

**PERCEPTION OF NATURAL HAZARD RISK  
AND PREPAREDNESS:  
A CASE STUDY OF ST. JEAN BAPTISTE, MANITOBA**

by

Deanna Jill Ogston

A Thesis submitted to the Faculty of Graduate Studies of  
The University of Manitoba  
in partial fulfilment of the requirements of the degree of

**MASTER OF ARTS**

Department of Environment and Geography

University of Manitoba

Winnipeg

Copyright © 2005 by Deanna Jill Ogston

**PERCEPTION OF NATURAL HAZARD RISK  
AND PREPAREDNESS:  
A CASE STUDY OF ST. JEAN BAPTISTE, MANITOBA**

by

Deanna Jill Ogston

A Thesis submitted to the Faculty of Graduate Studies of  
The University of Manitoba  
in partial fulfilment of the requirements of the degree of

MASTER OF ARTS

Copyright © 2005 by Deanna Jill Ogston

**Permission has been granted to the Library of the University of Manitoba to lend or sell copies of this thesis/practicum, to the National Library of Canada to microfilm this thesis and to lend or sell copies of the film, and to the University Microfilms Inc. to publish an abstract of this thesis/practicum.**

**This reproduction or copy of this thesis has been made available by authority of the copyright owner solely for the purpose of private study and research, and may only be reproduced and copied as permitted by copyright laws or with express written authorization from the copyright owner.**

## TABLE OF CONTENTS

i. Abstract.....	i
ii. Acknowledgements.....	iv
iii. List of Figures.....	v
iv. List of Tables.....	vi
v. List of Charts.....	vii
vi. List of Appendices.....	viii
<b>CHAPTER 1 - Introduction.....</b>	<b>1</b>
1.1 Natural Hazards.....	1
1.2 Hazard Adjustments.....	2
1.2.1 Perception of Risk.....	3
1.2.2 Disaster Preparedness.....	6
1.3 Hazard in the Red River Valley.....	6
1.3.1 Flooding.....	7
1.3.2 Extreme Snowfall and Blizzards.....	11
1.3.3 Drought, Extreme Storms, Tornadoes and Natural Fires.....	11
1.3.4 Human-Induced Hazards.....	12
1.4 St. Jean Baptiste, Manitoba.....	13
1.5 Research Objectives.....	16
1.6 Hypotheses.....	17
1.7 Outline.....	17
<b>CHAPTER 2 - Conceptual Foundations: A Review of the Literature....</b>	<b>19</b>
2.1 Overview of Natural Hazard and Disaster Research.....	19

2.2 Perception of Hazard Risk.....	25
2.2.1 Flood Hazard Risk Perception.....	31
2.2.2 Objective vs. Perceived Risk.....	33
2.3 Disaster Preparedness and Planning.....	37
2.3.1 Factors Influencing Disaster Preparedness.....	40
<b>CHAPTER 3 – Research Methodology.....</b>	<b>50</b>
3.1 Surveys.....	50
3.2 Selection of Study Area.....	53
3.3 Questionnaire Content.....	56
3.4 Analysis of Data.....	59
3.4.1 Likert Scaling Method.....	59
3.4.2 Descriptive Techniques.....	63
3.4.3 Non-Likert Type Questions.....	64
<b>CHAPTER 4 – Analysis of Data and Interpretation of Results.....</b>	<b>66</b>
4.1 Introduction.....	66
4.2 Questionnaire Analysis.....	68
4.2.1 Severity Rating of Problems Facing Community.....	68
4.2.2 Frequency Distribution of Individual Problems.....	71
4.2.2.1 Flooding.....	72
4.2.2.2 Drought Conditions.....	73
4.2.2.3 Blizzards.....	74
4.2.2.4 Severe Snowfall.....	75
4.3 Frequency Distributions – Chance of Experiencing Disasters.....	76

4.3.1 Flooding .....	78
4.3.2 Blizzards .....	79
4.4 Level of Concern about Natural Disaster Impact .....	81
4.5 Disaster Management and Provincial and Local Government Intervention .....	83
4.6 Local and Provincial Preventative Measures .....	90
4.7 Bearing the Loss .....	91
4.8 Public and Private Insurance .....	92
4.9 Emergency Planning and Training .....	95
4.10 Causes of the 1997 Flood .....	96
4.10.1 Past and Present Experiences with Flooding .....	99
4.11 Preparatory Measures .....	101
4.12 Mandatory Evacuation .....	105
4.13 Disaster Assistance .....	111
4.14 General Socioeconomic Data .....	115
4.14.1 Income .....	115
4.14.2 Education .....	117
4.14.3 Length of Time Lived in St. Jean .....	117
4.14.4 Age .....	118
4.15 Conflict and Stress During the 1997 Flood .....	119
4.16 Relationship between Perception of Flooding and Preparatory Measures .....	120
4.17 Conclusion .....	122

<b>CHAPTER 5 – Summary and Conclusion</b> .....	<b>123</b>
5.1 Summary of Research Objectives .....	123
5.2 Hypotheses Restated and Tested .....	124
5.2.1 Hypothesis 1 .....	124
5.2.2 Hypothesis 2 .....	128
5.2.3 Hypothesis 3 .....	129
5.3 Limitations of the Study .....	131
5.4 Summary .....	132
5.5 Recommendations .....	135
<b>APPENDICES</b> .....	<b>139</b>
<b>BIBLIOGRAPHY</b> .....	<b>176</b>

## **ABSTRACT**

The goals of this thesis research are to examine the perception of natural hazard risk and preparedness, and to determine which factors contribute to each of these. The respondents in this study consist of 49 household residents and 9 keypersons from the community of St. Jean Baptiste, located in the Red River Valley of Southern Manitoba. The household respondents were randomly chosen and the keypersons were purposefully selected based on the assumption that their roles in the community would lead them to have increased knowledge and experience with natural hazards. The specific objectives of this study are fourfold: 1) to examine the household and keyperson respondents' perceptions of different hazard types with an emphasis on natural hazards, and specifically flooding; 2) to examine the difference between perceived risk (household residents) and objective risk (keypersons) with regard to natural hazards; 3) to identify and analyze factors that determine perception of flood hazard risk; 4) to examine the relationship between disaster preparedness and risk perception, with respect to natural hazards.

Through survey questionnaires, respondents were asked their experiences of and opinions about natural hazards, with a particular emphasis on the 1997 Red River Flood. In addition, interviews were conducted with two long-standing residents for a more in-depth investigation of the subject. The data was analyzed using the Likert scaling method as well as descriptive techniques for non-Likert type questions. Computational techniques, such as the calculation of mode and mean, and diagrammatic representation, such as bar charts of frequency distributions,

were also employed in the analysis. A review of the published literature on natural hazards and disasters, and on the specified aspects related to the objectives of this study, such as perception of hazard risk, disaster preparedness, and the differences between objective and perceived risk, was undertaken.

The study objectives are fulfilled through the testing of three stated hypotheses which are as follows: 1) that levels of risk perception and preparedness are related to a variety of variables including; recent experience with past events, length of time lived in the community, education, and age of the individual; 2) that preparedness for a hazard event, specifically flooding, is influenced by perception of that event, 3) that the difference between objective and perceived risk is not as marked as sources in the literature have stated.

The findings of the study conclude that several identifiable variables are determinants of the perception of flood hazard risk and disaster preparedness. These include past experience with hazard events, the length of time that an individual has lived in the community, the levels of education and the age of the individual. For example, those household respondents who had higher levels of education were more likely to adopt preparatory measures than those with lower levels. In addition, hazard preparedness is related to perception of flood risk. This was clearly evident as respondents who assigned the 1997 Red River Flood a higher severity rating were more likely to undertake preparatory measures than those who perceived the Flood as less severe. Contrary to expectation, a notable difference does exist between objective and perceived risk, as was suggested in the literature. As a whole, the keypersons' responses often differed from those of

the household respondents. These findings lead to recommendations for the implementation of further disaster preparedness measures by the community of St. Jean for the purpose of reducing loss and damages associated with the flood hazard. It is recommended that community members should be more involved in decision-making during hazard events, especially floods since the residents of St. Jean have significant experience with this type of natural hazard. Additionally, government initiatives to adopt preparedness measures are beneficial for promoting preparedness. More communication between the community and external agencies in planning stages, as well as during a hazard event, is also a vital component to ensuring disaster preparedness.

## ACKNOWLEDGEMENTS

Firstly, I would like to acknowledge my thesis advisor, Dr. Jeff Brown for his guidance, enthusiasm and constant support. I thank him for his tireless efforts in helping me revise, modify and polish my thesis paper. In addition, it was Dr. Brown who sparked my interest in the area of natural hazards and disasters with his undergraduate courses. I was very fortunate to have such a wonderful teacher and advisor.

I must also thank the other members of my thesis advisory committee. Dr. Matiur (Moti) Rahman, whose initial suggestion of a thesis topic was greatly appreciated. Dr. Rahman allowed me to assist him in his research, and from one of his projects, my thesis research originated. I am extremely grateful for that opportunity. Dr. Jean-Luc Chodkiewicz, whose timely comments and suggestions were very valuable, also contributed to this thesis. I thank him for his involvement.

I would also like to thank my parents, sister and my other family members who are always there to encourage and support me in whatever I do. I am privileged to have such a great family.

I also thank Spirit, my loyal writing companion, who sat with me for hours on end without complaint.

Finally, I thank my amazing husband, Sean Johnston, whose undying love and support helps me through all things I strive to do. His sacrifices, encouragement and understanding enabled me to complete this project. Without his support, it would not have been possible.

### iii. LIST OF FIGURES

<b>Figure 1:</b> The interaction between natural events and the human-use system creates hazards. Burton, Kates and White (1993).....	2
<b>Figure 2:</b> Extent of flooding in the Red River Valley: 1826, 1950 and 1997 .....	8
<b>Figure 3:</b> Map of St. Jean Baptiste.....	14
<b>Figure 4:</b> Extreme Events, by Principal Causal Agent (after Burton and Kates, 1964).....	23
<b>Figure 5:</b> A Contextual Model of a Natural Hazards System (After Mitchell, Devine, and Jagger, 1989).....	25
<b>Figure 6:</b> Burton, Kates and White's (1978) Choice Tree of Adjustments .....	38
<b>Figure 7:</b> Outline of Components and Links Relating to Level of Preparedness (After Mileti, Drabek and Haas 1975).....	40
<b>Figure 8:</b> The Development of a Community Safety Plan (after Foster 1980) .....	48

#### iv. LIST OF TABLES

<b>Table 3.1</b> Examples of Likert Scales (After <a href="http://www.gifted.uconn.edu">www.gifted.uconn.edu</a> ).....	61
<b>Tale 4.1</b> Summary of Response Rates of Surveys.....	67
<b>Table 4.2.1</b> Severity Rating of Problems Facing Community on a scale from 1 to 10 .....	69
<b>Table 4.3</b> Percent Chance of Experiencing a Disaster within the Next 10 Years.....	77
<b>Table 4.4</b> Level of Concern for the following situations in the event of a serious natural disaster.....	81
<b>Table 4.6</b> Affect of Local Laws on Community of St. Jean.....	90
<b>Table 4.10</b> Causes of the 1997 Flood.....	97
<b>Table 4.11.1</b> Summary of respondents undertaking preparatory measures.....	103
<b>Table 4.11.2</b> Disaster Mitigation Efforts Made in the Community.....	105
<b>Table 4.13</b> Assistance Received from Agencies.....	112
<b>Table 4.13.1</b> Other Assistance Received.....	113
<b>Table 4.13.2</b> Usefulness of Temporary Dikes.....	114
<b>Table 4.14.1</b> Gross Family Income and Preparatory Measures.....	116
<b>Table 5.2.1</b> Length of Time Lived in St. Jean and Flood Perception.....	125
<b>Table 5.2.2</b> Age of Respondent and Flood Perception.....	126

**v. LIST OF CHARTS**

<b>Chart 4.2.2.1.1</b> Flooding - Household .....	72
<b>Chart 4.2.2.1.2</b> Flooding – Keypersons .....	72
<b>Chart 4.2.2.2.1</b> Drought Conditions – Keypersons .....	73
<b>Chart 4.2.2.2.2</b> Drought Conditions – Household .....	73
<b>Chart 4.2.2.3.2</b> Blizzards – Household .....	74
<b>Chart 4.2.2.3.3</b> Blizzards – Keypersons .....	74
<b>Chart 4.2.2.4.1</b> Severe Snowfall – Household .....	75
<b>Chart 4.2.2.4.2</b> Severe Snowfall – Keypersons .....	76
<b>Chart 4.3.1.1</b> Flood – Household .....	78
<b>Chart 4.3.1.2</b> Flood – Keypersons .....	78
<b>Chart 4.3.2.1</b> Blizzard – Household .....	79
<b>Chart 4.3.2.2</b> Blizzard – Keypersons .....	80
<b>Chart 4.5.1</b> Government Disaster Assistance –Household .....	84
<b>Chart 4.5.2</b> Government Land use Regulation – Household .....	86
<b>Chart 4.5.3</b> Government Enforced Building Codes – Household .....	87
<b>Chart 4.10.1</b> Causes of the 1997 Red River Flood .....	98
<b>Chart 4.16</b> Severity Rating of 1997 Flood VS Preparatory Measures .....	121

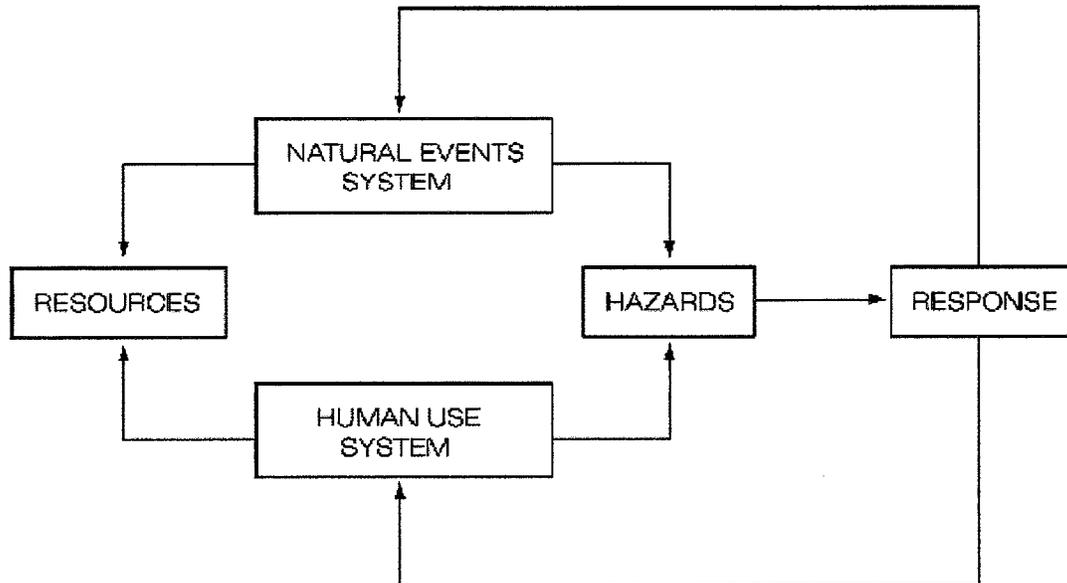
**vi. LIST OF APPENDICES**

Appendix A – Household Questionnaire.....	139
Appendix B – Keypersons Questionnaire.....	157
Appendix C – Breakdown of Household Questionnaire.....	171
Appendix D – Breakdown of Keypersons Questionnaire.....	173
Appendix E – Consent Form.....	174

## CHAPTER 1 – INTRODUCTION

### 1.1 NATURAL HAZARDS

Globally, natural hazards affect hundreds of thousands of people annually, causing great loss including death, damage and destruction, and risk of loss from natural disasters is increasing worldwide. An example of the devastation that can occur is the earthquake-induced tsunami in Asia on December 26<sup>th</sup>, 2004 which left nearly 300, 000 people dead or missing ([www.cnn.com](http://www.cnn.com)) and millions more impacted. In addition, an even more recent example of a disastrous natural event was Hurricane Katrina, which struck the coastal areas of Louisiana, Mississippi and Alabama on the morning of August 29<sup>th</sup>, 2005. The hurricane caused approximately 1300 deaths ([www.cbc.ca/news](http://www.cbc.ca/news)) and created a path of destruction with a storm surge and significant flooding in New Orleans and Mobile in particular. Widespread devastation occurred in the three states and thousands of people were without utilities, food and water. Subsequently, a large-scale evacuation of the area was implemented and one million people were displaced (The Winnipeg Sun – Reuters). A natural hazard can best be explained in the context of the model by Burton, Kates and White (1993, p.31) which asserts that natural hazards are a result of the interaction between “the natural events system, the array of wind, water, and earth processes” and that of the human use system (Figure 1).



**Figure 1: The interaction between natural events and the human-use system creates hazards. Burton, Kates and White (1993)**

Although it may not be possible to eliminate the risk of a hazardous natural event, it is possible to reduce loss and damages that may be incurred by such an event.

## 1.2 HAZARD ADJUSTMENTS

The function of a hazard event is dependent upon the characteristics of the hazard itself, the nature of the area affected, and the vulnerability of the objects which are exposed to the specific hazard (Petak and Atkisson 1982, p. 101). The severity of the hazardous physical phenomenon is an important determinant of the destructiveness of the event. Coping with natural hazards and their harmful events entails making adjustments to deal with the threat of hazard. There are many different types of adjustments that can be implemented. Several classifications

exist of adjustments that can be undertaken. Burton, Kates and White (1978) devised a hypothetical model of human adjustments to natural hazards. Adjustments may entail modifying the physical hazard itself or modifying the human use component of the system. Adjustments can be regarded as short term, such as emergency adjustments which are implemented after a disaster event has been forecast. Long-term adjustments may include adaptations that are part of everyday life, such as insurance or land use policies. Adjustments can be physical structures that are constructed, such as dams or retaining walls. Examples of non-physical adjustments include the reduction of human vulnerability to disasters and adopting effective coping strategies.

### **1.2.1 PERCEPTION OF RISK**

Human perception is the range of beliefs, attitudes and opinions that an individual possesses (Tobin and Montz 1997). According to Cutter (1993, p.2), perception of risk is the “measure of likelihood of occurrence of the hazard”. How an individual perceives the risk of hazard is an important aspect of research in the realm of hazards. Cutter (1993, p.14) asserts that hazard perception “links judgment to action and examines those factors that influence the individual’s choice of adjustments (or actions) in response to natural hazards”. Having this knowledge of how an individual may view a disaster, and aspects of disaster response, can be important when assessing why some types of adjustments are made whereas others are not, or why one public policy is adopted over another (Drabek 1986, p.317). What are the factors that determine perception of risk?

Many studies have indicated the importance of past experience with a hazard event in an individual's perception of that hazard (Burton, Kates and White 1993, Drabek 1986, Cutter 1993). Other factors, which have been found to relate to hazard perception, include age, gender, and ethnicity (Drabek 1986).

Human vulnerability is also an important concept in determining perception of risk. According to Blaikie, Cannon, Davis and Wisner (1994, p. 9) *vulnerability* is “the characteristics of a person or group in terms of their capacity to anticipate, cope with, resist, and recover from the impact of a natural hazard”. They also assert that vulnerability is made up of a combination of several factors, and that these factors in turn determine the individual's risk associated with specific natural or societal events. In studies of vulnerability, the emphasis is placed upon the community or individual and their exposure to the hazard. Hewitt (1997, p. 141) notes that “society, rather than nature, decides who is more likely to be exposed to dangerous geophysical agents, and to have weakened or no defences against them”. Considerations of socio-cultural and socio-economic aspects are important in evaluating risk perception. A community's or individual's capacity to deal with the threat of natural hazards is also related to these factors. Another concept related to vulnerability is *resiliency*, or the ability to ‘bounce back’ after a disaster event. The community's resiliency and its ability to return to its pre-disaster structure, is also an important determinant in examining risk perception. Cannon (1994, p.19 & 16) defines vulnerability as “a characteristic of individuals and groups of people who inhabit a given natural, social and economic space,

within which they are differentiated according to their varying position in society into more or less vulnerable individuals and groups". He notes that vulnerability is "a measure of the degree and type of exposure to risk generated by different societies in relation to hazards". He asserts that only "*vulnerable* people are the victims of disasters". Although it is important to recognize the concept of vulnerability in studying hazard risk perception, it will not be examined further as a part of this study's research objectives.

As indicated by Burton, Kates, and White (1993, p.31) individual human response can be made up of three elements, 1) the way in which the individual recognizes and describes a hazard, 2) how the individual will consider dealing with the hazard, and 3) how the individual will choose the action that is available to them. While the latter two elements are related to hazard response, the first is based on the individual's perception.

A distinction should also be made between perceived and objective risk. Perceived risk usually refers to the perception of the average individual or layperson, whereas objective risk is determined by experts, that is individuals who have knowledge, expertise and scientific facts on which they base their perceptions.

Perception of risk is an integral part of hazard research, since an individual's perception of risk may determine the adjustments adopted to mitigate loss.

### **1.2.2. DISASTER PREPAREDNESS**

One type of adjustment to reduce loss from natural hazard events is disaster preparedness. Preparedness is perhaps the most recognisable component in disaster management, and can be viewed within the concept of mitigation – “purposive acts designed toward the elimination of, reduction in probability of, or reduction of the effects of potential disasters” (Drabek 1986, p. 21). Planning and preparedness can reduce the loss, and can mitigate damages caused by these disastrous events. Often, if it is not possible to prevent the disaster, it is feasible to adopt the approach of lessening the effects of the event. The idea is that mitigation measures are undertaken to reduce the negative impacts of an impending disaster. Preparedness connotes “pre-arranged emergency measures which are to be taken to minimise the loss of life and property damage following the onset of disaster” (Smith 1992, p. 88). Preparedness measures may also be undertaken prior to the onset of a disaster event as a means of reducing loss. The concept of disaster preparedness may be applied to all types of hazards, including hazards which exist in the Red River Valley.

### **1.3 HAZARDS IN THE RED RIVER VALLEY**

In Canada, natural disasters have impacted millions of people, causing considerable damage and loss of life. Manitoba has a variety of natural hazards,

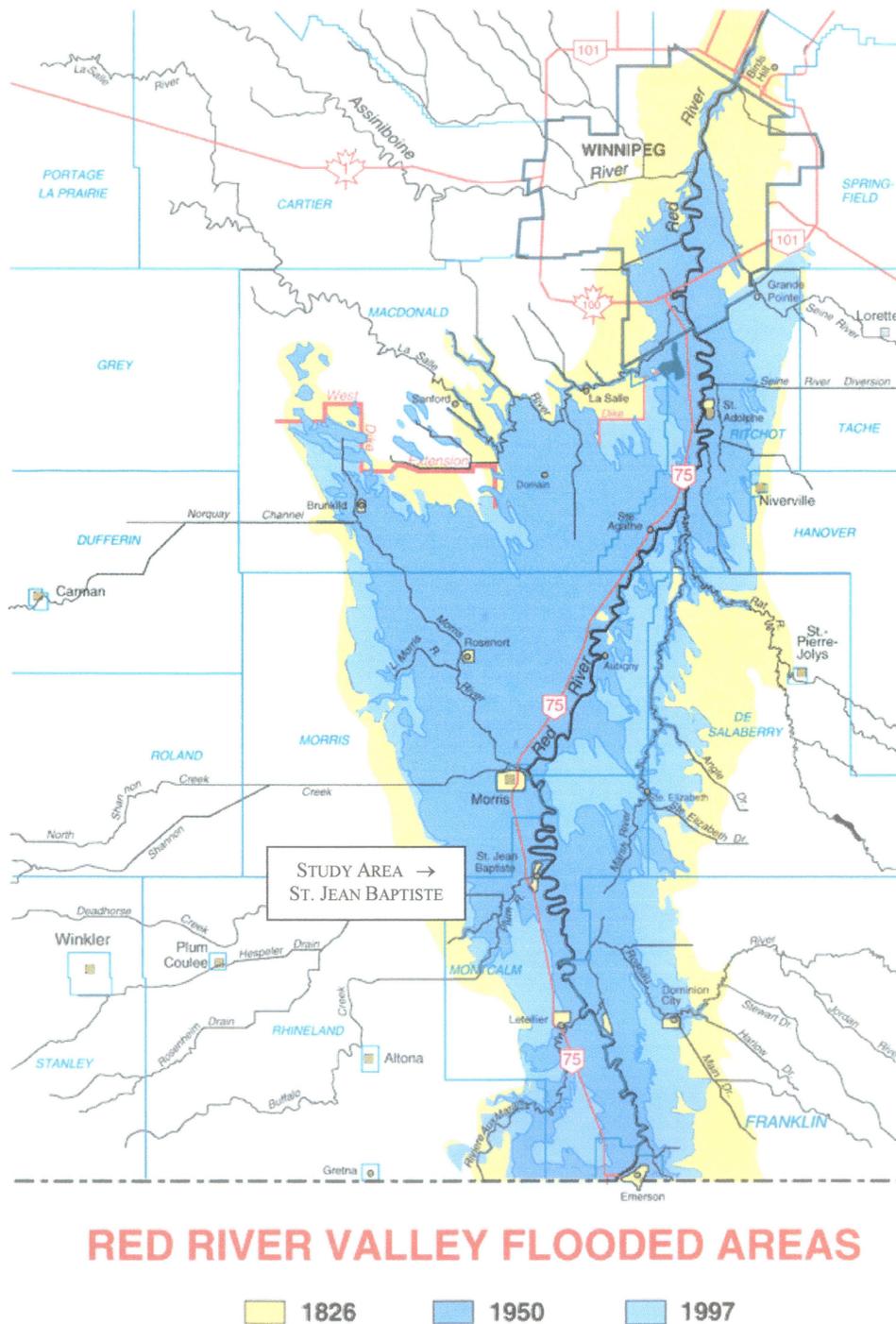
some of which have led to disaster events. The Red River Valley, an area encompassing 17, 000 square miles (44, 000 km<sup>2</sup>) of land, occupies part of Manitoba, eastern North Dakota and northwestern Minnesota (Krenz and Leitch 1998). It is susceptible to various hazards, most notably flooding. The current study will focus on that portion of the Red River Valley located in southern Manitoba.

### **1.3.1. FLOODING**

Worldwide, flooding is considered by some experts to be the natural hazard that affects the largest number of people. (Blaikie, Cannon, Davis and Wisner 1994 and Palm 1990). River flooding is also the natural hazard that has had the greatest impact on the Red River Valley. The Red River flood of 1997 affected thousands of people in the Valley, costing more than \$500 million in damages and related expenses (See Figure 2). The history of flooding in the Red River valley is impressive, and while it is not associated with large death tolls, huge losses are incurred from damage, destruction, and disruption of livelihood. The flood of 1997, which is still fresh in the minds of Manitobans, was not the only major flood to affect the Valley. The area has had a history of spring flooding which can be partially attributed to the geomorphic setting. During the last Ice Age a giant proglacial lake, Lake Agassiz, covered an area of 284, 900 square kilometers. ([www.newsreview.ca](http://www.newsreview.ca) - 1997), which included most of what is now the Red River Valley (Krenz and Leitch 1998). As the lake receded, southern Manitoba was covered with fertile glacio-lacustrine soils. As the Red River

meanders through the former lakebed of silt and clay, it travels over a broad, flat plain. The river flows northwards from its source at Breckenridge, Minnesota, to where it spills into Lake Winnipeg, as part of the Hudson's Bay drainage basin.

**Figure 2: Extent of Flooding in the Red River Valley: 1826, 1950 and 1997**  
**Source: Manitoba Conservation**



The Red River is highly sinuous, with a channel length of 880 kilometers ([www.gsc.nrcan.gc.ca](http://www.gsc.nrcan.gc.ca)). Many parts of its banks are steep and narrow, quite dissimilar to other prairie rivers whose banks are characteristically flat and broad. As it travels from Emerson, near the U.S. border, to Lake Winnipeg, its elevation decreases only 25ft (7.62 m), with its channel slope averaging only 3 inches (7.62 cms) per mile. (Bumsted 1997, p. 8). The geomorphic nature of the Valley is a contributing factor in the springtime flooding of the Red River. Once the steep riverbanks are overtopped, the water has no particular natural barriers or depressions to contain the flow, thus allowing the floodwaters to spread out onto the flat plain. The Valley is of low gradient, and does not have the capacity to contain the excess flow (Brooks, George, Lewis, Medioli, Nielsen, Simpson and Thorleifson 2003). In the 1997 Flood, the unusually extensive floodwaters were referred to as the 'Red Sea'. The Valley's silt and clay soils are not very permeable material, so percolation of excess water is slow. Since the Red River flows north, much of the river downstream is still frozen when snow melt and spring run-off begin upstream in more southern locations.

Clearly the threat of flooding is of utmost concern for many communities in the Red River Valley. Spring flooding has occurred frequently on the Red River, with some of the earliest history of flooding noted in the 1700s (Brooks, G. R., George, S. S., Lewis, M.C.F., Medioli, B. E., Nielsen, E., Simpson, S. and L. H. Thorleifson 2003). Of notable magnitude are Red River floods that occurred in 1826, 1852, 1861, 1882 and 1904. During the flood of 1916, the Red River at St.

Jean Baptiste, 60 kilometres south of Winnipeg, was reported to be one half mile wide (.80 km) (Red River Basin Investigation Water Resources Division 1953, p.29). Other notable Red River floods occurred in 1948, 1950 (when costs for the flood fighting measures were in excess of \$39 million (Hannigan and Kueneman 1978)), 1966, 1969, 1970 and 1974. The Flood of 1979 caused \$18.6 million in damages ([www.gsc.nrcan.gc.ca/floods](http://www.gsc.nrcan.gc.ca/floods)). With respect to eight community dikes in the Red River Valley, including St. Jean's, Haque (2000, p.230) states that "following the flood of 1979, the diking systems were upgraded to provide protection to the 100-year flood level". Significant flooding in the Red River valley also occurred in 1987, 1996 and the most recent of greatest magnitude, the flood of 1997 or as it was termed the 'Flood of the Century'. The most notable floods, in terms of severity and magnitude before the construction of the Red River Floodway, were in 1826, 1852, 1861 and 1950. The 1997 Flood had the greatest post-construction discharge, measured at Winnipeg as equivalent to the 1852 Flood, which was the second largest documented flood on record in the region since European settlement began.

The causes of flooding in the Red River are usually attributed to spring snowmelt (Krenz and Leitch 1998). Firstly, antecedent moisture in the ground from autumn is often trapped by the early or long-lasting fall frosts, and then this moisture is sealed in the ground. When this excess moisture is present, and the spring melting begins, this water cannot permeate the ground, which is already saturated. Large amounts of heavy snowfall, rapid spring melt, spring rainfall and ice jams where

the river is still frozen all contribute to extensive flooding (Hannigan and Kueneman 1978).

### **1.3.2 EXTREME SNOWFALL AND BLIZZARDS**

In the Red River Valley, flooding is not the only natural hazard that poses a threat to its inhabitants. Two other types of natural hazards are the threat of heavy snowfall and blizzards. Any given year in Manitoba, statistically there is a 50% chance that a blizzard will occur. A blizzard is distinguished from either a snow storm or heavy snowfall by virtue of meeting the following criterion: visibility less than 1km and/or blowing snow, wind speeds greater than 41km/hr, wind-chill factor greater than 1600watts/m<sup>2</sup> and a duration of 6 hours or more (Environment Canada web site 1998). In addition to blizzards, in any given winter in Manitoba, substantial snowfall can occur several times. The blizzard of April 5 and 6 1997, which produced large amounts of precipitation, was a major factor in the subsequent flood. Even though the risk of heavy snowfall may not be regarded as a severe hazard on its own, the phenomenon may lead to the secondary impact of flooding.

### **1.3.3 DROUGHT, EXTREME STORMS, TORNADOES AND NATURAL FIRES**

Although the threat of drought and drought conditions is not viewed as particularly large by most people, it certainly can have disastrous effects as demonstrated by the severe droughts of the 1930s, and the moderate drought

conditions occurring much more frequently. Bryant (1991, p.85) defines drought as “an extended period of rainfall-deficit during which agricultural biomass (total weight of living organisms) is severely curtailed”. Many residents of the Red River Valley will recall recent drought conditions in the years of 1995 and 1998, and some may remember 1988, which was a severe drought year too. Drought is especially a concern for farmers and producers in the region. As well, severe summer thunderstorms are common; these may produce destructive hailstorms, which can cause damage to structures, and wreak havoc on agricultural land. Manitoba’s tornado season is normally from May to August, with most tornadoes occurring in the afternoon or early evening. They are most common in southern portions of the province, including the Red River Valley (<http://www.gov.mb.ca>), so it is a possibility that one will be experienced. The most recent recollection of a tornado in the area of St. Jean Baptiste was in 1965, so it is expected that this type of hazard would not now be viewed as a large threat. Natural fires may also pose a small threat to the inhabitants of the Red River Valley since mostly farmland exists in the area, with only little amounts of riparian forest along the banks of the Red River. Wildfires may also be a concern in years with drought conditions, when fields are dry.

