INSTITUTIONAL ADAPTATIONS TO CLIMATE CHANGE
SSHRC MCRI Project

Report on Community Vulnerability Assessment of Taber, Alberta
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INTRODUCTION

This report describes and discusses the results of the vulnerability assessment of the community of Taber, Alberta. This assessment has been carried out as one of the research components of the Institutional Adaptation to Climate Change (IACC) Project. The assessment was conducted in the summer of 2006 by Susana Prado, a graduate student in the Masters of Social Work Program at the University of Regina, under the supervision of Dr. Polo Diaz.

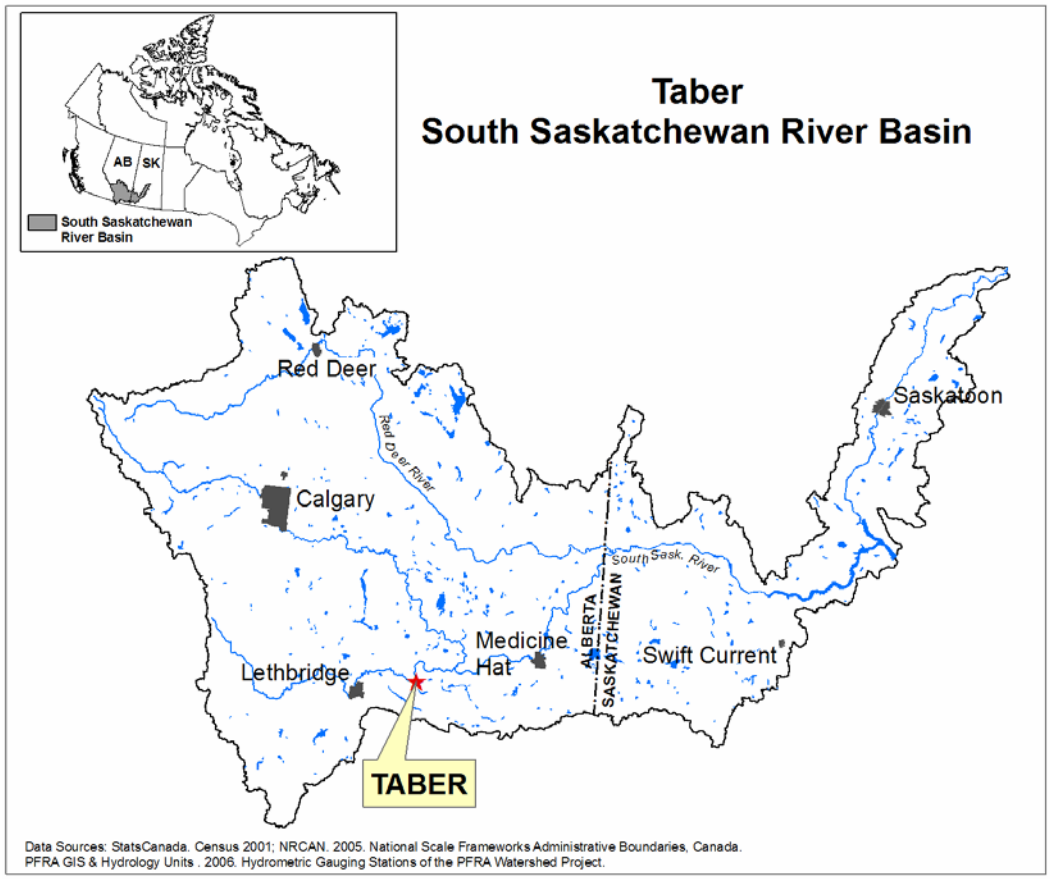
The IACC project, funded by a grant from the Multi Collaborative Research Initiatives (MCRI) program of the Social Sciences and Humanities Research Council of Canada (SSHRC), is an international comparative study of institutional adaptation to climate change in two watersheds: the South Saskatchewan River Basin in western Canada and the Elqui River Basin in north-central Chile. Its main objectives are: (1) to identify the current social and physical vulnerabilities of rural communities in relation to climate and climate-related water scarcities, (2) to examine the effects of future climate change risks on the identified vulnerabilities and (3) to assess the technical and social adaptive capacities of regional and national institutions in reducing the communities' vulnerabilities. The research activities in the community of Taber correspond to the first objective, being one of a series of community vulnerability assessments completed in Canada and Chile.

This report is divided into three main sections. The first section describes some of the characteristics of the community of Taber, such as location, history, economic forces and population characteristics, as well as the water resources of the community. The second section refers to the methodology that informs the project and the community assessment, including IACC objectives and methodological approach, and the main aspects of the data collection in the Taber community. The third section of this report discusses the findings of the ethnographic research and it is divided into four sections: (a) a description of the community's current and past exposures; (b) an explanation of current and past adaptive strategies; (c) a discussion of Taber's future exposures and adaptive strategies, and (d) a summary discussion of Taber's vulnerability to climate and the main conclusions.

STUDY AREA

Taber is one of the six communities from the South Saskatchewan River Basin selected by the IACC project. The others are the Blood Tribe and Hanna in Alberta, and Cabri, Stewart Valley and Outlook in the province of Saskatchewan. Taber, as indicated in Map 1, is located in the southern part of the province of Alberta, Canada.

Map 1: Localization of Taber in Canada and South Saskatchewan River Basin.



Taber is situated at 60 miles (98 km) north of the United States Border and 32 miles (50 km) east of Lethbridge, 169 miles (272 km) south-east of Calgary and 244 miles (392 km) south-east of Banff National Park. The Town lies a couple of miles south of the Oldman River which flows into the South Saskatchewan River. The area of Taber includes, in addition to the town of Taber, the towns of Vauxhall and Barnwell, and the locations of Enchant, Hays and Grassy Lake. The green part of the map shows all the Taber Municipal District area.

* Courtesy of Dianne Perrick, Canadian Plains Research Center.

Taber was settled by homesteaders in the 1890s (Town of Taber). In 1881 the government of Canada committed to build the railroad connecting Montreal and Vancouver. The land was surveyed and the settling of the prairies started to take place. People from Eastern Canada, the United States, the British Isles and Europe came to the prairies, and many of them saw Alberta as a 'land of opportunity' (Taber Irrigation Museum, 2003, p. 10). In 1885 the Canadian Pacific Rail Company (C.P.R.) built a tower 77 miles from Dunmore, the eastern junction of the railway near Medicine Hat, to serve its steam engines. Around this tower the town of Taber was built in 1899, becoming a village on March 15, 1905 (p. 23).

By 1903 more settlers had arrived and with them several businesses were established, providing groceries, dry goods, farm machinery and hotels, among others (p.18, 19). Wheat, oats, barley and rye were introduced to America in the 1600s (p. 46). Cattle were brought from Montana by enterprising ranchers in order to meet the beef need of the area (p.4).

The development of the Taber area had its beginnings with coal mining, since the areas along the C.P.R were being probed for coal (p. 8). The first mine in Taber was opened in 1903 (p. 9). Mining declined dramatically in the late 1920s; however, the extensive development of irrigation in Southern Alberta led to a major mining recovery in the early 1930s (Taber Irrigation Impact Museum, 2003). Irrigation also attracted sugar beet production, and a sugar processing plant was established in the area in 1950 (Town of Taber). Several other crop processing industries are located in the Taber area now.

In relation to the agricultural development of the area, wheat was the most grown crop in southern Alberta and thus in Taber, along with oats, barley and rye to feed the livestock (Taber Irrigation Museum, 2003, p.46). The first farmers in the area were the Mormons from Utah who started using irrigation (p.7). After the drought of 1920, agricultural practices in the area such as summer fallow and strip farming were incorporated, as well as shelter belts, which were encouraged by the experimental station in Lethbridge (p.17). In the 1950s technology provided great improvements to the agriculture of the area, with the introduction of trucks, tractors and combines. Fertilizers, herbicides and pesticides were also integrated along with new grain varieties (p.53). In the 1990s, diversification of crops welcomed canola, sunflower seeds, durum and barley (p.54). Since then diversification has led to specialty crops due to the extensive development of irrigation in the area.

Another relevant sector in the economy of the area is oil and gas. The oil industry became increasingly active in the early 1980s and companies have been actively drilling until the present time (p.353).

Climate and Economic Conditions

The town is in an area highly propitious to agriculture. It is surrounded by a “rich irrigated, diversified farmland belt, high in heat units and frost free days, with transportation links to major markets” (AlbertaFirst.com, p.2). Taber’s soil, as described by Massie (2004) is a “brown, rich sandy loam soil zone, with short prairie grass” (p. 10). Access to irrigation provides another significant advantage to local agricultural producers, ensuring the sustainability of a local dynamic agriculture. In addition to the existence of an excellent, fertile soil and the availability of water, the area has proper climate conditions, with a total annual of 2,344 hours of sunshine, and with an annual precipitation of 38 cm (15.01 inches). The temperatures on a seasonal average are less harsh than in other areas of western Canada: January –11.2 °C, April 5.4 °C, July 18.9 °C, October 7.5 °C (Town of Taber).

