

Final Technical Report to the Prairie Adaptation
Research Collaborative

*Assessing the Effectiveness of Climate Change
Communications: A Case Study of A
Community Climate Change Workshop*

Submitted by

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1.0 Introduction

Since the submission of the interim report in December 2000, the project objectives and deliverables have been completed. As the interim report included an introduction, a literature review and section describing the study methods, this information will not be included in this report. A copy of the final thesis containing a comprehensive synthesis of all research activities, including an in-depth discussion and communication strategy will be submitted to PARC upon completion.

The purpose of the project was to determine effective ways of communicating climate change information with adults in the region of Riding Mountain Biosphere Reserve (RMBR). There were four objectives of the project:

1. To determine the level of understanding of climate change among selected adult learners;
2. To evaluate a program of climate change to adult learners;
3. To establish the program effectiveness regarding communicating climate change information; and,
4. To suggest strategies for effective communication of climate change for successful implementation of adaptation strategies.

This report is the final project deliverable. As such it captures the work completed since the interim report and outlines:

1. The organization, promotion and successful implementation of the Community Climate Change workshop;
2. The development and implementation of the Pre- and Post workshop survey questionnaires;
3. A summary review and discussion of the survey results;
4. Workshop evaluation and summary of communication suggestions for the study region; and,
5. Attachments pertinent to the above research activities.

2.0 Workshop Overview

2.1 The Participants

The *Community Climate Change Workshop* occurred in Rossburn, Manitoba on February 17, 2001 between 10:00 am and 4:30 p.m. (see Figure 1 for a map of the study area). In response to the five promotional communication tools (described below), thirty- seven individuals pre-registered for the workshop by mail, fax, e-mail, or telephone. Pre-registrants accounted for eighteen of the twenty-seven workshop participants; the nine additional participants represented same day “walk ups.” Workshop participants resided throughout the southern region of the RMBR. Participants represented a variety of interests including farming and RMNP staff. Table

1 reviews the age and occupational information of the workshop participants. Table 2 identifies the communities where the participants reside (see also Figure 1).

Table 1 Age and occupation distribution of workshop participants at onset of workshop

Age category	Under 25	25 to 35	36-45	46-55	56-65	66 & over
N=22	4	6	4	4	1	3

Occupation	Grain/cattle Farmer	Conservation District	RMNP affiliation	Gov't./ MB. Agriculture	Student, Other citizen	No Response
N =27	10	1	5	1	4	6

Table 2 Area of Residence for Workshop Participants

Rural Municipality/Town	Number of inhabitants
RM of Rossburn	3
RM of Shoal Lake	2
RM Silver Creek	1
RM of Park	5
RM of Straithclair	2
Grandview	2
Russell	1
Dauphin	1
Clanwilliam	1
Town of Rossburn	3
Shilo/Wasagaming	1
Total	22

2.2 Workshop Promotion

Promotion of the Community Climate Change Workshop was necessary to facilitate awareness of the workshop to stakeholders within the RMBR and to encourage representative participation

among RMBR stakeholders. Initially the workshop was planned for February 25, but because of inadequate promotional efforts and/or interest, there were insufficient participants pre-registered to enable the workshop to proceed. Therefore, increased promotional activities were required to attract more participants. As a result of this constraint, the date of the workshop was moved to February 17. Future promotional activities reflected this change of date.

Five promotional activities described below were utilized prior to the workshop.

1. Mail Packages

The first promotional activity involved the development of a communications package. In late December 2000, twenty-seven packages containing a cover letter, 8.5 x 11-inch workshop poster advertisement (see Appendix 1), and accompanying pre-registration forms were sent to 23 town and/or RM offices, and four First Nations located within the RMBR. Due to insufficient pre-registration, twenty-seven mail packages were sent a second time to those same offices notifying them of the date change and encouraging attendance and pre-registration for the workshop.

2. Newspapers Advertisements

Workshop advertisements (see Appendix 2) were developed and placed in several local newspapers in the RMBR. These newspapers were:

The Dauphin Herald
The Shopper (put out by the Dauphin Herald)
The Rosburn Review
The Shoal Lake Star
The Russell Banner
The Crossroads (2 separate advertisements).

These advertisements were placed in these newspapers beginning in late December and ending a week prior to the workshop. The newspaper advertisements also contained pre-registration information. Considerable budget funds were required for these advertisements. The newspaper advertisements reached a readership estimated between 15,000 and 25,000.

Through an advertisement in the Crossroads newspaper, a Brandon Sun journalist became aware of the workshop. Lyndenn Behm contacted Mr. Shymko to inquire about the workshop. Subsequently, an article appeared in the Brandon Sun on February 13, 2001. For a copy of the article see Appendix 3.

3. Posters

Enlarged copies of the posters (see Appendix 1) and registration forms were placed on community notice boards in numerous towns within the RMBR. Posters were posted in Dauphin, Onanole, Erickson, Straithclair, Shoal Lake, Minnedosa, Angusville, Newdale, Elphinstone,

Oakburn, Sandy Lake, Keeseekoowenin First Nation, Birtle, and Rossburn. These posters were placed up approximately one to two weeks prior to the workshop.

4. Delegations

Personal presentations at town and/or RM council meetings were conducted between February 7th and 9th. They were given to explain the purpose and objectives of the workshop to councilors and any attending public; and, to encourage their participation in the workshop. In total, four delegations were made to town or RM councils in the region south of RMNP. In addition, a presentation was made to the RMBR Liaison committee. This committee includes stakeholders both within and outside RMNP, including three levels of government, park officials, farmers and other stakeholders within the “Zone of Co-operation.” Through the delegations personal contact was made with well over fifty area residents, most of whom hold positions that influence decisions regarding natural resources and the environment.

5. Electronic mail Notices

Electronic mail messages were sent to various stakeholders, such as conservation district managers, and RMNP employees within the RMBR. The e-mail message included the specified date and location of the workshop, and an electronic copy of the poster. RMNP contract worker Geraldine David conducted this promotion communication in early January 2001.

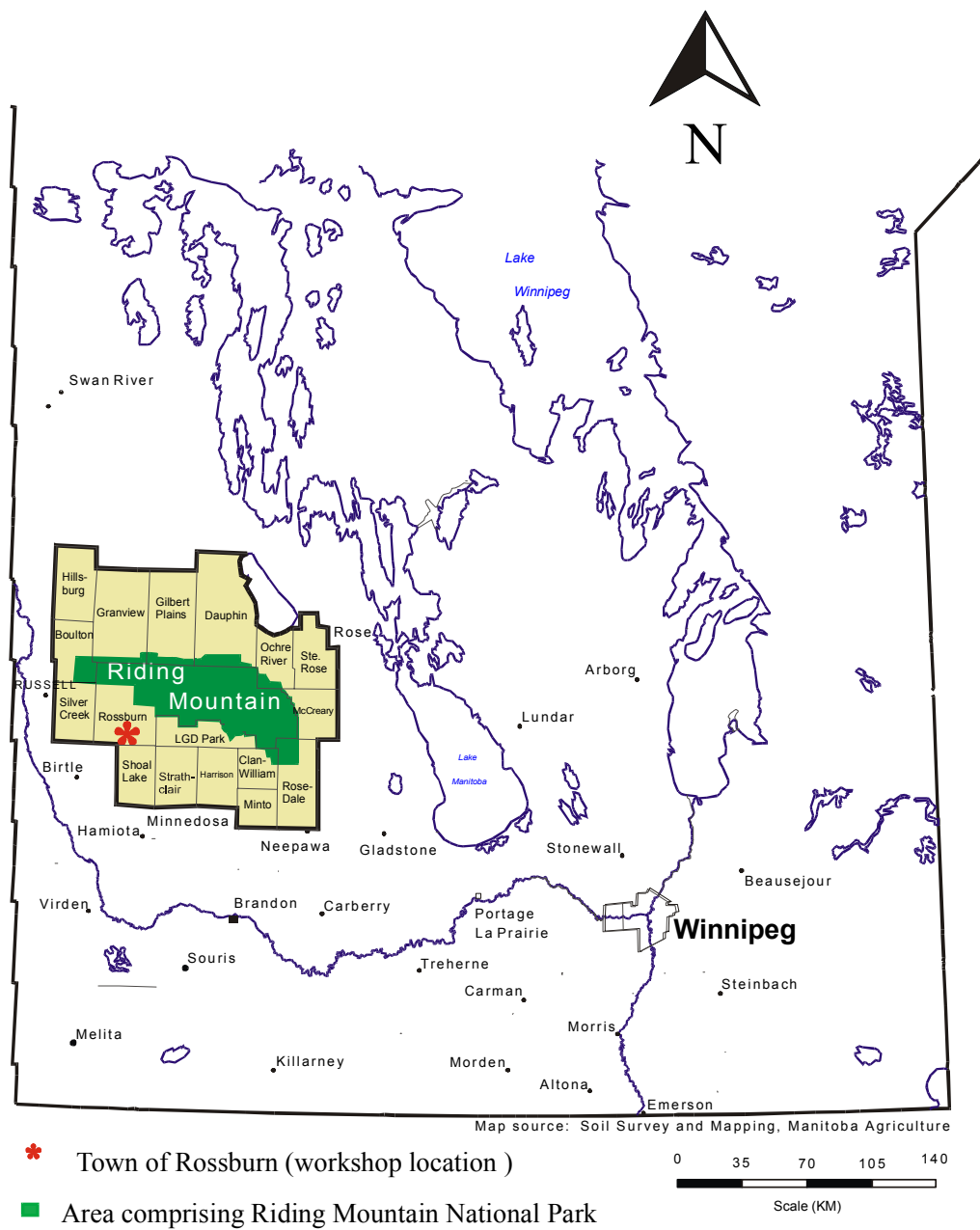


Figure 1 Riding Mountain Biosphere Reserve situated in the Northwest region of Agri-Manitoba

2.3 Community Climate Change Workshop Proceedings

Morning Workshop Proceedings

The workshop began at 10:00 am. A workshop package was given to participants as they entered the hall. The package included a workshop schedule, pre-survey cover letter, pre-survey, climate change short story, a pen and note pad. For a copy of the workshop schedule see Appendix 4.

Dwain Lawless, Reeve of Rossburn Rural Municipality (RM), and chair of the workshop, opened activities with welcoming remarks and initial introductions. Randall Shymko, Natural Resources Institute Graduate student, and research investigator introduced the issue of climate change, described the purpose of the workshop, and then briefly outlined the main workshop activities.

Introduction and Completion of the Pre-Survey

Randall explained the purpose of the pre-survey questionnaire. The survey was designed to determine participant perspectives of climate change and information and communication needs. Appendix 5 contains a copy of the pre survey questionnaire. Workshop participants were directed to their workshop package for the cover letter and the pre-survey. Participants proceeded to spend 20-25 minutes completing the survey (see Figure 2).

Environment Canada Meteorologist Presentation

Following the completion of the survey, the main morning presentation, given by senior climate trends Environment Canada Meteorologist Bevan Lawson from Winnipeg, Manitoba, was on the science of climate change. Bevan's seventy-five minute non-technical, public oriented presentation, focussed mainly on the causes of human and natural climate change, and the potential physical implications of future anthropogenic climate change. Bevan used an interactive PowerPoint presentation displaying numerous graphs, figures and animated AVI Global Circulation Model ensembles of potential temperature, precipitation, and soil moisture for North America to the year 2100. Figure 3 shows Bevan presenting to the workshop participants.



Figure 2 Workshop participants completing the first questionnaire



Figure 3 Bevan Lawson presenting to participants at the Rossburn Workshop

Bevan began his presentation by delineating between climate and weather. This was followed by an explanation of the enhanced greenhouse effect and its sources. He reviewed the natural factors that cause climate change including the earth's tilt and orbital changes, solar variations, and volcanoes. He then focussed on human influences on climate resulting from land surface changes and atmospheric inputs of greenhouse gases such as carbon dioxide and methane. Recent carbon dioxide and temperature profiles were compared to data spanning between one million years ago and the present. Canadian temperature anomalies for the past fifty years were presented in comparison to global averages.

After a brief review of global climate/circulation models, Bevan presented potential future impacts of a doubling of greenhouse gases to temperature, precipitation and soil moisture in North America using animated AVI images. Engaging graphs and figures displaying potential changes in weather extremes including more droughts and thunderstorms for North America were illustrated. At this time the presentation on the effects of global warming was focussed upon the Canadian Prairies and agriculture. This focus included a variety of changing conditions such as growing degree-days, ecozones and winter storms. The presentation concluded with Mr. Lawson indicating that the level of certainty surrounding future impacts is low on a regional and especially local scale.