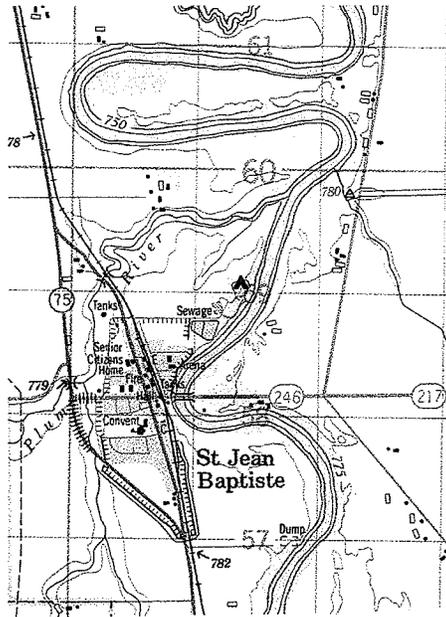
#### **1.3.4 HUMAN – INDUCED HAZARDS**

Natural hazards are not the only type of hazards that may pose a threat to the communities in southern Manitoba; human-induced hazards must also be considered and examined. Human-induced hazards are “produced largely by

human activity rather than by geophysical processes” (Palm 1990, p. 13). They are the “harm which one society or part of a society may do to another, (and) are pervasive sources of danger and disaster” (Hewitt 1997, p.111). In the realm of human-induced hazards, rural depopulation, crime, and unemployment may be regarded as a serious threat to rural communities in the Red River Valley. Other types of human-induced hazards that may be of significant concern are cuts in agricultural subsidies, inflation, shortage of farm labour, the risks associated with genetically engineered seeds and foods, as well as the transportation of dangerous goods through the community. While these types of human-induced hazards may pose a threat to a community, this study focuses on natural hazards.

#### **1.4 ST. JEAN BAPTISTE, MANITOBA**

One of the population centres in the Red River Valley, which is susceptible to a variety of hazards, is St. Jean Baptiste (See Figure 3).



**Figure 3: St. Jean Baptiste**  
**Map Scale 1:50, 000 Source: Energy, Mines and Resources Canada**

Types of natural hazards which have affected this small town include; river and overland flooding, blizzards, severe winter and summer storms, tornadoes, wildfires and drought. Some examples of human-induced hazards that affect St. Jean Baptiste (referred to by local residents as “St. Jean”) are; inflation, crime, agricultural subsidy cuts, rural depopulation and unemployment. The town is located in the Rural Municipality (RM) of Montcalm and is approximately 60 kilometres south of the capital city of Winnipeg. Of the three population centres comprising the RM of Montcalm, St. Jean has the largest population. St. Jean was settled in the late 1800s by francophone settlers. Its location was likely chosen for its proximity to a mode of transportation, the Red River, as rivers have proven throughout history to be a major factor in settlement location (Red River Basin Investigation, Water Resources Division 1953). Another probable factor in its

selection is that it is situated on fertile floodplain soil. Today St. Jean is a mainly French speaking community, with 70% of the town's residents estimated to be francophone (Buckland and Rahman 1999, p. 179) and many of its residents identifying themselves as Roman Catholic. Part of the history is evident today in the Old Convent, built in 1897, and the Parish Church, constructed in 1927.

According to Statistics Canada, the Census population for the rural municipality of Montcalm was 1, 567 in 1996, a slight decrease from 1991, when it was 1, 606 ([www.statscan.gov.ca](http://www.statscan.gov.ca)). Data provided by the RM of Montcalm for the year 2000 indicates that the population of St. Jean was 625, with 200 houses located within the town, and the average cost of these homes being \$50, 000 ([www.montcalmcdc.mb.ca](http://www.montcalmcdc.mb.ca)). For the entire RM, the average total income of those persons reporting in 1996, was \$25, 836, with \$34, 987 being the average for males, and \$16, 079 for females ([www.statscan.gov.ca](http://www.statscan.gov.ca)). The total number of people employed by all industries within the RM of Montcalm was 880. Within that total, 330 persons were employed in primary industry (agriculture and resource-based), and 90 persons were employed within the secondary industry, (manufacturing and construction-related). Tertiary industry (service industry) employed 455 persons in 1996 ([www.montcalmcdc.mb.ca](http://www.montcalmcdc.mb.ca)). Within the RM, of the population over 25 years of age, 16.5% obtained a university degree, 41.5% possessed a trade school or college degree, and 56.4% only had a high school education ([www.montcalmcdc.mb.ca](http://www.montcalmcdc.mb.ca)).

St. Jean is located adjacent to Provincial Highway 75, which is the main corridor for trade and travel between Manitoba and the United States. St. Jean is also divided by rail line that services the grain elevators. Economic generators in the town include the head offices of Sabourin Seeds and Roy Legumex, which supply speciality crops such as soup peas, and birdseed across Canada and the United States. There are several other agriculture-related industries located in the town, such as two seeds cleaning and processing plants, and Agricore. Also located within St. Jean are a grocery store, hotel, restaurant, bank, service station, catholic church and convent. The town possesses an elementary, junior and secondary school, as well as a public library. The MCDC, the Montcalm Community Development Corporation, was created as an apparatus to encourage further economic expansion.

### **1.5 RESEARCH OBJECTIVES**

The primary goal of this study is to examine the perception of hazard risk and preparedness in St. Jean Baptiste. This will be achieved through the following four research objectives.

- 1) To examine household and keypersons perception of different hazard types with an emphasis on natural hazards and specifically flood hazard.
- 2) To examine the difference between perceived risk (household individuals) and objective risk (keypersons) of local hazards.

- 3) To identify and analyze factors that determine perception of flood hazard risk.
- 4) To examine the relationship between disaster preparedness and risk perception, with respect to natural hazards.

## **1.6 HYPOTHESES**

Based on the preceding objectives, as well as a review of the literature, the following hypotheses have been formulated.

- 1) Levels of risk perception and preparedness are related to a variety of variables including; recent experience with past hazard events, length of time lived in the community, education, and age of the individual.
- 2) Preparedness for a natural hazard event, specifically flooding, is influenced by perception of that event.
- 3) The difference between objective and perceived risk is not as marked as the literature suggests.

## **1.7 OUTLINE**

This study is organized into five chapters, the first of which is the preceding introductory account. The second chapter will review the conceptual foundations of the study, with a general review of natural hazards literature, focusing on perception and preparedness. The third chapter will outline the research methodology, the methods of data collection, an outline of the survey instrument, the limitations of the methodology, and an overview of the Likert scaling method.

Chapter Four will be a presentation and interpretation of the data analysis. The final chapter will test the hypotheses, and present a summary with recommendations for the future.

## **CHAPTER 2 – CONCEPTUAL FOUNDATIONS: A REVIEW OF THE LITERATURE**

This survey of the literature on natural hazards and disasters is organized into three sections. The first section will provide an overview of some prominent themes in natural hazards and disaster research. The second section will focus on hazard risk perception, and the final one will explore preparedness and planning for natural hazards.

### **2.1 OVERVIEW OF HAZARD AND DISASTER RESEARCH**

Many of the early studies in the realm of natural hazards and disaster research were conducted in the United States and Canada during the 1950s and 1960s (Baker and Chapman 1962, Burton 1962, Burton, Kates and Snead 1969). Gilbert White has been credited as a pioneer in the field of hazards research (Kates and Burton 1986, Cutter 1993, Hewitt 1997, Smith 1992) and his research dates back to the 1930s, 1940s and 1950s when he examined such topics as human occupancy of floodplains, and floodplain management. White has been recognized with giving careful consideration to the geographical setting and, more importantly, the human nature of a hazard event (Hewitt 1997). A natural event is only deemed hazardous in the context of human beings, that is, an extreme natural event is only regarded as a hazard or disaster if it has some effect on, or some threat to, humans. According to Palm (1990, p.3), the environment may be regarded as hazardous “only when some aspect of (it) threatens the well-being of individuals or society”. She notes that it may be useful to view the environment as ‘neutral’, and that it is only when the interaction of humans and the

environment causes loss of life and/or damage, that we may view it as hazardous. White (1974, p. 3) notes “by definition, no natural hazard exists apart from human adjustment to it”. Chapman (1994, p.3) defines a natural hazard as “an interaction between a system of human resource management and an extreme or rare natural phenomenon, which may be geophysical, atmospheric, or biological in origin, greatly exceeding normal human expectations in terms of its magnitude or frequency, and causing a major human hardship with significant material damage to infrastructure and/or loss of life or disease”. Although Chapman is defining a natural hazard, his description is more fitting of a severe natural hazard *event*. Therefore, while it is the natural environment that causes the event, it is the interaction of humans with that environment that creates the hazard potential. A common distinction in the literature is that natural hazards are caused by extreme natural forces, whereas it is social processes and the human vulnerability to these forces, that cause natural disasters (Blaikie, Cannon, Davis and Wisner 1994).

Mileti, Drabek and Haas (1975, p.4) make the distinction between a hazard and a disaster, in that a hazard “refers to a potential set of events; disaster is a descriptive label for what is happening or has already taken place”. Hazard is the risk that exists by occupying a place that is subject to an extreme natural event (Burton, Kates and White 1978), and disaster is the realization of that hazard (Whittow 1980). A natural disaster is “the actual experiencing of loss due to the occurrence of a natural, but hazardous, process...A natural disaster, therefore, results from spatial interaction between a hazardous environmental process and a

population that is sensitive to that process and likely to experience tangible or intangible loss from it” (Degg 1992 p. 199).

Mileti (1980) indicates a difference that exists between hazard research and disaster research, in that the latter examines the response to the impact of a disaster event that has occurred (Barton 1969, Mileti, Drabek and Haas 1975), whereas hazard research examines preparedness and other adjustments which are undertaken in preparation for probable future disaster events. (Burton, Kates and White 1993).

Natural hazards and disaster research is multi-disciplinary in nature. It has been the subject of study by geographers, sociologists, psychologists, anthropologists and economists, with the majority of research being conducted within geography and sociology. As Hewitt (1997, p.12) notes, focus on natural disasters is evident in some of the earliest works of geographers, such as Strabo’s “Geography” which references earthquake disasters in the Mediterranean region. Hewitt (1997) has described the ‘geographicalness’ of risks and hazards, asserting the relevance of location in the realm of hazard and disaster research. The place where the disaster occurs is an important factor, as disaster events are often remembered by their location, for example Chernobyl or Love Canal. Barton (1969) notes that most studies of disasters conducted by social scientists have focused on the local impacts of disaster. In terms of spatial location, why do individuals choose to live in areas that they know are susceptible to natural hazards? Several studies have

been conducted in an attempt to answer this question (Burton, Kates and White 1968, Burton, Kates and Snead 1969, White 1975, Mileti and Fitzpatrick 1993, Chan 1995). For example, floodplains are obviously the most susceptible areas to flooding, yet they tend to be more heavily developed than other areas within a city or town (Gruntfest 1981, Montz and Gruntfest 1986). Research conducted in the area of sociology focuses mainly on disaster events, unlike hazards-based geographical research. Sociological research illustrates that theories propounded to explain human adjustment or response to disaster events are usually grounded in the examination of collective behaviour and social organization (Mileti 1980). Sociological studies have focused not only on collective behaviour in times of disaster (Dynes 1970, Barton 1969), but also on disaster subcultures that emerge (Hannigan and Kueneman 1978) and the impact of disaster on the societal structure (Palm 1990). As defined by Hannigan and Kueneman (1978, p.130), a disaster subculture is a "group level coping mechanism" which has been found to exist in times of natural disasters, and was the subject of their study in relation to Southern Manitoba's history of flooding. As well, it has been noted that sociological studies have focused more "narrowly on disasters rather than on the broader hazards-resources issues geographers have considered" (Palm 1990. p.7). Compared to geographers, sociologists consider the actual natural hazard that has caused the disaster as 'relatively unimportant' (Palm 1990, p.73). Sociologists such as Dynes (1970) are concerned with the relationships between society and environment in understanding the structure and organization of a community in times of disaster. Regardless of the discipline, research in the field of natural

hazards and disasters can be justified by the positive purpose of wanting to reduce loss and human suffering (Kates and Burton 1986, Hewitt 1997).

Different types or categories of hazards exist. These include natural hazards, human-induced hazards, and technological hazards. For the purposes of this study, hazards will be divided into two categories: natural, and human-induced. Natural hazards are caused by natural processes of the earth, whereas human-induced hazards are a product of human activity. Various classifications of hazards, or hazard taxonomies, have been developed to assist with their comprehension. Burton and Kates (1964) have categorized hazards by the principal causal agent. In this classification, extreme events are divided into geophysical and biological causal agents, further subdivided into meteorological and geomorphic, and floral and faunal respective categories (see Figure 4 below).

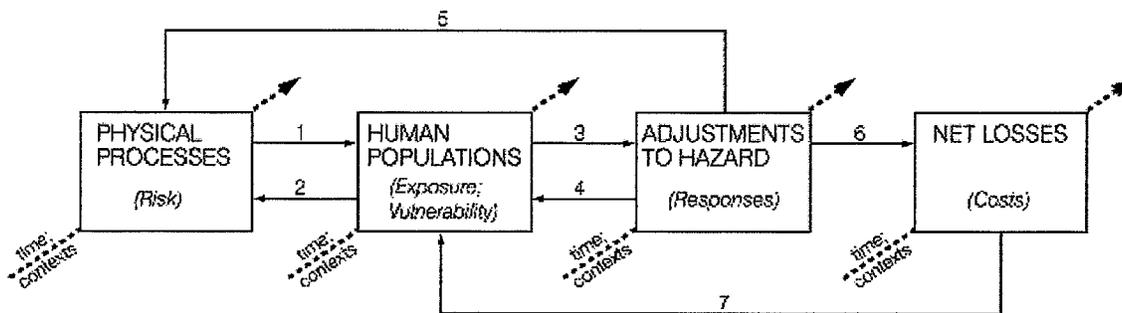
**Figure 4: Extreme Events, by Principal Causal Agent (after Burton and Kates, 1964)**

<b>Geophysical</b>		<b>Biological</b>	
<b><i>Meteorological</i></b>	<b><i>Geomorphic</i></b>	<b><i>Floral</i></b>	<b><i>Faunal</i></b>
Blizzard and snow	Avalanche – rock	Fungal diseases	Bacterial, viral and protozoal disease
Cold wave	Avalanche – snow	(examples)	
Flood	Erosion	<i>Athlete's foot</i>	(examples)
Drought		<i>Dutch Elm</i>	<i>Influenza</i>
Fog		<i>Wheat stem rust</i>	<i>Malaria</i>
Frost	Expansive soil	<i>Blister rust</i>	<i>Typhus</i>
Hailstorm	Landslide	Infestation	<i>Bubonic plague</i>
Heat wave	Shifting sand	(examples)	<i>Venereal</i>
Lighting strike and fire	Tsunami	<i>Weeds</i>	<i>Rabies</i>
Temperature inversion	Volcanic eruption	<i>Phreatophytes</i>	<i>Hoof and mouth disease</i>
Tornado		<i>Water hyacinth</i>	<i>Tobacco mosaic</i>
Tropical cyclone (hurricane, typhoon)		<i>Hay Fever</i>	Infestation
Windstorm		<i>Poison Ivy</i>	(examples)
		<i>Red tide</i>	<i>Rabbits</i>
			<i>Termites</i>
			<i>Locusts</i>
			<i>Grasshoppers</i>
			<i>Venomous animal bite</i>

Chapman (1994) lists a taxonomy of natural hazards originating from the atmosphere, hydrosphere, lithosphere and biosphere. Starr (1969) has created a classification based on voluntary or involuntary hazard, while Hewitt (1997) has broadly classified hazards into natural, technological, and violence and war hazards with major causes listed for each category. A classification based on perception of risk has been suggested by Slovic (1987). He asserts that this type of classification would be useful when examining perceived risk and in determining responses to this type of risk. Burton, Kates and White (1978) have outlined seven dimensions of hazardous events; specifically, these are magnitude, frequency, duration, areal extent, speed of onset, spatial dispersion, and the temporal spacing. These dimensions are of significance not only for the responses chosen, but also for an individual's perception of an event. Barton (1969) has created a typology of collective stress situations and disasters, which are categorized by their scope of impact, speed of onset, duration and social preparedness. He asserts that social preparedness is a system, or society in which individuals have defined roles that they have been well trained for, and that these roles are integrated into the overall organization of the system.

A contextual model of natural hazards has been conceived by Mitchell, Devine, and Jagger (1989) (see Figure 4). The natural hazard system is made up of a hazard components subsystem and a subsystem of hazard contexts. The former subsystem contains four interrelated components: physical processes, human populations, adjustments to hazard and net losses. Risk, exposure and

vulnerability, responses and costs are components which interact with and modify each other. Referring to the second subsystem, “The contexts are large problem sets that include or overlap with natural-hazard components” (Mitchell, Devine, and Jagger 1989, p. 108). This hazards contexts subsystem is comprised of exogenous factors that interact with and modify the hazard components. Contexts are very diverse; they may be spatial or temporal, and can be environmental, economic, sociocultural, organizational, political or have some other characteristic. It is the contexts in which a natural hazard event occurs that renders it unique. These factors may change as time passes, and are indicated with the dotted arrows (Figure 5).



**Figure 5: A Contextual Model of a Natural Hazards System (After Mitchell, Devine, and Jagger, 1989)**

## 2.2 PERCEPTION OF HAZARD RISK

How an individual perceives the risk or threat of a hazard is an important concept in the realm of hazard research. *Perception* is the way that individuals think of something, their mental understanding of it. Kates and Burton (1986, p.333) note that Gilbert White identified perception as the “process by which individuals organize exterior stimuli in order to form some concept of an event or situation”.

*Hazard* is the “potential threat to humans and their welfare and *risk* is the probability of hazard occurrence” (Smith 1992, p.6). According to Burton and Pushchak (1984, p.464) *risk* can be expressed as an equation where risk is the sum of the probabilities (P) of risk events (E) and their consequences.

$$\text{risk} = \sum P(E) \times \text{consequences}$$

Perception of the risk of a hazard “involves people’s beliefs, attitudes, judgements and feelings, as well as the wider social or cultural values and dispositions that people adopt, towards the hazards and their benefits” (Royal Society of London 1992, p. 89). Perception of hazard is the individual’s understanding of that hazard and it’s relevance to the person and/or the community (Mileti et al 1975). It is the “cognition or belief in the seriousness of the threat of an environmental extreme, as well as the subjective probability of experiencing a damaging environmental extreme” (Mileti 1980, p. 336). O’Riordan (1986) asserts that hazard perception is the process whereby individuals’ judgements of the degree of risk are linked to the actions they undertake. Why do some individuals regard a certain phenomenon or event as a risk or ‘risky’, whereas others do not? Chapman (1994) notes that all individuals and cultural groups may view hazards differently, with respect to their beliefs about the natural environment and how humans are meant to interact with it. An individual’s cultural beliefs provide “socially constructed myths about nature” which in turn become part of that culture’s overall system of beliefs, which influences perception (Laituri 2000, p. 451). Perception is based on

individual attitude, and “social, cultural and political processes are now acknowledged as all being involved in the formation of individual attitudes towards risk and their acceptance” (Royal Society of London, 1992, p. 90). Kates (1970) asserts that perception of a hazard is comprised of a combination of factors which include personal experience with the hazard and an individual’s personality. Slovic, Fischhoff and Lichtenstein (1982, p.84) state that individual perception of risk is drawn from a variety of both qualitative and quantitative factors, such as “a hazard’s degree of controllability, the dread it evokes, its catastrophic potential, and the equity of its distribution of risks and benefits”. Starr (1969) notes that individual tolerance for risk is related to the perception of benefits reaped from the natural environment. Wildavsky and Dake (1990) have found similar results regarding technological risks. They conclude that individual knowledge about risk is inversely related to fear of technology. The less an individual understands about certain technological issues (nuclear power, for example), the more they will perceive it as something to be worried or frightened about. Several sources in the literature have considered this type of cost versus benefits relationship with natural hazards, where the risk of living in a hazard-prone area is weighed against the benefits that are perceived to be reaped by living there (White and Haas 1975, Smith 1992). An example is a farmer who considers the costs of living near an active volcano, while benefiting from the fertile volcanic soil. Alhakami and Slovic (1994) have determined that an inverse relationship exists between the perceived risk of an event and the perceived benefit it provides.

O'Riordan and Timmerman (2001, p. 430) describe the emergence of a *risk culture* in society. They assert that it is possible to track its inception from “the mercantilism of the Renaissance, through the invention of probability theory in the seventeenth century, the rise of the insurance industry in the eighteenth and nineteenth centuries, all the way to the creation of technical risk analysis towards the middle of the twentieth century”.

The concept of the social amplification of risk as devised by Kasperson, Renn, Slovic, Brown, Emel, Goble, Kasperson and Ratick (1988, p. 178) states that “risk events interact with psychological, social and cultural processes in ways that can heighten or attenuate public perception of risk and related risk behaviour”. This may occur when the public overreacts to some type or risk or risk event that experts have deemed as only a minor or small risk. In this case, the behaviour may create secondary economic and social repercussions, and increase the physical risk.

Mental strategies or *heuristics* are also identified in studies of perception. Individuals utilize various heuristics to make sense of uncertainties and to simplify judgement of complexities (Tversky and Kahneman 1973, 1974). Several types of heuristics have been noted in the literature. The *availability* heuristic entails individuals determining the probability of a hazard event by comparing it to other events which have occurred, either an event that is available within the individual's memory, or in some instances, their imagination. It is easier for

individuals to make this comparison with events that have occurred more frequently (Slovic, Kunreuther, and White 1974). A second type of heuristic, the *anchoring* or *adjustment* heuristic, is when the individual identifies a starting point or anchor with which to associate the situation, and then makes subsequent adjustments to this anchor to accommodate the additional information that is presented in regards to the potential hazard event (Slovic *et al* 1974). It is noted by Slovic *et al* (1974) that the adjustments made by individuals to incorporate the new information into their anchors are often imprecise. The *representativeness* heuristic, as defined by Carlson (1990, p338) enables individuals to classify information in relation to some other occurrence or event that they can easily identify with. Individuals learn that certain characteristics are associated with each other, and when some of these characteristics are present, it is assumed that the other characteristics should be also present. The *affect* heuristic is when individuals have positive or negative affective reactions to certain ideas or images, and use these affective feelings to assist them in their judgements (Finucane, Alhakami, Slovic and Johnson 2000). This type of heuristic is often employed when individuals must assess complex ideas or situations. It enables the individual to make easier, simpler decisions than they may have if they were to utilize other more complex decision-making processes.

Differences in risk perception among individuals are usually attributed to psychological predispositions such as the individual's personality. Differences in risk perception among groups can be related to attitudes and beliefs that are a

result of individuals' identification and desire for conforming with a certain social group's norms and beliefs (Royal Society of London 1992). This is evident within the cultural theory approach of anthropology, where risk perception is "not homogeneous but var(ies) systematically according to cultural biases (Royal Society of London 1992, p. 112). The Royal Society (1992) asserts that the identification of a phenomenon as risky, is not determined by nature, but by cultural and social factors.

Several studies have also focused on the cognitive ways in which individuals cope with hazard. Anthropomorphism, assigning human-like qualities to non-human things, has been observed during or after a disaster event. This occurred in Jamaica when residents gave a personality to hurricane Gilbert as a part of the community's coping strategies. Assigning the hurricane human qualities allowed the residents to simplify and understand an extreme event, which was previously incomprehensible to them (Barker and Miller 1990). Personifying the hurricane also allowed them to incorporate humour into their perception of the event, which was an important psychological coping mechanism (Chapman 1994, p. 8). Chapman (1994) notes that national and international meteorological agencies may encourage this process of anthropomorphism by giving human names to tropical cyclones and hurricanes.

Cutter (1993) observes that natural hazards researchers have conducted some of the earliest studies of perception. She asserts that early studies of public

perception were undertaken to include public knowledge about natural events, as suggested by Gilbert White, and that these studies utilized social science research techniques from psychology. Slovic, Fischhoff and Lichtenstein (1982, p.91) state that risk perception is grounded in cognitive psychology, and that psychometric techniques can be used to quantify and predict risk perception. They also define a purpose for studying risk perception. They assert the importance of interpreting why an individual views something as a risk and of determining the specific factors that contribute to this assessment. In addition, they developed a theory of risk perception to predict how people will respond to newly implemented hazard management strategies. They have also established methods to assess the complex and subtle opinions that people form about risk.

### **2.2.1 FLOOD HAZARD RISK PERCEPTION**

In terms of research conducted on hazard risk perception, Whittow (1979) has stated that more studies have focused on flooding than on any other type of natural hazard. Gilbert White examined the human response to flooding and sought to explain why people live in flood-prone areas, noting that individual response to a hazard is related to perception (White 1974). White notes that in some cases, individuals are not aware that a hazard actually exists, or if they are aware of the hazard, they believe a significant hazard event will not occur. In some instances, individuals continue to live in hazard-prone areas because they feel that they will not experience a loss as a result of the hazard event occurring,

or because they plan to adopt adjustments to reduce loss from such an event. In addition, the greater the level of attachment individuals have to their homes, the greater the likelihood that they will relegate the risks of living in those particular hazardous locations. Chan (1995) found that individuals in Malaysia live in floodplain areas due to what he describes as 'structural factors'; these include poverty, low levels of education, and lack of residential or occupational mobility. A recent example of this concept was demonstrated with the extensive destruction caused by Hurricane Katrina on the hurricane-prone coastlands of Louisiana, Mississippi and Alabama on August 29, 2005.

The Churchill and Hutchinson (1984) study of flooding in Sri Lanka examined individual attitudes towards, and perception of, flood hazard. They assert that hazard perception is not highly related to socio-economic factors, as had been previously noted in other studies in the literature (Burton and Kates 1964). Instead, they assert that hazard perception is more related to individual attitudes and cultural factors. They note that in the United States, human perception of flood hazard reflects the nature of the individual's experience with the hazard, length of time since the last hazard event, and the individual's use of resources available to them (Burton and Kates 1964). In general, in areas where the risk of flooding is frequent, the level of overall flood hazard awareness is usually high.

Burton, Kates and Snead (1969, p.151) examined public perception of storm and coastal flood hazard, and noted that " any public manifestation of the awareness

of the hazard from coastal storms is an expression of public perception". Corroborating the above, they also explained that individual perception is based on past experience with a disaster event, or the history of disaster in the area. They found that the residents' perceptions were based not only on "the evaluation of past experience, (but) the expectation of future storms", and that a relationship exists between the hazard experience and the individual's expectation of an event (Burton, Kates and Snead 1969, p. 154). The respondents of the study reacted to the uncertainty of hazard in two ways: either "by making the events knowable, finding order where none exists, identifying cycles on the basis of the sketchiest knowledge of folk insight, striving to reduce the uncertainty of the threat of hazard by making it certain, (o)r conversely, they deny all knowability, accept the uniqueness of natural phenomena, throw up their hands, and transfer their fates into the hands of a higher power" p.160. The portrayal of the hazard event in the media also influences and increases the public's perception of risk (Fitzpatrick and Mileti 1994). Often, accounts of hazard events in the media are skewed, or incorrect. As well, government controls often manipulate the information before it is reported to the public in an attempt to avoid fear in the general public. This lack of disclosure often leads to a difference in perception between the general public and the experts.

### **2.2.2 OBJECTIVE VS. PERCEIVED RISK**

A significant concept in hazards literature is that risk perception varies between experts and ordinary citizens (Burton and Kates 1964, Burton and Pushchak 1984,

Slovic 1987, Williams, Brown, Greenberg and Kahn 1999, Burton, Kates and White 1993, Palm 1990, Foster 1980). These differing types of risk perception are defined as *perceived* and *objective* risk. "Perceived risk is an assessment of the probability of an event and its consequences arrived at subjectively by individuals. Objective risk is the probability of a future event calculated from statistical data provided by past events" (Burton and Pushchak 1984, p. 469). Cutter (1993) states that social factors and mechanisms determine individual risk perception as well as the differences between the perception of risk of experts and that of the general public. Foster (1980) asserts that the public will often overestimate deaths from well-publicized hazards but will underestimate deaths caused by chronic disease. Cutter (1993) also notes that collective judgement on the chance of loss or damages caused by a hazardous event do not differ from the judgements of experts for events which are deemed more probable; however, for less probable events, the difference is evident. Slovic, Fischhoff and Lichtenstein (1982) observe that experts discern risk with technical estimates of fatalities or loss. By contrast, laypeople can estimate annual fatalities if they are asked, but their judgement of risk is more highly related to other factors such as catastrophic potential and threat to future generations, and does not closely relate to the experts' views. Burton and Pushchak (1984, p.470) state that because individuals have limited access to assessment of risk, they will often make sense of the problem by simplifying it with "commonly held values, (and) rules of thumb". Individuals rely on sets of heuristic devices to simplify complexities of assessing hazard risk (Burton and Pushchak 1984). These sets of heuristics, as outlined by

Tversky and Kahneman (1974), allow individuals to establish risk perception of a hazard in a way that is understandable to them.

Other researchers claim that the difference between objective and perceived risk is not as significant as suggested (Baum 1986, Olczyk 2004). Fischhoff, Slovic and Lichtenstein (1983) offer several reasons to demonstrate that the variation between public and expert perception should not be regarded as contradictory. They explain that the marked difference in perception can be attributed to several factors. One reason is that the distinction between perceived and actual risk is a misconception, as it is not possible to establish a definite measure of risk because the calculations “inevitably contain some element of the scientists who produce them” (Fischhoff et al 1983, p. 237). This is corroborated by the Royal Society of London (1992, p. 90) which asserts that “...assessments of risk, whether they are based upon individual attitudes, the wider beliefs within a culture, or on models of mathematical risk assessment, necessarily depend upon human judgement. In this respect it can be argued that assessments of risk involve subjectivity, to a greater or lesser extent”. A second reason given by Fischhoff et al (1983) is that experts use terminology that the public may not understand, and if explained in different terms, the public would be more likely to comprehend. Laypersons often disagree with experts with respect to types of hazard prevention that are feasible, since laypersons’ conclusions are drawn without scientific facts. When laypersons have the facts, they interpret them differently. In general, Fischhoff, Slovic and Lichtenstein (1983) conclude that it is miscommunication, misinformation, and

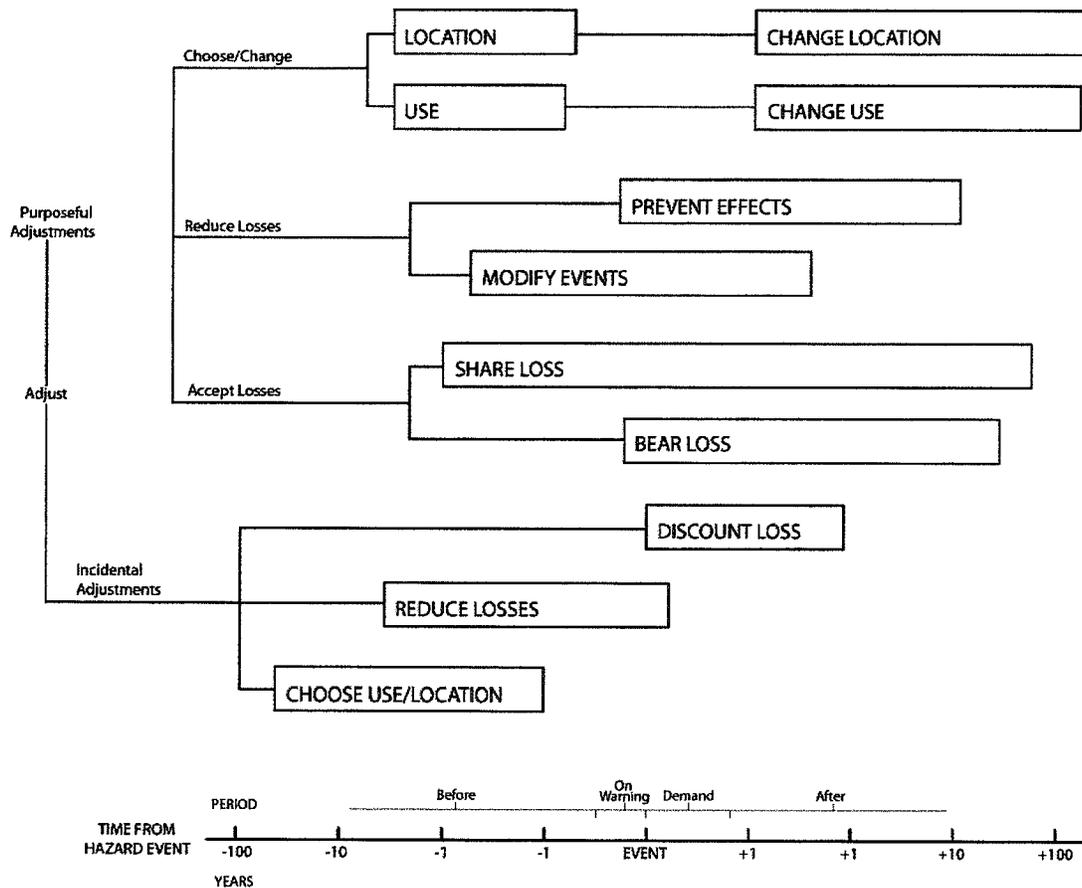
the subsequent misunderstanding that cause the differences in perception between experts and the public. In a recent study of flood perception in the Red River Valley of Manitoba, Olczyk (2004) concludes that while a difference in flood risk perception does exist between local residents and institutional experts, this is not as substantial as much of the literature suggests. He notes that flood area residents base their perception not only on subjective factors; many residents were cognizant of a degree of scientifically-determined risk. Smith (1992, p.57) notes that hazard management decisions are not based solely on objective evidence of risk. He explains that models of decision-making most utilized in natural hazard research focus on the individuals' choices and their rationale of risk and uncertainty.