Given these conditions, Taber is known as the "Market Garden of Alberta.” It is the centre of the most varied crop production in the province and perhaps anywhere else in the Prairies. In particular, the quality of its corn crop is world famous (Massie, 2004, p. 1). Other agricultural products available in the area are peas, carrots, wheat, flax/barley, beans, oats, sugar beets, potatoes, onions, and canola/mustard, as well as livestock—hogs, beef, and sheep—and poultry. Many of these agricultural products are locally processed into sugar, potato chips, french fries, aseptic fruit juice and canned vegetables. In the locality there is a diversity of agricultural organizations. Several of them are growers’ associations, such as the Potatoe Growers Association, Sugar Beet Growers Association and Vegetable Growers Association, with connections with local food processing industries. The link between producers and industries has resulted in economic development in the community. In addition, Taber also benefits from the existence of oil and gas resources, having well established services to these industries. In these terms, Taber is economically a successful and viable community, with a diversified economy

Climate change could certainly affect the sustainability of agriculture in the area of Taber. According to Sauchyn (in Hadarits, 2007), climate change scenarios for the area indicate that by 2050 there will be an increase of 1 to 3.6 degrees Celsius in temperature and an overall increase in precipitation. These increases are undoubtedly beneficial to agriculture, but changes to the seasonal patterns of precipitation are problematic. It is expected that there will be more precipitation in winter months and less in summer. Higher temperatures in summer months will extend the agricultural growing season, but with a simultaneous decrease in precipitation, there will be less available soil moisture. Dramatic increases in temperature are also expected in winter months, where more precipitation will fall in the form of rain. Water in the mountains will quickly run off rather than accumulate, affecting the availability of water in the months of high demand. In these terms, local agriculture will have to compete for scarce water resources. In addition, a substancial increase is expected in the frequency of consecutively dry days or droughts. Currently, central North America experiences 30 days without rain every 50 years. By 2070, climate change models suggest that central North America will experience 30 days without rain every 18 years.

Social Characteristics

In comparison to most of the other rural communities assessed in the IACC study, Taber has a relatively large population. Table 1 displays the population, dwelling counts and labour force indicators for the Town and Municipal District (M.D.) of Taber compared to similar data for the Province of Alberta. According to the 2006 census, the Town of Taber had 7,591 people and the M.D. area 6,280. Between 1996 and 2001 both the Town and the M.D. had an increase of population with a change of 6.3 and 0.7 respectively. However, between 2001 and 2006 the Town had one point of decrease in population and the M.D. increased its population, this time with a higher percentage of population change (4.5%). This increase in population in the M.D follows the more accelerated growing trend in Alberta, which has had a population increase of 10% over the last decade.

In relation to housing, according to the 2006 Census, there were a total of 2,895 private dwellings in the Town of Taber, with seventy-eight percent ownership. The majority of dwellings were single-detached homes followed by apartment buildings with fewer and never larger than five storeys. More than half of the population had not moved within the last five years. Of the portion that had moved since 2001, 57% had moved within the municipality, followed by those whose former residence was elsewhere in Alberta (28%), Canada (10%) or outside Canada (4%).

The Town of Taber had an unemployment rate of 3.4% in 2001, while the M.D. had a lower unemployment rate of 2.6%, both rates significantly lower than the provincial rate.

Table 1: Taber (Town) and Taber (Municipal District) Compared to Alberta

Characteristics	**Taber town**	**Taber M.D.**	**Alberta**
Population			
Population 2006	7,591	6,280	3,290,350
Population 2001	7,671	6,012	2,974,807
Population 1996	7,214	5,970	2,696,826
2001 to 2006 population change(%)	-1.0	4.5	10.6
1996 to 2001 population change (%)	6.3	0.7	10.3
Total Private Dwellings	2,897	1,852	1,335,745
Population density per square km.	503.2	1.5	5.1
Land Area (square km)	15.09	4,204.38	640,044.57
Labour Force Indicators in 2001			
Participation rate (%)	66.9	75.7	73.1
Employment rate (%)	64.6	73.7	69.3
Unemployment rate (%)	3.4	2.6	5.2
Source: Statistics Canada 2001 and 2006			

Table 2 shows the population for the Town and M.D. of Taber by age and gender (Census 2006). The two locations have a total population of 13,870 persons, 55% of them living in the town of Taber. The M.D. has a larger younger population than the town: approximately 40% of the residents in the M.D. are under 19 years of age while the proportion in town is only 30%. On the other side, the proportion of town residents over the age of 65 is 14%, while in the M.D. it is only 7.4%. The representation percentage for the people from ages 20 to 64 is 56.5% in the Town, and slightly lower in the M.D. with 51.3%. Males and females have a similar representation in the two areas, with a slight majority of males in the M.D. and the reverse phenomenon in the town.

According to Census 2006, there were 2,095 families in the Town area and 1,465 in the M.D. Most families included married couples (74.5% in the Town and 93.5% in the M.D.), followed by common-law couples (12.6% and 4% in the Town and M.D. area respectively). Female lone-parents represented 12.2% in the Taber area and 2% in the M.D., while male lone-parents had a representation of 0.7 percent in the Town vicinity and no representation in the M.D. area.

Table 2: Town and Taber Municipal District by Age and Gender

Population by Age and Gender	Total	%	Male	%	Female	%
Town of Taber						
Age 0 – 14	1,670	22.0	830	22.3	840	21.8
Age 15 – 19	580	7.6	295	7.9	280	7.3
Age 20 – 64	4,285	56.5	2,165	58.0	2,130	55.3
Age 65 and over	1,055	13.9	460	12.3	620	16.1
Total – All Persons	7,590	100.0	3,730	49.1	3,855	50.8
% population age 15 and over		78.1		77.8		78.3
M.D. of Taber						
Age 0 – 14	1,925	30.7	980	30.2	945	31.1
Age 15 – 19	655	10.4	335	10.3	320	10.5
Age 20 – 64	3,220	51.3	1,665	51.3	1,570	51.7
Age 65 and over	465	7.4	255	7.9	210	6.9
Total – All Persons	6,280	100.0	3,245	51.7	3,035	48.3
% population age 15 and over		69.3		69.6		68.8
Source: Statistics Canada 2006						

The Census 2006 data indicates that Taber has a diverse economic structure, although with variations between the town and the M.D. According to Table 3, which displays the numbers of persons by employment industry in both localities, the dominant industry category in the M.D. is 'Agricultural and other resource-based industries' with 54% of representation, followed by a variety of other industry areas with almost an even distribution among them. On the other hand, the Town of Taber has a more diversified structure of employment, with proportions ranging from 17% (Other services) and 15% (Agricultural and other resource-based industries) to 6% (Educational services). The only exemption is "Finance and Real Estate," with only 3% of the labour force. Slightly more than two-thirds of the town female labour force is concentrated in "Other services," "Health care and social services," "Retail trade" and "Manufacturing industries," while in the district 52% of the female workers are in Agricultural and Educational services.

According to the 2001 Census, the median total income of persons 15 years of age and over was 20,927 for the Town area and 19,196 in the M.D. vicinity. The median family income—in reference to all census families—was 53,470 in Town and 50,494 in the M.D.

Table 3: Taber Town and Taber Municipal District by Employment Industry

Industry Group	Taber Town			
	Male	Female	Total	Percent
Total – Experienced labour force	2,250	1,835	4,080	100
Agricultural and other resource-based industries	510	105	615	15
Construction industries	250	25	275	7
Manufacturing industries	345	240	585	14
Wholesale trade	250	70	320	8
Retail trade	205	270	480	12
Finance and real estate	65	80	140	3
Health care and social services	45	315	355	9
Educational services	55	165	225	6
Business services	255	130	385	9
Other services	260	435	690	17
Industry Group	**Taber M.D.**			
	Male	Female	Total	Percent
Total – Experienced labour force	2,055	1,300	3,355	100
Agricultural and other resource-based industries	1,335	485	1,820	54
Construction industries	165	20	190	6
Manufacturing industries	95	65	155	5
Wholesale trade	45	20	65	2
Retail trade	60	85	150	4
Finance and real estate	45	30	70	2
Health care and social services	10	125	140	4
Educational services	30	190	220	7
Business services	155	175	335	10
Other services	105	100	200	6
Source: Canada 2006 Census (numbers may not add up due to rounding)				

In the town of Taber, close to two-fifths of those between the ages of 15 and 24 were attending school either full or part-time (Census 2001). The largest portion had attended grades 9-13 without receiving a high school graduation certificate. A high school graduation certificate, along with a trades certificate or diploma each account for 16% of the total. Finally, one third attained some level of college or university education, while one fifth had successfully completed college or university.

