women, I hope to investigate whether or not the women felt there had been any unusual animal behaviour which could have suggested an imminent earthquake. Due to the traditional focus upon animal behaviour as a method of earthquake prediction in China, the Beichuan population may have already possessed knowledge regarding this method pre-5.12.

2.7 Integrating local knowledge

If the viewpoint that lay anticipations are based on irrational and often biased judgement is believed, it can be argued that it is not valuable to incorporate their anticipations with those of experts, as the latter determine 'real' risks and therefore identify the most important and 'risky' threats (Slovic 1981). This notion can be supported using findings from studies presented by Pilgrim (1999) and Lehman and Taylor (1987) who both show the link that indigenous communities make between natural hazards and religion. In his study of a rural Nepalese village, Pilgrim revealed that the local residents held deities responsible for the recent landslide event, with the belief that the community was being punished for wrong-doings. As such, their response to the event was not to develop practical mitigation practices, but rather to erect another statue to appease the goddess believed responsible for the landslide event. Such religious explanations have been shown as the understanding of many impacted upon by the 2005 Pakistan Earthquake (Halvorson and Hamilton 2009). Residents believed that they must follow the Qur'an more attentively, which would please God and prevent another event. Lehman and Taylor (1987) have shown how such a belief results in higher fatality rates than amongst communities who believe that they can exercise some sort of practical control. If this is the case, it could be suggested that it is not useful to integrate lay anticipations but rather focus upon those of the 'experts'.

Over recent years however, it has become evident that expert views alone are not adequate in the prevention of losses from natural disasters; an understanding of the victims' anticipations is crucial (Ho et al. 2008). The main reason behind this is that 'expert' assessments are seen as 'objective', and lack the inclusion of 'judgement' seen to influence lay anticipations. Halvorson and Hamilton (2007) have emphasised this point from the Kashmir Earthquake; a proportion of the damage could be associated with dwindling levels of traditional indigenous knowledge. As a result, a combination of traditional lay anticipations and help from more expert science-based education could increase the communities' anticipations of potential future impacts. Integration of lay anticipations and expert knowledge can create positive moves towards community level hazard mitigation, an example of which can be seen in work carried out by Cronin et al. (2004) on

Ambae Island, Vanuatu where there is a serious threat posed by volcanism. Success of previous 'top-down' expert-led initiatives was limited due to local resistance to 'outside' ideas and a lack of understanding. This lack of understanding stemmed from confusion in how the hazards had been represented by the experts on locally distributed hazard maps. By combining traditional and scientific knowledge a new and improved hazard map was created (figure 2.2).

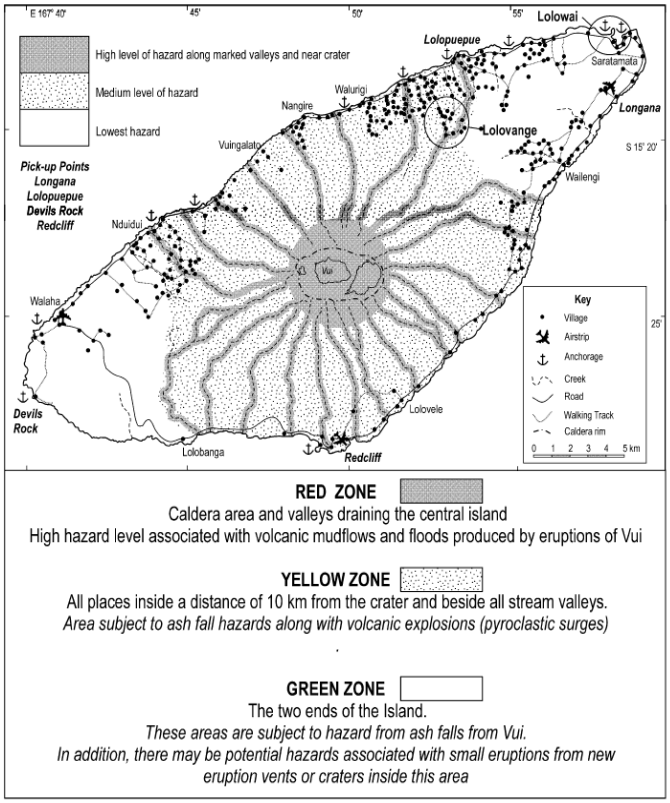


Figure 2.2*: English black and white version of the revised hazard map for Ambae Island, Vanuatu. The three zones represent high, medium and low levels of hazard relative to life. Source: Cronin et al. (2004)*

The resultant map was able to fulfil its main criteria of educating the local communities about volcanic hazards, with the focus on "common points of understanding" (Cronin *et al.* 2004:664). A further example can be seen in efforts following the Pakistan Earthquake where there was a serious need to integrate traditional views with science-based education, to re-establish a 'seismic culture' of prevention within exposed mountain communities. This was achieved through

similar methods used by Cronin et al. (2004), and resulted in the production of a simple yet instructive poster written in Urdu (figure 2.3). The residents could use this to understand the basic underlying mechanisms of the hazard, thereby promoting protective behaviour (Halvorson and Hamilton 2009).

WEATHER PATTERNS	Sky turns gloomy and overcast # Black rolls of cloud Weather unusually hot and humid/hot spells after rain # Strong wind blows from the south/south-east # East wind blows at full moon
SEA/RIVER PATTERNS	Big waves/dark rolls of water 'Goroom goroom' noise in the river Smokey or cloudy shapes in the sea Pond and river water becomes hot *
ANIMAL BEHAVIOUR	Cattle become restless and stop eating grass *** # Cattle/dogs wail continuously/at night *** # Ants climb trees with eggs on their backs # Bees move around in clusters *Kurpals* (type of gull) fly high and cry Birds fly without destination Increased number of flies and mosquitoes # Insects attack cattle ** Fish jump in the rivers and ponds Crows/cockerels call/fly at night Frogs call constantly Foxes bark during the day Crabs come into the house and courtyard ****
OTHER	Bending trees Water hyacinth in the canal Leaves of the *mandar* and cotton tree turn upside down New leaves of trees fall to the ground Muddy smell on the wind *

* Up to one day before
** 1 – 2 days before
*** 3 – 7 days before
**** 10 - 12 days before
\# Most commonly mentioned across all four chars

Table 2.2: *Table to show precursors for cyclone activity determined by local villagers at risk from floods in Bangladesh. Source: Howell (2003)*

Howell (2003) further supports this idea of incorporating local populations into hazard management, with her work which focuses upon the importance of integrating indigenous knowledge into early warning systems for cyclones in Bangladesh. Howell finds that although Bangladesh has many nationwide warning

systems (which fit within more international warning systems), the local populations most at risk do not respond to the warnings due to a lack of understanding, or in fact a reluctance to leave their land despite the threat of drowning. Through interviews, Howell (2003) was able to determine the local indicators used by the communities to predict cyclone activity (Table 2.2). Although many of the precursors stated by the villagers are a little ambiguous, Howell states that by combining a number of the precursors, a form of early warning system can be established for the local population. Furthermore, if this is then combined with more modern techniques, for e.g. a flag system of flood warning, the local population can better understand the meaning behind each flag through their indigenous beliefs. Howell (2003) specifically highlights the usefulness of animal behaviour as a forecasting implement due to its wide application possibilities.

Through exploring potential differences between expert and lay groups, my work will highlight whether or not this is an issue which needs to be addressed. Regardless of whether or not such differences are revealed however, it is clear that an integration of the two viewpoints is essential for improved hazard management programmes. We must ensure however, that the scientific information/education is situation-appropriate to promote effective results, i.e. it is not over-simplified or too complex. The effectiveness of human action within the first few hours and days following a disaster is heavily dependent upon risk anticipation and perception (Siegrist and Gutscher 2006). For the 2008 Wenchuan Earthquake, this concept is particularly relevant as landslides and collapsed infrastructure severely hampered initial recovery efforts, leaving the survivors themselves to help others in trouble (Collins 2009).

***Figure 2.3**: Simplified poster in Urdu which explains the basic mechanics of earthquake science and explains what measure to take in case of an earthquake event. Source: Hamilton and Halvorson (2007).*

2.8 Conclusion

The key aspect which affects the well-being of communities living within hazardous areas, is their level of vulnerability to surrounding risks. Through a review of the relevant literature it transpired that there are a number of factors such as gender, age, ethnicity and socio-economic status (see Table 2.1) which all interact to either increase or decrease vulnerability. All such factors are everyday issues, which will have exerted influence over the Beichuan population acting to either raise or lower their vulnerability to the forthcoming 2008 earthquake. It will be interesting to explore the manner in which these factors interacted for the respondents involved in this research pre-5.12, but of equal importance is how these aspects are continuing to impact upon their well-being in the recovering post-earthquake community. This concept of well-being sets the background for the main focus of this project: to investigate risk anticipation. As discovered through the literature, there are several steps required before anticipation will be held. Firstly, it is crucial to have basic knowledge of the hazard phenomenon posing a threat to households. This in turn can act to raise awareness where individuals recognise the risk posed to their own possessions, in addition to the simple acknowledgement that hazards exist. As discussed previously, possessing knowledge does not necessarily lead to the realisation that one's own home will be affected by such a disaster. Once the awareness stage is reached, anticipation of the potential risk is more likely to be held. Once again, several factors have been identified which can influence levels of risk anticipation. Lack of risk anticipation has been attributed in past studies to factors such as seismic exposure (the availability heuristic), information availability, the influence of 'positive illusions', as well as the relative importance of other risks. However these factors can be influenced by the occurrence of a devastating disaster. Perhaps the most influential aspect is the affect of experience upon the 'availability heuristic'. Studies have shown that respondents' rankings of natural hazards can radically change in the aftermath of an event (as shown in section 2.3 by Burger and Palmer 1992, Johnston et al. 1999, Naeem and Okazaki 2006). The anticipation of earthquake risk within Beichuan is likely to have been low due to lack of seismic experience pre-2008, combined with the expected social ranking of everyday risks as more important.

It will be interesting to investigate the effect of the 2008 earthquake upon these initial levels.

To create practical differences from this research, the potential conflicts between lay and expert risk anticipation, together with the possible value of integrating the two perspectives have been considered. Fundamental to the formulation of these anticipations is the different types and sources of knowledge available to all levels of society. Integration of the two perspectives is necessary to create the most effective and widespread implementation of mitigation practices and emergency response procedures. Successful integration efforts are evident across a range of countries with regards to a range of hazards (e.g. Cronin et al. 2004, Halvorson and Hamilton 2009). From such positive moves, it is clear that integration of both expert and lay views is a step in the right direction, and should form the protocol for risk research. To reach its potential therefore, an understanding of local risk anticipation is crucial, which in itself involves an in-depth study of what influences such views and how ranking scores between different risks are allocated. As a result this study aims to identify any difference between risk anticipation of the Beichuan community before and after the 2008 Wenchuan Earthquake. From these differences I hope to identify what the most influential factors are in determining anticipation of risk. In turn this will improve understanding of the local population's anticipation of risk, leading to improved, more sustainable participation and efficacy of future mitigation development and emergency responses at the community level.

Chapter 3

Methods: a ‘bottom-up’ approach

3.1 Introduction

The original quote which I have adapted from Deng Xiaoping was "it doesn't matter if the cat is black or white, as long as it catches mice". The adapted quotes is a useful phrase to summarise my experience in China, as the main focus of research as always is to collect data. For many of the Chinese people helping me along the way it was difficult to understand why I wanted to interview those who were living in the temporary accommodation as for them, these people were 'illiterate' and 'would not understand my questions'. As will transpire throughout this chapter however, the class and social status of participants was not of importance for me as long as I was able to recruit a significant number of people to help with my project.

My fieldwork was undertaken in one session within the period 25th February 2010 to 16th April 2010, providing 7 weeks in total. This period followed the long break for Chinese New Year and therefore allowed collaboration with the Chengdu University of Technology and Science. An additional Durham University postgraduate MSc research project was also taking place during the last 3 weeks of my fieldwork period. On arrival at Chengdu University of Technology and Science, it was apparent that the research assistant planned to help with this project was unable to speak English. As a result my translator (Michael) was required to accompany the researcher (Sian) during the period of 28/03/10 until 16/04/10, reducing my available time for data collection to 4 weeks.

This chapter outlines how the fieldwork was facilitated and carried out. To attain a variety of data with an emphasis on depth rather than quantity, a number of methods were employed ranging across several different social groups. As such, each method involved the most appropriate participants to enable successful and detailed data collection. I will examine my own positionality as well as that of those helping with the research. Finally, I will review the challenges faced during data collection and discuss how these were overcome. The way this chapter is structured follows a combination of the order in which the methods were used, and a grouping together of social groups; in doing so, this helps to outline the participants involved in the study.

3.1.1 Approach and target participants

A key theme of the methodology planned for this research was Participatory Rural Appraisal (PRA). To propose a definition of this term would be of little use, as the methods and approaches involved continue to develop rapidly. However to set the context, Chambers loosely defines PRA as "a family of approaches and methods to enable rural people to share, enhance, and analyse their knowledge...to plan and act" (1992:1). The notion of PRA is participatory rather than extractive where 'we' act as facilitators to 'them'. Pain notes that in addition to strategic benefits, a PRA approach is also "one of the most exciting new areas for methodological development" (2004:655). As a result, I use participatory tools to promote an up-to-date research project. To achieve this, there are multiple methods available, some of which I hoped to employ within this study. Preliminary, the aim was to conduct a general survey of the town of Beichuan to gain an insight into the demographics and culture of the local community. Chambers (1992) suggests a 'do-it-yourself' approach with researchers getting involved with everyday tasks, being taught by communities thereby building up a rapport and encouraging trust between the participants and the facilitator. This focus upon building up a rapport was an important aspect for me, as if a good rapport can be built up in a relatively short time, the success of data collection is likely to be higher, and therefore I was keen to address this as soon as possible. Following this initial survey, the objective was to collect more specific data through interviews, focus groups, and both written and photographic diaries.

From previous personal visits to the Beichuan area, I had hoped to focus my fieldwork within temporary settlements on the outskirts of the devastated Beichuan town (Figure 3.1). However on arrival to this area, it became evident that many of the population originally settled in this area had since been relocated to other prefabricated settlements. Through correspondence with the Beichuan Library, I was able to find out that many of those who lived in Beichuan pre-5.12 had been relocated to a town called Yongxing, on the outskirts of Mianyang (Figure 3.1). Within this settlement it is estimated that

There are about 3,000 residents (as of 27.04.10) and as a result this provided a sizable population to sample from.

Figure 3.1: *Location of the two pre-fabrication settlements post 5.12 in relation to one another. Inset 'A' shows the site of the original settlement on the outskirts of Beichuan itself. Inset 'B' shows the relocated community to the outskirts of Mianyang, at Yongxing. The specific site of the two towns is marked by a*

In addition to Beichuan residents, I also wanted to focus my research upon women. As seen in the previous chapter it has been discussed by many authors that natural disasters disproportionally affect women more than men (see for e.g. Cutter 1996; Fothergill 1996; Hewitt 1997; Peacock et al. 1997, 2000; Enarson and Morrow 1998; Enarson and Scanlon 1999; Morrow and Phillips 1999; Morrow 1999; Wisner et al. 2004; Wood et al. 2010). As a result, if it is women who are more adversely impacted upon, it is women who must be both aware of and anticipate natural hazards, but also have the knowledge to prepare for and the means to react to disaster events. In addition, due to the focus of data collection being within Yongxing, the socioeconomic status of the women was predefined as 'Lao Bai Xing' or 'the common people'. Within Chinese culture this is by no means a derogatory term as perhaps it would be if used in the West, but rather the Lao Bai Xing themselves use this term when referring to themselves and each other. As a result I will use this term 'Lao Bai Xing' throughout when referring to this group of people, but stress that as for the Chinese I use it with no derogatory connotation. The reason that the Lao Bai Xing was the target group was due to the ease with which these women could be accessed due to their residence within Yongxing. Those who had had access to financial means in post 5.12 Beichuan were able to rent houses privately, however for those who were left homeless as a result of the earthquake, the government provided pre-fabricated settlements such as Yongxing. As a result, the Lao Bai Xing are grouped within such communities.

3.1.2 Positionality

It is important to subject the researcher to scrutiny and not assume that "the researcher is a disembodied presence, removed from the research process" (Smith 2010: 165). Skelton is a key author who has recognised that it is important to assess the 'positionality' of the researcher involved in research. She defines this term as: "...things like our 'race', and gender...but also our class experiences, our levels of education, our sexuality, our age, our ableness, whether we are a parent or not. All of these have a bearing upon who we are, how our identities are formed and how we do our research. We are not neutral, scientific observers, untouched by the emotional and political contexts of places where we do our research" (Skelton 2001: 98). As a young, single, educated,

white female conducting research in a foreign country, I was no doubt viewed as an 'outsider'. Many of the women involved in the research would ask why I was away from my family for such a long period of time. However this was asked with concern and women often treated me with maternal concern during our meetings. The women would always want to feed and water me to ensure my well-being whilst I was away from my own mother. Over recent years, the development of China has meant that middle-class women of 22 are likely to be concentrating upon their education and employment opportunities so in this respect my marital status was commonplace. However, the 'courageousness' of travelling abroad to conduct research was less familiar.

Amongst the working-class people involved in this research, I was definitely seen as privileged, however due to my youthful appearance and the maternal care I received, this did not seem to create 'power' issues as perhaps it would have with an older or male researcher. In this respect having a young appearance lessened my image of an 'outsider'. Whereas many researchers involved in projects within the developing world feel marginalised amongst their participants, I felt welcomed by most and often stayed to chat and eat with them pre- and post-data collection sessions. Although the respondents sometimes voiced their confusion over my reasons to involve them in my research, they were never critical or disrespectful of me. Overall, although a definite novelty within the wider community, I did not feel marginalised amongst those recruited for the research. To ensure the reduction of power relationships further, I made use of traditional terms of age-appropriate respect, "Ayi" meaning "Auntie" for those without grandchildren, and "Po Po" meaning "Grandma" for those with grandchildren. The women called me "Mei Mei", meaning "little sister" – a term used to address anyone younger than yourself. This suggests further than the women thought of me as a younger sibling or child as younger members with authority would have been addressed with a more formal term.

There were times when I was most definitely considered as an outsider, and in fact although my youthfulness proved an advantage amongst the participants, when dealing with official authorities it proved a disadvantage. Although not as marked as some cultures, there remain definite gender divides within China

which presented challenges at times for the research. In addition there is a clear hierarchy according to age within Chinese culture. Older males often worked in positions of authority and therefore when dealing with research permissions and asking for help, I felt largely marginalised due to my gender and young age. In this respect, I was far more aware of my positionality when organising and planning the research, rather than during data collection sessions themselves.

3.1.3 Research Permission

Obtaining permission to undertake fieldwork in China was a process that began whilst still in the UK. Firstly visas were required to allow me to stay in China for longer than 3 weeks and as I wished to conduct research, I had to apply for a student visa. This meant obtaining the support of an education establishment which would take responsibility for me and my work during my time in China. Durham University has well established links with Chengdu University of Technology and Science and therefore this initial permission process was relatively easy to obtain.

Once out in China however, the intended research period of 7 weeks was cut short to 4 weeks due to the additional research project. However this shortened period was further reduced due to the lengthy permission process I had to follow before I was able to undertake data collection. Due to the communist regime in operation in China, every action planned has to be authorised by a document with a 'red stamp'. Therefore there were several red stamps I had to obtain before being able to go out in the field. Overall therefore I had a period of 3 weeks to undertake the majority of fieldwork, although I was able to conduct further data collection during the additional research project when Michael was not required for Sian's work. This meant that the total period for data collection was about 4 weeks. Once the permissions had been authorised however, it materialised that certain actions were not covered by the documents and in these circumstances I was reliant upon "Guanxi" meaning "connections". Although the Chengdu University of Technology and Science was a nationally recognised institution, it became evident that in order to conduct research at the local level, the Beichuan Library managers (Mrs Li and Mr Tang) were more influential figures than a red stamp document. My youthful positionality which

proved an issue despite official permission, was over-looked when supported by Mrs Li and Mr Tang.

3.1.4 Participant Consent

Any form of official written consent would have been inappropriate for the majority of participants involved in this research due to the inconsistent levels of literacy amongst the Beichuan population. In addition, due to the complex Chinese political system, many people are unwilling to take part until the project is made official. As a result, I decided that a more appropriate level of consent would be to explain what I was asking of each individual and obtain consent verbally as recommended by Scheyvens et al. (2003). To further protect the respondents, no personal information was collected and as such the women were identified by age and characteristics only and the names used within this study are all pseudonyms.

3.1.5 Language and translation

One of the major challenges in focusing the research in China was language. I am unable to speak Chinese and as a result required the constant support of a translator and research assistant. In addition, half of the participants involved in the research were unable to speak standard Mandarin (Putonghua) but instead spoke a regional dialect called Sichuanhua. This meant that despite my best efforts to learn key phrases before travelling out to China, I remained unable to understand the sessions. Towards the end of the fieldwork period, I was able to follow sessions to a certain extent due to the nature of Chinese language characteristics. However despite an improved understanding my speaking skills remained absent due to the difficult 'tones' required to speak Chinese.

All data collection sessions were conducted in Putonghua or Sichuanhua. The use of interpreters is not the ideal situation for participatory research, however it was necessary to facilitate this research. I was present at all of the sessions and received a running commentary of the conversation allowing me to take notes. My translator was my brother, Michael, who is a white, British male, aged 30 and able to speak fluent Putonghua. As a result I was able to fully convey the nature, aims and intended outcomes from the research without linguistic barriers. Due to my existing family relationship with Michael I felt comfortable

letting him take charge of the interview sessions once I was certain he fully understood the nature of the research. However as part of the permission requirements, I had to also be accompanied by a Chinese national and as a result I was also helped by Natalie, a postgraduate geography student from Chengdu University of Technology and Science. Unfortunately however, Natalie was unable to speak English, and Michael although able to understand Sichuanhua, could not speak it. This resulted in a three-way translation process: Natalie would ask the question to our respondent and listen to the answer in Sichuanhua, she would then confirm with Michael that he understood the answer in Putonghua so that Michael could translate the response to me in English. This whole process would then reverse should I wish to ask any follow up questions which created a lengthy period in which the interviewee was not involved. To improve the flow for the participants, I decided to record the sessions. This meant that Natalie was able to conduct the interviews whilst Michael provided me with a running translation, allowing me to follow up any interesting points if necessary whilst sustaining momentum for the interviewees.

In addition to the immediate translation challenges, differences in how to map my concepts in Chinese also arose (also found by Twyman et al. 1999). The originally devised format of the questions had to be changed to ensure complete comprehension of the topics from Natalie and the women being interviewed. Direct translation of the English questions was not always possible, and some distinct language issues arose. A marked example was presented in the form of the word 'risk', a concept of crucial important to the research. Within Chinese, there are 2 words for risk, '**feng xian**' and '**wei xian**'; the former simply means 'risk' but the second can be translated as 'danger'. Initially I felt that using 'danger' would be too much of a leading question however it transpired that when questions were posed using 'risk' the women did not understand the questions. As a result the data collected was in response to perhaps more leading questions that was originally intended, however linguistic anomalies make the impact of this decision hard to determine.

3.1.6 Research assistants

To facilitate this research I employed one translator (Michael) and was provided with additional help from two research assistants (Table 3.1). The Chinese research assistants were a necessity to allow access to the Beichuan population as being accompanied by a Chinese national was a requirement of my permission documents. Although Michael was not a geography graduate, his lengthy residency in China meant he had a good understanding of the Chinese culture and his British nationality meant he was able to ask questions easily without linguistic barriers. The two Chinese research assistants (Natalie and Sue) were both human geography postgraduates meaning they had a good background to comprehend my research. However, Natalie was a member of the Communist Youth Party and therefore I was conscious about her position as an interviewer. As a result, I made sure that Michael intervened if she was seen to be influencing participants answers or diverting away from the project aims. Sue's positionality was similar to mine due to her young age (22) but Natalie was a few years older (27) and as a result she may have caused some power relations between herself and the participants. On more than one occasion, she was asked about government issues and how the women could resolve such issues. This will no doubt have had an influence upon the responses of the interviews she conducted.

Name	***Sex***	***Age***	***Marital status***	***Education***	***Employment***
Michael[1]	M	30	Single	MSc Chinese and Business	Export Manager
Natalie[2]	F	27	Single	MA Geography and Management	Student
Sue[3]	F	22	Single	MA Geography and Management	Student

[1] *Involved from period 25/02/10 – 16/04/10*

[2] *Involved from period 25/02/10 – 25/03/10*

[3] *Involved intermittently during period 25/02/10 – 16/04/10*

Table 3.1: *Research assistants involved in the project. Format based on Oven (2009).*

I was conscious of the gender relations within the research which is why I requested for female research assistants. I felt a female interviewer would be able to better associate with the women participants. In this respect I was wary of the presence of my brother Michael as I felt that he might eradicate the benefit of having female researchers. Being 30, educated, and male I felt he might be seen as intimidating for the women. However, the women involved in the research built up a good rapport with Michael and seemed to have a lot of respect for the fact that he was able to speak fluent Putonghua. Michael is a single male with no children, which in China is quite unusual. This meant that the women involved in the research were often very concerned about his well-being and asked me more than once: "Is your mother upset that Michael isn't married?". As a result, Michael received a similar form of maternal care, reducing the power relationship. Although the women called Michael by his Chinese name (a more formal acknowledgement than was used for me), in reality, his relationship with the participants was a better one than Natalie's. At times Natalie seemed to lack the will to interact with the women more than she had to. This suggests that regardless of careful positionality planning, rapport and relationship building is often dependent upon individual characteristics.

3.2 Methods used

3.2.1 Household Surveys

The first method employed within the field was collection of household surveys. The concept of collecting data via household surveys is not a new phenomenon within developing countries, however typically these surveys involve whole populations in order to produce large data sets (Deaton 1997). This method is seen as advantageous as it allows documentation of a large amount of data and therefore enables description of large communities without bias and within measurable levels of uncertainty (Groves 2006). However as countries develop and research topics cover more complex issues, refusal rates of household survey completion have increased, thereby raising levels of uncertainty and bias within data sets (Groves and Heeringa 2006). As a result, within this study I decided to execute the household surveys personally to ensure all elements of questioning were completed satisfactorily. The aim of this tool was to produce

an overview of the population affected by the 5.12 quake, to gain a better understanding of the community prior to more in-depth interview sessions.

Through collection of about 30-50 household surveys, I hoped to identify the demographics of the relocated population of Beichuan whilst making the research known to the community. By spending time within the town I aimed to build up a rapport with the residents in order to familiarise myself with them and reduce the image of being an 'outsider' (Chambers 1992). This method was to be used as the first form of contact with the potential participants before recruiting members for the interview sessions, focus groups and written/photographic diaries.

Due to the shortened time period available to execute all methods, the large number of surveys intended had to be reduced. Once the other methods were allocated a required implementation period, only 2 days were left spare to carry out the household surveys. As a result, I reviewed the method and decided that a more productive means of data collection would be to conduct some short preliminary interviews, to allow key questions to be tested out on the population. This meant that I was able to outline problems in language, culture and sensitivity and rectify these issues before conducting the in-depth interviews. On arrival in Yongxing on the first day however, it also became evident that there were permission issues restricting our access to the community; an initial hurdle to overcome came in the form of opposition from those helping us in-field. Despite obtaining the correct government permission, the local 'Management Office' insisted that we must be accompanied by two officials for all the household surveys; with a team of 4 already (myself, Michael, Natalie and Sue) this was an overwhelming number of people to answer questions to. As a result, I decided to split the team of 6 in two, thereby creating less intimidating presence for the participants but also enabling a larger data set to be collected. Unfortunately, this meant that I was not able to be present for all of the surveys but as I had been able to easily convey the aim of the project to Michael without cultural and language barriers, I am confident that the data collected by the two teams is comparable. At the end of the first two days a total of 15 household surveys were collected. Several issues had arisen which

helped me to assess my interviewing method and adapt it to the local setting and community.