According to Cutter (1993, p.13) geographers focus on perception to understand response to hazards and the selection of hazard adjustments "Hazard perception links judgement to action and examines those factors that influence the individual's choice". In addition, she explains that psychologists focus more on cognition itself. Chapman (1994, p.7) notes that hazard perception is being recognized as an important factor in response to hazard events and that recently, more attention has been given to psychological concepts, such as cognition and perception. These can play a key role in hazard management. In examining risk perception, an individual's mental preparation is linked to disaster preparedness,

and this cognitive process appears to be the first priority in dealing with a hazard (Bryant 1991). How individuals view a hazard event, how they react to it, and how they plan for it, are all related to perception.

### **2.3 DISASTER PREPAREDNESS AND PLANNING**

Disaster preparedness is “the pre-arranged emergency measures which are to be taken to minimise the loss of life and property damage...both by individuals and groups, once a hazard is either forecast or has actually occurred” (Smith 1992, p.88). Preparedness, both short- and even long-term, can be a means of mitigating loss caused by natural hazards. According to Mileti (1980, p. 330), emergency preparedness is the capacity of a social aggregate to deal with a disaster event. Smith (1992, p. 88) states that disaster preparedness includes the promotion of public awareness programmes, the creation of local emergency evacuation plans, and the evaluation of individual emergency preparedness and planning. In addition, he notes the importance of planning and testing, as well as the effectiveness of these emergency responses. Several studies have provided classifications of adjustments in order to reduce loss. Burton, Kates and White’s (1978, p. 46) choice tree of adjustments offers several categories of adjustments to the threat of natural hazards which can be undertaken (Figure 6).



**Figure 6: Burton, Kates and White's (1978) Choice Tree of Adjustments**

Burton, Kates and White (1993) state that adjustment begins with the individual's initial choice of location and resource use; subsequent adjustments are chosen. An individual will make purposeful adjustments to either reduce the loss, or accept the loss incurred by a hazard event. Loss reduction may occur before, during or after a hazard event, by "reducing the damage potential or by modifying the events themselves" (Burton, Kates and White 1993, p.59). Preventing the hazardous event entirely is not usually possible, so reducing the loss is one type of

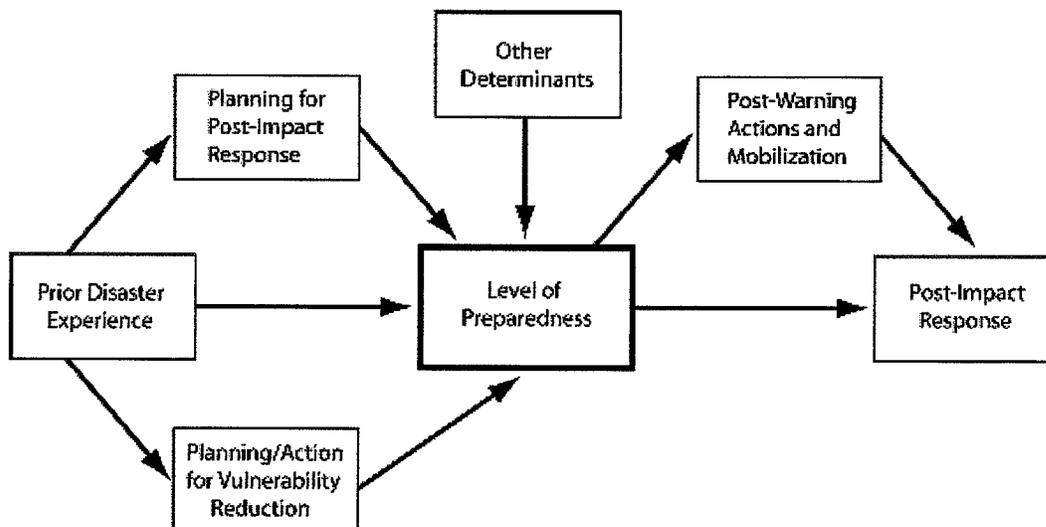
adjustment that will decrease vulnerability and “prevent injurious effect” (Burton, Kates and White 1993, p.60). Adjustments that seek to reduce hazard loss may include community preparedness and planning. Smith (1992, p. 66) classifies the range of adjustments to environmental hazards with three specific types of adjustments. Modifying the loss burden consists of such measures as disaster aid and insurance, which incorporate sharing the loss, whereas modifying the hazard event entails implementing adjustments such as environmental control or retrofitting structures. Modifying human vulnerability reduces loss through community preparedness, forecasting and warning, as well as by land use planning.

Mileti (1980) examines adjustment to hazard with a typology that defines different types of adjustments. He notes that original hazards research sought to explain why some types of adjustments to hazard were chosen or preferred over others. Mileti (1980, p.330) states that reducing risk and engaging in preparedness both reduce loss though adjusting to the risk of future disaster events, and that these “adjustments which enhance preparedness and reduce risk do not yield direct benefits until a low probability environmental extreme occurs; however, their associated costs begin to be incurred as soon as they are effected.” Disaster preparedness can be undertaken at different levels; at the national level through governmental policies, at the community level, and at the individual level through household planning and emergency readiness.

### 2.3.1 FACTORS INFLUENCING DISASTER PREPAREDNESS

What makes a person heed warnings and prepare for a hazard event? A variety of factors exist which influence disaster preparedness. Mileti (1980) explains that if adjustments are to be undertaken, there are several factors that must exist. The social unit must regard the adjustments as necessary, the costs must be perceived as worth the adjustment, the steps to undertake the adjustment do not require large scale change from the pre-adjustment way of life, the opposition to adjustment is not high, and finally, higher level groups, such as governmental agencies, offer incentive to adjust. Mileti, Drabek and Haas (1975) have explained that individual awareness of a hazard does not necessarily indicate that preparedness measures will be undertaken. They assert that individuals do not personalize the risk of a hazard, and feel that if a future hazard event were to occur, it would not affect them personally. Mileti *et al* (1975) propose a useful schematic diagram of factors linked to levels of disaster preparedness (Figure 7).

**Figure 7: Outline of Components and Links Relating to Level of Preparedness (After Mileti, Drabek and Haas 1975)**



Tierney, Lindell and Perry (2001) note that personalizing the risk is an important factor in determining whether the individual will seek out protective measures. While many individuals are aware of preventative measures that can be undertaken to reduce loss from a natural hazard, the actual implementation of these measures depends on the individual's past experience with a natural disaster (Cutter 1993, Mileti and Fitzpatrick 1993, Palm 1990). Lindell and Perry (2000) state that at the individual level, past experience with a hazard event leads to a willingness to undertake preparedness measures for future events. In addition, Drabek (1986) concludes that the more a community has experience with disaster events, the more its residents will undertake extensive planning measures. However, Tierney *et al* (2001) warn that, since it is difficult to measure individual or community experience with a disaster, current literature on the relationship between experience and preparedness should be cautiously considered. They point out that individuals who experience non-severe hazard events may perceive that a disaster event is nothing to be concerned about. In addition, individuals who have experienced an event of great magnitude, such as a 500-year flood, may think that there will not be a chance of having to face a comparable natural disaster. Alternatively, victims may experience learned helplessness, whereby they feel that nothing they can do will prepare them for another disaster. Sources in the literature state that the greater the amount of time that has elapsed since the last disaster event, the lower the individual's enthusiasm for preventative measures (Bryant 1991, Tierney, Lindell and Perry 2001). Conversely, the more recent the event, the more likely that preparatory measures will be undertaken.

The adoption of adjustments in response to an event's recent occurrence is dependent upon the event having a recurrence interval that is within the memory of the individual (Cutter 1993).

According to Kates (1970), awareness of adjustments is often dependent upon the accessibility to the information about these adjustments, which in turn is related to such factors as age, education and income. The adoption of mitigation measures, including preparedness, is also influenced by an understanding of, and belief in, the warning messages and signals dispatched (Cutter 1993, Mileti and Fitzpatrick 1993, Fischhoff, Slovic and Lichtenstein 1983). Janis (1962) defines a curvilinear relationship that exists between the level of personal fear and the reactions to warnings. When the average individual is given a warning of remote or improbable dangers, that warning will often be ignored. As fear increases, an individual will become less likely to ignore the warnings. With a high level of fear, the individual may not be able to process the information effectively and discriminate between what is safe and unsafe. The source of warning is also an important determinant in the implementation of preparedness measures. Individuals will often seek advice from neighbours, family or friends, rather than official bodies (Bryant 1991, Drabek 1986). Whittow (1979) notes that response to hazard varies with differing levels of community wealth, and Baumann and Sims (1974) observe that response also varies cross-culturally. Bryant (1991) asserts that those groups of individuals who respond to hazard warnings the least are, women, those of low socio-economic status, and ethnic minorities. Lindell

and Perry (2004) state that ethnic minorities experience greater difficulties with preparedness measures because they often have lower incomes and problems with communication about hazard risks, prevention and post-disaster aid. In the Buckland and Rahman (1999) study of relationships between community development patterns and the community's ability to deal with the threat of flooding and the 1997 Red River Flood, it was found that communities with "higher levels of physical, human and social capital were better prepared and more effective responders to the flood" (p. 174). Communities with lower socio-economic status were found to be more vulnerable, with limited effective hazard management undertaken at the community level (Blaikie, Cannon, Davis and Wisner 1994, Buckland and Rahman 1999, p. 174, Whittow 1979). Nonetheless, communities with higher levels of social capital may be hindered by more complications in decision-making processes. Butler's study of snow avalanche hazard in Montana concluded that, although residents were highly educated and aware of the hazard, they did not undertake significant preparedness measures for the threat of a future avalanche because they did not feel that they would be affected by one (Butler 1987).

One type of adjustment to the threat of a natural hazard event is *evacuation*, which temporarily removes people from the area at risk. According to Alexander (1993, P. 422), when carried out (on the basis of prior planning) in an effective manner during a disaster event, evacuation is one of the best methods of protecting individual safety. Evacuation can also be controversial, especially

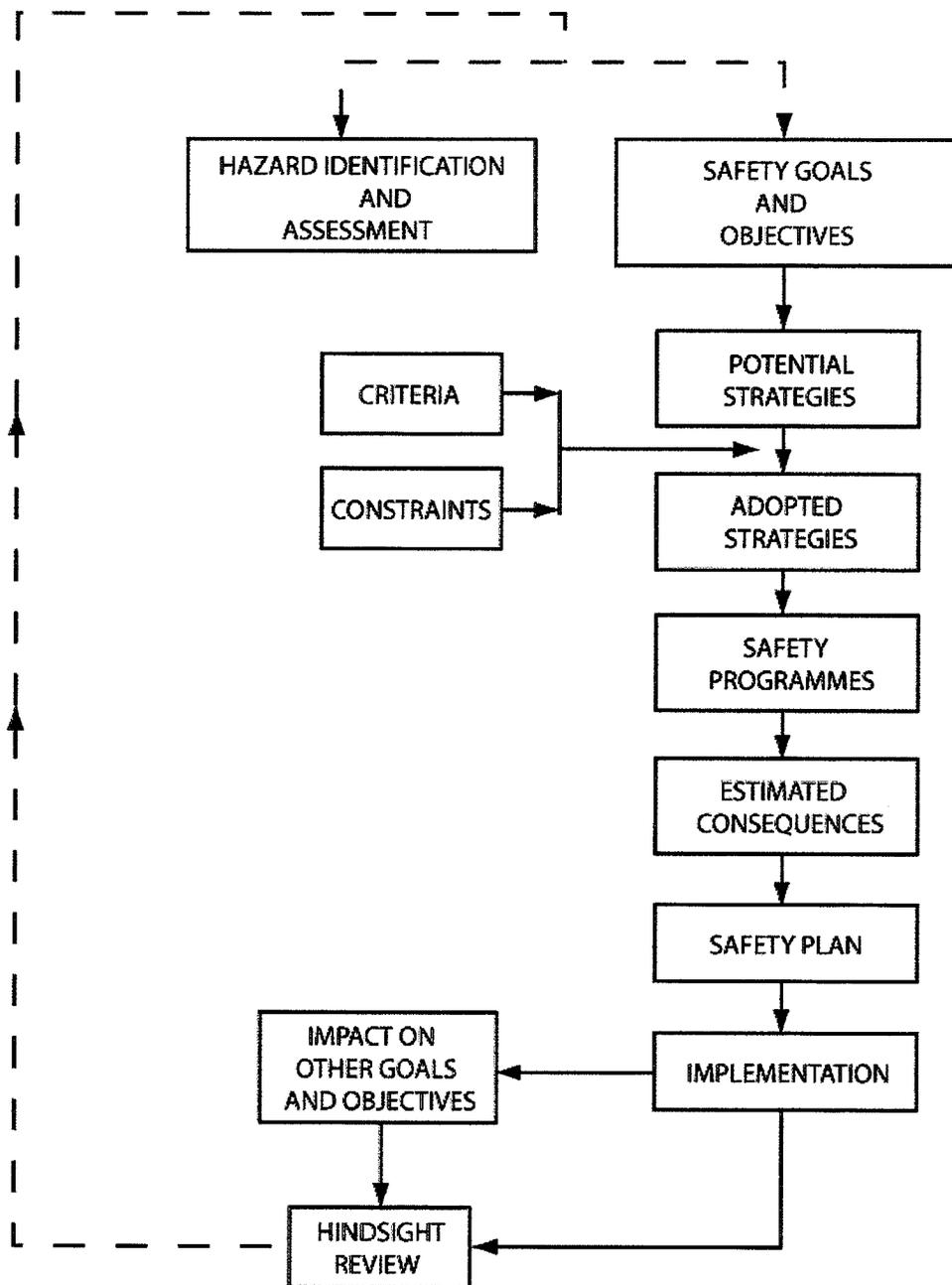
when it is mandatory, as was the case during the 1997 Red River flood when more than 20,000 people were evacuated from the Red River Valley (Haque 2000, p. 238). In a study by Rasid, Haider and Hunt (2000, p. 379) on the evacuation associated with the 1997 Red River flood, nearly half of the survey respondents who were forced to evacuate would have rather remained in their homes in order to undertake their own adjustments for the purpose of protecting their residences and possessions from floodwaters. Why do people evacuate, or decide not to? There are a variety of contributing factors that determine the likelihood of an individual voluntarily evacuating, which are similar to reasons for heeding emergency warnings. These may be economic reasons; it will cost money for individuals to leave the community and their jobs. Some individuals remain for fear of something happening to their homes, either looting or vandalism. Residents may stay and protect the home by undertaking further preparatory measures such as floodproofing. Additional reasons that have been noted in the literature include, bravado, wanting to project a public display of fearlessness, peer pressure and even religious taboos (Bryant 1991). The Saarinen and Sell (1985) study of human response to the 1980 Mt. St. Helen's volcanic eruption found that even when people clearly understood the severity of the warnings, they refused to co-operate with officials by evacuating. Whittow (1979) states that in many cases when evacuation from an area is voluntary, the majority of the residents remain whereas most visitors or tourists leave. In the previously cited study by Rasid, Haider and Hunter (2000), it was stated that many of the models and studies on flood evacuation show that voluntary evacuation is more

successful than mandatory. Research on mandatory evacuation is apparently quite limited (Alexander 1993).

An interesting post-disaster response is that that many individuals rebuild their homes in the exact same location. Even when experts try to discourage this, as the location is deemed hazardous, many people feel the need to ignore this rational argument and rebuild on the same sites. This was noted after the 1997 Red River flood, when many residents rebuilt their homes on the sites where these had just been inundated. Individuals have a connection to the place, the geography of an area, and wish to retain this connection. An analogous example in the literature is the 1979 earthquake-induced landslide that destroyed Yungay, Peru. Oliver-Smith (1986) concluded that the residents of Yungay who were rebuilding in the same hazardous area did so partly because they wanted to create a new sense of the same community; it was their refusal to let that part of their identity which had been destroyed in the earthquake be forgotten. In general, individuals often feel a strong sense of attachment to their home, and they perceive the home as a part of their sense of self and their history. Bryant (1991) notes that the home is a familiar place associated with personal identity. In the face of a disaster event, many individuals will often risk their safety by remaining in their homes to fiercely protect them, even when they have been informed of an impending threat. There was evidence of this recently during the Hurricane Katrina disaster, when some residents remained in their homes to protect them despite evacuation orders. At the same time, it should be noted that many individuals in poor areas of New

Orleans could neither afford to leave, nor were provided with the means to do so. Government agencies, especially the Federal Emergency Management Agency (FEMA) were unprepared, and did not facilitate residents' evacuation for days after inundation occurred. Hewitt (1997, p. 47) notes that individuals view their possessions as not just objects which can be replaced, but as part of the structure and evidence of security and continuity, which will symbolize survival of the family unit. He also claims that often the most significant losses during a disaster are those that affect individuals' homes, since the latter start to signify and represent the disaster event.

An integral part of disaster preparedness is the conception and implementation of a comprehensive community disaster plan. Even at the individual level, planning is very important. Communities and individuals need to be informed and aware of the risks that exist in order to undertake preparedness measures. Kates (1970) states that unawareness related to the diversity of risk inevitably leads to inaccuracies in the decision-making process, and frequently results in disasters that may have been avoided. Foster (1980) emphasizes the importance of a community disaster plan that includes hazard identification and assessment, strategies for risk reduction, and estimated consequences (see Figure 8).



**Figure 8: The Development of a Community Safety Plan (after Foster 1980)**

Alexander (2000, p. 163) asserts the importance of disaster planning in the conception of an effective emergency management structure. He notes that a plan

must be firmly rooted prior to a disaster event as “it cannot be improvised successfully in the heat of the crisis”.

Alexander (2000, p.168) also notes that *scenario modelling* is an important part of disaster planning, and can be utilized to prepare for certain outcomes and consequences of an event. Within this type of model, certain event chains or situations are identified and then possible outcomes are considered from which conclusions can be made, and lessons learned.

In conclusion, disaster preparedness is an integral part of reducing loss caused by natural hazard events. Planning and preparedness well before an extreme event occurs are powerful ways of mitigating natural disasters as they materialize.

## CHAPTER 3 – RESEARCH METHODOLOGY

In the paradigm of social science research, there are several methodologies employed for the collection and analysis of data. Both qualitative and quantitative approaches exist. *Qualitative* research involves strategies that collect data that represent the opinions and attitudes of the individuals being studied. *Quantitative* research utilizes strategies to collect data that can be expressed numerically (McIntyre 2005, p. 300).

### 3.1 SURVEYS

One of the methods used in social sciences research for the collection of data is the survey. A survey consists of the collection of data using interviews and/or questionnaires from a large number of respondents who are usually spatially diverse (Orr 1995, p. 291). Notwithstanding Orr's (1995) statement, some qualitative research may entail collecting data from a relatively small number of respondents. The survey is the most important method of data collection in the field of social sciences (Frankfort-Nachmias and Nachmias 1996, Chadwick, Bahr and Albrecht 1984). The survey method is useful in that it may be used to collect retrospective data about events that have occurred in the past, and may exist only in the memories of the respondents rather than be documented elsewhere (Chadwick, Bahr and Albrecht 1984). Several categories of surveys exist. Some may be governmental and obligatory involving a *census*, which includes all members of a given population. Another category of survey is the *poll*, exemplified by opinion polls in which respondents are asked to 'vote' on

something. A different category of survey is the *sample survey*, which examines a sub-set of a total population (Orr 1995). There are three different types of surveys that can be used to collect data and these consist of *personal interviews*, *mail questionnaires*, and *telephone interviews*.

In this thesis research one of the methods utilized was the sample survey by personal interview. Frankfort-Nachmias and Nachmias (1996) present both advantages and disadvantages to this type of personal interview survey. Firstly, and perhaps most importantly, personal (face-to-face) interviews are desirable because they have a high rate of response. They also allow for flexibility in the questioning process because, depending upon the specific objectives of the research, the interviews may be either highly structured or non-structured. A third advantage of the personal interview method compared with the telephone interview and mail questionnaire is the existence of control over the interview situation. For example, the face-to-face interviewer has control over who answers the questions. A fourth advantage is that more information may be gathered, as the interviewer is often able to elicit additional information from respondents. Some disadvantages to the personal interview have been noted by Frankfort-Nachmias and Nachmias (1996). Firstly, there tend to be higher costs, especially if the respondents are not located within a small geographical area. Secondly, the lack of anonymity for respondents may influence the answers given. Additionally, if the respondent feels uncomfortable with the interviewer, the answers provided may not accurately reflect the respondent's opinion. A further disadvantage is the

possibility of an interviewer bias, where different characteristics, particularly personality, attitude, or actions of the interviewer, or the interviewing style, may affect the responses given.

In addition to corroborating Frankfort-Nachmias and Nachmias's (1996) advantages and disadvantages of personal interviews, Bailey (1987) provides other strengths and weaknesses of this method. He states that non-verbal behaviour and spontaneity of the respondent, as well as a greater complexity of the questionnaire, are advantages to this face-to-face method. Bailey (1987) specifies another disadvantage that includes an increased length of time to complete the survey process. Another significant disadvantage is the lack of opportunity for the respondent to consult with records, family members, or to think carefully about the responses given. Furthermore, there may be inconvenience in terms of the respondent having to reply to the survey in circumstances that are less than favourable (respondent preoccupied, in a rush, or not feeling well).

A recent investigation of flood risk perception in the Red River Valley (Olczyk 2004) employed the Delphi process, consisting of two techniques, applied sequentially. Face-to-face interviews of residents and experts were followed by a two-round mail-out questionnaire survey. The Delphi questionnaires are not ordinary mail-out surveys. The initial questionnaire requests individuals to respond to a broad question; the second questionnaire is based upon responses to

the first mail-out survey. Olczyk (2004, p. 75-76) summarizes the main advantages (such as anonymity and controlled feedback) and disadvantages (lengthy research process and high dropout rates). The Olczyk study was part of a larger research project entitled "Flood Research Partnership (FRP): Promoting Stakeholders' Participation in Sustainable Floodplain Management in the Red River Basin" (Olczyk 2004, p.11).

Unlike the Olczyk (2004) study, which entailed surveying flood area residents of Winnipeg and of the rural Red River plain to the south, the present thesis research is confined to a single small rural community, St. Jean, for which the Delphi process is inappropriate.

### **3.2 SELECTION OF STUDY AREA**

The town of St. Jean Baptiste was selected as one of the sample towns in a larger project entitled "Community Differentials in Hazards Perception and Emergency Needs: A Report to the Emergency Preparedness Canada, March 2001" (Rahman and McLachlan, 2001). This study was commissioned in June 2000 by Emergency Preparedness Canada. Its principal research investigators were Dr. Matiur Rahman and Dr. Stephane McLachlan. The purpose of this study was to examine the differences in perception and emergency needs between three culturally diverse communities in southern Manitoba that had experienced the Red River flood in 1997. A predominantly Mennonite town was chosen, a First Nations community, and a predominantly francophone community. St. Jean was

selected as the latter. The current thesis research was developed from a specific portion of the data that was collected by the author as a part of this major project. The author's function in the larger project was that of research assistant, responsible for gathering primary data from St. Jean. The author conducted interviews with some householders in St. Jean, and with several keypersons who were identified as having experience and knowledge with natural hazards from their role or position in the community. The keypersons included reeves, former reeves, emergency co-ordinators, fire fighters and flood volunteers. In addition, the author conducted one in-depth case study to gain additional, more detailed information. A local resident of the town of St. Jean assisted the author with some of the interviews. With the permission and consent of Dr. M. Rahman, principal researcher of the larger project, the author was allowed to use the data that she collected in St. Jean for her own thesis research, which had somewhat different perspectives from those of the larger study. These objectives were similar enough to those of the initial project as to remain within the boundaries of approval that had been granted by an ethics approval board at the University of Manitoba.

Field research was undertaken to collect primary data used in this study. As noted earlier, one of the methods of data collection utilized in this study was a personal interview survey. An interview questionnaire was presented to the respondents, and those who were able to answer face-to-face did so. On occasion, the respondent requested that the survey questionnaire be left so it could be completed by the respondent at a more convenient time, and then be picked up by

the interviewer. The survey consisted of a structured questionnaire, which was designed solely by the principal researchers of the above-mentioned major project. This questionnaire was employed to gather information from the interviewees, both household heads, and identified keypersons. It consisted of mostly close-ended questions, as well as several open-ended ones. Some of the questions were contingent on answers provided to previous questions. These contingency questions would only be applicable to the respondent if they had answered a preceding filter question in the appropriate manner. A filter question precedes a contingency question and the relevance of the contingency question depends on the answer to the filter question (Frankfort-Nachmias and Nachmias 1996). In addition to the interview surveys, two one-on-one open-ended, non-standardized interviews were conducted in St. Jean to provide the researchers with an in-depth look at the interviewee's experiences with the 1997 Red River flood. Names were omitted from analysis to protect privacy and confidentiality. The survey was conducted to collect both qualitative and quantitative data. The purpose of the questionnaire was to collect information from both households and keypersons in the town of St. Jean. It contained questions regarding human perception of, and preparedness for natural hazard events. The household questionnaire consisted of 120 questions, and was divided into three sections; the keypersons questionnaire contained 93 questions and was divided into the same three sections (See Appendices A and B). Both questionnaires were pre-tested by the principal researchers of the larger project.

### **3.3 QUESTIONNAIRE CONTENT**

The first section, Section A of the household survey, investigated overall hazard perception and awareness. It consisted of 30 questions (See Appendix C). In question 1, respondents were asked to rate, on a scale from 1 to 10, different types of community problems, which included natural, human-induced and social problems. The subsequent questions focused solely on natural hazards, their impacts and adjustments. In one sequence of questions, respondents were asked their opinions on provincial government loss reduction, and about their knowledge of provincial and local preventative measures. Another sequence of questions sought opinions and ideas on public and private disaster insurance. The final questions in the first section dealt with awareness of emergency plans and what the respondents felt were the causes of the 1997 Red River flood.

Section B, the second part of the questionnaire, was designed to find out the householders' past and present experience with natural disasters. This section was comprised of 57 questions (Appendix C). Questions pertained to flood effect and management, preventative measures, and personal experiences of the 1997 Flood. Damage, and amount of loss were considered, as well as disaster aid. Respondents were also asked their opinions about government dike construction and mandatory evacuation policies. In addition to floods, Section B also sought information about three other types of natural hazards, specifically wildfires, tornadoes, and blizzards. The final section of the questionnaire, Section C, consisted of questions regarding each respondent's personal demographic and socio-economic

attributes. These questions included political affiliation, length of time lived in the community, marital status, employment, level of education and income and assets.

The questionnaire that was designed for the keyperson interviews (Appendix B) was similar to that administered to householders. However, the survey for the keypersons elicited more detailed information about emergency plans that individuals in these key positions would be more acquainted with than would householders. More specific questions about provincial regulations regarding development and construction in floodprone areas were asked. The keyperson questionnaire also had a section on emergency training and planning that was not included in the household interview survey (see Appendix D). Keyperson interviewees were also asked their present and past experience with natural disasters (Section B), with more emphasis on flooding, in particular the 1997 Red River flood. Section C of the keypersons survey pertained to personal demographic and socio-economic questions, and the level of stress during the 1997 flood.

The survey was distributed to 50 households within the town of St. Jean. In order for the sample to be representative of the population of the town, the households were chosen using random sampling. Although random sampling does not ensure that the particular sample chosen is truly representative of the population, it does enable the laws of chance to evenly distribute the population characteristics of the

sample and it is also the most common method for achieving representativeness (Orr 1995). At the beginning of the questionnaire, a consent form was attached which included an explanation and purpose of the survey (Appendix E). The respondents who agreed to participate in the survey signed the consent form, understanding that the information would be kept confidential and anonymous. The respondents were informed that the project had been approved by the Joint Faculty Research Ethics Board at the University of Manitoba and were given a number to contact with any concerns of procedure. An interviewer (my co-worker or myself), originally delivered the questionnaires in October and November of 2000. Follow up visits and telephone calls were made between November 2000 and January 2001 to those who had not yet completed the survey, or had requested that the survey be left with them for completion. At the end of the latter month, the survey process was complete. Of the 50 household surveys in St. Jean, 49 were completed, giving a return rate of 98%. A possible reason for such a high rate of return was that one of the interviewers was a local, well-known resident of the town and made the follow-up calls to remind the respondents to complete the questionnaire. Out of the 15 keypersons who were selected to be interviewed, nine completed the survey thereby resulting in a response rate of 60%. In general, reasons given for not completing the surveys were; that the questionnaire that was left to be completed was lost or misplaced, or that the individual was unavailable to complete the survey due to an absence from home, or illness.

One limitation of the survey process was the language barrier as a few of the selected respondents spoke only French. This limitation was overcome with the use of an assistant who was fluent in French. The use of a known interviewer in the community may be considered as both an advantage and disadvantage. People in the community knew the researcher and may have felt more comfortable answering the survey than they would with a stranger. However, having a local interviewer, who was an acquaintance, may have been a deterrent for people in answering personal questions.

### **3.4 ANALYSIS OF DATA**

#### **3.4.1 LIKERT SCALING METHOD**

Many of the questions in the interview survey sought to elicit the respondents' attitudes and beliefs about certain issues, therefore the need for measurement of these factors was essential. Attitudes are comprised of feelings, beliefs and behaviours that are directed towards certain phenomenon (Baron and Byrne 1997). The *Likert* scale is a method of assigning values to certain statements for the purpose of measuring an individual's attitudes or beliefs. It was developed by Rensis Likert in 1932 to "improve the levels of measurement in social research through the use of standardized response categories in survey questionnaires" ([www.arches.uga.edu/~portek/likertscale.html](http://www.arches.uga.edu/~portek/likertscale.html)). It is the most widely utilized method of scaling in the realm of social sciences, likely due to the fact that the scale is relatively simple to design and is often more reliable than other types of

scaling methods with the same number of items (Tittle and Hill 1967). This type of research method entails individuals being asked a series of questions in which they must state their level of agreement or disagreement. The levels of agreement are assigned specific values on a predetermined scale. The Likert method is chosen because it enables the researcher to obtain more quantitative information about attitudes to issues from the respondents. The survey questions are presented in the form of statements wherein the respondents decide which level of agreement with the statement reflects their respective attitudes. The Likert method entails unidimensional scaling. The data collected are ordinal, that is, they have an inherent order of sequence.

In the construction of the survey undertaken by Dr. M. Rahman and Dr. S. McLachlan, the principal researchers of the parent project “Community Differentials in Hazards Perception and Emergency Needs: A Report to the Emergency Preparedness Canada, March 2001”, a series of questions was designed to determine the attitudes of respondents on various subjects related to natural hazards. In the simplest form, qualitative answers such as ‘yes’ or ‘no’ are possible. Qualitative differentiation can be used for testing respondents’ attitudes, beliefs, and knowledge of issues and phenomena (see Table 3.1).

**TABLE 3.1 EXAMPLES OF LIKERT SCALES (AFTER [www.gifted.uconn.edu](http://www.gifted.uconn.edu))**

<b>ISSUE</b>	<b>AVAILABLE RESPONSES</b>				
<b>Agreement</b>	Strongly Agree	Agree	Disagree	Strongly Disagree	Undecided
<b>Frequency</b>	Very Frequently	Frequently	Occasionally	Rarely	Never
<b>Importance</b>	Very Important	Important	Moderately Important	Of Little Importance	Unimportant
<b>Quality</b>	Excellent	Above Average	Average	Below Average	Poor

Many of the questions in the research questionnaires in this thesis contain a four-point scale of semantic differentials, such as ‘strongly agree, agree somewhat, disagree somewhat, disagree strongly, with an additional option of ‘no opinion’ or ‘don’t know’ available to respondents. Each response is assigned a value of, respectively, 3, 2, 1, 0, and 9. These values are used to determine a certain attitude about an issue depending on the way the scale is constructed, as the weights of the value of an item can be reversed into the opposite direction depending on the objective of the study (reversal items). For odd numbered responses, the middle response is labeled as ‘neutral’. In some cases, *forced-choice* responses are used, whereby there is only an even number of responses and respondents must decide which way they feel about an issue. If the respondent does not possess an opinion on the item, another response option of ‘no opinion’ can be provided. This type of scaling “presumes the existence of an underlying (or latent or natural) continuous variable whose value characterizes the respondents’ attitudes and opinions” (Clason and Dormody 1994 p.31). According to Bailey (1987), the basic method for Likert scaling is to compose a large number of questions in order to determine the dimensions to be scaled; to choose a sample of the population to be measured;

to assign values to the items in a way that either strong agreement, or strong attitude will be measured at one end of a value scale and the negative attitude or negative agreement will be assigned a value of the opposite end of a numerical scale; to finally select the items to be used in the questionnaire by eliminating those items that do not clearly differentiate between the high and low scores. Questions that discriminate between the high and low scores are analyzed. Some advantages and disadvantages of employing the Likert scale method of survey as outlined at ([www.arches.uga.edu/~portek/likertscale.html](http://www.arches.uga.edu/~portek/likertscale.html)) are: that they are relatively easy for a researcher to construct and that they enable the researcher to collect the data in a relatively quick manner. The responses are obtained in a standardized format, and can be collected from a large sample population. The Likert scale format gives the respondent several options that may make that person feel more comfortable when choosing to agree or disagree with a given statement. Some limitations of employing a Likert scale are: that respondents may base their answers on feelings about the overall subject or the interviewee; that respondents may not be entirely honest when answering the questions, or may respond in ways that they feel is expected of them rather than responding in ways that accurately reflect their beliefs or attitudes. Other disadvantages are that the Likert scale questionnaire set of statements requires a large amount of decision making, and that it may take a large amount of time to analyze the data once it has been collected.

