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Imaging the Future of Cross Border Environmental Resource Management within the Fraser Lowland: A Delphi Analysis

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Final Report

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Executive Summary

This report presents the findings of a study that utilizes a Delphi questionnaire technique to explore trans-border environmental governance issues in the Fraser Lowland of south-western British Columbia/ north-western Washington State. The international border that bisects this area, presents an implicit obstacle to coherent and consistent management of the environmental resources located in this unified bio-physical region. Moreover, as population and industrial pressures continue unabated, there is a sense that some degree of unified bi-national effort is inevitable in this cross-border region (CBR).

The Delphi method (Adler and Ziglio. 1996; Dalkey, 1972, Gupta and Clarke, 1996, Sackman, 1975) is a "qualitative, long-range forecasting technique that elicits, refines and draws upon the collective opinion and expertise of a panel of experts." (Gupta and Clarke, 1996, 185).

Eighteen panellists were recruited for the study (7 Canadian and 11 American). One American dropped out after the first round and a second American skipped the third round resulting in 16 to 18 valid responses per round, split between the two nations. Panellists included political leaders, planners and academics, business people, and environmentalists, both inside and outside of government.

Areas of focus in the study were: (1) Geographic Context, (2) Critical Cross Border Environmental Issues and their Consequences, (3) Solution Mechanisms to address the Issues, and (4) General Questions raised by panellists but not addressed elsewhere.

Geographic Context: Panellists were asked to consider the impact of the border itself on addressing environmental issues, a joint sense of consciousness across the border, and the importance of involving various levels of government in addressing the issues. The results were:

- the border exerts a moderately negative impact on environmental management issues;
- panellists were clearly split into two nearly equal groups over the level of cross border consciousness, both current and future, one fairly high and the other fairly low resulting in averages virtually in the centre of the scale;
- there is broad consensus that involvement of government at all scales (local, provincial, and federal), in both the United States and Canada, is key to the success of cross-border environmental management in the Fraser Lowland, however what actions those other scales of government should execute is not clear, and
- There is a moderately high level of confidence by panellists in their responses to these questions.

Critical Cross Border Environmental Issues and their Consequences: Two sets of outcomes were generated here. First, panellists generated a list of issues facing the region, which the researchers collated into nine separate, but interrelated, issues. These in turn were ranked and scored by importance or expected impact. Then the top five issues were further investigated in later rounds for consequences including the degree to which an international solution would be required, the probability that the issue would be addressed over the next decade, and the impact if it was not addressed in this time period.

The nine critical environmental issues proposed in round one were in alphabetic order: border security, conversion of open space and more impervious surfaces, economic growth, pandemic diseases, population growth, spill over of issues, stressed air shed, water resources, and winter Olympics 2010. For importance:

- The shared physical resources of water and air are highest in the minds of local actors, with means in the very high 800's on a 1,000 point scale.

- Population growth, a prime mechanism for stress, and the physical resource of open space, a resource impacted by such stress as more people congregate in a confined area, represent the second cluster of issues with means in the very high 700's.

- Economic growth, a key precursor and resultant of population growth as well as an issue that produces an impact on the physical environment, follows the above in the high 600's. Much of the discussion surrounding this issue by the panellists focused not on growth itself but on type of growth and its footprint.

- The impact of cross border spill over in general and pandemic disease in particular, clustered together around the value of 600. This seems to show a lower level of concern that events on either side of the border will inordinately spread across. However, it does indicate that such issues are important and cannot be ignored.

- Border security, perhaps a surprising issue to raise in the context of the environment, demonstrates that the border itself remains an important factor in searching for solutions. However, it has a fairly low mean of roughly 550, indicates that this is hardly the most critical area the local actors feel they face, but it cannot be completely ignored.

- Finally the very low value assigned to the 2010 Winter Olympics, at less then 350, indicates that this one time event although not inconsequential, is dwarfed by far more pressing and longer term issues in the region.