3.2.2 Interviews

The long interview can be viewed as one of the most powerful tools for qualitative research (McCracken (1988). As the focus of this study is upon anticipation, and awareness, the in-depth interview is hugely useful for investigating what people 'think' and why Rubin and Rubin (2005). However, due to the in-depth nature of such long interviews, the sample required is much smaller than for questionnaire or survey focused studies (Weiss 1995). As a result, the original aim for sample size for this method was to interview 8 people for 3 separate sessions each. Within such interviews, Kvale (1996) has described the interviewer as a 'traveller', going on a journey with the participant and only returning to assess the data once fieldwork is complete. To put this more simply, interview sessions can be seen as conversations (Rubin and Rubin 2005), where unlike questionnaires and surveys, the questions posed to individuals can vary from interview to interview (Douglas 1985). Due to Natalie leading the interview sessions (as previously discussed) however, a completely undefined session may negate important aspects of the research. As a result, I decided to conducted more semi-structured interviews, developing a series of open-ended questions which would still allow participants to explore their own direction. This form of interview has been reviewed within the literature and found that with the presence of a 'script' the interviewer is able to control the topic of conversation whilst allowing the respondent to explore their own thoughts (see for e.g. Seidman 2005; Spence 2007). The importance for more open-ended data collection when focusing upon women is also stressed by Rubin and Rubin (2005) as well as Finch (1984) who suggests that through conducting more free conversation-like interviews, issues of hierarchy can be reduced and in fact through her own experience, she found that such an approach created a much better rapport between herself and the interviewees.

I planned to introduce the general topic of risk anticipations through asking preliminary questions, with the aim of encouraging the participants to explore their own views as they unfolded, rather than allowing my own opinions to direct

the sessions (see Mashall and Rossman 1999). I wanted to try and straddle a broad range of age and backgrounds through the interviews and therefore excluding gender and pre-quake location; there were no prerequisites for the interviewees. With the understanding that all of the participants would vary in personality, no specific interview time was allocated before the sessions, however a target of 1 hour was used when devising and creating the interview script. Although the interviews were only semi-structured, a script was devised with a list of key themes and example questions within each theme to guide the facilitator in the event of a very quiet or reluctant interviewee (as discussed by Seidman 2005; Spence 2007).

3.2.2.1 Changes in the interview process

Having attained all the relevant permissions and 'red stamps' through the household surveys, continuing on with the interviews was relatively straightforward. My biggest challenge here was not posed in the form of authority, but rather in finding people who were willing to talk to us for three separate sessions. Alongside the need for willingness, was also the preference for talkative participants; the more at ease with us and their feelings the women could be, meant that the results and information would be more beneficial for the research. Through the household surveys, I had met several women who seemed very welcoming and at ease when answering the questions. These women also spoke for long periods at a time, giving detailed answers to the questions posed as well as bringing up issues which they themselves felt important. As a result, the aim of semi-structured interviews was achieved with these women and I wished to involve them in the full length interviews. As the first interview session was very similar to the household surveys, I felt conducting it with those we had involved in the surveys would be too repetitious and therefore off-putting for the women involved. This means that for 3 of the interviewees (Grandma, Housing Lady and Restaurant Owner), the first session was not as detailed as the other respondents, however due to the nature of the women's original lengthy answers, I feel enough data was collected to compare with the other women. In addition to these three women, I recruited a further 6 women who all participated in the 3 interview sessions. I hoped that all the women involved would have lived within Beichuan at the time of the 5.12

earthquake, however as I subsequently decided to avoid those who'd experienced family fatalities this became quite difficult. All the women involved however were residing within the larger area of Beichuan County on the day of the 5.12 earthquake, with 5 of the 8 within Beichuan town itself (Figure 3.2).

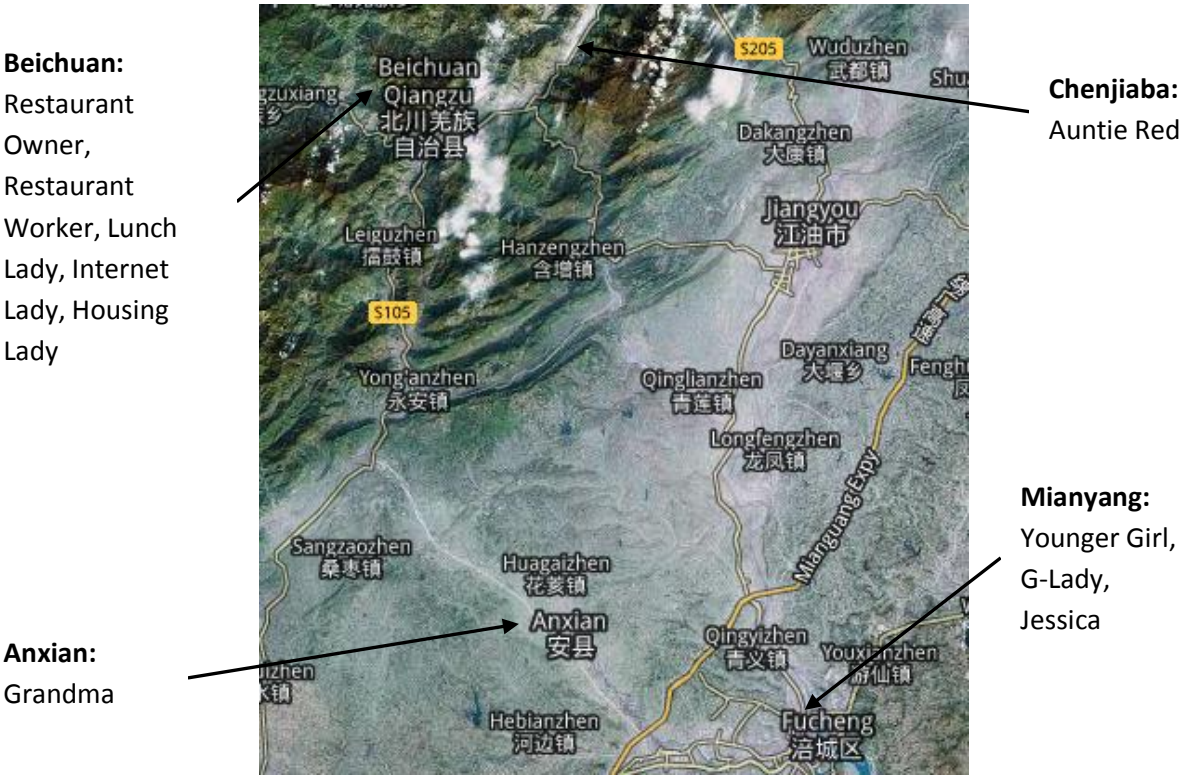


Figure 3.2: *Map to show the locations of each of the participants on the day of*

A second issue to arise came in how to record the answers given in the interview sessions. Due to the nature of the research only requiring a general impression, when planning fieldwork in the UK I did not feel that I needed to record the sessions. However, it soon became evident that this decision would need to be revised due to the lengthy translation process. I devised an interview script which Natalie could follow, covering all of the key topics I wished to cover with the participants. Each question was worded in an open manner allowing the women to interpret and respond according to their own understandings. This meant that Natalie was able to conduct the interviews whilst Michael provided me with a running translation, allowing me to follow up any interesting points if necessary whilst sustaining momentum for the interviewees. As a result I

decided to record the sessions to allow post-fieldwork analysis of the sessions. Having a running commentary of the themes arising allowed me to ask follow up questions, and the audio files would then allow me to read through in detail the women's responses. A knock-on effect of this change in structure however, was that I was unable to make such detailed notes, but the recordings undoubtedly provided more detailed results. This benefit of recording is supported by Kvale (1996) who states that if audio recording is possible, it enables the researcher to concentrate on the interview itself rather than writing.

Overall, the interviewing method worked well, with a total of 8 people completing the 3 interview sessions, which was better than expected. For all but one interviewee (Jessica) the interviews were conducted within the participants' houses or the local restaurant in order to promote familiarity and comfort for the women (as shown by Finch 1984). Extra family members were absent as much as possible but in some circumstances the women felt more comfortable with others present, and therefore demanding their departure would have been impolite and culturally insensitive. Sessions were pre-arranged when possible, but due to Chinese culture, pre-defined times were hard to enforce and as a result myself, Michael and Natalie spent all day within the pre-fab housing area, circulating the respondent's houses until we found them present. Certain visit times were avoided such as meal times and early afternoon (traditionally a rest period in China) to reduce inconvenience as much as possible for the women involved.

3.2.3 Focus Groups

In more recent years, the value and use of focus groups as a stand-alone method has been growing, however as Bloor (2001) identifies, their usefulness in this context can be limited. However, when employed as a complimentary method alongside other methods such as surveys and interviews, they can have an important part to play (Bloor 2001). The use of focus groups as an accompanying method is also supported by Stewart et al. (2007) and Kreuger (1988) who explore the different stages at which sessions can enhance data collection. Within this study, I chose to carry the sessions out towards the end of fieldwork as a form of "confirmatory method" (Stewart et al. 2007:41). My aim

was to conduct a proportion of the interview sessions primarily in order to investigate which themes arose and therefore provide a series of issues to explore further within the focus group sessions. Due to the nature of group discussions, the use of focus groups promote open responses, whilst also allowing the respondents to interact with each other on points of contention (Morgan 1997; Stewart et al. 2007). They act as a good compromise between completely uncontrollable participant observation, and easily controlled interview sessions (Morgan 1997). Focus groups can be seen as a useful method to collect a large amount of information in a relatively short period of time (Gibbs 1997). This aspect is advantageous for my research as the focus of the individual interviews was upon depth and understanding, therefore through conducting focus groups, although they will provide less detail per respondent (Morgan 1997), a broader range of data can be collected which can then be compared and contrasted with the long interviews. McCracken (1988) adds a further point of worth to this method through its ability to promote confidence amongst participants and therefore encourage greater involvement. However, in order to create such a favourable environment it is first necessary to recruit members which in itself can be a difficult task and as a result researchers must be prepared to arrange incentives for those who agree to participate (Gibbs 1997).

The original plan for this method was to enable a broader scope of Beichuan residents to become involved in the research. As many people find individual interview scenarios intimidating, focus groups can be used to create a more relaxed environment where the participants are in the majority and surrounded by their peers (Gibbs 1997). To promote a comfortable environment I intended to hold the sessions in a local restaurant and provide the respondents with drinks and snacks. Incentives such as meals included can help to generate willing participants (Gibbs 1997) and in China dining out is a big culture. Therefore I hoped that such an incentive would reduce the problem in generating interest.

3.2.3.1 Hurdles in Recruitment

After struggling to recruit enough women to interview, and following several attempts to engage further individuals into the focus groups, I decided that it was not going to be possible to employ focus groups within Yongxing. The reduction in time available to spend within the pre-fab settlement added increased difficulty in using this method. I remained keen to use focus groups as a complimentary research tool and so decided to broaden the sample of women to include students from Chengdu University of Science and Technology. This adaptation also allowed the time spent in Yongxing to focus upon the interviewees. To uphold continuity amongst participants as much as possible, the girls involved in the focus group sessions had all been living within Beichuan County at the time of the earthquake, although many were residing within schools situated in larger towns and cities than Beichuan.

I conducted two sessions, two weeks apart and there were 7 girls present at each. These two sessions were split up much like the 3 interview sessions, allowing similar questions to be posed to a different group of people. The first session concentrated upon risk anticipations in general, with the second focusing more upon earthquake related risk anticipation and understanding of science. I chose not to record the sessions, as Sue was available to help during these sessions and was able to speak English to a high level. As a result she provided translation throughout both of the sessions allowing me to take extensive notes. The sessions were also both video-recorded which allowed further analysis of the data collected at a later date. Each of the sessions conducted lasted about an hour and within the groups I employed as much participant involvement as possible; the girls were given ranking exercises as well as creating posters which they had to complete as a group (Figure 3.3). Although the direction of this method was not as originally planned, it allowed a broader involvement of participants as well as a more appropriate use of time. Each of the sessions was conducted on the university campus within a 'common room' available for students to use for social and study purposes. Due to the nature of Chinese education, I did not need to provide incentives for the girls to attend, however I was very grateful for their involvement and therefore I

provided some snacks at the end of the second session as a "thank you" to them.

Figure 3.3: *Photos showing the group ranking (A) and poster making(B) exercises within the Focus Group Sessions. Source: Author's own.*

3.2.4 Cameras

The use of the photo-diary has come to represent a very different way of gleaning information from respondents over recent years and this innovative tool is increasing in popularity amongst participatory social geographers (Pain 2004). Through distributing a set of disposable cameras amongst a set of participants, it is possible for the researcher to gain access to data without needing to be present at the time of collection. Much of the focus of this method has previously been upon young informants (see for E.g. Leavitt et al. 1998, Leyshon 2002), but more recently its importance within feminine geographies

has also been highlighted (Kindon 2003) with the emergence of the theory of the 'photovoice' (Wang 1999; McIntyre 2003). Harper (1998) suggests that through photos taken by the participants themselves during their everyday lives, it is possible to identify different levels of thought therefore an insight into evidence of behaviour. A sequence of photos is able to provide a visual narrative without the presence of the researcher (Harper 1998). As this study is focused upon women's attitudes and behaviour it is important to employ this method alongside the interviews and focus groups to provide an alternative inlet into the participants awareness and anticipation of risk.

The pre-fieldtrip intention for this method was to distribute a set of disposable cameras amongst the Beichuan residents at the beginning of the trip and collect them before returning to England. The aim was to ask residents to keep the camera at close call during their everyday lives and take pictures of factors that they considered a risk to their well-being. Through this, I hoped that I would be given an insight into the women's lives without having to be physically present. Visual methods such as this have shown in previous studies how when left unmonitored, respondents are able to express their perceptions more freely than during one-to-one contact with the researcher, as they are not influenced or guided in their results (Harper 1998; Latham 2003).

3.2.4.1 Adaptations to the photo-diary method

Due to space limitations, I planned to purchase a set of cameras once in China, however following several shopping attempts within Chengdu, it became apparent that it was not possible to buy disposable cameras in China. As a result Sian, who was arriving in China 4 weeks into my research, agreed to bring several cameras out with her. This therefore created time constraints upon the method and in fact, Sian did not arrive until my research time within Yongxing had ended. As a result I decided to distribute the cameras amongst the girls involved in the focus groups in Chengdu, to provide an added dimension to their results. The cameras were allocated to six of the girls at the end of the first focus group session and collected at the end of the second session. On distribution, I asked the girls to take 2 photos each day (within the 2 week period) of things that they worried about each day. If they felt that they

had no worries on certain days I asked them instead to take a photo of something that they felt was an achievement or to note that they simply had no concerns on that day (an example was to take a self-picture of themselves smiling). To accompany the cameras, I suggested that they noted down what they had photographed each day with a couple of sentences to explain why.

Due to the complications which arose with this method, I was unsure how productive the results would be, however I felt it important to employ regardless, to reveal the extent to which different methods work with different people. Through asking the girls to use the cameras in addition to taking part in the focus groups, it was possible to compare whether their responses during a group activity matched their individual thoughts. In addition it provided an insight into whether my presence influenced the responses given. In total therefore I collected six cameras, each with a roll of 24 photographs, and 6 pieces of paper to accompany each camera explaining what each image was and why it had been taken. I feel that the benefit of this method amongst the Chengdu students was limited and would not use this method within this capacity again. However I do feel that it would have produced worthwhile results amongst the Beichuan residents so would be keen to try this method amongst the Lao Bai Xing were I to repeat this research.

3.2.5 Diaries

Similarly to photographic methods, written diaries can be seen as a way to access individuals' thoughts and attitudes without having to be present during data collection (Latham 2003). In addition, further similarities are found in the fact that written diaries are evident within much of the youth literature (see for e.g. Leyshon 2002), and more recently has been applied to feminist research (for E.g. Kindon 2003). In the same way that cameras can provide a visual insight into behaviour and attitude, written diaries are a space where respondents can convey in as many or as little words as they wish, how and why they feel about the issue they have been asked to document. Unlike cameras however, this method does limit the contribution of the illiterate and in this respect could be seen as a biased form of data collection. Before arriving in the field, I was unsure about the level of literacy amongst the Beichuan

population; I knew that I wanted to primarily involve the Lao Bai Xing but did not know how educated these women would be. As a result, this was a method which would have to evolve once preliminary investigation had been conducted.

I intended to supply each of the women involved in the interview with a small diary and hoped that they would note down each day if there had been anything that they had worried about. The aim was to distribute the diaries during the first interview session and collect them in again once the last session had been completed. I did not want to force the women to complete this task for a great length of time, so I intended each to note their worries down daily for a period of 2 weeks and then if they wished they could continue until the last interview session but there was no pressure to carry on for this long. Each of the diaries included a small set of instructions on the front page to remind the women of the intended task and to promote the topic of risk anticipation.

3.2.5.1 Extending the participant group

Once present in Yongxing and having carried out several of the interview sessions with the women residing here, it became evident that many could not read or write. In addition, many of the women had very busy schedules each day involving work, housework and childcare and as a result I felt that it would be a burden to ask them to carry out a further task for the research. During fieldwork within Yongxing however I became acquainted with a set of student volunteers who visited the pre-fabricated settlement each weekend to help the elderly with chores. This group of students ranged in age from 15 to 19 and were studying at Mianyang High School. All the girls within this group were eager to help with research and as a result I decided to aim the diary method at this group of girls. As I only had 10 diaries to give out, I defined a series of prerequisites to meet in order to take part: the girls must be at least 16 years old (to avoid ethical issues of working with children), the girls must have been living within Beichuan at the time of the 5.12 earthquake, and the girls must agree to writing in the diary on a daily basis for a period of 2 weeks. This selection process was successful and a total of 10 girls produced a diary each noting down their worries and concerns during their everyday lives. In a similar way to the cameras, I noted that if they had no concerns on a particular day that they

should note down any achievements also. An advantage with this new research group was that the focus upon education in China meant that girls were very keen to take part and were more used to listening to and following specific instructions. The completion of 10 diaries can be regarded as a success for this method, but the accounts within the diaries were very much limited to teenage angst and as a result were not hugely insightful for the purposes of my research. I would be eager to reemploy this method should I redo this research, but would target a more mature set of participants.

3.3 Ethical considerations

The key ethical guideline within the literature is that which advises to 'do no harm' to participants (Kellehear 1989; Babbie 2007). This is a concept which has been much debated however with tension centred on the balance between research benefiting the participants in the long-run and protecting the well-being of the respondents (Collogan et al. 2005). For my research, this issue of causing no harm poses additional problems due to the delicate nature of post-disaster projects. Collogan et al. (2005) identify that disaster experience leads to both physical and mental stresses alongside changes in social conditions which all combine to create trauma for survivors. However Kellehear suggests that although there are clear guidelines surrounding 'do no harm' approaches, "there are no suggestions for dealing with participants when hurt and trauma are companions in the research enterprise" (1989:66). For my research, I tried to be empathetic with my participants and from initial surveys it became apparent that families would had lost close relatives during the 5.12 earthquake became very distressed during the sessions. This was upsetting for both the respondent and the researcher and as a result I decided to only involve women who had not lost close loved ones in the disaster. I feel as though I employed methods sensitive to the topic and as a result minimised the harm caused to my participants. As Kilpatrick proposes that "it is unethical not to facilitate research as long as it is well-designed an makes every effort to protect its research participants" (2005:362). I hope that the results from this study will be able to guide future mitigation practices in China in the best direction, and as a result feel it was necessary to conduct the research that I carried out.

The process of ethics has become formalised through the concept of informed consent (Collogan et al. 2005; Babbie 2007). As noted previously, the idea of written consent would not have been appropriate for this project, however verbal consent was given by all of those involved in research. In addition to formal consent, I have sought to protect my respondents through anonymity (as suggested by Babbie 2007). All names within this document are pseudonyms, including research assistants. The only cause for concern regarding this research for me, is the issue of communicating back the findings of my work, which I have yet to do. Kellehear (1989) states that the benefits for the researcher are clear in the form of increased knowledge, gaining qualifications and perhaps publications, but as Oven (2009) finds it is often difficult to decipher which findings would be of interest to the participants. For my research amongst the Lao Bai Xing, the women often voiced their gratitude that I felt they were important to my project and therefore I feel confident that they agreed with the beneficial aspects of the work. However, they also conveyed that they did not fully understand the intended outcomes. As a result I feel that it may not be effective to convey the direct findings of the research to the participants, but believe that the recommendations which come out the finding should be taken on board to help those involved in the study.

3.4 Compromises made

There were a number of compromises made within this research project. Firstly, I only spent a total of 4 weeks within the field and as a result, the degree to which I can completely understand the thoughts of my participants is limited. Although I was able to live close to the temporary housing site, I was unable to stay within the area and as a result could not fully understand the hardship encountered by the women in the post-5.12 community. To gain a certain level of understanding however I did spend 2 night within a pre-fabricated settlement in Leigu, during Sian's fieldwork due to a lack of hotel accommodation. This gave me some insight into the challenges faced by the women such as having no personal bathroom space or running water.

Secondly, due to the communist political system in China, I was advised to avoid politically orientated questions following the arrest of a social researcher 2

weeks before my departure (Branigan 2010[2]). Although the focus of the research was not concerned with politics, it is an inevitable aspect of disaster management, therefore avoiding this topic may have skewed data. Politics also created a certain amount of misperception of my work amongst some of the participants. Some of the women, although not asked, felt they needed to voice their anger at local authorities with the belief that I would be able to rectify the problems. This meant that for some women, a large proportion of interview sessions were irrelevant for my work. Finally, there is the problem of posing retrospective questions about pre-5.12 thoughts and anticipations. The accuracy of some responses to these questions could be doubted as the impact of such a large disaster will no doubt have caused mental effects (Collogan et al. 2005). However the collection of data less than 2 years after the disaster has hopefully reduced the negative effect of asking retrospective questions; Yarrow et al. (1970) identify that the greater the period of time required to recall, the less accurate the memory is likely to be. Nevertheless, it is a serious limitation which must be considered whilst analysing the data.

3.5 Summary

- The female population of Beichuan was the target group for this research, using a combination of interviews, focus groups and both photographic and written diaries.
- In total, 24 interview sessions were conducted in Yongxing, 2 focus group sessions took place in Chengdu, 6 disposable cameras were completed in Chengdu, and 10 written diaries were filled in Mianyang.
- I was accompanied by one translator (Michael) for the duration of the fieldwork and received additional help from Natalie and Sue, both postgraduate geography students from Chengdu.
- A number of challenges presented themselves throughout the fieldwork process, however solutions were thought up and the best adaptation for each problem was identified.
- I strove to uphold ethical issues throughout the research, protecting the women through anonymity and ensuring their voluntary participation through verbal consent.

[2] See http://www.guardian.co.uk/world/2010/feb/09/china-eathquake-schools-activist-jailed

- A number of compromises had to be made which must be taken into consideration when contemplating the results of this study. However, I tried to limit the impact of such compromises upon the final conclusions.

Chapter 4

Risk Awareness

4.1 Introduction

Although the main focus of this research is to reveal risk anticipations, it is also interesting to first review the levels of risk awareness; if local communities are unaware of potential hazards, it is very unlikely that they will anticipate the associated disasters. 'Awareness' within my research can be defined as not only possessing the knowledge surrounding earthquakes, but also recognising the potential for earthquakes to impact upon you as an individual. As discussed previously, 'knowledge' plays an important role in affecting awareness. Within this section therefore I hope to explore the levels of knowledge and awareness held by the Beichuan population before the 5.12 earthquake and to reveal whether or not the event has impacted upon these levels in the post-earthquake community. Before exploring the results, I will briefly review the literature surrounding knowledge and awareness to allow a more comprehensive understanding of the results presented from this research.

The distinction I argue here is that knowledge is the first key step to anticipating, preparing and therefore reducing losses from natural disasters (figure 4.1). Without knowing that a potential hazards exist, communities are unaware of associated risks and are therefore much more vulnerable to the consequences of natural disasters. The basic knowledge of local risks can take many different forms from local folk tales to formal education and no type of knowledge is superior to another in its ability to raise awareness. Halvorson and Hamilton (2007) define this local level knowledge as "seismic culture", which "is one in which adaptations to seismic hazard become ingrained in society through knowledge sharing, indigenous building practices, vernacular architecture, and so forth" (pp. 322). Unfortunately, an absence of knowledge leads to an unaware population, which in turn is therefore more vulnerable to imposing disasters. Through further research into the Kashmir earthquake, Halvorson and Hamilton (2009) reiterate how a lack of knowledge creates a lack of awareness which in turn therefore leads to a lack of anticipation and ultimately a highly vulnerable community at great risk of loss and damage from disasters. However an increase in knowledge does not necessarily lead to greater levels of awareness as was noted by Solana and Kilburn (2003) (also see for example:

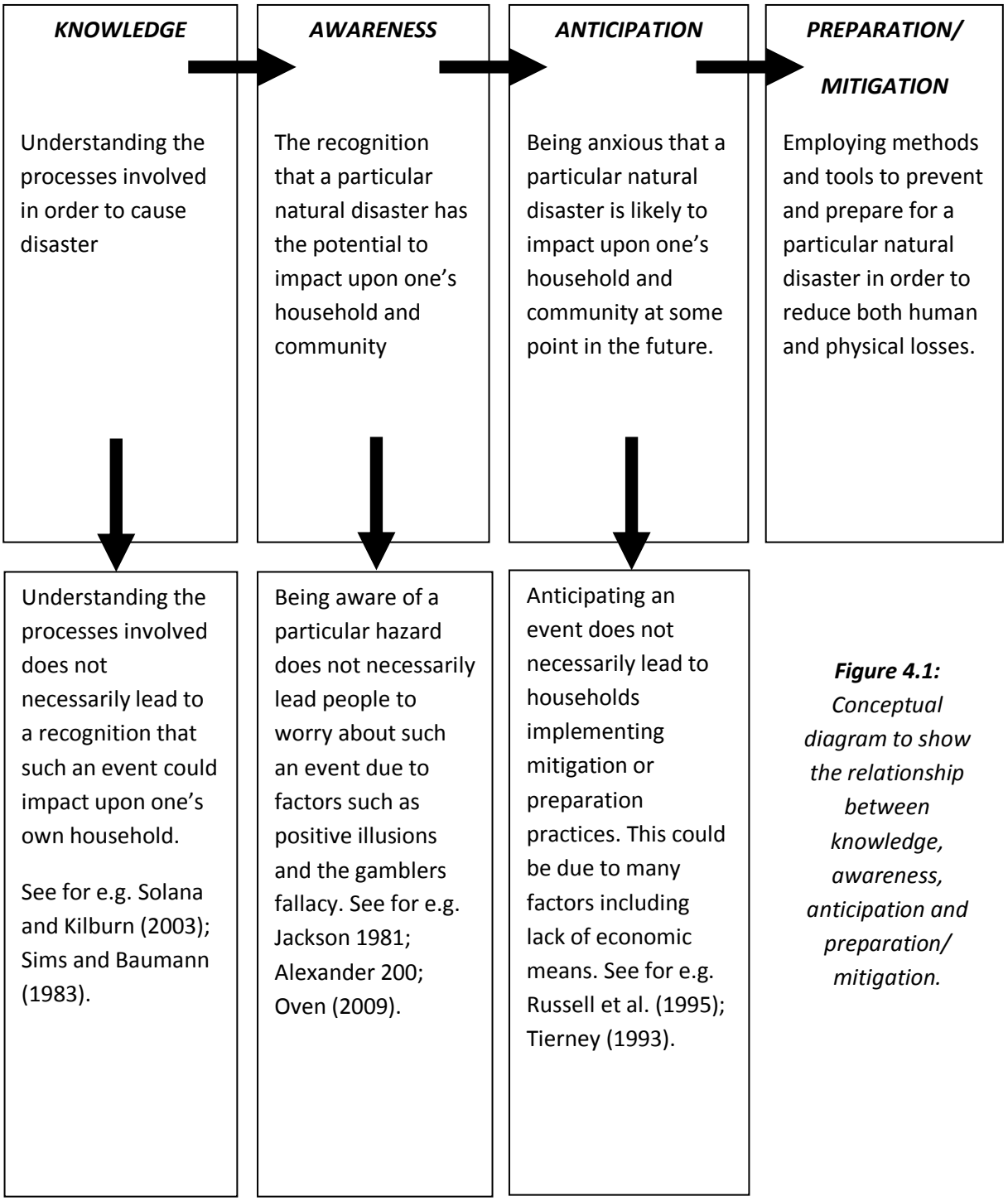


Figure 4.1: *Conceptual diagram to show the relationship between knowledge, awareness, anticipation and preparation/ mitigation.*

Sims and Baumann 1983). In their study of landslide risk perception on the island of Gran Canaria, it was revealed that despite knowledge of almost 2000 slope movements, neither the local population nor government authorities recognised that they posed a serious risk, and as a result awareness of landslide risk was low. In many circumstances however, a higher level of knowledge often results in a greater awareness of potential hazards; within this study, being 'aware' requires the recognition that a particular event poses a real

threat to the local area. Through research into risk awareness of seismic hazards in Istanbul, Turkey, Tekeli-Yesil et al. (2006) found that local populations “demonstrated relatively good knowledge of the earthquake risk and its consequences...Participants typically knew what kind of a risk existed in particular parts of Istanbul: those from Bakırköy were aware that their district is characterised by relatively more risk due to its proximity to the fault and less stable soil conditions, while those from Beykoz knew that their area is characterised by relatively less risk. Participants also knew quite well what kind of consequences Istanbul would endure in the event of an earthquake” (2006: 916).