### 3.4.2 DESCRIPTIVE TECHNIQUES

Likert scale data does not necessarily need to be analyzed in the summated or numerical way. Since the data collected from the Likert scales is ordinal, a sequence exists, and these data can be analyzed using descriptive techniques. Each question can be depicted and analyzed using diagrammatic representation, such as a bar chart. On a bar chart, the mode is evident, and the distribution of responses can be identified. Statistically, the median and the inter-quartile range can be computed. Since the initial researchers of the parent project had pre-coded the responses to Likert-type questions, it was not necessary for the author of this thesis to convert the content of the questions to numerical form before analysis, which is known as *coding* (Chadwick, Bahr and Albrecht 1984). The 'don't know' response was systematically coded throughout the questionnaire as a value of 9. Once the data was collected, the codes representing the Likert responses were entered into a spreadsheet in Microsoft Excel. The data was checked so that any errors in coding were identified, and any coding that was incorrect was omitted. The next step in the data analysis in this thesis was to examine the data for relationships, by producing *frequency distributions*. These are also known as *marginals* (as the totals appear in the margins of a tabulation), which express "the distribution of answers to each item or variable in the data set" (Chadwick, Bahr and Albrecht 1984, p. 358). By examining the distributions, it is possible to identify which scores are frequent or infrequent. Using the standard normal distribution, where the median, mean and mode are all located at the same point in the curve, other variables (questions responses) may be compared.

Where several Likert-type questions elicit the opinions of respondents regarding a particular issue (such as government intervention in disaster response/adjustment), coded Likert response scores may be summated, in order to derive a meaningful 'final' (total) score for each respondent. "The summated scale approach works because persons who are strongly favourable to some idea, will more often select positive response categories, while those who have more neutral ideas will select some positive and some negative categories" ([www.stolaf.edu/people/leming/soc371res/oper.html](http://www.stolaf.edu/people/leming/soc371res/oper.html)).

### **3.4.3 NON-LIKERT TYPE QUESTIONS**

Approximately one half of the questions in the survey questionnaires consisted of non-Likert scale types. Many of the questions were open-ended and respondents could provide their own answers, such as Question 67 in the keypersons questionnaire (See Appendix B) which asked respondents what they did well in managing the 1997 Red River Flood. These types of questions elicited qualitative information. Other questions were more structured, but respondents were able to choose several responses (See Appendix A: Question 38). In this question, the householders were asked to list any precautionary measures that they had undertaken in preparation for the 1997 Flood. In addition, questions in the survey asked respondents to rate certain variables, such as serious problems, including natural hazards, that their community faces (Question 1 in both the household and keypersons questionnaire: Appendix A and B).

The techniques that were used for the analysis of data included comparative analysis between the household and keyperson respondents, as well as between differing variables within the household survey. Descriptive techniques, which consisted of verbal interpretations of the data, were also utilized. A component of the descriptive techniques included the author's personal interpretation which was provided for the results of the analyzed data.

Computational techniques, which include such measures of central tendency as mode, mean and median, are used in the analysis. Once the data has been entered into spreadsheet format, it is possible to employ these techniques. This analysis of data is presented in various formats, including the above-mentioned verbal descriptive format, and in tabular methods as well as on bar charts. Once the data has been analyzed with these techniques, it can be examined for similarities in variables.

## **CHAPTER 4 – ANALYSIS OF DATA AND INTERPRETATION OF RESULTS**

### **4.1 INTRODUCTION**

Chapter 4 presents the data that will be analyzed and interpreted. This chapter forms the basis for testing the stated hypotheses (Chapter 5). The analysis of the data is organized into different subsections. These parallel the subjects that are addressed in the survey questionnaires. The questionnaire documents, as outlined in Chapter 3, elicited both qualitative and quantitative responses. Two separate surveys were used for the household and the keypersons respondents. While some of the questions were asked to both sets of respondents, there were differences between the two surveys. The household questionnaire consisted of 120 questions, while the keyperson questionnaire was comprised of 93 questions. There were common categories to both surveys, while a few of the categories formed only a part of either the household or keyperson questionnaire. The categories are as follows: the severity of different problems facing the community, disaster management and provincial and local government intervention, public and private insurance, emergency planning and training, causes of the 1997 Flood, past and present experience with flooding, preparatory measures, mandatory evacuation, disaster assistance, general socio-economic data and sources of stress during the 1997 Flood. The response rates for both surveys were acceptable, with a completion rate of 98% for the householders and 60% for the keypersons.

#### **TALE 4.1 SUMMARY OF RESPONSE RATES OF SURVEYS**

The following table presents the total surveys completed for both the household and keyperson respondents.

<b>Household Surveys</b>			<b>Keyperson Surveys</b>		
Total	Completed	Response Rate	Total	Completed	Response Rate
<b>50</b>	<b>49</b>	<b>98%</b>	<b>15</b>	<b>9</b>	<b>60%</b>

The data was analyzed using different statistical measures such as mode, median and mean. In addition, descriptive techniques were also used to present findings. This analysis is presented in different formats, including diagrams, tables and verbal descriptions. The difference in the sample sizes, 49 for the household respondents and 9 for the keypersons, is significantly large, so the methods of data analyses were chosen accordingly. It should be noted that due to time constraints of the thesis study, as well as informational constraints, not all questions in survey documents were data analyzed. The interpretation of the analytic results is presented, sometimes with reference to concepts and findings in published literature.

## **4.2 QUESTIONNAIRE ANALYSIS**

In the subsequent sections, the household questionnaire will be referred to by 'H', whereas the keyperson questionnaire will be identified as 'K'. The specific question number (Q) in either questionnaire will be referred to; for example Q H:27 signifies Question 27 in the household questionnaire.

### **4.2.1 SEVERITY RATING OF PROBLEMS FACING COMMUNITY**

The first question of both the household and keypersons questionnaires presented a list of problems facing the community of St. Jean (Q H:1 K:1). The respondents were asked to rate the seriousness of each problem on a scale of 1 through 10, with 1 being the least serious and 10 being the most serious. Respondents were not restricted in their use of a specific numerical value in rating the problems. The first seventeen variables were the same on both questionnaires, enabling a comparative analysis. One additional problem on the household questionnaire and three additional issues on the keypersons questionnaire were unique to that respective survey and so were omitted from the analysis.

**TABLE 4.2.1 SEVERITY RATING OF PROBLEMS FACING COMMUNITY ON A SCALE FROM 1 TO 10 (10 AS THE MOST SERIOUS PROBLEM)**

<b>Problem</b>	<b>Household Mode</b>	<b>Keyperson Mode</b>
1. Inflation	5	5
2. Drought	1	2
3. Unemployment	1	1
4. Crime	2	2
5. Damage/Injury from Flooding	10	10
6. Cuts in Agricultural Subsidies	8	5 and 6**
7. Damage or Injury from Blizzards	1	5
8. Damage or Injury from Fires	1	3
9. Damage or Injury from Hailstorms	1	2
10. Damage or Injury from Tornadoes	1	1
11. Damage or Injury from Pests	1	1
12. Water Pollution	1	1
13. Air Pollution	1	1
14. Drought Condition*	1	5
15. Severe Snowfall	1	5
16. Rural Depopulation	5	6
17. Shortage of Farm Labour	1	8

\* The difference between drought and drought condition was not distinguished in the survey.

\*\* This question was bi-modal

As depicted by Table 4.2.1, overall there were slight modal differences between the responses of household respondents and the keypersons when severity rating the problems facing the community. However, there were several notable significant differences between the two types of respondents' perception of some

of the problems, as revealed by their respective modes. The keypersons had estimated that flooding is just as serious a problem as household respondents perceived it to be, since both assigned it a value of 10. The similarity in rating was likely due to the fact that many of the respondents were recalling the most extreme recent event that had occurred in the community. Although the keypersons assigned higher values than did the householders to many of the problems, the reasons for assigning the top rating to flooding may be due to the fact that many of the keypersons were involved directly in the flood fighting, and that during the 1997 Flood, many of the keypersons were those who remained in the town once it had been evacuated, and witnessed the severity of the flooding. Many of the household residents were evacuated, and had to rely on the media and RCMP accounts of what was happening in the community while they were away. Overall, 8 of the 17 problems yielded the same modal value for householders and keypersons. Flooding was rated by both groups of respondents as the most serious threat to the community. This rating can be expected as it has been noted in the literature (Kates 1970) that personal experience of a severe hazard event greatly influences perception of that hazard. In addition, as noted by Slovic, Fischhoff and Lichtenstein (1982) the hazard's degree of controllability influences perception, and in the case of flooding, the residents of St. Jean had little control over the 1997 Flood. As noted in Chapter 2, in areas in which there is frequent risk of flooding, the overall levels of flood awareness are high (Burton and Kates 1964, Churchill and Hutchinson 1984). The greatest difference in the severity rating of the problems facing the community was the issue of shortage of

farm labour; keypersons viewed this problem as very serious whereas household respondents did not. This was due to the fact that most of the household respondents lived within the town and only a few were farmers. Keypersons may have recognized farm labour shortage as a more serious problem for a rural community because they were more aware of overall problems facing such communities. As a whole, the keypersons seemed to regard natural hazards such as drought, blizzards, severe snowfalls and natural fires as more serious than did the householders. A difference between the householders' view of the hazards (perceived risk), and that of the keypersons' (objective risk), can be seen in this question. Conversely, both groups of respondents gave the same severity rating to flooding. Basically, this supports what Cutter (1993) has asserted; for fairly probable events, collective judgement (householders) regarding the chance of the event causing damage does not differ from that of the experts (keypersons).

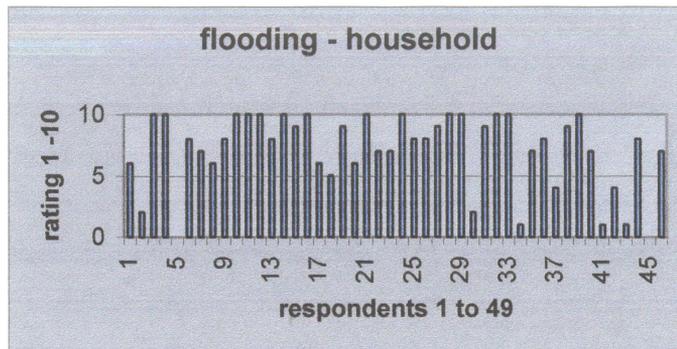
#### **4.2.2 FREQUENCY DISTRIBUTIONS OF INDIVIDUAL PROBLEMS – (Q H:1 K:1)**

In the cases of four natural hazards, the results from Q:1 were analyzed individually, so that for each problem, a comparison between the ratings of the two sets of respondents could be made. The four hazards chosen had all been rated with a modal score of five or greater by at least one set of respondents, that is, householders or keypersons.

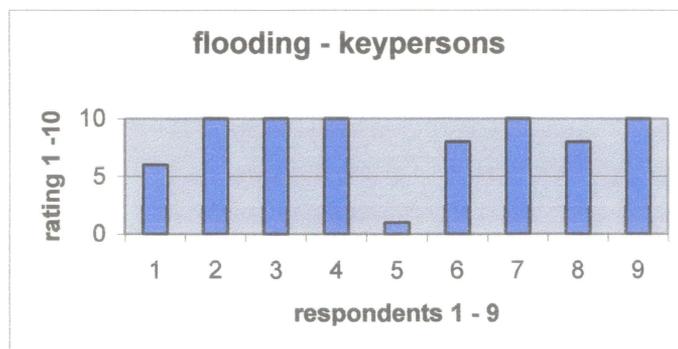
In the series of bar charts below, each respondent is represented by a number (householders 1 to 49: keypersons 1- 9); the respondent's rating for the hazard is depicted as a bar, whose length is proportional to that rating (1 to 10). The absence of a bar signifies that a particular respondent failed to rate the hazard in question.

#### 4.2.2.1 FLOODING

**CHART 4.2.2.1.1 FLOODING - HOUSEHOLD**



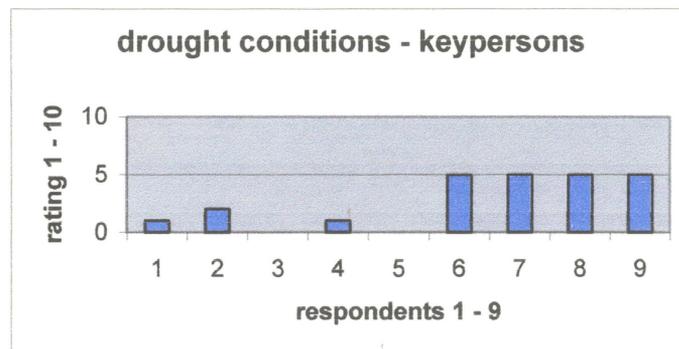
**CHART 4.2.2.1.2 FLOODING - KEYPERSONS**



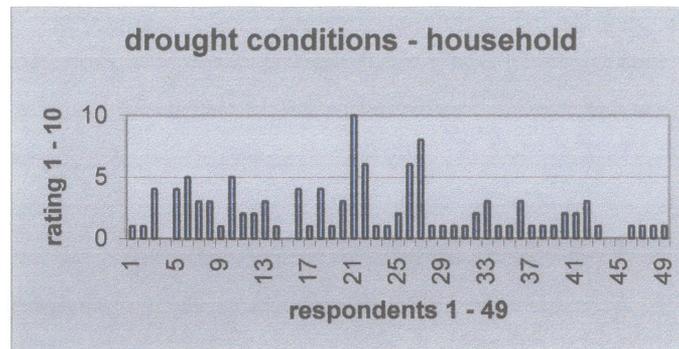
Overall, both sets of respondents rated flooding as the most serious problem facing the community, with only a few respondents assessing the problem with a rate below 5. This very high rating would be expected, as the 1997 Flood was the most recent and most severe natural disaster that had impacted the community at the time of the survey. The concept of familiarity and recency of an extreme event playing an important role in the perception of a hazard is well documented in the literature (Burton, Kates and Snead 1969, Kates 1970), and exemplified by the flood perception in St. Jean.

#### 4.2.2.2 DROUGHT CONDITIONS

**CHART 4.2.2.2.1 DROUGHT CONDITIONS - KEYPERSONS**



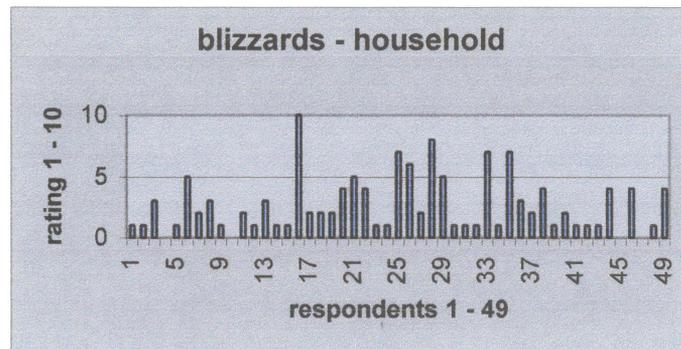
**CHART 4.2.2.2.2 DROUGHT CONDITIONS - HOUSEHOLD**



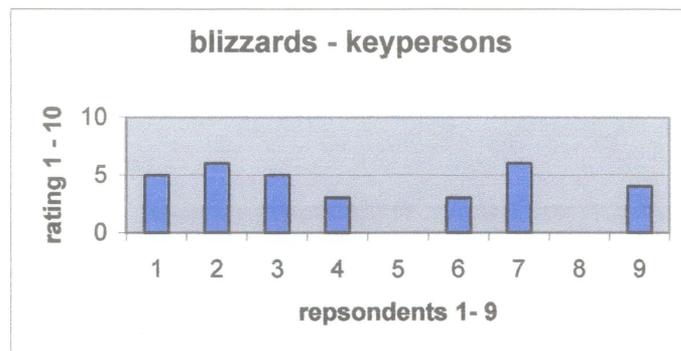
Relative to flooding, drought conditions were not rated as serious a problem. Keypersons tended to rate drought conditions higher than did the household respondents, at least half of whom provided a rating of 2 or less. (In fact, only 6 out of the 49 householders rated this hazard as 5 or greater). Keypersons, within their roles in the community, realize that while the onset of drought is slow and the probability of property destruction is low, the financial impact of crop failure can be quite significant. Most of the household respondents are not farmers or producers, so might not perceive the risks associated with drought to be high.

#### 4.2.2.3 BLIZZARDS

**CHART 4.2.2.3.2 BLIZZARDS - HOUSEHOLD**



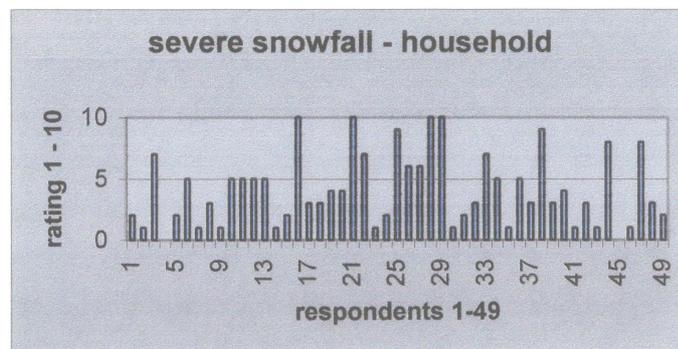
**CHART 4.2.2.3.2 BLIZZARDS - KEYPERSONS**



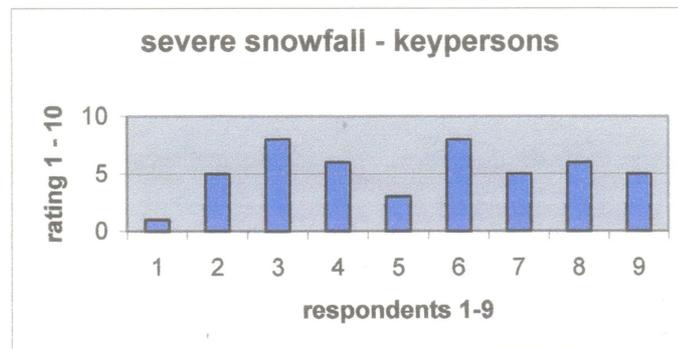
Blizzards were rated substantially higher by the keypersons. Two keypersons gave blizzards a rating of 6, two others, of 5. Most of the household respondents did not feel that blizzards were a serious threat to the community. In fact, only 6 of the 49 respondents rated the problem higher than 5, which may be regarded as peculiar since the chance of a blizzard in Southern Manitoba in the winter is relatively high. This perception may be attributed to the fact that the most recent type of disaster, flooding, was dominant in the minds of the householders. By comparison, keypersons are expected to consider overall hazards (and subsequent safety) to the community. Keypersons would be more involved in the aftermath of a blizzard, that is, ensuring that the community had functioning utilities and that main roads were cleared. It was expected that both the keypersons and the householders would rate the threat of a blizzard as higher than they did, for the blizzard of April 5 and 6, 1997 was a prelude to the 1997 Flood.

#### 4.2.2.4 SEVERE SNOWFALL

CHART 4.2.2.4.1 SEVERE SNOWFALL - HOUSEHOLD



**CHART 4.2.2.4.2 SEVERE SNOWFALL - KEYPERSONS**



There is great variation in the rating among household respondents of the severe snowfall hazard. Many respondents gave a rating of only 1 or 2, while a notable minority rated the problem as serious (i.e. rate of 7 to 10). Hence, there are large differences in perception of the severe snowfall hazard among householders. The keypersons rated severe snowfall as more serious, and perceived this problem as more severe than blizzards. Only two keypersons gave a rating lower than 5 for this hazard. In general, compared with householders, keypersons have more knowledge of the overall problems that the community might encounter in the event of a severe snowfall, and would, consequently, regard this hazard more seriously.

#### **4.3 PERCENT CHANCE OF EXPERIENCING A DISASTER WITHIN THE NEXT 10 YEARS**

Question (Q H:2 K:5) asked the respondents to estimate the percent chance of a specific type of natural disaster being experienced within the next ten years. Respondents were able to assign their own percentage. Table 4.3 presents the

findings for this survey of six natural hazards. The average of the percentage probability for the keypersons and householders respectively are presented for each hazard.

**TABLE 4.3 PERCENT CHANCE OF EXPERIENCING A DISASTER WITHIN THE NEXT 10 YEARS**

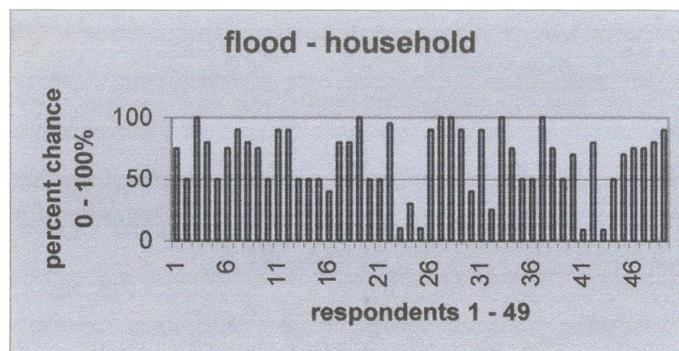
<b>Disaster Type</b>	<b>Household Average (%)</b>	<b>Keypersons Average (%)</b>
1. Flood	50.0	80.0
2. Blizzard	50.0	80.0
3. Tornado	10.0	10.0
4. Hailstorm	50.0	40.0
5. Heavy Snowfall	50.0	80.0
6. Drought	50.0	35.0

As indicated in Table 4.3, relative to householders, the keypersons felt that there was a greater chance of a flood, blizzard, and heavy snowfall occurring within the next decade. Conversely, the householders thought that there was a greater chance of drought, and a slightly greater probability of a hailstorm occurring in the next ten years in their community. Paradoxically, the household respondents assigned a low severity rating (1) for drought in the previous question, but felt that there was a 50% chance that one would occur in the next ten years. Keypersons gave drought conditions a higher severity rating (5) yet only a 35% chance of occurrence in the next ten years. The householders did not overestimate the risk as is noted in the literature by Slovic, Fischhoff and Lichtenstein (1982), wherein laypersons often overestimate the probability of occurrence of an extreme event relative to experts. Householders may have underestimated the probability of

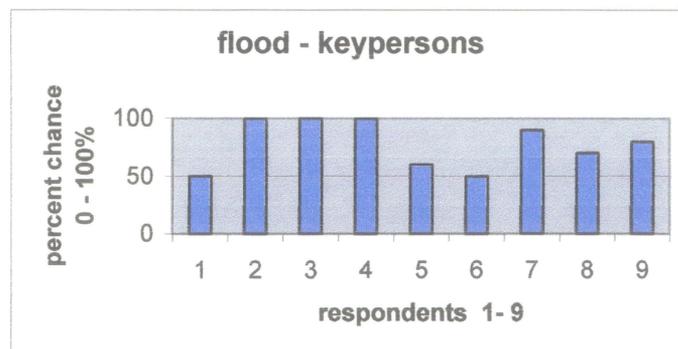
serious events for these hazards since in three cases (floods, blizzards and heavy snowfalls) the keypersons assigned higher probabilities of occurrence than did the householders. The perceptions of these two groups of respondents to flood probabilities and blizzard probabilities are analyzed further in terms of bar charts depicting responses. These frequency distributions reveal significant diversity of opinion within the household respondents group and within the group of keypersons.

### 4.3.1 FLOODING

**CHART 4.3.1.1 FLOOD - HOUSEHOLD**



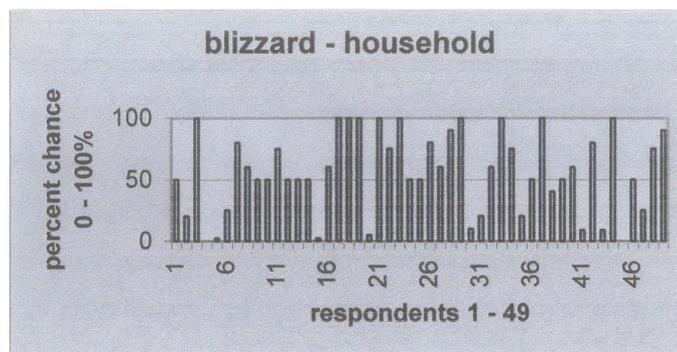
**CHART 4.3.1.2 FLOOD - KEYPERSONS**



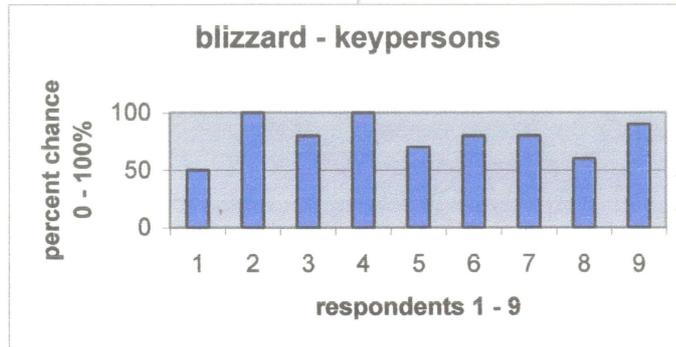
With regard to Table 4.3, the average percent chance of experiencing a flood in the next 10 years was 50% according to householders. However, many of the household respondents assigned it a higher value. The household responses for floods bar chart (4.3.1) reveals that 29 of the 49 respondents assigned it a value of greater than 50%. This result might be expected as sources in the literature have stated that an individual's perception of a hazard event is heightened when that type of event has occurred recently (Cutter 1993). Conversely, 8 of the 49 household respondents assigned it a value of less than 50%. This perception may be related to what Tierney, Lindell and Perry (2001) have stated; that individuals who experience events of great magnitude (such as the 1997 Flood), believe that there is little chance of a disaster of that size occurring again. Amongst the keypersons, there was less variance as all of the respondents assigned a value of 50% or greater.

#### 4.3.2 BLIZZARDS

CHART 4.3.2.1 BLIZZARD - HOUSEHOLD



**CHART 4.3.2.2 BLIZZARD - KEYPERSONS**



There was great variability in the householders' responses. While the mean percent chance assigned to experiencing a blizzard in the next ten years was 50% for householders, more than ten of the respondents assigned a value much lower. In addition, 23 of the 49 assigned a value greater than 50%, and 10 assigned a 100% percent chance that a blizzard would be experienced in the next 10 years. Similar to the previous disaster type, flooding, the keypersons responses were less diverse. All 9 of the keypersons assigned a value of at least 50%.

For the above questions (Q H:1 K:1 and Q H:2 K:5), the keypersons had more uniform response and would be expected to be able to more accurately estimate the chance that a certain hazard event would occur.

#### 4.4 LEVEL OF CONCERN ABOUT NATURAL DISASTER IMPACTS

One of the survey questions dealt with the possibility of a hypothetical serious natural disaster occurring in the community of St. Jean (Q H:3 K:6). Respondents were asked, on a Likert scale, to what extent they were concerned that certain problematic situations would arise.

**TABLE 4.4 LEVEL OF CONCERN FOR THE FOLLOWING SITUATIONS IN THE EVENT OF A SERIOUS NATURAL DISASTER**

Situation	% of household level of concern				% of keypersons level of concern			
	very	some what	none	Don't know	very	some what	none	don't know
the building you live in would suffer damage (K: that housing in the community would suffer damage)	30.61	57.14	12.25	-	55.56	33.33	11.11	-
your household assets would be seriously damaged (K: that peoples' household assets would be seriously damaged)	24.49	57.14	18.37	-	44.44	44.44	11.11	-
someone in your family would be seriously injured (K: that someone in the community would be seriously injured)	32.65	34.69	28.58	4.08	55.56	33.33	11.11	-
fire or police departments would be unprepared	10.20	34.70	44.90	10.20	22.22	77.78	-	-
long delays in getting people to hospitals	20.41	51.02	18.37	10.20	22.22	77.78	-	-
hospitals would not be able to handle all people needing care	32.65	44.90	14.29	8.16	22.22	66.67	11.11	-
utilities would be out of service for days	36.74	51.02	10.20	2.04	66.67	33.33	-	-
dike may collapse	36.74	38.78	20.41	4.08	44.44	55.56	-	-

(Note: the first three situations were worded differently for the keypersons questionnaire, as indicated by K)

It is apparent from Table 4.4 that, with respect to the 'very concerned' category, keypersons tended to be more keenly concerned than householders were in all situations except that regarding the hospitals being unable to handle all of the people needing care. With respect to the latter issue however, overall there was still a greater concern on the part of keypersons (88.89%) than householders (77.55%). It is notable that keypersons were particularly aware of the possibility that utilities would not function for days. Compared with householders, keypersons would be expected to be more knowledgeable about these disaster impacts given their roles in the community and their actual knowledge about such situations (i.e., the capability of the fire department or the hospitals). Householders were asked about their level of concern for their own family and their own possessions, whereas the keypersons were asked about concern for the overall community. This may explain why the householders were more conservative in their levels of concern; they did not feel responsible for others' personal safety and possessions as the keypersons may have.

The householders may have gained knowledge about the above situations through second hand sources, or possibly the mass media, whereas the keypersons probably had direct access to this kind of information. In the literature (Whyte and Burton 1982), it has been noted that the public learns information about disasters from the mass media, and that television is a major source, especially for less educated persons. The portrayal of the 1997 Flood in the newspapers and on television was also partially responsible for the way that household respondents

viewed the disaster. Since many of the household residents had been evacuated from St. Jean, they had to rely on second-hand sources of information, whereas many of the keypersons remained in the town and were able to gather their knowledge and form their opinions first hand by witnessing the disaster event in its entirety.

#### **4.5 DISASTER MANAGEMENT, AND PROVINCIAL AND LOCAL GOVERNMENT INTERVENTION**

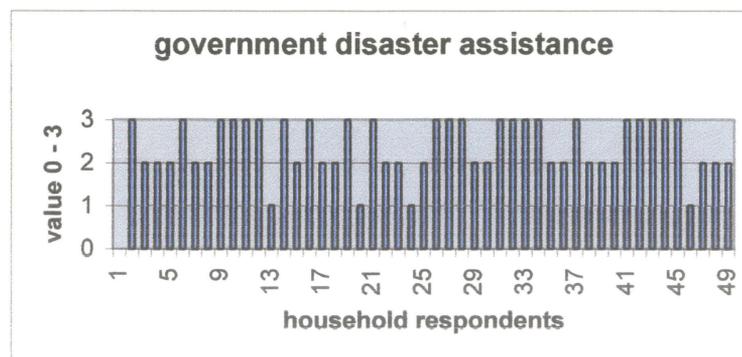
One set of Likert-type questions asked respondents about their opinion on government assistance and intervention (Q H:4, 6, 7 K:7, 9, 10). These three questions were posed to both the keypersons and the individual households. The possible responses were ‘agree strongly’, ‘agree somewhat’, ‘disagree somewhat’, ‘disagree strongly’ and ‘no opinion’. These questions gauged the respondents’ opinions about government intervention with regard to disaster assistance as well as regulations to mitigate loss from natural hazards.

Statement: (Q H:4 K:7) Suppose natural disasters cannot really be predicted or controlled. Since there is not much that can be done to reduce the risk in advance, the government should routinely provide financial assistance to victims of disasters for damage to their homes and other possessions.

Household Mode	Keyperson Mode
3 = Agree Strongly	2 = Agree Somewhat

For this question, the householders agreed strongly with the statement while the keypersons agreed somewhat. This divergence of opinion may be due to a variety of factors. The keypersons are likely to be more familiar with community emergency plans and regulations, and land use regulations, and may understand that it is not possible for the government to provide financial assistance to everyone who lives in hazard prone areas. The keypersons are also more likely to know about individual emergency and disaster planning that can be undertaken at the household level in order to reduce the risk of suffering a loss from a natural disaster such as flooding. As seen from the bar chart below (Q H:4), only one household respondent felt that the government should not provide financial assistance to victims of disasters for damage to their homes and possessions.

**CHART 4.5.1 GOVERNMENT DISASTER ASSISTANCE**



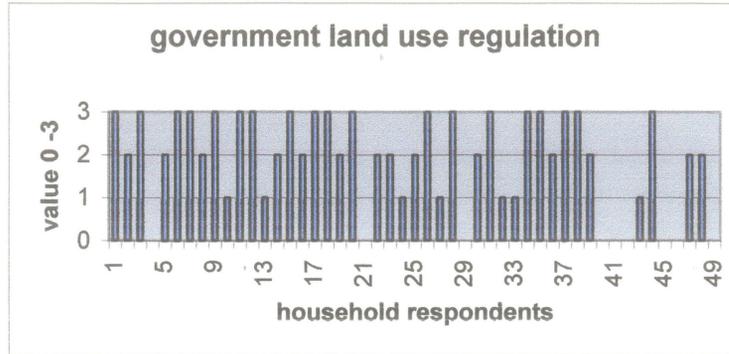
Statement: (Q H:6 K:9) Regardless of whether people know the risks of living in hazard prone areas, the government should *prevent* people from building in these areas through regulations on how land can be used.

Household Mode	Keyperson Mode
3 = Agree Strongly	1 = Disagree Somewhat

The responses to the above statement demonstrate what some sources in the literature have stated, that is, a marked difference between perceived and objective risk (Burton and Kates 1964, Burton and Pushchak 1984 and Foster 1980). The household respondents agree strongly that the government should control land use, while the keypersons somewhat disagreed. It could be assumed that the keypersons would be more knowledgeable about types of government regulations regarding hazard prone areas, and felt that the government should not have broad control over public land use. The notion of government prevention of building seems too stringent.

Chart 4.5.2 represents the household respondents' opinions about government land-use regulations, explicitly that the government should restrict building in areas that are prone to natural disasters (Q H:6). The responses for this issue were more varied, for although the commonest response was 'agree strongly', at least one quarter of householders opted for 'agree somewhat'. Overall, householders regarded government intervention as appropriate.