Throughout, and following Bevan's presentation, participants who posed questions were rewarded with both a succinct and non-technical responses. Some of the questions included those related to the discrepancy between the terms "climate change" and "global warming," the influence of volcanoes on Canadian climate, changes in oxygen levels causing carbon dioxide increases, and on the temperature changes during the Medieval warm period. There was some commentary on the issue of communicating future climate scenarios using analogs. The theory of ocean circulation conveyor belt changes or cessation due to global warming as a cause of global cooling was briefly discussed as the presentation came to a close.

Afternoon Workshop Activities

At noon a catered hot buffet lunch was provided free of charge for the workshop participants. Following lunch the main afternoon presentation by Gerry Luciuk from Prairie Farm Rehabilitation Administration (PFRA) took place between 1:15-to 2:20 p.m. (see Figure 4 for photograph of presentation). Gerry's PowerPoint presentation entitled "*Prairie Agriculture and Adaptation to Climate Change*" began by outlining recent global and Canadian warming trends in relation to past geologic temperature fluctuations. He then indicated some possible implications of global warming to agriculture including decreased water quality and quantity, longer growing season, extreme weather events and coping limits to these events. An ongoing PFRA study that combines climate, soil, and Land Suitability Rating System data into a Geographic Information System to model potential climate and growing conditions for 2040-2069 in the Canadian Prairies was presented.

After briefly commenting on potential climate change implications for the Rossburn area, the PFRA speaker referenced the resilience of farmers in dealing with past environmental and policy changes. He suggested this previous adaptation of farmers strengthens the ability of farmers to

adapt to future climatic changes. General agricultural adaptation measures were presented including crop diversification; more irrigation; improved management of water, energy and pests; identification and implementation of regret options; and, reducing vulnerability to current climate variability. Gerry then proceeded to discuss the merits of real time weather information as an adaptation tool for improved disease modeling and seasonal weather forecasts to help facilitate risk management measures and modify conservation practices.



Figure 4 Gerry Luciuk presenting to workshop participants

Following the forty five-minute presentation, questions and comments were posed to Gerry. One participant mentioned the time required in making crop changes (such as switching production from grains to soybeans). Another commented on the disparity between the need to adapt to climate change and current government policy. One of the final comments indicated that not much is happening right now in the policy arena as most work is focussing on mitigation.

Short Story Presentation

Following the PFRA presentation, Randall introduced an alternative tool for communicating climate change information. Workshop participants were invited to read the 1700-word climate change short story or narrative entitled *“Climate Change in Manitoba: Challenge and Opportunity.”* The purpose of the narrative was to provide an alternative way of communicating

climate change information to the workshop participants. The narrative was the only communication tool developed entirely by the researchers. Other communication components of the workshop were either brought in for viewing or developed by the respective presenters.

This story, developed specifically for the workshop, led the participant's back in time from the year 2050 through the eyes of a retired Rossburn area farmer. The story follows the farmer's reflections on the changes from climate that occurred on the Prairies since 2005, both from human influences and natural causes. The story describes the impacts those changes in weather and climates have had on the family farm. Pro-active adaptive and mitigative responses to those changes taken by the farmer were also described. Appendix 6 provides the full text of the story.

In short, the narrative was intended to create a vivid picture of future climate in the Prairie region of Canada and Riding Mountain area specifically in 2050. In doing so, the state of agriculture, ranching, and socio-economic conditions were depicted.

The narrative format was developed using suggestions from the literature. Four criteria for effective narratives as well as other suggestions made by Kearney (1994) were considered when researching and writing the story. As well, the narrative was developed using suggestions from other authors (Hughes and Andrey, 2000; Meisner, 2000; Gilmore, 2000).

The narrative included information on scientific predictions of human induced climate change derived from several sources. The publications used most extensively when developing the short story were the *Canada Country Study: Responding to Global Climate Change In The Prairies* (Herrington et al., 1997), and Parks Canada/Environment Canada's *Climate Change and Canada's National Park Systems: A Screening Level Assessment* (Scott and Suffling, 2000). Other articles, publications, and scientific materials were utilized in the attempt to make the story both vivid and interesting but also plausible and within the range of scientific predications (Luciuk and O'Brien, 2000; Smit et al., 1996; Chiotti and Johnson, 1995; Mooney and Arthur, 1990; and, Wittrock, 1999).

After workshop participants spent approximately fifteen minutes reading over the story, Dr. John Sinclair lead an informal discussion session with the participants inviting comments and perspectives on the story and techniques of communicating climate change information.

The first few participants reflected upon the story. The initial comment supported the need for the governmental and policy changes mentioned in the story. One individual believed the 2050 scenario depicted in the story is indicative of current weather variability. Another comment stated that the implications of livestock operations to water quality referenced in the story should be emphasis in the future.

Following feedback on the story, John focussed the discussion on the issue of participants climate change information needs. This lead to a comment that the biased media and newspapers are the source of climate change information. Another said that money is the driving force.

John then requested suggestions on how to best communicate climate change information to people in the RMBR. There was considerable commentary on the need for information to reach

grade school children; one individual indicated that students in the middle to senior years should be targeted for climate change education. Another individual thought that people might have to be paid to make changes, emphasizing that the federal government is currently in a period of inaction on the issue. One thought that a commodity price fixing formula should be introduced to increase parity for all farmers. The final comment reminded participants that increased costs get passed on to the producer.

Winds of Change Poster and Governmental Materials available at the Workshop

Throughout the day, workshop participants were encouraged to view the *Winds of Change: Climate Change on the Prairies* poster (EAS, 2000). Five posters were placed in the community hall where the workshop took place. Time was allocated for participants to view the poster to enable evaluative comments on its quality in the post-survey.

At the back of the hall a table containing governmental climate change information was available to workshop participants. Although some materials were for viewing only, the following items were made available to participants to take home:

1. *Canada's Climate Change and Canada's National Park Systems: A Screening Level Assessment* by Scott and Suffling (2000);
2. The Government of Canada's Global Climate Change Program *information kit* on climate change; and,
3. The Government of Canada's *The Climate is Changing: Its Time to Act*.

The materials at the back of the hall were supplementary in nature and were not a large component of the workshop or the evaluation that followed.

Post-Survey Introduction and Dissemination

At about 4: 00 p.m. Randall introduced the post-survey questionnaire to the workshop participants. Appendix 7 contains a full text copy of the survey. Randall briefly described the purpose of the survey, then directed the participants to read over the cover letter and complete the survey at their own discretion.

Most workshop participants spent an unexpected twenty-five to thirty minutes completing the post-survey. This was after participants took in a full day of presentations and activities! Upon their completion, the surveys were collected. Closing statements were then given by Randall and Dwain Lawless, thanking the participants for their attendance and participation in the workshop activities.

3.0 Pre-survey Summary Results

Survey Structure

The pre-survey questionnaire consisted primarily of closed-ended responses. Most of these questions were developed using a five scale rating system. More detailed responses were solicited through open-ended questions. The pre-survey was separated into six sections. Section A assessed the respondent's perspectives and knowledge of the climate change issue. Section B addressed how well informed participants felt on six main climate themes, and on pre-workshop climate change information. Section C asked participants to provide their own views on the most useful climate change communication methods, asking them to rate numerous communication tools. Section D requested participant's personal views on future climate in southern Manitoba and the importance of potential physical impacts and related rural and environmental issues. Section E questioned participants about what to do to address climate change and who is responsible for such actions. Section F asked for some background information such as occupation and area of residence (see Appendix 5 for the complete survey).

Pre-Survey Respondents

Workshop participants spent about 20-25 minutes completing the pre-survey prior to climate change presentation or the display of any materials. This sequence of events enabled the collection of participants "existing" knowledge and perspectives on climate change.

Twenty-three surveys were returned; four participants choose not to complete the survey.

Section A: On the Issue of Climate Change

Most participants have known about the issue of climate change for over 5 years; nearly all have known of the issue for greater than 3 years (see Table 3).

Table 3 Duration respondents have known of the climate change issue (N=22)

Less than 1 year	One to two years	Three to five years	Six to ten years	Eleven to twenty years	More than twenty years	Other
0	9%	22%	27%	37%	0	5%

Most participants indicated that they have come in contact with climate change information once a month or more. Many do so one to two times a week, while some only once or twice a year (see Table 4).

Table 4 Frequency participants come in contact with climate change information (N=22)

Once or twice a year	About once a month	Once or twice a week	Daily	Never seen, heard or read anything	Other
18%	27%	41%	9%	0	4%

The first open-ended question asked participants about the main causes of climate change. Figure 5 summarizes workshop participant's views prior to the workshop. The responses were categorized into two main themes: human related causes and natural causes. Three secondary categories emerged from the human related causes: factual/correct, erroneous, and abstract/ambiguous causes.

Many responses fell into the "factual" or known causes of climate change category. The production of anthropogenic greenhouse gas emissions into the atmosphere from fossil fuel consumption was the main "factual" response given on the causes of climate change. "Erroneous" responses were characterized by incorrect causes to any human or natural climate change; for example, "too much hardware in orbit" or "...education" and "mad scientist manipulation." There were far fewer "erroneous" responses than "factual".

The third sub-category under human causes were considered "abstract" or "ambiguous" in nature. These responses nearly equalled the number of factual responses. These responses could not be construed as incorrect or entirely erroneous, but were rather vague or very broad in nature. Examples of this sub-category include responses such as "chemical" and "pollution" as a cause of climate change. "Natural causes" emerged as the second main category regarding the causes of climate among respondents. Factors such as volcanoes were listed by a few respondents as a cause or one of the causes of climate change.

Primary Category		
		emissions
		Hardware in orbit, economics
		Environment, , human manipulation, pollution
<i>Natural Causes</i>		Volcanoes

Figure 5 Emerging themes of Participants views on the causes of climate change

In the series of questions where participants were asked to choose the best response from two options, respondents often answered correctly. Correct responses related to the basic concepts of climate, the greenhouse effect, global warming, and climate change in general were provided eighty percent of the time. Only one question had a response rate of less than eighty-two percent. In response to the sub-question relating to the main concept of global warming, fifty-seven percent correctly answered the question. The incorrect response made reference to the ozone layer. This reference may have caused some difficulty in correctly answering the question, as misunderstanding of global warming and the ozone layer is consistent with erroneous responses related to the causes of climate change described above.

Less than one third of respondents indicated that they were “well” or “very well informed” on six major climate change themes (climate science, natural variability, physical impacts, social and economic impacts, mitigating greenhouse gases, adapting to climate change). In general, most responses ranged between the categories of “not at all informed” to “somewhat informed.” For how well informed felt on all six climate themes, see Table 5 below.

Table 5 How well informed Participants felt about six main themes of climate change prior to workshop activities. (N= 22/23)

Climate change Theme	Not at all informed	Only slightly informed*	Somewhat informed	Well informed*	Very well informed
Climate Science	9%	35%	39%	13%	4%
Natural climate variability & change	23%	18%	36%	18%	5%
Physical impacts of climate change	5%	30%	30%	30%	5%
Social and economic impacts of climate change	0	52%	22%	17%	9%
Strategies for mitigation	9%	21%	52%	18%	0
Strategies for adapting to climate change	9%	31%	40%	11%	9%

* These response categories were not explicit in the survey. They were inferred from the adjacent response categories on each side. As an illustration, the category “well informed” lies in between “somewhat informed” and “very well informed.” Categories were inferred in this way for other tables where indicated (Tables 6, 8 and 9).

Section B: Climate Change Information Needs

The open-ended question on what previous climate change information has made the biggest impression provided a wide array of responses, but no obvious emergent themes. A few participants referenced information regarding glaciers and polar ice caps melting. Some cited future climate forecasts including climate change impacts to the entire earth, to agriculture in general, and to the Canadian Prairies. Other responses made reference to pollution and ozone depletion as impressionable climate change information.

Most survey respondents indicated that they would like to receive more information on six climate change themes (see Table 6 for the complete findings). There is an appreciable need for more information on climate science and natural climate variability and change. “More” or “much more information” is required by most participants on the physical, social, economic impacts of climate change, and strategies to reduce greenhouse gas production and make adaptations.

Table 6 Climate Change Information Needs Among Pre-survey Respondents (N=22/23)

Climate change Theme	No More Info	Slightly More Info*	Somewhat More Info	More Info*	Much More Info
Climate Science	0	0	48%	43%	9%
Natural climate variability & change	0	14%	23%	46%	18%
Physical impacts of climate change	0	0	18%	32%	50%
Social and economic impacts of climate change	0	5%	9%	41%	45%
Strategies for mitigation	4%	8%	17%	25%	46%
Strategies for adapting to climate change	0	0	18%	27%	50%

* These response categories were not explicit in the survey. They were deduced from the adjacent response categories.