The authors noted that for the majority of respondents knowledge had been gained through scientific statements in the media. This suggests that information is readily available for the residents of Istanbul, allowing them to increase their knowledge about earthquakes and subsequently become more aware of the potential dangers that they face. As with knowledge, types of information are wide ranging from formal education to local hearsay. Riad et al. (1999) noted that formal education can act to “facilitate a better understanding” (1999: 9222) but as seen previously through work by Halvorson and Hamilton (2007) traditional beliefs passed down from generation to generation can play an equally important role in increasing knowledge and therefore hopefully increase awareness.

Burningham et al. (2007) indentify a number of factors which interplay to increase or reduce awareness such as age, class and tenure and experience. Within this project I am focusing upon the impact of experiencing a devastating event and therefore through my research in Beichuan I hope to reveal any changes in awareness as a result of experiencing the large 5.12 event. It is interesting to look first at what previous studies have found when investigating the effect of experience upon risk awareness. Sims and Baumann (1983) found through a study into hurricane evacuation that experiencing a disaster in the past can have different effects upon future awareness. In some instances past experience increases awareness and as a result also influences anticipation and modification. However experience can also have the opposite effect and in the case of hurricanes, past experience of false alarms can lead to communities

reassessing the potential impact and in turn awareness in fact decreases. In this case it seems that frequency and severity of past disasters act to influence awareness of future events (Waterstone 1979). However Shaw et al. (2004) question this heavy influence of experience and through their study into earthquake perception in Japan, found that other factors were more influential. Through interviews with Japanese students the authors found that education and family influence has a greater impact upon risk awareness than experiencing a disaster (Shaw et al. 2004). It seems therefore that the literature is inconclusive as to whether or not disaster experience can alter awareness of future events and so it will be interesting to explore whether the 5.12 earthquake has changed levels of knowledge and awareness of earthquakes amongst the Beichuan population.

4.2 Pre-earthquake awareness

I will firstly explore the level of knowledge held by the women prior to the 5.12 earthquake. Initially, from asking the participants about their pre-5.12 earthquake awareness it seemed as though levels were low as the women felt they had little knowledge of the seismic threat in the area:

> "...how did I know there was going to be an earthquake...?"
>
> *Restaurant worker*

> "...I've never heard big reports about earthquakes, so I didn't worry about them."
>
> *Jessica*

> "...we had absolutely no idea that there was going to be an earthquake."
>
> *Grandma*

However through digging a little deeper in subsequent interview sessions, it became apparent that levels of awareness were higher than I originally believed. For many of the women, they associated their lack of awareness with a low level of knowledge due to a lack of formal education which had resulted in most being illiterate. This illiteracy was, for the women, the reason behind their

limited understanding of seismic potential in the region. However, it emerged that there was in fact a folk tale that had been circulating in pre-5.12 Beichuan which acted to increase knowledge therefore raise awareness within the community. According to the women now living in Yongxing, the older generation had been recounting the tale which said that Beichuan would one day be 'bao jiaozi' (made into a dumpling); the mountains would slide down into the town and wrap up both the houses and people living in the valley. In other words, the people would become like a meat filling, wrapped up by the landslides acting as dough. All the participants who lived in Beichuan at the time of the earthquake had heard this analogy, even those who were not originally from the town, and regardless of age. It becomes apparent therefore that levels of knowledge of natural disasters were higher than the women recount. In addition, there was a further myth circulating which was raised through the interviews, which concerned the location of Moaba Middle School.

G-lady told of how the popular Chinese folk tale 'Journey West' had been adapted to Beichuan, with one of the God-like characters, 'Erlangshen', reported to have stamped on Beichuan in the past. According to G-lady, a pile of 'wild boar' rocks (a phrase used to describe very large rocks the size of buildings) in Maoba village marked the site where Erlangshen had stamped on Beichuan. These large rocks had been flattened in order to build Maoba Middle School, but when the 5.12 earthquake hit, it triggered a huge rockfall which completely buried the school, described by some as Erlangshen stamping on Beichuan for a second time (figure 4.2 and 4.3). In this respect in seems as though the dumpling analogy had come true; part of Beichuan had been 'bao jiaozi'. However, despite this knowledge circulating, it seems as though awareness levels remained low, with the women failing to recognise the real potential for seismic activity within the local area. The argument that a lack of formal education can lead to lower levels of awareness, can be supported by the difference in response from a highly education person. For the second and third interview sessions with Housing Lady, her Husband was also present, and it became apparent that he had had a very high level of earthquake knowledge pre-5.12. I wanted to understand why so decided to ask more about this greater

knowledge in comparison with the women I had interviewed and so decided to ask a few more questions specifically aimed at him.

Figure 4.2: *The Maoba Middle School Rockfall, described as Erlangshen stamping on*

Figure 4.3: *The school flag and basketball hoop were all that survived the rockfall which crushed Maoba Middle School. (Source: Authors own photograph)*

Although not female and therefore not a focus of the study, I felt it was important to find out the channels of knowledge that he had been privy to, which were seemingly not accessed by the women involved in the research. It transpired that Grandpa had worked for the government in the 1990s, involved in the research team in charge of deciding the location of a new cement factory in the Beichuan valley, south of Beichuan town itself. Through this employment, Grandpa had learnt of the fault lines running through the valley due to the importance of not locating such a large structure in close proximity to active faults. As a result he knew of the seismic threat faced by Beichuan and this knowledge acted to increase his awareness of a potential large event in Beichuan in the future. However, perhaps surprisingly, this awareness seemed not to have been passed on to his wife, Housing Lady. When asked whether or not she had been aware of the earthquake threat pre-5.12, she claimed that she had not known that there was the potential for a large seismic hazard and therefore was not aware of the risk. In response, Grandpa claims that he had told her about the earthquake potential many times before. Perhaps then, although Housing Lady had been told about the seismic potential of Beichuan, but lacked understanding due to minimal education about earthquakes, she remained unaware of the earthquake risk in the area. This raises the issue of the fact that knowledge and information does not necessarily lead to awareness.

This idea is supported by the fact that the older participants also recounted their memories of evacuating Beichuan following the 1976 Tangshan earthquake in China. These stories suggest that the residents therefore knew about the potential for large earthquakes in the area, however as shown with Housing Lady, this knowledge did not necessarily transpire into awareness. This break in the chain between knowledge and awareness has been highlighted by Solana and Kilburn (2003) and can perhaps be attributed to the common notion of “it won’t happen to me” (Jackson 1981). It seems as though amongst ‘at risk’ populations, residents are often fully equipped with the knowledge about potential disasters, however for some reason do not believe they themselves are vulnerable to such events. The literature outlines several reasons behind why communities lack awareness despite having some level of knowledge such

as lack of or over experience with a certain disaster or a lack of formal education (see for example: Riad et al. 1999; Sims and Baumann 1983; Shaw et al. 2004; Waterstone 1979). I therefore hope to investigate these factors and perhaps reveal other factors in addition through further analysis of the interview sessions.

4.2.1 Levels of education pre-5.12

It is important to explore the level of education that was available to the participants before 5.12 to fully understand their levels of knowledge. If the women are attributing their low levels of awareness to low levels of knowledge this suggests that any type of earthquake education in the past was limited. For the Mianyang school students and Chengdu university students it was apparent that they had received lessons regarding what to do in the event of an earthquake, being allocated an evacuation route and being made aware of how to protect themselves if unable to escape. However, such formal education does not seem to have been available to the older generation who were living in Beichuan. These women recall how the main method of education for them was through government posters throughout Beichuan, or simply from hearsay around town as seen in the folk tale examples. However, the type of information communicated also differed from the school children's, with an emphasis on precursors and more specifically animal behaviour. Following the 1976 Tangshan earthquake, the Chinese government focused their earthquake education and mitigation practices on the average person, the Lao Bai Xing. The belief was that animals acted peculiarly in the days, hours and minutes leading up to an earthquake and therefore through monitoring pets and stocks carefully, those at risk would be able to identify a forthcoming earthquake and take precautionary measures (Alexander 1997). Grandma recalls how this policy targeted the Lao Bai Xing by educating a few government workers who were then expected to transfer this knowledge to the wider community through word of mouth:

"...we had a meeting then in 1977 and the earthquake department told us...to go and tell the public about the earthquake belt, they called it the fault line, about the earthquakes in Anxian, why there had been shaking for several months."

Grandma

However Grandma goes on to reveal that this meeting was a one-off activity and in the 10-20 years before the 5.12 earthquake there was no subsequent reminder about the seismic potential within Beichuan County. Jessica reiterates this point about pre-5.12 earthquake education within Mianyang High School, stating that her main sources of information to increase her earthquake knowledge came from the television and her parents. When asked about more formal education within school lessons she responded:

"...we don't often have them in school...If there hasn't been a very big disaster [recently], it's probably unlikely that the school will mention these kinds of things".

Jessica

This focus upon increased education in the immediate aftermath supports Grandma's story of her 1976 experience and it seems therefore that unless the government is reminded by a large national or international catastrophe of the potential damage posed by seismicity, they are unlikely to enforce any form of formal education. Li (1991) identifies similar findings in his research following the 1976 Tangshan earthquake which assessed pre-quake knowledge origins. He found that friends, family and hearsay were the most common source of earthquake information. However within the same study, it was found that 95% of respondents stated that the most reliable source of information was the government. As a result therefore it could be said that the most readily available source of information is presented in the form of family, friends and folk tales, however the most reliable source of education is the government or scientific communities. For the residents of Beichuan this does also seem to be the case; the dumpling analogy and Erlangshan tale were the most readily recounted forms of knowledge, however the most specific and accurate knowledge lay with the local government office and those who worked within it as shown by

Grandpa's response alongside correspondence with local academics. However, throughout the interviews it was clear that the women had knowledge of international disasters too, as large events such as the earthquakes in Haiti 2010, Chile 2010 and Qinghai, China 2010 were reported through the media. Although this could be considered a form of hearsay as individuals did not always watch the news programme themselves but rather heard about the reports from family, friends and neighbours.

From the previous sections I have revealed that the women living in Beichuan possessed a level of earthquake knowledge prior to 5.12. I now wish therefore to explore why this knowledge did not lead to a level of awareness amongst the women. Heightened provision of information of any type in hazardous regions can cause an increase in disaster awareness and therefore lead to improved mitigation and modification practices (Siegrist and Gutscher 2006). However regardless of the level of knowledge held, individuals and often whole communities possess positive illusions (Burger and Palmer 1992), believing that such an event "won't happen to me (us)" and is more likely to impact upon others rather than they themselves. Such an opinion was revealed as commonplace amongst Hong Kong and Australian populations through research conducted by Finlay and Fell (1997) regarding landslide risk anticipation. In this case, the informants showed that they understood the threat posed by landslides however lacked the awareness that such hazards could impact upon their own lives. This possession of knowledge not necessarily leading to awareness is reiterated by Paul and Bhuiyan (2009) as optimistic bias.

4.2.2 Issue of shaking vs. large earthquakes

A key issue which arose from all the interviewees as well as during the focus groups was that the women had never experienced an earthquake before, and for them, this was a major cause for their lack of awareness. However, through the latter interview sessions in particular, it became evident that the participants' definition of an earthquake differed from mine. For them, there was a clear differentiation between 'normal shaking' and a large earthquake. To provide context, a 'normal' earthquake would be shaking felt below approximately

moment magnitude (M_w) = 5.0, whilst a large earthquake would constitute events with shocks of greater than M_w = 5.0. Many of the women now residing in Yongxing talked about how there was a huge influencing factor which had lead to a large number of avoidable deaths; the residents of Beichuan thought that the initial foreshock was just regular "shaking" which the town was very accustomed to. As a result many people didn't react to the first low level shaking but remained inside when the main shock hit and therefore were unable to escape. This reaction is epitomised by recollections of behaviour on the 12th May 2008:

"I said it seems like there's going to be an earthquake today. And then I went back to my butchering...But how did I know it was going to be so big afterwards? I wasn't bothered by a few seconds of shaking like that. Aaahhh, but then the second part, it shattered everything, shattered, shattered... A lot of people died for this reason, if they had started running after it shook for a few seconds, then so many people wouldn't have died. But they didn't think there would be any shaking afterwards and then the big earthquake hit..."

Housing Lady

"I'll give you an example, a simple example. There were some people, four people playing mah-jong at a table, Sichuan people love to play mah-jong (...) Then it shook a bit, they carried on playing because they all thought they'd seen these earthquakes before, so they didn't get up...But when it came to the big earthquake, they couldn't escape by running...Too many people died because of this."

Lunch Lady

The above responses were echoed by several of the women interviewed, and it seems that for Beichuan residents, a few seconds of low-intensity shaking was a regular occurrence, happening at least once a year. For the participants therefore it seems as though intensity is the most important aspect in term of earthquake characteristics. This local differentiation according to size is also found by Paul (1983) in his study on flood risk perception in Bangladesh. Within his study, Paul found that the local communities named normal undamaging

floods (ones which do not overtop onto village mounds) as “barsha”, whereas damaging, disastrous flood events (ones which cause widespread damage to crops and properties) are classed as “bonna” (1984: 9). This notion of defining events according to size was found to be common amongst the women of Beichuan.

From these accounts therefore it seems that the regularity of low intensity shaking had skewed the seismic awareness for the residents of Beichuan. The effect of personal experience influencing future awareness is discussed by Sims and Baumann (1983) who suggest that for severe rare natural hazards such as earthquakes, populations are unlikely to have a sufficient amount of experience to allow them to generalise for future events. Saarinen (1979) exemplifies this notion through work on Hurricanes in Missippi; it was found that the majority of fatalities were from those who had tried to “ride out the storm” (1979:2) due to past events having much smaller magnitudes. For the population of Beichuan, experience of earthquakes was limited to a few seconds of low intensity shaking once every year or two. As a result although the community had an awareness of small earthquakes, perhaps their awareness of >5.0 magnitude events was more limited. Waterstone (1979) highlights the effect of prior hazard experience claiming that it can be “The single factor identified as an important predictor of hazard awareness” (1979: 39). As a result therefore it seems that one of the contributing factors to a low awareness of earthquake potential was not a lack of knowledge of seismicity, but rather limited knowledge of the potential magnitude.

4.2.3 Different levels of awareness

Another interesting issue which arose from the interviews was the difference in levels of awareness between the Lao Bai Xing and higher levels of society. For some, such as Grandma, the difference in class had no impact upon realising the seismic threat pre-5.12:

“No-one knew. At that time, not even Beichuan County Head didn’t know...The government officials, the police, these kinds of people none of them knew”.

Grandma

However, it seems as though Grandma was misled in this belief. From speaking to both western and Chinese geologists with lengthy experience of research in the Longman Shan region, it appears that the seismic threat was definitely known, at least at the local government level. As seen in the methodology section of this thesis, in order to conduct any type of research in China, it is essential to have the cooperation of the local government. As a result, during both Chinese and Western research trips to Beichuan County, it is inevitable that local government officials would be aware to a certain extent at least of the research findings for the area. In fact, the government office in Sichuan responsible for earthquake science, were trenching the fault line in Beichuan as early as the year 2000 (Densmore pers. Comm.). This viewpoint is supported also by some of the respondents. Grandpa's role in locating the Beichuan cement factory has already shown a level of government awareness of the local seismic threat, and this is echoed by Restaurant Owner. She talks about how her nephew worked for the "earthquake office" and as a result was privy to scientific information concerning seismic potential. As a result therefore it seems as though higher societal classes had been aware that the potential seismic threat was high, and had been for many years. The key fact then, seems to be that this awareness was not communicated down to the community or individual level of the Lao Bai Xing. This ambiguity surrounding government awareness is attributed by Restaurant Owner as a result of regulations imposed by the research offices. She states that although her nephew was aware of the seismic potential in the region, he was unable to share such information with his family:

"...the department always had a regulation, so their families never knew. He didn't dare tell us about such information."

Restaurant Owner

However Restaurant Owner later reveals that her nephew died in the earthquake so how she came to know his seismic awareness pre-5.12 is unclear. It seems therefore as though there was a higher level of awareness at the government level, in comparison with the Lao Bai Xing. It is unclear

however why this was not communicated down to the local Beichuan population in order to try to increase awareness of a potentially damaging earthquake. In Post-Mao China, the culture of liability is ever-increasing (see Potter 1994 for e.g.), however this change in culture has yet to permeate down to the local, especially not to the rural, level of communities. Rather, the more widely spread attitude amongst the Lao Bai Xing is the notion of 'fate' where the events which occur in life are "nothing less than the order of nature" (Harrell (1987: 92). That is to say that the awareness apparent at the local government level would perhaps not have been perceived in the same light amongst the Lao Bai Xing due to their cultural ideologies.

4.3 Post-earthquake awareness

For many of the participants involved in this research, the impact of experiencing an earthquake is not as straight forward as examples in the literature have investigated, due to the complication of relocation. All but one of the residents interviewed in Yongxing will not be returning to their original homes, therefore their post-earthquake seismic awareness will relate to a new site rather than Beichuan. For Auntie Red, Jessica and the focus group students, a more direct comparison of before and after can be made, as this group are either currently living in the same locations, or will be moving back in the near future. As a result, I will discuss the impact of 5.12 upon awareness of each of these groups in turn. Before doing so however, it is interesting to investigate whether or not the respondents have an increased understanding of earthquakes two years after the 2008 event.

4.3.1 Earthquake understanding post-5.12

The level of understanding of earthquake mechanics ranged amongst the women, however there appeared to be no influence of class or age behind the different groups. At one end of the scale was Restaurant Owner, Restaurant Worker and G-Lady who all stated that due to their illiteracy, they had no idea why or how the earthquake had occurred. G-Lady said she knew about the fault line running through Beichuan, however this was only after the interviewer brought it up. The next group of women had a greater knowledge of the cause of earthquakes, however I remain unconvinced about the level of understanding

behind this knowledge. This group consisted of Lunch Lady, Housing Lady, Grandma, Auntie Red, Younger Girl and the majority of the Focus Group students, who all talked unprompted about the fault line, although the actual scientific term ‘fault line’ was not always used:

“I think they said there was an earthquake line...”

Younger Girl

“ ...earthquake, seismic thing, seismic, earthquake, that thing...”

Housing Lady

For this group of women, the fundamental reason which was given almost unanimously, was because Beichuan was located in the mountains, therefore it seems that for them, earthquakes are associated with mountainous rather than flat areas. This is an interesting concept to consider, as the location of New Beichuan is on a wide flat plain and so will be discussed in more detail later in the chapter. Although these women knew about the fault line, none of the women talked about how the fault line had caused an earthquake, which suggests that the level of understanding of seismic mechanics remains low. Amongst all the participants, only Jessica talked about the movement of plates, and in fact correctly identified the plates involved in the 2008 earthquake. This could be because she is currently at school and therefore potentially received a more formal education in the aftermath of the quake, however the girls involved in the focus groups were also at school following 5.12 but their understanding remained low. This could be a result of the different types of education available and their relative success amongst different types of people. The link to education availability however is challenged once again by Housing Lady and her husband. Grandpa unsurprisingly had a high level of scientific understanding of earthquake mechanics and during the interview session it became clear that he felt he had relayed this knowledge on to his wife. However her original individual answer had shown that her knowledge was limited. This therefore reiterates the notion that availability of information and education does not necessarily lead to increased knowledge and understanding (see for e.g. Solana and Kilburn 2003, Sims and Baumann 1983). For example, women who left school after primary level will not necessarily find a formal hazard education

programme enlightening and as a result it is important to research how different types of education can benefit different people. Kandel (2008) focuses his research upon the human memory and how this brain function works: "...the brain's storage is...always a mixture of many facades of the past event: images, pictures, feelings, words, facts and fiction...". As a result it is important to recognise that within my sample group of women, the way in which they process and retain information differs which is an important factor to consider within the following chapter focused upon how to promote hazard awareness and mitigation.

4.3.2 Group returning to original homes

The group of participants who were able to return to their homes or will be doing so shortly consists of Jessica, Auntie Red and the Chengdu focus group students. Due to the different locations of the women at the time of the earthquake, the effect of 5.12 upon awareness of future events also differs. The students involved in the focus group were all living within Sichuan Province at the time of 5.12, however none of the girls were living in close proximity to the epicentre, and as a result the shaking was not as strong. For this group therefore they appear more aware of the possibility that future earthquakes could hit, but the feeling that one as large as 2008 would hit Chengdu itself seems low. Jessica, who was in Mianyang at the time and so would have experienced fairly strong shaking, appears to be more aware of earthquakes now than before 2008. For her, the seemingly increased occurrence of large earthquakes globally in the past year, have made her more aware of the threat within China. Perhaps the fact that her parents live in a remote area, which was severely affected by the earthquake, acts as a constant reminder to remain aware of seismic threat. Within this returning group, the person most severely affected by 5.12 was Auntie Red, and she has had the most drastic increase in awareness. Her village of Chenjiaba was hit heavily by landslides triggered by the earthquake, and it is this, alongside other secondary hazards, that she has become more aware of. During the second interview session, Auntie Red described how on the day of the 5.12 earthquake, all the mountains that she had known since childhood collapsed and buried many homes. Therefore, her direct experience of 5.12 has increased her awareness of future events, despite

the fact that her level of understanding of the processes behind such disasters appears to be low.

A more straight forward analysis of the effect of experience upon this group is possibly due to the fact that they will be living in the same locations as pre-5.12. On average it seems that the women have become more aware of earthquake propensity than prior to the 2008 event. Burnigham et al. (2007) support this idea that direct experience of a large damaging event acts to increase awareness to a repeat occurrence in the future. Through research into flood awareness in the UK, they found that individuals with experience of flooding were “four times more aware than those with no experience” (Burningham et al. 2007: 224). Anderson-Berry (2003) also revealed how hazard experience can impact upon risk awareness through her study of cyclone awareness in Cairns, Australia. Here Anderson-Berry found that experience takes two forms: direct and indirect. Indirect experience can be classed as either hearing about large past events through family and friends, or experiencing a ‘non-event’; a warning is released concerning a potential cyclone but the storm never hits. In the latter case, the impact can actually be negative, where a number of incorrect warnings lead populations to become less aware. However the same study reveals that direct experience of a large devastating event heightens risk awareness to repeat disasters (Anderson-Berry 2003). In agreement with these studies, it seems as though the Beichuan women able to return to their original homes are much more aware of seismic potential now than pre-5.12 as a result of direct earthquake experience.

4.3.3 Group relocated to New Beichuan

For the women who are unable to return to their old houses however, the affect of the earthquake upon awareness is more complicated. It was revealed that the participants believed there to be strong correlations between mountainous areas and earthquake occurrence. As a result, their awareness of earthquakes were they to be returning to the original site of Beichuan Town, would presumably be higher than before 5.12 due to the realisation that seismicity was a threat in the area. However, it seems as though by relocating the town, their direct experience is having a lesser impact. A key fact within this is that New

Beichuan is situated on a large flat floodplain area in the Sichuan Basin, rather than its previous mountainous location within the foothills of the Tibetan Plateau. The link between flat areas with low seismicity therefore seems to have counteracted the impact that direct experience had on those who were returning to their original homes. Through a potentially misleading understanding that earthquakes occur more readily in mountainous regions, the women in Yongxing are not equipped with the knowledge that there exists seismic potential within the new town. The awareness gained through experiencing the 5.12 earthquake, rather than benefiting the community for the future as it will for the returning group, has limited benefit for the relocated group, as it is not directly transferrable to New Beichuan. In some respects in can be shown as an example of erosion of disaster culture demonstrated by Halvorson and Hamilton (2007). The stories of the 2008 earthquake which will no doubt be told down through generations as with the dumpling analogy and Erlangshan folk tale, will not be as resonate and impacting upon the community as for those who are returning to the scene of the disaster. However through conversations with Grandpa, it was evident that if an individual has a desire to learn about potential risks to New Beichuan, it is possible to do so. From researching the site of New Beichuan on the internet and reading relevant books, Grandpa had learnt where the fault line ran throughout Beichuan County and as a result had gained an awareness of seismic propensity to the new town:

"...this place is not on the fault line...[it's] 3 km directly from the fault line, that's 3000 m...It's no problem, the fault line runs here...But, you see (...) aftershocks could reach this place."

Grandpa

Numerous studies in the past have shown how more educated people have a more accurate awareness of risk (for e.g. Mileti and Fitzpatrick 1993, Drabek 1986, Faupel et al. 1992), however Anderson-Berry (2003) suggests that perhaps it is more a case that those with a higher level of formal education are more skilled and adept at researching relevant information. For the women involved in the interviews this seems true to a certain extent as many of the women were illiterate and not conversant with computers:

"Interviewer: Do you go on the internet?

Housing Lady: I don't know how to...I can only make calls on my mobile, I don't know how to send text messages.

Grandpa: Let alone get on the internet!...She only had a primary school education"

Part of session 3 interview with Housing Lady

This example supports the notion suggested by Anderson-Berry (2003) as without the means to access the information, the women will find it much more difficult to increase their knowledge. As a result therefore, the types of information and knowledge circulating with regards to natural hazards must become all-encompassing allowing all members of society, regardless of education or financial circumstances, to learn more and increase their risk awareness.

In addition to an erosion of disaster culture and difficulties in information accessibility, the Beichuan population moving to the new town will also suffer from the effect of low residency time (Burningham et al. 2007, Anderson-Berry 2003). Burnigham et al. showed that interlinked with the effect of experience upon risk awareness was "length of time in residence"; residents who had lived in the area for longer (over a year) were three times more aware than shorter term inhabitants (2007: 224). For the residents of Beichuan relocating to the new town then, their awareness levels have been impacted by their understanding that earthquakes occur in mountainous rather than flat areas, alongside the decreasing seismic culture, limited information accessibility and lack of residency time. It appears therefore that although they have become more aware of the seismic threat to Beichuan old town, their levels of awareness of seismic and other natural disasters has not been affected with respect to New Beichuan.

4.4 Summary

1. After initial suggestions from the participants that earthquake knowledge in pre-5.12 Beichuan was lacking, it became evident that there was a level of understanding of seismic processes as a result of local myths and folklore. However, formal levels of earthquake education were lacking with little apparent government involvement in community programmes.
2. Despite the presence of knowledge, levels of awareness within pre-5.12 Beichuan were low.
3. The low levels of earthquake awareness can be attributed to limited information accessibility, inappropriate forms of hazard education, the issue of 'normal' shaking and a lack of large earthquake experience.
4. Following the 5.12 earthquake, for the group returning to their original homes levels of earthquake awareness appear to have increased. This suggests that the impact of experiencing a devastating event acts to increase risk awareness of future similar events as implied by Burningham et al. 2007.
5. For the relocated group however, the impact of the 2008 earthquake upon risk awareness is a more complicated issue. It can be hypothesised that were they to be returning to old Beichuan, their awareness of seismic activity would be heightened. However due to the new site, there exists the danger that the effect of eroded seismic culture and lack of residency times will result in low levels of seismic awareness within the new town.

