III. Risks and Vulnerabilities

The first section of this document, the Benton County Community Profile, is a compilation of information about various aspects of the county. This effort was designed to present a broad overview of many different aspects of the past, present, and future development of the county. This section was expanded to include more complete socio-economic data on Benton County.

The second section, the Benton County hazard analysis, reflects the comprehensive study of all hazards that affect the county's communities. It is based on the best available information, describing those hazards, which have occurred and are most likely to occur. Where possible, maps were used to illustrate areas of particular vulnerability. Local communities and state and federal agencies provided data collected for this analysis.

Section V discusses the planning process, which also includes the results from public surveys and extensive meetings with local critical infrastructure and key resources within the community.

By examining and analyzing aspects of these three sections, we are able to get a comprehensive view of the risks and vulnerabilities that face the county.

Several vulnerabilities have not yet been addressed in the first two sections of the plan. Some residents in Benton County would need special consideration in the event of a disaster. These include people who are mentally disabled, physically challenged, hearing impaired, visually impaired, etc. The elderly and children also warrant special concerns. Residents who are not native English speakers also require special attention.

In addition to the Important Facilities shown in Section I, other locations would require consideration, including adult and child foster care, assisted living sites, mobile homes, and day cares.

There are over approximately 8,000 total addresses known to be at risk of a flood or a hazardous material spill, the two hazards that can be associated with a specific geographical area within Benton County. It should be noted, however, that this address list is not comprehensive.

Another possible part of the county infrastructure that might be at risk is the bridges that exist in the county over its many rivers and streams. Flooding and ice have the ability to erode and do physical damage to these bridges

Bridges	**Map #, Appendix D**
Benton County	32

Prioritized Risk Assessment

The following pages give a summary of each hazard by gathering information about each hazard. The risk assessment looks at these questions and then attempts to quantify the risk level by giving number values to levels of risk. This information allows the hazards to be compared in order to assess which hazards pose the greatest risk. The values for the prioritized risk assessment were determined by a variety of resources including meetings and discussions with businesses and citizens throughout the community in order to determine a ranking for each hazard based on the risk assessment criteria. Also taken into consideration was information from the community profile, analysis of historic disasters and information provided by the public to identify past, present and future disasters.

The risk assessment is determined by the following:

1) The frequency of occurrence: This asks how often it may happen and how likely is it that the hazard will occur. The number values are determined by:

a) Unlikely: 1
b) Possibly: 2
c) Likely: 3
d) Highly Likely: 4

2) Magnitude/Severity: How large of an event and how severe it is.

a) Negligible: 1
b) Limited: 2
c) Critical: 3
d) Catastrophic 4

3) Warning Time: This ranks how much warning time is normally available prior to the event.

a) <6 hours 4
b) 6-12 hours 3
c) 12-24 hours 2
d) >24 hours 1

4) Duration: How long would the event normally last.

a) <6 hours 1
b) <24 hours 2
c) <1 week 3
d) >1 week 4

The overall hazard priority level was then determined by plugging the numbers into the Calculated Risk Priority Index (CPRI), which is a tool used to assess hazards based on an indexing system that considers probability, magnitude/severity, warning time, and duration. The CPRI value is obtained by assigning varying degrees of risk to each of the four categories for

each hazard, and then calculating an index value based on a weighting scheme as described in the following table.