Section C: Climate Change Communication

Nearly equal numbers (26-30%) of participants learned about the workshop through a local newspaper, neighbour, and e-mail communications respectively. Thirteen percent of participants became aware of the workshop through a poster advertisement. Four percent found out about the workshop from a meeting (see Table 7).

Table 7 How pre-survey respondents became informed about the workshop (N=22)

Local Newspaper	Poster Advertisement	Neighbour or word of mouth	E-mail notice	Council/RMBR Liaison meeting	other
29%	13%	25%	25%	4%	4%

The responses to the open-ended question on how to best communicate climate change information to people in the Southwest region of Manitoba elicited insightful trends. Almost half (43%) of respondents indicated that workshops/public meetings/forums were the best way or one of the best ways get information out. Forty-three percent also included newspaper as a useful/ one of the most useful tools (twenty-four percent indicated local papers/newsletters). Twenty-four percent of respondents thought that both media (radio and TV) and pictures and graphs were useful mechanisms for providing information to local populations.

Responses to the question asking workshop participants to rate the usefulness of various communication methods illustrated only minor trends. Most participants generally rated the communication methods listed in the question between “somewhat useful” and “very useful.” Most responses indicated that workshops are “useful” or “very useful.” There was less agreement on the usefulness of newspapers, as thirty-three percent of responses indicated they were only “somewhat useful.” About a quarter of responses indicated that TV and radio news media were between “not at all useful” and “somewhat useful.” Fourteen percent of respondents rated posters and Internet websites in the “not at all useful” category.

Section D: Participants Views on Future Climate in Southern Manitoba

Fifty percent of responses indicated that the annual average temperature is “very likely” to increase in the Southwest region of Manitoba by 2050. Eighteen percent thought that a temperature increase is “likely” (see Table 8).

Table 8 Participants views on how likely the annual average temperature will increase in the Southwest region of Manitoba by the year 2050 (N=22)

Very Unlikely	Unlikely*	No Change	Likely*	Very Likely	Uncertain
9%	4.5%	5%	18%	50%	13.5%

* These response categories were not explicit in the survey. They were deduced from the adjacent response categories.

Respondents revealed fewer trends on perspectives regarding changes in annual average precipitation by 2050. Many were uncertain on the issue. The rest of the responses were nearly evenly spread between the two categories of a “decrease in precipitation” and “increase in precipitation.” While many believe a temperature change is likely in the future, many appear uncertain on the implications of global warming on precipitation in southern Manitoba.

The next question addressed the importance of anticipated climate change induced biophysical changes among respondents, given a 3-5 degree Celsius temperature increase by 2050. Most survey respondents thought that the impacts of these changes were “important” or “very important” to them and their community. More extreme weather events appeared to be the most important issue. However, increased drought and evapotranspiration, as well as longer, hotter summers were three other important implications of global warming to the participants (see Table 9 below).

Table 9 Importance of predicted impacts of climate change among respondents
(N= 21-23)

Predicted Impact Of climate change	Not important	Important*	Neutral/ Uncertain	Important*	Very Important
More extreme weather events	0	0	9%	26%	65%
Increase in drought severity and frequency	0	0	13%	30%	57%
Longer hotter summers	0	0	32%	18%	50%
More insects, weed pests and crop diseases	0	0	24%	33%	43%
Longer growing season	4%	0	22%	35%	39%
Increased evapotranspiration	0	0	14%	27%	59%

* These response categories were not explicit in the survey. They were deduced from the adjacent response categories.

A question in the pre-survey inquired about general environmental and social perceptions among workshop participants. Results show that sixty-five percent of post-survey respondents rated sustainable agricultural practices and environmental conservation as “very important.” Forty-eight and thirty-five percent of respondents thought co-operation among RMBR stakeholders and rural economic development was “very important” respectively. Overall, the four issues addressed below in Table 10 received a rating of “important” or “very important” by eighty-seven to ninety-one percent of respondents.

Table 10 Importance of socio-economic & environmental issues among participants
(N=23)

Issue	Neutral or uncertain	Important	Very Important
Rural Economic Development	9%	54%	35%
Co-operation among stakeholders in RMBR	13%	39%	48%
Sustainable Agriculture	13%	22%	65%
Environmental Conservation	13%	22%	65%

Section E: Views on Taking Action on Climate Change

Most participants (78%) agreed upon the need to mitigate greenhouse gas production. Fifty-two percent indicated a need to adapt to present and future climate change.

The open-ended question on responsibility for acting on climate change resulted in some general trends. Thirty-nine percent of respondents indicated that governments (local, provincial, federal, RMNP) were fully or partly responsible for taking action or leading efforts on the climate change issue. Eighteen percent of respondents included or singled out conservation groups as leaders in the region. Eleven percent of responses placed responsibility on the Riding Mountain Biosphere Reserve. Some participants assigned responsibility to everyone, often including government and other organizations. An unusually high thirty percent of survey respondents choose not to answer this question or were uncertain about who is responsible.

4.0 Post survey summary results

Survey Structure

The second survey was organized into seven sections. The first section assessed participant's views on the causes of climate change and knowledge of the issue. Section B elicited responses on why participants came to the workshop and the main message received by the end of the day. Sections C to F contained the main component of the survey. These sections addressed the climate change information communicated during the workshop. Qualitative evaluations were determined through open-ended questions. Section C requested responses on the least and most useful *information* (i.e. what information content was considered valuable and not valuable; what information stood out). Five information climate themes were evaluated and are listed below:

1. Possible physical impacts of climate change to the land;
2. Possible social and economic impacts of climate change;
3. On ways to reduce greenhouse gases;
4. On ways to adapt to climate change; and,
5. Natural climate change and variability.

The respondents were also asked to justify why climate change information provided at the workshop was most or least useful for each of the five themes listed above. Questions in section D were identical to those in section C with two exceptions: 1) the request was for responses focused on the least and most useful *communication style/presentation* at the workshop; and, 2) there was a sixth theme included on general climate science.

In section E, additional closed-ended response questions on the most useful communication styles/presentations relevant to agriculture were posed. This section was designed to assess how to communicate climate change information in this agricultural based study region. Section F requested responses on participants' intent to change their lifestyle in relation to the mitigation of

greenhouse gas production and adaptation to climate change. Section G asked for the same background information requested in the pre-survey. The post-survey questionnaire is presented in Appendix 7.

Post Survey Respondents

For the most part, participants completing the post-survey were those who completed the pre-survey. However, fewer farmers and Park workers/officials, and one more conservation district manager filled out the post survey.

Participants arriving late missed portions of the main workshop presentations. While only one post-survey respondent indicated that he/she missed the presentations, there were likely others who completed the post-survey but did not complete the first survey and/or missed parts of the workshop activities.

Section A: On the Issue of Climate Change

Post-survey responses on the main causes of climate change differed somewhat from the pre-survey. More referred to human causes of climate change, such as greenhouse gas emissions from various anthropogenic sources. A few more included natural factors as a cause of climate change. Fewer references were made to chemical, and ozone factors than in the pre-survey.

Thirty percent of respondents thought that global warming would occur in southern Manitoba by 2050; forty-five percent believed this event was very likely. Ten percent were both uncertain and/or neutral on the issue respectively. These results indicate that, compared to pre-survey responses, more participants believed that a human induced warming was likely in the future.

The paired right or wrong questions testing knowledge of climate change issues produced accurate responses that were between slightly below to slightly above the percent of correct responses seen in the pre-survey. The one exception was in part C where there was a moderate increase of correct responses compared to the first survey. Seventy-eight percent of respondents correctly identified global warming as an “enhanced greenhouse effect,” an increase of twenty-one percent from the first survey.

Section B: Overall Views of the Workshop

Most participants indicated that they attended the workshop to get more general or agriculturally-specific information on the issue. Some are concerned about the environment. A few respondents wanted climate change information so they could educate and communicate the issue to others in the region.

The open question asking participants about the main message they took from the workshop provoked comments from ninety-five percent of respondents. The main themes consistent in most of the responses were:

- 1) A concern over climate change;
- 2) The seriousness/importance of the issue; and,
- 3) The need to do something about it.

Many participants suggested that climate change was inevitable and/or changes are bound to occur to the land. Twenty-five percent of respondents indicated the need to adapt to climate change. Five percent emphasized the importance of preventing or mitigating greenhouse gases.

Section C: Participant's Views on Least and Most Useful Workshop Information

Despite a distinction between “information” and “communication,” identified in the survey, some respondents may have misinterpreted the questions in Section C on least and most useful workshop information, for questions related to communication style/presentation. Alternatively, some participants indicated that a certain communication method (e.g. poster, or Bevan Lawson) provided the best information. In these cases the respondent did not indicate what specific information was useful or not useful.

Another important consideration is the absence of information given out by the main presenters. For example, mitigation of greenhouse gases was scarcely mentioned by the two verbal presenters. As a result, there was little evaluative feedback on the usefulness of this type of information. Furthermore, responses sometimes contained comments on the communication style rather than the “information content.” Therefore, only general summary comments were available. Where responses to Section C related to communication tools, they have been included in the discussion related to section D.

Post-survey comments given by the participant's on the five workshop information themes are summarized below.

1) Physical Impacts of Climate Change

Precipitation data was found to be least useful by a few participants. This was due to the absence of data and the uncertainty of future scenarios. The most useful information on the physical impacts of climate change related to temperature predictions and changes to growing zones/Ecozones. Longer growing season, soil moisture and agriculture were also mentioned as useful information.

2) Social and economic impacts of Climate Change

Government information and the prospect of farmers benefiting from climate change was not appreciated by a few respondents. The most useful social and economic information reflected the economic implications of climate change, and to a lesser degree, the future state of agriculture and rural areas.

3) Mitigation of Climate Change

One participant found information specific to urban audiences the least useful. Most useful information included specific rural examples such as more permanent ground cover, and data on carbon dioxide production from combustion engines.

4) Adaptation to Climate Change

Critical responses indicated the lack of specific information given at the workshop (i.e. to agriculture). Information regarding the benefits of climate change was also disliked. The most useful information included the diversification of crops and better water management.

5) Natural climate change

Many found all natural climate change information, including weather and climate cycles and examples of naturally occurring climatic change, useful. One participant found the uncertainty of information on natural climatic change and variability to be least useful.

Section D: Climate Change Communications

1. Bevan Lawson

Mr. Lawson was found to be the best communicator in providing information on three themes:

- 1) General climate science;
- 2) Natural climatic change and variability; and,
- 3) Physical impacts of climate change.

Bevan was useful because he used numerous diagrams, provided background information, and explained the information in an interesting fashion. He was also “succinct” and a good speaker. In the adaptation theme section, Bevan only received one vote as the most useful. This is not surprising given his presentation made reference to adaptation on only a few occasions. Overall, Bevan was considered the most useful or one of the most useful communication style/presentation by fifty-seven percent of respondents.

2. Gerry Luciuk

Gerry’s presentation focussed upon agriculture and adaptation. It was not unexpected that sixty-two percent of respondents rated him as the most useful presenter in terms of communication related to climate change adaptation. His maps and agricultural related information was well received. Gerry was rarely given positive or negative evaluation in the theme sections on climate science, natural climate variability and reduction of greenhouse gases. When he was mentioned as the least useful communicator, reference was made to the fact that his presentation did not cover those particular themes.

There were, however, specific comments on Gerry's presentation. Under the economic and social impacts theme his presentation was considered not interesting. Under the adaptation theme, he gave a "poor presentation" according to a few respondents. On overall usefulness, Gerry was considered the most useful and least useful communicator by seven percent and twenty-one percent of respondents respectively.

3. Story

The climate change story was rated as the most useful communication style in the potential social and economic impacts theme by sixty-seven percent of respondents (fifty percent of responses indicated that the story itself was the most useful). Many of these respondents indicated that the story depicted a reality in terms of future impacts that, for one respondent, made an "emotional impact." In the adaptation theme, the story was the most useful style for twenty-one percent of respondents. In the general science theme, the story was found to be least useful for twenty-seven percent of respondents. Here one indicated that the story lacked explanation. Another said that the story was "...fiction, induces fear," and provides "...no clues for [the] basics of solving a problem." Under the adaptation theme, one participant thought the story was least useful because it was only coping with the change and offering no solution. On overall usefulness, the story received no votes as the least useful communication style and three (twenty-one percent) as the most useful style.