Chapter 5

Risk Anticipation

5.1 Introduction

Within this section I will explore the responses gained from interviews, focus groups and diaries to try and uncover the risk anticipations of the Beichuan community both before and after the 5.12 earthquake. For the purpose of this research, 'anticipation' can be defined as being significantly concerned that an earthquake will impact upon your own household. Therefore being aware of earthquakes but unconcerned by their occurrence, would lead to low anticipation levels. Before discussing the results of this study, it is useful to review some of the literature surrounding risk anticipation, especially research which focuses upon the impact of large disasters upon risk rankings. Firstly, I investigate pre-earthquake anticipations, when a community living in a seismically active area has yet to experience a big event. Through research into perceived seismic risk and preparedness in Bangladesh's capital, Paul and Bhuiyan (2009) found that the residents of Dhaka felt there was almost no chance of a large seismic event occurring in the near future within the region. This viewpoint was found to be a result of the fact that the area had not experienced such an event in living memory. In China, the last large earthquake to hit Sichuan Province was a magnitude 7.3 in May 1948, and killed 800 people (USGS 2010). No details are available concerning the epicentre of this earthquake however, so it is possible that the impact was not felt within Beichuan and therefore it seems that there had not been a large earthquake within the region in living memory. The link between risk anticipation and seismic quiescence is supported by Jackson (1981) who focused upon San Francisco, USA. He also reveals that an absence of seismic experience (within the last 30 years) can lead residents to consider themselves at low or even no risk from earthquake damage. This work therefore suggests that direct 'experience' plays a crucial role in affecting which risks the population are aware of.

As discussed in the previous chapter, the availability of information and the different levels and types of knowledge can play a crucial part in influencing risk awareness. As shown by Halvorson and Hamilton (2009) local populations can be completely unaware that destructive earthquakes present a distinctly possible threat. An absence of seismic awareness inevitably leads to a lack of

earthquake anticipation and therefore the vulnerability of such communities is considerably higher than amongst populations who understand and anticipate seismic events. Therefore although low awareness could explain low risk anticipations, seemingly having some level of knowledge does not necessarily create higher levels of anticipation. It has also been recognised that there are often simply more pressing concerns surrounding everyday livelihoods. Alexander's (2000) 'prison of experience', identifies this more specifically as poorer individuals who regard natural hazards as less important than other issues such as unemployment, ill-health or low levels of education. Pilgrim (1999) also finds this to be the case during his research in Nepal where the local community face grave landslide threats but are more concerned about recovering firewood and building materials from landslide scars in the immediate minutes and hours following hillside movement. However it could also suggest a level of understanding of recurrence rates; because the landslide had just occurred, the residents knew that further movement was unlikely in the immediate future. Less developed countries are not alone in their low levels of disaster anticipation; as Jackson (1981) shows a similar consensus amongst the population of San Francisco, USA where residents assign more concern to social and environmental problems (such as crime, climate and traffic accidents) than earthquake propensity. Oven (2009) produces similar findings through work into landslide vulnerability in Nepal. In her study, Oven (2009) finds that a lack of awareness is not the problem, but rather the more immediate threats of unemployment, education fees and household prosperity take precedence above natural risks. The immediate livelihood concerns of the Nepalese villagers may differ from the wider community issues prioritised by the American city residents, however regardless, both groups rank earthquakes as secondary risks. It can be theorised therefore that within many communities, natural hazards "are contextualised in terms of the myriad threats and risks facing people and as a result are seldom a priority concern" (Oven 2009: 174).

A lack of experience of an event can result in lower levels of risk anticipation with regard to natural hazards, but equally, the occurrence of an event can change anticipations and alter attitudes and behaviour (Paul and Bhuiyan 2009). This is highlighted by Siegrist and Gutscher (2006), through their

investigation into flood perceptions in Switzerland, who showed that anticipations can increase through hands-on involvement in clean-up operations. However it has also been suggested that the occurrence of such a large event can impact upon anticipations in an opposite way: local populations feel that a repeat event would be even less likely that the original. This is explained by Alexander (2000) as the 'gambler's fallacy' where populations believe in disaster cycles, and therefore once a large hazard has hit, the probability of a repeat similar event dramatically reduces. This can be true to a certain extent for seismic events (see Bolt 1999; Parsons and Kirby 2008), yet differentiating between a precursor and the *final event* remains challenging. There exists a wide range of research which demonstrates how the occurrence of a large unexpected event can change risk anticipations of future disasters. From research into the effects of a volcanic eruption on North Island, New Zealand, Johnston et al. (1999) found that the event led to changes in ranking scores due the perceived immediate nature of the hazard which as a result caused other hazards to become momentarily less salient. The impact of an event upon future anticipations is also observed by Burger and Palmer (1992) through their research into the Chernobyl incident. Here they find that participants used information surrounding the disaster to alter their anticipations of other relevant hazards. Therefore in addition to greater anticipation of the occurred event, experience of one disaster can also sensitise individuals to other types of disasters. It seems that post-disaster communities re-assess their anticipations in relation to the event encountered, which may override ongoing concerns surrounding livelihoods.

From investigating both pre- and post-earthquake anticipations of risk after the Wenchuan earthquake, I hope to reveal whether or not risk perceptions have changed within households. Through an increased understanding of how such an event can affect anticipation of risks, especially anticipation of natural hazards, I hope to show how this is turn can impact upon individual and household well-being.

5.2 Pre-earthquake anticipations

In order to better understand post-quake anticipations, it is first necessary to explore the pre-quake anticipations, allowing a before and after comparison, and therefore enabling discovery of potential impacts that disasters can have upon risk rankings. Within the present study, the women generally shared a common thought concerning pre-5.12 anticipations of risk:

"At that time I was very happy...I'm very easily satisfied...everything was good...[there was] nothing particular that I worried about"

Internet Lady

It seems initially therefore that worries were limited pre-quake, and in terms of natural disasters, events such as earthquakes and landslides were not anticipated. This was in response to very open-ended questions, and through asking more specific questions I was able to explore the influences behind this lack of anticipation. It became apparent that the women had more concerns than they initially showed, and it is these that I will investigate within the current section.

5.2.1 Flooding

When asked specifically about pre-quake environmental concerns, a familiar theme ran through all the interviews: flooding. For the residents of Beichuan pre-5.12 it seems that the threat posed by the Jianjiang River was understood far more than any seismic or landslide hazard:

> "On average, we didn't really attach much importance to [earthquakes]...because when we thought about disasters, we thought about floods."
>
> *Lunch Lady*

This viewpoint is seconded clearly by Younger Girl, who despite spending the majority of her life in Mianyang, also appreciated the anticipated flood risk through hearsay:

> "...I just knew that Beichuan had flooded a few times before. I didn't expect that they would have an earthquake."

So, it poses the question why was primary concern attached to flooding, rather than the possibility of a large seismic event? The impact of the river's visibility and annual variability in discharge vs. the inherent invisibility of seismic risk, could be the main reason behind the formulation of these pre-5.12 anticipations; "Whereas floods can be seen as a deviation from normal runoff, earthquakes are an intangible phenomenon, not usually apparent in the environment, and with no constant reminders of their existence" (Jackson 1981: 409). Jackson (1981) identifies this phenomenon as "out of sight, out of mind"; the results of his study showed the residents of San Francisco took the view that if you couldn't see the threat, then you may as well "forget it" (pp. 409). This theory is also supported by Ho et al. (2008) who noted the invisibility associated with earthquakes compared with the more visual and dynamic aspects of other hazards such as the presence of mountains reminding populations of the threat of landslides, and as shown by Jackson (1981), or rising water levels warning communities of the possibility for flooding. In addition, the visibility of floods could lead to a better understanding of the process; it is clear to see that when there are heavy rains the river level rises and has the potential to flood the local area. However the build up of seismic pressure cannot be seen and fault lines are essentially 'invisible' to local communities. In addition to the more apparently dynamic nature of rivers compared to mountains alongside its clear boundary of where risk lies, this could also lead to greater awareness of flooding disasters and therefore a lack of, or diversion away from, anticipation of seismic events. Perhaps then one reason behind why the residents of Beichuan had little or no anticipation of earthquake potential was due to the intangibility of seismic risk. However, some other key issues can be identified in addition to this concept, related to why pre-5.12 earthquake anticipation was apparently so low.

5.2.2 Earthquake anticipation

A key theme to emerge from the previous chapter was that the women felt that they had little awareness that earthquakes were likely to occur. As 'Lao Bai

Xing', many of the women spoke about not 'hearing' about the possibility of a large earthquake hitting Beichuan. It was evident that the women had some level of knowledge that earthquakes posed threats to other places, however they did not appear to relate this hazard to Beichuan and therefore awareness was low. The women suggested that they were subjected to informational vulnerability (Degg and Homan 2005), and as a result attached limited importance to seismic hazards. This is exemplified by the fact that not one of the women had bought insurance for their properties; almost all the interviewees had built or owned at least one building, but not one had bought insurance. In fact on the contrary, due to the women's low economic status, the houses themselves acted as social security and insurance, providing an income if rented out and also a pension for the older respondents:

"...I built some apartments and relied on that for my living, I didn't buy social security, I didn't pay into the basic living costs fund, I didn't buy anything."

Housing Lady

It is apparent that the Chinese government encourage individuals to buy housing insurance, especially in areas at risk from natural disasters (Wang 2010). Unfortunately it is difficult to acquire specific statistics concerning the percentage of the Chinese population who have purchased housing insurance, but according to Whalley (2003) there exists "relatively little personal life or housing insurance" across China (2003: 14). However it is evident that there exists a significant divide between rural and urban levels of government aid, and therefore the number of insured properties in rural areas is low (UN 2010). In this respect, it is perhaps unsurprising that the rural women involved in this research had not bought property insurance, as without financial help from the government they lacked the economic means to facilitate this.

The informants suggested a critical reason behind low earthquake awareness levels was a lack of experience. For many, having never witnessed an earthquake before, there was no reason to anticipate such a disaster:

"I used to say, how could there be an earthquake? I'd never experienced one."

Housing Lady

"..."in Chenjiaba we didn't suffer from that [earthquakes]..."

Auntie Red

Throughout the sessions, I started to question this lack of experience following several participants' stories about the 1976 Tangshan earthquake. This led to the realisation that the definition of an earthquake to the respondents differed from my own. For them, smaller earthquakes were simply referred to as 'shaking' in contrast to the 'earthquake' of 2008; in reality therefore, the occurrence of 'shaking' was in fact rather 'normal'. In a scientific context, the Beichuan area (< 85 km from Beichuan town) experienced 10 earthquakes of ≥ 4.0 (Figure 5.1) within a ten year period (1994-2004). On average it is likely that the Beichuan community would have experienced mild shaking about once a year. This is an important aspect as it clearly further influenced the lack of pre-5.12 earthquake anticipation held by the respondents.

Due to numerous experiences of mild 'shaking' but no experience of associated loss, the level of risk associated with seismic activity was very low. A similar impact of experience was identified by March and Shapira (1987) who found that individuals based their future anticipations on past experiences of coping ability. Oven (2009) also found similar results with respect to landslide hazards in Nepal where individuals had become so used to living alongside landslides that they were regarded as part of 'normal' life. For the residents of Beichuan therefore, the history of only limited damage from 'normal' earthquakes meant they did not worry about such events, and as a result underestimated the potential for a large event (Lefcourt 1973; Langer 1975). Staw and Ross (1987) created the 'escalating commitment model' to represent how past experience can increase 'risky' behaviour (putting humans or physical property in danger) over time, and this theory is also supported by Sitkin and Pablo (1992) and Lewitt and March (1988). This model suggests that prior experiences influence future 'risk' decisions by creating high levels of confidence in very experienced

Year	Month	Day	Magnitude	Distance from Beichuan (km)
1994	9	4	4.7	50
1995	6	10	4.6	25
1995	9	9	4.2	85
1997	5	24	4.5	28
1998	10	31	4.3	22
1999	9	14	5.1	30
1999	11	30	5	50
2002	7	16	4.1	48
2004	8	18	4.6	85
2004	9	24	4.2	15

Figure 5.1: Map and table to show the locations and dates of ≥4.0 earthquakes which occurred within an 85km radius of Beichuan town between 1994 and 2004. The table also includes information about the specific magnitudes of each event.

or inexperienced individuals (Sitkin and Pablo 1992). The residents of Beichuan had a lot of experience of mild shaking and a distinct lack of experience of violent shaking, and as a result the model could be seen to work in both ways amongst this population. Their vast experience of mild and undamaging earthquakes has led to them to believe that earthquakes do not cause damage amongst their community. Supporting this notion is the lack of large-scale events in the area, leading the population to believe that they are not at risk

from damaging seismic shaking. Unfortunately, it was precisely this 'risky' behaviour on the day of the earthquake, which resulted in many of the people in Beichuan not reacting to the initial low intensity shaking, and some who did react, simply returned to their previous actions;

"A lot people died this way"

Housing Lady, Lunch Lady

A local seismograph for the 2008 earthquake (Figure 5.2) shows a similar pattern of shaking that is described by the women who were in Beichuan on 5.12:

"At first it seemed like a normal earthquake, we thought that it was the usual kind of earthquake that we had, at the start. I think that went on for about one to two minutes. It was just rumbling at the start and we ran outside, it carried on like that for another few seconds. Then it started to bang and boom and the deafening noise of the mountains collapsing and the earth cracking up started, started."

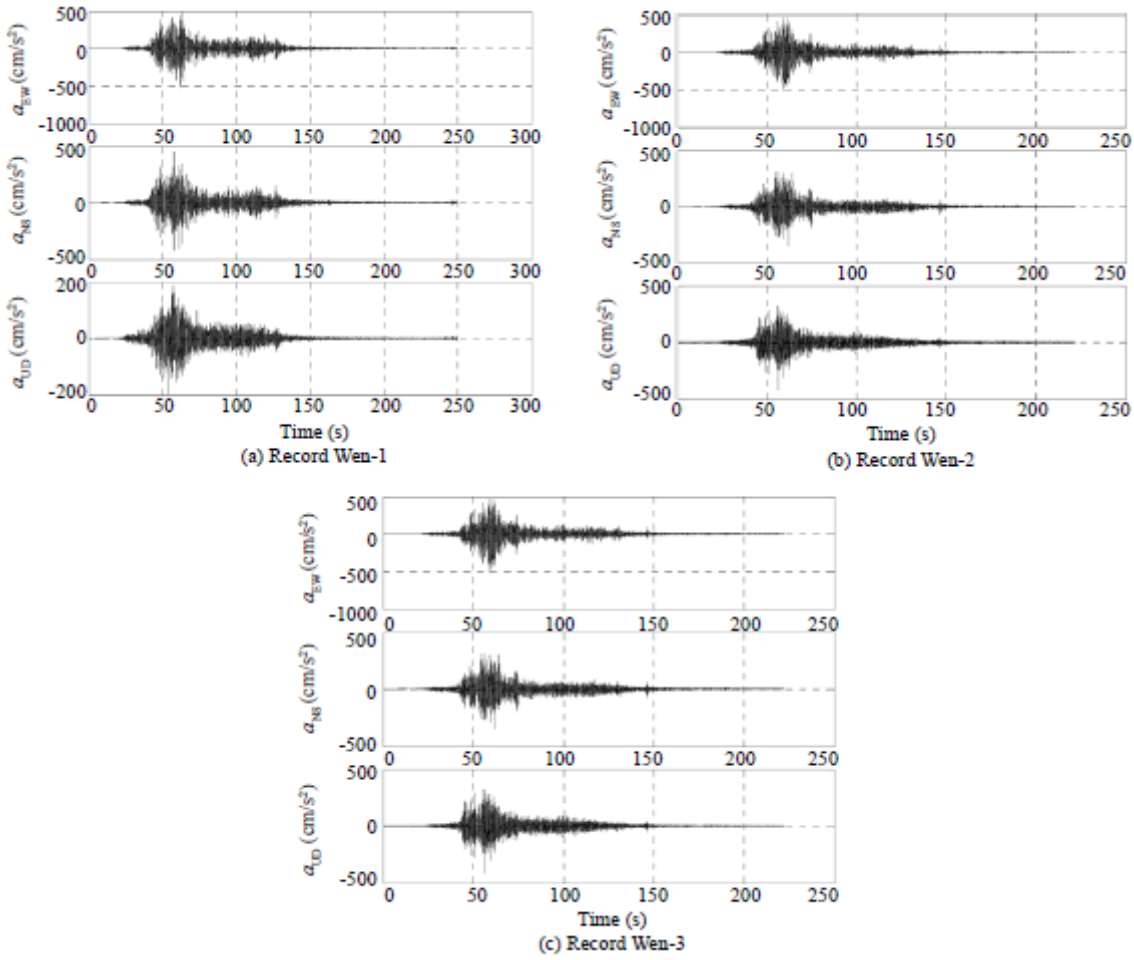
Lunch Lady

"Yep, on the day, at the start, I didn't think that it was shaking much, I… I… I ran to the bed by the window and shouted down to some people below, "seems like an earthquake today"! Then I went back, carried on chopping the meat, chopping, chopping, I still hadn't finished chopping… whoooaaaa… clink-clonk, clink-clonk, made me fall down, fell down, our door was there, I could get out in one step, I wanted to run at first, then, but I still couldn't stand up steadily, clink-clonk, clink-clonk, clonk, clonk, I fell down, fell down nine stairs, it just flung me down."

Housing Lady

Figure 5.2 shows from the horizontal (both easting and northing) and vertical accelerations. The pattern of shaking shows that the vertical and horizontal components were effectively equal, and unusually, incredibly high. Overall, the event lasted for a total of 2 minutes with a relatively long period of high intensity

shaking with a significantly damaging period between 40 and 60 seconds. The accounts from the respondents suggest that there was a small foreshock before the main event and there is some evidence of low M_w precursory shaking in the trace to support this. The lack of experience identified by the respondents as the reason behind their lack of earthquake anticipation therefore relates only to large events, and in fact the regularity of 'normal' earthquakes can be seen as a big influence behind the formulation pre-5.12 anticipations.



Record No.	Stations	Serial number	Latitude (°)	Long. (°)	EW components		NS components		UD components	
					t_{EW} (s)	PGA (cm/s²)	t_{NS} (s)	PGA (cm/s²)	t_{UD} (s)	PGA (cm/s²)
Wen-1	Jiangyou	51JYD	104.7	31.8	62.12	-507.9389	58.12	456.836	53.85	-198.1359
Wen-2	Hanzeng	51JYH	104.6	31.8	59.06	-509.3733	61.855	-350.3079	56.175	-442.9893
Wen-3	Zhonghua	51JYC	105	31.9	57.225	295.7031	55.235	279.7677	68.925	-180.3038

Figure 5.2: *The three seismographs and table below show the horizontal and vertical accelerations caused by the earthquake at three stations close to Beichuan. The station at Hanzeng (Wen-2) is the closest station to Beichuan itself but it is clear that the pre-earthquake shaking experienced by the population was not recorded and so the experience on the ground was different from the actual seismic signature.(Source: Dai et al. 2009)*

5.2.3 The role of awareness

The women suggested that an additional reason for their lack of earthquake anticipation was due to insufficient seismic knowledge leading to a lack of awareness; they simply did not know that an earthquake could hit Beichuan. To some extent this has already been dismissed by the understanding of 'normal' earthquakes, therefore perhaps the lack of awareness concerns the possibility of event size potential, rather than the possibility of event occurrence. Rather than being unaware of the possibility of earthquakes, the residents were unaware of the possibility that such a large event could occur:

"I was very relaxed about earthquakes. I thought the earth so thick, the mountains are so big, how could some shaking move them?"

Housing Lady

As seen in the previous chapter the concept of Beichuan 'bao jiaozi' (being wrapped up like a dumpling) revealed that the women possessed local knowledge concerning seismic potential. Further examples of folk tales have also been explored and therefore it seems that in fact the participants had experienced earthquakes pre-5.12. Regardless, only Housing Lady had followed seismic building codes to reduce losses from a potential earthquake. This suggests that some form of earthquake anticipation existed and circulated, but most people attached little importance to it. As seen above, the source of information and experience came from the Lao Bai Xing themselves, rather than from official forms of education or public information. In this respect, perhaps the Beichuan residents didn't attach importance to the hearsay of older generations in the same way they would have done to government advice, resulting in low levels of pre-5.12 earthquake anticipation.

5.3 Post-earthquake anticipations

This section will cover the topics which arose from the initially open-ended questions and will then go on to focus more upon the 'natural' risk anticipations which were unpacked through more guided questions. Initially then, the question put to the participants was simply "What do you worry most about now?" Responses to this question were wide ranging, but one key concern was

brought up more than any other; the issue of housing. It was clear to see that for the interviewees in Yongxing, the primary risk to their well-being was the chance that they wouldn't be able to register for, or afford housing in the relocated Beichuan town. This continued throughout the research to be one of the most important topics and as such I will discuss this in detail.

5.3.1 Housing

Being unable to return to the original site of Beichuan town, the main option available to those currently living in Yongxing is to move into the new town, located on the outskirts of Anxian (Figure 5.3), and for the women I spoke to, this is the most desirable option. However, the government policy regarding who can relocate here and when they can do so is yet to be released [as of 18/04/10]; as such this is the major reason behind the respondents concern. When asked why housing posed such a likely risk for them, the women began to discuss the issue of 'hukou'. This is an official document which states a persons' residency both regarding location, but more importantly including status. There are two different types of hukou: rural and urban; all Chinese nationals must register for one (and only one) residency location (Liu 2005). Within the former Beichuan town there were a number of villages, such as Maoba, Xiangshuiba and Renjiaping. To an outsider, the boundaries of these villages and the town itself would be difficult, if not impossible, to delimit, however for the residents and the government, these boundaries mark differences in hukou (Figure 5.4). Boundaries determine whether families can register for urban hukou, or whether they must settle for rural hukou, and this difference brings with it many problems for the now displaced Beichuan population.

The women's concerns lie in the fact that the new town is 'urban', but their hukou from pre-5.12 for almost all the women is 'rural'. Therefore what the women are most concerned about "...is whether we're going to have a place to live in the new town or not" (Grandma). Such concerns are not restricted to the residents of Beichuan however, and examples of hukou problems have been reported in the media where people have been deprived supplies and policy

Key:

♦ Site of new Beichuan town

Figure 5.3: Map(A) and satellite image (B) to show the location of the new Beichuan town, with an artists impression of the complete town (C) and photo of part of the new town(D) as of 03/03/10. Sources: Map and Satellite image – Google Maps, Artist Impression and Photo – author's own.

benefits, such as temporary housing and food aid, due to having the incorrect hukou (see for e.g. Wiseman (2008)[3] and China Daily[4]). For example, those who had migrated to cities for work before the earthquake are often not 'officially' registered in the area. As a result they have been denied access to temporary shelters due to their lack of correct hukou, and are forced to live in

[3] USA-Today online: http://www.usatoday.com/news/world/2008-05-26-china_N.htm
[4] China Daily: http://www.china.org.cn/china/2010-04/22/content_19880940.htm

damaged buildings at serious risk of collapse. The World Bank (2008) issued a report following the 2008 Wenchuan Earthquake including recommendations to provide urban hukou for displaced populations affected by the earthquake. However policies have yet to be released by the Chinese government, and as a result the women in Yongxing still lack the assurance of a house to live in. This means that when ranking risks to their well-being, the risk of homelessness is given the most weight above other concerns.

Figure 5.4: *Map to show the locations of the 'rural' villages of Maoba (A), Xiangshuiba (B) and Renjiaping (C,) located within Beichuan town (highlighted by the black striped area). Source: Google Maps.*

5.3.2 Unemployment

The second most talked about concern was the problem of finding work; a concern which traversed all respondent groups regardless of age or circumstance. For those living in Yongxing, the problem of employment was a very real and current problem. The women expressed a desire to find employment within the pre-fab housing such as cleaning or shop-keeping in order to sustain a living and thereby support their family. Enarson (2000) identifies this as a common trend amongst post-disaster communities, showing that women typically take longer to return to work than men in the post-disaster phase due to family commitments. Domestic responsibilities and childcare

mean that women are restricted to employment opportunities close to home (Robinson et al. 1986). Several of the women interviewed were grandparents and were taking care of their grandchildren on a full-time basis. For Restaurant Owner, this presented little difficulty as her granddaughter was able to play within the restaurant that she ran. However for other interviewees such as G-Lady and Lunch Lady, the importance of family nurturing balanced against a lack of job opportunities within close proximity, meant unemployment seemed inevitable whilst living in Yongxing (last suggestion of a moving date whilst conducting research was 30/09/10).

This was not only an issue for the women whilst living in Yongxing. Several of the women also articulated their anxiety about the risk of unemployment continuing once they moved to the new town. Many had been self-employed prior to the earthquake and as a result, had lost not only employment, but the space and provisions to work too, which has not been provided in the replacement accommodation. This problem is also identified by Enarson (2000), who shows how the self-employed are affected more adversely by disaster, because it takes time to create a business and so in post-disaster life it is more difficult to return to work. For the interviewees, forms of self-employment ranged from making tofu to running a shop, and can also be seen to include farming. Enarson (2000) attaches specific importance to the effect upon farmers in post-disaster communities, and this is of particular significance for the residents of Beichuan, because they were not given the chance to return to their land and salvage what they could. As a result, the women are having to try and find new types of employment, however believe that they are at a difficult age and therefore few employers will want to provide jobs for them:

“Maybe I can work, but I’m also over 40 years old, it’s like this for sure…Yep, people say that in the factories there is an age limit, so I’m worried about this point.”

Lunch Lady

Those in this situation are in the 40-60 age range and expressed a belief that factories in the area had strict age limits, making employment within this

vocation impossible. This problem is highlighted by Dunford and Li (2009) who stress the importance of enabling both agricultural and extra-agricultural employment prospects in post-earthquake Sichuan.

The issue of age was also part of the reason why the younger girls involved in the focus groups and diaries are worried about being unable to find work once they graduate from university. For this group, the main problem is China's huge population; they believe that because so many people of their age will be looking for employment, the competition will be much higher than in the past, meaning the risk of future unemployment for them is a very real risk. This problem is shown by Bai (2006) who reports on the increased numbers of graduates in China following policies to encourage university education, which has lead to employment problems. This notion is also supported by Min who suggests that "the rising enrolments [in universities] will make the employment issue a serious challenge for China in the years to come" (2001:14). From these responses, it seems as though 'everyday' risks are anticipated far more readily than more 'natural' risks. However in order to explore why such risks had not emerged through the open-ended questions, more specific questions were posed.

5.3.3 Flooding

The pre-existing concern about flooding held by the residents of Beichuan continues to be anticipated amongst the post-5.12 community. However it is important to note that prior to the earthquake, this risk was primarily concerned with the Jianjiang River which ran through Beichuan town, whereas it was apparent that within the pre-fab settlement, torrential rain-induced runoff and flooding was the big problem:

"...sometimes during the summer, when it rains, the water can be really deep, really, really deep, and when that happens the roof of the house could even be lifted off!"

Younger Girl

In part, the risk posed by flooding in the temporary Yongxing settlement is a direct result of the prefabricated housing. The participants living here were quick to relate the problems and threats posed by heavy rain to the unstable nature of the buildings. Therefore perhaps it is the temporary nature of housing which is influencing their current anticipation of flooding. However, this past and present concern of flooding looks set to continue into the future also, with many of the participants already discussing the potential flooding risk in the new town and their villages. So, it seems that flooding is the primary natural risk anticipated by the respondents; the focus group participants also felt that flooding was the most likely natural disaster to occur. The informants were also aware of the effects that the earthquake had had upon flooding, and landslide-dams were considered as a great threat. The majority of the participants however felt that the location of the new town was safer than old Beichuan, and would be at lower risk from natural disasters. As discussed earlier, a potential reason behind the higher anticipation of flooding could be a result of the inherent visibility of floods, versus the apparent invisibility of earthquakes (Jackson 1981, Ho et al. 2008). For the post-earthquake population, this effect could in fact be even more influential in formulating risk anticipations due to the fact that both the pre-fab settlement and the new town lack the surrounding mountains of old Beichuan. In this respect, not even landslides pose as a reminder of seismic activity, suggesting once again that “out of sight, out of mind” is an important part of risk anticipation.