When the consequences of the top five of these issues (air, water, population growth, open space, and economic growth) were focused on, the following emerged:

- The most serious cross border environmental issues in the Fraser Lowland vary in how international they are. This has major implications on the extent to which international collaboration is necessary and/or possible in management of the issue. "Air shed" and "water" were judged to be the most international whereas "population growth" and "open space" were seen to be more local.

- Generally, panellists expect some progress to be made in management of these top five issues over the next decade.

- Despite the potentially greater challenges inherent in cross border issues, managing the air shed was judged to have the "highest potential of success" over the next decade, compared to other top five issues.

Solution Mechanisms to address the Issues: When asked how to address the issues panellists responded:

- For effective cross border management the use of existing, formal organizations that combine public and private sector organizations are favoured.

General Questions raised by panellists but not addressed elsewhere. The study concluded with a final set of questions that were intended to shed light on several themes that appeared in the comments of previous rounds. These questions were to determine how widely they were held. Regarding these issues panellists are:

- In agreement on the environmental attractiveness and liveability of the region, so much so as to create a magnet for national and international in-migration.
- They reaffirmed that unless we work together on cross border environmental issues, they will not be solved.
- They were less certain that the primary engine fuelling environmental stress was more people in a confined area.
- Panellists on average anticipated that it would be more than a decade before we successfully address the issues identified in this study, but felt that there would be little change in the actual decision makers during that time.

Analysis of results: Responses were analyzed for variation by national origin by comparing those from the 7 Canadians to the 11 to 9 Americans participating in each round using several non-parametric statistical techniques. These tests demonstrated that:

- Overwhelmingly nationality appears to have little to no bearing on how panellists assessed key environmental issues in the Fraser Lowland. Both Americans and

Canadian panellists share a single mind on the issues raised in the study with a few small exceptions.

- Two exceptions show an initially slightly greater sensitivity by Canadians to air shed concerns, which then disappear as the study progressed, and Canadians being a bit more disposed to the need for joint action to tackle cross border environmental issues.

- A third exception is that Americans are more likely to support the notion that population pressure is at the root of environmental stress, while Canadians believe the problem lies more with the way in which the population is arranged, rather than with absolute size.

Conclusions: A clear set of cross border environment issues exist with air and water as the dominant environmental themes. The unity shown in the opinions of the bi-national panel with regard to these issues and, indeed, the entire range of topics covered in the Delphi is quite striking. This provides evidence that a Fraser Lowland regional consciousness exists to the extent that these expert panellists share opinions on the critical environmental issues. The implication of such a finding is immense. Additionally, there is a relatively high degree of confidence expressed that international solutions will be found to address these issues and we should expect substantial progress in the next decade and a half.

1. Introduction:

This report explores trans-border environmental governance issues in the Fraser Lowland of south-western British Columbia/ north-western Washington State. The international border that bisects this area presents an implicit obstacle to coherent and consistent management of the environmental resources located in this unified bio-physical region. Moreover, as population and industrial pressures continue unabated, there is a sense that some degree of unified bi-national effort is inevitable in this cross-border region (CBR).

This study represents a further collaboration between researchers in the Departments of Geography at University College of the Fraser Valley, Abbotsford BC and Western Washington University, Bellingham WA. This relationship was initiated formally in 2000 with the creation of a joint course, "Borderlands", which used the Fraser Lowland as a case study to explore issues that beset border regions in general (Nicol et al, 2003) In effect, the course studies the impact that the international boundary has had on the region. In that it brings Canadian and American students together annually in a single class, the course remains unique in North America. Over the years, the course has benefited greatly from contributions by individual policy makers throughout the Fraser Lowland. The research described in this report marks the first attempt to directly engage such actors in analysis.

The research conducted is highly exploratory in nature. As will be discussed in more detail below, our goal is to shed light on the current and future state of environmental policy development and application as it is perceived by those at the front lines of implementation. In other words, this study attempts to clarify the meaning of "environment" as it applies to the Fraser Lowland, by tapping into the minds of key decision makers. Given that the study region is bi-national, an important question for us is what impact the border has on the perceptions of such decision makers: has the border divided opinion?