CPRI Category	Degree of Risk			Assigned Weighting Factor
	Level ID	Description	Index Value	
Probability	Unlikely	• Extremely rare with no documented history of occurrences or events • Annual probability of less than 0.001	1	45%
	Possible	• Rare occurrences with at least one documented or anecdotal historic event. • Annual probability that is between 0.01 and 0.001.	2	
	Likely	• Occasional occurrences with at least two or more documented historic events. • Annual probability that is between 0.1 and 0.01.	3	
	Highly Likely	• Frequent events with a well documented history of occurrence. • Annual probability that is greater than 0.1.	4	
Magnitude /Severity	Negligible	• Negligible property damages (less than 5% of critical and non-critical facilities and infrastructure). • Injuries or illnesses are treatable with first aid and there are no deaths. • Negligible quality of life lost. • Shutdown of critical facilities for less than 24 hours.	1	30%
	Limited	• Slight property damages (greater than 5% and less than 25% of critical and non-critical facilities and infrastructure). • Injuries or illnesses do not resulting permanent disability and there are no deaths. • Moderate quality of life lost. • Shut down of critical facilities for more than 1 day and less than 1 week.	2	
	Critical	• Moderate property damages (greater than 25% and less than 50% of critical and non-critical facilities and infrastructure). • Injuries or illnesses result in permanent disability and at least one death. • Shut down of critical facilities for more than 1 week and less than 1 month.	3	
	Catastrophic	• Severe property damages (greater than 50% of critical and non-critical facilities and infrastructure) • Injuries or illnesses result in permanent disability and multiple deaths. • Shut down of critical facilities for more than 1 month.	4	
Warning Time	Less than 6 hours	Self explanatory.	4	15%
	6 to 12 hours	Self explanatory.	3	
	12 to 24 hours	Self explanatory.	2	
	More than 24 hours	Self explanatory.	1	
Duration	Less than 6 hours.	Self explanatory.	1	10%
	Less than 24 hours.	Self explanatory.	2	
	Less than one week.	Self explanatory.	3	
	More than one week.	Self explanatory	4	

The results of using the CPRI are as follows:

Hazard	Probability				Magnitude/Severity				Warning Time				Duration				CPRI Score
	Unlikely	Possibly	Likely	Highly Likely	Negligible	Limited	Critical	Catastrophic	< 6 hours	6 - 12 hours	12 - 24 hours	> 24 hours	< 6 hours	< 24 hours	< 1 week	> 1 week	
NATURAL																	
Drought			x				x					x				x	2.8
Flooding/Flash Flood			x			x				x					x		2.7
Ice Storms		x					x				x			x			2.3
Snow Storms				x		x						x		x			2.75
Thunderstorm/High Winds				x			x			x			x				3.25
Tornadoes			x				x		x				x				2.95
Wildfires		x				x			x					x			2.3
HUMAN CAUSED																	
Infectious Diseases		x					x					x				x	2.35
Haz-Mat Spills		x					x		x					x			2.6
Radiological Incident	x						x		x							x	2.35
Water Contamination		x					x		x						x		2.7

The Mitigation Plan Development Team reviewed the above hazards; some scores were changed from the original plan, some up and some down.

Hazards that had risk priority decreased:

Tornado — In reviewing the history of tornados in Benton County the frequency rating was decreased from likely to possible.

Hazards that had risk priority increased:

Flooding — A change in the warning time from 24+ to 6-12 hours caused the increase in this hazard's priority rating. Ice jams this year on the Mississippi caused flooding of the Little Rock Lake area it took approximately 6 hours before it started to affect the area.

Snow — The frequency was changed from possible to likely, this is Minnesota.

Ice — The warning time was decreased from 24+ to 12-24, conditions that are conducive to ice formation can develop rapidly.

Drought — Benton County has a long history of drought; the frequency was changed from possible to likely.

Based upon the above ratings the committee's hazards rank as follows:

Hazard	CPRI Ranking
Thunderstorms/High winds	3.25
Tornado	2.95
Drought	2.8
Snow Storms	2.75
Flooding/Flash Flood	2.7
Water Contamination	2.7
Hazardous Material Spills	2.6
Infectious Diseases	2.35
Radiological Incident	2.35
Ice Storms	2.3
Wildfire	2.3

Color Code	Grey	Orange
Meaning	Natural Disaster	Man-made Disaster

The Minnesota Hazard Mitigation Plan divides the state into five regions. Benton County lies in the West Central Region of Minnesota, and the natural hazards, which face it, are ranked as follows:

West Central Minnesota Regional Natural Hazard Rankings

	Economic Impact			**Deaths**			**Injuries**
1)	Floods		1)	Blizzards		1)	Tornadoes
2)	Severe Wind		2)	Tornadoes		2)	Blizzards
3)	Tornadoes		3)	Lightning		3)	Lightning
4)	Lightning		4)	Severe Winds		4)	Winds
5)	Blizzards		5)	Floods		5)	Floods
6)	Extreme Cold		6)	Extreme Cold		6)	Extreme Cold
7)	Ice Storms		7)	Ice Storms		7)	Ice Storms
8)	Extreme Heat		8)	Hail		8)	Hail
9)	Hail		9)	Extreme Heat		9)	Extreme Heat
10)	Drought		10)	Drought		10)	Drought

Source: Minnesota Hazard Mitigation Plan

The following discusses the results of the surveys and meetings held to gain input from the community as to which hazards that were of concern to them.

The top Natural Hazards that people living within Benton County believe could occur are:

Natural Hazard	Points
Tornado	214
High Winds	135
Ice Storms	50
Floods	44
Drought	40
Wild Fires	23
Epidemic	14

The top Man-made Hazards that people living within Benton County believe could occur are;

Man-made Hazard	Points
Hazardous Materials Spill*	235
Pipe Line Accident	46
Plane Crash	34
Monticello Nuclear Plant Event	33

* This includes spills from commercial, highway

Analysis of Mitigation Planning Team's Rankings and Citizen/Businesses

The Planning Teams ranking included rating the frequency, magnitude/severity, warning time and duration of an event. This created a scale that led to the final rankings. While the citizens were asked just to rank the frequency, (likelihood) and then rank order them. The CI/KR representatives were asked the same questions as the citizens with one notable difference. They were asked to rank the hazard as to how important it was to that CI/KR representative.

It is difficult to correlate the differences because the purposes of the evaluations by the three groups were different.

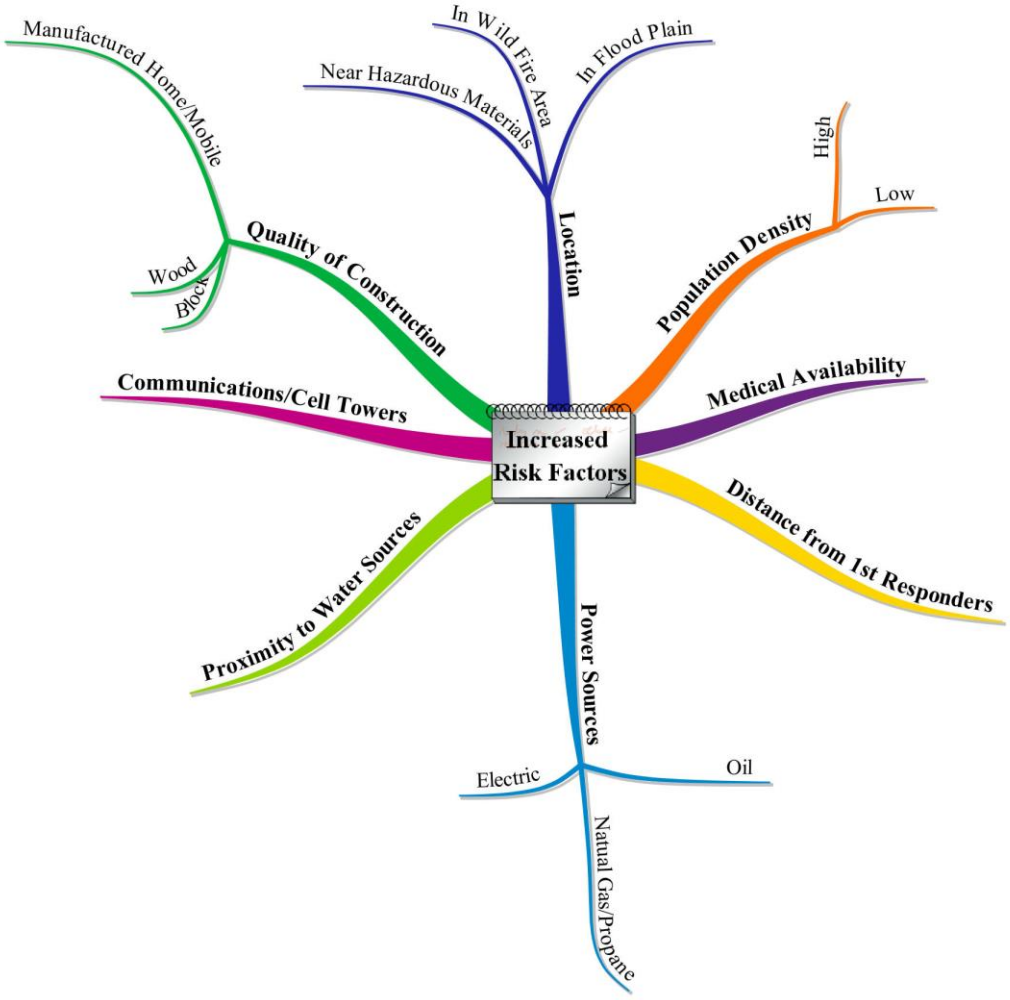
The Planning Team was looking at the disasters used in the previous mitigation plan. They also were ranking additional factors such as warning time, severity and scope of the disaster. The citizens questionnaires solicited more of their perception as to what disaster could occur. They were not concerned with the warning time, severity or scope of the disaster. The CI/KR representatives' rankings included their perspective on the disaster as it related to their area. For example, long-term care facilities and hospitals were extremely concerned by the loss of water supply more so than the loss of power. They have backup generators; however, they have