4. Winds of Change Poster

The poster received a mix of positive and negative comments in the post-survey. Reviewing all responses from section C the poster was cited as the least useful information source on four occasions and only once as the most useful style. Most participants made no evaluative comments on the poster.

The poster failed to attract the attention of many participants. One respondent indicated that he/she wasn't in a reading mood. Another indicated that there was too much information given the size of the poster, causing him/her to lose interest. This comment was echoed under the social and economic theme and in section C on information content evaluation. One respondent mentioned that the poster was least useful because it was out of the way.

The poster was considered the most useful communication style in the physical impacts, social and economic impacts, and natural variability themes by eight percent of respondents respectively. Twenty percent of respondents rated the poster as most useful in communicating the reduction of greenhouse gases. Good diagrams, text, and the useful bits of information were found to be beneficial for a few workshop participants. Overall, the poster was found to be least useful by twenty-seven percent and most useful by fourteen percent of post-survey respondents.

5. Governmental brochures and sheets

It is not known how many people looked at the governmental materials located at the back of the hall. In terms of evaluative comments, this medium was rated as the least useful style under the climate science, physical impacts, and social and economic themes by twenty-five to thirty-eight percent of respondents. For many, these materials were found to be “vague,” and to “side track the issue,” only to be read quickly and then thrown away. Only in the reduction of greenhouse gas theme did a significant portion of the respondents (33%) think the governmental handouts were most useful. For one participant the most useful document outlined step by step actions individuals can take to reduce emissions. However, the governmental materials were considered the least useful communication style overall by fifty-five percent of respondents. No respondents rated these materials as the most useful method overall.

Section E: Usefulness of Communication of Agricultural Related Information

This section of the post-survey assessed which communication style/presentation were most useful on an overall basis in improving participants understanding about potential impacts of climate change to agriculture. Table 11 shows that thirty-three percent of respondents rated Gerry Luciuk, and thirty percent rated Bevan Lawson as most useful. Eleven percent did not respond. Eleven percent indicated that the story was most useful.

Table 11 Most useful communicator of information on potential impacts of climate change to agriculture based on post survey responses (N=17/27*)

Best style	Bevan Lawson	Gerry Luciuk	Poster	Story	Discussion	Gov't Brochures	No response
	30%	33%	7%	11%	4%	0	11%

*Seventeen participants responded to the question. However a total of 27 responses were listed. Therefore some respondents selected more than one response option. This is also the case in Tables 12 and 13 below.

The story was selected by twenty-three percent of respondents as the most useful communication style/presentation in improving understanding of strategies to reduce greenhouse gas production in the agricultural sector. Table 12 illustrates the range of responses related to the success of communication tools.

Table 12 Most useful communicator of information on strategies to reduce greenhouse gas production in the agricultural based on post survey responses (N=17/26)

Best style	Bevan Lawson	Gerry Luciuk	Poster	Story	Discussion	Gov't Brochures	No response	other
	12%	15%	8%	23%	8%	4%	15%	15%

Table 13 shows what communication style/presentation was most useful on an overall basis in improving participants understanding about strategies to adapt to climate change in the agricultural sector. Gerry Luciuk received twenty-six percent of the responses. The story received the next largest proportion of responses at twenty-two percent.

Table 13 Most useful communicator of information on strategies to adapt to climate change in the agricultural based on post survey responses (N 15/23)

Best style	Bevan Lawson	Gerry Luciuk	Poster	Story	Discussion	Gov't Brochures	No response
	17%	26%	4%	22%	9%	0	22%

Section F: On Intent to Act on Climate Change

A) Intent to Mitigate Greenhouse Gas Production

The first question in this section queried workshop participants on their intent to change their lifestyle to reduce greenhouse gas production as a result of the workshop. From eighteen responses, forty-four percent indicated that they will try to make changes. Potential behavioral adaptations identified include a decision to drive less, use a more efficient car, and possibly set up wind breaks. Included in their responses, a few participants indicated a general concern for the environment. One noted the greater evidence of climate change that justifies action. One plans to educate him/herself on the issue.

Interestingly, seventeen percent of respondents were already informed on climate change and have made changes to either their driving behaviour, energy efficiency, or farming practices. It cannot be ascertained, however, whether these behavioural changes were a result of previous knowledge and understanding about climate change or whether other socio-economic factors were an additional or primary catalyst.

Conversely, twenty-eight percent of respondents have no intention of making any new changes to reduce greenhouse gas emissions. For two of the respondents this was due to mitigative behaviour changes they have previously undertaken. One has made considerable changes that have resulted in improved farm sustainability and environmental conditions. However, this respondent also emphasized the need for more compensation for his/her efforts. A few participants appear to be unwilling or unsure regarding reducing greenhouse gas emissions. A few more still wanted more information on the issue. One indicated the need for more communication to farmers on the issue.

B) Intent to Make Adaptations to Climate Change

There were similar trends regarding intended behavioural changes towards adaptation to climate change based on workshop materials and presentations. Of fifteen total responses, forty-seven percent indicated that they intent to make adaptations to climate change. However, reasoning for such actions were due to necessity rather than choice. For example, one response to this question was “yes we all have to survive,” while another indicated “yes because I have to.” Twenty percent of responses indicated that they have no intention of adapting to climate change. Thirteen percent were indecisive on the issue. A few indicated the need for more information/communication on the issue. One was unclear on how to go about making adaptations based on the workshop materials.

5.0 Summary of Climate Change Workshop Activities

The Community Climate Change Workshop held in Rosburn Manitoba attracted farmers, RMNP staff as well as other stakeholders living mainly in the southern regions of the RMBR. During the workshop an extensive amount of climate change information was communicated with the participants through various verbal, textual, and diagrammatic methods. They in turn gave their perspectives on the issue through comments, questions and two survey questionnaires.

The pre-survey results indicate that area stakeholders are concerned about environmental and socio-economic conditions of the region. Most came into the workshop having a general awareness of the climate change issue from having come in contact with information on the topic on an occasional basis. Many likely came to the workshop with an existing interest or concern about climate change. Many also came maintaining a basic knowledge and concern on the issue of climate change. Half of the respondent's indicated that global warming will occur by 2050. There was no trends regarding future precipitation changes. Most respondents are concerned about the anticipated potential physical impacts of climate change. However, few appear to maintain a clear understanding of the possible impacts of climate change and, more over, what mitigative and adaptive measures can and need to be taken. As such, most respondents don't feel well informed on the issue and therefore need more information on nearly all aspects of climate change. Almost half of respondents included workshops/meetings and newspapers among the best methods to communicate climate change in the RMBR. About a quarter of respondents suggested mass media and diagrammatic means were effective communication tools.

Following the workshop, the post-survey respondents provided some evidence of improved awareness, concern, knowledge and understanding regarding the issue of climate change. Knowledge was gained on the causes of climate change and the potential future physical impacts. Most workshop participants indicated a heightened concern about climate change, a greater understanding relating to the importance of the issue and the need to take action. Workshop information on natural climatic change, predictions for future climate and subsequent biophysical changes, as well as economic and social implications at the local level was identified to be the most useful among participants. The presentation by Meteorologist Bevan Lawson was found to be highly useful by participants due to his informal nature, good information and graphs, and well paced explanation. Gerry Lucuik's presentation was found to be somewhat general in nature, less relevant to the farmers in the audience and delivered in a more technical manner. The Winds of Change poster and governmental materials provided good information on climate change. However, both were considered to be less effective ways to communicate the message of climate change among most of the workshop participants. Many participants identified the short story as being effective. The story made a personal, local connection with the participants, especially when communicating information on the socio-economic impacts of climate change and taking adaptive and mitigative actions.

6.0 Evaluation of Climate Change Workshop Materials

Information content and communication are inextricably linked. However, to enable an effective evaluation of the information program contained in the climate change workshop (objective

two), it was necessary to separate the informational content of the workshop materials from the communication process.

The climate change communication evaluation (third project objective) for the workshop was conducted using data from the survey instruments to assess the effectiveness of the workshop materials and presenters. The process extracted and analyzed all relevant research data to determine the degree to which the workshop communication tools adhered to communication guidelines below (Table 14). Eleven of nineteen communication guidelines developed by Andrey and Hackey (1995) were selected. Permission was granted to use these guidelines (Andrey, 2001). The researchers developed the last two guidelines in Table 14. Although the two verbal presenters were notified that the workshop contained an evaluative component, they were not informed on the content of the two surveys or the criteria used for the communication evaluation.

To facilitate the evaluation, post workshop interviews were conducted with eight workshop participants (four farmers and four RMNP staff). Information from the interviews was used to facilitate the evaluation process and in developing future communication suggestions for the RMBR region (section 8).

Table 14 Guidelines assessed for the communication evaluation

- 1) Use interactive expert-participant communications;
- 2) Set communicators goals;
- 3) Be careful about choice of language
- 4) Be Proactive about uncertainties
- 5) Use analogs, parables, comparisons, examples, indexes to increase understanding;
- 6) Focus on actions of what can be done for different groups;
- 7) Emphasize points where scientific consensus exists;
- 8) Break down the message into components and build knowledge base one step at time;
- 9) Do not trivialize the communication challenge-is it addressed?
- 10) Capitalize on opportunities to piggyback climate change issue on other environmental /social issues;
- 11) Invoke the precautionary principle in the absence of unequivocal scientific certainty;
- 12) Emphasize the current need for adaptation to current climatic variability and change;
- 13) Emphasize the importance of past, present and future natural climatic variability as an incentive to reduce greenhouse gas emissions and adapt to anthropogenic climate change

1. Bevan Lawson

Information Evaluation

Bevan provided excellent and abundant information on climate science, natural climatic variability and physical impacts of climate change. Between “more” and “much more” of the above information was needed by fifty-two to eighty-two percent of pre- survey respondents (see

Table 7 above). Evaluative comments by participants indicated that the information presented by Bevan was very useful overall. People in this region are interested in how conditions such as temperatures, Ecozones, and soil moisture, are potentially going to change in the future. Having this science-based information is key to building the knowledge and understanding base among adult learners. A minority of workshop participants appeared to be somewhat critical of the precipitation and soil moisture information due to the existing level of uncertainty or lack of data available.

Communication Evaluation

Overall, fifty-three percent of respondents in the post survey singled out Bevan as the most useful workshop communicator or presenter. He was found to give a useful presentation on climate change impacts to agriculture where thirty percent of respondents rated him as most useful in improving knowledge.

Bevan's presentation adhered to many of the communication guidelines listed above in Table 14. The presentation contained interactive qualities (guideline 1) as he was able to connect with the participants in an interactive fashion. He was informal and spoke in a down to earth manner. He even encouraged questions by giving our prizes to participants who asked a question, or gave an answer throughout his presentation.

Bevan was cognizant about the language he used (guideline 3), and avoided the use of difficult technical terms. Bevan is an experienced speaker and has delivered many presentations on the science of climate change in conjunction with Environment Canada. Workshop participants repeatedly indicated that his presentation was clear, concise and well explained. Indeed, Bevan was able to break down his message into comprehensible pieces (guideline 8). Despite the enormous quantity of information presented, he did not rush into lengthy details and explanation that would possibly lose the attention of the audience. He used a multimedia PowerPoint presentation filled with colorful graphs and diagrams (guideline 5) often providing full explanations, comparisons, and examples that appeared to assist understanding among the participants.

Bevan was pro-active in pointing out the inherent uncertainties and lack of data on the issue of climate change (guideline 4). He even indicated that he was not an expert on the issue. This may have helped to break down the expert-lay communication barrier and improve his credibility amongst the participants. However, he did emphasize the points where scientific consensus exist (guideline 7) strongly stating that global warming is occurring. Bevan provided a good review of past climatic change and the natural factors that influence past and present climate (guideline 13).

While Bevan provided an excellent review of natural influences upon climate, he did not link natural influences as an incentive to make proactive changes to human induced climate change. Bevan made no indication of what can be done to take action on climate change (guideline 6), nor did he piggyback climate change onto any other environmental or socio-economic issue

(guideline 10). He also did not emphasize the need for current adaptation to present climatic conditions (guideline 12). Respondents commented that Bevan declined to discuss climate change policy or governmental actions on the issue. He stuck to science-based information. This was his area of expertise and what he chose to present. And clearly he was considered the best communicator for the science-based component of the workshop. His presentation was on the science of climate and possible future climate with an enhanced greenhouse effect, not on the policy process or what can be done to take action on climate change. Still, touching on policy issues would have likely made his presentation even more effective among workshop participants. Overall, the effective qualities in his communication of climate change information demonstrate that Bevan was very successful in improving understanding of the issue among the participants.