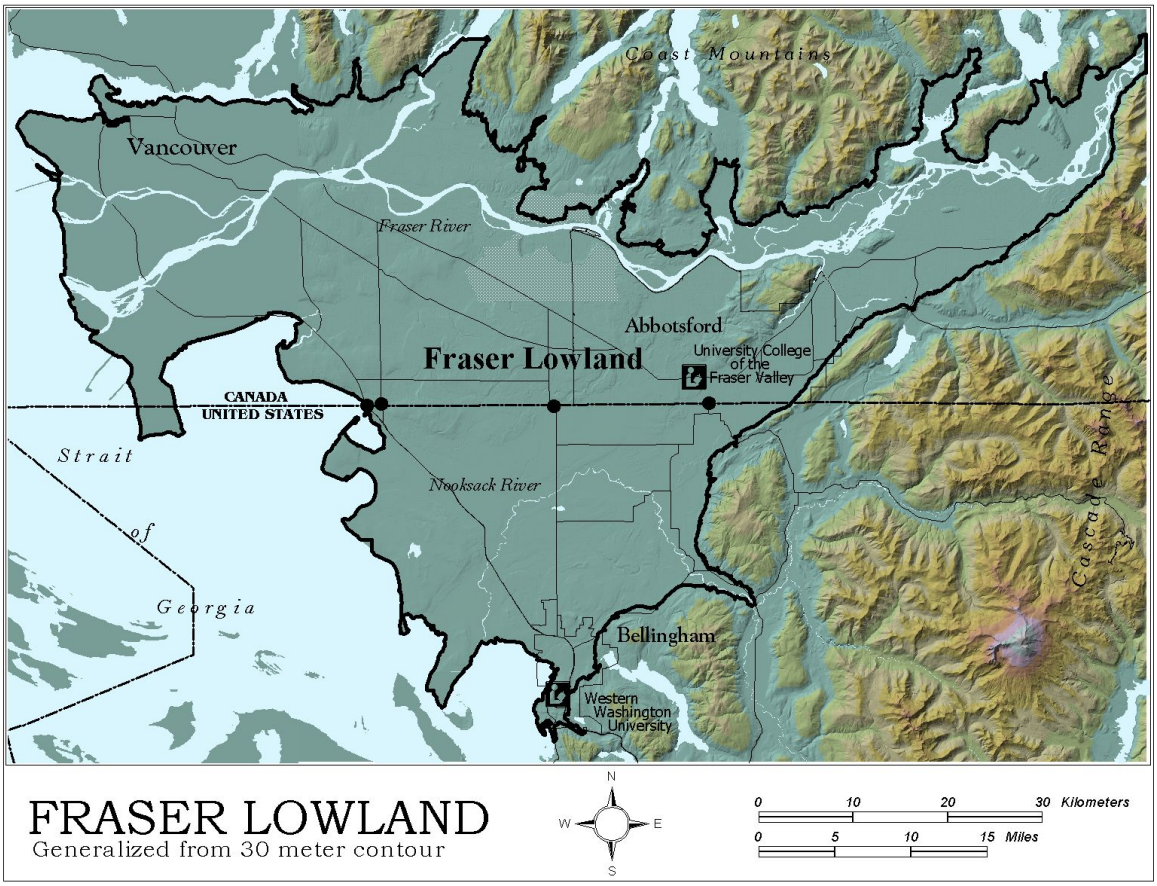
2. Purpose.

The purpose of this study is to investigate possible future policy scenarios and solutions for resource management issues in the Fraser Lowland through use of the Delphi method of questionnaire analysis. The event that demonstrated the need for such a study was the now moot proposal by National Energy Systems Co. (NESCO) to build a second electrical generation plant in Sumas WA(Sumas Electrical 2 [SE2]) just across the border from its much larger Canadian neighbour, Abbotsford BC, by utilizing Canadian natural gas from a local pipeline. The grassroots furor raised on both sides of the border over further stressing the bio-region in general and the air-shed in particular, caught many local leaders by surprise.