**CHART 4.5.2 GOVERNMENT LAND USE REGULATION**



The final question in this series (Q H:7) asked for the respondents' opinion about whether the government should require building codes to make structures safe and able to withstand damage from a natural hazard event.

Statement: (Q H:7 K:10) The government should require local building codes so that buildings are constructed safe and strong enough to withstand a serious natural disaster.

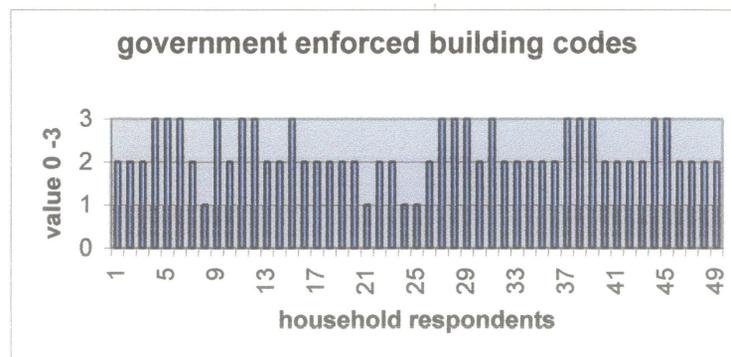
Household Mode	Keyperson Mode
2 = Agree Somewhat	3 = Agree Strongly

Although the previous three questions are similar in terms of opinions regarding government intervention, there is quite a difference in the responses of the keypersons. The keypersons disagreed somewhat about land-use regulation but agreed strongly about building codes. Opinions of this nature would be expected

from keypersons who have knowledge about disaster prevention and planning. When considering major flooding on the flat Red River plain, government prevention of building construction over such an extensive area is probably unfeasible, whereas enactment/implementation of building codes for building safety is practicable. Keypersons were basically supportive of financial assistance to disaster victims.

Most of the household respondents agreed somewhat or agreed strongly with government enforced building codes. None of the respondents disagreed strongly and only 4 disagreed somewhat with this statement. It is likely obvious to the household respondents that building codes are a useful measure to reduce hazard damage potential.

**CHART 4.5.3 GOVERNMENT ENFORCED BUILDING CODES**



Overall, these three questions selected for Likert analysis provide an insight into the respondents' opinions about the government's intervention and role with respect to disaster management. The assessment denotes more of a positive

attitude by the household respondents than the keypersons, that is; overall the householders are more favourable towards the idea of government intervention. Although the keypersons can not be said to be opposed to this concept, since only one of their question group responses had a modal value of 'disagreeing somewhat', they are less disposed than the householders toward the idea of government intervention with regard to natural disaster assistance and loss prevention.

Statement: (Q H:8 K:11) Many Manitoba communities have laws prohibiting construction of homes on floodplains, in areas prone to forest fires, or on sites close to rivers. How do you feel about such legislation for this community; in this case, St. Jean?

Household Mode	Keyperson Mode
3 = Agree Strongly	3 = Agree Strongly

Both household and keyperson respondents agree strongly with laws governing the construction of building in hazard prone areas, as it is likely obvious that this is an effective strategy for mitigating loss from natural hazards.

With the Likert scaling method, it is possible to sum the responses given in a certain group of questions which are all related, and that have the scales in the same order, that is, if the respondent feels favourable toward some idea or

concept, that person's scores will be on the higher end than a respondent who disagrees, or feels negatively about a certain concept. In this section of the questionnaire (Q H: 4, 6, 7), Likert scales were used to measure how respondents felt about government intervention, respectively, financial assistance, land use regulation, and building code implementation. The Likert scale response of 'agreeing strongly' was coded with a value of 3, 'agree somewhat' 2, 'disagree somewhat' 1 and 'disagree strongly' 0. Since there was no neutral alternative response, respondents were forced to select one side of the spectrum with regard to levels of agreement. Individual respondents whose total summated value for the three questions was 6 or higher are interpreted as being in favour of government intervention. Since the mode and mean were values of 6 or greater, in general, the respondents agreed with, or felt favourable toward government intervention in terms of financial assistance to victims, prevention of building through land use regulations, and introduction of building codes in regards to natural hazards and disasters.

Household Respondents	MODE	MEAN
	6	6.46

Examining the questions individually, there was no great variation in the responses given. Q H:4 and 6 had modes of 3, while question 7 had a mode of 2.

#### 4.6. LOCAL AND PROVINCIAL PREVENTATIVE MEASURES

Respondents were asked if they were aware of their community having laws to prevent people from constructing their homes or other buildings in hazard prone areas (Q H:9 K:12).

Household Mode	Keyperson Mode
1 = Yes	1 = Yes

The majority of respondents did know about such a law that existed in their community. In a subsequent question (Q H:13 K:17), respondents were asked whether these local laws had specific types of effect on their community

**TABLE 4.6 AFFECT OF LOCAL LAWS ON COMMUNITY OF ST. JEAN**

Have the laws affected the following:	Household MODE (√)			Keypersons MODE(√)		
	Yes	No	Don't know	Yes	No	Don't know
Made it more expensive for industry/business to locate in your community?		√		√		
Led to the construction of safer buildings?	√			√		
Raised the cost to taxpayers of constructing new schools, hospitals and other public buildings?			√			√
Made the local fire and police dept. better prepared?	√			√		
Made your community seem a less desirable place for new people to move into?	√			√		
Raised the operating costs for industry and business already located in your community?		√		√		
Increased the costs of building new homes and apartments?		√		√		
Made the people in the community better prepared?	√			√		
Made the buying and selling of homes far more complicated?		√		√		
Produced housing shortages?		√			√	

Overall, the keypersons felt that these community regulations had more of an affect on the community than did the household respondents in both positive and negative ways. The keypersons may be more knowledgeable about the ways in which these laws have directly affected the community. This again demonstrates a difference between perceived and objective risk. The only effect for which the mode was 'Don't Know' for both sets of respondents was whether or not the local laws had raised the costs to taxpayers of constructing new schools, hospitals and other public buildings. It is surprising that the keypersons would not know if these costs had, in fact, increased. At the time of the study, no new schools or hospitals, or public buildings had been built in St. Jean since the 1997 Flood, so perhaps this was the reason for both sets of respondents' unawareness.

#### 4.7 BEARING THE LOSS

The survey solicited the opinions of respondents about the *individual* taking full responsibility for living in a hazard-prone area when damages are incurred.

Question Q H:5 K:8 is presented in the following form.

Statement: Since people knowingly live in areas that are prone to natural hazards, they *alone* should bear the costs associated with damages from these events.

Household Mode	Keyperson Mode
0 = Disagree Strongly	0 = Disagree Strongly

Both modes for the households and keypersons were 0, to disagree strongly and there was little divergence of opinion among the householders, for people would

not the like the notion of having to fully bear the damage costs. It is interesting to note that most respondents felt that the individual should not bear responsibility for loss resulting from natural disasters. Over the last 50 years, the face of disaster management has changed, from an emphasis on an individually oriented planning, to that of shifting more responsibility to government.

In addition to the surveys, two long-standing members of the community were interviewed in-depth about their experience with the 1997 Red River Flood. One of these cases provided a detailed written account of his experiences with flooding in St. Jean, and in particular, the 1997 Flood. In terms of disaster management and government intervention, he gave his opinions on what he felt was the responsibility of the government, as well as that of the individual homeowner. He noted that he was very offended when at the time of the 1997 Flood, Manitoba premier, "Gary Filmon noted that 'they chose to live in flood prone areas'" , referring to the southern Manitobans who were flooded. The respondent took exception to this comment because he felt that many residents in the flood-affected communities had "homes that were certainly 30 feet higher than his (Premier Filmon's), above sea level". He noted that "flooding of the Red River has so greatly been influenced by different government infrastructure that I believe they should be responsible - even liable - for the financial compensation of flood damage and flood protection in the Valley!". In conclusion he noted that he viewed the Red River flooding as a *disaster*, but not necessarily *natural*. The concept of what can be defined as solely a natural disaster was noted in the

literature. In the literature, there has been much discussion about the difference between what can be defined as a *natural* disaster, and what is really just a disaster that has been caused by human-induced changes of the Earth's surface (Palm 1990, Chapman 1994, Degg 1992, Cannon 1994). This also relates to the book by Blaikie, Cannon, Davis and Wisner's (1994) that distinguishes between an extreme natural event and a natural disaster that is caused by human vulnerability to that event.

#### 4.8 PUBLIC AND PRIVATE INSURANCE

One part of the questionnaire focused on private and public insurance. Respondents were asked (Q H:16 K:20) if they had heard of initiatives in their community to set up a federal government public flood insurance program. This would involve the Federal Government subsidizing flood insurance for residents living in areas prone to flooding, if in return, local communities agree to establish policies that restrict further construction and development in those areas.

Household Mode	Keyperson Mode
0 = No	0 = No

Most of the respondents had not heard of any such program being discussed, let alone implemented in their community. Respondents were subsequently asked, in a Likert question, what their opinions would be regarding a national public insurance program (Q H:17 K:21). Response options were 'strongly favour', 'somewhat favour', 'somewhat oppose', 'strongly oppose' and 'no opinion'.

Household Mode	Keyperson Mode
9 = No Opinion	2 = Somewhat Favour

The keypersons were more in favour of such a public flood insurance program, than were householders. It has been asserted that, in areas where government incentives to undertake preparatory actions for natural hazards exist, such as an insurance program, overall disaster preparedness at the community level is typically higher (Mileti 1980).

Many of the household and some of the keyperson respondents had not heard of the program and many of the household respondents had 'no opinion' regarding this initiative.

Respondents were asked if they currently had public flood insurance (Q H:19 K:23). The majority of respondents (H: 94% and K:78%) answered 'No', likely because flood insurance is not available in Manitoba, and living in a flood prone area, residents would be expected to be aware of this. It is interesting to note that 2 of the 9 keyperson respondents did not answer 'No' as it would be expected that individuals in their positions in the community would be aware that flood insurance was not available. The subsequent question (Q H:20) asked the household respondents if they had private flood insurance. Only 3 of the 49 householders answered 'Yes' to this question, while all others answered that they did not have private flood insurance. In Manitoba, private flood insurance is not

available. Normally, these types of losses are insurable only in cases of sewer back up.

#### **4.9 EMERGENCY PLANNING AND TRAINING**

This section on emergency planning and training pertained to the keypersons only (Q K:27-43). Only three of the nine keypersons had emergency management training (Q K:30). However, almost all of the keypersons knew that their community had some type of emergency plan (Q K:28). Seven of the nine respondents were aware that their community had an emergency management committee (K Q:29). Two-thirds of the keypersons knew where emergency management training was offered in Manitoba (K Q:37). Only five keypersons stated that their municipal administration had a system in place to educate people on disaster impact, adjustments and mitigation, as well as types of assistance available from the municipal office (Q K:38). All but one of the keypersons were familiar with the Emergency Measures Act of Manitoba (Q K:40), and three respondents stated that there was a representative from the municipality on the Manitoba Emergency Planning Committee (Q K:41). Five of the respondents stated that there was a representative from the community in the Manitoba Emergency Management Organization's Emergency Operations Centre (EOC) (Q K:42). In a subsequent section of the keypersons questionnaire, respondents were asked to state what they required to better face a disaster in the future (Q K:93). Several of the keypersons stated that they required greater preparedness in terms

of disaster management, and that more communication and training were essential.

In terms of the household questionnaire, respondents were asked if they were aware that every community is supposed to have an emergency plan in order to deal with emergency situations such as the 1997 Flood (Q H:27-29). As noted by Foster (1980), an emergency disaster plan is key to a community's preparedness for natural hazards. Most household respondents were aware that this type of plan was to be in place, and agreed that their community did have this type of plan. In fact, the Manitoba Emergency Act does require every community in Manitoba to have an emergency plan. However, most respondents did not know if their community had an emergency management committee. In addition, most household respondents felt that their respective families should also have emergency plans to deal with different types of emergencies that may arise. This is vital, as disaster preparedness should be undertaken at all levels.

#### **4.10 CAUSES OF THE 1997 FLOOD**

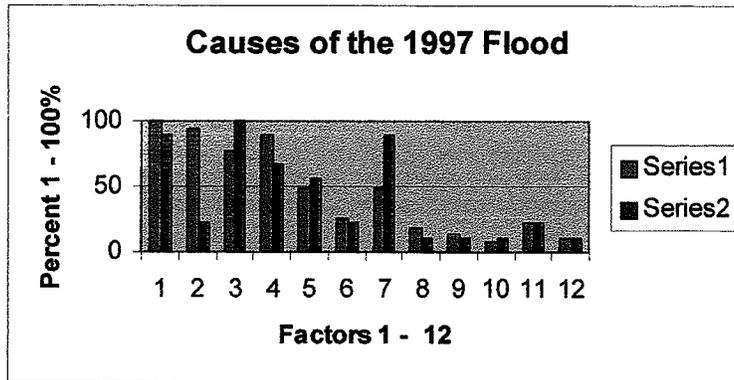
Both the keypersons and household respondents were asked a question about causes of the 1997 Red River flood (Q H:30 K:44). Respondents were asked to identify causes of the flood from a list of twelve factors. Individuals had the option of selecting several determinants. Factors were hydrological, technological or more broadly environmental, by and large.

**TABLE 4.10 CAUSES OF THE 1997 FLOOD**

<b>Factors 1 - 12</b>	<b>HOUSEHOLD (out of 49) Choosing response</b>	<b>KEYPERSON (out of 9) Choosing response</b>
1.Excess water in Red River	49 – 100%	8 – 88.8%
2.Heavy Rainfall	46 – 93.8%	2 – 22.2%
3.Excess Snowfall	39 – 77.5%	9 – 100%
4.Blizzard of April 1997	44 – 89.7%	6 – 66.6%
5.Quick spring thawing	24 – 48.9%	5 – 55.5%
6.Barrier to the natural flow of water i.e. dikes, plugging culverts	13 – 26.5%	2 – 22.2%
7.Increased drainage (enhancing natural flow by conversion of marshes/wetlands to agricultural fields)	24 – 48.9%	8 – 88.8%
8.Will of God	9 – 18.3%	1 – 11.1%
9. Lack or respect for, and care of nature	7 – 14.2%	1 – 11.1%
10. Human activities, such as too much infrastructure development in the Valley	4 – 8.1%	1 – 11.1%
11. Red River Floodway	11 – 22.4%	2 – 22.2%
12. Change in Climate	5 – 10.2%	1 – 11.1%

There were quite notable differences in the responses given between the household and keypersons responses. These are apparent in the bar chart below, which compares the percentage frequencies of householders and keypersons who selected each of the twelve specific causes.

**CHART 4.10.1 CAUSES OF THE 1997 RED RIVER FLOOD**



Series 1 = household respondents  
Series 2 = keyperson respondents

The majority of respondents felt that the primary causes of the 1997 Flood were excess water in the Red River, excess winter snowfall and the blizzard of April 1997. It is interesting to note that only about 22% of the respondents regarded the Red River Floodway as a major contributor to the Flood. In contrast, other Red River Valley residents closer to Winnipeg perceived the Floodway as a major factor; this perception was evident in the media in the aftermath of the Flood (Winnipeg Free Press 1997). About half of the household and keyperson respondents believed that quick spring thawing was a significant cause of the 1997 Flood. Factor 7, increased drainage, was almost universally recognized by keypersons as a major determinant of the 1997 Flood, yet only half of the household respondents thought that this was a notable cause. In addition, the case study certainly supported the belief that drainage ditches were a critical factor in

flooding. His written account of the 1997 Flood began with an introductory statement: “Please note that I view Natural Disasters and Flooding in the Red River Valley as two somewhat different categories – flooding in the Red River Valley though highly affected by nature's climatic conditions, has been greatly influenced in the second half of the 20<sup>th</sup> century by government approved or constructed infrastructures”. He felt that the construction of drainage ditches was a major cause of the 1997 Flood. In addition, construction of roads, damming of the Red River south of Manitoba in the United States, as well as the Red River Floodway, were major contributors to flooding. He notes that his great grandfather's farmyard, which was in the exact same location as his current home, and farming operation was interrupted only once in his first 65 years of farming, so he perceived the problem to be with the increased amount of infrastructure.

#### **4.10.1 PAST AND PRESENT EXPERIENCES WITH FLOODING**

Respondents were asked to identify the river closest to their home (Q H:31 K:45). 93 % of all respondents identified the Red River. Most respondents resided about 300 – 400 metres from the river.

Respondents were asked to rate the seriousness of the 1997 Flood; in the question (Q H:33 K:47), four semantic differential responses were permitted; ‘extremely serious’, ‘very serious’, ‘serious’ and ‘not serious’.

Household Mode	Keyperson Mode
3 = Extremely Serious	3 = Extremely Serious

As would be expected, both sets of respondents viewed the 1997 Flood as an extremely serious event. As stated in the literature, the more recent an event is in its occurrence, the more heightened the perception of that event will be (Burton, Kates and Snead 1969). In addition, in areas where the risk of flooding is periodic, overall awareness of that hazard is usually high (Burton and Kates 1964, Churchill and Hutchinson 1984).

Respondents were then asked if they could recall a flood worse than the 1997 Flood (Q H:34-35 K:48-49). The majority of the keypersons did not recall a flood worse than the 1997, but two of the keypersons stated that they felt the 1979 Flood was more serious. The majority of the household respondents did not feel that there was a more serious flood than the 1997 event, but several did mention the 1950 Flood and one respondent cited the 1979 Flood as being more serious. It was likely that respondents who experienced the 1950 Flood would perceive that flood as more serious. In 1950, St. Jean did not have the flood protection of the town ring dike that was present during the 1997 Flood, even though the water levels at St. Jean were higher in 1997 than in 1950. None of the keypersons cited the 1950 Flood, and this is likely because they were not old enough to remember the event: at the time of the research study all were currently employed, and not near retirement age. Other serious floods that were recalled during the last twenty years included 1979 and 1996. Keypersons, by and large, regarded 1996 as the second most serious flood after 1997. In fact, many felt that the 1996 Flood was

actually more serious than the 1979 Flood. In terms of floodwater discharges and extent, these two floods were equally severe.

As noted in Chapter 2, Mitchell, Devine and Jagger (1989) proposed a contextual model of a natural hazards system with interrelated components. The hazards *context* is made up of exogenous factors which influence each hazard event. For St. Jean (as for elsewhere) the contexts vary and are diverse. The respondents' perception of flooding in St. Jean was likely influenced by the contexts in which the flooding occurred. Different contexts existed during the 1950 Flood and the 1997 Flood. After the 1950 Flood when the ring dike was built, the residents' perception of flood risk would be altered. The temporal context, for example, the difference in time between 1950 and 1997 would have a great effect on the way the respondents would recall the flooding. An environmental context, that the water levels were actually higher in 1997 than in 1950, may not have had as much influence on the respondents' perception of the events.

#### **4.11 PREPARATORY MEASURES**

The respondents were asked what measures they undertook when they had learned that Grand Forks, North Dakota, had been flooded and that the water was approaching Manitoba (Q H:38 K:51). This question was open-ended so respondents could include all measures that they had undertaken. Responses of the nine keypersons included: moving belongings in the home to higher levels, building bigger dikes, sandbagging, hiring an emergency co-ordinator, preparing

to evacuate, creating an emergency plan, marking roadways, and moving machinery.

Responses from the much larger group of householders (49) were obviously more diverse. These responses could be categorized into groups. For example, the most common type of preparatory measures undertaken were those related to the home. These included moving belongings to a higher level in the house, moving belongings out of the home, relocating, packing clothing, installing a back-up valve in the basement, boarding up windows, shutting off the Hydro, listing and photographing items in the home, and sandbagging. Hewitt (1997) has noted that individuals regard their possessions and homes as symbolizing the survival of the family unit, so it is obvious that the respondents would want to protect this aspect of their lives. Other measures undertaken could be categorized as acquiring emergency equipment and supplies, such as obtaining generators, machinery and powerboats, as well as stocking up on food and water. Additional types of responses included listening to the news, finding a temporary place to reside during the 1997 Flood, and preparing to evacuate.

For both the keypersons and household respondents, the most common response was moving the contents in the home to higher levels.

**TABLE 4.11.1 SUMMARY OF RESPONDENTS UNDERTAKING PREPARATORY MEASURES**

Proportion of Householders	Proportion of Keyperson
31 of 49 <b>63.3%</b>	8 of the 9 <b>88.9%</b>

Overall, a majority of respondents undertook some type of preparatory measures for the 1997 Red River flood. All but one keyperson adopted this type of adjustment, and almost two-thirds of householders employed such measures.

Respondents were asked who suggested that they undertake the preparatory measures for the flood hazard (Q H:40 K:54). Most householders identified the Manitoba Emergency Management Organization (MEMO) as the principal source of information about these measures. The Department of Natural Resources personnel were the second most common source of suggested measures. The majority of keyperson respondents stated that it was the Manitoba Emergency Management Organization that suggested the measures; two respondents noted that, additionally, the media were significant. This corroborates the view stated in the literature that receiving information from the media is important (Fitzpatrick and Mileti 1994). Contrary to what sources in the literature have stated about receiving and valuing information more from family or friends rather than officials (Bryant 1991, Drabek 1986), very few respondents stated that they had heeded recommendations from friends or family in making preparations for the ensuing flood.

One small component of the questionnaire asked respondents what resources and equipment they had available during the 1997 Flood (Q H:50 K:71), and what respondents would need to better face a natural hazard in the future (Q H:51 K:72). It has been noted in the literature that an individual's perception of flood hazard is related to that individual's use of resources (Burton and Kates 1964). Resources that the householders had available were diverse and included emergency supplies, sandbags, flashlights, radios, pumps, generators and powerboats. The responses from the keypersons were similar to those of the householders but included the presence of the RCMP in town for assistance and an emergency committee. Responses from the keypersons in terms of what they required to better face natural hazards in the future included: more sandbags, places for relocation, cell phones, a better dike, and more community co-operation. Householders' responses included more input from the local residents in terms of disaster management, and more co-operation between external agencies. Respondents from both categories cited that not having a mandatory evacuation order would better help them face a natural hazard event in the future.

Both keyperson and household respondents were to identify the mitigation efforts that had been made to their community since the 1997 Flood (Q H: 58 K:74). Eight efforts were specified. Table 4.11.2 presents the data on the responses.

**TABLE 4.11.2 DISASTER MITIGATION EFFORTS MADE IN THE COMMUNITY**

<b>Changes made in the Community since the 1997 Flood</b>	<b>Householders</b>	<b>Keypersons</b>
More infrastructures were built	43 of 49 <b>87.7%</b>	9 of 9 <b>100%</b>
More dikes were built	37 of 49 <b>75.5%</b>	9 of 9 <b>100%</b>
Affected houses/buildings were raised above 1997 Flood level	29 of 49 <b>59.1%</b>	9 of 9 <b>100%</b>
Communication systems were improved	21 of 49 <b>42.8%</b>	8 of 9 <b>88.8%</b>
Residents are now strictly subjected to land-use zoning regulations	11 of 49 <b>22.4%</b>	5 of 9 <b>55.5%</b>
Building codes in the flood-prone areas are now strictly enforced	5 of 49 <b>10.2%</b>	2 of 9 <b>22.2%</b>
Severely affected buildings/houses were relocated voluntarily	3 of 49 <b>6.1%</b>	1 of 9 <b>11.1%</b>
Severely affected buildings/houses were relocated through government initiatives (buy-outs)	2 of 49 <b>4.1%</b>	0 of 9 <b>0%</b>

The most common responses from both categories of respondents were that more infrastructure was built, more dikes were built and that affected houses and/or buildings were raised above the 1997 Flood level. In addition, 8 of the 9 keypersons felt that communication systems had been improved while only 21 of the 49 householders felt this way. Keypersons would likely have more knowledge about this subject with their role in disaster management. Very few respondents referred to severely affected buildings or houses being relocated, either voluntarily or through government initiatives.

#### **4.12 MANDATORY EVACUATION**

An important adjustment to the developing threat of inundation during the 1997 Flood in Red River Valley communities in Manitoba was mandatory evacuation.

As noted by Alexander (1993), evacuation is one of the most important methods of ensuring public safety during a disaster event. One question (Q H:43 K:58) asked respondents if they were subject to mandatory evacuation, did they follow the order thoroughly. The response data is presented below.

Household		Keyperson	
40 of 49	<b>81.6%</b>	6 of 9	<b>66.6%</b>

In cases where respondents did not follow the evacuation order thoroughly, the respondents were asked, in an open-ended question, to provide their reasons for not doing so (Q H:44 K:59). One category of responses included protection measures, such as monitoring their homes, protecting a work-site and caring for livestock. Other reasons for not following the mandatory evacuation order were that the respondents felt that they would be safe remaining in their homes, and that they had been educated by previous experience with flooding. Reasons that keypersons did not follow the order thoroughly also included protection measures such as checking on belongings and homes. Another keyperson response was the responsibility of working in the Emergency Operations Centre.

One Likert-type question (Q H:56 K:62) asked the respondents if they agreed with the statement that during the 1997 Flood people were treated as moveable property, and removed from the flood zone by a mandatory evacuation order, instead of being allowed to remain in their homes to protect their own properties.

Of the nine keypersons, one 'agreed strongly', four 'agreed somewhat' and four 'disagreed somewhat'. Conversely, the majority of household respondents (31 out of 49) 'agreed strongly.' Likely, the keypersons were able to better understand the consequences of people being left in their homes with no access out of the town, or with no possibility of emergency assistance if it became necessary. Additionally, the household respondents may not have been aware of the potential dangers, such as inundation or lack of medical assistance, of remaining in their own homes.

One of the case studies did not follow the mandatory evacuation order. He noted that it was important for him to stay in his home to man the pumps within his dike that were protecting his home, which was located outside St. Jean's ring dike. He stated that he did not at any point feel physically threatened by the approaching floodwaters. He noted that although the mandatory evacuation order was appropriate for some people in the community, he felt that those able-bodied individuals who had experience in dealing with, and fighting floods, should be given the opportunity to remain and protect their property (Lindell and Perry (2000) have noted that past experience with a hazard event will lead individuals to be inclined to adopt effective preparedness measures). The respondents' diversity of opinion on mandatory evacuation and the case study person's opinion corroborate the findings in two other studies of flooding in Southern Manitoba, that is, mandatory evacuation is controversial (Haque 2000) and residents would much prefer to remain in their homes (Rasid, Haider and Hunt 2000). It has been

suggested that a voluntary evacuation from flood-prone areas is much more successful than forcing residents to evacuate (Rasid *et al* 2000). The keyperson and household respondents, as well as the case study, reveal the diversity of opinion and controversy about this issue. The case study also noted that Winnipeg media portrayal of the evacuation was incorrect. Media reports claimed that during the mandatory evacuation notice, no persons who refused to leave their homes were actually physically removed from them. However, the case provider stated that he knew this did happen, and people were forcibly removed. This type of misinformation has been suggested, where the government officials have regulated what is depicted in the media in an effort to reduce public fear (Fitzpatrick and Mileti 1994).

One question asked respondents to state what they did well in managing the 1997 Flood (Q H:46 K:67). Since this answer was open-ended, respondents could give any reply that they chose. The answers varied and included respondents stating that they took care of their families and themselves. In addition, they undertook measures to protect their homes and possessions. Additional responses given were that the respondents were able to remain calm and help others. Some individuals felt that they did 'everything' well in managing the 1997 Flood, while one respondent did 'nothing' well.

Subsequent questions (Q H:47 K:68) asked respondents what went wrong during the 1997 Flood with respect to disaster management, and what aspects could be

improved upon (Q H:48). The most popular response from the householders was that residents felt that they should be allowed to stay in their homes and not be subject to a mandatory evacuation order. In some instances, individuals will choose to disobey evacuation notices, as was the case in the 1997 Red River flood, when many residents refused to leave their homes because they worried that if they left, their homes would be destroyed. Reasons for remaining despite orders to evacuate also included fear for safety of the home and belongings from robbery, and the necessity of remaining to ensure the dikes they had constructed held, and to pump out water from the inside of the dike. One of the case studies noted that he felt that if everyone in the town of St. Jean had obeyed the mandatory evacuation notice, including the member of the St. Jean fire department, he was certain that the dike would have been eroded and that this breach in the dike would have caused the town of St. Jean to flood. He recognized the importance and supports evacuation of a community during times of flooding if it is appropriate. He also noted the importance of control and order during an evacuation. He felt that the military and MEMO were doing a good job until the mandatory evacuation notice caused panic. He sees the community members who are experienced with flooding as an asset to the community. He noted: "In the event of natural disaster, local people may not know much about forest fires, but we have experienced Red River flooding quite often in the past 50 years and this should be recognized as a **valuable resource** to people in charge of emergency services".

Other respondents felt that in order to improve upon disaster preparedness more help was need from the RCMP, Manitoba Emergency Management Organization (MEMO), and neighbours. Further popular responses were that nothing should be done differently, that exactly the same reactions and responses to the 1997 Flood would be sufficient. Other respondents felt that there was not enough coordination between agencies and organizations, and that the media fostered conflict amongst flood residents, and that there was too much input from untrained people. The keypersons felt that in the event of a future disaster situation that the mandatory evacuation policies be revised, and that the same rules for all residents of the town should exist. In addition, one keyperson noted that the construction of access roads in the town would be useful.

The case study noted that the worst part of the experience for him was that although he did not feel physically threatened by the encroaching water, he saw that the ring dike around the town appeared to be eroding, but since he had disobeyed the mandatory evacuation notice, he didn't feel he could call anyone such as MEMO, because he was not supposed to be there. He also explained that he felt the biggest problem during the 1997 Flood was the lack of communication. He stated that many people did not know what they were supposed to be doing or not doing, and who was actually doing things that needed to be done.

#### **4.13 DISASTER ASSISTANCE**

Two questions that householders were asked pertained to monetary flood assistance in connection with the 1997 Flood. The survey revealed that 33 of the 49 household respondents (67.3%) were recipients (Q H:53). The amount of disaster assistance received among recipients varied widely, from several hundred dollars to tens of thousands of dollars in a few cases (Q H:54). Many respondents received assistance from the Manitoba Disaster Assistance Board, the Red Cross Flood Assistance Program and other sources, including Emergency Social Services (Q H:54).

Keyperson and household respondents were asked in one question (Q H:57 K:76) about support and assistance they received from the following twelve agencies, rated on a scale of 1 to 5, with 5 representing the most support and 1 the least.

**TABLE 4.13 ASSISTANCE RECEIVED FROM AGENCIES**

SUPPORT AGENCY	HOUSEHOLD MODE	KEYPERSONS MODE
Emergency Preparedness Canada (EPC)	1	1
Manitoba Emergency Management Organization (MEMO)	4	4
Fire Department	5	5
RCMP	3	3
Department of Natural Resources	4	4
Department of Agriculture	1	2
Red Cross Assistance Program	4	4
Mennonite Disaster Services	1	5
Salvation Army	5	3
Department of Defence (military)	5	5
Local municipal administration	4	5
Spontaneous volunteer groups	5	4

In general, both household and keyperson respondents rated the support that they received from various groups or organizations as very high. There were slight differences in the rating of the support received from the Salvation Army; the household respondents rated it as 5, whereas the keypersons rated it as only 3. This difference in perception may be due to the fact that the Salvation Army was offering assistance to individuals in St. Jean, but also in Winnipeg, where many of the respondents were temporarily relocated. During the 1997 Flood, the Salvation Army assisted by offering food to residents in flooded areas and the keypersons may not have regarded this type of help as important as other types of support that were received from different groups. The only large difference in perception of support between household respondents and keypersons pertained to the

Mennonite Disaster Services: the keypersons ranked this agency's support as high, whereas the householders rated it as low. Perhaps this divergence in perception was due to the fact that the Mennonite Disaster Services worked more closely with groups, such as emergency personnel, than with individual residents in communities, during the 1997 Flood.

Additionally, keypersons were asked with respect to their managing the 1997 Flood emergency, if they would rate the support they received from the following groups on a scale from 1 to 5, with 5 being the most support (Q K:77).

**TABLE 4.13.1 OTHER ASSISTANCE RECEIVED**

GROUP	KEYPERSON MODE
Neighbouring communities	3
Local church	3
Community clubs/associations	3
Local municipal administration	4
Local businesses	3

This question was asked only of the keyperson respondents. In general, the overall support was rated as relatively high, with the support received from the local municipal administration rated as the highest. Only one keyperson rated the support received from the above groups as very low.

An additional Likert-type question, which was worded slightly differently on the household and keypersons questionnaires (Q H:55 K:61), asked the respondents to rate the usefulness of the some of the emergency measures that were undertaken by the government. These included the temporary dikes that were

constructed, such as the Brunkild Z-dike. The respective Likert response options in the household and keyperson questionnaires are tabulated below (Table 4.13.2). Frequencies of response rates are provided.