2. Gerry Luciuk

Information Evaluation

Gerry's presentation was on adaptation to climate change in agriculture. The information he provided was rather general in nature. He did present some general impacts of climate change to agriculture in the Rosburn region and general adaptation measures. This was well appreciated by a number of workshop participants. There was, however, a partial absence of what specific actions can be done at the farm and personal level. This lack of locally-specific information left people unsure on what they can or should do to take adaptive action on climate change. Gerry chose to present specific climate change adaptation information on innovative satellite and weather station technology. While found to be interesting, this information was not relevant to most of the area farmers in the audience, many of whom are struggling financially with the ongoing economic farm crisis and could not afford such innovations.

In his presentation, Gerry made only minor reference to reducing greenhouse emissions in the agricultural sector. Yet mitigation is the central focus of the Agricultural and Agri-food Climate Change Issue Table options report entitled *Reducing Greenhouse Gas Emissions From Canadian Agriculture* (Agriculture Issue Table, 2000). Of eleven recommendations the table submits, only one deals directly with adaptation. Adaptation to climate change in the agricultural sector is required and the information Gerry presented is useful at the regional level and higher. However, many workshop participants are likely unaware or do not understand the basic principles of the Kyoto protocol as it pertains to agriculture. A description of the Kyoto Protocol or information related to policy changes or actions was not included in his presentation. Given his affiliation with PFRA, it is understandable that Gerry focussed upon adaptation and not mitigation to climate change. Though it may have been beneficial to have some information on the Kyoto Protocol and mitigation of greenhouse gases. But presenting mitigation and adaptation information together may have been too much for one day. Given Gerry's topic, it would have been nice to see more specific information relating to the stakeholders participating in the workshop. However, given the general lack of tangible information on adaptation and mitigation as it relates to climate change and agriculture, Gerry cannot be held entirely accountable for delivering less useful information.

Communication Evaluation

Gerry Luciuk's presentation adhered to some of the communication guidelines in Table 14. He used examples in his presentation (guideline 5). He also indicated the potential to piggyback adaptive responses with other environmental issues (guideline 10). He gave some general attention to general adaptive actions that can be implemented in the Prairies, also communicating the need to incorporate actions of other various stakeholder groups (guideline 6). Gerry also made a clear statement indicating the need to adapt to present climate variability and change as part of the response to global warming (guideline 12). Other authors have also made this suggestion (e.g. Smithers and Smit, 1997; Morehouse, 2000). Gerry was rated among the most useful communicator on the impacts of climate change to agriculture by thirty-three percent of respondents and on adapting to climate change in agriculture by twenty-six percent of respondents. This was an anticipated result since he was the main workshop component containing agriculture and adaptation information.

While Gerry's presentation contained some favourable communication qualities, there were also some less useful qualities identified by workshop participants and researcher investigators. An initial researcher observation was that his presentation was not commonly recalled as a useful communication tool, compared to the story or Bevan's presentation. It would appear that his presentation did not fully engage workshop participants. Gerry did not seem to connect with the participants to the extent that Bevan or the story did. There are several possible factors that likely contributed to this. To begin, Gerry limited the interactive quality of his communications (guideline 1) at the beginning of his presentation by not encouraging questions throughout his presentation until after he was finished. Doing so appeared to limit the level of interaction in his communications. This resulted in more of a one-way dialogue to the participants but not with the participants. This may have disengaged some participants from the presentation.

Another observation of Gerry's presentation pertains to the language used. His presentation contained language that was found to be somewhat technical in nature for the audience in attendance (guideline 3). This may have been compounded by a somewhat hasty presentation that was somewhat limited in providing a stepwise explanation of the information (guideline 8). As such it would appear unlikely that Gerry gave thorough consideration to the communication challenge at hand (guideline 9). He touched upon the need to adapt to current climate change and variability, address the opportunity to piggyback the issue onto other environmental areas, and give some examples of adaptive action. However, despite alluding to the issue of future actions, he could have given more attention to future policy and adaptive strategies for the farmers and other stakeholders of the RMBR (guideline 6). Another communication suggestion that could have been given attention was the use of analogies, examples, or comparisons to help improve understanding among participants (guideline 5). This may have been caused in part by the rushed nature of his presentation, and the lack of encouragement given to participants to ask questions when they needed clarification. These factors likely made it somewhat more difficult for workshop participants to understand Gerry's presentation. This is especially true for the those in attendance who were not affiliated with RMNP and were generally less informed on the issue prior to the workshop.

The high effectiveness of Bevan's presentation and the relatively lower effectiveness of Gerry's may be partially attributable to the timing of the workshop presentations. At the start of the day when Bevan presented, workshop participants were alert and eager for information. However, by the time Gerry presented, participants just returned from a full lunch and following a morning of activities and presentations. As well, he repeated some information that Bevan presented. When all these factors are added up, they tend to reduce the potential effectiveness of his presentation. In sum, Gerry was moderately effective in improving understanding of agricultural adaptation to climate change. Post-survey results support this conclusion indicating that only seven percent rated Gerry among the most useful workshop communicator; whereas twenty-seven percent thought he was the least useful.

3. Climate change short story

Information Evaluation

The story was not considered effective for climate science and the physical impacts of climate change. However, the information contained in the story was very effective in creating an image of local social and economic impacts of climate change. The information in the story was found to have a human dimension at the local level relevant to the workshop participants.

Communication Evaluation

The communication evaluation of the story illustrates that the informational content of the story was useful to participants. Given the nature of the story as a textual form of communication, evaluative comments in this section tend to focus upon its informational qualities. This made the separation of the story's information and how it was communicated (words) even more difficult. Despite this constraint, the qualities of the story as a communication tool are detailed below, with the caveat that in many cases the information contained in the story should also be considered.

In the social and economic impacts of climate change category, sixty-seven percent of respondents included the story as the most useful communication style during the workshop. For communicating agricultural information, the story was considered the most useful method among twenty-three percent and twenty-two percent of respondents on mitigating and adapting to climate change respectively. Overall, twenty-one percent thought the story was the most useful.

From the responses of the workshop participants it would appear that some communication guidelines were followed successfully by the project investigators when developing the short story. The story was interactive (guideline 1). This can be inferred by the numerous responses on the quality of the story. For example, the recurring theme that the story "hit home," by making people aware of the impacts of climate change on "the ground" is telling evidence of its interactive qualities. The story was well understood and was not considered technical in nature. The language (guideline 3) was given attention to during the story development and appears to have been quite effective.. Participants appreciated that the story gave some sense of what

actions can be made on climate change, both mitigation and adaptation (guideline 6). Much of the other main workshop materials did not provide much detail on this important aspect of climate change. The story was found to be quite effective in improving understanding on the issue of what climate change may mean both socially and economically to the RMBR region and what actions can be taken as a response.

One consideration when evaluating the effectiveness of the story relative to other workshop materials was the amount of time allocated for each activity. Fifteen minutes was allocated for workshop participants to read over the short story. Given the short duration of time given towards the story, considerable commentary on its content and quality occurred during the discussion session and in the post-survey. For comparison, Bevan Lawson's presentation and discussion was about seventy-five minutes and Gerry Luciuk's presentation was fifty minutes. While Bevan received the most evaluative comments in the post-survey, the story and Mr. Luciuk received nearly equal amounts.

The story was less effective in communicating the science of climate and what the physical impacts of climate change may be for the Prairies. The story also lacked in detail. The story didn't provide the in depth explanation often required when giving background science information on climate change and detailing the various potential impacts possible. The story also assumed that current socio-economic conditions be similar to what they are now, failing to give adequate consideration on such matters. There was some suggestions put forward that the story should be further simplified and shortened when targeting farmers in the RMBR area.

4. Winds of Change Poster

Information Evaluation

The poster contained good and useful information. There is data on past current and potential future climate and impacts to the Prairies among various sectors. The extensive quantity of information contained in the poster, however, may be the strongest weakness of this tool. The amount of information on the poster was a disincentive for some workshop participants to read it fully. During the workshop there was time devoted exclusively to the *Winds of Change* poster. There was also an abundant amount of information given by the other presenters. Yet the poster was disengaging to many respondents. But since there were other presenters and information available, participants were likely already overloaded with enough climate change information to have much desire to view the poster.

Communication Evaluation

Evaluative comments on the communication value of the poster elicited both positive, but more often opposing opinions. The graphs and diagrams were attractive to view for some respondents. Some indicated that the poster was a good way to communicate the climate change issue. However, more substantive comments revealed that the poster was not very useful, due mainly to its high information content described above. The poster was also thought to be impersonal in nature. And while everybody remembered Bevan Lawson's presentation, some respondents could not remember any of the content within the poster. No post-survey respondents indicated that the poster was the most useful communication method. In the categories of natural climate

change, physical impacts, and socio-economic impacts, only eight percent of respondents rated the poster as the most useful communication method. On communicating agricultural information only six percent of post-survey respondents indicated that the poster was most useful. These results tend to draw the conclusion that the *Winds of Change* poster was a less effective communication media.

When assessing the poster to the communication guidelines, only a limited degree of adherence can be assessed. The poster did use visual examples as a means to improve understanding (guideline 5). There was some general information on mitigative and adaptive actions that readers could engage in (guideline 6). There was also good information communicated on past natural climate change (guideline 13)

However the poster did not communicate the opportunity to use natural climatic variability and change as an incentive to make changes. The poster also failed to generate the interest and positive comments that were anticipated. This was an unexpected result. When the same poster was displayed at a climate change workshop for policy-makers and researchers in Winnipeg in March of 2000, it was difficult to view the poster due to the constant congregation of people around it. Perhaps the poster is not the best communication tool for those who are generally uninformed on the issue.

7.0 Research Conclusions and Recommendations

Conclusions

- All stakeholders in the RMBR are concerned about socio-economic and environmental conditions at the local level.
- Nearly all workshop participants were aware of climate change prior to the workshop with most having knowledge of the potential for temperature increases in the future. A small minority held an in-depth understanding of the potential impacts and response options available. RMNP staff were found to elicit a greater knowledge and understanding of the issue compared to most other area stakeholders.
- Overall, RMBR stakeholders are, however, generally not well informed on the issue of climate change. Stakeholders' knowledge was particularly poor regarding mitigation and adaptation strategies. When presented with potential climate change scenarios, there was a strong concern about the possible biophysical impacts of climate change in fifty years.
- Following the workshop most participants displayed and increased level of concern, knowledge and understanding on the issue of climate change.
- The most useful materials presented during the workshop include information on natural variability, and the biophysical and socio-economic implications of climate change.
- Climate change communications during the workshop were found to be most useful to participants when it was informal in nature, non-technical, delivered personally, and applied the potential impacts of climate change to a personal and local level.

- The climate change short story contained many of the effective information and communication qualities identified by workshop participants. Participants felt that the short story was an effective way to communicate climate change information. This finding was contrary to the results the researchers expected.
- Personal communications conducted by climate experts who deliver information in a manner conducive to the needs of area stakeholders and adhere to important communication guidelines are very effective in improving understanding on the issue.
- Posters, governmental materials, brochures, and information kits were identified as being the least effective communication mediums for stakeholders in the RMBR.
- The Community Climate Change Workshop held in Rossburn was a successful manner to deliver climate change information to RMBR stakeholders through various means. Workshops were identified by participants as the most effective way to exchange pertinent climate change information with area stakeholders. This approach allowed the use of interactive, personal, informal and credible communications. Local newspapers and selective media were identified as being the next best communication mediums.

Communication Climate Change Information in the RMBR Region

Suggestions for improved communications in the Riding Mountain Biosphere Reserve region were developed from four sources:

- 1) Workshop participant's perceptions and views on climate change;
- 2) Participants evaluative comments on the workshop communications;
- 3) Participants views on informational and communication needs in the future; and,
- 4) Suggestions from the researchers based on the cumulative comments provided by the workshop participants.

This information lead to the following suggestions:

- No one group or organization is solely responsible to taking the lead in climate change communications. There is, however, a need for higher level co-ordination, financial, and policy support from the federal government. With federal support, existing organizations are identified by participants to lead communications in the RMBR. These organizations include the RMBR, RMNP, Conservation Districts, Prairie Farm Rehabilitation Administration, Rural Municipalities, farming groups and agricultural representatives.
- A multi-jurisdictional sub-committee of the RMBR could serve as a regional co-ordination and nerve centre for interested stakeholders to communicate ideas, and develop regional and local strategies for public education, mitigation and adaptation. As put forward by one

participant, this sub-committee framework has been implemented successfully in the past in the RMBR.