Local government officials in both locales initially approved of the project since it was seen to provide economic benefits to both parties. To the Canadians, increased revenue would flow through the sale of natural gas. But more specifically, Abbotsford was offered water transmission and sewer system upgrades of CAN$5.35 million and annual revenue from the sale of water and sewage treatment of up to CAN$1.25 million. (Beyak, 2002) To the Americans, especially in Sumas, would come a small number of high paying jobs plus a sizeable increase to tax base to help replace income lost when cross border shopping collapsed a decade earlier. In large part, the politicians saw this as little more than an incremental addition onto an existing relationship that dated back to 1997 when the City of Abbotsford agreed to process sewage from Sumas. The effluent included discharge from SE1, a much smaller and highly profitable cogeneration plant that was built in 1993 to generate power for the North American grid, plus provide heat to dry imported Canadian lumber. In return for accepting the effluent, it was reported that NESCO offered to pay capital costs of $4.5 million toward the construction of a new sewer line to Sumas, although it was never written into the contract. Although the sewage is still flowing, the contribution was never made. (Beyak, 2002)

The ferocious opposition that eventually led to the cancellation of SE2 demonstrated that the current nature of the bio-region's environmental management regime is inadequate, if non-existent. Further, given the fact that a very strong distance decay relationship can be demonstrated in regards to interest in issues like SE2 (it is doubtful that either Ottawa or Washington, DC wishes to focus on this type of event and even Victoria and Olympia, although important players in this drama, have provided limited direction towards building a true cross-border solution for these neighbouring places), it is paramount that new cross-border policy options be investigated. Can local actors, both government and non-government, rise to a challenge of this nature? Is it possible that a cross-border consciousness might be building and that shared governance of mutually exploited environmental resources in this region is a possibility, or is this hoping for too much? Our study addresses these questions

3. The setting.



The focus of this study is the geographical region known as the Fraser Lowland. (see map above). The name, and much of the description that follows, is derived from Armstrong (1990). The Fraser Lowland is relatively flat terrain, measuring approximately 3,500 kilometres^2 (1,350 miles^2) in area.. It is delimited by the Coast Mountains to the north, Cascades to the south and east, and the Strait of Georgia shoreline to the west. This geographical setting has resulted in a confined air shed. The rich soil and mild climate make this prime agricultural land. The dominant physical feature of the region is the Fraser River whereas the dominant human feature is the United States – Canada international boundary and the Vancouver metropolis. The boundary divides the Lowland approximately into two halves that represent extremes of location in their respective nations.

With regard to population, the Fraser Lowland is dominated by the Vancouver metropolis, which includes the City of Vancouver in the extreme west, and is functionally integrated with suburban communities in the eastern periphery. This functional region is roughly equivalent to the Greater Vancouver Regional District (GVRD- now officially known as "Metro Vancouver") which also corresponds with the Vancouver Census Metropolitan Area (CMA). The GVRD has a population of 2,116,581[1]. A second population base on the Canadian side of the border, to the east of the GVRD, is the Fraser Valley Regional District (FVRD), with a population of 257,031. Three communities dominate the FVRD: Abbotsford (population: 123,864) and Mission (population: 34,505), which together constitute the Abbotsford CMA, and further east, Chilliwack

(population: 80,505). Although distinctly more rural in character than the GVRD, the FVRD is nevertheless rapidly urbanizing, as its connections to the Vancouver metropolis expand. The average five year percentage change in population (2001-2006) for the three dominant centres of the FVRD was above nine percent and, for the FVRD as a whole, 8.2 percent.[2]

The 2.4 million people that occupy the Canadian portion of the Fraser Lowland, dwarf the 185,953[3], south of the border. The American portion of the region is entirely contained within the jurisdiction of Whatcom County, dominated by Bellingham (population: 75,220). Despite the population imbalance, the Fraser Lowland as a whole is characterized by high rates of population growth and attendant economic activity. Whatcom County's six year growth rate (2000-2006) of 11.5 percent[4] is similar to the communities of the FVRD, presented above. It is notable that growth rates of these communities in the "shadow" of the metropolis far exceed that of the metropolis itself: Vancouver's comparable growth rate was 6.5 percent. (Statistics Canada, 2006)