5.3.4 Education

The above sections have predominantly expressed the opinions of the participants involved in the in-depth interviews. This group requires more detailed exploration as a greater amount of time was spent with them and therefore a greater understanding was developed. However it is also important to discuss the issues which arose through the focus groups, written and photographic diaries. The females involved in these methods varied in age from 16-19 but all shared similar views concerning risk anticipation and some interesting points were raised which I hope to explore in more detail within this section. For this age group, one major risk was easy to define: education. For them, not attaining good grades from their study was the biggest risk within their

daily lives. This could be seen to be a result of living within a purely educational environment, in their view 24 hours per day. As one of the Mianyang high school students commented in their diary, “I feel that every day is a copy of yesterday...everything is about study. Studying is the main thing amongst everything.” The amount of study that these Chinese students undertake is epitomised by another of the diary entries:

“I often don’t have enough time to finish all of my homework. You may ask, how can I finish my homework? In fact, I stay up to do my homework until midnight at the risk of being blamed. But there is no choice but to stay up.”

Diary 10

This concern over study is most likely a product Chinese communist culture, with its focus upon repetitive to rote learning, lack of abstract thinking, and issues of loss of face amongst peers (Chan 1999). For the Mianyang high school students there is a great pressure to succeed at school, from both parents and teachers, but also from the peer group themselves. In China today it is regarded that to do well in life and secure a successful future, children must concentrate hard on their studies from a very young age. As a result for the majority of girls involved in this research, opportunities to take part in activities away from academia are limited and so all they think about is education.

However aside from education, an additional anticipated risk can be identified for this age group: ‘friendship’. For the students, not having close friendships presents the risk of being lonely. Although for some, the nature of these friendships can produce risks within themselves. The issue of relationships for the students, particularly the high school students, is a contentious one, with a divide in opinion amongst the girls. For some, male and female relationships can bring positive effects, and in fact similarly to friendships, an absence of relationships poses the risk of loneliness;

“...when happiness comes knocking at your door, don’t keep it outside...for some people, once they are gone, they could never be found again”

Diary 4

However the opposite viewpoint taken by some, which links back to education, that in fact developing relationships can impact negatively upon study and should therefore be dealt “with caution” (Diary 1). Once again, this issue of friendships and relationships can be seen as a product of Chinese culture. With education seen as such an important factor for most parents (Chan 1999), anything which may distract a child is considered a problem. In addition to this, traditional relationship beliefs are still the norm for most families in China and as a result high school relationships are often frowned upon. For this age group therefore, education frames their anticipations of risk, with studying at the forefront of their minds continuously. It seems as though culture is also playing an important part within the students lives however as it is the traditional views and pressures which have lead the girls to worry about education. Additional concerns were also raised through the dairies and focus groups, but most link back to education, reiterating the importance attached to this risk for the students.

5.3.5 Earthquake anticipation

For the majority of people involved in this research, the issue of seismic hazard remained un-discussed, unless intentionally instigated by the interviewer. As seen previously, anticipated risks were very much associated within the everyday, and when asked specifically about ‘natural’ risks, flooding accounted for effectively all concerns. To fully understand the apparent absence of seismic anticipation in post-5.12 Sichuan, targeted questions about the possibility of future earthquakes were put to the interviewees and the focus groups. The responses showed two very different sets of anticipations; those who were very worried about future earthquakes, and those who thought another seismic disaster was now nearly impossible.

For many, the experience of 5.12 has dramatically increased both their awareness and anticipation of earthquakes as a likely risk to their lives. Auntie Red and Grandma for example were two women who prior to the 2008 quake had never thought about the possibility of a large earthquake event in Beichuan, despite their experience of compulsory evacuation following the 1976 Tangshan earthquake. For these women, it seemed as though their minimal experience

served as the main reason behind their lack of earthquake anticipation. Following the 2008 earthquake they have changed their perception and state that now they "...worry about them frequently..." (Grandma), and it seemed this change in concern would remain for the foreseeable future. This affect of experience is reiterated by Younger Girl who similarly held no concern about earthquakes pre-5.12, but feels that "...once you've experienced it once, you'll always be a little bit scared of it after." This suggests therefore that having experience of an event impacts upon whether you anticipate such risks more in the future. This notion is supported by Ho et al. (2008) who found that having experience of an event meant future anticipation of the same risk were likely to increase compared with pre-event anticipations. Jessica was another respondent whose anticipation of earthquake risk changed following the 2008 event, however her reasoning behind the change was not due to her direct experience alone, but rather the added impact of indirect experiences seen on recent television following the 2010 Haiti earthquake, and the 2010 Chile earthquake:

"It seems earthquakes are a regular occurrence this year...and that makes me think it might happen for a second time in China."

Jessica

The impact of the media reports therefore seems to have heightened her awareness of earthquake risk, leading to an increase in her anticipation of such events. The effect that the media can have upon an individual's risk anticipation has been discussed by several authors and found to have a positive effect (see for e.g. Lai and Tao 2003). As Hilton et al. (1992) note, the media is a key producer of disaster information and therefore plays a key part in the shaping of risk anticipation. Cowan et al. (2002) put this effect down to the over-exaggeration of devastation portrayed in the media creating a more threatening image to disasters and therefore causing members of the public to worry about them more. This impact of the media is also discussed by Grandma who feels that when earthquake events are reported in the news "they're in our minds", which therefore adds more weight to their own experiences and pushes earthquake risk anticipations up. This concept is supported by Sood et al.

(1987) who showed that disasters reported on the news were well remembered by those who watched, thereby adding indirect experience to any pre-existing direct experience, and shaping future anticipation of risk, often causing an increase in concern (Cowan et al. 2002).

For Chinese individuals the effect of the media could be seen as more influential due to the traditionally censored nature of the press within the country until more recent times (Chu 1994). For example Jessica felt that there were a higher number of earthquakes occurring globally in previous years, but perhaps this is simply a reflection of the changing media in China. Until recently, due to censorship from The Party, the focus of the Chinese press has been homeland concerns and stories covering foreign nations were scarce (Chu 1994); to the Chinese public there seems to have been an increase in natural disasters globally, but perhaps it is rather that these events are simply being reported more widely due to a relaxation in press censorship. In addition there is the added aspect that the Chinese government may want to report other disasters in their media in order to compare their own response to the 5.12 disaster with other countries. Due to the effectiveness of the government's reaction to the 5.12 earthquake, this is likely to highlight China in a positive light to other countries, especially nations who lack the financial capacity to deal with disaster in the way China was able to.

However, this increased anticipation of future seismic events was not unanimous amongst the participants, and in fact an equal amount held the opposite view about post-5.12 earthquake anticipation. For Restaurant Owner worrying about earthquakes is "superfluous" as nobody can know where is likely to be hit by seismic activity, therefore there is nothing anyone can do. This idea that earthquakes are uncontrollable, was also found to be the consensus in research into natural hazard perception in Germany by Plapp and Warner (2006), who stated that the majority of participants felt it was impossible to prevent natural hazards and therefore the occurrence of disaster was inevitable. This idea is also supported by McClure and Williams (1996) who show that the uncontrollable nature of earthquakes leads to a belief that the impacts from seismic events are inevitable. It is this helplessness that is stressed by

Restaurant Owner who feels that there is no point anticipating a risk that is unavoidable (also see for e.g. Jackson 1981). This lack of earthquake anticipation is echoed by Housing Lady, but for her the absence of concern is due to the fact that "...we don't have enough experience..." The effect of experience is of equal importance for Younger Girl: "I think it probably won't happen, how could anything so terrible happen, especially to the people here..." Therefore it seems as though the very reason behind others increase in earthquake anticipation (experiencing a large event) acts as Younger Girl's reasoning for a decrease in anticipation. This is supported by Lunch Lady: "...we've already experienced such a big disaster ourselves, so we're not scared".

This concept of 'we've had ours now' is discussed by Jackson (1981) who finds that rather than increasing anticipations, experience can in fact decrease anticipations of risk. Within his study in San Francisco, USA, Jackson (1981) shows the impact that misconceived cyclicity of large events can have upon risk perceptions. Once a population experience a disaster, general feelings are that there won't be another large event for a very long period of time, perhaps reaffirmed by a miscomprehension of the concept of a 'recurrence interval'. Therefore, having experience of natural disasters seems to influence people in different ways: for some it increases anticipations due to the proximity of memories, however for others, anticipations decrease due to the misconception of event periodicity or frequency. In addition, it can also be seen that direct impact can have no effect at all, and as a result it seems the influence of experience is not a straightforward issue.

As presented above, some women suggested that their anticipations of risk had not been affected or had decreased post-5.12, however once unpacked, parts of the interviews seem to contradict this opinion. The main issue which arose to contest lowered or unchanged anticipations was that of insurance. For example, Restaurant Owner appeared adamant that earthquakes were uncontrollable and therefore she did not worry about them, but when asked about insurance, she seemed to imply some level of anticipation:

"Maybe we'll buy insurance if we move to the new town...If it's confirmed that we have no land left, then we'll buy insurance".

Restaurant Owner

As discussed, none of the women involved in the interviews in Yongxing had bought insurance for their properties pre-5.12, which reiterates the previous notion that there existed very little earthquake anticipation in pre-2008 Beichuan. This could be because many insurance policies would perhaps not cover losses from natural disasters, however it seems (through speaking to the interviewees and correspondents in China – see Ping'an.com[5]) that it is possible to purchase insurance from foreign companies which is actually cheaper and also covers households against disasters:

"I tell you, in Beichuan, my sister had bought insurance and they paid out on it, they got compensation for everything. But we didn't have insurance."

Lunch Lady

It is interesting to note that now, the majority of women interviewed would at least consider buying insurance for future properties. This suggests that despite some claims that the 2008 earthquake has failed to change their anticipations of earthquake risk, the event has impacted upon certain risk anticipations, most notably the risk of losing property through some form of disaster:

"We've paid a little bit for insurance now..."

Housing Lady

"When we move to the new town, if there is housing insurance available, then we will definitely buy it."

Lunch Lady

From the previous sections, it is possible to identify changes in risk anticipation between the pre-5.12 community and the post-5.12 community. The impact of the 2008 earthquake has created new risks for the women, most notably the

[5] http://www.pingan.com/investor/en/index.jsp

threat of housing, and as a result everyday priorities have changed. Although the broad categories have not changed, i.e. everyday risks are anticipated more readily than natural disasters, the finer issues within these are thought about differently. In addition, despite initial denial that earthquake-specific risk anticipations were unchanged by the 2008 event, it became apparent that this was not the case. Due to factors such as experience (Jackson 1981, Ho et al. 2008) and media reports (Hilton et al. 1992, Cowan et al. 2002, Lai and Tao 2003), the importance attached to preventing loss from natural disasters has increased, therefore showing that anticipation of natural disasters has also increased.

5.4 Potential influences upon anticipations

Within this section, I hope to synthesise the above findings and draw out common themes. Several key topics can be highlighted as potential influences upon the anticipations discussed above and it is these that I now discuss.

5.4.1 Gender

Natural disasters disproportionally impact negatively upon women (Ferguson 1999, UNISDR 2004, Chew and Ramdas 2005, Hamilton and Halvorson 2007). One major reason behind this gendered difference is due to the role of women as carers for other family members, most notably children and the elderly, which is a significant part of disaster impact, response and recovery (Enarson and Scanlon 1999). Women's employment is also often more greatly impacted upon by natural disasters due to the more informal nature of jobs such as cleaning or shop work. In addition, the outmigration of males from more rural areas leaves women as the heads of households, and therefore makes them responsible for response to potential disasters (Chew and Ramdas 2005). For the Sichuan earthquake no official figures are available, but from spending time talking to those affected, it can be suggested that here too women were more adversely affected by the event than men. As such, experiencing the full force of a disaster will undoubtedly impact more perhaps upon women's post-disaster anticipations than their male counterparts, who may not hold the same experiences. A key reason behind the differences between men and women can be linked to the male-dominated trend of out-migration (Hamilton and

Halvorson 2007). Speaking to the women in Yongxing, it was evident that many of the male members of families were not permanently residing in Beichuan, but rather worked in nearby large cities such as Chengdu in order to earn more money to support the family. The result of this was that these men were not present in Beichuan on the day of the 2008 earthquake, and therefore do not share the same direct experiences as their female family members. In the hours following the disaster, the limited number of males present meant that the recovery and rescue was predominantly done by women:

"...we had to save ourselves, had to run for our lives, as there was no-one to help us."

Auntie Red

However, this recovery effort was a difficult one; "...as women we had no way of going to save people." (Lunch Lady). A lack of male manpower and skills affects the ability to carry out heavy duty tasks (Hamilton and Halvorson 2007). Therefore, the difficulty caused by the disaster increased disproportionately for women who, within the widespread devastation, found it difficult to help those trapped under the rubble.

Gender can also have an influence upon other risks such as finding work post disaster. Speaking to the women, it became evident that following 5.12 the well-being of family, although always important, became a more pressing concern for them. The result, however, was that often they felt a responsibility to provide for their family domestically, thereby reducing the possibilities available to them for work:

"I think, living here, I want to go out and work as well, but I can't. I don't know the people around here and also, I always think that I need to wait until our family is settled down before I can go out and find something."

Lunch Lady

As Enarson (2000) notes, being relocated to new places limits the ability for many women to travel to jobs. In addition, the care of grandchildren was the

responsibility of the grandmother, restricting these women's ability to work anywhere other than within the pre-fab settlement (see for further e.g. Robinson et al. 1986, Enarson 2000). It became apparent that for the post-5.12 women of Beichuan, the prioritisation of certain risks above others was an everyday inevitability, with the majority choosing family safety and well-being above earning money and stimulating their own life. This influence of gender, however, can be seen pre-5.12 also, as shown by the fact that it was the women who stayed in the hometown to look after the house and the children, with the men going out to larger cities to find work. Hamilton and Halvorson (2007) show how male outmigration from more remote communities creates societies dominated by women. Perhaps rather than a change in anticipations following the earthquake, the effect of gender in this respect has just become more pronounced, with women's responsibilities increasing, leaving them to shoulder more concerns, heightening their vulnerability to future potential disasters.

5.4.2 Age

The age of participants can also have an effect upon the risks that they anticipate (Newton 1995; Lai and Tao 2003; Halvorson and Hamilton 2007). The age bracket involved in my research ranged from 16 to 77, but most of the women fell into two age categories: 16-20 or 45-70. Within the present study, a distinct difference between the worries of the students involved in the diaries and the focus groups, compared with the older interviewees in Yongxing can be identified. There were also more subtle differences between the women in Yongxing with the 'grandmas' and 'aunties' prioritising slightly different worries to each other.

Firstly then, the issue arising for the students and the youngest interviewee - Jessica - was clearly a matter of education. For these girls, life revolves around school, and as discussed previously, the risk of doing badly in school is the greatest risk. The reasoning behind education as the primary concern can be linked to the fact that the students are surrounded by studying continuously. The impact of visual versus more invisible nature of risks, discussed previously in reference to natural disasters (Jackson 1981, Ho et al. 2008) could be playing a part in influencing the anticipations of the students. The students spend most

of their term-time life studying, and therefore education for them is the most important aspect whilst living in school, and could be interpreted as the most 'visual' concern for them. It was also seen that the reason behind education as a key to a secure future, was often a result of the importance attached to study from the older generation. Therefore, it would suggest that this risk should be equally anticipated by the older participants within the research. For some, such as Grandma, education was mentioned as an important risk, however predominantly, other risks were more highly prioritised. Perhaps then, rather than age, this is an issue of class. For the Lao Bai Xing of Yongxing, the opportunity to go to school is limited because of the high cost, and therefore greater importance is attached to work rather than education. For example, education for Younger Girl was not mentioned despite similarities in age to the students in Chengdu and Mianyang, and rather her main concern was being able to sustain employment in the near future. Despite the initial apparent link to age therefore, it seems as though education may be more to do with class, but as this research was not concerned with comparing class, there is not enough data to make more than an inference about this.

For the interviewees in Yongxing, it is possible to ascertain differences according to age, because all the women I spoke to regarded themselves as Lao Bai Xing, and therefore there are no discrepancies of class which could impact upon the findings. Within the interviewees (disregarding Jessica), the age ranged from 23 to 66, and within this some differences in risk anticipation were noted. For all ages, as mentioned above, the issue of housing was their first priority; however family well-being seemed to be of (often unmentioned) obvious importance. For the 23-56 age range though, a second major risk was seen in the threat of unemployment. These women were both worried about work in the present, but were also concerned about being able to find a job in the new town. For the 57+ women, the problem of money was a very real one, but due to their age, they had already retired, and so the reality of them being able to work, let alone wanting to, was limited. For these older women, a bigger risk was that of ill-health:

"We're over 60 years old now, we get ill very often, our health is not as good as it was when we were younger. From now on you think, I haven't brought any social security, so health is really a danger."

Housing Lady

This quote from Housing Lady articulates the anticipations of Grandma and Auntie Red too, showing that for this age, health rather than finding work, is a primary concern. Therefore, it seems that age can determine which risks are anticipated to a certain extent. For the younger students, education was the primary concern; for the middle-aged women, unemployment was a big risk; for the more elderly participants, ill-health posed a large threat. These differences in anticipated risks associated with age, can be linked to differences in lifestyles of each group, and as such, perhaps the visibility of risks plays an important role alongside age in determining risk anticipations.

5.4.3 Culture and superstition

Although no women specifically mentioned culture as a factor which influenced their decision-making process regarding risk anticipation, it can be seen as a potential control. Values and traditions play an important role within the everyday lives of the Chinese population. Lai and Tao (2003) raise an interesting link between low hazard perception and the notion of Confucianism, suggesting that the culture of Confucianism leads to less worry being attached to uncontrollable hazards. Confucians in China are eager to prevent disasters and promote harmony, however they do not concern themselves with risks that are unknown or seemingly remote (Lai and Tao 2003). This theory could therefore explain the responses of those who felt that there was no point in worrying about earthquakes, as they are impossible to control, such as Restaurant Owner. Within this culture of Confucianism, there is also a strong belief in 'fate' within China; that all events are fixed and predetermined (Harrell 1987). This concept equally could explain some of the responses behind why some of the participants did not anticipate earthquakes. For them, the lack of control over such events occurring meant that they didn't waste time worrying about them because this would achieve nothing.

5.5 Conclusion: the geography of risk

Through data collection it became evident that prior to the 5.12 earthquake, the women had few pressing concerns as all everyday requirements had been met. In terms of natural disasters, there was some level of anticipation of flooding due to past events and hearsay, however this anticipation was not significant enough for the women to consider preparing for flood risk and none of the women had brought insurance or made personal arrangements to prevent losses. In terms of seismic risk, this did not feature as a possible risk before 2008. Since the impact of the 2008 earthquake, the women have developed a series of concerns which did not exist pre-5.12. The main current concerns for the women were found within the everyday, with anticipation of not being able to find work, afford new housing, succeed in education or ensure that family members did not come to any harm, topping the list. Again, natural hazards did not immediately feature although due to the instable nature of the current accommodation in Yongxing the threat of monsoon induced flooding was a concern for several of the interviewees. Earthquakes remained unmentioned again initially, however when more specific questions were posed it became evident that seismic risks was now anticipated to some level as a serious threat by at least half of the participants. It is apparent therefore that there has been a shift in risk anticipation between the pre-5.12 community and the post-5.12 community. It has been found that the effect of direct experience was a key factor in changing risk anticipations although the impact of media reports can also be seen to increase anticipations due to news programmes and newspaper articles bringing direct memories back to the forefront of victims' minds. This increase in seismic anticipation was not uniform however with some of the participants feeling that they'd experienced one event now so wouldn't again (Jackson 1981, Alexander 2000), or that it was irrelevant whether or not they worried about earthquakes because seismic events are uncontrollable. In addition to the effect of experience, other factors such as age, gender and culture have been found to influence both original formulations of risk anticipation and also effect any changes in risk rankings post 5.12.

One additional crucial factor to consider, however, is the impact that relocation has had upon the women's' anticipations of risk. 'Place' can impact upon risk

rankings due to the different risks present in different locations. For example in Beichuan pre-5.12, landslides may have presented a very real risk due to the town's mountainous location, however within the prefabricated settlement at Yongxing, landsliding no longer poses as a threat due to the settlement's site upon a plain away from any significant relief. In the same respect, relocation has also presented some of the women with the threat of homelessness but this does not affect all of the participants. For those who lived outside the old Beichuan town, such as Auntie Red, it is possible to rebuild another property in their original communities whilst also salvaging what they can from the ruins of previous properties. For these households, they have much more control upon the budget of rebuilding. However for the women who are unable to return to their original dwellings, they must rely upon the government policies and hope that they appreciate and encompass their difficult financial situations. As a result it can be hypothesised that the impact of relocation in itself is enough to cause disorder and anxiety. For a population unaffected by natural disasters but forced to relocate their whole community, many of the issues raised by the women through my research would very likely emerge. Therefore, although some very interesting and insightful conclusions can be reached through my study, perhaps the forced out-migration of a whole town means that the results must be taken within this context. In this respect, it can be said that 'geography' acts as the fundamental influence behind risk anticipations. This is not just geography in the purely physical sense, but rather the all-encompassing geography of place and space, including temporal effects. An interplay of all the influences discussed (place, experience, age, gender and culture) appears to affect those risks which are anticipated and those which are not.

Chapter 6

Hazard Preparation and Risk Mitigation

Through the previous two chapters it has become evident that the impact of the 5.12 earthquake had an effect upon awareness and anticipation of risk amongst the Beichuan population. However, in order to prevent losses from natural disasters, preparation is of utmost importance. Within this chapter therefore, I hope to reveal the level of pre-earthquake preparedness and whether or not there were any mitigation measures in place. Following this I will investigate how the 5.12 quake has influenced such levels and whether or not modifications have been made in order to prevent such devastating losses from any potential future hazards. For this study the meaning of 'modification' can be taken to encompass any change in preparedness or mitigation at both the household and community level; modification includes small-scale changes such as preparing a kit of emergency supplies, right through to retrofitting buildings to prevent collapse. Before exploring my own data, it is useful to review some of the relevant literature in order to explore previous findings and define the important terms. Tierney (1993) identifies that there is an important difference between 'preparedness' and 'mitigation'. For her, preparedness is an individual's ability to respond to a disaster once it has hit and therefore minimise fatalities and secondary hazards. However mitigation can be viewed as a longer-term process which aims to implement measures before an event has occurred in order to reduce losses such as building collapse, landslides and fatalities. In reality, mitigation measures are often lacking amongst communities until they have experienced a large devastating event, after which preventative measures are developed to protect the community from further losses in the future (Tierney 1993). I hope to explore whether or not this is the case for Beichuan and to what extent the 2008 event has influenced future mitigation and preparedness.

6.1 Literature Review

As seen with the link between awareness and anticipation, anticipating an event does not necessarily result in preparing for such a disaster. Russell et al. (1995) have shown that communities can appreciate that there exists a seismic threat but this does not always lead to preparedness. In their study into earthquake preparedness in the eastern USA, it was found that many people believed earthquakes to be uncontrollable, and therefore although they recognised that

seismicity was a real threat to their community, the population felt preparing for such an uncontrollable event was useless; there was a 'why bother' attitude amongst many of the participants. Tierney (1993) also supports this view that risk anticipation does not always mean higher levels of preparedness, but suggests further reasons for the break in chain. Through her research, it is found that many individuals appreciate that they are at risk from natural hazards but due to a lack of funds, a lack of understanding of available preparation methods or lack of economical sense, many fail to employ any form of preventative measure. From Tierney's work therefore it seems as though preparedness can be influenced by several factors which can act to increase or decrease preparation levels within communities.

This notion is supported throughout the literature with many studies examining levels of preparedness and how these can be increased in order to prevent large losses from natural disasters. One major factor which arises within the literature is the effect of socioeconomics and demographics upon levels of household preparedness (see for e.g. Bourque et al. 1973; Turner et al. 1986; Tierney 1993; Russell et al. 1995; Shaw et al. 2003). Russell et al. (1995) identify that income, home ownership, education, gender, age and ethnicity all affect levels of individual preparedness; the poorer, elderly, less educated and migrants amongst populations are less likely to have implemented preventative measures than their richer, younger, more educated counterparts. This effect of socioeconomics is very interesting for this study as, in accordance to the findings of previous studies, the Beichuan residents involved in this research are likely to have had low levels of preparedness due to their low socioeconomic status. It will be interesting to investigate therefore whether or not this is found to be the case. In addition to demographics such as age, gender and income, Tierney (1993) has also identified that culture and beliefs can influence levels of preparedness. An example of this can be taken from work into the Kashmir Earthquake of 2005 by Halvorson and Hamilton (2009). It was found that in the aftermath of the disaster, local populations were enforcing religious rules more fiercely due to a belief that the earthquake had been caused by people not following the Qur'an as devoutly as they should. In this instance therefore levels of effective preparedness were low due to

communities believing in their own methods of preparedness. Although many Chinese do not follow religion, the Qiang culture within Beichuan remains prevalent and as a result it will be interesting to explore whether this had an impact on pre-5.12, or remains to have influence over post-5.12, preparedness levels.

Another factor widely discussed within the literature and of utmost importance for this study is the effect of past earthquake experience upon future levels of preparedness. Kunreuther and Kleffner (1992) found that levels of seismic preparedness following the 1989 Loma Prieta earthquake dramatically increased compared with pre-event levels. This increase in preparedness levels could be a result of what Alesch and Petak (1986) term a 'window of opportunity' for preparedness and mitigation education programmes. The high levels of damage caused by an event can act as dramatic evidence for the need for preventative and mitigating activities (Tierney 1993). Russell et al. also support this notion of a "teachable moment" (1995: 767) but state that there needs to be more investigation into the extent that post-event scenes can be used to motivate increased preparedness. I hope to reveal how the 2008 event has influenced preparedness within the Beichuan community and therefore hopefully the results from this study can help add to the literature. However, Mulilis and Duval (1991) suggest that it is not just experience of an event alone that increases preparedness levels, but rather it is experiences of damage, fear and evacuation which are more influential in raising preparedness amongst populations. In fact if populations are repeatedly affected by the same disaster, and therefore are accustomed to dealing with the effects, levels of preparedness are likely to be low (Tierney 1993). As a result, it seems as though earthquake experience has been seen to both increase and decrease preventative measures.

For many however, all these influencing factors upon preparedness are insignificant if the benefits of implementing preventative measures is outweighed by the cost; if an event has a typical recurrence time of more than 100 years, and the price of preparing for such an event is high, most households are unlikely to undertake the advised activities. In simple terms, the

benefits of mitigating practices are seen by the general public to decrease as the cost of implementation increases (Kunreuther and Kleffner 1992). As a result, the simplest forms of preparation can often be seen in place, but perhaps the more protective measures which require more time or effort to employ are lacking, despite their higher importance (Russell et al. 1995). In such circumstances, the availability of financial incentives can be useful in encouraging households to implement more costly activities (Kunreuther and Kleffner 1992; Russell et al. 1995). For example, low cost loans could be made available, or insurance companies could reduce their premiums for those who have followed preventative guidelines. Such financial incentives are reliant upon the involvement of more regional and national level institutions, and the incorporation of all levels has been identified as a highly important issue when aiming to increase both levels of household preparedness as well as more widespread mitigation practices. However, alongside the initial incentives, it is important that preparation and mitigation activities are maintained through time. The protectiveness of a mitigation scheme is limited if there is not continued maintenance following implementation (see for e.g. Brammer 1990; Rodetis 1999). This can be seen through the 1987 UNDP flood review which found that embankment failures (in place to protect against flooding) were in part due to a lack of maintenance and upkeep (UNDP 1988). However the costs involved in more community based mitigation maintenance can be high and as a result it is essential that local funds are available to aid with effective upkeep (Brammer 1990).

Many populations living in locations at risk from natural disasters often have an over-reliance upon government-level response should an event occur (Russell et al. 1995), but in many disaster situations the families are stranded on their own for up to the first 72 hours following the event (Petak 2002). As a result it is of crucial importance that households are self-sufficient and able to cope and respond to a disaster until more widespread help is available (Russell et al. 1995). In addition, the Kobe Action Plan (2003) identified that those who have experienced and been affected by disasters, make the best disaster managers; many government-level officials in charge of regional or national level mitigation activities do not have such direct experience. Therefore it is important to

combine all levels when developing mitigation practices. This idea is supported by Prater and Lindell (2000) and Petak (2002) who stress the importance of coalition when building hazard-resilient communities. The problems of dependence upon government-only-involvement can be seen from hazard management programmes within countries such as China and Hong Kong. Landsliding (both seismic and precipitation-induced) is prominent in both countries and the solution according to the government is often concrete (Engineered Slopes in China 2008). Figure 6.1 shows a common method employed within China in order to combat landslide hazards.