Table 4 displays the level of education of residents of the Town and the M.D. of Taber. In the town of Taber, almost 30% of the population from 20 to 64 years old has not completed high school, while in the M.D. area this proportion rises to almost 40%. Individuals living in town are more likely to get a college or university diploma or certificate than their counterparts in the Municipal District.

Table 4: Taber Town and Taber Municipal District Level of Schooling for Population 20-64 Years

Taber Town		
Highest Level of Schooling for Population 20-64 yrs	**2001**	**%**
Total population	4,505	100.0
Individuals with less than a high school certificate	1,335	29.6
Individuals with a high school certificate	1,090	24.2
Individuals with a trades certificate or diploma	725	16.1
Individuals with a college certificate or diploma	595	13.2
Individuals with a university certificate, diploma, degree and above	760	16.9
Taber M.D.		
Total population	3,435	100.0
Individuals with less than a high school certificate	1,355	39.4
Individuals with a high school certificate	720	21
Individuals with a trades certificate or diploma	425	12.4
Individuals with a college certificate or diploma	405	11.8
Individuals with a university certificate, diploma, degree and above	530	15.4

Source: Canada 2001 Census (numbers may not add up due to rounding)

According to the 2001 Census, approximately two-thirds of Town of Taber residents were born in Alberta with another 23% born in Canada. As expected, the dominant official language is English, while the knowledge of French is extremely limited. The bulk of Taber's immigrant population[1] originates from Europe. The residents' ethnic origins are varied, but most are from German, Canadian and English origins. About 20 additional languages are spoken in Taber, the most popular being German and Dutch.

[1] According to Statistics Canada's definition, immigrants are persons who are, or have ever been, landed immigrants in Canada.

Taber provides a variety of services such as churches; arts, culture and historical societies; sports and recreation facilities; service clubs; educational facilities; health services (including a hospital); and a local newspaper. Taber is a growing, healthy community. Since the economy of the area is diverse, there is a wide variety of services and businesses in town. Some of the important growers' associations of Southern Alberta have their main office in Taber, such as the Sugar Beets Growers Association, the Potato Growers Association, Vegetable Growers Association, etc. In addition, processing industries such as Rogers Sugar Ltd have important investments in the area. In general, residents feel proud of the way the locality is growing and attracting big businesses, Wal-Mart being one of them, and food services such as Tim Hortons or Boston Pizza, which were opened in 2006. The Town office is planning for welcoming more investment in the area to keep the community growing. All these unique characteristics along with investment related to agriculture, oil and industry in the area make Taber a location known countrywide.

Water Resources and Issues

Water has been a fundamental component of the life of the community since its early origins. As any agricultural community, Taber is dependent on a proper provision of drinking water for its population, as well as on the right balance between soil, temperature, and the quality and quantity of water to maintain the economic viability of farms and ranches. There are three irrigation districts that serve farms and ranches in the area of Taber: Taber Irrigation District, St. Mary River Irrigation District and Bow River Irrigation District. By the year 2005, these districts irrigated approximately 77,522, 346,596, and 206,452 acres respectively (Alberta Agriculture, 2006). The numbers of irrigated acres vary from year to year: for instance, when there is a rainy growing season there is reliance on irrigation systems. Also, prior to 2005, acres irrigated included all acres under an irrigation system, whereas 2005, 2006 and 2007 include only acres actually irrigated.

The Bow River Project is one of the major irrigation schemes in Western Canada, providing water for some 120,000 irrigable acres in an area where about 240,000 acres may eventually be brought under irrigation. Since 1950 it has been operated by the Canadian government. It is one of several projects operated under the Prairie Farm Rehabilitation Act, with much of the land used to resettle farmers from drier areas of the three Prairie Provinces (Massie, 2004, p. 6). The resettlement policy took place in the 1930s[2] and was designed to make the shift from one area to another and from one type of farming to another, as easy as possible for the farmer and his family. To help farmers in their transition from dryland to irrigation farming, various services were offered. These services included assistance in farm layout design, advice on irrigation techniques and practices, planting tree shelterbelts, and developing suitable facilities for water supply. Seed to develop irrigated pastures or for grass-seed production, as well as for grain crops, was provided at cost and could be paid either in cash or on a crop-share basis in the fall.

Work carried out by Prairie Farm Rehabilitation Administration on the Bow River project has allowed the irrigated area to more than double since 1950 (p. 8-9). According to the Annual Report of the Bow River Irrigation District (2008), a total of 201,286 acres were irrigated during the 2007 season. Secure access to water encourages the production of specialty crops and the establishment of food-processing plants in such centers as Vauxhall and Taber. Like the St. Mary Irrigation project, the Bow River project was transferred to the province in 1973 under the Canada-Alberta Irrigation Rehabilitation Agreement and the farmers in the area were organized into an irrigation district (p. 8-9).

The existence of an irrigation infrastructure has ensured the economic life of the community and its surroundings. The Taber Irrigation District was the first district established under the *Alberta Irrigation Districts Act* of 1915. More than 97 per cent of the landowners in the area voted to establish and operate a district to supply themselves with water. Water is supplied to the district from turn-outs on the St. Mary main canal. The St. Mary River Irrigation District (SMRID) is Canada's largest irrigation district delivering water through 2060 km (1280

[2] This date needs further verification.

miles) of canals and pipelines to approximately 150,500 hectares (372,000 acres) of land south of the Oldman and South Saskatchewan Rivers between Lethbridge and Medicine Hat, Alberta. The major conveyance system within the district is the St Mary River Irrigation District Main Canal. It is 283 km (176 miles) in length and has the capacity to carry 91 cubic meters per second (3200 cubic feet per second) at the start of the system.[3]

The source of water for the town of Taber is St Mary's River reservoir, which has a capacity of 9,946 cubic metres, measured in treated substance (Massie, 2004, p. 3). The town uses 13,638 cubic m of water per year. Most of the use—approximately 40%—is domestic. Commercial and institutional use counts for 10%, while another 30% is consumed by local industry (p.3). The Taber water treatment plant provides treated water for the households in town and also raw untreated water delivered to the major food processing industries (AlbertaFirst.com, p.2). This plant has struggled sometimes to meet the needs of all users; it needs to have a better infrastructure and expand in accordance to the increase of residents and the possibility of new industries in town.

Taber has suffered significant water-stress moments in its short history. As with many other communities in the Canadian prairies, the most stressful moments have been related to extreme climate events, such as drought and floods. The Irrigation Impact Museum of Taber has a large amount of information about these historical water-stress moments. The following paragraphs on drought and floods are based on that information.

Drought

After the settlement and following a few good years of farming, the pioneer families were soon faced with what was possibly the first drought many of them were to experience. By 1910, ten years after the town was built, the community experienced the first drought. Farmers barely got their seed back that year, but by 1913 the rain came again and the next three years were good ones. In 1917 and 1918 there was another drought, severe enough to raise public awareness in the local newspapers of the need to have access to irrigation.

[3] http://www.smrid.ab.ca/smrid/general.htm

The best-known drought years were the 1930s. Adding to the impacts of the economic depression and the beginning of 10 years of economic strife, drought hit the prairies in 1929. It has been estimated that farms in the Palliser Triangle area, where Taber is located, lost from 100 to 1,000 tons of nutritious topsoil per acre as a result of wind storms during 1930s. Those years were hard but the experience contributed to the development of a stronger adaptive capacity to water scarcities.

After the 1930s new farming practices to help control future droughts and soil erosion were developed. Strip farming, planting shelter belts and contour farming became common practices. Acres of land, that were marginal for farming, were put back to pastures and farm dugouts to save spring runoff water were dug. The need for irrigation in the region became more and more obvious.

As irrigation was developed and farmers were able to water more and more acres, the most devastating impacts of droughts on farms were becoming a thing of the past. However, serious droughts are still a hazard. The years 2000 and 2001 were the driest years in the Taber area between 1990 and 2005, with above normal temperatures between 1997 and 2001 (Wittrock et al., 2007). The drought of 2001 in the area created a water crisis. Farmers were given fewer inches of water per acre to irrigate their crops and the town's people were asked to limit the watering of their lawns and gardens as well as restricting watering times to early mornings or late afternoons to avoid evaporation as much as possible.

Flood

Flood constitutes another source of risk for Taber and its vicinity. Rain, spring defrost and snow pack melting are what normally contribute to the flooding of the river, which usually causes damage to the Taber park land at the river bottom, and occasionally affects farmers' crops and soils. After the water recedes, damage, mosquitoes and mud are left behind.