4. The Fraser Lowland and Cascadia

The Fraser Lowland lies at the geographic epicentre of the larger cross-border region known as "Cascadia". Sparke (2002) describes Cascadia to be a "concept" CBR with indistinct limits; more of a " state of mind" or commodity than fixed geography. Nevertheless, Cascadia is the most prominent CBR of any description along the western portion of the United States-Canada border. Depending on the eye, or intent, of the beholder, Cascadia might encompass the entire west coast of the US and Canada, from California to Alaska and inland to encompass the states of Idaho and Montana and the province of Alberta. At the other end of the spectrum, the linear strip that connects Vancouver, BC to Seattle, WA and Portland OR has been dubbed the "Cascadia Corridor".

In his review of the Cascadia concept, Alper notes that all applications share the same goal: "to diminish the barrier effect carved by the border in order to stimulate common action on behalf of regional goals." (1996 2). However, there are two fundamentally opposed visions for Cascadia: economic versus ecological. The ecological vision can be traced back to the original writings of David McCloskey in Seattle in the late 1970's, and the concept of bioregionalism. Much work has focused on the state of health in the Georgia-Basin – Puget Sound ecosystem.

Cascadia's ecological realm is largely the domain of non-governmental organizations, although with some significant exceptions; the British Columbia/Washington Environmental Cooperative Council is perhaps the most notable. The Council brings legislators and agencies together, at least annually, to consider trans-boundary issues. The Council directs the work of task forces that study border issues at the micro level, including the Abbotsford-Sumas aquifer, Nooksack River flooding, habitat and marine issues in Georgia Basin-Puget Sound and air and water quality issues in the Columbia River Basin. An additional task force focuses on "air quality in [the] lower Fraser

Valley/Pacific Northwest airshed." An outcome of this group is an interagency agreement signed in the mid-1990s. Agencies in BC and Washington have agreed to provide "timely prior consultation on air quality" in the areas governed by the Greater Vancouver Regional District and the State of Washington's Northwest Air Pollution Authority. (British Columbia/Washington Environmental Cooperative Council, 1994)

It is much more common to find at least quasi-public support and/or involvement in such economic entities as the Pacific Northwest Economic Region (PNWER) or the Pacific Corridor Enterprise Council. The economic vision received a major boost with the creation of the 1989 U.S.- Canada Free Trade Agreement, ultimately replaced with NAFTA in 1993. Undoubtedly, these competing visions have further stymied efforts to create the kind of institutional structures indicative of an advanced stage of "governmentality regime" (Leresche and Saez 2002) within Cascadia generally, and the Fraser Lowland in particular. The ultimate loser in this void, according to Johnny Wilson (1990) is the environment. In a remarkably prescient paper vis-à-vis SE2, Wilson made a plea for the creation of a "Department of Transborder Ecosystem Management" with representatives from the governments of Washington and British Columbia. Such an entity would include a "conflict resolution framework" to deal with contentious issues. The general outline of the SE2 saga was predicted by Wilson, over a decade ago,

> Without the benefit of institutionalized cooperation, supplemented by a conflict resolution framework, a shared ecosystem will only be as healthy as the most negligent management on either side of the border allows. In the long term, such a situation will, at best, strain the cross-border relationship and, at worst, encourage opportunism and reactionary retaliation. (1990 2)

As a micro CBR within the larger framework of Cascadia, the Fraser Lowland shares many of the limitations to effective cross-border governance ie, a poorly developed, or absent, institutional structure and low level of regional consciousness. These are indicative of a CBR at an early stage of development or governmentality regime. At this stage, the CBR lacks local decision-making power. Instead, public affairs are largely governed by national and provincial/state level authorities in a top-down fashion. This can have the effect of reinforcing the impermeability of the border, rather than its penetration.