**TABLE 4.13.2 USEFULNESS OF TEMPORARY DIKES**

<b>Household Respondents</b>			<b>Keyperson Respondents</b>		
Very useful measure	23 of 49	<b>46.9%</b>	Very useful measure	0 of 9	<b>0%</b>
Somewhat good measure	8 of 49	<b>16.3%</b>	Somewhat good measure	3 of 9	<b>33.3%</b>
Useless measure	3 of 49	<b>6.1%</b>	Not so good measure	2 of 9	<b>22.2%</b>
Somewhat damaging measure	2 of 49	<b>4.1%</b>	Useless measure	0 of 9	<b>0%</b>
Very damaging measure	3 of 49	<b>6.1%</b>	Good for the City, bad for rural areas	4 of 9	<b>44.4%</b>
No opinion	7 of 49	<b>14.2%</b>	No opinion	0 of 9	<b>0%</b>

NOTE: three of the householders did not attempt Q H:55

Nearly half of the household respondents felt that the dike construction measures were very useful, and only a few thought them to be damaging. By contrast, none of the keypersons regarded dike construction 'very useful', at least for St. Jean. However, almost half of the keypersons believed that the emergency measures undertaken by the government were good for the city of Winnipeg, but bad for the rural areas. This could be considered as damaging for the latter. However, 3 of the 9 keypersons felt that these measures were somewhat good, so amongst the keypersons, there is a great difference of opinion. Overall, the two groups of household and keyperson respondents disagreed markedly about the usefulness of

the government's emergency actions, such as the temporary dikes that were constructed.

#### **4.14 GENERAL SOCIO-ECONOMIC DATA**

Kates (1970) has suggested that awareness of potential hazard adjustments, which can be undertaken in response to the risk of natural hazards, is directly related to the accessibility to information about adjustments. He notes that this accessibility is related to such factors as age, education and income.

##### **4.14.1 INCOME**

One question on both the household and keypersons questionnaire was related to the respondents' gross family income (Q H:106 K:83). The modal response for gross family income for household and keyperson sets of respondents is presented below.

Household Mode	Keyperson Mode
1 = less than \$30, 000	1 = less than \$50,000

Two different scales were used for the questions regarding gross family income. For the household questionnaire, there were choices of six income categories: under \$30,000, \$30,000-\$44,999, \$45,000-\$59,999, \$60,000-\$74,999, \$75,000-\$89,999 and \$100,000 and over. Additional household responses included, 'Don't Know' and 'Refuse to Answer'. The keypersons were given only three responses: less than \$50,000, \$50,000-\$100,000 and more than \$100,000. This question was marked as optional for the keypersons and most did not respond.

Table 4.14.1 (below) represents the number of household respondents reporting the income categories and the number of those respective respondents who undertook preparatory measures.

**TABLE 4.14.1 GROSS FAMILY INCOME AND PREPARATORY MEASURES**

<b>Income Bracket</b>	<b>Number of Respondents out of 49 Reporting Income Bracket</b>	<b>Number of Respondents Undertaking Preparatory Measures</b>
1. Under \$30, 000	14 28.5%	12 out of 14 85.7%
2. \$30, 000-44, 999	7 14.2%	3 out of 7 42%
3. \$45, 000-59, 999	4 8.1%	3 out of 4 75%
4. \$60,000-74,999	1 2%	0
5. \$75,000-89,999	4 8.1%	3 out of 4 75%
6. \$100,000 or over	1 2%	1 out of 1 100%
7. Don't Know	1 2%	0
8. Refuse to Answer	13 26.5%	11 out of 13 84.6%

NOTE: An error was made in category 6, as it should read \$90, 000 and over, however, no respondents reported an income between \$90, 000 and \$99,000.

\* 4 of the household respondents did not answer this question

Since there were only a few respondents in some of the categories of income bracket, it is not possible to determine a relationship between wealth, and perception and preparedness measures. In general, gross family income did not seem to be highly related to the number of preparatory measures undertaken as has been suggested in the literature (Tierney, Lindell and Perry 2001). In this case, respondents with lower incomes were no less likely to undertake preparatory measures than respondents with higher incomes.

#### **4.14.2 EDUCATION**

Householders were asked (Q H:97) what the highest level of achievement was in their respective education (university, college, or grade at school). The most common response was that Grade 12 was completed. Of the 49 household respondents, 24 had completed grade 12 or higher. On average, this category of education level adopted 2.12 preparatory measures. The category of respondents who had completed grade 11 or lower adopted an average of 1.88 preparatory measures, only slightly lower than the category of respondents who had completed grade 12 or higher. In relation to preparatory measures undertaken, education level did not seem to be a significant factor, although it is apparent that respondents with less education did adopt fewer preparatory measures. In terms of the relationship between hazard perception and education levels, Lindell and Perry (2004, p.23) have asserted that, in a study of ethnic minorities, participants with “higher levels of education tended to rate levels of risk from flooding conveyed in a specific message more similarly to environmental hazard managers than those with lower levels of education”.

#### **4.14.3 LENGTH OF TIME LIVED IN ST. JEAN**

Household respondents were asked to identify the length of time they have lived in the community of St. Jean (Q H:93). This question was posed only to the household respondents. Drabek (1996) had noted that the more experience a community has with disaster events, the more likely its residents will be to adopt

planning measures. In the case of St. Jean, the lengths of time that individuals have lived in the community will help determine their experiences with flooding, as floods of significant magnitude have occurred on the Red River in 1996, 1979, and 1950. On average, household respondents had lived in the community for almost 43 years (42.6). Respondents who had lived in the community for 20 years or more adopted an average of 1.25 preparatory measures. Those residents who reported living in the community for less than 20 years adopted an average of 1.83 preparatory measures. However, only 6 of the 49 residents had lived in the community for less than 20 years.

#### **4.14.4 AGE**

At the time of the survey, the average age of household respondents was 52. Those residents who were age 50 or higher in the year that the study was conducted adopted an average of 0.86 preparatory measures, while respondents aged less than 50 adopted an average of 1.57 measures.

Since there are numerous other factors that could contribute to whether or not a respondent adopted preparatory measures, it is difficult to determine if a relationship exists between the age of the individual or the length of time that they have lived in St. Jean and the level of disaster preparedness.

#### **4.15 CONFLICT AND STRESS DURING THE 1997 FLOOD**

The 1997 Flood was a major hazard event at St. Jean that induced stress and generated conflict within families and within the community. The survey attempted to assess these problems. One of the questions on both the household and keypersons questionnaire asked the respondents to indicate problems experienced in relation to the 1997 Flood (Q H: 112 K:90).

Household residents were asked if there was any source of conflict during the 1997 Flood (Q H:88). Keypersons were also asked this question (Q K:90) and then were asked to identify between whom, that is, individuals or agencies, the conflict existed (Q K:91). A further question (Q K:92) enquired as to the causes of these conflicts. Many of the household residents noted that this conflict was caused by difficult living conditions as a result of being evacuated from their homes. Some indicated that the mandatory evacuation was the major source of conflict, as well as disagreement with authorities, limited communication with the authorities, and a lack of organization between agencies (such as the Manitoba Emergency Management Organization and the military).

Many of the keypersons stated that the sources of conflict existed between the external agencies and the residents of the community. One keyperson noted that conflict was caused by the Manitoba Emergency Management Organization (MEMO) and resulted from that agency's lack of 'knowledge, experience,

listening and understanding'. Communication with these external organizations listed above was also given as a cause of the conflict with external agencies.

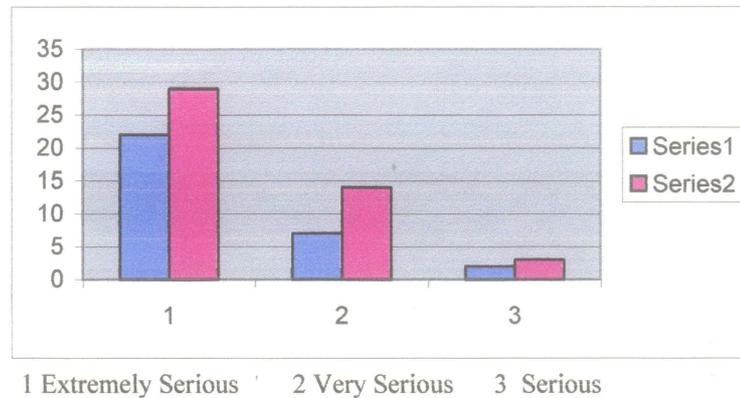
Additionally, the household respondents were asked if they experienced any stress during the 1997 Flood (Q H:112) and the cause of this stress (Q H:113). For the majority of residents, the main source of stress was being evacuated from their homes and community. Many respondents experienced anxiety, particularly because of concern about their homes and possessions, thinking that they would be flooded. Several respondents noted that bureaucracy was the principal cause of stress; not being able to get answers about compensation was troubling. Many residents experienced anger, resentment, frustration, loneliness and depression. Other respondents indicated that they were worried about future floods and wondered if the dike would hold.

#### **4.16 RELATIONSHIP BETWEEN PERCEPTION OF FLOODING AND PREPARATORY MEASURES**

The average number of preparatory measures undertaken when the respondents heard that Grand Forks had been flooded and that the water was approaching was two (Q H:38).

Those respondents who rated the 1997 Flood as 'Very Serious' rather than 'Extremely Serious' were also the same respondents who were more able to recall other severe floods that had taken place in the last twenty years (Q H:33, 35).

**CHART 4.16 SEVERITY RATING OF 1997 FLOOD VS PREPARATORY MEASURES**



Series 1: number of respective respondents who undertook measures  
Series 2: number of respondents rating the 1997 Flood as:

Of the respondents who rated the 1997 Flood as ‘Extremely Serious’, 75.8% undertook some type of preparatory measure, whereas only 50 % respondents who rated the 1997 Flood as ‘Very Serious’ did so. Interestingly, 3 respondents categorized the 1997 Flood as ‘Serious’, but 2 of the 3 adopted some preparatory measure. None of the household respondents felt that the Flood was ‘Not Serious.’ As indicated from the chart above, more residents who rated the 1997 Flood as ‘Extremely Serious’, undertook preparatory measures than those who perceived it as ‘Very Serious’.

Householders who rated the 1997 Flood as ‘Extremely Serious’ were also more likely to assign a higher severity rating, when asked to rate the problems facing the community on a scale of 1 to 10 (Q H:1). 62% of respondents who rated the 1997 Flood as ‘Extremely Serious’ assigned values of 8 or greater when rating the severity of flooding as an overall problem facing the community.

#### **4.17 CONCLUSION**

With the analysis and interpretation for the data presented in this part of the thesis, the three stated hypotheses can now be revisited and tested in the final chapter, Chapter 5.

## **CHAPTER 5 – CONCLUDING SUMMARY AND RECOMMENDATIONS**

This chapter provides a summary of the research objectives, the testing of the hypotheses, and the limitations of the study. In addition, a concluding summary is presented and recommendations for the future are offered.

### **5.1 SUMMARY OF RESEARCH OBJECTIVES**

The broad objective of this thesis research was to examine the experience of the residents of St. Jean with natural hazards and disasters, with a particular emphasis on flooding. All of the respondents in the study, both household residents and keypersons, experienced the 1997 Red River Flood. Using a questionnaire, respondents were asked their personal experiences of the 1997 Flood. The questionnaire was designed to elicit people's opinions, actions and reactions related to the 1997 Flood and, to some degree, to other natural hazard events. From this information, conclusions were drawn about people's perceptions of natural hazard risk and their preparatory actions. Factors that determine human perception of risk as well as influence hazard preparedness were examined. Responses of the household residents were compared to those of the keypersons in order to determine the difference between perceived and objective risk.

## **5.2 HYPOTHESES RESTATED AND TESTED**

- 1) Levels of risk perception and preparedness are related to a variety of variables including; recent experience with past hazard events, length of time lived in the community, education, and age of the individual.
- 2) Preparedness for a natural hazard event, specifically flooding, is influenced by perception of that event.
- 3) The difference between objective and perceived risk is not as marked as the literature suggests.

### **5.2.1 HYPOTHESIS 1**

**Levels of risk perception and preparedness are related to a variety of factors including; recent experience with past hazard events, length of time lived in the community, education, and age of the individual.**

By comparing variables within the surveys for the household respondents, it is possible to determine if a relationship exists between these different factors and the respondents' perception of risk and overall disaster preparedness. Are factors such as income, age, education and the length of time that an individual has lived in the community related to the way that flooding is perceived and prepared for?

Burton, Kates and White (1978) note, that overall, recent experience with disaster leads to individuals being more knowledgeable and more sensitive to that type of extreme hazard event. This was clearly demonstrated in this study, as a majority

of the respondents rated flooding as the most serious type of problem facing their community, having recently experienced the 1997 Flood. This was likely the greatest factor influencing the respondents' perceptions and preparedness. Additionally, 25 of the 49 respondents, or 51%, had lived in St. Jean for forty or more years. Within this latter group of long term members of the community, 56.1% rated the 1997 Flood as extremely serious, and 90.4 % assigned flooding the highest of their ratings of serious problems threatening the community. The table below (Table 5.2.1) presents the length of time that the household respondents have lived in the community of St. Jean as well as the average severity rating for flooding and their perception of the 1997 Flood.

**TABLE 5.2.1 LENGTH OF TIME LIVED IN ST. JEAN AND FLOOD PERCEPTION**

<b>Household respondents Total 49</b>	<b>Mean Severity Rating of Flooding (1 least serious and 10 most serious)</b>	<b>The 1997 Flood was 'Extremely Serious'</b>
Lived in community for more than 20 years <b>41 out of 49 83.6%</b>	7.64	23 out of 41 56.1%
Lived in community for 20 years or less <b>6 out of 49 12.2%</b>	6.28	5 out of 6 83.3%

\* NOTE: two of the household respondents did not respond to this question

The mean severity ratings were very close for both categories of respondents; those who had lived in the community for twenty years or less, and those that had lived in the community for more than twenty years. However, a higher percentage of respondents who had lived in St. Jean for twenty years or less rated the 1997 Flood as "extremely serious" whereas only 56.1% of the respondents living in the community for more than twenty years rated it this way. Although

only 12.2% of the residents lived in St. Jean for twenty years or less, this very high proportion who regarded the 1997 Flood as 'Extremely Serious' is quite likely significant.

Household respondents who were younger than 50 were more likely to perceive the 1997 Flood event as 'Extremely Serious' than those respondents who were age 50 or over. These results are presented in the table below (Table 5.2.2).

**TABLE 5.2.2 AGE OF RESPONDENT AND FLOOD PERCEPTION**

<b>Household respondents Total 49</b>	<b>Mean Severity Rating of Flooding (1 least serious and 10 most serious)</b>	<b>The 1997 Flood was 'Extremely Serious'</b>
<b>Aged 50 or higher 25 out of 49</b>	7.41	11 out of 25 44%
<b>Aged 49 or less 24 out of 49</b>	7.16	18 out of 24 75%

In terms of the individual's age influencing flood hazard perception, both sets of age groups rated the flood similarly. Respondents who were age 50 or over at the time of the survey rated flooding as only slightly more serious than did the respondents who were younger than 50. Conversely, the respondents who were aged less than 50 adopted an average of 0.71 more preparatory measures as a whole.

Burton *et al* (1978) assert that levels of adjustments to natural hazards are related to wealth. They state that the wealthy perceive hazards more accurately than the less wealthy, and that social pressure can influence adjustments either negatively

or positively more so than individual attitude. Did respondents with higher incomes have different perceptions, and adopt more preparatory measures than did respondents with relatively low family incomes? The results from the data analysis were not conclusive in that the questions were not specific enough to determine a relationship between wealth on the one hand, and hazard perception and adoption of preparedness measures on the other hand.

It has also been noted that education plays an important role in disaster perception and levels of preparedness (Lindell and Perry 2004). This was evident in the St. Jean study, although only moderately; household respondents with an education level of Grade 12 or higher adopted an average of 0.24 more preparatory measures than did those respondents with less than Grade 12 education.

It is evident that the length of time that an individual has lived in the community and their past experience with natural disasters are two determinants of perception and preparedness. These two variables haven been proven to have an effect on perception (Lindell and Perry 2004). Although it is not possible to determine the exact relationship between these particular variables and respondents' perceptions and levels of preparedness in this study of St. Jean based on the data that was collected, it is obvious that a relationship does exist.

Although Hypothesis 1 was not a particularly strongly supported hypothesis, it can be accepted. Levels of risk perception and preparedness are related to a

variety of factors, especially recent experience with past hazards, the length of time that an individual has lived in the community experiencing the disaster, and level of education.

### **5.2.2. HYPOTHESIS 2**

**Preparedness for a natural hazard event is influenced by perception of that event, specifically, the 1997 Red River flood.**

As O’Riordan (1986) has stated, hazard perception at the individual level determines the actions that will be undertaken in preparation for that hazard. Both the household and keyperson respondents on average adopted two types of preparatory measures. The relationship between preparedness (adopting preparatory measures) and the level of perception for the 1997 Flood was clearly apparent in this study. As outlined in Section 4.16, the higher the level of seriousness that a respondent assigned to the 1997 Red River flood, the more likely it was that they undertook preparatory action. Respondents who rated the 1997 Flood as ‘Extremely Serious’ were far more likely to undertake preparatory measures than those who rated the Flood as ‘Very Serious’. Hence, Hypothesis 2 is accepted.

### 5.2.3. HYPOTHESIS 3

**The difference between objective and perceived risk is not as marked as many sources in the literature have ascertained.**

It has been stated in the literature that the public's perception of risk differs from that of technical experts in the field (Burton and Kates 1964, Williams, Brown, Greenberg and Kahn 1999). Others have noted that this variance in risk perception is not as marked (Baum 1986, Fischhoff, Slovic and Lichtenstein 1983). In the Olczyk (2004) study of flood risk perception in southern Manitoba, the research corroborates the latter assertion.

In this study, the householders estimated more conservatively than did the keypersons for the question regarding the chance of a flood occurring in the next ten years (Q H:2 K:5 ). This difference in perception was also demonstrated by the question dealing with the level of concern for certain situations in the event of a serious natural disaster (Q H:3 K:6). In all of the hypothetical problematic situations given, except for one, the keypersons answered that they were 'very concerned' more than the household respondents did.

When respondents were asked to rate the severity of problems facing their community (Q H:1 K:1), overall the household respondents were more conservative and assigned lower ratings to the problems than did the keypersons. In only one instance (cuts in agricultural subsidies), did the householders assign a

value greater than did the keypersons. This contradicted sources in the literature that state that the public will tend to overestimate the risk of some events, more so than technical experts in the field (Slovic, Fischhoff and Lichtenstein 1982). However, this corroborates what Baum (1986) has asserted; that the public, when asked to estimate risk from events that are knowable will not vary greatly from what the experts have determined. Although, in this study, this is only partially demonstrated since for many of the problems given, the keypersons tended to rate the problem as more severe than did the householders, sometimes significantly so (i.e. blizzards, drought condition, severe snowfall and shortage of farm labour). The question in which respondents were asked to estimate the percent chance of experiencing a certain type of disaster in their community in the next ten years (Q H:2 K:5) also corroborates the above concept that laypersons do not tend to overestimate risk. In this question, of the six natural hazards presented, the householders only assigned percentages higher than the keypersons for two of the hazards (hailstorm and drought), and only marginally.

Of the three stated hypotheses, Hypothesis 3 is the only one not accepted. In addition to the abundance of literature on the differences between objective and perceived risk, the analysis of the data extracted from the questionnaire refuted this hypothesis. There is a *marked* difference between objective and perceived risk, hence, Hypothesis 3 is rejected.

### **5.3 LIMITATIONS OF THE STUDY**

In this study, several notable limitations exist and should be recognized. Firstly, since the data was collected four years after the 1997 Flood, many of the respondents may have forgotten certain aspects of that flood. Although in the larger study, "Community Differentials in Hazards Perception and Emergency Needs" (Rahman and McLachlan 2001), three different communities in the Red River Valley were examined, in this study only one community, St. Jean, was selected, so it is not representative of the overall population of Manitoba's Red River Valley. In St. Jean, the most recent type of disaster was the 1997 Red River flood. In addition, this natural hazard event was probably the most traumatic and the focus of attention for many respondents when asked to recall other type of disasters facing the community.

The limitations of the survey questionnaire itself for the purposes of this study's objectives were that many of the questions focused mainly on the 1997 Flood, the most prominent natural hazard event at St. Jean since 1950, and not on other flood events. For this thesis research, detailed questions about experience with other floods, in addition to the 1997 Flood, would also have been useful for comparisons. More information about individual experiences would be helpful since the current questionnaire asked respondents only if they could recall other floods, but did not elicit details about individual's past experiences with flooding.

If a similar study were to be undertaken in the future, it would be beneficial to have more keyperson respondents.

#### **5.4 SUMMARY**

This thesis research consists of a study of the residents of St. Jean, Manitoba and their experience with natural hazards and disasters. Specifically, the research focuses on flooding, and in particular, the 1997 Red River Flood. The respondents of the study were comprised of household residents as well as keypersons in the community who were chosen because of their experience and knowledge with natural hazards. In total, 49 household and 9 keyperson respondents participated in the study. The specific objectives of this thesis research were fourfold; 1) to examine household and keypersons perceptions of different hazard types with an emphasis on natural hazards, and specifically flood hazard; 2) to examine the difference between the perceived risk of household individuals and the objective risk of keypersons with regard to natural hazards; 3) to identify and analyze factors that determine perception of flood hazard risk; 4) to examine the relationship between disaster preparedness and risk perception, with respect to natural hazards.

Upon review of conceptual foundations in the literature, it is evident that a wealth of published literature exists on natural hazards, and on the specific aspects related to the objectives of this study, in particular, natural hazard risk perception, disaster preparedness, objective and perceived risk and social science research

methodology. The literature suggests that there are certain factors which influence human perception of natural hazards. Several sources have stated that a difference exists in the perception of hazard risk between that of laypersons (perceived risk) and that of experts in the field (objective risk), although some sources have sought to explain that these differences are not as significant as others have asserted. Disaster preparedness and planning are vital components to reducing loss resulting from natural hazards and disasters. All of these concepts were explored in Chapter 2. In Chapter 3, a review of research methods was undertaken to determine the most appropriate methods for analysis of the data that was collected in the survey questionnaires. The questions in the survey elicited both qualitative and quantitative data. Likert-type questions were utilized as well as open-ended, non-structured questions. The questionnaire content addressed such themes as hazard perception and awareness, and past and present experience with natural disasters, as well as general socioeconomic variables. The data was analyzed using the Likert scaling method as well as descriptive techniques for non-Likert type questions. Chapter 4 presented the analysis and interpretation of the survey data using the methodologies that were described in Chapter 3. The results were presented as verbal descriptions, as well as in tables and bar charts. The research objectives were achieved through the analysis of data and the testing of the stated hypotheses.

The acceptance of Hypothesis 1 concluded that several variables were related to the perception of flood hazard risk and disaster preparedness. The length of time

that individuals have lived in St. Jean influenced how respondents perceived the 1997 Red River Flood. Those respondents who had lived in the community for less than 20 years were more likely to rate the 1997 Flood as 'extremely serious'. In addition, those respondents who were less than age 50 were also more likely to perceive the 1997 Flood as 'extremely serious'. Educational levels were found to have an effect on the adoption of preparatory measures as well; those with higher levels of education were slightly more likely to undertake preparedness measures. A distinct relationship between income levels and preparedness was not determined, as several different categories of income level had respondents who adopted preparedness measures equally.

Hypothesis 2 found that, for individuals, hazard preparedness is related to perception of the hazard event; those household respondents who viewed the 1997 Flood as 'extremely serious' were more likely to adopt preparatory measures than those who regarded the Flood as merely 'serious'. This was evident in analyzing household respondents' perceptions of the 1997 Flood in relation to the adoption of preparatory measures.

Contrary to expectation and Hypothesis 3, it was found that a marked difference does exist between objective and perceived risk, as was postulated in the literature. When asked to rate the severity of problems facing their community, and the level of concern for certain situations that may arise in the event of a natural disaster, the household respondents tended to be more conservative in

their estimates than did the keypersons. These three tested hypotheses enabled the objective research goals to be met. By and large, useful information and knowledge was gained by examining the experiences of the residents of St. Jean with respect to natural hazards, and specifically, to the 1997 Red River Flood.

## **5.5 RECOMMENDATIONS**

In St. Jean Baptiste, there is the general consensus, of both household and keypersons in the community, that flooding is the most significant natural hazard, in terms of severity, affecting the community. A majority of the residents in St. Jean felt that their community did very well in managing the 1997 Flood, but it is still possible to learn from the experiences and reduce the possibility of loss from future disasters.

Residents in the community, including keypersons, felt that there might have been too much influence in decision making from external agencies, when they felt that many people within the community had the knowledge and experience to deal with the disaster. The community should have more control over their resources and decision making. This would likely result in lower stress levels, since many of the respondents indicated that stress was caused by outside agencies and these external agencies' decision-making.

It was evident from the case studies as well as additional comments made by the study participants, that preparedness and planning are key components to successful mitigation. Overall, the residents in St. Jean support hazard mitigation and disaster preparedness. *The government should be more involved in hazard mitigation and disaster preparedness, and should provide incentives to undertake preparatory measures.*

*More communication between external and internal agencies within the community is essential to deal with a disaster. In addition to the community's emergency plan, a separate protocol for flood disasters is required. Also, better communication within the community is a vital component of hazard preparedness.* One keyperson indicated that he had to listen to the local news to find out what was happening in the community, even though he had remained in the town.

St. Jean has an emergency plan to deal with natural disasters, and most residents were aware of this. As indicated by the study conducted by Rahman and McLachlan (2001, p. 47), emergency plans and the existence of emergency committees are indicative of the overall emergency preparedness of a community. *Community members, not only keypersons, should be included in disaster related decision-making processes.* Numerous members of the community have dealt with many floods, (1950, 1979, 1996, and 1997) and could provide valuable insights to their experiences. In fact, 25 of the 49 respondents, or 51%, have lived

in St. Jean for 40 or more years. This is a significant amount of time to have lived in one community and it can be assumed that the experience that people have gained from living in this community and experiencing several large floods is vast. This is a vital reason for the residents having more involvement in the preparatory measures and decision-making processes to mitigate loss from natural disasters like flooding.

With the passing of time, people's perception of hazard often diminishes, as does their willingness to make adjustments to the hazard (Tierney, Lindell and Perry 2001). In addition, the International Joint Commission of the Red River Basin Task Force (2000, p.32) concludes that "analysis of the geological record, historic floods of the nineteenth century, statistics, and the hydrometeorological factors that cause floods in the Red River basin indicate that floods of the same size as in 1997, or even greater, can be expected in the future". Hence, the most effective time to implement further preparedness measures is the present. While many of the respondents felt that overall, they did well in managing the 1997 Flood, there are still many aspects of preparation that can be improved upon. Many of the respondents, both household and keyperson, noted that the lack of organization and communication was a major problem. *Better organization, and communication with all of the different agencies that are involved in a disaster, is paramount. In addition, preparedness could also be improved upon and increased, at both the household and community levels.* As Drabek (1986) has

noted, the more experience that a community has had with a hazard event, the more its residents will be eager to implement disaster planning.

## APPENDIX A – HOUSEHOLD QUESTIONNAIRE

### Natural Hazard Vulnerability and Community Response

#### SURVEY OF RED RIVER VALLEY FLOOD-1997 IMPACT (Household Residents Interview Schedule)

Respondent's Name: \_\_\_\_\_ Male \_\_\_\_\_ Female \_\_\_\_\_

Head of Household, if other than the Respondent:

Community of: \_\_\_\_\_

Date and Time of Interview: \_\_\_\_\_ am/pm

#### Role of Interviewer:

The interviewer's responsibility is to read the question EXACTLY AS WRITTEN. We require that EVERY respondent be presented with the identical questions. DO NOT ABBREVIATE any questions. You may explain the questions if it is not clear to respondent. But DO NOT prompt for answer unless there are specific prompt responses shown.

You must query any response if it is clear to you that it does not make any sense or if the answer appears unrealistic. Use your common sense in this regard – but DO NOT PUT any answer in the respondent's mind. Note that for many questions MULTIPLE response is possible. Do not force the respondents to give multiple answers.

#### Section A: Hazard Perception and Awareness

1. We are interested in knowing what have been the serious problems facing your community over the past 10 years. I am going to read you a list of problems commonly faced by communities much like yours. As I read the list, I will ask you to rate each problem on the list with a score between 1 and 10 to represent just how serious you think that problem has been for your community over the past 10 years. Here is a list with a scale from 1 to 10. Think of a score of 1 as no problem at all, and a score of 10 as a most serious problem. What score between 1 and 10 would you give to (REPEAT FOR EACH CATEGORY).

#### PROBLEM

- a. inflation
- b. drought
- c. unemployment
- d. crime
- e. damage or injury from flooding
- f. cuts in agriculture subsidies
- g. damage or injury from blizzards
- h. damage or injury from fires
- i. damage or injury from hailstorm
- j. damage or injury from tornadoes
- k. damage from pests
- l. water pollution
- m. air pollution
- n. drought condition
- o. severe snowfall
- p. rural depopulation

#### SCORE

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_ (e.g.. Crow Rate)  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

- q. shortage of farm labor \_\_\_\_\_
- r. genetically engineered seeds/food \_\_\_\_\_

- Any other problem/s:
- 1. \_\_\_\_\_
  - 2. \_\_\_\_\_
  - 3. \_\_\_\_\_
  - 4. \_\_\_\_\_

**Now I would like to turn to the issue of natural disasters, in particular, floods, blizzards, tornadoes, hailstorms and pests.**

2. Over the next 10 years, what are the chances that your community will experience a serious (REPEAT FOR EACH DISASTER)? What we mean by percent chance is the kind of thing we hear on weather reports, like "40 percent chance of rain." On a scale from 0 to 100 percent chance, where would you place your community's chance of experiencing a serious (repeat for each disaster)?

- a. flood \_\_\_\_\_%
- b. blizzards \_\_\_\_\_%
- c. tornadoes \_\_\_\_\_%
- d. hailstorms \_\_\_\_\_%
- e. heavy snowfall \_\_\_\_\_%
- f. drought \_\_\_\_\_%

3. We are interested in how concerned people are about what would happen to themselves or to their families if a serious natural disaster were to occur in this community. Are you very concerned, somewhat concerned, or not at all concerned....(repeat for each category)

Categories	Very concerned	somewhat concerned	not at all concerned	don't know
a. that the building you live in would suffer damage	2	1	0	9
b. that your household assets would be seriously damaged	2	1	0	9
c. that someone in your family would be seriously injured	2	1	0	9
d. that the fire or police depts. would be unprepared	2	1	0	9
e. that there would be long delays in getting people to hospitals	2	1	0	9
f. that hospitals would not be able to handle all the people needing care	2	1	0	9
g. that utilities would be out of service for days	2	1	0	9
h. that the dike may collapse	2	1	0	9

**Now I would like to ask your opinion about some things the provincial government could do to deal with the effects of natural disasters. There are, of course, some things every one seems to agree on—for example, that**

**warning systems should be accurate and that all government agencies should do every thing they can to reduce suffering in the immediate aftermath of a disaster. But on other issues, there is quite some disagreement.**

4. For instance, one view says that natural disasters cannot really be predicted or controlled. They can happen to almost anyone at any time. Since there is not much that can be done to reduce risks in advance, **the government should routinely provide financial assistance to victims of disasters for damage to their homes and other possessions.** How about you?

Agree strongly	3
Agree somewhat	2
Disagree somewhat	1
Disagree strongly	0
No opinion	9

5. Another view is that people really know the risks they are taking when they live in areas prone to floods, tornadoes, blizzards, and forest or brush fires **Since people take these risks knowingly, therefore, they alone should bear the costs of damage to their homes and other possessions.** How about you?

Agree strongly	3
Agree somewhat	2
Disagree somewhat	1
Disagree strongly	0
No opinion	9

6. Yet another view is that regardless of whether people really know the risks, **the government should keep people from building in dangerous areas through regulations on how land can be used.** How about you?

Agree strongly	3
Agree somewhat	2
Disagree somewhat	1
Disagree strongly	0
No opinion	9

7. A final view is that regardless of whether people really know the risk, **the government should require local building codes that would make people construct buildings safe and strong enough to withstand a serious natural disaster.** Do you agree strongly, agree somewhat, disagree somewhat, or disagree strongly....

Agree strongly	3
Agree somewhat	2
Disagree somewhat	1
Disagree strongly	0
No opinion	9

***I would like to discuss preventive measures that are taken at the provincial and local level.***

8. Many Manitoba communities have laws prohibiting people from constructing homes and other kinds of buildings in flood plains, areas prone to forest fires, or on sites close to river banks. How do you feel about such legislation for this community?

Strongly favor	3
Somewhat favor	2
Somewhat oppose	1
Strongly oppose	0
No opinion	9

9. As far as you know, does your community have such laws?

Yes	1
No	0
Don't know	9

10. Many Manitoba communities have laws requiring new buildings in flood plains to be flood-proofed, new buildings in fire areas to be fire resistant. How do you feel about such legislation for this community?

Strongly favor	3
Somewhat favor	2
Somewhat oppose	1
Strongly oppose	0
No opinion	9

11. As far as you know, does your community have any such laws?

Yes	1
No	0
Don't know	9

12. Have any of the kinds of local laws we have been talking about affected you or your family, for example, have they (repeat for each category)

	Yes	No	Don't know
a. raised your housing costs?	1	0	9
b. lowered your risks from natural disasters?	1	0	9
c. made it difficult to find the kind of housing you want?	1	0	9
d. made you feel safer?	1	0	9
e. caused higher taxes?	1	0	9
f. made you prepare better for natural disasters?	1	0	9
g. increased your insurance premium on your home or possessions?	1	0	9

13. In your community do you think the local laws we have been discussing have had any effects on your community.. for example, have they (repeat for each category)

	Yes	No	Don't know
a. made it more expensive for industry and business to locate in your community?	1	0	9
b. led to the construction of safer buildings?	1	0	9
c. raised the costs to tax payers of constructing new schools, hospitals, and other public buildings?	1	0	9
d. made the local fire and police dept. better prepared?	1	0	9
e. made your community seem a less desirable place for new people to move into?	1	0	9
f. raised the operating costs for industry and business already located in your community?	1	0	9
g. increased the costs of building new homes and apartments?	1	0	9
h. made people in the community better prepared?	1	0	9
i. made the buying and selling of homes far more complicated	1	0	9
j. produced housing shortages?	1	0	9

14. Some people think that the **dikes** and **sand bagging** saved much of their properties, and some people feel that these efforts damaged their properties. Do you feel that these efforts saved properties?