The first flood recorded in Taber's history was in 1908. Since then flooding has had a continuous presence in the area. The flood of 1953 was one of the major floods in the records. As reported by the Lethbridge Herald of June 9, 1953, croplands were inundated and the Oldman River at the McLean Bridge passed its capacity. Residents from the area had to be evacuated.

Later, in March of 1972 there was a flood believed to be the result of dynamiting an ice-jam at Fort Macleod. Park attendants who lived on the grounds at that time reported water well over their waists and homes flooded to four feet deep. The 1980s saw a number of wet years and more damage was done to the park. On June 8, 1995, the *Lethbridge Herald* reported that the Oldman River had risen to its highest level ever. "The Oldman River is into damage. Swollen by heavy rains, the normally placid waterway is expected to crest at a depth of eight meters by 8 p.m. today, higher than the greatest flood on record more than 40 years ago." This flood was eventually described as the "flood of the century." Water treatment plants did their jobs and kept the drinking water supply safe; however, there was extensive damage to homes in the towns along the course of the river as sewage systems were not able to handle the onslaught of rain from the skies and the river overflowing. Some of the people interviewed indicated that floodings would be a lot worse if it not were by the Oldman River dam, built in 1992, which is used to help control the flooding. In the 1995 flooding the presence of the dam reduced significantly the damage to the community. Operators began releasing water downstream early on the morning of Tuesday, June 6 to accommodate the excess of water.

The flooding most likely to damage homes in the Town of Taber is flash flooding caused by too much rain too quickly, causing the drainage system to overflow and backup. In June 1998, when 45 mm of rain fell in half an hour, there was extensive damage of this type.

Recent years have also been characterized by intense rain storms. The Annual Report of the Taber Irrigation District (2007) informs of the existence of a cycle of large rain events in June for the last several years. June 2005 was of one of the wettest Junes on record and there was extensive flooding in Alberta with most of the damage seen in the High River and Calgary areas. During the year of this assessment, 2006, Taber received between seven and nine inches of rain (equivalent to 175 to 225 millimeters) in just four days in June. Some buildings and basements were flooded and some businesses damaged. Overflow of water occurred at the Horizon School Division and Taber Animal Clinic. Water got into the basements at the Administration Building and Parkside Manor as well (*Taber Times*, 2006)

THE COMMUNITY VULNERABILITY ASSESSMENT

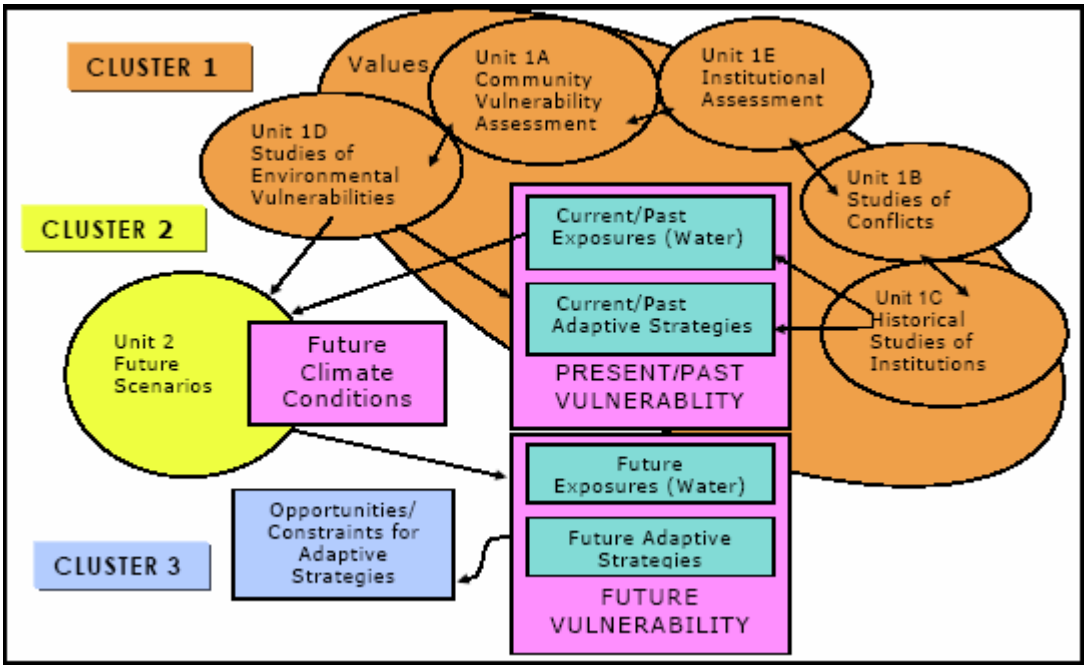
The assessment was conducted in the summer months of 2006. The work was carried out by Susana Prado, a graduate student in the Masters of Social Work Program at the University of Regina, under the supervision of Dr. Polo Diaz. This component of the report describes the framework and the assessment process. It presents and discusses the methodology that informed the work, the characteristics of the data collection process and the main findings.

Methodology

The methodological approach of the IACC project is based on a vulnerability assessment model, following a "bottom-up methodology" that is increasingly used in climate change research. The model emphasizes first, the need to analyze not only the future vulnerability of systems, but also their past and current vulnerability in order to understand how present vulnerabilities could be affected in the context of future climate conditions; and second, the perspective of the community members about their own vulnerability, how they experience and interpret their exposure to climate and other stressors and how they organize themselves to reduce that exposure.

As indicated in Figure 1, the IACC project is structured around three sets of interrelated research clusters: (1) the development of a systematic understanding of the current vulnerability of rural communities (exposure and adaptive capacity to stressors, with an emphasis on institutional contexts) in the two basins (Chile and Canada); (2) the assessment of future climate conditions for the area where the communities are located; and (3) the assessment of future vulnerabilities based on an analysis of how the existing vulnerabilities of the communities will be affected by future climate conditions. Figure 1 presents in detail the organization of the different research activities. The Taber community vulnerability assessment is part of cluster 1.

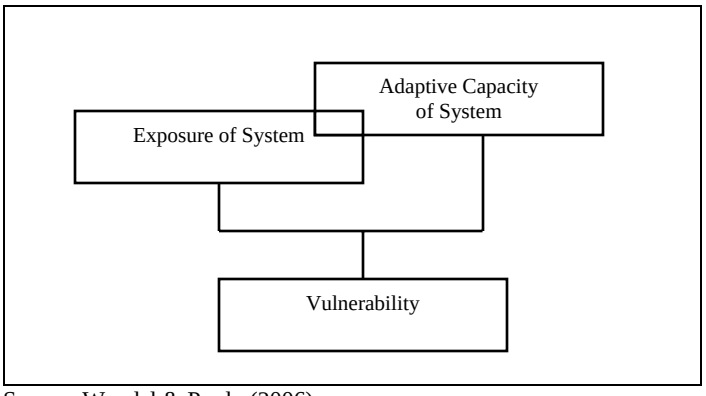
Figure 1: The Research Clusters of the IACC Project.



Source: IACC 2006, p. 4.

Vulnerability, in the context of the IACC project, is understood as the degree to which a system is susceptible to adverse effects of climate change, being a function of both the **exposure** (or sensitivity) of the system to hazardous conditions or risks and also of its **capacity** to deal with (or adapt to) that exposure (See figure 2). Thus, vulnerability to climate is a product of the interrelation of (1) environmental factors involving the frequency, severity and periodicity of climate events that affect the availability of water, such as the cases of drought and flooding in the case of Taber; and (2) social conditions of the system that determine its exposure and the capacity of the rural community to reduce it (access to resources, understandings of risk, governance systems, social capital, and other determinants). The existence of an irrigation infrastructure and the Oldman River dam are, accordingly, examples of what it is understood as adaptive capacity.

Figure 2: Vulnerability Approach



Source: Wandel & Prado (2006).

The assessment process followed the conceptual structure of the idea of vulnerability. The process of data collection was oriented to obtain information about the past, present, and future exposure and adaptive capacity of the members of the community

Data Collection

The vulnerability approach utilized by the IACC project, and thus in this study contemplates vulnerability as a starting point, in which the involvement with the community is crucial in order to characterize exposures and adaptive strategies. The major aspects of the data collection were:

✓ **Involvement with the community**: The field worker lived in the community during the time that the data was collected. A room supplied by the Town of Taber Office was used for office work and as a space for conducting many of the interviews. The fieldworker also had the opportunity to observe the everyday life and culture of the community and participate in some local activities such as *Cornfest*, baseball games, farmers' markets, sharing everyday activities with local residents and volunteering for the *Funrun*. Some visits to places like the Taber Public Library, Taber Irrigation Impact Museum and to the Taber Police Service enabled the field worker to understand some of the local institutions. Some local residents also gave tours to the fieldworker to Red Law (a rural area in the Municipal District of Taber) and to some corn, potato and onion fields.