Figure 6.1: *An example showing the use of steel rods and concrete to stabilise a hillslope.*

Source: Nadgouda (2006).

The use of concrete as a mitigation practice however also raises the previously discussed issue of maintenance. Within China, concrete methods used widely during the 1990s have actually caused more damage to the surrounding environment than landslide occurrence with concrete mitigation activities cracking and peeling showing poor durability (Jiao 2008).

Therefore as well as the initial costs of covering hillslopes in concrete, there are added costs of maintaining such extravagant measures. In addition, by covering hillslopes in concrete, local land resources can be radically altered affecting nearby populations, especially those relying upon agriculture for income. In many instances, the over-reliance upon farming has led to slope instability, however the other extreme adopted by government planners should not be seen as the only alternative. It has been found that slope stability is reduced when slopes are bare and lacking in vegetation (Alcantara-Ayala 2006). Both over-faming and concreting whole hillsides leads to bare surfaces, which in turn, increases landslide propensity. In more recent years, mitigation in China is starting to encompass environmental protection through a realisation that more natural activities often have better outcomes that man-made ones. Slopes once concreted in China are now being planted with vegetation (Shi 2008). This vegetation also requires much less maintenance, as plant-life can develop and grow, with increases in vegetation creating increased slope stability. In terms of household level preparedness, a collaborative approach would consider ideas from both local populations and government official enabling a more sustainable and environmentally friendly solution. However, although government-only mitigation development is not the best way forward, the image of authority associated with such institutions can help to spread implementation of mitigation programmes (Tierney 1993; Prater and Lindell 2000; Shaw et al. 2003). Encouragement and motivation from the government to employ preventative and mitigating actions is crucial to avoid repeated losses. Bhatt (1998) has illustrated that without substantial levels of preparedness, communities can get trapped within a ‘disaster-poverty cycle’. Recurrence of disasters without increased levels of preparation or mitigation, result in populations being unable to recover or rebuild and therefore they become stuck in a constant state of poverty. This again reiterates the importance of household and individual level preparedness. From the literature reviewed within this section it is evident that preparedness can be influenced by many different factors which act to both increase and decrease preventative actions. I hope therefore to now explore the data collected from the Beichuan population in order to indentify both pre-5.12 and post-5.12 levels of household

preparedness, as well as investigate the level of government mitigation practices.

6.2 Pre-earthquake preparation

Due to the low socioeconomic status of the majority of my participants, I would expect from reviewing the literature that levels of preparedness pre-5.12 amongst the Beichuan Lao Bai Xing would have been low. As already defined, 'preparedness' within this study is concerned with the household level, however from interview responses it seems that there exists different types of preparedness; there is both the physical process of preparing one's house, as well as being equipped with the knowledge of what to do should an earthquake hit. If levels of preparedness are low therefore it can be expected that the levels of mitigation will also have been low. Table 6.1 shows different types of preparedness and mitigation available to protect against earthquake losses, with the levels of possibility for each method showing how accessible each tool would have been to the Beichuan population.

6.2.1 Pre-5.12 Mitigation

The physical process of implementing mitigation measures was distinctly lacking amongst the Beichuan population, with only one of out a total of 17 respondents having taken action to protect themselves from seismic loss. Housing Lady had built the 16 apartments and 10 shops that she owned in accordance to the highest seismic specification, and as a result not one of her properties had collapsed during the 2008 earthquake. However this was not due to her own actions, but rather because her husband had insisted that the most severe building regulations were adhered to. As seen in the previous chapters, Grandpa had a much higher level of risk awareness and anticipation than the other participants, so perhaps it is not surprising that he also employed a high level of mitigation. The cost of building the apartments at such a high safety standard would have been great, however the importance Grandpa attached to the seismic threat meant that he felt the benefits outweighed the extra price. But why was it that only one household from 17 had prepared for a potential seismic threat? For the most part, all the participants had similar characteristics; however there are two distinct differences between Grandpa and the other

respondents; gender and education levels. In terms of gender, it is difficult to draw any conclusions as Grandpa was the only male involved in any form of interview, however some preliminary suggestions can be made from varying education levels. As seen in earlier chapters, the women currently residing in Yongxing were often lacking in more than a primary school level of education. The girls recruited for the focus groups had received a much higher level of education as they were currently studying for university degrees. Amongst all the female participants however, there appeared to be an equally low level of mitigation for potential earthquake events. Therefore a higher level of formal education does not appear to increase preventative action. Grandpa had a similar level of education to the focus group students, however in addition to this, his employment had been specifically focused upon seismic hazards. As a result this specialised knowledge had increased his mitigating actions at the household level. Rather than socioeconomics having an influence therefore (as suggested by Bourque et al. 1973; Turner et al. 1986; Tierney 1993; Russell et al. 1995; Shaw et al. 2003), it seems rather that there was a lack of understanding amongst the women that there were various mitigation measures available (Tierney 1993). This idea that the women were unaware that there were ways to protect themselves from earthquake losses is supported by some of the responses to the question "Before the 2008 earthquake did your household have measures in place to protect from losses?":

> "I'd never thought about it at all"
>
> *Restaurant Owner*
>
> "I don't know anything about this kind of thing, don't know anything"
>
> *G-Lady*

Without knowledge of how to prepare, populations cannot be expected to implement mitigation practices. Therefore it seems as though an important fact to consider is the availability of information and mitigation programmes to the general public living in 'at risk' communities.

Method	Preparation or Mitigation?	Literature	Possibility
Storing emergency supplies such as water, tinned food, torch, battery-operated radio and a first aid kit.	Preparation	Russell et al. (1995); FEMA (2010)	Easily available
Building houses to a high seismic standard or retrofitting existing buildings to allow withstanding of high levels of shaking.	Mitigation	Russell et al. (1995); Petak (2002); Kanamori et al. (1997); Bostrom et al. (2006); US Congress Office of Technology Assessment (1995); Oliveira et al. (2006); Godschalk et al. (1999); FEMA (2010)	Aspirational
Arranging an emergency meeting place for the household in the event of an earthquake.	Preparation	Russell et al. (1995); FEMA (2010)	Easily possible
Stabilising slopes to prevent secondary hazards becoming triggered by seismicity.	Mitigation	Kanamori et al. (1997); US Congress Office of Technology Assessment (1995); Oliveira et al. (2006); Godschalk et al. (1999)	Desirable
Identifying safe places to take shelter during an earthquake.	Preparation	FEMA (2010)	Easily possible
Buying housing insurance to cover losses from earthquakes.	Preparation	Russell et al. (1995); Oliveira et al. (2006)	Desirable
Increasing levels of knowledge both individually and for other family members such as how to dial an emergency number and how to turn off electricity and gas supplies.	Preparation	FEMA (2010); Congress Office of Technology Assessment (1995)	Desirable
Securing large furniture such as cupboards and bookshelves.	Mitigation	Russell et al. (1995); US Congress Office of Technology Assessment (1995); FEMA (2010)	Possible
Community-level emergency communication plan.	Preparation	Russell et al. (1995); US Congress Office of Technology Assessment (1995); Oliveira et al. (2006); Allen and Kanamori (2003); FEMA (2010)	Desirable
Early warning systems – real time earthquake information systems.	Mitigation and Preparation	Kanamori et al. (1997); Kanamori (2005); Oliveira et al. (2006); Allen and Kanamori (2003)	Desirable

Table 6.1: *Table to show methods of earthquake preparation and mitigation and the level of possibility for the average Lao Bai Xing.*

6.2.2 Pre-5.12 Preparedness

When asked about how to prevent losses from earthquakes, many of the women felt personal safety was key; if they have the knowledge of how to respond to an earthquake, fatalities and injuries can be prevented. Therefore although the physical implementation of mitigation measures seemed not to be important, the possession of personal safety knowledge was considered imperative:

"If everyone had [known to] run outside at that time, then not so many people would have died in Beichuan"

Restaurant Owner

The respondents' level of knowledge varied greatly, with age and class seemingly having no effect. At one end of the scale was Restaurant Owner, G-Lady, Grandma and Auntie Red who explained that they didn't know what to do in the event of an earthquake and their survival was often down to coincidental actions; these women were either visiting relatives outside of Beichuan on 5.12, or happened to be outside at 14.28 when the earthquake hit. After this group of women came Jessica, Lunch Lady, Younger Girl, Housing Lady and the focus group students, who all felt they had some knowledge concerning how to protect themselves during an earthquake such as hiding under a table, running to the bathroom, or getting outside if possible:

"...our knowledge was that you should run into the kitchen or the bathroom, because the bathroom has a "bridge" there...Also, under the table, that kind of knowledge".

Lunch Lady

"...when an earthquake happens, you should kneel below a desk or table. Then, if you have the opportunity, if you're near the bottom of the building, then you should try your best to run outside, run to a wide open place, somewhere there are no electricity poles or tall structures etc., or least not close to them."

Jessica

However, this knowledge seemed to focus upon an individual's ability to move out of harm's way rather than the recognition of other ways to prepare for earthquakes such as storing food, touches, radios and water. Therefore for the participants of my research, their knowledge was confined to personal response once the earthquake hit rather than preparing or mitigating in anticipation of an event. This pattern is also shown by Solberg et al. (2010) through their study into earthquake preparedness in the USA. Within this study, the authors found that "response and recovery-related seismic adjustments were more widespread than preparedness and mitigation adjustments" (Solberg et al. 2010: 1664). Another factor which has been found to effect household-level preparedness is the familiarity with repeat events. If communities get accustomed to a hazard occurring they often don't see the need to put protective measures in place (Tierney 1993). This is an important idea to note for Beichuan due to the regular occurrence of 'shaking' within the town as revealed in the previous chapters. As the population were unaware that earthquakes had the potential to be so large, it may have been that the respondents felt they were actually well prepared for these shaking events and rarely suffered losses. This misunderstanding could be a further reason behind the low levels of preparedness discovered in Beichuan pre-5.12.

6.2.3 Pre-5.12 Local government level mitigation

Through the brief interview with Grandpa there is support for speculation that local authorities had an awareness of the seismic threat faced by Beichuan. Therefore it is surprising to learn that there were no mitigation practices in place, not even an emergency recovery plan in the event of a large earthquake. Through some of the latter interview sessions, it became evident that there was no heavy machinery or tools available in the hours and days immediately after the earthquake, and it appears that there was no communication plan either:

"...the mayor of Mianyang...he said that no such thing had happened...He didn't believe it, didn't believe it, even when a minor leader had gone to register there and explained everything he didn't believe, so what can you do?"

Restaurant Owner

"...there were three disaster reports from Beichuan, he [the mayor of Mianyang] said there was no earthquake, he said that. We asked him to come to Beichuan and save the people, we only asked him to save the students, but he didn't come."

G-Lady

"Some people were trapped underneath, there were no tools to use, so you couldn't pull them out...I went to look for my niece at the school. When I got there, everywhere I could hear children shouting for their mums and dads, shouting for them to help them. The whole building had collapsed. There were only small cracks in the rubble, you couldn't see what was behind, it was all dark...I shouted in and the children inside heard there was someone outside. I told them to look for where they could see light, to see if they could put their hands out where they could see any light and I could try and pull them out. But they said they couldn't move, there was no way they could move, they couldn't climb up. They said they could see me, but they couldn't reach my hand, they were too far away. So there was nothing I could do, nothing I could do."

Restaurant Owner

According to several of the participants, due to the epicentre being located in Wenchuan, the situation in Beichuan was not initially realised. The devastation was only realised once rescue teams destined for Wenchuan but redirected around impassable roads arrived:

"...the rescue team realised then as they were trying to get to Wenchuan through Beichuan the morning after the earthquake had happened. They realised then that Beichuan had been damaged the most of all places. In fact, the damage in Beichuan was worse than Wenchuan, it was just that the earthquake had been reported from Wenchuan at first."

Restaurant Owner

In addition to low levels of household mitigation and preparedness the regional levels were also incredibly low. There appeared to be no tools available to the local population in event of a large earthquake such as machinery to rescue those trapped under the rubble. From speaking to the women, it was also

apparent that Beichuan was lacking a community level disaster communication link. From the previous quote from Restaurant Owner it shows that the first realisation outside of the Beichuan population of the damage caused was from a redirected rescue effort. This suggests that had the roads to Wenchuan been passable, the situation in Beichuan would have gone unnoticed for even longer. In the absence of individual level mitigation practices amongst local populations, the infrastructure for response recovery must be as good as possible to ensure minimal losses. It is clear therefore how such vast devastation continued for hours and days after the initial seismic shock. Solana and Kilburn (2003) found similar results in their study on Gran Canaria, where there was no government recognition of landslide threat and therefore the challenge to increase preparedness amongst local populations was even greater. It will be interesting to investigate whether or not levels of preparedness and mitigation at both the household and regional level have increased in response to the revelation of such low pre-5.12 levels now and whether further increases are planned for the future.

6.3 Post-earthquake modification

From the literature it can be speculated that disaster experience can act to both increase and decrease levels of preparedness as well as having no effect at all (see for e.g. Bourque et al. 1973; Alesch and Petak 1986; Tierney 1993; Russell et al. 1995). Having found that pre-5.12 levels of preparedness and mitigation were low, I now aim to investigate whether or not the impact of the 2008 event had an influence enough to change these levels.

6.3.1 Post-5.12 Mitigation

From the interviews in Yongxing it is clear that direct experience of the 2008 earthquake has increased awareness of mitigation practices amongst the participants. In contrast to a low level of understanding pre-5.12, the issues of building standards and housing insurance arose as ways to protect physically and economically from seismic losses in the future:

> "The building should be able to support itself for as long as possible..."
>
> *Restaurant Worker*

"...when you build your own house, the building, the toilet, the whole thing built together can prevent loss..."

Grandma

"... you can strengthen the building, strengthen it..."

Auntie Red

It seems therefore that the devastatingly large number of houses which collapsed have shown the importance of structural stability. This supports the idea raised by Tierney (1993) that the evidence created by an earthquake can make the need for mitigation and preparedness more apparent to local populations. In addition, the increase in mitigation awareness could also be due to the fear, forced evacuation and damage caused by the 5.12 event which is also suggested by Mulilis and Duval (1991). In turn, it would seem that the notion of a 'window of opportunity' following a disaster, as indentified by Tierney (1993) and Russell et al. (1995), could play an important role amongst communities affected by natural hazards and at risk from similar future events. If mitigation programmes can be developed whilst the devastation of the previous event is still clear in the landscape and memories of those affected, the motivation to implement preventative measures may be higher.

However, the results from this study must be taken with caution as the situation faced by the respondents is different to many affected by disasters. Due to the relocation of Beichuan town, the rebuilding of structures became the sole responsibility of the government, so the importance attached to safety standards by the women has increased substantially. The realistic increase in mitigation levels is hard to determine as the cost of including seismically resistant materials lies solely with the Chinese government; whether the women would employ such practices if they were in charge of rebuilding their own homes is hard to tell. In addition, many of those involved in the research lived in the more marginalised and dangerous locations of Beichuan but again due to the relocation of the whole town, it is hard to know whether or not they would consider spending more to live in less 'at risk' sites were they to be returning to the original town. This speculation can be supported from the final interview

session with Auntie Red who is able to return to her village and is therefore in charge of her own rebuild:

"...because it's [the house] in quite a high position, the terrain is quite high and the building is tall as well, so...I'm afraid it will tumble down again later"

Auntie Red

Despite the fact that she can build the house to the specification that she feels necessary, due to a lack of funds her family is unable to build a single storey house or provide stronger re-enforcement and bracing and as a result they have not increased their levels of mitigation. This situation is likely to have been true for many of the women involved in the research and stresses the importance of incentives to motivate people to acknowledge mitigation action to protect their households and prevent future losses.

6.3.2 Post-5.12 Preparedness

In terms of personal safety, the women involved in the research are generally at the same level of preparedness as before the 5.12 earthquake. However, an increased level is not apparent with regards to storing emergency supplies or developing an emergency evacuation plan for their household or community. There was some mention of storing water and torches within bathrooms due to the heightened stability of small rooms, however this was rarely brought up by the respondents themselves which puts the suggested actions in doubt. It seems therefore that although preventative actions appear to have increased as a result of the 5.12 earthquake, the response levels amongst the population have not increased; mitigation practices have become more prevalent, but preparedness does not appear to have increased.

In fact those who felt that they had at least a basic level of understanding of what to do in an earthquake pre-5.12 raised an interesting issue. Despite their knowledge of what to do and where to go to avoid personal injury, the shock and unexpected nature of the event caused panic and confusion resulting in the women responding to basic instinct rather than acting on their knowledge:

"...we knew that if there was an earthquake, if it was a light one, an average earthquake, if you couldn't run out of the building, then we definitely knew that you should run to the bathroom. But in a large earthquake like this, you really didn't have time to react and once you had reacted there was no time to run. It came so quickly and fiercely, there was no (...) you didn't have the time to think, I tell you...that's the reason why so many people died in this earthquake."

Lunch Lady

"If you're inside you should run out as quickly as possible...In a tall building, then you shouldn't run, you should go into the stairwell, somewhere that's held together well, and stand there...[but] I was scared, I didn't know where to run. It was too strong."

Housing Lady

The women who felt that they were well prepared with knowledge to react to such a large earthquake therefore seem to have changed perspective slightly. In the post-5.12 community there is a common attitude that the 5.12 event was so large, there was no way that anyone would have been able to react appropriately in order to protect themselves. For the women the earthquake was just too large and uncontrollable, and no amount of preparedness would have saved lives. This attitude was also found by Russell et al. (1995) amongst residents in the USA who despite realising they were at serious risk from seismic events, adopted a 'why bother' approach due to a belief that losses from large earthquakes are unavoidable. For the women of Beichuan, luck plays a big role within their lives and with seemingly no benefit of knowing how to respond during an earthquake event, they see no reason to change their levels of preparedness.

6.3.3 Post-5.12 Local government level modification

The change in government mitigation and preparedness appears to have been quite marked following the 5.12 earthquake. The most notable mitigation activity had been to relocate the whole of Beichuan town to a new site where the seismic threat is much reduced and secondary hazards are also at a minimum. Due to the enforced relocation, the Chinese government are also financing the building of the whole town ensuring that all structures conform to high seismic

resistance standards. This is in stark contrast to pre-5.12 mitigation levels when there existed no apparent emergency plan. However these actions only cover the residents of Beichuan, and it is unclear whether or not government level mitigation has increased evenly across the region affected by the 5.12 earthquake. In Chenjiaba, Auntie Red seems to feel as though everything is returning to how it was prior to the devastating earthquake with little concern for future seismic potential. As Beichuan was such a key town in the media eye, it is likely to be dealt with very closely to be held up by the Chinese as an example to the rest of the globe. In addition, the timing of the 5.12 Sichuan Earthquake came just 3 months before the occurrence of the 2008 Beijing Olympics and therefore China's government were being watched closely in particular to monitor their levels on humanity when dealing with the disaster. Politically, the Chinese needed to show their efficiency and humanity in response to 5.12 to promote the 2008 Olympics to the rest of the world. The effect upon the globe's portrayal of China following the 5.12 earthquake in the build-up to the Beijing Olympics is encapsulated by Callick (2008), writing for The Australian in May 2008:

"The world has been watching with distaste and some nervousness the surge in strident nationalism that has followed the unrest in Tibet and the resulting protests during the international torch relay...Now the world is witnessing a nationalism it can applaud: a China uniting in both empathy and efficient practicality to respond to the latest of the natural disasters... This human, and humane, face of China and its leaders - portraying a vulnerable people, not just a surging economic superpower - will frame the final preparations for the Olympic Games, and relax some of the tensions that have been building between the affronted hosts and their increasingly anxious guests".

Therefore the government succeeded in receiving media attention applauding their response to the 5.12 earthquake. However, it is likely that many other areas affected or disaster events will not receive such drastic increases in mitigation and preparedness at the government level. A simple example of the attention received by the 5.12 earthquake in comparison with other Chinese earthquakes can be taken from a literature search. When searching for

"Sichuan Earthquake 2008", ISI Web of Knowledge returns 297 articles, however a similar search for "Yushu Earthquake 2010" returns only 6 articles. Although the area affected by the 5.12 event was much larger than the 6.9 Yushu earthquake of 2010, the startling difference in attention between the two earthquakes suggests the media focus of the 5.12 event would have increased the Chinese government's spotlight upon Beichuan's future mitigation practices. As discussed in the literature review at the introduction of this chapter, it can be dangerous to have all mitigation control at the government level, as it is at the individual level where most of the losses are prevented in the first few days following a disaster. As a result, if the community of Beichuan become over-reliant upon government response, they could in fact become less prepared for future events and therefore more at risk of losses.

6.4 Conclusion

Before the 2008 earthquake hit Beichuan, it seems as though the community had low levels of mitigation practices in place. Many of the women claimed a lack of knowledge pre-5.12 was the reason behind the absence of preventative actions. This pattern has been acknowledged in the literature as a common occurrence, where it takes the impact of a large disaster to highlight the need for mitigation programmes (Solberg et al. 2010). This certainly seems to be the case from the participants' responses currently living in Yongxing who in the aftermath of the 2008 earthquake are now aware of the importance of preventative action. In terms of individual level preparedness, pre-quake physical actions were lacking, however there seems to have been a certain level of knowledge about how to react to seismic activity in order to prevent human losses. Unlike changes in mitigation levels however, preparedness does not seem to have increased as a result of the 2008 event. Due to an apparent lack of benefit in knowing how to respond to earthquakes, many of the women have adopted a 'why bother' approach to increased preparedness (Russell et al. 1995). For the respondents, luck is in charge of fatalities and therefore earthquake losses are uncontrollable. In terms of government level mitigation there has been a drastic change in practices since the Wenchuan earthquake struck. Pre-5.12 there was seemingly no preventative measures in place to protect the population from seismic activity, not even an emergency evacuation

plan. Since the 2008 quake however relocation programmes have been established, building standards more closely enforced and education programmes increased. This information must be interpreted with caution however as Beichuan has become the example town for the Chinese government and as a result it hard to determine whether such increased levels of mitigation are nationwide.

Having established both past and current levels of awareness, anticipation and mitigation it is now important to use this information to facilitate a better understanding of how to continue forward with increased preparedness. In the next section I hope to draw together all three analysis chapters and determine how they help to reveal the best practices of hazard management in order to reduce future losses from such devastating events.

6.5 Summary

1. Pre-5.12 levels of mitigation at both the household and local government levels were very low. Only one participant displayed implementation of protective measures before the 5.12 event.
2. Levels of household preparedness pre-512 were more widespread than mitigation activities, however these measures were focused upon knowledge rather than practical methods. The women knew where to run in the event of an earthquake, but few had prepared an emergency supply kit or arranged an emergency family meeting place.
3. Post-5.12 there has been a clear increase in government levels of mitigation – the most notable being the relocation of the whole of Beichuan to a more seismically stable site. However, as discussed, the motivation behind such a drastic change in mitigation is likely to be a result of politics. It will be interesting to see if the improved mitigation practices are maintained to a high standard over the coming years.
4. Due to the relocation of Beichuan post-5.12, and the keenness of the government to promote an effective response, there is little left for the local population to implement in terms of mitigation practices. As a result, mitigation measures amongst the women have remained similar to pre-5.12 levels.

5. The importance of household preparation has been discussed but unfortunately there seems to have been little effect of the 5.12 event upon these levels. There has been some increase in the presence of emergency supply kits alongside knowledge, however this is not unanimous. The women expressed that the 5.12 experience has in fact suggested that they have little control during such a large earthquake and as a result many of the participants felt preparation achieved little.

Chapter 7

Discussion: towards an integrated approach

The previous three chapters have each reviewed the findings of the relevant field data, and so within the current chapter I hope to take a more reflexive approach to the study as a whole.

7.1 Beichuan awareness levels

Within pre-5.12 Beichuan, levels of seismic awareness were low. There appeared to exist a certain amount of local knowledge circulating, however this knowledge had not lead to a realisation that there was a distinct possibility for seismicity in the area and therefore earthquake awareness was almost non-existent. It is important that local communities are aware of the hazard they are at risk from. As seen from the Beichuan women, a major reason for lack of preparation and mitigation was a lack of seismic awareness. As discussed in chapter 4, knowledge does not necessarily lead to an increase in awareness, however educating at risk populations can promote a more aware community if implemented carefully. It was discovered within this study that the women had a certain level of knowledge regarding seismic potential through the folk tales of Erlangshen and the myth of the dumpling analogy. Therefore there seemed to exist a level of knowledge within the Beichuan community which has been identified within the literature as 'indigenous knowledge'. Mercer et al. define indigenous knowledge as "a body of knowledge existing within or acquired by local people over a period of time through accumulation of experiences, society–nature relationships, community practices and institutions, and through passing it down through generations" (2009:158, see also for e.g. Brokensha *et al*. 1980; Sillitoe 2000; Fernando 2003). Such knowledge can take many forms but often it is rooted in folk tales, religion or identifying changes in animal behaviour (Pilgrim 1999; Halvorson and Hamilton 2009; Donovan 2010). The presence of indigenous knowledge existing amongst 'at risk' communities is also supported by the International Federation of Red Cross and Red Crescent Societies (1995) who found that those living in close proximity to natural hazards know about the risks they face and in addition often know of the remedies too. However, although communities appear to possess knowledge regarding natural disasters, the political will to finance solutions and commit time and resources towards such activities is often lacking, and therefore mitigation practices remain absent (Pearce 2003). This lack of encouragement

within Beichuan from the local government offices could have lead to the low levels of awareness, as although the women had heard the folk tales, the apparent lack of importance attached to such stories from local officials lead the women to attach relative insignificance also. In addition, as previously discussed, there is the issue of cultural erosion, where the prominence of indigenous knowledge is often lower than previous generations. The relocation and displacement of communities, alongside the disintegration of traditional societies has worn away neighbourhood ties and responsibilities (Pardasani 2006) and therefore increased individual household vulnerability. If local knowledge is promoted, hazards can be understood within a society's specific context and a better understanding of risk is likely to encourage increased hazard awareness. This is a crucial issue for the Beichuan residents as the forced relocation could lead to knowledge erosion. Therefore the local government and community figures must ensure that there are programmes in place to circulate the folk tales and give weight to the myths to prevent them being dismissed as elderly hearsay. This in turn could help to harness shared history and experiences to rebuild and protect the community from losses in future.

7.2 Beichuan anticipation levels

The presence of seismic anticipation was almost non-existent within Beichuan pre-5.12. Due to the low awareness levels this finding was perhaps unsurprising, however even amongst those who were aware of the potential for earthquakes in the area, there was no anxiety attached to such an event. For the post-5.12 community there seemed to be a greater level of concern for future potential events, although not all the participants had altered their earthquake anticipation. It seems rather that the day-to-day worries which took greater precedence within the pre-5.12 population, are now even more pressing due to the hard post-earthquake living conditions. Before the 5.12 event all the participants either owned or rented property, and possessed jobs with which they could sustain their families. Amongst the post-5.12 women however, there is a high level of anxiety concerning housing and unemployment, and as a result the importance of earthquakes, although the cause of these problems, seems to have been forgotten to a certain extent. In the aftermath of disasters

it is important to maintain the initial raised awareness and anticipation levels as this provides a good opportunity to introduce education programmes.

Within Beichuan both pre- and post-5.12 there appears to be a significant absence of hazard education programmes. The circulation of folk tales alone is not enough to raise hazard awareness, and without awareness, levels of mitigation will also be low. The state regime in place in China has led to a population who look to their government for confirmation on many issues and as a result, it is crucial that local officials support indigenous knowledge through increased disaster education. Without such focus upon learning, perceptions and anticipations will remain unchanged and is likely that the uptake of mitigation practices will therefore remain low. Aldunce and Leon (2007) identify how information is often not as accessible to marginalised groups (such as the Lao Bai Xing in Beichuan), but note how education is key to community empowerment if households are to change their perceptions and take control of their own mitigation. The role of education within more disadvantaged communities must be appropriate however, as levels of literacy are often low. Kandel et al. suggests that to achieve successful disaster education it should follow the cycle of: “risk perception – intention to search information – searching information – intention to take measure – taking measure – higher risk perception” (2007:585). In this respect, the population at risk must be provided with information surrounding the potential threat, but should also be encouraged to go away and search for information themselves. Through self-learning, individuals are able to think through the important aspects and therefore rank mitigation measures in order of preference (Pearce 2003; Kandel et al. 2007). The public has a right to know and understand about the hazards of their community (the International Federation of Red Cross and Red Crescent Societies; Pearce 2003), but unfortunately governments seldom provide the means for households to learn more (Aguirre 1994), despite local populations being in favour of increased hazard education programmes (Drabek 1986).