In a study of the adjoining Alberta-Montana border region, Morris (1999) sought to determine if "there exist ideas that unify border-region residents and set these areas apart, as international spaces and places, from the rest of the continent." (1999 470). His conclusion, following research of the vernacular landscape was that a borderland identity was absent. Instead, "[n]ationalism…provides the frame and foundation for borderland regulation." (1999 476) Such a conclusion can also be tentatively applied to the case at hand. Although the grass-roots protest against construction of the plant included participation from both sides of the border, in Canada at least, there was a tendency to frame the issue as one of undifferentiated rapacious American greed. In the absence of

any cross-border dispute resolution mechanism, opponents had to direct their energies to encourage Ottawa's National Energy Board to refuse SE2's application to tie into the power grid. The effect was to reinforce the shielding effect of the border

5. Methodology.

This report is based on information obtained through a type of questionnaire technique known as the "Delphi" method. The Delphi method (Adler and Ziglio 1996, Dalkey 1972, Gupta and Clarke 1996, Sackman 1975) is a "qualitative, long-range forecasting technique that elicits, refines and draws upon the collective opinion and expertise of a panel of experts." (Gupta and Clarke 185). It provides a method for thoughtful anonymous discussion of complex issues that are not easily addressed in other formats while limiting impacts of political or national bias. To accomplish this it utilizes a method of controlled conversation among panel members whose identities remain anonymous throughout the exercise. This guarantees that through a series of rounds the discussion focuses on ideas not personalities, politics, backgrounds, or other biases or baggage, and that no group or individual dominates the discussion. This is done by submitting positions or ideas to the researchers who summarize and organize these before submission to the group as a whole. In addition, it enables the researchers to ask for further clarification if necessary in order for all panellists to fully express and understand each idea. As rounds progress panellists are asked to rank and order ideas submitted by members of the group as a whole based on the likelihood that a given suggestion will come to pass and second that if it does occur, the level of importance or its impact upon the situation. This allows for the airing of all positions including contradictory or unpopular ones and for evaluating the level of their impact and their probability of occurrence. In addition, a Delphi does not require that the panel eventually agree to one set of answers. Ranked and ordered results are reported back as both summary averages and histograms thus providing information on not only the most likely response but also the deviation and whether a multimodal result is present. This enables the clear representation of not only majority positions but also minority ones. Finally, panellists are asked to report their own confidence in addressing any of the ideas raised. Given the wide range of possible ideas raised, not all panellists will be equally familiar with each and can express a lack of or limited knowledge in any given area or even decline to respond on some issues. Thus results will report three things: importance, probability, and the confidence of a panelist in his/her response.

6. Applying the Delphi Methodology

The project began by interviewing current decision makers who were involved in the SE2 controversy or other cross border issues within the study area and asking them to volunteer for the study and/or recommend others with similar influence and expertise. Given the location of the SE2 issue, it was decided to seek Canadian participants from the eastern portion of the Fraser Lowland ie, within communities of the FVRD. Eighteen panellists were recruited for the study (7 Canadian and 11 American). One American dropped out after the first Round and a second American skipped the third round resulting in 16 to 18 valid responses per round, split between the two nations. Panellists

included political leaders, past and present, academics and planners, business people, and environmentalists, both governmental and non-governmental.

Category	*Number of Panellists*
Academics, Planners and other local government officials	8
Elected Officials, past and present	5
Environmental non-government organizations	3
Private Sector	2
TOTAL	**18**

Between February 2005 and December 2006, four Delphi rounds were performed. Table 1 lists the foci of each round. Note that the bold faced type indicates the round in which a line of discussion began, and the plain faced type, the rounds in which it was repeated.

Table 1: Round by Round Foci of the Delphi

Round 1	
	Identify pressing cross-border environmental issues.
	Evaluate the current understanding of cross border identity and consciousness and the spatial scale required for addressing the above issues.
Round 2	
	Rank and score pressing cross-border environmental issues.
	Second evaluation of the current understanding of cross border identity and consciousness and the spatial scale required for addressing the above issues.
Round 3	
	Second scoring of pressing cross-border environmental issues.
	Evaluate the critical and cross border nature of the top five cross-border environmental issues.
	Evaluate organizational ways of addressing the top five cross-border environmental issues.
Round 4	
	Second evaluation of the critical and cross-border nature of the top five cross-border environmental issues.
	Second evaluation of the organizational ways of addressing the top five cross-border environmental issues.
	Evaluate general issues raised by the study not covered elsewhere.