Agree strongly	3
Agree somewhat	2
Disagree somewhat	1
Disagree strongly	0
Don't Know	9

*Now I would like to ask some questions about public and private insurance.*

15. First, do you own or rent the home or apartment in which you live?

Own	1
Rent	0
Other (specify)	9

16. One way to protect communities from flood damages is to set up public flood insurance program. The idea behind the program is that the federal government will subsidize flood insurance for property owners in flood hazard areas, if, in return, local communities agree to establish policies which restrict further construction and development in those areas. Have you heard any discussion about a public program of that sort for this community?

Yes	1
No	0
Don't know	9

17. Thinking of the country as a whole, what would be your personal opinion about such a public insurance program?

Strongly favor	3
Somewhat favor	2
Somewhat oppose	1
Strongly oppose	0
No opinion	9

18. Did you ever try to get public flood insurance?

Yes	1	
No	0	(go to q. 22)
Don't know	9	(go to q. 22)

19. Do you currently have such public flood insurance?

Yes	1	
No	0	(go to q. 22)
Don't know	9	(go to q. 22)

20. Do you currently have private flood insurance?

Yes	1	
No	0	(go to q.22)
Don't Know	9	

21. Suppose your home was destroyed by a flood. Would your flood insurance cover,

All of loss	3
Most of loss	2
Some of loss	1
None of loss	0

Don't know 9

22. If someone were to buy the home/apartment unit in which you live, what do you think they would have to pay for it? Probe: what is your best estimate? \$....., .....

23. If the building in which you currently live was destroyed by a natural disaster, about how much do you think it would cost to rebuild it? Probe: what is your best estimate? \$....., .....

The next questions are about insurance of the contents of your home furniture, carpets, appliances and things like that--in case of a natural disaster.

24. Do you have **insurance just for the contents** of your home that would cover damage caused by floods, tornadoes, blizzards, fire or any other hazards?

Yes	1
No	0
Don't know	9

25. Do you have insurance just for the contents of your **farm-buildings** (e.g., grains, livestock, equipment, etc.) that would cover damage caused by floods, tornadoes, blizzards, fire or any other hazards?

Yes	1
No	0 (go to Q.27)
Don't know	9 (go to Q. 27)

26. Suppose the contents of your home/ farm building were damaged by a flood, tornado, blizzard or a fire. Would your insurance cover:

All of loss	3
Most of loss	2
Some of loss	1
None of loss	0
Don't know	9

27.a. Do you know that every community is supposed to have an **emergency plan** in order to deal with emergency situation such as the 1997 Flood

Yes	1	No	0	Don't Know	9
-----	---	----	---	------------	---

b. Do you think your family should have an **emergency plan**?

Yes	1	No	0	Don't Know	9
-----	---	----	---	------------	---

28. Does your Community have an **emergency plan**?

Yes	1	No	0	Don't Know	9
-----	---	----	---	------------	---

29. Does your community have an **emergency management committee**?

Yes	1	No	0	Don't Know	9
-----	---	----	---	------------	---

I am not aware of this plan or committee 3

30. What do you think might have been the cause/s of 1997 Flood?

1. Excess water in Red River
2. Heavy rain fall
3. Excess snowfall
4. Blizzard of April 1997
5. Quick spring thawing
6. Barriers on the natural flow e.g. dikes plugging the culverts

7. Increased drainage (enhancing the natural flow by conversion of marshes/wetlands to agricultural fields)
8. Will of God
9. Lack of respect to, and care of nature
10. Human activities, such as too much infrastructure development in the Valley
11. Red River Gate/Floodway
12. Change in climate
13. Other (specify) \_\_\_\_\_

**SECTION B: PAST AND PRESENT EXPERIENCES WITH NATURAL DISASTERS**

31. What is the distance of your home from the river bank? \_\_\_\_\_ meters  
note the Name of the nearest River. \_\_\_\_\_

32. Did the crest of the flood water approached your home/property,

- 1 Rapidly
- 2 Moderately rapidly
- 3 Slowly

33. How serious was this flood of 1997?

Extremely Serious	3
Very serious	2
Serious	1
Not serious	0

34. Can you recall of a flood worse than the 1997 Flood?

If yes, which year \_\_\_\_\_?

don't know \_\_\_\_\_ 9

35. Can you recall any other severe flood/s during last twenty years?

1. \_\_\_\_\_ year
2. \_\_\_\_\_ year
3. \_\_\_\_\_ year
4. \_\_\_\_\_ year

36. Is riverbank Erosion a hazard to your property? Yes 1 No 0

37. Is riverbank Erosion a hazard to your neighbors or community? Yes 1 No 0

38.. When you heard that the Red River water had flooded Grand Forks and was approaching your way, what precautionary measures did you undertake?

Measures: 1.

- 2.
- 3.
- 4.

39. Have any precautionary measures ever been suggested to you to help you cope with the ensuing flood hazard? If yes, what measures?

- Measures:
- 1.
  - 2.
  - 3.
  - 4.

40. Who suggested these measures?

1. Manitoba Emergency Management Organization (MEMO)
2. Emergency Preparedness Canada (EPC)
3. Natural Resources personnel
4. Agricultural Department personnel
5. RCMP
6. Local fire department
7. Local Emergency Coordinator
8. The Mayor/Reeve
9. The Church
10. Any social organization
11. Relatives/friends/neighbors
12. Radio/TV
13. Newspaper

41. Of the measures listed in Q 39, which have you adopted? \_\_\_\_\_

42. Given the measures that were suggested to you, what other action have you taken? \_\_\_\_\_

43. If you were subject to mandatory evacuation order, did you follow the order thoroughly?  
Yes 1 No 0

44. If no to Q 43, what did you do? \_\_\_\_\_  
\_\_\_\_\_

45. What is/are the reason/s for doing do? \_\_\_\_\_

46. What did you do well in managing the 1997 Flood? \_\_\_\_\_

47. What went wrong in the last disaster management that could be improved? \_\_\_\_\_

48. What needs to be done or changed to reduce the likelihood that a disaster would occur in the future?  
\_\_\_\_\_

49. What would you do differently if another disaster approaches your household in the future?  
\_\_\_\_\_

50. What resources/equipment did you have in the emergency of 1997? \_\_\_\_\_

51. What do you need for meeting emergency situations created by natural hazards in the future?  
\_\_\_\_\_

52. How much public assistance you have applied for? \$ \_\_\_\_\_

53. Have you received any flood assistance from any of the following sources? \_\_\_\_\_

54. If yes to Q 53, how much assistance did you receive from the sources listed below??

- |                                              |          |
|----------------------------------------------|----------|
| 1. Manitoba Disaster Assistance Board (MDAB) | \$ _____ |
| 2. Crop Insurance                            | \$ _____ |
| 3. Business Recovery Assistance (Federal)    | \$ _____ |
| 4. Red Cross Flood Assistance Program        | \$ _____ |
| 5. Mennonite Disaster Services Assistance    | \$ _____ |
| 6. Salvation Army Assistance                 | \$ _____ |
| 7 Any other source (specify) _____           | \$ _____ |

**Emergency measures the government undertook, such as temporary dike construction, and mandatory evacuation, did generate some resentment amongst some of the Red River Valley residents.**

55. What is your opinion about the **Dike Construction** the government undertook?

- |                           |   |
|---------------------------|---|
| Very useful measure       | 4 |
| Somewhat good measure     | 3 |
| Useless measure           | 2 |
| Somewhat damaging measure | 1 |
| Very damaging measure     | 0 |
| No opinion                | 9 |

56. Some people think that people are treated as movable property, and removed from the flooded area by a **Mandatory Evacuation Order**. Instead people should have been allowed to stay in to protect their own properties.

- |                   |   |
|-------------------|---|
| Agree strongly    | 3 |
| Agree somewhat    | 2 |
| Disagree somewhat | 1 |
| Disagree strongly | 0 |
| No opinion        | 9 |

57. Would you please rank the assistance/support you r received (if any) from the following agencies on a scale from 1 to 5?

- | Support from                                         | Rank      |
|------------------------------------------------------|-----------|
| a) Emergency Preparedness Canada (EPC)               | 1 2 3 4 5 |
| b) Manitoba Emergency Management Organization (MEMO) | 1 2 3 4 5 |
| c) Fire Department                                   | 1 2 3 4 5 |
| d) RCMP                                              | 1 2 3 4 5 |
| e) Department of Natural Resources                   | 1 2 3 4 5 |
| f) Department of Agriculture                         | 1 2 3 4 5 |
| g) Red Cross Flood Assistance Program                | 1 2 3 4 5 |
| h) Mennonite Disaster Services                       | 1 2 3 4 5 |
| i) Salvation Army                                    | 1 2 3 4 5 |
| j) Department of Defense (the military)              | 1 2 3 4 5 |
| k) Local Municipal Administration                    | 1 2 3 4 5 |
| l) Spontaneous Volunteer Groups                      | 1 2 3 4 5 |
| m) Any other organization/agency (specify) _____     | 1 2 3 4 5 |

58. In terms of disaster mitigation efforts, what changes have been made in your community since the Flood of 1997?

- 1) More infrastructures were built (Roads, Utilities , Government buildings, Industries etc.)
- 2) More dikes were built
- 3) Affected houses/buildings were raised above the 1997 Flood level
- 4) Communication systems were improved
- 5) Residents are now strictly subjected to land-use zoning regulations
- 6) Building codes in the flood-prone areas are now strictly enforced
- 7) Severely affected buildings/houses were relocated voluntarily
- 8) Severely affected buildings/houses were relocated through government initiatives (buy out)

**Experience of Flood:**

59. Have you ever personally experienced a serious flood, either in your present community or elsewhere before this flood of 1997?

Yes	1	
No	0	(go to Q.61)
Don't know	9	(go to Q.61)

60. In that flood(s), did you or any member of your household suffer property losses over \$5,000?

Yes	1
No	0
Don't know	9

61. Have you personally experienced the flood of 1997?

Yes	1	
No	0	(go to Q.66)
Don't know	9	(go to Q. 66)

62. Can you make an estimate of damages caused by this 1997 flood? We are interested in losses before any reimbursement by insurance companies or public assistance

	Replacement cost	Depreciated Cost
Homestead	\$ _____	\$ _____
Contents of the House	\$ _____	\$ _____
Farm houses	\$ _____	\$ _____
Machinery (specify)	\$ _____	\$ _____
Storage facilities	\$ _____	\$ _____
Stored Grains	\$ _____	\$ _____
Livestock	\$ _____	\$ _____
Fertilizer/pesticides stocks	\$ _____	\$ _____
Seeds	\$ _____	\$ _____
Nurseries	\$ _____	\$ _____
Business Loss	\$ _____	\$ _____
Any other losses	\$ _____	\$ _____

63. Did you suffer other revenue loss from any other business due to the flood of 1997? \$ \_\_\_\_\_

64. In that flood of 1997 that you personally experienced, did any close friends or relatives suffer property losses over \$5,000?

Yes 1                      No 0 (go to Q 66)                      Don't Know 9 (go to Q 66)

65. What are your estimates of damages to your relative/friend caused by that flood of 1997?

	Replacement cost	Depreciated Cost
a) House	\$ _____	\$ _____
b) Content of the house	\$ _____	\$ _____
c) Other personal properties	\$ _____	\$ _____
d) Other losses	\$ _____	\$ _____

**Experience of Fire:**

66. Have you ever personally experienced a serious fire, either in your present community or elsewhere?

Yes 1  
 No 0 (go to Q.72)  
 Don't know 9 (go to Q.72)

67. In that fire(s), did you or any member of your household suffer property losses over \$5,000?

Yes 1  
 No 0  
 Don't know 9

68. Can you make an estimate of damages caused by that fire? We are interested in losses before any reimbursement by insurance companies or public assistance.

	Replacement Cost	Depreciated Cost
Homestead	\$ _____	\$ _____
Contents of house	\$ _____	\$ _____
Farm houses	\$ _____	\$ _____
Machinery (specify)	\$ _____	\$ _____
Storage facilities	\$ _____	\$ _____
Stored Grains	\$ _____	\$ _____
Livestock	\$ _____	\$ _____
Fertilizer/pesticides stock	\$ _____	\$ _____
Seeds	\$ _____	\$ _____
Nurseries	\$ _____	\$ _____
Business loss	\$ _____	\$ _____
Any other losses	\$ _____	\$ _____

69. Did you suffer other revenue loss from any other business due to that fire? \$ \_\_\_\_\_

70. In that fire that you personally experienced, did any close friends or relatives suffer property losses over \$5000?

Yes 1  
 No 0 (go to Q 72)  
 Don't know 9 (go to Q 72)

71. What are your estimates of damages to your relative/friend caused by that fire?

	Replacement cost	Depreciated cost
a) House	\$ _____	\$ _____
b) Content of the house	\$ _____	\$ _____
c) Other personal properties	\$ _____	\$ _____
d) Other losses	\$ _____	\$ _____

**Experience of Tornado:**

72. Have you ever personally experienced a serious tornado, either in your present community or elsewhere?

Yes	1	
No	0	(go to Q.78)
Don't know	9	(go to Q.78)

73. In that tornado(s), did you or any member of your household suffer property losses over 5,000?

Yes	1
No	0
Don't know	9

74. Can you make an estimate of damages caused by that tornado? We are interested in losses before any reimbursement by insurance companies or public assistance.

	Replacement Cost	Depreciated Cost
Homestead	\$ _____	\$ _____
Contents of the house	\$ _____	\$ _____
Farm houses	\$ _____	\$ _____
Machinery	\$ _____	\$ _____
Storage facilities	\$ _____	\$ _____
Stored Grains	\$ _____	\$ _____
Livestock	\$ _____	\$ _____
Fertilizer/pesticides	\$ _____	\$ _____
Seeds	\$ _____	\$ _____
Nurseries	\$ _____	\$ _____
Business loss	\$ _____	\$ _____
Any other losses	\$ _____	\$ _____

75. Did you suffer other revenue loss from any other business due to that tornado? \$ \_\_\_\_\_

76. In that tornado that you personally experienced, did any close friends or relatives suffer property losses over \$5,000?

Yes	1
No	0
Don't know	9

77. What are your estimates of damages to your relative/friend caused by that tornado?

	Replacement cost	Depreciated Cost
a) House	\$ _____	\$ _____
b) Content of the house	\$ _____	\$ _____

c) Other personal properties \$ \_\_\_\_\_ \$ \_\_\_\_\_  
 d) Other losses \$ \_\_\_\_\_ \$ \_\_\_\_\_

**Experience of Blizzards:**

78. Have you ever personally experienced a serious blizzard, either in your present community or elsewhere before the blizzard/flood of 1997?

Yes 1  
 No 0 (go to Q.84)  
 Don't know 9 (go to Q.84)

79. In that blizzard(s), did you or any member of your household suffer property losses over \$5,000?

Yes 1  
 No 0  
 Don't know 9

80. Can you make an estimate of damages caused by that blizzard? We are interested in losses before any reimbursement by insurance companies or public assistance.

	Replacement cost	Depreciated Cost
Homestead	\$ _____	\$ _____
Contents of the House	\$ _____	\$ _____
Farm Houses	\$ _____	\$ _____
Machinery (specify)	\$ _____	\$ _____
Storage facilities	\$ _____	\$ _____
Stored Grains	\$ _____	\$ _____
Livestock	\$ _____	\$ _____
Fertilizer/pesticides	\$ _____	\$ _____
Seeds	\$ _____	\$ _____
Nurseries	\$ _____	\$ _____
Business Loss	\$ _____	\$ _____
Any other losses	\$ _____	\$ _____

81. Did you suffer other revenue loss from any other business due to that blizzard? \_\_\_\_\_

82. In that blizzard that you personally experienced, did any close friends or relatives suffer property losses over \$5,000?

Yes 1  
 No 0  
 Don't know 9

83. What are your estimates of damages to your relative/friend caused by that blizzard?

	Replacement cost	Depreciated Cost
a) House	\$ _____	\$ _____
b) Content of the house	\$ _____	\$ _____
c) Other personal Properties	\$ _____	\$ _____
d) Other losses	\$ _____	\$ _____

Now I would like to ask some questions about leaving your home quickly in an emergency.

84. In case you had to evacuate your home in a hurry because of a serious disaster, such as, fire or flood

	Yes	No	Don't know
a) Do you have any young children who could not get out by themselves?	1	0	9
b) Do you have any elderly or ill people living with you who could not get out by themselves?	1	0	9
c) Do you have any pets who could not get out by themselves?	1	0	9

85. Do you have any gas appliances in your home, such as a gas stove or clothes dryer, or a gas furnace or hot water heater?

Yes	1
No	0
Don't know	9

86. Do you have any of the following in or around your home?

	Yes	No	Don't know
a) a first aid kit	1	0	9
b) a fire extinguisher	1	0	9
c) a fire hose or garden hose	1	0	9
d) a smoke alarm	1	0	9
e) a Kerosene or Coleman type lamp	1	0	9
f) emergency lights (candles or flash lights)	1	0	9
g) a portable radio	1	0	9
h) a boat	1	0	9
i) emergency food stock	1	0	9
j) generator	1	0	9
k) Other items (specify)			

87. Suppose that in the face of an imminent disaster, you have to move your household members out of the current habitat immediately. What kind of transport do you have under your disposal for such emergency movement?

- 1) Car
- 2) Small Truck
- 3) RV
- 4) Tractor with a trailer
- 5) Motorized Boat
- 6) Rubber Boats
- 7) Hovercraft
- 8) Other vehicle (specify) \_\_\_\_\_

**Section C: General social and economic data.**

88. Was there any conflict during the emergency period of the 1997 Flood? \_\_\_\_\_

89. Was your community supportive during the emergency of 1997? Yes 1 No 0

90. If yes to Q 89, from whom did you have the most support?

1. The local church
2. Community Clubs/Associations
3. Neighbors/Friends
4. Ward members, RM Councilors, Reeve

91. Would you please rank the support you received (if any) from the following on a scale of 1 to 5?

Support from	RANK				
-Neighboring communities	1	2	3	4	5
-The local church	1	2	3	4	5
-Community clubs/associations	1	2	3	4	5
-Neighbors/Friends/Relatives	1	2	3	4	5
Ward members, RM Councilors, Reeve	1	2	3	4	5

92. In national politics, do you consider yourself a supporter of PC, Liberals, NDP, Reform, or and Independent?

- 01) PC
- 02) Liberal
- 03) NDP
- 04) Reform
- 05) Independent
- 06) Indifferent in party politics
- 09) Refuse to respond

93. For how many years altogether have you lived in this community?

(IF less than one year, enter 99) \_\_\_\_\_ years.

94. What type of dwelling unit are you currently living in?

- |                                |   |
|--------------------------------|---|
| a) Unattached home             | 1 |
| b) Duplex or triplex           | 2 |
| c) Other type of attached home | 3 |
| d) Apartment                   | 4 |
| e) Other (specify)             | 5 |

95. In what year were you born? 19 \_\_\_\_\_

96. Are you currently.....

- 1) Married
- 2) Widowed
- 3) Divorced
- 4) Separated
- 5) Never married

97. What was the highest grade you finished in school/college/university \_\_\_\_\_

98. How many people besides yourself are members of your household? \_\_\_\_\_

a. How many of these are your children under 18 \_\_\_\_\_

99. Aside from your immediate household, do you have any close family or relatives living in your home?

Yes                      1                      No                      0

100. Do you have any financial investments in Winnipeg or other places in Canada?

	Yes	No	Don't know
a. Residential property (other than own home)	1	0	9
b. Business property	1	0	9
c. Land	1	0	9
d. commercial enterprises	1	0	9
e. stocks and bonds	1	0	9

101. Are you currently employed?

Yes 1

No 0

If yes, is that 02)Full time 01)Part time

102. Do you currently receive social assistance? Yes 1 No 0

103. What is your and your partner's principle occupation?

\_\_\_\_\_ self

\_\_\_\_\_ partner

104. What do you actually do on your job? (record main activities only).

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

105. (If other people live in this household) Is there another person who is a wage earner in your household? Probe: If more than one additional wage earner, select the person who makes the largest contribution to the family besides you.

Yes 1. No 0

a) If yes: Does that person have a full or part-time job? Full time 2  
 Part-time 1

b) What is his/her Occupation? \_\_\_\_\_

106. What was your total before-tax family income (less operating costs), from all sources in 1999?

- (01) Under \$30,000
- (02) \$30,000-44,999
- (03) \$45,000-59,999
- (04) \$60,000-74,999
- (05) \$75,000-89,999
- (06) \$100,000 or over
- (12) Don't know

(13) REFUSE to answer

107. a) If farming household, what is the size of your farm \_\_\_\_\_ Ha

b) Owner operator 1.

c) Tenant operator 2.

108. What type of farm you operate? (circle the letters)

- a. Grain farm
- b. Cattle-grain farm
- c. Dairy-grain farm
- d. Dairy farm
- e. Poultry farm
- f. Hog farm
- g. Any other type \_\_\_\_\_

109. What principle crop/s do you grow?

Last year (1999)

1 _____	_____ ha
2 _____	_____ ha
3 _____	_____ ha

110. What is the total approximate value of your total assets?

- 1. Residence \$ \_\_\_\_\_
- 2. Equipment and machinery \$ \_\_\_\_\_
- 3. Livestock/poultry \$ \_\_\_\_\_
- 4. Storage facilities (Barns, grain bins etc.) \$ \_\_\_\_\_
- 5. Grain reserve \$ \_\_\_\_\_
- 6. Other \$ \_\_\_\_\_

111. Did you experience a shortage of emergency equipment/supplies during the Flood of 1997?

If yes, what are those

- 1) Water pump
- 2) Sump pump
- 3) Sand bags
- 4) Vehicle
- 5) Boat
- 6) Emergency medical kit
- 7) Portable Radio
- 8) Flashlight
- 9) Volunteers
- 10) Other (specify) \_\_\_\_\_

112. Finally, did you experience any stress during the Flood of 1997? Yes 1 No 0

113. If yes to Q 112, what caused the stress? \_\_\_\_\_

(use back of page if necessary)

114. Did the stress you experienced have any lasting affect on yourself? Yes 1 No 0

115. If yes to Q 114, would you please explain what was the affect? \_\_\_\_\_

116. Did the stress you experience have any lasting affect on your family? Yes 1 No 0

117. Of yes to Q 116, would you please explain what was the affect? \_\_\_\_\_

118. Was counseling services to your stress problem provided by anyone? Yes 1 No 0

119. If yes to Q 118, specify who provided the service \_\_\_\_\_

120. Was the stress counseling provided adequate?    1 Adequate            0 Inadequate

**End of interview.**

**Thank you very much for your time and help.**

Name of Interviewer \_\_\_\_\_ Time interview ended \_\_\_\_\_

## APPENDIX B – KEYPERSONS QUESTIONNAIRE

### Keyperson

#### SECTION A: HAZARD PERCEPTION AND AWARENESS

1. We are interested in knowing what have been the serious problems facing your community over the past 10 years. Here is a list of problems commonly faced by communities much like yours. Please rate each problem on the list with a score between 1 and 10 to represent just how serious you think that problem has been for your communality over the past 10 years. Here is a list with a scale from 1 to 10. Think of a score of 1 as no problem at all, and a score of 10 as a most serious problem. What score between 1 and 10 would you give to each of the following problem?

<u>PROBLEM</u>	<u>SCORE</u>
a. inflation	_____
b. drought	_____
c. unemployment	_____
d. crime	_____
e. damage or injury from flooding	_____
f. cuts in agriculture subsidies	_____ (e.g. Crow Rate)
g. damage or injury from blizzards	_____
h. damage or injury from fires	_____
i. damage or injury from hailstorm	_____
j. damage or injury from tornadoes	_____
k. damage from pests	_____
l. water pollution	_____
m. air pollution	_____
n. drought condition	_____
o. severe snowfall	_____
p. rural depopulation	_____
q. shortage of farm labour	_____
r. civil disorder	_____
s. water pollution	_____
t. hazardous material	_____

Any other problems:

1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____

2. Thinking back over the last years, has your municipality experienced any of the following disaster that you would consider to be a serious event?

	Yes	No	Don't Know
1. Flood	1	0	9 (please circle a number)
2. Tornado	1	0	9
3. Blizzard	1	0	9
4. Drought	1	0	9
5. Forest Fire	1	0	9

Events                      Years of occurrence                      What were the lasting economic effects of that event?

1. Flood
2. Tornado
3. Blizzard
4. Drought
5. Forest Fire

3. Was there any change in public policy as a result of that/those disaster/s that your municipality experienced over the last ten years? (e.g. new legislation, new government agency)

Yes    1                      No                      0                      Don't Know    9

4. If yes to Q. 3,                      Which disaster                      Year of legislation what was changed in legislation

1. Flood
2. Tornado
3. Blizzard
4. Drought
5. Forest Fire

5. Over the next 10 years, what are the chances that your community will experience a serious (REPEAT FOR EACH DISASTER)? What we mean by percent chance is the kind of thing we hear on weather reports, like "40 percent chance of rain." On a scale from 0 to 100 percent chance, where would you place your community's chance of experiencing a serous (repeat for each disaster)?

- a. flood                      \_\_\_\_\_
- b. blizzards                      \_\_\_\_\_
- c. tornadoes                      \_\_\_\_\_
- d. hailstorms                      \_\_\_\_\_

- e. heavy snowfalls \_\_\_\_\_
- f. drought \_\_\_\_\_

6. How do you feel about what would happen to people or to their families if a serious natural disaster were to occur in this community. Are you very concerned, somewhat concerned, or not at all concerned.... (repeat for each category).

Categories	very concerned	somewhat concerned	not at all concerned	don't know
a. that the housing in community would suffer damage.	2	1	0	9
b. that peoples' household assets would be seriously damaged.	2	1	0	9
c. that someone in the community would be seriously injured.	2	1	0	9
d. that the fire or police depts. would be unprepared.	2	1	0	9
e. that there would be long delays in getting people to hospitals	2	1	0	9
f. that hospitals would not be able to handle all the people needing care.	2	1	0	9
g. that utilities would be out of service for days.	2	1	0	9
h. that the dike may collapse	2	1	0	9

7. What is your opinion about some things the provincial government could do to deal with the effects of natural disasters? There are, of course, some things everyone seems to agree on—for example, that warning systems should be accurate and that all government agencies should do everything they can to reduce suffering in the immediate aftermath of a disaster. But on other issues, there is quite some disagreement. For instance, one view says that natural disasters cannot really be predicted or controlled. They can happen to almost anyone at any time. Since there is not much that can be done to reduce risks in advance, the government should routinely provide financial assistance to victims of disasters for damage to their homes and other possessions.

How about you?

Agree strongly	3
Agree somewhat	2
Disagree somewhat	1
Disagree strongly	0
No opinion	9

8. Another view is that people really know the risks they are taking when they live in areas prone to floods, tornadoes, blizzards, and forest or brush fire. Since people take these risks knowingly, therefore, they alone should bear the costs of damage to their homes and other possessions. How about you?

Agree strongly	3
Agree somewhat	2
Disagree somewhat	1
Disagree strongly	0

No opinion 9

(If you have more to say on any one of these questions, please use the other side of this page/s)

9. Yet another view is that regardless of whether people really know the risks, the government should keep people from building in dangerous areas through regulations on how land can be used. How about you?

Agree strongly 3  
Agree somewhat 2  
Disagree somewhat 1  
Disagree strongly 0  
No opinion 9

10. A final view is that regardless of whether people really know the risk, the government should require local building codes that would make people construct buildings safe and strong enough to withstand a serious natural disaster. Do you agree strongly, agree somewhat, disagree somewhat, or disagree strongly.

Agree strongly 3  
Agree somewhat 2  
Disagree somewhat 1  
Disagree strongly 0  
No opinion 9

#### On Preventive Measures

11. Many Manitoba communities have laws prohibiting people from constructing homes and other kinds of buildings in flood plains, areas prone to forest fires, or on sites close to riverbanks. How do you feel about such legislation for this community?

Strongly favor 3  
Somewhat favor 2  
Somewhat oppose 1  
Strongly oppose 0  
No opinion 9

12. As far as you know, does your community have such laws? Yes 1 No 0 Don't know 9

13. Many Manitoba communities have laws requiring new building in flood plains to be flood-proofed, new buildings in fire areas to be fire resistant. How do you feel about such legislation for this community?

Strongly favor 3  
Somewhat favor 2  
Somewhat oppose 1  
Strongly oppose 0  
No opinion 9

14. As far as you know, does your community have any such laws?

Yes 1 No 0 Don't know 9

15. As far as you know, does Manitoba currently have province-wide regulation or restrictions concerning development and construction in areas that are subject to floods?

Yes 1 No 0 Don't know 9

16. If yes to Q. 15, how effective have the provincial regulations been on restricting development and construction in flood hazard areas?

Very effective 1

Somewhat effective 2  
 Not too effective 3  
 Don't know 9

17. Have any of the kinds of local laws we have been talking about affected your community? Do you think the local laws we have been discussing have had any effects on your community, for example, have they (repeat for each category)

	Yes	No	Don't know
a. made it more expensive for industry and business to locate in your community?	1	0	9
b. led to the construction of safer buildings?	1	0	9
c. raised the costs to tax payers of constructing new schools, hospitals, and other public buildings?	1	0	9
d. made the local fire and police dept. better prepared?	1	0	9
e. made your community seem a less desirable place for new people to move into?	1	0	9
f. raised the operating costs for industry and business already located in your community?	1	0	9
g. increased the costs of building new homes and apartments?	1	0	9
h. made people in the community better prepared?	1	0	9
i. made the buying and selling of homes far more complicated	1	0	9
j. produced housing shortages	1	0	9

18. Some people think that the dikes and sand bagging saved much of their properties, and some people feel that these efforts damaged their properties. Do you feel that these efforts saved properties?

Agree strongly	3	any other comment:
Agree somewhat	2	
Disagree somewhat	1	
Disagree strongly	0	
Don't know	9	

19. Some people argue that the government should make vulnerable areas safer by building protective public works, such as flood-water reservoir, levees, embankments/permanent dikes, and the like. According to this view, the government should spend money on those structural protective measures rather than on spending money on disaster assistance. Do you:

Agree strongly	3	any other comment:
Agree somewhat	2	
Disagree somewhat	1	
Disagree strongly	0	
Don't know	9	

### On Public and Private Insurance

20. The next set of questions is about public flood insurance program. The idea behind such a program is that the government will subsidize flood insurance for property owners in flood hazard areas, if, in return, local communities agree to establish policies which restrict further construction and development in those areas. Have you heard any discussion about a public program of that sort for this community?

Yes	1	No	0	Don't Know	9	any other comment:
-----	---	----	---	------------	---	--------------------

21. Thinking of the country as a whole, what would be your personal opinion about such a program?

Strongly favor	3
Somewhat favor	2
Somewhat oppose	1
Strongly oppose	0
No opinion	9

22. Did you ever advocate flood insurance to your community?

Yes	1	No	0	Indifferent	9
-----	---	----	---	-------------	---

23. Do you currently have such insurance for yourself?

Yes	1	No	0	Don't know	9
-----	---	----	---	------------	---

24. Suppose your own home was destroyed by a flood. Would your flood insurance cover,

All of loss	3
Most of loss	2
Some of loss	1
None of loss	0
Don't know	9

25. The next questions are about insurance of the contents of your home; furniture, carpets, appliances and things like that—in case of a natural disaster. Do you have insurance just for the contents of your home that would cover damage caused by floods, tornadoes, blizzards, fire or any other hazards?

Yes	1	No	0	Don't Know	9
-----	---	----	---	------------	---

26. Suppose the contents of your home were damaged by a disaster (flood, tornado, blizzard or a fire). Would your insurance cover:

All of loss	3
Most of loss	2
Some of loss	1
None of loss	0
Don't know	9

### On Emergency Planning and Training

27. Do you know that every municipality is supposed to have an emergency plan in order to deal with emergency situation such as the 1997 Flood?

Yes	1	No	0
-----	---	----	---

28. Does your Municipality have an Emergency plan?

Yes	1	No	0	I am not aware of such a plan	9
-----	---	----	---	-------------------------------	---

29. Does your Municipality have an Emergency Management Committee?

Yes	1	No	0	I am not aware of such committee	9
-----	---	----	---	----------------------------------	---

30. Do you have any training on emergency management?

Yes	1	No	0
-----	---	----	---

31. If yes to Q 30, where did you get the training? \_\_\_\_\_

32. What was the training on? \_\_\_\_\_

33. Does any one else in the municipality have this training?

Yes 1 No 0

34. If yes to Q 33, who has the training? \_\_\_\_\_

35. Where did he get the training? \_\_\_\_\_

36. What was the training on? \_\_\_\_\_

37. Do you know who offers training in emergency management in Manitoba?

Yes 1 No 0

(if yes, name the organization that provided the training) \_\_\_\_\_

38. Does your municipal administration have a system in place to educate people about the impact of disasters, possible method of adjustment and mitigation, and on the kinds of assistance available from the municipal office?