7.3 Beichuan preparedness and mitigation

Pre-5.12, preparedness and mitigation activities were very low within Beichuan. Both at the household and the community level, there was a serious lack of

mitigation schemes in place. A few individuals had taken their own action to protect against seismic activity, however there was no government organised education, or community-level emergency response plan. From interview sessions with the Beichuan locals, and personal communication with scientists working in the Beichuan area, it seems as though there was awareness and anticipation of seismicity at the government level, which begs the question, why was nothing done to promote awareness and protect the residents? However, Tsang (2008) reveals that prior to the 5.12 event, official seismic zonings of Sichuan Province designated the area devastated by the earthquake as 'non-seismically active' (Figure 7.1). As a result, the regional earthquake hazard of the area had been grossly underestimated. The occurrence of the 5.12 earthquake unquestionably demonstrated the seismic power in the area. As a result, the government within China have drastically increased their mitigation activities within the area through settlement relocation, stricter building enforcement regulations and slope stabilisation.

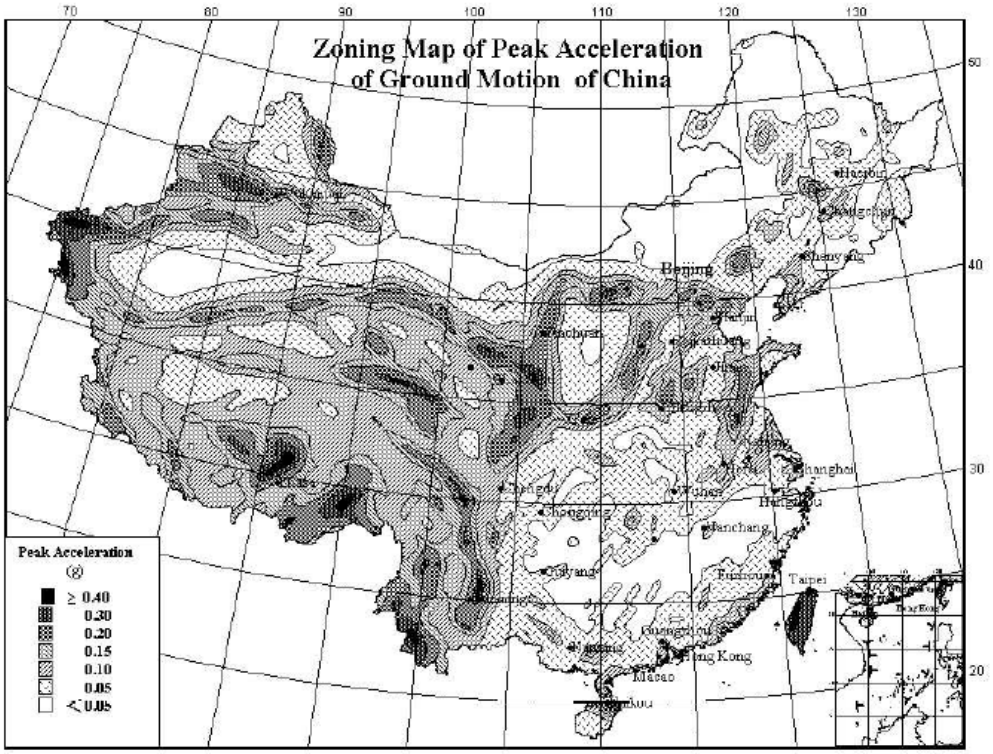


***Figure 7.1**: Seismic zoning map of peak ground acceleration (PGA) for China. Source: Tsang (2008).*

The motivation behind such raised mitigation activities could be seen as questionable however, due to the timing of the 5.12 earthquake a few months before the 2008 Beijing Olympics. Whilst this is purely speculative, there are several factors which suggest that the devastation caused in Sichuan did not act to increase mitigation measures in other 'at risk' communities within China. One major issue to arise from the 5.12 earthquake was the poor structure of many Chinese buildings both publically and privately built (Wang 2008). Post-5.12 therefore this was a crucial point of focus for the government, with increased seismic building regulations and programmes of retrofitting (Figure 7.2). However from the Qinghai earthquake devastation 2 years later, it could be suggested that the government had not applied the lessons learnt from the 5.12 event any further than within Sichuan Province. During the 2010 Qinghai earthquake thousands of people were killed, and although the impact was nowhere near that of the 5.12 event, the proportion of building collapse was similar (BBC News Online 2010[6]). Perhaps then, the focus of the media upon China prior to, during, and post-5.12, ensured that the government response was of the highest standards for the Beichuan population. However the importance of earthquake mitigation shown through the 5.12 earthquake was not necessarily extended to other regions within China. In addition, for those women returning to their villages outside of Beichuan town, the enforcement of stricter building regulations seems to be lower than within the newly built Beichuan. Auntie Red talked about how they had rebuilt their house in Chenjiaba in exactly the same manner as their previous house, which was levelled during 5.12. Although this is only one example within a vast population, it is important to highlight the challenges facing the government to ensure the impact and devastation of the 5.12 earthquake is not repeated in the future. For Beichuan specifically, it is crucial for the Chinese government to ensure that the high levels of mitigation are maintained now that it is no longer in the media spotlight. In can be all too easy for mitigation activities to be implemented and not followed through once the initial devastation has been overcome (UNDP 1988; Brammer 1990; Rodetis 1999).

[6] http://news.bbc.co.uk/1/hi/world/asia-pacific/8619109.stm

Figure 7.2: *Signs surrounding the devastated site of Beichuan old town stating "build back better". Such slogans were very common around Sichuan Province. Source: author's own.*

Despite the increase in government-led mitigation however, household preparedness levels remained low even after the 5.12 disaster. Some women displayed a certain level of preparedness, however the few households that this related to had focused their methods upon response and recovery, rather than preparation and protection. This is not an uncommon trend amongst populations living at risk from natural disasters as for many communities, the assistance arrives post- rather than pre-disaster (Linnerooth-Bayer 2005). However mitigation practices can be seen as empowering and "much further-reaching...than those of disaster relief" (Boyden and Davis 1984:2). Within developing nations, there is a great need to promote sustainability and in terms of disaster management this will only be reached through locally lead mitigation practices (Salter 1998; Pearce 2003; McEntire 2004). This move from response to mitigation has not been completely recognised by the Beichuan population with the government taking charge of recovery activities rather than local communities. Although some of the government actions have been protective in nature, there does not appear to be any promotion of household level mitigation.

7.3.1 From 'top-down' to 'bottom-up' hazard management

Focus upon post-disaster response rather than pre-disaster preparation can lead to over-reliance upon donor agencies such as governments and international aid groups (Boyden and Davis 1984). For the Beichuan population, promotion of household-level protective measures is lacking. If China wants to reach sustainability in terms of natural disasters, it must direct government focus towards encouraging community level mitigation programmes, alongside national level recovery. The reliance upon government response in China could be a product of 'top-down' disaster management. Historically, the aims,

objectives and implementation of hazard mitigation programmes have been 'for' rather than 'with' local communities (Laughy 1991). Governments have focused funding upon 'experts' and 'science' to develop and distribute protective actions in order to reduce losses from natural disasters. However, such approaches have typically adopted centrally driven actions which can fail to appreciate the skills, knowledge and anticipations of local communities to which the schemes are intended to help (Bims et al. 1997). This failure to appreciate local cultures and practices can in turn lead to an erosion of traditional knowledge which historically has protected populations from disaster losses (Pande 2006; Pardasani 2006; Halvorson and Hamilton 2009). As a result of failing to appreciate local complexities and perceptions, the success of large-scale institutions is often limited, with local populations misunderstanding or disapproving of 'scientific' programmes (Bims et al. 1997). The combination of traditional knowledge erosion, and lack of effective top-down mitigation actions has lead to an "institutional vacuum", where social fragmentation and social, economic and political alienation, all lead to increased hazard vulnerability (Pande 2006:426). The financial help of central government institutions is crucial, but without an appreciation of local perspectives, the success of locally-driven mitigation initiatives will be limited. It can therefore be argued that the focus of programme development should be a bottom-up one (Figure 7.3). This shift in focus can provide momentum for implementation through promoting a unifying relationship between governments and the lay public (Pearce 2003; Pande 2006). In addition, it is an almost impossible feat for a central organisation to attempt to reach all levels of

From		To
· Hazards	→	· Vulnerability
· Reactive	→	· Proactive
· Single Agency	→	· Partnerships
· Science Driven	→	· Multidisciplinary Approach
· Response Management	→	· Risk Management
· Planning for Communities	→	· Planning with Communities
· Communicating to Communities	→	· Communicating with Communities

Figure 7.3: *Table to show the move from top-down approaches (from) to the more inclusive bottom-up approach (to). Source: Salter 1998.*

society, therefore creating inequality, but through locally implemented policies, households in more remote areas are more likely to receive successful actions (Pande 2006).

7.3.2 The importance of participation

Amongst the participants involved in this research, there remains a low understanding of seismic hazards, and a lack of appreciation of the value of mitigation practices. Without an understanding of the importance of hazard mitigation and the devastation it can prevent, the willingness to follow preventative actions will be limited. Purely scientific approaches to hazard mitigation often neglect the social complexities involved in the socioeconomics and cultural traditions of the communities requiring mitigation practices (Bims et al. 1997; Haque, 2003; Martin and Taher, 2001; Vargas, 2002; Aldunce and Leon 2007). The Lao Bai Xing involved in my research suggested that such traditional scientific explanations for earthquakes are too complex to fully comprehend. The reason behind such traditional 'top-down' approaches has often been to find universal solutions (Hill 1986) rather than to focus on each population in its specific local context (Bims et al. 1997). However the lack of communication and cultural understanding of such scientific programmes can often lead to hostility between the implementers and the local community (Bims et al. 1997). An example of a populations disregard for 'official' hazard mitigation plans can be seen in research conducted by Donovan (2010) who investigated the volcanic threat faced by Central Java, Indonesia. Here it was found that communities would only evacuate the area once they had received both a traditional and official warning. The recognition of the scientific was therefore apparent, however without the appreciation of the traditional signs, mitigation activities would be limited due to the importance attached to religious signs by the local population (Donovan 2010). As a result, if successful mitigation practices are to be achieved, it is critical that local communities are incorporated into both the development and implementation stages of hazard management schemes.

In order to facilitate such bottom-up inclusive programmes, participatory methods can be employed to promote community involvement in the decision-

making process (e.g. Comfort et al. 1999). The 'power of peoples' science' (Wisner et al. 1977), through factors such as folk tales and animal behaviour, has been recognised, and therefore the ability of local groups to develop solutions to disaster impacts should not be overlooked (Pearce 2003). Within the Beichuan area, this traditional knowledge is exemplified through indigenous building practices. Although this was not a factor to arise from my fieldwork, the traditional buildings of the Qiang minority were seen to withstand the 5.12 earthquake much better than the modern Chinese structure (Figure 7.4).

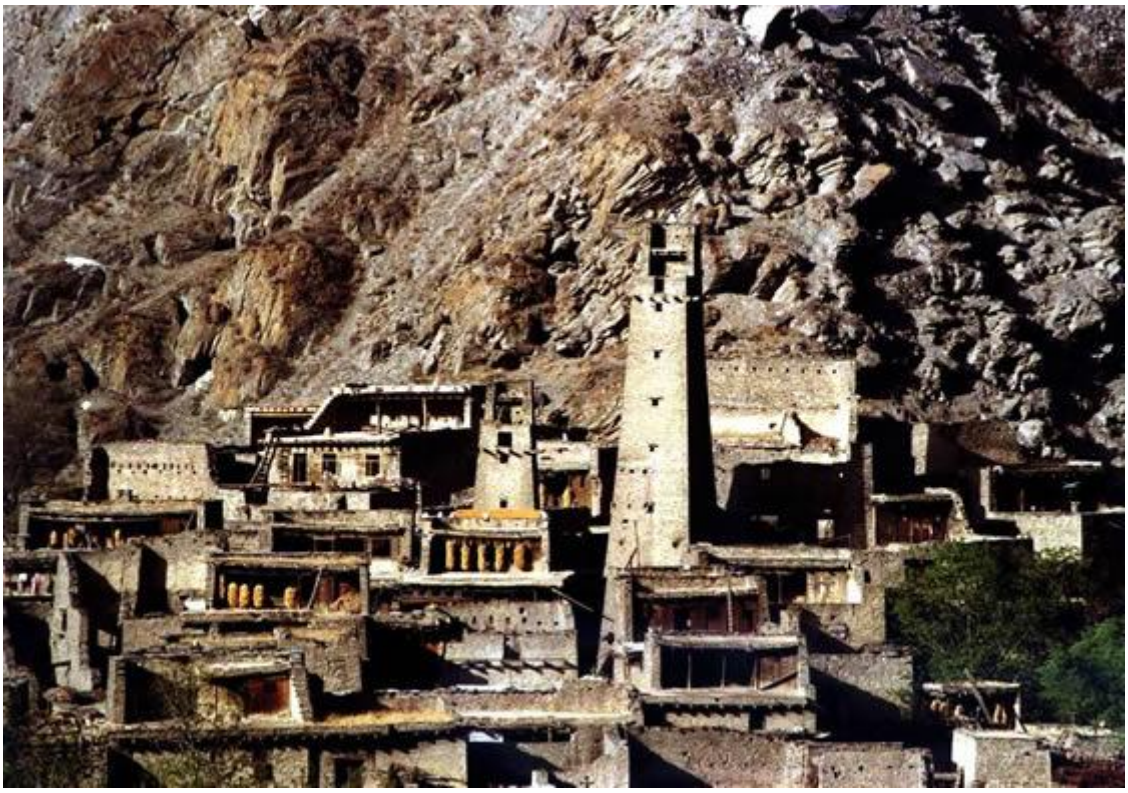


Figure 7.4: *Example of the traditional Qiang building style. This village became well-known in China for its resistence to the 5.12 earthquake. Source: Liu (2009).*

The traditional structure and choice of material of the Qiang stone towers has resulted in the survival of these buildings for centuries, spanning numerous earthquake events (Liu 2009[7]). Within Beichuan town itself, only one building encompassed these traditional Qiang building techniques and materials: the library. This building experienced some damage during the 5.12 earthquake, however remained standing after the event and in comparison to surrounding

[7] http://chinablog.cc/2009/05/qiang-village-mysterious-oriental-castle-that-survived-in-2008-earthquake/

buildings was relatively unscathed (Figure 7.5). If such cultural building practices had been promoted amongst the pre-5.12 Beichuan community, it could be hypothesised that there would have been fewer building collapses, and therefore lower fatalities. In the same respect, perhaps it would be sensible to encourage Qiang building practices amongst the post-5.12 population in order to increase seismic culture in the area. This has been achieved to a certain extent within the relocated New Beichuan, as some of the buildings have been constructed with the Qiang style in mind. It is important for the government to spread and support this cultural knowledge throughout the area.

Figure 7.5: *Photos to show the relative undamaged structure of the Beichuan library post-5.12 (A), in comparison with many of the surrounding buildings (B) which were raised to the ground or severely impacted upon by the earthquake. The Beichuan library can be seen to encompass the Qiang culture's building structure which has been suggested as a potential reason behind its survival. Sources: author's own.*

For Beichuan, levels of community involvement are low and as a result, there is reliance upon the government for mitigation solutions. Therefore the Chinese government must focus upon introducing participatory strategies to facilitate self-reliance and community coping mechanisms. Without such participation, the likelihood of local sustainability is low, but increased participation promotes development, which in turn benefits the national economy (Newport and Jawahar 2003). Therefore it is in the interest of the government to encourage

participatory schemes. However, the biggest challenge faced by Beichuan mitigation is that of longevity, and as such this should be a key concern for the Chinese government. Within the literature there has been a suggested format to follow in order to promote participatory research (Table 7.1), in order to enable risk identification, solution development, and programme implementation (Paton and Johnston 2001; Chen et al. 2006).

Step	Process	Description
1	Orientation	Recruiting members to involve the population in the research.
2	Collecting disaster experiences	Designed to reveal the disaster history of the community.
3	Assessing vulnerability	Mapping out risk areas.
4	Evaluating problems/developing solutions	Discussing potential problems of risk areas and how to solve them – the focus is upon the community developing its own strategies.
5	Community-based organisation	Developing a sustainable framework for community-based hazard mitigation organisation.
6	Final Presentation	Sharing the project results and therefore the mitigation programme with other community residents.

Table 7.1: *A six step guide to participatory involvement of communities to develop hazard mitigation practices from a bottom-up approach. Source: Chen et al. (2006).*

Through participatory techniques, it is possible to work with communities, in order to develop mitigation actions that they will work and comply with (Donovan 2010). This in turn is likely to increase engagement rates within populations and an increase in mitigation activity will in turn lead to decreased vulnerability and disaster losses. However communities will not be successful in running mitigation programmes alone; a holistic approach is vital (Bims et al. 1997; Donovan 2010). The collaboration of government institutions with local communities will act to allow the financial means to implement local level strategies whilst recognising and appreciating the importance of traditional knowledge and culture in the management process. In this respect, it is crucial to build up sustainable relationships through the strengths of both scientific and indigenous knowledge, alongside cultural beliefs (Agrawal 1995; Wisner 1995; Larsen 2006; Mercer et al. 2008). However it is not just the implementation

stage, but the management stage which must be promoted, and it is within this long-term frame that government institutions must play a key role (Surjan and Shaw (2009).

7.3.3 The importance of government involvement

Within Beichuan, government involvement is of utmost importance, as within China the authority of the government is strong, and therefore a government-approved programme is far more likely to succeed than a privately organized one. Although the involvement of local communities should be the primary concern for hazard management development, the cooperation of the government is also of critical importance. One aspect behind the need for government involvement is from a financial perspective; the cost of mitigation practices can be high and as a result local populations, especially the poor and marginalized, are limited in their actions due to lack of resources. Linnerooth-Bayer (2005) has demonstrated the high cost of disaster insurance premiums compared with the relatively few annual losses from natural hazards. In this respect, the cost of protecting losses from natural disasters outweighs the benefits. As a result, there is a need for financial incentives and grant schemes to enable 'at risk' communities to implement mitigation practices (Chen et al. 2006). The other important role for governments within disaster mitigation programmes, is that in order to recruit members and encourage participation in protective strategies, the activities are often reliant upon the credibility attached to it by local authorities (1991). Berke and French (1994), and Surjan and Shaw (2009) reiterate the importance of government credibility, stressing that particularly in developing countries, government authorities will always remain in the driving seat of hazard management.

7.4 Successful participatory hazard mitigation schemes

There are several examples within the literature of successful mitigation programmes which have combined both scientific and indigenous knowledge. This merging of the two knowledge bases creates a relationship of trust amongst local communities and ensures that the population understands the protective practices through the development process. Cronin et al. (2004, 2006) have demonstrated how the use of PRA methods can lead to a more

widespread understanding of hazard risk within indigenous communities. Through simple pen and paper mapping exercises (see also Mercer et al. 2009), the authors were able to gauge the population's perceptions and knowledge surrounding volcanic risk on Vanautu Island. To promote the research initially, gifts were given to the villagers in the form of disaster rescue tools. In addition, through follow up research, further tools were presented as gifts to demonstrate the commitment of the research team to the maintenance of the programmes developed (Cronin et al. 2004). A similar volcanic project was established in Samoa by Nameth and Cronin (2009). Here however, it was acknowledged that due to the cultural setting specific to Samoa, group exercises would not have been the most appropriate method to use. Instead, a series of open-ended one-to-one interviews were conducted with numerous members of the community. Mapping exercises were still the main focus of each interview, with each participant drawing a risk map of the area (Figure 7.6). Due to the previous project methods being adapted to the local Samoan setting, the research yielded successful results and was able to develop a site specific hazard management programme for the Samoan residents.

Figure 7.6: E*xample of an individual's risk map of Samoa. The lack of natural hazard representation highlights the importance of participatory schemes in raising risk awareness.*

The above two examples focus upon increasing awareness and education, in the hope that in the event of a hazard warning, the use of indigenous knowledge within disaster mitigation will promote cooperation amongst the population. However, it is also possible to involve communities so much, that they themselves take control of disaster preparation and response. Bajek et al.

(2008) showed the success of the Japanese "*Jishu-bosai-soshiki*" scheme or "*Jishubo*" for short; this literally means "autonomous organization for disaster reduction" and is a neighbourhood lead system of disaster preparedness and rescue. Member households are responsible for organising disaster drills, hazard education, patrols, and upkeep of rescue tools during the 'normal' periods. In the event of disaster, these households are in charge of evacuating residents to shelters, rescuing those in trouble, administering basic first aid, and providing food and water. The theory of the Jishubo scheme is that communities are self-managing and self-reliant, however in reality, participation is encouraged by the government through tool provision and subsidies for those who are involved (Bajek et al. 2008). This project is one which could realistically be achieved in China due to its social structure and government authority. The participation in the Japanese Jishubo scheme increased at a much higher rate in the year following the 1995 Kobe earthquake (Figure 7.7), stressing the influence that large events can have upon the importance that individuals attach to natural disasters. In this respect, it is important that the Chinese government acts to increase mitigation activities now, before the memory of the 5.12 earthquake has dwindled to have minimal effect upon risk anticipations.

Hamilton and Halvorson (2007) provide a further example of successful participatory hazard management schemes through their research into the 2005 Kashmir earthquake. Here, they show how the strong religious beliefs of the indigenous populations can skew their perceptions and understandings of natural risks. However through involving the community in the development of hazard education projects, some common understandings were established which help to promote the important aspects of earthquake processes. Through their own experiences, as well as those of the women involved in the research, Hamilton and Halvorson (2007) have been able to distinguish a set of guidelines for future participatory projects (Table 7.2). The use of previous work is invaluable for participatory research as it avoids the same mistakes being repeated by future authors. However the guidelines must be interpreted within the local context of each participatory programme in order for the results to be beneficial to specific communities.

Recommendation	Description
1. Conduct pre-disaster vulnerability assessments	Socioeconomic and cultural context of vulnerability and gender-based needs in pre-disaster settings should be evaluated and incorporated into disaster preparedness plans.
2. Support access to health and livelihood resources	Communities should be entitled to emergency medical training, land rights, health services, and income-generating activities. Infrastructure, responsive institutions, and access to markets are vital to expanding disaster-resistant livelihood options for at risk populations.
3. Utilize indigenous knowledge	Traditional knowledge should be considered and integrated into early warning plans. Local populations are well-placed for identifying and monitoring potential disaster precursors such as animal behaviour or changes in weather. Elderly residents may have memories of past disasters and could pass lifesaving information to younger generations.
4. Provide science-based earthquake education	Extending formal and informal earthquake education initiatives is imperative. Literacy should be promoted. Training should address life-saving earthquake drills, basic earthquake science, risk awareness, and information about building seismically appropriate dwellings.
5. Give active roles in relief, rehabilitation, and rebuilding to local inhabitants.	Liaisons need to be identified early to act as representatives for communities. Aid distribution methods should be culturally and gender sensitive. More training courses on disaster preparedness are needed.
6. Provide physical and legal protection	Accountability for the safety and the protection of populations and their land must be upheld by all organizations and agencies. Temporary site residents must be accurately registered, and detailed records maintained. Widows and girls are particularly at risk in post-disaster situations, so provisions must be made for women who are illiterate and/or lack personal identification documents.
7. Ensure psychological care	Standards for treating trauma in earthquake-related crises should be culture-, gender-, and age-sensitive. Male members of the population should be recipients of appropriate therapy in order to reduce the risk of gender-based violence and exploitation.
8. Provide gender training to disaster relief organizations	The majority of displaced adults during earthquakes are women, but most relief operations are biased towards, if not dominated by men. Gender awareness training should be routine for all relief organizations and is critical for securing the full protection of women.

Table 7.2: *Recommendations to ensure the specific needs of at risk communities are institutionalised in disaster management schemes. Source: Hamilton and Halverson (2007) – originally focused on women but adapted for this project to be a more all-encompassing set of guidelines.*

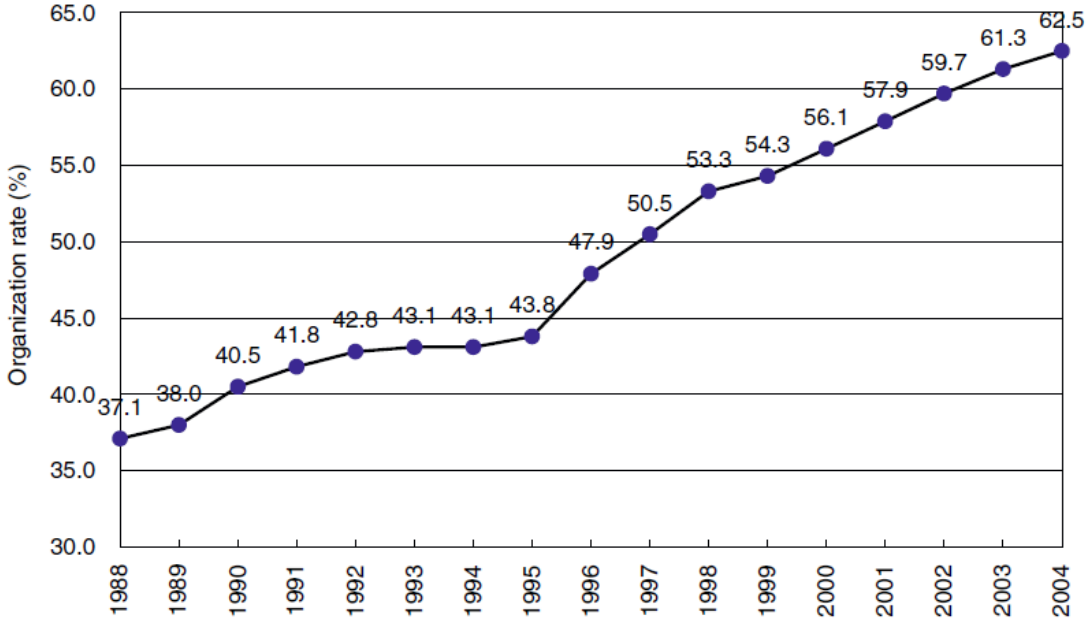


Figure 7.7: *Average organisation rate of Jishubo between 1988 and 2004. Rate increased to 4.1% following the 1995 Kobe earthquake compared with an average rate of 1.0% before the earthquake and 1.8% following the earthquake. Source: Bajek et al. (2008).*

7.4.1 The Chinese context

The examples from '7.4' form a good basis to guide future research in China. For Beichuan, the current levels of community participation are low, and this suggests therefore that sustainability is also low, which in turn can affect the development of China as a nation. Although the above examples do not focus upon China, a further example can be presented to suggest that successful participatory programmes can be established amongst the Chinese culture. Chen et al. (2006) centred their participatory approach in Taiwan, which although differs in political structure to mainland China, the traditions and culture of the population stems from the same history. In summary, the project employed by Chen et al. (2006) was focused upon increasing community awareness of hazard mitigation in order to increase their capacity to cope with disasters, through developing local management organisations. The key recommendation from this research was to use a phase process (Figure 7.8), which promotes cooperation between all participating groups and allows identification of potential threats, the risks associated with these threats, the problems presented by such risks, and finally solutions to the problems. In addition, this participatory methodology established a community organisation

with rescue equipment, refuge shelters, and the means to identify the most vulnerable people (Chen et al. 2006). The support of international organisations has also facilitated the community with the ability to maintain the community-level management. The success of inclusive mitigation programmes within a Chinese context, suggests that if a similar programme was drawn up for the new Beichuan town, positive results would be achieved.