✓ **Establishment of contacts**: The first meeting in town was with the mayor of the town. On that particular occasion the fieldworker was introduced by a researcher of the IACC project. This initial meeting was used to present the project and introduce the fieldworker to the local authority. After this initial meeting, the fieldworker established contacts with several key informants in the community, who facilitated contacts with community members and facilitated the process of arranging for the interviews. People from the Town Office, the Municipal District Office, local residents and representatives of local organizations were the key informants for this study.

✓ **Community characterization and history**: Before and during the community assessment, the fieldworker collected material related to the local history and current community issues from local archives, local newspapers, web material and census data.

✓ **Sampling strategy**: Key informants contributed to the process by providing advice to the interviewer about who should be interviewed and how to approach the potential participants. Based on this information, the fieldworker elaborated a list with the possible respondents for the interviews that was completed with a snowball sampling strategy: people that were interviewed referred other possible contacts. A special effort was made by the fieldworker to ensure a process of selection of the diversity of people living in the community. Table 5 provides a profile of the variety of respondents who were interviewed for the assessment according to occupation, age and place of residence. Several respondents were representativeS of local organizations, such as the Alberta Sugar Beet Growers Association, Chinook Community Futures, Horizon School Division, Potato Growers Association, Rogers Sugar, Taber and District Housing, Taber Irrigation District, Taber Water Management Plant, Municipal District of Taber and the Town of Taber.

Table 5: Respondent's Profile

Occupation	No.	Age	No.	Residence	No.
Farmer/rancher	12	30-39	8	In town	18
Oil work	2	40-49	6	M.D.**	12
Business	3	50-59	8	Other	1
Local authority	4	60-69	2		
Organization/Association/Corporation	3	70-79	5		
Service	3	Unknown	2		
Retired	2				
Other	2				
Total	31*		31		31

* The number of respondents is 31 with a number of 30 interviews. One interview had two respondents.
** Municipal District of Taber.

Semi-structured interviewing: Table 5 indicates the number of people interviewed for the community vulnerability assessment. Interviews were organized according to a set of topic areas identified in the IACC field guidelines (See Appendix 1). Each respondent was asked for some demographic information, detailed in Appendix 2. Interviews were recorded, transcribed into computer files and codified using NIVO, a software package for qualitative data analysis, by matching portions of the transcripts with categories of investigation corresponding to the field guidelines.

Reporting back: A workshop activity was organized with some of the interview respondents in Taber. In the context of a Public Participatory Geographic Information System approach which is being applied by Lorena Patiño—a Ph.D. Geography student from the IACC project—on her thesis, the results of the Community Vulnerability Assessment were presented to the participants, allowing the process of reporting back to the community. The main objectives of the workshop were to facilitate knowledge transfer, to assess potential impacts of climate change on water and to develop a set of recommendations to policy makers (Patiño, 2008, p.2). This activity included the realization of two focus groups.

FINDINGS

The following pages discuss the results of the interviews conducted during the community vulnerability assessment of Taber. The discussion has been organized into different sections, each related to one of the main components of the Community Vulnerability Assessment Guide (a summary of the topics covered in the interviews are found in appendix 2), which involve current exposures, current adaptive strategies and future exposures and adaptive strategies.

Exposures

The community of Taber is exposed to very favourable climate conditions to grow specialty crops in the area. Elements such as heat and sunshine provide positive conditions for growing potatoes, sugar beets, and corn (among others). The availability of irrigation water multiplies the benefits of these positive exposures, reducing the risks associated with water scarcities. Taber, however, is exposed to several stressors, climate events being just some of them. Table 6 lists all the stressors.

Table 6: List of Exposures

Environmental
➢ Water
Drought
Flooding
➢ Temperature
Chinooks
Temperature fluctuation
Early frosts
➢ Hail
➢ Wind
➢ Tornadoes
➢ Great fluctuation of weather from year to year
➢ Weather is becoming more extreme
➢ Thunder and lightning
Economic
➢ Diversified agriculture
➢ Specialty crops

Continuation of Economic
➢ Internationally driven prices; North American Free Trade Agreement NAFTA, making the trade easier but also affecting the variability of prices. World Trade Organization WTO affects the prices of local agricultural production.
➢ Competing with subsidized economies
➢ Labour shortage in agriculture
➢ Oil industry is a great influence in the economy of the area
➢ Housing is becoming less affordable and available
➢ Optimism in the local economy
➢ High input costs
➢ Growers increase their land size in order to raise production.
Employment
➢ Food processing and oil industry
➢ Labour Shortage
➢ Inter-level positions and basic skilled workers are difficult to find
➢ Agriculture is no longer a secure source of revenue.
Social
➢ Withering social support network.
➢ Tension in relations among people from different cultural backgrounds.
➢ Drug use.
➢ Change in lifestyle, more availability of money and ‘spending culture’
➢ Concentration of services and consumption patrons in larger settings, along with disappearance of small local business and public services.
➢ Lack of recreation programs for youth.
➢ Fewer people participating in community organizations.
➢ Youth do not seem very interested in completing secondary school or further education, opting for getting a job instead.
Institutional
➢ Diversity of organizations related to local production of crops and industry.
➢ Alberta Agriculture supports the development of the area, placing regulations and throughout programs.
➢ Alberta Environment places standards sometimes hard to follow, and disproves the construction of more dams in the area.
➢ Alberta Government does not seem to support rural communities or to do it with a consistent long-term vision.
➢ Taber and District Housing lacks proper fund to address all needs.
➢ Water Management Plant constraints
➢ Educational institutions challenged by the arrival of new immigrants and seasonal workers.

From year to year, weather often fluctuates in the Taber area, which leads to different and sometimes unexpected conditions. Thus, agriculture has to be very flexible in order to adapt to different weather conditions every year. Many of the respondents express their perception of the weather becoming more extreme, for instance the presence of more violent rainstorms or mild weather during the wintertime.

In regards to water-related exposures, respondents noted several instances of flooding in both the town and the municipal district. The most recent instance of flooding was in June of 2006. Referring to this particular instance, respondents said to have rained approximately 8 to 10 inches, which is substantial considering that the average amount of precipitation for the entire growing season (April to September) in the area is approximately 6 inches. In this particular instance the heavy rainfall was said to have flooded both the basements of several houses and town businesses. The rural areas were also affected. Even though farmers have implemented drainage systems in order to control flooding in fields, they were still impacted by the flood. The extra moisture affected the development of crops, whith considerable costs to agricultural producers. On the other side, ranchers experienced the opposite as the excess of water provided favourable conditions to grow grass, which provides sustenance for cattle.

Drought is another one of the predominant water-related exposures that affect the community and surrounding areas. According to respondents, the most recent droughts (2000 and 2001) had devastating effects on the community. Respondents have noted a decrease in the amount of precipitation over the winter months. This lack of precipitation results in a loss of snowpack in Alberta's Rocky Mountains, which causes a depletion of surface runoff, resulting in low water levels (Hayashi and Kemp, 2005). This leaves farmers without a sufficient amount of water to irrigate crops. Respondents also noted that a few years ago, the St. Mary's reservoir (the main water supplier for the area) was emptied for repairs. This contributed to an insufficient quantity of water during already unfavourable drought conditions. It should be noted, however, that the aforementioned droughts were said to have a lower impact on ranchers than on farmers as there was no reduction of water for their operations. In town, water waste is a point of concern for community residents during drought times. Many respondents complained that some people water their lawns and gardens in the hottest part of the day. However, people in town also think

that the water they consume is an extremely low amount in comparison to the water use in the Taber M.D.

Temperature is another fundamental element that affects agricultural livelihood. When temperature is too high, crops get ripe before they can develop, which decreases yields, with obvious consequences for farm income. Respondents also noted that Chinooks cause a drastic fluctuation in temperature, and affect crops in many ways. For instance, crops in long-term storage, such as sugar beets, struggle due to this increase of temperature since it diminishes the sugar content of the beets. Another effect of this fluctuation in temperature is the expansion and contraction of the building material of sidewalks in town, causing costly structural damage to buildings.

As well, respondents noted that extreme weather conditions, such as hailstorms and windstorms, are more common in recent years**.** Hailstorms result in loss of defoliation of crops, a reduction of yields, and in the worst cases, a complete loss of crops. In regards to wind, respondents noted that when extreme winds occur close to harvest, grain is blown onto the ground, rendering it incapable of being harvested, which, again, results in lower yields and less revenue. Also, there have been some tornadoes which have gone through some places in the M.D. of Taber. Thunder and lightning affect the work in the oil industry, causing loss of power in outside facilities. This also causes some losses of cattle.