The purpose of the complete Delphi exercise was to identify the current geographic context within which cross border environmental issues exist in the Fraser Lowland, the issues themselves that need to be addressed including their relative importance of impact, and finally, how these should be addressed organizationally .

Round one served as both a brainstorming session and an initial attempt to understand the geographic context within which these issues exist. The purpose of subsequent rounds was primarily to probe and refine the thoughts offered in round one. The brainstorming portion of this round enabled panelists to state and describe up to three of the most pressing cross border environmental issues faced by the inhabitants of the Fraser Lowland. Specifically they were asked to:

> *Identify up to three key cross border issues that you believe will have a significant impact on the quality of life in our local region and affect shared cross border environmental resource management over the next decade.*
> *(a) Briefly state the issue*
> *(b) Provide any additional definition or description of the issue to make sure that other panel members and researchers will fully understand your idea.*
> *(c) Discuss why this issue will be of importance over the next 10 years.*
> *(d) Describe the nature of potential cross border environmental impact, if any.*

This brainstorming section began the Delphi process by determining possible issues that later rounds would rank, evaluate, and provide suggested organizational means of addressing.

In addition to brainstorming, round one also had six targeted questions using a ten point Likert scale to identify the geographic context within which these issues exist. These questions looked at the importance of the border and cross border consciousness in addressing the issues as well as the most appropriate scale from which to deal with them:

> *1. Considering both the current and future state of environmental health in the Fraser Lowland, how positive or negative is the impact of the international border on effective shared resource management?*
>
> *2. What is the current degree of cross border identity or consciousness among people living in our local cross border region?*
>
> *3. Ten years from now what will be the degree of cross border identity or consciousness among people living in our local region?*
>
> *4. For effective cross border management of our local common environmental resources, what degree of success can be attained without the participation of the Greater Vancouver Regional District?*
>
> *5. What degree of success can be attained without the participation of the state/provincial officials and institutions?*

6. What degree of success can be attained without the participation of the federal officials and institutions?

The brainstorming section in round one provided panellists with a blank slate on which to suggest issues for group consideration, in an open an unbiased manner. Panellists were also asked to assess the impact of the international border. They evaluated the current and future expected level of cross border consciousness, which could prove to be crucial in successfully addressing the issues. And finally, they considered the need for participation by institutional actors at various levels of geographic scale in order to successfully address the issues. This latter represented a way of measuring the level of confidence panellists had in instituting cross border solutions to the above issues with or without participation of other local, regional, or national players. Overall these six questions establish a geographic context within which the actors can and must make decisions while the issues section provides just that, the issues upon which decisions will be made.

7. Geographic Context

Table two lists the variable codes representing each geographic context question used in the first and second rounds plus the range of possible answers to each. Table three provides the descriptive statistics from the panellists' responses to these six questions. Two types of data are provided here; first, the perceptions indicating the average strength and deviation of panellists' convictions for round one and two and second, the confidence they had in their response during round two (the only round in which this line of inquiry was pursued).

Table 2: Geographic Context Questions

Variable	*Question*	*Answer Range*
R# Border	1. Impact of the international border on effective shared resource management	1= very positive, 5= neutral, 10= very negative

R# Identity_2006	2. Degree to which there is cross border consciousness in our local cross border region	1= very high, 5= some, 10= little to none
R# Identity_2016	3. Ten years degree to which there will be cross border consciousness be in our cross border region	1= very high, 5= some, 10= little to none
	Effective cross border management of our local common environmental resources, what degree of success can be attained without the participation of the:	
R# GVRD	3. Greater Vancouver Regional District	1= very high, 5= some, 10= little to none
R# State	4. State/provincial officials and institutions	1= very high, 5= some, 10= little to none
R# Federal	5. Federal officials and institutions	1= very high, 5= some, 10= little to none

Table 3: Descriptive Statistics for the Six Questions Addressing Geographic Context