- The type of climate change information that respondents indicated would be most useful was in the area of Biophysical impacts (changing temperature, precipitation, soil moisture, extreme weather events and frequency, Boreal forest migration, etc). Also needed is information on what actions can be taken at the personal and local to make appropriate adaptations to climate change and mitigate greenhouse gas emissions. Overall, people want to know how climate change will impact their personal activities at the local level, what needs to be done, and how to go about doing it.
- Climate change information will be more successfully communicated if it is interesting, easy to read, contains credible facts, and is relevant to local residents. All communication efforts should avoid being information intensive, overly technical language, and non-integrative of the views and perspectives of area residents.
- Several communication techniques identified by workshop participants are well suited to getting the climate change message out to RMBR stakeholders.
 - ✓ Workshops/meetings (being the most effective technique)
 - ✓ Newsletters/brochures
 - ✓ Radio/mass media
 - ✓ Personal communications
 - ✓ Stories
 - ✓ Field Days
- Workshops will work best when conducted over one day and which draw upon experts to present and discuss the issue in an interactive and personal manner. This provides sufficient time for those less informed to develop a fuller understanding of the issue.
- Workshop participants identified existing organizations as the most effective way to get newsletters out to stakeholders in the RMBR. Rural Municipalities, Conservation Districts, Tourism Boards, Ducks Unlimited, Manitoba Habitat Heritage Corporation, Riding Mountain National Park are organizations that could use their existing brochures, pamphlets, and publications to communicate climate change. Toll free phone numbers should be listed for those interested to access more extensive free federal government information.
- Television news media is not seen as a highly useful communication method in this region. However, other mass media outlets such as radio and newspapers should be engaged to present climate change information. Journalistic efforts should emphasize the side of the story that has the majority of scientific consensus.
- Using a short story and/or regional analogies forms of communications in local newspapers may be a good opportunity to get the climate change message across in the region.
- Interactive, hands-on activities and events were identified by participants as a useful way to communicate climate change information. For example, “Field Days” demonstrating on farm

adaptation and mitigation strategies may be a potential future tool once concern and knowledge on climate change increases. Climate change calculators could be given out showing how much an individual activities reduced greenhouse gas emissions and simultaneously save money.

- Climate change communications could be linked with existing environmental issues and concerns to reduce redundancies and increase interest and awareness. The Regional Conservation Districts could be used to implement “no regret” actions as a way to reduce greenhouse gas mitigation and adapt to climate change; these actions would simultaneously conserve the soil, water, air and other environment parameters.
- Workshop participants underscored the need for linking climate change communications to economic factors related to energy efficiency, reduced farming costs, credits, and incentives/disincentives related to mitigative and adaptive responses to climate change. Given the current economic farm crisis in this region, any economic incentive or disincentive will likely be a catalyst for change.

Acknowledgements

This research project was made possible through the assistance of many individuals. Special thanks go to Bevan Lawson from Environment Canada and Gerry Luciuk from Prairie Farm Rehabilitation Administration for their excellent presentations. Steven Wolfe of the Geological Survey of Canada must be thanked for his quick delivery of the Winds of Change posters. Thanks go to Geraldine David, and John Whitaker of the RMBR for their logistical assistance before and during the workshop. Appreciation also goes to the N&L restaurant in Rosburn for catering the delicious buffet lunch. The assistance of Dwain Lawless for acting as Chair of the workshop on short notice is greatly appreciated. Gratitude also goes to the University of Waterloo’s Dr. Jean Andrey for providing assistance in developing the surveys. Virginia Shemekiuk and Allen Tychniewicz must also be thanked for their suggestions in planning the workshop. Special thanks go to Janna Wilson for her assistance throughout the process of organizing and implementing this research project.

At the end of the workshop the door prizes were raffled off. Prizes were donated from several organizations in support of the workshop. These organizations were: the federal governments Office of Energy Efficiency, Parks Canada, Manitoba Conservation, Natural Resources Canada, Environment Canada, and the University of Winnipeg Continuing Education Department. Acknowledgements go to these organizations for their donations.

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Appendix 1 Poster and mail advertisement used to promote climate workshop

Community Climate Change Workshop

All are invited to a free *Community Climate Change Workshop* to be held at the **Community Center hall in Rossgburn, Manitoba on Saturday February 17, 2001 from 9:30 am to 4:15 p.m.** In the event of inclement weather or very poor highway conditions, the workshop will be held on Saturday March 3. Stayed tuned to your local radio station or CJOB (680 AM) for updates. Pre-registration is recommended but you can also register at the door beginning at 9:00 am with the **workshop commencing at 9:30 sharp**. The workshop is sponsored in part by the Riding Mountain Biosphere Reserve, the Prairie Adaptation Research Co-operative, and the University of Manitoba.

**** Please note **** the original date of the workshop was January 25. The date of the workshop has been changed to February 17 due to logistical difficulties and to allow for more people to attend. We give our sincere apologies for any inconveniences this may have caused.

Workshop Highlights

- A meteorologist presentation on climate science and possible future scenarios and impacts
 - A presentation from a Prairie Farm Rehabilitation Administration representative on the issue of climate change and agriculture
 - Opportunity for questions and discussion with the presenters
 - A chance to see the *Winds of Change: Climate Change on the Prairies* poster
 - **Free lunch** for those who pre-register by **filling out a pre-registration form below**
 - Door prizes!!
-

The first goal of the workshop is to provide an open forum for the public to hear, see and discuss the issue of climate change in the Canadian Prairies, specifically the Riding Mountain Biosphere Reserve region of Manitoba.

The second goal of the workshop is to determine what climate change information is required and how to best communicate that information to the people living in this region of Manitoba. As such, the workshop will have a research component where participants will be provided the opportunity to give their views and perspectives on the issue of climate change, and rate the quality of the workshop by completing two fifteen minute surveys. However, the workshop is open to the general public so completing the surveys and participating in any workshop activities will be entirely optional. The results of the surveys will be used for the partial completion of a Masters thesis in Natural Resource Management.

Those interested in attending can register at the door. However, we cannot guarantee a free lunch for those who do not pre-register as lunch availability will be based on pre-registration numbers. Therefore, those expecting to attend are **strongly** encouraged to fill out a pre-registration form below and return by fax or mail. Alternatively, you can also pre-register by leaving your name at the **phone number below**, or e-mail your name at the **e-mail address below** and indicate your intent to attend the workshop.

Space is limited. The pre-registration deadline has been extended to Monday **February 12, 2001**. For more information or to pre-register send contact information to **Randall Shymko** by one of four ways:

1) Mail:

c/o Natural Resources Institute
University of Manitoba
Winnipeg, Manitoba, R3T 2N2

2) **Phone: (204) 667-6707 (Winnipeg)**

3) **Fax: (204) 261-0038**

4) **E-mail: rcs23@hotmail.com**

Appendix 2 Copy of the Newspaper advertisement

Community Climate Change Workshop

All are invited to a free Community Climate Change Workshop to be held at the Community Center hall in Rosburn, Manitoba on Saturday, February 17, 2001 from 9:30 am to 4:15 p.m. In the event of inclement weather or very poor highway conditions, the workshop will be held on Saturday, March 3. Stayed tuned to your local radio station or CJOB (680 AM) for updates. At the door registration begins at 9:00 am with the workshop commencing at 9:30 sharp. The workshop is sponsored in part by the Riding Mountain Biosphere Reserve, the Prairie Adaptation Research Co-operative, and the University of Manitoba.

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A complete lunch will be provided free of charge for those who pre-register. There will be registration at the door, with some extra lunches available. However, we cannot guarantee lunch for those who do not pre-register. Therefore, those expecting to attend are strongly encouraged to fill out a pre-registration form below and return by fax or mail. Alternatively, you can also pre-register by leaving your name at the phone number below, or e-mail your name at the e-mail address below and indicate your intent to attend the workshop.

Pre-registration mail or fax form:

Name: _____

Address: _____

Town: _____

Phone: _____ Fax: _____ E-mail: _____

Space is limited, so please pre-register by February 9, 2001 (or for more information) to:

Randall Shymko
c/o Natural Resources Institute
University of Manitoba
Winnipeg, Manitoba, R3T 2N2

Phone: (204) 667-6707 (Winnipeg)
Fax: (204) 261-0038
E-mail: rcs23@hotmail.com

Appendix 3 February 13, 2001 Brandon Sun article on the Community
Climate Change Workshop

Workshop explores climate changes

By LYNDENN BEHM
Brandon Sun

The impact of climate change on both farming and the Riding Mountain region will be examined at a workshop Saturday in Rosburn.

In addition to providing information through presentations, people who attend the workshop will also be surveyed for their views by a University of Manitoba student who will use this information as part of his masters thesis.

"The purpose of my research is to find out what people know and what they think," Randall Shymko.

"I want to give the public the opportunity to listen to information on climate change," said Shymko, who also organized the workshop. "They will also have the opportunity to give their own views on climate change."

One of the presenters will be Bevan Lawson, climate trends meteorologist for the Prairies and northern Canada. He said that computerized weather models provide some interesting information.

The most probable scenarios would have the temperature in the Manitoba prairies rising by an average of 2-3 C during summers and 3-4.5 C during winter over the next half century. This could have a big effect on agriculture, such things as what crops could be grown, he said.

"There are two things to look at if you are a farmer. One is risk. The other is opportunity," he said explaining that change provides new opportunities.

Complicating everything is that global warming will affect different areas of the world differently. For instance, it has been projected that North America will be affected more than the earth on average and that

Feb 13/01
the Prairies will warm more than the rest of the continent, he said.

Climate change could affect such things as the length of winters and growing seasons and how quickly water runs off following melts. However, he said he didn't want to predict specifically how crops or natural vegetation would be affected because that wasn't his area of expertise.

A presenter from the Prairie Farm Rehabilitation Administration will look at the impact on agriculture.

The workshop is from 9:30 a.m. to 4:15 p.m. in the community centre hall in Rosburn. The workshop is sponsored by the Riding Mountain Biosphere Reserves, the Prairie Adaptation Research Co-operative and the University of Manitoba.

The deadline for pre-registration has passed, but registration will also be available at the door, Shymko said.

Appendix 4 Workshop Schedule

Community Climate Change Workshop

Rosburn Community Hall, Rosburn, Manitoba, Saturday February 17th 2001

General Outline of workshop activities:

9:00-9:30 am	Registration and pick up workshop packages at the door
9:30-9:45	Welcoming and introductions -Issue of climate change and purpose of workshop
9:45-10:00	Pre-survey given out
10:00-10:05	Quick coffee and donut break
10:05-10:30	<u>Bevan Lawson (Environment Canada Meteorologist)</u> -What is climate change -Causes of climate change -Climate change from the past to the present
10:30-10:50	Break (refreshments provided)
10:50-11:30	<u>Second half of Bevan Lawson's presentation:</u> -Anticipated human induced climate change -Future impacts of climate change in Canada and the Prairies
11:30-11:45	Questions and discussion
11:45-12:00	<u>Winds of Change: Climate Change on the Prairies poster introduced</u>
12:00-1:00 pm.	Lunch at N&L Restaurant
1:00-2:00	<u>Gerry Luciuk (Prairie Farm Rehabilitation Administration)</u> -On climate change and agriculture
2:00-2:20	Gerry Luciuk: Questions and discussion period
2:20-2:40	Break (refreshments provided)
2:40-3:00	Opportunity to read " <i>Climate change in Manitoba: Challenge and Opportunity</i> " -Feedback taken on usefulness of story as a communication style
3:00-3:30	<u>Discussion & brainstorming session</u> -Present and future information and communication needs on: 1) climate science, climate change and global warming 2) potential impacts to agriculture and southern Manitoba 3) adaptation to climate change and reducing greenhouse gas emissions
3:30-3:50	Post-survey given out
3:50-4:10	Closing statements; Door Prizes!!!

Appendix 5 Pre-survey questionnaire “Climate Change in Southern Manitoba”

Climate Change is emerging as an increasingly important environmental issue. This survey explores your perspectives and views of the climate change and, specifically, the global warming issue. You may find some questions easy to answer, while you may be uncertain about others. Please try to be as candid and open as possible, and please use your best judgement when answering the questions. Carefully review the questions and response options available. Feel free to clarify or add comments. If you are uncertain or uncomfortable about answering a particular question, you may simply leave it blank. Confidentiality of your responses is guaranteed, as this survey is anonymous.