Taber has a diversified economy with farming and oil and food processing industries at the forefront. Agriculture, the predominant source of livelihood, produces a wide variety of crops such as peas, carrots, wheat, flax/barley, corn, beans, sugar beets, potatoes, onions, and canola/mustard. The area is important in the production of specialty crops like timothy hay, corn and sugar beets.

Local agricultural production is directly dependent on internationally driven prices; as international markets fluctuate so do crop prices. This is very relevant for agriculture as it creates exposures to external and not always manageable economic stressors. Producers in the Taber area made clear their struggle to compete with subsidized economies from other countries, such

as the case of the sugar industry in US. This industry is subsidized, which produces challenges for local producers, who have to increase their production in order to get enough revenues and compete with subsidized economies.

According to respondents, other economic stressors, such as increased input costs, are a significant issue for the community as well. The rising cost of land, machinery, and other technology required to run an efficient farm results in higher input costs, and, consequently, less income. Thus, it is now more difficult than ever for farmers to earn a secure source of revenue, with a decrease in prices and increased costs. Lack of access to capital also prevents young people from taking on farming, to the extent that this activity has become too expensive and does not provide a stable and secure livelihood.

Increased housing costs and decreased availability is another issue in the community that affects youth and other people that seek for jobs in the town area. This situation cause difficulties, for instance to the industry area, to fully meet the employment needs.

The oil industry plays a crucial role for the local economy as it generates both employment and revenue. The oil industry provides a supplemental income for farmers that would otherwise struggle financially, as well as additional revenues for placing oil pumps in the farmers' fields. In addition, there has been a recent economic upheaval in the food processing industry in Alberta, which has turned into a strong employment factor in Taber. This activity, like the oil industry, provides a necessary supplemental income for agricultural producers during the winter months. However, some of these economic activities could also have detrimental effects upon the community and local people. The oil industry, for example, affects the viability of community business to the extent that they cannot compete with the high wages that the oil industry offers to local labour, so it becomes hard for them to find workers as the turnover rate is so high. As a result, many of these community businesses, such as the food processing industry, end up generating employment for foreign workers.

Respondents also noted that community members' participation in local activities and organizations are becoming sparser, which has some major implications for the community's social capital. According to the respondents, individuals are more focused on individual and

family-related activities, whereas in the past people had a more active participation in community organizations and events. Consequently, social cohesion and social solidarity within the community is not as strong as it once was. As community members participate in communal activities and events less and less, cohesion between these members disintegrates as well, resulting in a weak social support network.

Respondents of the Municipal District also attribute the weakening of the communal social support network to the decline of public services, such as the loss of some schools in the Municipal District area. As a result of the concentration of services in larger settings, Taber's residents go to them for shopping and recreation activities (either to Taber Town or Lethbridge area) and participate less in community activities. Big companies in town such as Wal-Mart and Boston Pizza, among others, have transformed into attraction poles.

There is a diversity of recreation activities and infrastructure in Taber, especially for kids. However, there is a concern of a lack of recreation programs for youth. Many respondents revealed their preoccupation with drug use by young people and some of them relate this problem to the oil industry. The success of this industry has brought a change in lifestyle in the community; there is more availability of money, particularly among people related to the oil industry. A related issue in the community is the lack of interest of young people to complete secondary education or to obtain further education, who opt for finding employment in the oil sector.

There is also a noted tension in relations among people from different cultural backgrounds, particularly seasonal agricultural workers. There are a significant number of foreign seasonal workers, mainly Mexican Mennonites, who come to the area during the summer months to find employment. According to the field worker's observations, there is a welcoming attitude toward these seasonal workers because they bring the necessary labour, but at the same time they are considered a problem by local people, especially in relation to their use of educational and health services. In the area of education they are seen by local people as increasing the secondary desertion numbers due to the lack of interest in formal education that this population seem to have. In terms of the use of health services, some locals consider them a

burden, to the extent that they use these services without paying taxes, which is considered unfair. There is also tension with new immigrants, especially those coming from rural sectors in Europe. They come to Canada with the financial means to purchase land, machinery and other inputs in the area, increasing their prices, which creates challenges for the local farmers.

International trade and agreements also impact on the community. The regulations established by the Free Trade Agreement with the United States and Mexico benefit trade, but they could also affect local producers. Protection by the USA also affects local economy, as in the case of Taber: the decision of the US to close its border to Canadian beef as the result of BSE had devastating consequences for the local producers. The World Trade Organization (WTO) was also noted to influence the prices of local agriculture. For instance, the sugar prices are under international control according to competitiveness of prices, which constitutes an external exposure for local producers, pressing them to produce more in order to get enough revenues. Another international agreement that is perceived as potentially problematic by local people is the possible changes to the agreement between Canada and U.S. about the regulation of the distribution of the Milk River flow. According to several respondents, the US government's aim is to change this agreement by trying to attain more water, which will affect the future water supply for those in Canada.

At the provincial level, several respondents mentioned Alberta Environment and Alberta Agriculture as important institutions that impact upon the life of people in the community. More specifically, respondents expressed a discomfort with the increasing amount of rules and regulations that these institutions are creating, as it makes it very difficult for people to meet the standards specified by these regulations. Alberta Environment, for instance, placed standards for water treatment which are necessary but hard to meet as the community's resources are not sufficient enough to do so. Furthermore, according to respondents, Alberta Environment seems to oppose the construction of more dams in the area, which the majority of the respondents consider necessary in order to secure the water available in Alberta and diminish the risks of floods. In the same vein, Alberta Agriculture is seen as an institution that places regulations and supports local agriculture; however, the programs created by this organization are considered to be too complicated and hard to understand to fully take advantage of them.

There is a general perception among respondents that the Alberta government does not provide enough infrastructure funding for its rural communities. They believe that this is an area that leaves much to be desired and something that must be improved in order for rural communities to be sustainable.

Adaptive Strategies

Table 7 list the most important adaptive strategies described by the respondents. They range from water management to internal institutions, all mechanisms that allow local people to reduce their exposure to the multiplicity of stressors that characterize their daily life and livelihoods.

Table 7: Current Adaptive Strategies

Water Management
➢ Irrigation
➢ Rationing in times of water shortage
➢ Construction of on-farm water storage facilities
➢ Irrigation of higher value crops in times of water shortage
➢ Drainage systems on farm in case of flooding
➢ Use of non drinking water by some industries for processing purposes
➢ Water supply for cattle is not restricted in case of drought.
➢ Increasing use of bottled water.
➢ Fill cisterns with water from town in M.D.
➢ Dugouts filled by ranchers.
Financial
➢ Crop insurance.
➢ Diversification of income by people in agriculture.
➢ Workers from outside the town and the country to fill jobs in agriculture.
➢ When farming revenues are not what expected, farmers cut back on fertilizer and equipment.
➢ Bank loans due to high input costs
Technology
➢ For irrigation, in order to improve efficiency in the use of water.
➢ For harvesting, as an adaptation to the labour shortage.

Social
➢ Educational programs specialized for new immigrants or seasonal workers.
➢ Seasonal workers bring more workers along to fill jobs in agriculture.
➢ Youth not very interested in farming.
➢ Education is not a high value in the community (in general)
Internal Institutions
➢ Programs by police, town and local organizations in relation to youth and recreation.
➢ Church as a space for social interaction and support.
➢ A variety of organizations and associations related to agriculture such as potato growers association and sugar beet growers, which have connection with local food processing industries.
➢ Irrigation districts in the area play a role in water rationing for times of water shortage and upgrading irrigation infrastructure. Taber Irrigation District's role in improvement of irrigation systems.
➢ Organization that looks after social housing. It is called Taber and District Housing.
External Institutions
➢ Government financial support for flooding in town. Disaster relief program.
➢ Technical assistance, research, development from industry; provincial and national.
➢ Provincial funding for water infrastructure and roads.
➢ Federal government influencing food safety improvements.
➢ Government programs for hail insurance.
➢ Alberta Agriculture and Alberta Environment are looking at issues of water and climate change. Informing farming people in the area, working on research.
➢ Lethbridge research station develops research to support the local agriculture in issues such as seeding, weather events like storms, rains, and tornadoes.
Other
➢ Dryland farming increasingly being mixed with ranching.