Yes 1 No 0

39. If yes to Q 38, please elaborate briefly \_\_\_\_\_  
\_\_\_\_\_

40. Are you familiar with the Emergency Measures Act of Manitoba?

Yes 1 No 0

41. Is there any representative/s of the rural municipalities to the Manitoba Emergency Planning Committee?

Yes 1 No 0

42. During this 'flood of the century', the Manitoba Emergency Management Organization (MEMO) coordinated province's response to the flood emergency through an Emergency Operations Centre (EOC). Was there any one to represent your municipality in that EOC?

Yes 1 No 0

43. If not to Q 42, why not? \_\_\_\_\_  
\_\_\_\_\_

44. What do you think about the cause/s of the flood of 1997?

- 1) Excess water in the Red River
- 2) Heavy rain fall
- 3) Excessive snowfall
- 4) Blizzard
- 5) Quick spring thawing
- 6) Barriers on the natural flow e.g. dikes, plugging the culverts,
- 7) Increased draining in the Valley (i.e. Conversion of marshes/wetlands to agricultural fields)
- 8) Will of God
- 9) Lack of respect to, or care of nature
- 10) Human activities, such as too much infrastructure development in the Red River Valley
- 11) Red River Floodgate/Floodway

12) Change in climate

13) Any other cause (Specify) \_\_\_\_\_  
\_\_\_\_\_

**SECTION B: PAST AND PRESENT EXPERIENCE WITH NATURAL DISASTERS**

45. What is the distance of your home from the river bank? \_\_\_\_\_ meters  
note the Name of nearest River \_\_\_\_\_

46. Did the crest of the flood water approach your community,

01) Rapidly    02) Moderately rapidly    03) Slowly

47. How serious was the flood of 1997?

03) Extremely Serious    02) Very Serious    01) Serious    0) Not Serious

48. Can you recall a flood worse than this one? If yes, which year \_\_\_\_\_? Don't know    0

49. Can you recall other severe floods during last twenty years?

1. \_\_\_\_\_ year    2. \_\_\_\_\_ year    3. \_\_\_\_\_ year    4. \_\_\_\_\_ year    5. \_\_\_\_\_ year

50. Is riverbank Erosion a hazard to your community?

Yes    1    No    0    don't know    9

51. When you heard that the Red River water had flooded Grand Forks in 1997, and was approaching your way, what precautionary measures did you undertake?

Measures:    1.  
                  2.  
                  3.  
                  4.  
                  5.

52. Have any precautionary measures ever been suggested to you to help you cope with the ensuing flood hazard?

Yes    1    No    0

53. If yes to Q 52, what measures were suggested?

Measures:    1.  
                  2.  
                  3.  
                  4.  
                  5.

54. Who suggested these measures?

1. Emergency Preparedness Canada (EPC)  
2. Manitoba Emergency Management Organization (MEMO)



Agree somewhat	2
Disagree somewhat	1
Disagree strongly	0
No opinion	9

63. As the first local level responder to the flood emergency of 1997, what serious problem/s did you face?

- 01) Lack of emergency resources
- 02) Shortage of Experienced/Trained personnel
- 03) Cooperation from local residents
- 04) Weak communication system
- 05) Lack of appropriate Transport (e.g. Inflatable boats, Hovercraft etc.)
- 06) Lack of Coordination among various agencies involved in the emergency management
- 07) Others \_\_\_\_\_

64. Have you ever personally experienced a serious flood, either in your present community or elsewhere before this flood of 1997?

Yes 1                      No 0                      Don't Know 9

65. In that flood(s), did you or any member of your household suffer property losses over \$5,000? We are interested in losses before any reimbursement by insurance companies or public assistance.

Yes 1                      No 0                      Don't Know 9

66. Can you make an estimate of damages to your property caused by the 1997 flood?

Homestead	\$ _____
Content of the House	\$ _____
Farm houses	\$ _____
Machinery (specify)	\$ _____
Storage facilities	\$ _____
Stored Grains	\$ _____
Fertilizer/pesticides stocks	\$ _____
Seeds	\$ _____
Nurseries	\$ _____
Business Loss	\$ _____
Any other losses	\$ _____
Can not estimate	9

67. What did you do well in managing the 1997 Flood for your community?

---



---



---

68. What went wrong in managing the last disaster in 1997?

---



---



---

69. What would you do differently if another disaster approaches your community in future?

---



---



---

70. What needs to be done or changed to reduce the likelihood that a disaster would occur in the future?

---



---



---

71. What resources/equipment did you have at the time of the 1997-Flood emergency?

---



---



---

72. What resources and/or equipment would you need in managing future emergencies in your community?

---



---



---

73. Who should provide these resources/equipment for your community?

---



---



---

74. In terms of disaster mitigation efforts, what changes have been made in your community since the flood of 1997?

- 1) More infrastructures were built (Roads, Utilities, Government buildings, Industries etc.)
- 2) More dikes were built
- 3) Affected houses/buildings were raised above the 1997 Flood level
- 4) Communication systems were improved
- 5) Residents are now strictly subjected to land-use zoning regulations
- 6) Building codes in the flood-prone areas are now strictly enforced
- 7) Severely affected buildings/houses were relocated voluntarily
- 8) Severely affected buildings/houses were relocated through government initiatives (buy out)
- 9) Others (specify \_\_\_\_\_)

75. How would you evaluate the performance of various emergency response agencies, such as EMO, the Military, Department of Natural Resources etc.

---



---



---

76. Could you please rank the assistance/support you received for your community (if any) from the following agencies on a scale from 1 to 5? (5 most 1 least)

Support from	Rank	Remarks (e.g., agencies not involved)
a) Emergency Preparedness Canada (EPC)	1 2 3 4 5	
b) Manitoba Emergency Management Organization (MEMO)	1 2 3 4 5	
c) Fire Department	1 2 3 4 5	
d) RCMP	1 2 3 4 5	
e) Department of Natural Resources	1 2 3 4 5	
f) Department of Agriculture	1 2 3 4 5	
g) Red Cross Flood Assistance Program	1 2 3 4 5	
h) Mennonite Disaster Services	1 2 3 4 5	
i) Salvation Army	1 2 3 4 5	

- j) Department of Defense (the military) 1 2 3 4 5
- k) Local Municipal Administration 1 2 3 4 5
- l) Spontaneous Volunteer Groups 1 2 3 4 5
- m) Any other organization/agency (specify) \_\_\_\_\_ 1 2 3 4 5
- n) Other agencies (specify) \_\_\_\_\_ 1 2 3 4 5

77. Would you please rank on a scale of 1 to 5 the support you received (if any) from the following in the matter of managing local emergency during Flood of 1997?

Support from	Rank
Neighboring Communities	1 2 3 4 5
Local church	1 2 3 4 5
Community Clubs/Associations	1 2 3 4 5
Local municipal administration	1 2 3 4 5
Local businesses	1 2 3 4 5
Any other (specify) _____	1 2 3 4 5

78. Did you experience a shortage of emergency equipment/supplies in managing the emergency situation during the flood of 1997?

Yes 1 No 0

79. If yes to Q78, what are those equipment/supplies?

- 1) Water pump
- 2) Sump pump
- 3) Sand bags
- 4) Vehicle
- 5) Boat
- 6) Emergency medical kit
- 7) Portable Radio
- 8) Flashlight
- 9) Volunteers
- 10) Other (specify) \_\_\_\_\_

**SECTION C: SOME MORE GENERAL QUESTIONS.**

80. In national politics, do you consider yourself a supporter of PC, Liberals, NDP, Reform or an Independent?

- 01) PC 02) Liberal 03) NDP 04) Reform (Canadian Alliance) 05) Independent
- 06) Indifferent in party politics 09) Refuse to respond

81. How long have you been in your present official position? \_\_\_\_\_ years.

82. If respondent is involved in the local municipal administration, do you have any other occupation, other than the present official positions?

- 01) Farming 02) Business 03) Employment in the private sector 09) None

83. What was your total before-tax family income in 1999? (Optional)

- a) less than \$50,000
- b) between \$50,000 - \$100,000
- c) more than \$100,000

84. If farming household, what is the size of your farm \_\_\_\_\_ Ha. 01) Owner operator  
02) Tenant operator

85. What type of farm do you operate?

- a) Cattle-grain farm
- b) Dairy-grain farm
- c) Dairy farm
- d) Poultry farm
- e) Hog farm
- f) Any other type \_\_\_\_\_ (circle the letters)

86. What principle crop/s do you grow?

Crops	Acreage cultivated in 1999
1 _____	_____
2 _____	_____
3 _____	_____

87. Was there any change in acreage cultivated by you in 1997,1998, and in 1999 as a result of 1997 flood?

88. What are those changes? \_\_\_\_\_

89. What is the total approximate value of your farm assets (Optional)

- 1. Equipment and machinery \$ \_\_\_\_\_
- 2. Livestock/poultry \$ \_\_\_\_\_
- 3. Storage facilities (Barns, grain bins etc) \$ \_\_\_\_\_
- 4. Grain reserve \$ \_\_\_\_\_
- 5. Other \$ \_\_\_\_\_

90. Was there any conflict during the emergency period of the 1997 flood?

Yes 1 No 0

91. If yes to Q90, conflict arose between? a) 1. \_\_\_\_\_ and 2) \_\_\_\_\_  
b) 1. \_\_\_\_\_ and 2) \_\_\_\_\_  
c) 1. \_\_\_\_\_ and 2) \_\_\_\_\_

92. What was/were the cause/s of such conflict/s \_\_\_\_\_  
\_\_\_\_\_

93. Finally, could you please tell us what are the primary needs of your community in terms of preparedness for, and mitigation of, future disasters? \_\_\_\_\_

---

---

---

**End of questionnaire. Thank you very much for your time and help.**

## **APPENDIX C – BREAKDOWN OF HOUSEHOLD QUESTIONNAIRE**

### **A. Hazard Perception and Awareness – 30 questions**

Question 1: Severity rating of different types of hazards

Questions 2-3: Natural hazards and impact

Questions 4-7: Provincial government loss reduction

Questions 8-14: Provincial and local preventative measures

Questions 15-26: Public and private insurance

Questions 27-29: Emergency plans

Question 30: Causes of 1997 Flood

### **B. Past and Present Experience with Natural Disasters – 57 questions**

Questions 31-54: 1997 Flood effect and management

Questions 55-58: Emergency measures, including dike construction and evacuation

Questions 59-65: Experience of flood, including losses

Questions 66-71: Experience of fire

Questions 72-77: Experience of tornado

Questions 78-83: Experience of blizzards

Questions 84-87: Emergency evacuation of individual homes

### **C. General Social and Economic Data**

Questions 88-120: various questions regarding support received in the community, political affiliation, length of time lived in community, age, education, finances, assets, employment, stress levels during 1997 Flood.

## **APPENDIX D – BREAKDOWN OF KEYPERSONS QUESTIONNAIRE**

### **A. Hazard Perception and Awareness – 44 questions**

Question 1: Severity rating of different types of hazards

Question 2: Natural hazards and impact

Questions 3-4: Public policy/legislation resulting from disasters

Question 5: Natural disaster occurrence

Question 6: Community preparedness

Questions 7-10: Government intervention

Questions 11-19: Preventative measures

Questions 20-26: Public and private insurance

Questions 27-44: Emergency planning and training

### **B. Past and Present Experience with Natural Disasters – 35 questions**

Questions 45–50: 1997 Flood effect and management

Questions 51–62: Emergency measures, including dike construction and evacuation

Questions 63-66: Experience of flood, including losses

Questions 67-79: Overall experience during 1997 Flood and preparatory measures

### **C. General Social and Economic Data – 14 questions**

Questions 80-93: various questions regarding political affiliation, length of time lived in community, age, education, finances, assets, employment, stress levels during 1997 Flood related to conflict, and primary needs of the community to enable preparedness for future disasters.

## APPENDIX E - CONSENT FORM

### INFORMED CONSENT TO PARTICIPATE IN THE STUDY

#### **Interviewer must obtain the respondent's signature:**

The Community Differentials in Hazard Perception and Emergency Response Needs is a research project sponsored by Emergency Preparedness Canada (EPC) and being undertaken by Dr. Matiur Rahman (Phone 204-XXX-XXXX), Assistant Professor of Geography and Dr. Stephane MacLachlan (204-XXX-XXXX), Assistant Professor, Environmental Science Program, University of Manitoba, Canada. This study is conducted in associate with Mr. Terrance Nelson (Phone 204-XXX-XXXX), a researcher and writer for the Anishinabe First Nation in Roseau River, and Ms. Marj Heinrichs (Phone 204-XXX-XXXX), a freelance journalist and social worker from Rosenort, in the RM of Morris.

The aim of this research is to collect information on the community's perception of, and preparedness needs assessment for, Natural Hazards. This information will be circulated to government agencies in Canada. We believe that there has not previously been any attempt collect information which summarized the plight and difficulties faced by rural people when there occurs a natural hazard such as the flood of 1997.

We do not promise that this research will have any direct impact upon improving your conditions. We do, however, guarantee that the information we gather and analyze will reach the ears of people in government who are in a position to formulate programs and polices aimed at assisting hazard prone communities. We believe that the collection of a data base will give such agencies the necessary information which may, hopefully, lead to more effective planning and mitigation measures in disaster affected areas.

It is our desire that you, the people affected by natural disasters, be informed of our findings. These findings should be available in about one year's time. We urge you to request a summary of the findings from your local authorities.

This questionnaire is in three parts. We are focusing upon the household unit, and ideally we wish to interview the household head. In the first part of the questionnaire we will ask you a few questions about how you consider and understand natural hazards and currently available disaster management resources. A section dealing with your experience of disasters in the place you lived, follows this section. Only if you have had personal experience at some point in your life, we will ask you the questions contained in this part of the questionnaire. In a third section we ask you about the demographic and socio-economic make up of your household.

We would like to request that only you answer these questions, that is, that the other people that are here do not participate in the interview. The interview will take about one hour. If you are unable to spare so much time right now, then please advise us now, so that we may schedule the interview at a more convenient time for you. Although we will be asking your name, the information you give will remain anonymous. Any information released by the research team will not contain the names of any individuals. You may refrain from answering any questions in part or full, and you may withdraw from the survey at any time.

This study has been approved by the Joint Faculty Research Ethics Board (JFREB) of the University of Manitoba. Any complaints regarding the procedure adopted in this study may be reported to the Human Ethics Secretariat, 244 Engineering Building (Tel. 474-7122), [margaret\\_bowman@umanitoba.ca](mailto:margaret_bowman@umanitoba.ca).

I have read the above statement regarding the study entitled "The Community Differentials in Hazard Perception and Emergency Response Needs." I agree to participate in the survey.

\_\_\_\_\_  
Signature of the Respondent

Date \_\_\_\_\_

\_\_\_\_\_  
Signature of the Interviewer

Date \_\_\_\_\_

## BIBLIOGRAPHY

- Alexander, D. (1993). *Natural Disasters*. New York: Chapman and Hall.
- Alexander, D. (2000). *Confronting Catastrophe: New Perspectives on Natural Disasters*. New York: Oxford University Press.
- Alhakami, A. S. and P. Slovic. (1994). "A Psychological Study of the Inverse Relationship between Perceived Risk and Perceived Benefit", *Risk Analysis*. 14 (6), pp. 1085 –1096.
- Bailey, K. D. (1987). *Methods of Social Research: Third Edition*. New York: The Free Press.
- Baker, G. W. and D.W. Chapman. (Eds.) (1962). *Man and Society in Disaster*. New York: Basic Books Inc.
- Barker, D. and D. Miller. (1990). "Hurricane Gilbert: Anthropomorphising a Natural Disaster", *Area*. 22 (2), pp. 107 – 116.
- Baron, R. A. and Byrne, D. (1997). *Social Psychology*. (8th edition). Boston: Allyn and Bacon.
- Barton, A.H. (1969). *Communities in Disaster: a Sociological Analysis of Collective Stress Situations*. Garden City: Doubleday and Company Inc.
- Baum, A. (1986). "Toxins, Technology, and Natural Disasters", *Cataclysms, Crises, and Catastrophes: Psychology in Action*. VandenBos, G. R. and B. K. Bryant (Eds.) Washington: American Psychological Association. pp. 5-55.
- Baumann, D. D. and J. H. Sims. (1974). "Human Response to the Hurricane", *Natural Hazards: Local, National, Global*. G. F. White. (Ed.). New York: Oxford University Press. pp. 25-30.
- Blaikie, P., Cannon, T., Davis, I. and B. Wisner. (1994). *At Risk: Natural Hazards, People's Vulnerability, and Disasters*. New York: Routledge.
- Brooks, G. R., George, S. S., Lewis, M.C.F., Medioli, B. E., Nielsen, E., Simpson, S. and L. H. Thorleifson. (2003). *Geoscientific Insights into Red River Flood Hazards in Manitoba: The Final Report of the Red River Flood Project*. Natural Resources Canada.
- Bryant, E. A. (1991). *Natural Hazards*. Cambridge: Cambridge University Press.
- Buckland, J. and M. Rahman. (1999). "Community-based Disaster Management during the 1997 Red River Flood in Canada," *Disasters*, 23 (2) pp.174-191.

- Bumsted, J.M. (1997). *Floods of the Centuries: A History of Flood Disasters in the Red River Valley 1776-1997*. Winnipeg: Great Plains Publications.
- Burton, I. (1962). *Types of Agricultural Occupance of Flood Plains in the United States*. Chicago: Department of Geography, University of Chicago.
- Burton, I. and Kates, R. (1964). "The Perception of Natural Hazards in Resource Management", *Natural Resources Journal*. 3, pp. 412 – 441.
- Burton, I., Kates, R. and R. Snead. (1969). *The Human Ecology of Coastal Flood Hazard in Megalopolis*. Chicago: Department of Geography, The University of Chicago.
- Burton, I., Kates, R. and G. White. (1968). "The Human Ecology of Extreme Geophysical Events", *Natural Hazard Research Working Paper No. 1*.
- Burton, I., Kates, R. and G. White. (1978). *The Environment as Hazard*. New York: Oxford University Press.
- Burton, I., Kates, R. and G. White. (1993). *The Environment as Hazard*. Second Edition. New York: The Guilford Press.
- Burton, I. and R. Pushchak. (1984). "The Status and Prospects of Risk Assessment", *Geoforum*. 15 (3), pp. 463-475.
- Butler, D. R. (1987). "Snow-avalanche hazards, Southern Glacier National Park, Montana: The nature of local knowledge and individual responses", *Disasters*. 11 (3), pp. 214 – 220.
- Cannon, Terry. (1994). "Vulnerability Analysis and 'Natural' Disasters". *Disasters, Development and Environment*. Ann Varley (Ed.). John Wiley and Sons Ltd. pp. 13-30.
- Carlson, N. R. (1990). *Psychology: The Science of Behaviour*. (Third Edition). Boston: Allyn and Bacon. pp. 337 –339.
- Chadwick, B. A., Bahr, H. B. and S. L. Albrecht. (1984). *Social Science Research Methods*. New Jersey: Prentice-Hall Inc.
- Chan, N. W. (1995). "Choice and Constraints in Floodplain Occupation: The Influence of Structural Factors on Residential Location in Peninsular Malaysia", *Disasters*. 19 (4), pp. 287 – 307.
- Chapman, D. (1994). *Natural Hazards*. Melbourne: Oxford University Press.

- Churchill, R. and D. Hutchinson. (1984). "Flood Hazard in Ratnapura, Sri Lanka: Individual Attitudes vs. Collective Action", *Geoforum*, 15 (4), pp. 517-524.
- Clason, D. I. and T. J. Dormody. (1994). "Analyzing Data Measured by Individual Likert-Type Items", *Journal of Agricultural Education*. 35 (4), pp 31 – 35.
- Covello, V.T., Flamm, W.G., Rodricks, J.V. and R.G. Tardiff. (Eds.) (1982). *The Analysis of Actual Versus Perceived Risks*. New York: Plenum Press.
- Cutter, S. L. (1993). *Living with Risk: The Geography of Technological Hazards*. New York: Edward Arnold.
- Degg, M. (1992). "Natural Disasters: Recent Trends and Future Prospects", *Geography*. 77 (3), pp. 198 – 209.
- Drabek, T. (1986). *Human System Responses to Disaster: An Inventory of Sociological Findings*. New York: Springer-Verlag.
- Dynes, R. R. (1970). *Organized Behavior in Disaster*. Lexington: D. C. Heath and Company.
- Finucane, M. L., Alhakami, A., Slovic, P. and S. M. Johnson. (2000). "The Affect Heuristic in Judgements of Risks and Benefits", *Journal of Behavioral Decision Making*. 13, pp. 1 – 17.
- Fischhoff, B., Slovic, P. and S. Lichtenstein. "The Public' VS. 'The Experts': Perceived VS. Actual Disagreements About Risks of Nuclear Power", *The Analysis of Actual Versus Perceived Risks*. Covello, V.T., Flamm, W.G., Rodricks, J.V. and R.G. Tardiff. (Eds.) (1983). New York: Plenum Press. p.235-249.
- Fitzpatrick, C. and D. S. Mileti. (1994). "Public Risk Communication", *Disasters, Collective Behavior, and Social Organization*. Dynes, R. R. and K. J. Tierney. (Eds.). Cranbury: Associated University Presses. pp. 71-84.
- Foster, H. D. (1980). *Disaster Planning: the Preservation of Life and Property*. New York: Springer-Verlag.
- Frankfort-Nachmias, C. and Nachmias, D. (1996). *Research Methods in the Social Sciences*. 5<sup>th</sup> Edition. New York: St. Martin's Press.
- Gillespie and Streeter, "Conceptualizing and Measuring Disaster Preparedness", *International Journal of Mass Emergencies and Disasters*. 5 (2), pp. 155-175.

- Gruntfest, E. (1981). *Changes in Flood Plain Land Use and Flood Hazard Adjustment in Denver and Boulder, Colorado, 1958 – 1979*. Ph.D. dissertation, Department of Geography, University of Colorado.
- Hammond, R. and P. S. McCullagh. (1978). *Quantitative Techniques in Geography: An Introduction*. Second Edition. New York: Oxford University Press.
- Hannigan, John A. and Kueneman, Rodney M. (1978). "Anticipating Flood Emergencies: A Case Study of a Canadian Disaster Subculture," pp. 129 – 146, Quarentelli, E.L. (Ed.) *Disasters: Theory and Research*. Sage Publications, London.
- Haque, C. E. (2000). "Risk Assessment, Emergency Preparedness and Response to Hazards: The Case of the 1997 Red River Valley Flood, Canada", *Natural Hazards*. 21, pp. 225 – 245.
- Hewitt, K. (1997). *Regions of Risk: A Geographical Introduction to Disasters*. Essex: Addison Wesley Longman Limited.
- International Joint Commission. (2000). *The Next Flood: Getting Prepared*. Ottawa: Final Report of the International Red River Basin Task Force to the International Joint Commission.
- Janis, I. L. (1962). "Psychological Effects of Warnings," p. 55-92 in *Man and Society in Disaster*. Baker, G.W. and D.W. Chapman (Eds.) New York: Basic Books Publishing Co. Inc.
- Kasperson, R. E., Renn, O., Slovic, P., Brown, H. S., Emel, J., Goble, R., Kasperson, J. X. and S. Ratick. (1988). "The Social Amplification of Risk: A Conceptual Framework", *Risk Analysis*. 8 (2), pp. 177 – 187.
- Kates, R. W. (1970). "Natural Hazard in Human Ecological Perspective: Hypotheses and Models", *Natural Hazard Research Working Paper No. 14*.
- Kates, R. W. and I. Burton. (Eds.). (1986). *Geography, Resources, and Environment Volume 1: Selected Writings of Gilbert F. White*. Chicago: The University of London Press.
- Krenz, G. and J. Leitch. (1998). *A River Runs North: Managing an International River*. Red River Water Resources Council.
- Laituri, M. J. (2000). "Cultural Perspectives of Flooding", *Inland Flood Hazards: Human, Riparian, and Aquatic Communities*. Wohl, E. E. (Ed.). Cambridge, Cambridge University Press, pp. 451 – 468.

- Lindell, M. K. and R. W. Perry. (2000). "Household Adjustment to Earthquake Hazard: A Review of Research", *Environment and Behavior*. 32, pp. 590 – 630.
- Lindell, M. K. and R. W. Perry. (2004). *Communicating Environmental Risk in Multiethnic Communities*. Thousand Oaks: Sage Publications.
- McIntyre, L. J. (2005). *Need to Know: Social Science Research Methods*. New York: McGraw-Hill.
- Mileti, D. S. (1980). "Human Adjustment to the Risk of Environmental Extremes", *Sociology and Social Research*, 64, pp.327-347.
- Mileti, D. S. (1999). *Disasters by Design: A Reassessment of Natural Hazards in the United States*. Washington: Joseph Henry Press.
- Mileti, D. S., Drabek, E.T. and E. J. Haas. (1975). *Human Systems in Extreme Environments: A Sociological Perspective*. Program on Technology, Environment and Man, 21. Institute of Behavioral Science. Colorado: University of Colorado.
- Mileti, D. and C. Fitzpatrick. (1993). *The Great Earthquake Experiment: Risk Communication and Public Action*. Westview Special Studies in Society, Technology, and Public Policy. Chicago: Westview Press.
- Mitchell, J. K., Devine, N. and K. Jagger. (1989). "A Contextual Model of Natural Hazards", *Geographical Review*. 79 (4), pp. 391 – 409.
- Montz, B. and E. C. Grunfest. (1986). "Changes in American Urban Floodplain Occupancy since 1958: the Experience of Nine Cities", *Applied Geography*. 6, pp. 325 – 338.
- Olczyk, M.E. (2004). *Flood Risk Perception in the Red River Basin, Manitoba: Implications for Hazard and Disaster Management*. M.N.R.M. Thesis. Natural Resource Institute, University of Manitoba
- Oliver-Smith, A. (1986). *The Martyred City: Death and Rebirth in the Andes*. Albuquerque: University of New Mexico Press.
- O'Riordan, T. (1986). "Coping with Environmental Hazards", pp. 272 – 309 in *Geography, Resources, and Environment Volume 2: Themes from the Writings of Gilbert F. White*. Chicago: The University of Chicago Press.
- O'Riordan, T. and P. Timmerman. (2001). "Risk and Imagining Alternative Futures", in Kasperson, J. X. and R. E. Kasperson. (Eds.) *Global Environmental Risk*. Tokyo: The United Nations University Press. pp. 429 – 450.

- Orr, D. B. (1995). *Fundamentals of Applied Statistics and Surveys*. New York: Chapman and Hall.
- Palm, R. I. (1990). *Natural Hazards: an Integrative Framework for Research and Planning*. Baltimore: John Hopkins University Press.
- Petak, W. and A. Atkisson. (1982). *Natural Hazard Risk Assessment and Public Policy*. New York: Springer – Verlag New York Inc.
- Pilgrim, N. K. (1999). "Landslides, Risk and Decision-making in Kinnaur District: Bridging the Gap between Science and Public Opinion", *Disasters*. 23 (1), pp. 129 – 146.
- Quarentelli, E.L. (Ed.) (1978). *Disasters: Theory and Research*. London: Sage Publications.
- Rahman, Matiur, M., and Stephane McLachlan. (2001). *Community Differentials in Hazards Perception and Emergency Needs: A Report to the Emergency Preparedness Canada*. Emergency Preparedness Canada, March 26, 2001.
- Rasid, H., Haider, W. and L. Hunt. (2000). "Post-flood Assessment of Emergency Evacuation Policies in the Red River Basin, Southern Manitoba," *The Canadian Geographer*, 44 (4) pp. 369-386.
- Red River Basin Investigation Water Resources Division, Department of Resources and Development, Water Resources Division, Report on *Investigations into Measures for the Reduction of Flood Hazard in the Greater Winnipeg Area. Appendix 'B'*, "History of Floods on the Red River", Winnipeg: March 1953
- Royal Society of London. (1992). *Risk: Analysis, Perception and Management*. Report of a Royal Society Study Group. London: The Royal Society.
- Saarinen, T. F. and J. L. Sell. (1985). *Warning and Response to the Mount St. Helen's Eruption*. Albany: State University of New York Press.
- Slovic, P. (1987). "Perception of Risk", *Environmental Risks and Hazards*. Cutter, S. L. (Ed.) (1994), New Jersey: Prentice Hall. pp. 155 – 165.
- Slovic, P., Fischhoff, B. and S. Lichtenstein. (1982). "Why Study Risk Perception?", *Risk Analysis*, 2 (2), pp. 83-93.
- Slovic, P., Kunreuther, H. and G. F. White. (1974). "Decision Processes, Rationality, and Adjustment to Natural Hazards", in White, G. F. (Ed.). *Natural Hazards: Local, National, Global*. New York: Oxford University Press, pp. 187 – 205.

- Smith, K. (1992). *Environmental Hazards: Assessing Risk and Reducing Disaster*. London: Routledge.
- Stallings, R. A. (1994). "Collective Behavior Theory and the Study of Mass Hysteria", *Disasters, Collective Behavior, and Social Organization*. Dynes, R. R. and K. J. Tierney. (Eds.). Cranbury: Associated University Presses. pp. 207-228.
- Stallings, R. A. (1997). "Methods of Disaster Research: Unique or Not?", *International Journal of Mass Emergencies and Disasters*, 15 (1), pp. 7 – 19.
- Starr, C. (1969). "Social Benefit versus Technological Risk", *Environmental Risks and Hazards*. Cutter, S. L. (Ed.) (1994), New Jersey: Prentice Hall. pp. 55 – 68.
- Tierney, K. J., Lindell, M. K. and R. W. Perry. (Eds.) (2001). *Facing the Unexpected: Disaster Preparedness and Response in the United States*. Washington: Joseph Henry Press.
- Tittle, C. and R. Hill. (1967) "Attitude Measurement and Prediction of Behavior: An Evaluation of Conditions and Measurement Techniques", *Sociometry* 30, pp.199-213 in [www.stolaf.edu/people/leming/soc371res/oper.html](http://www.stolaf.edu/people/leming/soc371res/oper.html)
- The Winnipeg Sun - source: Reuters, September 17, 2005.
- Tobin, G. A. and B.E. Montz. (1997). *Natural Hazards: Explanation and Integration*. New York: Guilford Press.
- Tversky, A. and D. Kahneman. (1973). "Availability: A Heuristic for Judging Frequency and Probability", *Cognitive Psychology*. 5, pp.207 - 232.
- Tversky, A. and D. Kahneman. (1974). "Judgement under Uncertainty: Heuristics and Biases", *Science*. 185, pp.1124 – 1131.
- White, G. F. (Ed.). (1974). *Natural Hazards: Local, National, Global*. New York: Oxford University Press.
- White, G. F. (1975). *Flood Hazard in the United States: A Research Assessment*. Colorado: Institute of Behavioral Science, The University of Colorado.
- White, G. F. and J. E. Haas. (1975). *Assessment of Research on Natural Hazards*. Cambridge: The MIT Press.
- Whittow, J. (1979). *Disasters: The Anatomy of Environmental Hazards*. Athens: The University of Georgia Press.

Whyte, A. and I. Burton. (1982). "Perception of Risks in Canada", *Living with Risk: Environmental Risk Management in Canada*. Burton, I., Fowle C.D. and R. S. McCullough. (Eds.). pp. 39 – 70.

Wildavsky, A. and K. Dake. (1990). "Theories of Risk Perception: Who Fears What and Why?" *Journal of the American Academy of Arts and Sciences*. 119 (4), pp. 41 – 60.

Williams, B. L., Brown. S., Greenberg, M. and M. A. Khan. (1999). "Risk Perception in Context: The Savannah River Site Stakeholder Study", *Risk Analysis*. 19 (4), pp. 1019 – 1035.

Winnipeg Free Press. (1997). *A Red Sea Rising: The Flood of the Century*. Winnipeg, Winnipeg Free Press.

## WEB SITES

[http://www.ec.gc.ca/search\\_e.html](http://www.ec.gc.ca/search_e.html) Environment Canada web site visited May 1998.

[www.arches.uga.edu/~portek/likertscale.html](http://www.arches.uga.edu/~portek/likertscale.html) visited on December 16, 2004.

[www.stolaf.edu/people/leming/soc371res/oper.html](http://www.stolaf.edu/people/leming/soc371res/oper.html) visited on December 16, 2004.

[www.sp.uconn.edu/~ps202vc/likert.pdf](http://www.sp.uconn.edu/~ps202vc/likert.pdf) visited on December 16, 2004.

[www.newsreview.ca](http://www.newsreview.ca) News in Review, September 1997, CBC.

[www.statscan.gov.ca](http://www.statscan.gov.ca) visited May 2001.

[www.montcalmcdc.mb.ca](http://www.montcalmcdc.mb.ca) visited May 2001.

<http://www.gov.mb.ca/emo/pubinfo/summerhaz.html> visited March 15, 2005.

[http://gsc.nrcan.gc.ca/floods/redriver/geomorphology\\_e.php](http://gsc.nrcan.gc.ca/floods/redriver/geomorphology_e.php) visited March 17, 2005.

[http://hsc.uwe.ac.uk/dataanalysis/quant\\_spear.htm](http://hsc.uwe.ac.uk/dataanalysis/quant_spear.htm) visited May 11, 2005

<http://www.geography.btinternet.co.uk/spearman.htm> visited May 11, 2005

[http://www.icbl.hw.ac.uk/ltidi/cookbook/info\\_likert\\_scale/](http://www.icbl.hw.ac.uk/ltidi/cookbook/info_likert_scale/) visited May 20, 2005

<http://www.gifted.uconn.edu/siegle/research/Instrument%20Reliability%20and%20Validity/Likert.html> visited May 20, 2005

<http://www.cbc.ca/news> visited October 27, 2005