Section A: On the Issue of Climate Change

Q1. Approximately how long have you known about the climate change issue? Please check (✓) the best response.

- | | |
|---|---|
| <input type="checkbox"/> Less than one year | <input type="checkbox"/> 6-10 years |
| <input type="checkbox"/> 1-2 years | <input type="checkbox"/> 11-20 years |
| <input type="checkbox"/> 3-5 years | <input type="checkbox"/> More than 20 years |
| <input type="checkbox"/> Other-please specify _____ | |

Q2. Approximately how often do you come in contact with information about climate change?

- ☐ Never seen, heard or read anything about climate change
- ☐ Once or twice a year
- ☐ About once a month
- ☐ Once or twice a week
- ☐ Daily
- ☐ Other-please specify _____

Q3. In the space provided below, please describe your thoughts on the main causes of climate change.

Q4. For each pair of statements below, please check (✓) the one that you believe is most correct:

- A ☐ Climate includes the day to day temperature, humidity, wind, and air pressure conditions.
 ☐ Climate is the long-term average weather conditions seen in a particular region.
- B ☐ The greenhouse effect is a result of the ozone layer which keeps damaging ultraviolet radiation from reaching the earth's surface.
 ☐ The greenhouse effect is the warming caused by the reflection and trapping of the sun's energy within the lower atmosphere by the so called “greenhouse” gases.

- C ☐ Global warming is the increase in average temperatures caused by the depletion of the ozone layer.
☐ Global warming is the phenomena in which increases in surface temperatures are caused by an “enhanced” greenhouse effect.
- D ☐ Climate change can be described as the result of changing weather conditions over many decades.
☐ Climate change can be described as the result of changes in weather from one year to the next.
- E ☐ Climate change is caused only from human influences (eg. burning oil and coal, cars, agriculture)
☐ Climate change is caused by both human influences (eg. burning fossil fuels) and natural change and variability such as volcanoes and solar cycles.

Q5. For this question, please rate how well informed you feel about the following climate change issues. Please use the five-point scale provided where 1 is “Not at all Informed” and 5 is “Very well Informed”

	Not at all Informed		Somewhat Informed		Very well Informed
a) Climate science in general (eg. wind & ocean circulation)	1	2	3	4	5
b) Natural climatic variability and change	1	2	3	4	5
c) Physical impacts of climate change to the Canadian Prairies (eg. temperature and precipitation)	1	2	3	4	5
d) Social and economic impacts of climate change to the Prairies	1	2	3	4	5
e) Strategies for reducing green- house gas production	1	2	3	4	5
f) Strategies for reducing the negative impacts of climate change and taking advantage of opportunities	1	2	3	4	5

Section B: Climate Change Information

****Please note:**

In this section (B) when asked about “**Information**” please think of the material content, for example, temperature predictions for the year 2050. In Section C when asked about “**Communication**,” please think of the style of presentation such as graphs, pictures and verbal interactions.

Q6. In the past, what **information** on climate change has made the biggest impression on you? Please briefly explain.

Q7. For this question, please indicate what level of information you would like to receive on the following climate topics:

	No more info		Somewhat more info		Much more info
a) Climate science in general (eg. wind & ocean circulation)	1	2	3	4	5
b) Natural climatic variability and change	1	2	3	4	5
c) Physical impacts of climate change to the Canadian Prairies (eg. droughts, severe weather)	1	2	3	4	5
c) Social and economic impacts of climate change to the Prairies	1	2	3	4	5
e) Strategies for reducing greenhouse gas production	1	2	3	4	5
f) Strategies for reducing the negative impacts of climate change and taking advantage of the opportunities	1	2	3	4	5
g) Other _____	1	2	3	4	5

Section C: Climate Change Communication

Q8. How did you find out about this workshop? Please check (✓) the best response.

- | | | |
|---|--|---|
| <input type="checkbox"/> Local newspaper | <input type="checkbox"/> E-mail message | <input type="checkbox"/> Meeting-please specify |
| <input type="checkbox"/> Poster advertisement | <input type="checkbox"/> Other- please specify | |
| <input type="checkbox"/> Neighbor/ by word of mouth | | |
-

**** Please note:** for the remainder of this section please think of “*Communication*” in terms of the style of presentation, or example, using graphs, pictures, or verbal interactions.

Q9. Overall, what’s the best way to get the climate change message across to people in the southwestern region of Manitoba? (Please refer to Map A on page 5).

Q10. Climate change information can be communicated in a number of different ways. For this question, please rate how **useful** the following ways of **communicating** climate change information has improved your understanding of the issue:

	Not at all Useful		Somewhat useful		Very useful
a) TV Programs	1	2	3	4	5
b) TV news media	1	2	3	4	5
c) Radio programs	1	2	3	4	5
d) Radio news media	1	2	3	4	5
e) Workshops	1	2	3	4	5
f) Posters	1	2	3	4	5
g) Books/magazines	1	2	3	4	5
h) Internet Websites	1	2	3	4	5
i) Newspaper	1	2	3	4	5
j) Other _____	1	2	3	4	5



Map “A” The southwestern region of Manitoba

Section D: Future climate in Southern Manitoba

Q11. How likely or unlikely do you think the annual average temperature will increase in the **Southwestern region of Manitoba** by the year 2050? (refer to Map A). Please circle the best response.

Very unlikely	No change			Very likely
Uncertain				
1	2	3	4	5

√

Q12. For this question, please rate on how you think the annual average **precipitation** will change from the current average conditions in the southwestern region of Manitoba by the year 2050? (See Map A)

Decrease in Precipitation	No change in precipitation	Increase in precipitation	Don't know/ uncertain
1	2	3	4
			5

□

Q13. If the annual average temperature were to increase between 3 and 5 degrees Celsius in the southwestern region of Manitoba by about 2050, many potential impacts from this change are anticipated. Please rate how important or unimportant you feel the following potential impacts would be to your activities within your community:

	Not Important		Neutral or Uncertain		Very important
a) More extreme weather events such as droughts, floods, hailstorms, and heat waves	1	2	3	4	5
b) Increase in drought severity and frequency	1	2	3	4	5
c) Longer hotter summers	1	2	3	4	5
d) More insects, weed pests and crop diseases	1	2	3	4	5
e) longer growing season	1	2	3	4	5
f) Increased evaporation and transpiration & decreased soil moisture	1	2	3	4	5

Q14. For this question, please rate how important or unimportant the following issues are to you:

	Not Important		Neutral/ uncertain		Very important
g) Rural economic development	1	2	3	4	5
i) Cooperation among stakeholders that live around Riding Mountain National Park	1	2	3	4	5
j) Sustainable agricultural practices	1	2	3	4	5
k) Environmental conservation	1	2	3	4	5

Section E: Responsibility for taking action on climate change

Q15. Overall, what, if anything, should be done about human induced climate change? Please check (✓) as many responses that are applicable to you.

- ☐ Do nothing even if global warming occurs
- ☐ Take action only when human induced climate change is absolutely certain to be occurring
- ☐ Do something now, but not at the expense of rural economic growth
- ☐ Take action now to slow down climate change by reducing greenhouse gas production
- ☐ Take action now to respond and adapt to changes in present and future climate
- ☐ Other _____
- ☐ Don't know or uncertain as to what should be done

Q16. What individuals, groups, or organizations, if any, are responsible for doing something about climate change in your region?

Section F: Background information for statistical purposes. Please check (✓) the correct response.

Q17. Are you:

- ☐ Male ☐ female

Q18. What is your age?

- | | |
|-----------------------------------|-------------------------------------|
| <input type="checkbox"/> under 25 | <input type="checkbox"/> 46-55 |
| <input type="checkbox"/> 25-35 | <input type="checkbox"/> 56-65 |
| <input type="checkbox"/> 36-45 | <input type="checkbox"/> 66 or over |

Q19. What do you do for a living? Please try to be as specific as possible.

Q20. In which Rural Municipality, town, or city do you live?

Q21. Please use this space to provide any additional comments on any of the previous questions or anything that relates to climate change that is important to you.

Appendix 6 Climate Change Short Story

Dear Workshop participant,

The following is a short of what the future climate and its impacts may be like for southern Manitoba in the year 2050. This story contains some information on the possible impacts of climate change from various scientific documents. However, this story is a fictional account.

The purpose of this story is to provide an alternative method of communicating climate change information that is interesting and engaging to read. The story is not a prediction of the future, nor is it intended to create fear. While leisurely reading through this short story please keep the above comments in mind.

Sincerely

Randall Shymko

"Climate Change in Manitoba: Challenge and Opportunity"

It was a mild and sunny day on February 5, and Tulips were poking out along a Manitoba farmyard. This was not unusual for this time of year, not for the middle of the 21st century. The year is 2050 on a farm south of Riding Mountain National Park, east of Rosburn. The temperature was 9 degrees Celsius. As Bill sat outside on his porch, his mind wandered back to when he began farming in 2005. He is still amazed that in such a short time the climate would have changed so much and the weather become so unpredictable.

As it turned out, predictions of global warming became a reality for many parts of the world, especially places like the Canadian Prairies. By 2050, temperatures had increased globally by an average of about 2 degrees Celsius, despite considerable greenhouse gas reductions. In southern Manitoba and much of the southern Prairies, the temperatures have risen even more, between 3 and 5 degrees Celsius.

Around 2001, climate scientists had gathered enough convincing evidence to conclude that human activities were primarily responsible for the global warming phenomena. The scientists said that the main causes were too many people burning fossil fuels and changing the landscapes.

While there have been many implications of global warming, what has affected Bill and the family farm the most has been the increased variability and severity of the year to year weather. Temperatures have increased the most in winter and spring. In February, daytime temperatures near 8 degrees usually melt most of the thick snow-pack laid down by more frequent and severe snowstorms.

March is now more like early May was forty years ago. Even by the year 2030 there was a 50/50 chance for a snow free Christmas. Although more snow falls, much of it often melts or evaporates during frequent January thaws.

Now, in 2050, the snow usually starts melting by mid February. Rapidly rising temperatures often melt snow too rapidly to be absorbed, making soil and water conservation measures more difficult. Following the beginning of seeding in mid March colder arctic air occasionally plunges down to the southern Prairies bringing untimely frosts and freezing rains. Later in May, warm humid air from the Gulf of Mexico sometimes clashes with colder arctic air creating severe thunderstorms often with destructive hail and tornadoes. As predicted, tornado alley had extended northward into southern Manitoba. Now tornadoes are more frequent and more destructive when they occur. But the thunderstorms that spawn these tornadoes cause more damage to crops and infrastructure from their winds, hail and flooding downpours.

While Bill knows how variable the weather can be at any time of the year, he and many others are struck at how unpredictable the weather has become since 2005. This increased weather variability has not been restricted to the winter and spring. Summer is also increasingly unpredictable and unforgiving.

Summer rainfall is even more erratic than in the spring. The only constant reality seems to be a greater scarcity of water. This is because of the hotter and longer summers. The longer summers are a benefit as there are more heat loving crops to choose from such as Sorghum and corn. The benefit to agriculture has been improved yields and increased production from more heat and carbon dioxide fertilization. But the longer growing season has also increased the period of evaporation and crop water needs. The result has been less available water overall. Compared to forty years ago, drought frequency has increased by thirteen fold and the number of days with temperatures over 30 degrees Celsius has doubled. But while drought is more frequent and intense, there have also been cycles of damaging wet spells. Some of these wet spells appeared to have been caused by human influences. Some of them have reflected sources out of the human domain.

In 2028, two volcanic eruptions, both larger than Pinatubo in 1991, ejected billions of tons of ash high into the upper atmosphere. For two years global temperatures cooled as the ash blocked a portion of the sun's energy from reaching

the earth's surface. The following year, damp and relatively cool conditions prevailed over the eastern Prairies creating a haven for Sclerotinia and other moisture loving diseases, some of which have been able to migrate from the US in the past ten years due to the milder Manitoba winters. These conditions came as a surprise to many who were unprepared for the cooler wet conditions especially right on the heels of a three year drought. But that three year drought was mild compared to the one in the 2030's.

In 2034, five years of successive drought struck the southern Prairies. Crops wilted, dugouts dried out, weeds grew out of control, and the water table dropped as much as 3 meters. By 2038 agricultural and municipal water supplies were nearly dry. It's no wonder. Water quality and quantity has become scarcer since livestock operations have expanded and temperatures have increased in southern Manitoba. Legal battles over ownership of water rights are now common newspaper stories. Since water is now allocated and purchased by volume, more efficient pipeline irrigation systems have been developed to reduce both costs and water loss from evaporation and leakage.