In the area of water exposures, respondents reported irrigation as being the main adaptive instrument for the community as it has allowed farmers to grow a wide variety of crops and obtain higher yields. This has resulted in more sustainable livelihoods for individuals, and, as a result, a more prosperous local economy. In times of serious water shortage, such as during the drought of 2001, institutional water rationing has proved to be a successful adaptive strategy. The Town of Taber implemented water conservation strategies by regulating household watering to lawns and gardens. In the case of farmers, the Taber Irrigation District put a water rationing regulation in place that allowed each farm only 10 inches per acre, which was about a 30% reduction of water supply in relation to a normal year. However, many farmers took it upon

themselves to halt the irrigation of low-value crops and even some others simply decided not to grow altogether and temporarily pass or sell their water rights to other farmers with more valuable crops. This cooperative agreement is a good example of the role that social capital could play in increasing the adaptive capacity of farmers (Adger, W, 2003; Diaz and Nelson, 2005). The Taber Irrigation District was identified as the chief internal institution to play a role in water conservation in times of water shortage. They have also taken the lead on the upgrading of irrigation infrastructure, improving a regional drought coping capacity. Other coping capacities to water scarcities involve the use of on-farm water reservoirs, the use of better irrigation technologies, the filling of cisterns with water from town, or even the use of bottled water bought from the local store. It is interesting to note that there is a trend of increasing use of bottled water in the community. Community members prefer bottled water, considering it fresh, good-tasting and convenient.

In the case of floods, the use of drainage systems and dams provide a way of coping with extreme cases. There is an adequate construction of drainage systems on many farms, which are very useful when those heavy rains come and there is flooding in the field. An interesting measure in water management adopted by industries in the area is the use of non-treated water for some stages of the processing. This provides relief for the town water treatment plant, as it does not have to process as much water, which results in less maintenance and a longer life span. Rogers Sugar industry was identified as having its own water supply resources.

In regards to financial management, the majority of respondents noted purchasing crop insurance as one of the predominant adaptive strategies to deal with climate-related events. In addition, as previously noted, since farming is no longer as a secure source of revenue as it once was, those involved in agricultural production tend to secure additional jobs to supplement income in order to reduce their economic vulnerability. The majority of these respondents identified the oil industry to be their main secondary source of income, either working in the oil industry or allowing drilling operations to take place on their land. Another adaptive mechanism to deal with declining returns has been farming larger tracts of land in order to produce more products and secure a stable income. Many of the respondents who adopted this mechanism are forced to hire workers, often from other countries, to harvest the larger crops. In addition, when

farming revenues are not what was expected, farmers reduce their investments on fertilizer and equipment or they just get bank loans, an alternative that could put farmers in an even more serious situation.

With regard to social vulnerabilities, several adaptation strategies have been developed by the community. Local institutions have implemented services and programs contributing to reduce many of the stressors that impact upon community cohesion. For example, the Town of Taber and local churches have implemented various recreational programs for young people. Churches such as the United Church and the Church of Jesus Christ of Latter Day Saints are local institutions that organize recreation activities, acting as an arena for social interaction between children and parents, contributing to the strengthening of the communal social support network. Taber & District Housing was mentioned by respondents as aiding in the housing situation that faces the community of Taber as the result of the influx of immigrants to the community in search of employment. In the town of Taber, Ace Place Learning Centre, an alternative/outreach school, has also developed and delivered especial educational programs for immigrant workers. These programs are geared to aid immigrants in the process of societal integration. Respondents believe that it is highly beneficial for the community to implement such programs as it draws such workers to the community, which, in turn, aids in promotion of the local economy.

A variety of local agricultural organizations and associations, such as the Potato Growers Association and the Sugar Beet Growers Association, have played an important role in the development of the local economy, developing the associative potential of local producers and contributing to the community's social capital. They act as a link between producers and industries, strengthening the production in order to compete in the international market.

Although there is a perception by some community members that there is not enough provincial government funding for the infrastructure of rural communities, some respondents identified programs and provincial institutions that have been noted to aid in funding for various things such as local infrastructure. A typical example provided by respondents is the Disaster Relief Program, which provides financial support for flooding damage through the funding for

water infrastructure and roads, and insurance for crop damage. Alberta Agriculture and Alberta Environment were specifically identified for informing farmers about climate change and the various water-related issues that accompany it. The Lethbridge research station is the leading institution that was identified in spearheading research initiatives involving extreme weather patterns. This helps the community prepare for extreme weather events that otherwise may not be known about, which would result in substantial damage to crops.

Provincial and national institutions such as Environment Canada and Alberta Agriculture are also recognized for facilitating technical assistance, research and development for the agricultural industry. The Federal government specifically has geared research towards promoting safe food processing.

As in many other communities, new technology has been an important means of adapting to the economy and the climate, especially in the areas of irrigation and harvesting. In irrigation, for example, the inclusion of pivots replaced flooding irrigation. This new form of irrigation reduces evaporation, thus making crops less vulnerable to water quantity issues. As these technologies have reduced the amount of manual labour that is required for farming, farmers do not need to hire as many manual labourers as in the past, which saves them money in the long run.

FUTURE

Future Exposures

Table 8 describes the most important future exposures that Taber faces, as noted by respondents. Respondents expected an increase of water scarcities, which have become unwelcomingly common in the recent past, as a result of an increasing demand for the resource. Respondents also highlight that they believe there will be inter-provincial and international water conflicts and tensions in the future, also due to projected decreases in water quantity. On the

whole, there is an uncertainty about the future state of climate for community members, which makes difficult to plan for the future in terms of agricultural production.

Table 8: Future Exposures and Adaptive Capacities

Future Exposures-Constraints
➢ Future dry periods are expected to occur.
➢ There is uncertainty about future climate.
➢ Inter-provincial and international water conflicts
Future Adaptive Capacities-Opportunities
➢ Global warming can bring more rain, which can bring opportunities.
➢ More heat, along with the availability of water, will be positive for agriculture in the area.
➢ Better preparation for flood prevention.
➢ The community has a certain capacity to deal with dry periods.
➢ Technology is considered a relevant mechanism to overcome water scarcity.
➢ Find ways to conserve water and to use in a more efficient way.
➢ Construction of more dams in the area.
➢ Education in water conservation.
➢ The water management plant will have to be upgraded or substituted.
➢ Water planning.
➢ To keep updated the infrastructure of the town.
➢ To meet the needs of social housing
➢ Government is expected to play a role in providing more water storage and technology for agriculture.
➢ Agriculture activities will expand.
➢ Improvement of technologies in weather warning systems
➢ Development of nontraditional energy resources.

Future Adaptive Capacities - Opportunities

Respondents see climate variability as a process that occurs in cycles, and the community of Taber intends to utilize the climate shift to its advantage. For instance, global warming can bring more rain. This increase in rain can reduce irrigation, which results in farmers saving money as they no longer have to pay as much for water or maintenance to irrigation equipment. If the climate shift presents an increase in heat, respondents believe that agricultural production will flourish to the extent that it will provide the opportunity for a crop diversification, increasing

the variety of non-traditional high-value crops in the agriculture of the area. Nevertheless, respondents are not considering the evapotranspiration factor into this analysis.

Technology is considered to be a relevant mechanism to overcome water scarcity. Respondents consider it crucial to finds new ways to be more efficient with water usage. One of the possibilities frequently mentioned is the construction of more dams in the area. On the other side, both the local government and residents consider it necessary to have better preparations, such as on household drainage systems and improvement of sewer system in the town area in order to prevent flooding due to intense rainfall events.

Respondents believe that some future measures need to be taken in order for the community to be sustainable. These measures include education and planning. More specifically, respondents believe that as more immigrants seek employment, it is necessary to undergo initiatives to educate community members on water conservation and plan accordingly to meet the population growth that is occurring. Also, increased housing was identified as something that needs attention in order to support the population growth.

In addition, for the future adaptive capacity, the government is expected to play a role in building more water reservoirs and continuing research and development in the area of agriculture; specifically, improving technologies for weather warning systems and implementing non-traditional energy sources such as wind power. Respondents anticipate that expansion of agricultural activities is absolutely necessary in order to meet the criteria of and keep up with the global economy.

CONCLUSION

For the vast majority of respondents in Taber, environmental exposures such as flooding, drought, and hail proved to be the most detrimental to their sustainability as they directly affect the community's economic state. In addition to the environmental exposures, people from Taber are affected by international processes, such as trade and agreements, which make it difficult for agricultural producers to obtain a reliable source of income in already unfavorable conditions. These economic conditions in the community directly and indirectly affect many other facets of the community, some of which include challenges in relation to housing, agricultural employment, and the communal social support network.

In relation to adaptation strategies, irrigation is crucial as it has allowed producers to diversify into more high-value crops. Another important adaptation strategy has been employing immigrant workers to aid in agricultural production. The incorporation of technology is another strategy adopted in water conservation and the development of agriculture in the area. To accompany the population boom from migrant workers, there have been both social and housing initiatives such as culturally sensitive educational programs.