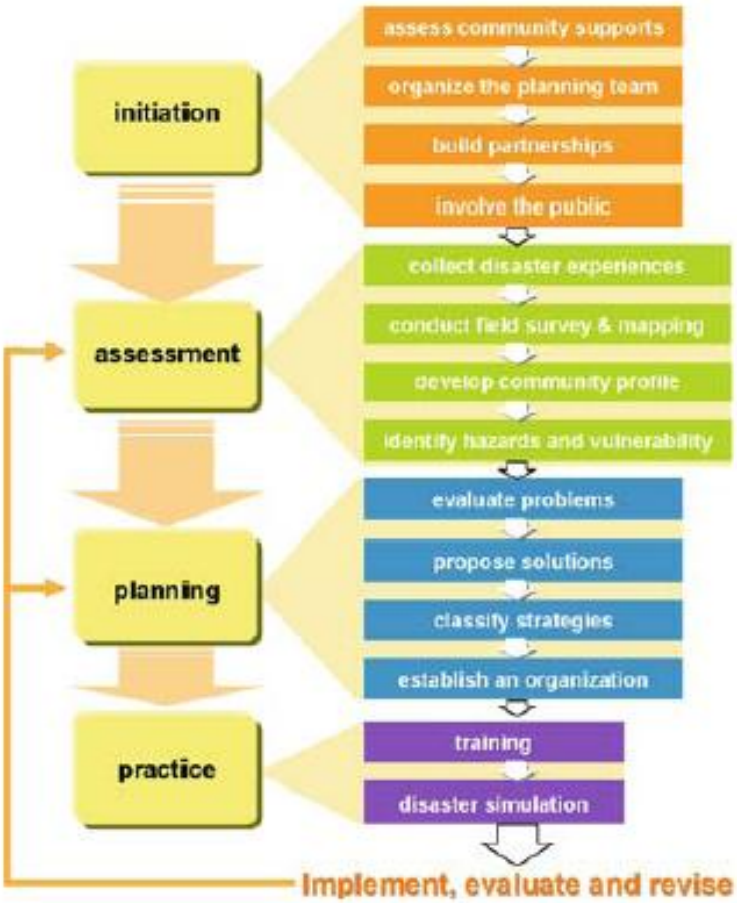


Figure 7.8: *Phased approach recommended for participatory hazard management development by Chen et al. (2006).*

Through the challenges presented when trying to recruit a group of Lao Bai Xing for participation in the focus groups, I would suggest that a more one-to-one method of participation would be the most appropriate to use amongst the Beichuan population. The importance of mitigation practices was recognised by many of the women involved in my research, with the main barrier for most presented in the form of a lack of education opportunity. In order for Chinese

communities to move away from complete reliance upon the national-level government, it is critical that participatory schemes are developed with 'at risk' populations. The local-level authorities must come to appreciate the value of indigenous knowledge in order for an open and incorrupt hazard management scheme to prosper. However, although there is a need for the government to take a step back from the decision-making process, its authority is crucial to promote involvement in research projects at the local level. In this respect, a scheme such as the community Jishubo present in Japan (Bajek et al. 2008) could work well in China. The local communities could develop their own understandings of, and solutions for the potential hazards they face through participatory schemes, whilst the financial and authoritative responsibility lies with the government. After the initial financial costs of establishing such a scheme, such as education programmes and protective/responsive tools, the maintenance costs can be kept low due to the sustainable nature of such a programme. In addition, this form of hazard management can be adapted for each community, to ensure the most appropriate materials and education is provided.

7.5 Conclusion

Through this chapter it has been possible to explore the main findings of my research in more detail, through questioning the conclusions drawn out and comparing each to other examples in the literature. It is also important to consider the project as a whole however, and be reflexive about the influences and challenges faced. Firstly, conducting research in earthquake zones following large events has an influence upon the findings. Those people who are affected by devastating disasters are undoubtedly affected both mentally and physically by the impact itself, but also by the conditions and events which occur in the aftermath (Drabek and McEntire 2003). As such, it is critical to consider how this could have influenced the findings of my research. The emotive state of the Beichuan women was demonstrated through the initial household surveys, when many were becoming upset and distressed through recounting their earthquake experience. Such emotions will undoubtedly act to influence the responses given, and this factor is crucial, in particular for the retrospective findings. The choice to interview those who had not lost relatives

in the 5.12 earthquake gives the results bias due to the lesser impact upon the women involved than other potential participants. However although outward distress was not displayed amongst my respondents, it is important to recognise that there is a serious potential for emotive influence throughout this research. Secondly the focus of this research within China makes the findings presented here specific to China. A large influencing factor within this is the unique political regime at play in China, which could have affected the responses given by the women. There is a large amount of censorship within China amongst all levels of society, and in addition local government authorities can be corrupt. These issues can therefore create an air of caution amongst community members in fear of reprimand. As a result, it is possible to say that the responses given by the women involved in this research may not have been their honest feelings and understandings, but rather caged responses to prevent the portrayal of the government in a negative light.

The structure of this research can also be critically questioned in relation to use of terms adopted at the outset. The importance of definitions is crucial to set the scene for data analysis, however as research progresses some of these terms can inevitably become blurred and perhaps less helpful than initially thought. The division of responses within this project has been based upon ‘knowledge’, ‘awareness’ and ‘anticipation’. For me, knowledge was defined as purely possessing the facts surrounding earthquakes such as what happens during an event. ‘Awareness’ was set as recognising the potential for such an event to occur within the local area, and realising that earthquakes could affect they themselves. The added dimension of anxiety created the definition for ‘anticipation’; some of the women were aware that earthquake may affect their households however they did not worry about such events as there existed more pressing day-to-day concerns. Despite assigning definitions, through data analysis it became clear that such boundaries are not always easy to set as many of the concepts are intertwined with one another. As such, were I to conduct this research again I would revise the use of terms in order to present clearer definitions in an attempt to reduce intertwining of concepts.

The focus upon women in the research also impacts upon the results presented. The emotive influence of disaster experience is likely to have been stronger amongst women. In addition, although (as discussed) disasters disproportionally affect women - who are likely to be responsible for household running in developing countries - the success of mitigation activities is dependent upon the whole community. As a result, before conclusive statements can be made with reference to best mitigation practices in Beichuan and China as a whole, it is important to access all areas of the community, including men and children. Finally, the data presented here is only mainly relative to the 5.12 event itself. Therefore the attitudes and anticipations presented are with relation to one specific event at one specific time in one specific location. The broader themes can be applied to other areas, however in order to produce a more widely applicable report for Sichuan Province, or China, or other countries globally, it is crucial to expand this research to other areas and other events. This would provide the means for comparison, and the development of successful and appropriate hazard management schemes is dependent upon finding site-specific solutions, drawn from as many previous experiences as possible.

Chapter 8

Conclusions

8.1 Thesis aims

At the outset of this research, the primary aim was to investigate levels of post-5.12 risk awareness and anticipation, amongst the population of Beichuan. Through retrospective interviews, I aimed to explore how these levels differed from pre-5.12 awareness and anticipation. In addition, I set out to examine the presence of household and government level mitigation activities in place, within both pre- and post-earthquake Beichuan. Through the primary focus upon awareness and anticipation levels, I aimed to explore how these factors influence preparedness behaviour in China. This could indicate how best to improve future mitigation practices, and therefore reduce a repeat of the devastating losses caused by the 5.12 earthquake. The following research questions were posed:

1. To what extent did the Beichuan population anticipate natural hazards pre-5.12?
    a. How aware were individuals that there was a serious seismic threat in the area?
    b. To what extent did local households possess knowledge about earthquakes?
2. How does this pre-5.12 anticipation differ in the post-earthquake household?
    a. How have rankings of risk been affected by experience of the 5.12 event?
    b. To what extent has knowledge and awareness of natural hazards increased within the post-5.12 Beichuan community?
3. How have levels of mitigation changed in the post-earthquake household in relation to lifestyle modifications?
    a. What, if any, methods of preparation and mitigation were in place within Beichuan pre-5.12 both at the household and government level?
    b. How have these levels of preparation and mitigation changed post-5.12?

8.2 Thesis methods

Through participatory methods, I conducted 24 interviews with 8 Beichuan women, providing a ~3 hour data set per individual. This method was focused

upon gaining a more thorough insight into a few women's perceptions, rather than examining a large population but collecting only superficial responses. The interviews worked well and provided an appropriate method through which to build up a good rapport with the women, which successfully enabled more in-depth responses. To further this in-depth knowledge, I involved Sichuan-local university students through focus groups and camera diaries. This enabled a broader range of ideas to be explored and provided a means to compare the interview data with. The focus groups worked well, with activities such as risk ranking and poster making acting as ice breakers which successfully promoted participation. The cameras provided added insight into the girls' perceptions, however were of limited use alone. In future, I would recommend employing this method amongst the primary participants rather than as a secondary resource. Finally, I assessed a younger perspective, through a set of written diaries distributed amongst Sichuan high-school students. This again enabled a broader range of participants to become involved in the research. The diaries were a useful tool to access a younger set of respondents, however in terms of data they were limited in their contribution. In hindsight, I think it would have been more successful to distribute these amongst the women in Yongxing. The Beichuan women provided the bulk of data within this thesis, however the alternative methods enabled me to explore the benefits and challenges of multi-method research. In total therefore, 4 weeks were spent in the field, situated mainly in Yongxing amongst the Beichuan women, but also within Chengdu and Mianyang.

8.3 Key Findings

8.3.1 Risk Awareness

Although initial participant suggestions were that earthquake knowledge pre-5.12 was lacking, it became evident that through circulation of myth and folklore, there was a certain level of seismic understanding within Beichuan. There was a distinct absence of formal education however, with little apparent government involvement. The folk tales were not given importance by the Lao Bai Xing, and as a result pre-earthquake awareness was lacking. In addition to the limited information accessibility, the lack of awareness can be attributed to the issue of 'normal' shaking combined with a lack of large earthquake experience. In terms of post-5.12 awareness, the results must be considered

with respect to the two different types of women: those returning to their original homes, and those being relocated to New Beichuan. For the returning group, levels of awareness appeared to have increased, which suggests that an experience of a large devastating event can act to increase risk awareness of future similar events (as implied by Burningham et al. 2007). The effect upon the relocated group however, is a more complicated one; it could be hypothesised that if they were to be returning to the original Beichuan site, their seismic awareness would have increased, however the relocation process poses a risk to this, as the build up of direct seismic experience will not be directly related to the new site. An erosion of seismic culture and a lack of residency time within New Beichuan could result in unchanged levels, and therefore of seismic awareness, despite the devastating experience of 5.12.

8.3.2 Risk Anticipation

Levels of seismic anticipation in pre-5.12 Beichuan were low, which is perhaps not surprising considering the low levels of earthquake awareness. More 'visual' concerns such as social care, employment and housing were recounted by the women as being the primary worries for them pre-5.12. Amongst the post-5.12 community, there is a mixed response to post-earthquake anticipation. For some of the women, the occurrence of the 5.12 event has increased their anxiety about future events; however this is not a universal change. The location of the women during the 5.12 earthquake can be seen to have had an influence to a certain extent, with those in the less affected areas such as Chengdu, remaining to posses low seismic anticipations despite the 5.12 event. However even some of the women who experienced the full force of the earthquake within Beichuan itself remain unconcerned about future seismicity. For these women, the conditions created by the earthquake have caused the pre-5.12 primary risks to become even more prevalent. The lack of housing and destruction of employment has led to real livelihood risks, which for many of the Lao Bai Xing presents a much greater threat than any future earthquake event. It seems therefore that one risk can multiply other risks; the seismic risk has created an increase in the day-to-day household risks.

8.3.3 Mitigation and preparedness levels

Mitigation levels pre-5.12 were low, at both the household and government level. Reliance of the Beichuan population seemed to be upon household response schemes, rather than adopting a preparation attitude; government mitigation activities were ineffectual for a large event such as 5.12. In post-5.12 Beichuan, the government-organised mitigation practices have dramatically increased, most notably with the relocation of the whole town to a more seismically stable location, away from the added danger of slope instability. Although the motives behind such high-level response can be questioned, the degree of mitigation is undoubtedly high. The internationalisation of the 5.12 earthquake has no doubt brought to attention the importance of disaster mitigation. The effect of the media focus upon Sichuan has informed a wide audience of the potential perils of earthquake hazards. Hopefully therefore media coverage of this event and other subsequent events such as Chile 2010, and Haiti 2010, will continue to promote the need for protective behaviour amongst 'at risk' communities.

The key for the Chinese government now is to ensure that these high levels of mitigation are maintained and circulated nationwide. Household levels of preparedness on the other hand seem to remain unchanged post-5.12. A few households have increased their response capacity, however few have implemented protective measures. This lack of protection attempt could be a result of reliance upon the government for support. Although the authority and financial support of governments is essential in promoting uptake and participation in mitigation practices, local involvement and management is also key. Without knowledge, understanding and willingness to follow preventative actions at the individual level, mitigation practices can be unsuccessful. Through the inclusion of local communities, common points of understanding and culture can be used to develop appropriate and accepted forms of preparation. Indigenous knowledge and practices can be adapted to enable a more thorough comprehension of the potential risks, alongside the solutions to prevent losses from such risks.

8.4 Extension to previous studies

Many of the above findings are all specific to China and the Chinese culture. The lack of social research within China, especially with relation to natural hazards, means that there is little understanding of risk perceptions and understandings amongst local populations. There is a vast array of scientific research conducted within China focused upon the purely physical processes of earthquakes and landslides (for e.g. see Densmore et al. 2010; Zhang et al. 2008 Wang et al. 2009), however such phenomenon do not become serious problems without the presence of a vulnerable population. Therefore, through 4 weeks of fieldwork, I have been able to provide a Chinese perspective to work done previously in other regions of the world.

However the findings are not restricted to a Chinese context, but are locally conditioned by a socio-political lens in how they are manifest, and can be used to guide research in other areas of the world. The results from this research have, to a large extent, supported the idea that the capacities of local populations can be underestimated (see for e.g. Matin and Taher 2002; Allen 2006). It was evident that within Beichuan there existed numerous forms of seismic culture circulating, however through time, factors such as traditional building practices or the believability of some of the tales had decreased. This had therefore led to an erosion of traditional knowledge (as shown also by Halvorson and Hamilton 2007). In the aftermath of 5.12, the government-led response team was unable to reach Beichuan until 48 hours after the initial impact of the earthquake; the local community was left to face and relieve the devastation by itself. Although the lack of any mitigation practices probably made such a rescue effort more difficult, earthquakes of such a large magnitude are likely to cause widespread damage even when protective measures have been implemented. As a result it is critical that communities possess the capacity to respond. Many of the women involved in this research expressed a will to learn more but were unsure how to gain such knowledge. This adds further weight to previous studies therefore where it was found an increase in government help at the local scale was required, in order to raise risk awareness and perception, and therefore increase mitigation participation (Berke and French 1994; Matin and Taher 2002; Chen et al. 2006; Surjan and Shaw 2009). As a result it is critical to encourage community coping capacities

amongst ‘at risk’ populations, whether that be in the Nepali Himalaya, the Chilean Andes or the Tibetan Plateau. The findings presented here must not be directly applied to other areas, but the key concepts should be taken onboard and adapted to incorporate local cultures and understandings.

8.5 Future Recommendations

8.5.1 Hindsight reflections

There are a number of issues which, were I to start this project again from scratch, I would consider approaching from a different angle. Firstly, I would set aside a greater period of time in which to collect data. In addition, once interviewees had been recruited, it was a struggle to engage additional people. As a result, it would be useful to focus the research upon another pre-fabricated settlement in addition to Yongxing, in order to facilitate a wider available population. Secondly, although it remains true that women are disproportionately affected by disasters, I would be keen to involve more male respondents, in order to consider a different point of view. Through informal conversations with male members of the Beichuan community, it was evident that some of their perceptions differed from the women’s. Although not specifically a patriarchal nation, male members of the household do often command greater respect, and as a result, the involvement of families in mitigation activities could be a man’s decision. For this reason, it is important to consider the male point of view in addition to the female. With extended time available it would be interesting therefore to compare the views of men and women in order to develop appropriate mitigation practices. Finally, I feel that the diary method would have been more insightful if distributed amongst the Lao Bai Xing residing in Yongxing. As a result, was I to redo this research, I would target these women for this method due to their exposure to a greater set of potential threats than the school-age group.

8.5.2 Future research potential

My thesis has brought to attention a number of issues which have been found in other regions of the world, but not fully investigated within China. However, the results presented here must be thought of as a first glimpse of the potential outcomes. A more wide-spread study within China would add the much needed increase in data, allowing a more thorough analysis, and therefore leading to

more precise conclusions. The use of retrospective interviews is also highly limiting. It would be highly useful to indentify an area in China which is predicted to experience a large event in the future, to gain a much more reliable insight into pre-earthquake risk perceptions. This could shed light in particular, upon the effect that the 5.12 earthquake has had upon government level mitigation on a more national level. It would be interesting to investigate whether the change in protective attitude has spread further than the relocation of Beichuan town, as this is what is required to prevent further devastating losses. Much of the disaster literature is centred upon investigating circumstances post-event, but at this point it is too late for mitigation. If social research into risk perceptions were to combine with more scientific work focused upon earthquake forecasting, it would help to promote an understanding, and perhaps influence, how people comprehend the risk that they are exposed to.

The use of long-interviews within this research proved to be a big success, creating a large in-depth data set, allowing a more personal understanding of each participant to be achieved. As a result of time constraints, the success of the other methods employed was limited, however potential can definitely be identified within their use, and as such it would be useful to employ these methods in future social research in China in order to fully assess their abilities. A temporal study would also provide a better insight into the issues arisen within this study. If a Chinese community expected to experience a large earthquake could be indentified and studied, the change in perception in the aftermath of such an event could also be monitored. Such research would no doubt be timely however, with the unpredictable nature of seismic activity.

This research supports the notion of integrating lay knowledge with ‘expert’ science presented in numerous previous studies (see for e.g. Cronin et al. 2004; Nameth and Cronin 2006; Halvorson and Hamilton 2009). The women involved in my research were, more often than not, keen to learn more about how to protect their households from future earthquake losses. The different types of knowledge have been identified in section ‘2.6’ and were clearly supported by the data present in Chapter 4. Through the integration of local knowledge with scientific understanding and government support, it is possible to develop widely comprehended mitigation practices which communities are

likely to participate in. Therefore a critical recommendation from my research is to promote integration of local communities and scientific/government groups in order to prevent major losses from natural disasters.

Overall there is large scope to further the initial findings presented in this research. My thesis has provided a critical first look at natural risk perceptions within the Chinese context. Although many of the conclusions may be slightly blurred in nature, I have taken the first step in revealing the importance of investigating the social aspects of natural hazards in China. In order for this to become a benefit for local populations in China, it is critical that future researchers take onboard the challenges I faced and the recommended solutions I provided. There always has to be a first investigative look which this thesis provides.

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Appendix 1: Letter of Invitation

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Chengdu University of Technology
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Chengdu,Sichuan 610059, P. R. China
Tel.:(86-28) 84078889
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December 20, 2009

Ms Harriet Tomlinson
Department of Geography
Durham University
Durham DH1 3LE
United Kingdom

Dear Ms Tomlinson,

I would like to formally invite you to visit Chengdu and the Longmen Shan area to work with me and my graduate students on the landslides after the 2009 Wenchuan earthquake. I understand that you are working on a Masters degree at Durham University with Dr Alexander Densmore and Dr Nick Rosser. Dr Densmore and I have collaborated for many years on the Longmen Shan area, and I am happy to help with your project. Your work is very important for understanding the landslide hazard in this region and for the way in which society responds to these hazards.

I understand that you would like to come to Sichuan Province in late February 2010 and stay for 8 weeks. You will be working with one of my graduate students in the areas around Beichuan Town, Leigu, and Jiangyou. I know this area well and my students and I have worked on this extensively. My graduate student will accompany you, and your field assistant, Siobhan Whadcoat, will join you in late March. We can supply you with maps and photographs of the field area.

I will arrange for a driver and vehicle from Chengdu University of Technology during your stay. I will also arrange for accommodation at the university at the beginning and end of your visit. I understand that your visit will be completely supported by a research grant and that you will be reimbursed for your expenses from Durham University.

Please apply for your visa in plenty of time and tell me if you need any other information. I look forward to welcoming you to Chengdu!

Sincerely,

Professor Li Yong

地址：中国 四川 成都 二仙桥东三路1号 邮编：610059 电话：(86-28) 84078889 传真：(86-28) 84077163 网址：http://www.cdut.edu.cn

Appendix 2:

Household Survey 家庭调查

House reference:

House location:

Ethnic background:

Questions:

1. How many people live in this house? 几个人住在这里？
2. Does everybody live here all the time? 他们都总是住在这里吗？
3. How many people in this house work? 有几个上班？
4. How many people are in education? 有几个上学？
5. What do you worry about most? 您在日常生活中，最关心什么？
6. Why? 为什么最关心?
7. What are the next 2 things you worry about the most?
   除了最关心的事情，接下来的两件事情是什么？
8. Do natural disasters worry you? 您关心自然灾害吗？

9. Did you experience the earthquake? 你经历了2008年的地震或者山体滑坡吗？

10. How did it affect you? 地震是怎么样影响您的生活？

11. Do you worry that another earthquake might happen? 您担心还会发生地震吗？

12. Do you worry about any other natural disasters? 您担心其他的自然灾害吗？

13. Why do/don't you worry about these? 为什么？

14. Do you worry more about the things you mentioned since the earthquake?
您最担心刚才提出来的日常生活中的困难还是自然灾害？

Appendix 3:

Interview agenda: 采访议程

Session 1: General risk anticipation 第一段时间：总体的危险提前行动（预期）

Theme progression: 主题的进程

1. Ice-breaker general Qs, e.g.: 介绍和总体的问题 等
    i. Where do you live? 您住在哪里？
    ii. What language/dialect do you speak at home?
    您在家里说普通话还是说方言？
    iii. How many people are there in your family? 您家有几个人？
2. General risk Qs – everyday worries and threats, e.g.:
    总体的关于危险和日常生活中的担心/忧虑
    i. What are your main concerns/worries? 您主要的忧虑是哪些？
    ii. Why do you worry about these things in particular?
    您为什么特别关心这些忧虑？
3. Importance of natural disasters – are they considered as risky, e.g.:
    自然灾害的重要性
    i. What kind of hazards in Beichuan susceptible to?
    北川受到哪些灾害的影响？
    ii. What kind of natural hazards in Beichuan susceptible to?
    北川受到哪些自然灾害的影响？
    iii. Do you worry about natural disasters? 您担心自然灾害吗？
    iv. What kind of natural disaster do you think is most likely to affect your household? 您认为哪种自然灾害最可能会影响到您的家庭？

Session 2: Earthquake specific risk anticipation 第二段时间：地震具体的提前行动（预期）

Theme progression: 主题的进程

1. Personal experiences of the 2008 earthquake, e.g.: 对于2008地震的个人经历，如：
    i. Can you tell me about the day of the earthquake?
    您可以给我描述一下您那天的经历吗？
    ii. What were you doing when the earthquake struck?
    地震发生的时候您在做什么？

iii. How did you respond immediately/long-term?
您在短期和长期是怎么反应的？

2. Pre- vs. past-earthquake risk anticipations, e.g.: 地震发生之前和之后的危险预期？
   i. Before the 12th May 2008, did you worry about earthquakes?
   地震发生之前，您担心地震吗？
   ii. How have your anticipations of risk changed since the earthquake?
   地震发生了以后，您对危险的预期有什么变化？
   iii. How has your life changed since the earthquake? 您的生活有什么变化？
3. Comparison of earthquake vs. other risks, e.g.: 地震与其他的危险的比较
   i. Do you worry that another earthquake will happen?
   您担心地震会再次发生吗？
   ii. If so, how has your household planned for another earthquake?
   如果您担心地震会再次发生，您的家庭是怎么样准备面临？
   iii. Do you think that you are well-prepared for another earthquake?
   您认为您够准备面临地震吗？
   iv. How important is planning for another earthquake for your household?
   您认为准备面临地震，对您的家庭来说，是多重要？

Session 3: Lay understandings of science: 老百姓的科学理解

Theme progression: 主题的进程

1. Understanding of earthquake precursors and causes: 地震预兆和原因的理解
   i. Why do you think that an earthquake hit this area?
   您觉得2008的地震为什么是在这个地区发生的？
   ii. What do you think causes an earthquake? 您觉得地震是怎么样发生的？
   iii. Can you describe an earthquake? 您可以描述地震的过程吗？
      i. Before 预兆和原因
      ii. During 发生期间的过程
      iii. After 发生以后还有什么影响吗？
   iv. How likely do you think another earthquake is?
   您认为在这里再次发生地震的可能性多高？
   v. Are there any other natural disasters that you think are likely to happen since the earthquake? 您认为地震发生后，它发生还会产生其他的自然灾害吗？
2. Knowledge of disaster prevention: 预防灾害的知识

i. Do you know of any way to prevent losses for your household from earthquakes? 地震发生的时候，您知道如何预防您家庭的损失吗？

ii. Does your household have an ‘emergency procedure’ for natural disasters? 您家庭有没有自然灾害的紧急程序吗？

3. Sources of information: 消息来源

i. Where did you learn about natural disasters? 您是在哪里学到自然灾害的知识？

ii. Do you want to learn more about potential natural disasters? 您现在还要学习更多的关于可能性的自然灾害的知识吗？

iii. Would the community benefit from increased natural hazard education? 您认为更多的关于自然灾害的教育会利于这里的社区吗？

Appendix 4:

Focus Group: Session 1

Hazard ranking – ranking cards, mapping local hazards

Top worries:

i. What do you worry about most (paper)
ii. Why do you worry about these?
iii. What do you think is most important to ensure a happy life? (paper)
iv. What do you consider as a 'risk'? (paper)
v. Think of 10 risks that you consider **likely** to happen to you (paper)
vi. Out of all of those discussed, can you chose the 10 most important and put them on 10 cards
vii. Using these cards, can you place them in order of what you consider as the **most likely** to happen to the least likely (1 being most and 10 being least)
viii. Can you now rank the cards as which you would be **most frightened** of (1 as the scariest and 10 as the least scary)

Importance of natural disasters:

ix. Do you consider natural disasters as likely risks? Which ones and Why? (paper)
x. Do you consider them as likely risks within your everyday life? Why?
xi. Which natural hazards (if any) do you think Chengdu is susceptible to? (paper)
xii. Which natural hazard do you think is most likely to happen and why?
xiii. How would these natural hazards affect you personally?
xiv. Do you consider earthquakes as a likely risk?

Anticipation of future events:

xv. How likely do you think it is that another large earthquake would hit this area?
xvi. Have you considered what you would do in earthquake? (paper)
xvii. Before the 2008 event had you thought about earthquakes as a likely risk? Why (not)?
xviii. How have your worries changed from before the earthquake?

Understanding of science:

Earthquake mechanics:

i. Why do you think an earthquake hit this area? What do you think causes an earthquake?
ii. Can you tell me about any precursors that you know signify an earthquake is about to hit? (paper)
iii. Can you tell me about the 'science' behind earthquakes – i.e. what processes are involved? If not 'science' can you describe what happens in an earthquake, I have never experienced one so I would like to know everything that you remember happening (e.g. ground shaking, buildings swaying, etc.) (paper)
iv. In 2008 did you realise at the time that it was an earthquake? How big did you think it was at the time? Did you realise it was pretty big?

Importance and knowledge of potential mitigation practices/sources of information:

v. How important is preparing for another earthquake? Do you think you are well-prepared? How have you prepared?
vi. Have you ever been taught about natural disasters? Was this in a formal or informal manner? (i.e. school education or similar, or just hearsay from friends/neighbours)
vii. Do you think it is important to educate people about natural disasters? Especially those in susceptible regions for e.g.?
viii. What is the best way to conduct this education in your opinion? (Possible here pass round a couple of examples of flyers and show a couple of videos)
ix. How much do you think people would comply with 'emergency procedures' especially if they were an inconvenience to daily life?
x. Would you personally be interested in learning more about natural disasters? Which methods would best encourage you to attend sessions?
xi. Do you think there are more important things to consider than increasing natural hazard education, if so what and why?