Improved irrigation systems couldn't stop the extensive fires that broke out during the peak of the drought in the summer of 2038. Following a series of dry electrical storms, fires that started in tinder dry forests spread into the forage and bush lands both outside and inside the park. Infrastructure, forage crops, bales, shelterbelts and agroforestry operations, and livestock adjacent to the park were damaged or destroyed. The air became thick with smoke from the local fires and from huge fires in the US Rocky Mountains. Poor air quality from the smoke and from wind blown topsoil lead to more hospitalizations due to respiratory illnesses. The sick, young and elderly were forced to stay indoors. Increased temperatures and fluctuating weather since the fires of 2038 have prevented the reestablishment of trees both around the park and inside the park.

With increasing scientific predictions and the growing consensus of global warming by 2005, Bill believed the risks for maintaining the status quo were just too great. Instead of having to bear the economic costs of more extreme weather events and variability in the future, Bill decided to take proactive action to adapt to the anticipated changes. It made sense to adapt since farms were rather vulnerable to current weather variability and extremes such as drought, floods, frost and hail. And, where feasible, he also took steps to reduce his on farm production of greenhouse gas emissions.

Initially, making his farm more resilient to climate change seemed hopeless for Bill in 2005 given that many in the area didn't even foresee many family farms being around in 20 years because of the ongoing farm crisis. Low grain prices, high production costs, governments either passing the buck of responsibility or turning

a blind eye to the state of agriculture in the Prairies were among the main challenges facing the family farm.

With the growing realization of the value and importance of the family farm, and the reality of global warming and other environmental concerns, policy makers began to take steps to reform agricultural policy and help farmers like Bill take action towards climate change and sustainable agriculture..

Instead of providing subsidies to farmers after the losses have occurred, governments redirected a portion of the funds and incentives for farmers who initiated proactive measures. Bill received assistance to diversify his farm to a wider variety of crops that were more tolerant of a typical prairie climate. By 2015, he had a rotation of Hemp, flaxseed, dry peas, lentils, mustard seed and buckwheat. Bill also moved towards more adaptable hay and pasture options such as wheat and fescue grasses. He also had his dugout deepened and enlarged to hold water even during severe multi year droughts.

While increased aridity and scarcity of water since 2008 has been attributable to global warming, the increasing presence of large-scale livestock operations, and pressure from the US to share Canadian water has become an additional incentive to conserve water quality and quantity for all users. Previously existing water and soil conservation programs were linked to climate change actions. Conserving soil moisture and preventing erosion by implementing zero tillage and planting trees also helped to reduce carbon dioxide losses to the air by keeping it in the soil and wood.

A national carbon credit program for farmers came into effect allowing income and property tax incentives for those who reduced their greenhouse gas emissions. This was done in conjunction with conservation agreements where Bill and other interested landowners would set aside marginal land for the sake of maintaining native plants and animals. Newer, more efficient technologies in fertilizer application helped reduce nitrogen losses to the air and to surface water. Technologies for injecting hog manure directly into the soil improved reducing both the smell and input costs in chemical fertilizers. Improved technology for fertilizer, manure, and other chemical applications reduced Bills costs, improved the quality of the air, and simultaneously reduced greenhouse gas emissions. By reducing his emissions of greenhouse gases to the air and water, Bill gained carbon credits and saved money. Some of the savings and carbon credits went towards the cost shared initiatives Bill undertook to make the family farm more adaptable to climate change. These short and medium term investments to reduce his on farm greenhouse gas emissions and make his operation more resilient to change have proved successful to Bill in the long run.

Bill knows this because while he reminisces about the past, he watches his son in the distance on the same family farm that he bought 45 years ago. At the

age of 67 Bill is retired from farming. But he still lives here to help his son farm the land. His son needs it. The climate continues to warm and become more and more unpredictable. But Bill and many other innovative farmers have persevered in the past during difficult times. The next 50 years are certain to provide even more challenges, but also more opportunities and solutions.

Appendix 7 Post-survey questionnaire

“Climate Change in Southern Manitoba: Part 2”

This second survey will once again assess your views and opinions on the issue of climate change, mainly with respect to the workshop materials that were presented to you today. Again, please be as open and candid as possible. As well, use your best judgement for questions you may be uncertain about. Please carefully review the questions and response options where available. If you feel that none of the provided responses match your view, then you may choose to leave it blank or else use the additional space to add comments. You can be assured that your responses are anonymous and confidentiality will be guaranteed.

Section A: On the Issue of Climate Change

Q1. Following this workshop, how would you now describe the causes of climate change?

Q2. Given the information that has been presented today, how certain or uncertain are you that a **human induced global warming will occur in the Southwestern region of Manitoba by the year 2050**? Please circle the response that **bests** fits your view.

Very Unlikely	Not Likely	Neutral	Likely	Very Likely	Don't know/ Uncertain
1	2	3	4	5	√

Q3. For each pair of statements below, please check (√) the one that you believe is most correct:

- A
- ☐ Climate includes the day to day temperature, humidity, wind, and air pressure conditions.
 - ☐ Climate is the long-term average weather conditions seen in a particular region.
- B
- ☐ The greenhouse effect is a result of the ozone layer which keeps damaging ultraviolet radiation from reaching the earth's surface.
 - ☐ The greenhouse effect is the warming caused by the reflection and trapping of the sun's energy within the lower atmosphere by the so called greenhouse gases.
- D
- ☐ Global warming is the increase in average temperatures caused by the depletion of the ozone layer.
 - ☐ Global warming is the phenomena in which increases in surface temperatures are caused by an “enhanced” greenhouse effect.
- ☐ Climate change can be described as the result of changing weather conditions over many decades.
 - ☐ Climate change can be described as the result of changes in weather from one year to the next.

- E ☐ Climate change is caused only from human influences (eg. burning oil and coal, cars, agriculture)
- ☐ Climate change is caused by both human influences (eg. burning fossil fuels) and natural change and variability such as volcanoes and solar cycles.

Q3b. Do you think you answered any of the above questions differently from the first survey? If so, what new source of information did you receive and from who or where did it come from?

Section B: On the overall Quality of the Workshop

Q4. What was the main reason you came to the Community Climate Workshop today? Please check as many responses that apply to you.

- ☐ I am concerned about climate change and want more general information on the issue.
- ☐ There is not enough information on how climate change will affect my family.
- ☐ I want more information on how climate change may affect agriculture in my region
- ☐ I came mainly because there was a free lunch
- ☐ Other-please explain _____

Q5. What is the main message that you will take from this workshop? Please briefly explain.

Section C: On Climate Change Information

Q6. During this workshop you were provided with information (material content) on six themes related to climate and climate change. Listed below are the six main themes that were presented today. For each theme, please indicate what information was **most useful** and **least useful** in **improving your understanding of climate change**. Below each response please briefly indicate why.

Please note that “*information*” is defined as the material content such as anticipated temperatures for Manitoba in 2050. In Section D on page 4, “*Communication*” will be defined as the style of the presentation, for example, pictures, graphs, or verbal interactions.

a) What **information** on the possible physical impacts of climate change to the land (eg. temperature, precipitation, etc) was:

Least useful _____

Why? _____

Most useful _____

Why? _____

b) What **information** on the possible social and economic impacts of climate change was:

Least useful _____

Why? _____

Most useful _____

Why? _____

c) What **information** on ways to reduce greenhouse gases was:

Least useful _____

Why? _____

Most useful _____

Why? _____

Again, please note that “*information*” is defined as the material content for example, the anticipated temperatures for southern Manitoba in 2050.

d) What **information** on ways to adapt to climate change was:

Least useful _____

Why? _____

Most useful _____

Why? _____

e) What **information** on natural climatic change and variability was:

Least useful _____

Why? _____

Most useful _____

Why? _____

Section D: On Communicating Climate Change Information

Q7. During this workshop climate and climate change information was given out in 6 main styles or presentations. They were:

- | | |
|----------------------------------|---|
| 1) Bevan Lawson | 4) Climate Change Story |
| 2) Gerry Luciuk | 5) various governmental sheets and brochures |
| 3) Winds of Change Poster | 6) News paper articles |

Listed below in parts a to f are the 6 main themes that were addressed today. For each theme, please indicate which presenter or communication style/method listed above was **most useful and least useful in improving your understanding of climate change**. Below each response, please briefly explain why.

Please note: **communication** is how the information was presented in terms of style and method.

a) What presentation or **communication style** on general climate science was:

Least useful _____

Why? _____

Most useful _____

Why? _____

b) What presentation or **communication style** on natural climatic change and variability was:

Least useful _____

Why? _____

Most useful _____

Why? _____

c) What presentation or communication style on the physical impacts of climate change (eg. temperature and precipitation) was:

Least useful _____

Why? _____

Most useful _____

Why? _____

d) What presentation or communication style on the potential social and economic impacts of climate change was:

Least useful _____

Why? _____

Most useful _____

Why? _____

e) What presentation or communication style on the ways to reduce greenhouse gas production was:

Least useful _____

Why? _____

Most useful _____

Why? _____

f) What presentation or communication style on ways to adapt to climate change was:

Least useful _____

Why? _____

Most useful _____

Why?

Q8. Overall, which presentation or communication style was most useful and least useful in **improving your understanding** of climate change?

Most useful: _____

Least useful _____

Section E: Rating the Quality of Agricultural Presentations

Q9. Overall, what communication style/presentation was most useful in improving your understanding about potential **impacts of climate change to agriculture**? Please check (✓) the best answer.

- | | |
|---|---|
| <input type="checkbox"/> Bevan Lawson | <input type="checkbox"/> Climate story |
| <input type="checkbox"/> Gerry Luciuk | <input type="checkbox"/> Discussion session with other participants |
| <input type="checkbox"/> Climate poster | <input type="checkbox"/> Brochure and other hand out materials (please specify) |
| <input type="checkbox"/> Other (please specify) | |
-

Q10. Overall, what communication style/presentation was most useful in improving your understanding about **strategies to reduce greenhouse gas production in the agricultural sector**? Please check (✓) the best answer.

- | | |
|---|---|
| <input type="checkbox"/> Bevan Lawson | <input type="checkbox"/> Climate story |
| <input type="checkbox"/> Gerry Luciuk | <input type="checkbox"/> Discussion session with other participants |
| <input type="checkbox"/> Climate poster | <input type="checkbox"/> Brochure and other hand out materials (please specify) |
| <input type="checkbox"/> Other (please specify) | |
-

Q11. Overall, what communication style/presentation was most useful in improving your understanding about **strategies to adapt to climate change in the agricultural sector**? Please check (✓) the best answer.

- | | |
|---|---|
| <input type="checkbox"/> Bevan Lawson | <input type="checkbox"/> Climate story |
| <input type="checkbox"/> Gerry Luciuk | <input type="checkbox"/> Discussion session with other participants |
| <input type="checkbox"/> Climate poster | <input type="checkbox"/> Brochure and other hand out materials (please specify) |
| <input type="checkbox"/> Other (please specify) | |
-

Section F: On Intent to Act on the Climate Change Issue

Q12. Based on what you have seen, read or heard today, do you intend on changing your lifestyle or activities to **reduce greenhouse production**. Please briefly explain why or why not.

Q13. Based on what you have seen, heard or read today, do you intend on changing your lifestyle or activities to **adapt** to climate change. Please briefly explain why or why not.

Q14. Please use this space to add additional information from any of the above questions or provide additional comments regarding today's workshop, climate change or that is important to you.

Section G: Background information for statistical purposes

Q15. Are you:

☐

Male

☐

female

Q16. What is your age?

- ☐ under 25
- ☐ 25-35
- ☐ 36-45

- ☐ 46-55
- ☐ 56-65
- ☐ 66 or over

Q17. What do you do for a living? Please be as specific as possible.

Q18. In which Rural Municipality, town, or other city do you live?

Q19. Would you like a summary of the survey results?

- ☐ Yes
- ☐ No

Q20. Would you like a copy of the summarized project results?

☐ Yes ☐ No

Q21. Would you be interested in further discussing these issues in a follow up interview?

☐ Yes ☐ No

If you yes what type of interview would you be interested in?

☐ Personal interview
☐ Telephone interview

If you answered **yes** to any of the above three questions please provide your name, address, and phone number below. Contact will be made within 30 days.

Name: _____

Address: _____

Phone number: _____

****Please hand this page in separate from the rest of the survey**

Thank you for taking the time to complete this survey!

**Your views and perspectives on this issue are
important**