On the whole, Taber is adapting to most of the stressors that affect it in the current context. Therefore, the community has a certain adaptive capacity to maintain agriculture as one of the main economic activities of the area, and its vulnerability is not as high as in other communities from the South Saskatchewan River Basin that are being studied in the IACC project. The future vulnerability of Taber will depend upon their capacity to deal with more frequent droughts and heavy rainfall events, as well as

further development of adaptive strategies in order to work with social problems that are arising with the current changes in the economy of the area, and migration patterns.

BIBLIOGRAPHY

Adger, N. (2003). Social aspects of adaptive capacity. In J. Smith, R. Klein, & S. Huq (Eds.), *Climate change, Adaptive capacity and development* (pp. 29-49). Imperial College Press: London.

Adger, W. (2003). Social capital, collective action, and adaptation to climate change. *Economic Geography*, *79*(4), 387-404. Retrieved February 16, 2006, from ABI/INFORM Global database.

Alberta Agriculture, Food and Rural Development (May 2006). Irrigation in Alberta; Facts and figures for the year 2005. Accessed on November 15, 2007. Available at: http://www.smrid.ab.ca/smrid/IrrigationReport2005.pdf

AlbertaFirst.com (2006). *Taber*. Retrieved June 29, 2006, from http://www.albertafirst.com/profiles/statspack/20473.html

Bow River Irrigation District (2008). *2007 Financial Statement and Annual Report*. Accessed March 20, 2008. Available at: http://www.brid.ab.ca/files/2007_AnnualReport.pdf

Data analysis guide for community-based assessment of vulnerabilities. Institutional Adaptations to Climate Change Project (IACC).

Diaz, P. & Nelson, M. (2005). Rural community, social capital and adaptations to climate change. *Prairie Forum*, 30(2), 289-312.

Elves, J. (2006, June 21). Underwater: Town it with over seven inches of rain last week. *Taber Times*, pp. A1, A2, A7.

Hadarits, M. (2007). *Lethbridge Stakeholder Workshop on Water and Climate* (Summary Report). IACC. Accessed December 2, 2007. Available at the World Wide Net: http://www.parc.ca/mcri/pdfs/Lethbridge_Workshop_Report.pdf

Hayashi, M. & Kemp, G. (2005). Snowmelt Contribution to Groundwater Recharge, in Sauchyn et al., (Eds), The Science, Impacts and Monitoring of Drought in Western Canada: Proceedings of the 2004 Prairie Drought Workshop, Canadian Plains Research Centre: University of Regina. Pp. 21-26.

IACC Project, (2005). Annual report January 2004 - April 2005. Available at: http://www.parc.ca/mcri/pdfs/First%20Annual%20Report.pdf

IACC Project (2006). Annual Report April 2005 – April 2006. Available at http://www.parc.ca/mcri/pdfs/PATFinalAnnualReport2005-2006August2006.pdf

IACC Project (n.d.). *The Project*. Available at: http://www.parc.ca/mcri/project.php

Kuiper, L., & Phillips, L. (August 2003). *Community profile*. Town of Taber, Planning.

Magzul, L. (2006, August). *Blood Tribe. Report on the Blood Tribe (Kainai Nation): community vulnerabilities*. IACC. Available at: http://www.parc.ca/mcri/pdfs/Uni1tA_BloodTribe_vulnerability__DRAFTreport.pdf

Massie, M. (2004). *Structural Outline - SSHRC Project – Community characterization project – Community: Taber – Alberta*.

Matlock, B. (2007). Report on the community vulnerability assessment of Cabri and Stewart Valley, Saskatchewan. Available at: http://www.parc.ca/mcri/pdfs/cabri_stewart_valley_com_report.pdf

100 years of news, the way it was (2005, May 25) Taber Times, pp. 1, 103.

Patiño, L. (April 2008). Report on Participatory Mapping Sessions. University of Regina, IACC project. Available at: http://www.parc.ca/mcri/pdfs/geospatial/part_m1.pdf

Prado, S. (April 2007). *Community vulnerability assessment of Taber – Progress Report*.IACC.

Sells, S., Smith, E. & Newfield, N. (1997). Teaching ethnographic methods in social work: a model course. *Journal of social work education, 33*(1), 167-185.

Smit B., Wandel J. & Young G. (2005). *Vulnerability of communities to environmental change* (IACC project working paper No. 21). University of Guelph. Available at: http://www.parc.ca/mcri/pdfs/SmitWandelYoung(05).pdf

Statistics Canada (2002). 2001 Community profiles. Released June 27, 2002. Last modified: 2005-11-30. Statistics Canada Catalogue no. 93F0053XIE. Available at: http://www12.statcan.ca/english/Profil01/CP01/Index.cfm?Lang=E

Statistics Canada (2007). *Taber, Alberta* (table). *2006 Community Profiles*. 2006 Census. Statistics Canada Catalogue no. 92-591-XWE. Ottawa. Released March 13, 2007. Available at: http://www12.statcan.ca/english/census06/data/profiles/community/Index.cfm?Lang=E

Taber Irrigation District, 2007, *88th Annual report and financial statement, 2006*, Taber.

Taber Irrigation Impact Museum. Display material. Retrieved June 22, 2006.

Taber Irrigation Impact Museum (2003). History of Taber 1905-2005. Taber and District Museum Society.

Town of Taber. *The history of Taber*. Available at http://www.taber.ca/explore_TABER/history.asp

Wandel, J., Smit, B,. Young, G., Salas, S., & Diaz, P. (2005). *Field guide for community-based assessment of vulnerabilities and adaptive capacities related to water and institutions in the context of climate change, Elqui and South Saskatchewan river basins*. IACC. Available at: http://www.parc.ca/mcri/pdfs/Fieldwork%20Guide%20FINAL.pdf

Wandel, J. & Prado, S. (December 2006). *Community Vulnerability in the SSRB: Alberta Case Studies*. Available at: http://www.parc.ca/mcri/pdfs/stakeholder/Lethbridge%20PPT%20Presentations/cCommunitiesHannaTaber%20Wandel%20Prado%20Lethbridge.pdf

Wittrock, V., Kulshreshtha, S., Weathon, E., & Khakapour, M. (December 2007). *Vulnerability of prairie communities during the 2001 and 2002 droughts: Case studies of Taber and Hanna, Alberta and Outlook, Saskatchewan*. Saskatchewan Research Council and the University of Saskatchewan

APPENDICES

APPENDIX 1: SUMMARY OF THE TOPICS COVERED IN THE INTERVIEWS
(From Wandel et al, 2005)

Situational/Setting the Stage

- Name, age, occupation, sources of income, where live
- Family – who live with, ages, employment
- Occupation/Livelihood (e.g. for farmers: land farmed, owned, rented; crops/livestock raised, how long farming)
- Role in the community
- Membership and role in organizations/institutions

Exposure-Sensitivities

To identify the main exposures that affect the respondent, his/her family and community, and the local livelihoods:

- Water: too much, too little, timing, quality (incl. potable water)/contamination
- Temperature: too hot, cold, variability, predictability
- Biophysical environment: hazards related to flooding, mudslides…
- Economic environment: markets, agribusinesses, unemployment
- Social: loss of kinship networks, psychological stress, health status…

Adaptive Strategies

To identify the ways in which the respondent, his/her family, and the community have dealt with the exposures.

- Water management: irrigation, canals, wells, crop changes, livestock changes
- Management of other conditions: planting cold/heat tolerant cultivars…
- Financial management: insurance, draw on reserves, off-farm income
- Institutions: role of specific institutions (local and regional/national) in managing exposures
- Social: kinship networks and local organizations

Future Exposure-Sensitivities and Adaptive Strategies

To identify future conditions relevant to both exposure-sensitivities and adaptive strategies/capacities as perceived, anticipated and predicted by the respondent.

- Climate: extreme weather events.
- Water: drought, rainfall, snow.

Institutions: internal and external institutions to the community.

APPENDIX 2: FORM TO FILL WITH INTERVIEW RESPONDETNS

INTERVIEW	**:**	**Tab**	
GENDER	:	Male	( )
		Female	( )
OCCUPATION	:	Farmer	( )
		Rancher	( )
		Business person	( )
		Retired	( )
		Unemployed	( )
		Local authority	( )
		Member of local organization / association	( )
		Other _____	
EDUCATION	:	Primary	( )
		Secondary	( )
		Post – Secondary	( )
		Post – Graduate	( )
AGE	:		
MARITAL STATUS	:	Married	( )
		Single	( )
		Divorced (includes separated)	( )
		Widowed	( )
		Common – law	( )
NUMBER OF PEOPLE IN HOUSEHOLD	:		
RESIDENCE	:	In town of Taber	( )
		Rural Taber	( )
		Other	( )
PRIMARY WATER SOURCE		Personal well	( )
		Municipal well	( )
		Town	( )
		Cistern	( )
		Canal	( )
		Surface	( )