no backup water supplies. Therefore, if a city's water supply were contaminated for a period they would have to find alternative sources to replace their current water supply. Another example would be in the transportation area of railroads. The railroad representatives did not rank tornados as much of a concern to them as they did train derailment. Agriculture ranked crop diseases, hail and drought very high but felt that epidemics, flooding and snow were much less of a concern.

Overall it appears that all three groups did agree that in the natural hazard arena storms (including lightening, hail, winds, tornados, high winds) were in the top bracket of concern. In the manmade arena, hazardous materials (spills and incidents) were at the top of the list.

In reviewing the different perspectives, the County has to focus on the hazards that historically occur, first then focus on hazards that have the greatest potential to have the most impact upon the overall viability of the County. Lastly, it must help each CI/KR area with identifying mitigation methods that are particular to their business.

INCREASED RISK FACTORS



The preceding diagram lists a number of factors considered when deciding the risk that different areas of the county face.

Location & distance from First Responders:

Where a person lives determines first responder availability and response time. In addition, if they live in a flood zone, near a pipeline or in a wildfire area they are at increased risk.

Population Density:

Population density has a bearing on the number of neighbors close by that may be able to assist in a disaster. A dense population increases the likelihood for more injuries, property damage and death.

Medical Availability:

The availability of medical assistance or the lack of increases or decreases one's risk factor. Those that live in the Eastern portion of the county are more at risk due to be further from medical help.

Proximity to Water Sources:

This has an affect when it comes to firefighting. A person who lives in an area that has limited access to water has a greater risk from fires. In addition having one's own well may reduce the effects of contamination of a city's water supply, allowing the homeowner to switch from City to well water.

Communications & Cell Phone Towers:

Communications availability affects risk. In the Central and Eastern portions of Benton County, there is no cell phone coverage. In an emergency if the landlines have been knocked out of service then there is no way to request emergency aid.

Quality of Construction:

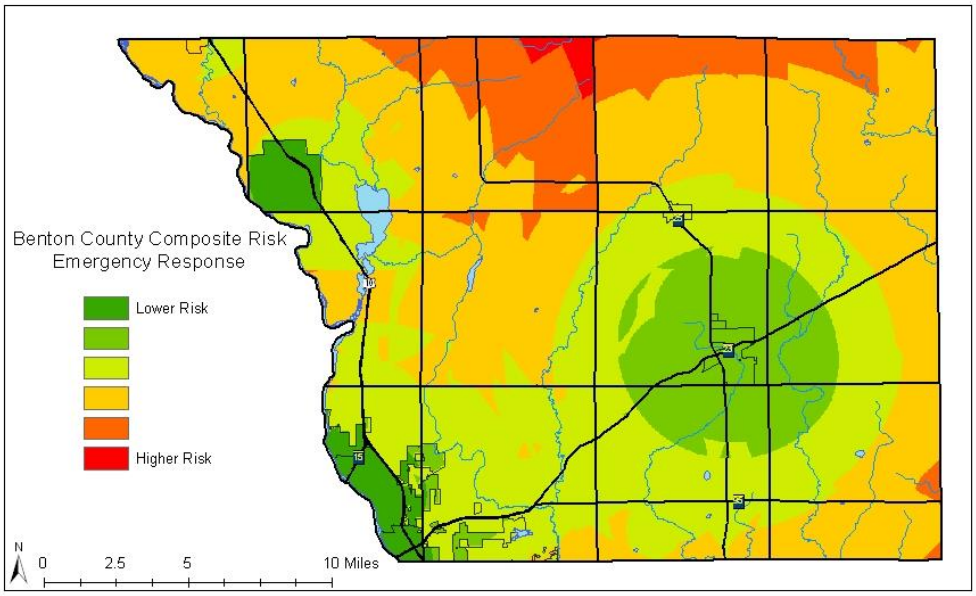
The quality of construction of dwellings and businesses had a direct affect upon overall risk. A well constructed block house with reinforced doors and roof will fare much better than a manufactured (mobile) home.

Self-Preparedness:

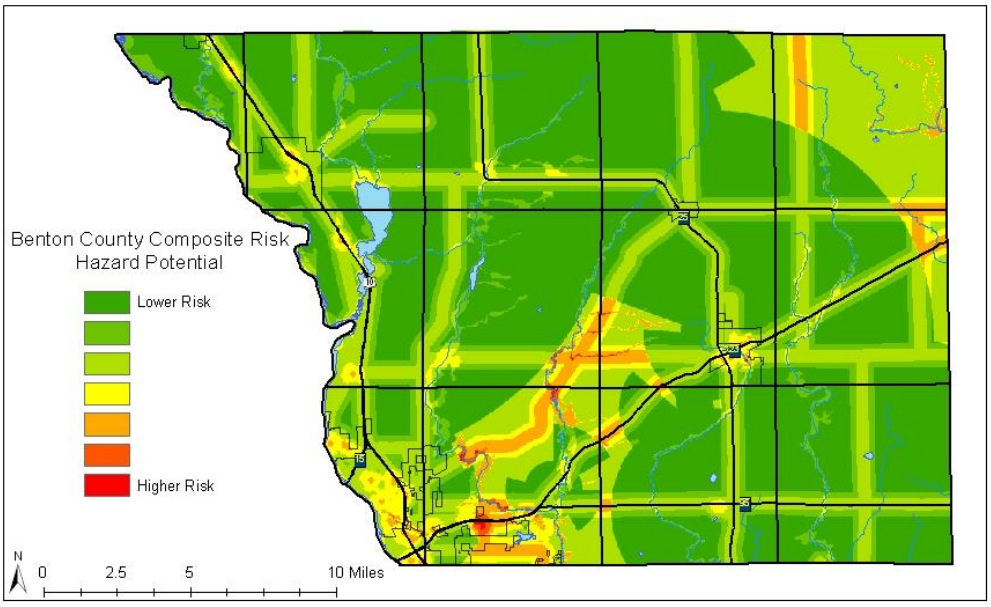
This factor was not included in the original mind-map; however, it does have a bearing on one's risk. A well-prepared family substantially reduces the affect that a natural or manmade hazard might have on them.

Composite Risk Emergency Response Maps

Two additional sets of maps were developed, by the Benton County GIS Officer, which indicates the composite risk based upon emergency response and the overall risk hazard potential.



These maps are based upon the ability and availability of first responders. The largest number of trained first responders serves the dark green areas while the lighter shaded areas have few or no available first responders.



The above map is a composite of all risks and hazards. It focuses more on hazardous materials and history.