PERCEPTIONS

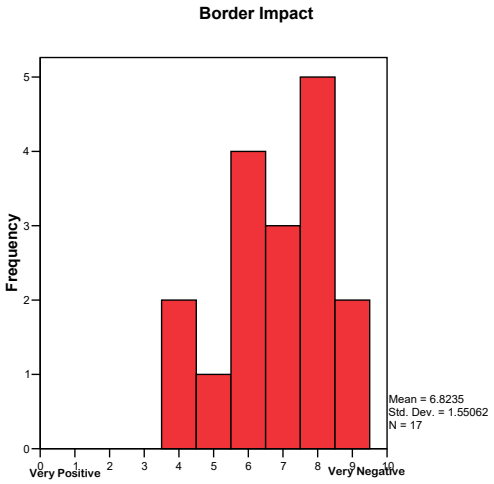
ROUND 1

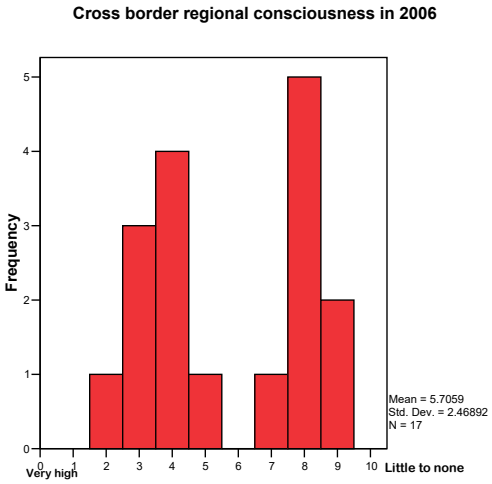
	Mean	*Median*	*Minimum*	*Maximum*	*Std. Dev.*	*Skewness*	*cases*
R1Border	7.1	7.8	3	9	1.73	-1.13	16

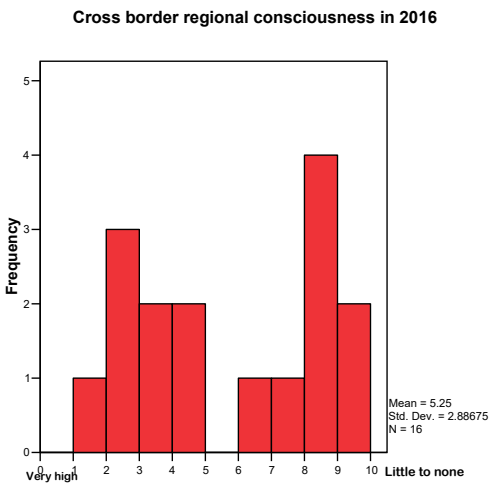
R1Identity_2006	5.7	6.0	1	10	2.42	-0.19	17
R1Identity_2016	5.6	6.0	1	10	2.83	-0.47	16
R1GVRD	7.1	7.0	3	10	2.49	-0.37	16
R1State	7.0	7.5	2.5	10	2.75	-0.44	16
R1Federal	6.8	7.0	3	10	2.67	-0.27	17
	ROUND 2						
R2Border	6.8	7.0	4	9	1.55	-0.47	17
R2Identity_2006	5.7	5.0	2	9	2.47	0.02	17
R2Identity_2016	5.3	5.0	1	9	2.89	-0.04	16
R2GVRD	7.7	7.0	5	10	1.70	0.10	16
R2State	7.8	8.0	3	10	1.81	-1.06	17
R2Federal	7.5	7.0	4	10	2.07	-0.31	16
CONFIDENCE IN RESPONSE							
	ROUND 2						
R2Border	8.1	8.0	6	10	1.25	0.22	15
R2Identity_2006	8.1	8.0	5	10	1.50	-0.24	16
R2Identity_2016	7.4	7.0	3	10	1.82	-0.41	16
R2GVRD	7.3	8.0	2	10	2.43	-0.94	15
R2State	7.9	8.0	5	10	1.59	-0.23	16
R2Federal	8.3	8.5	3	10	1.81	-1.74	16

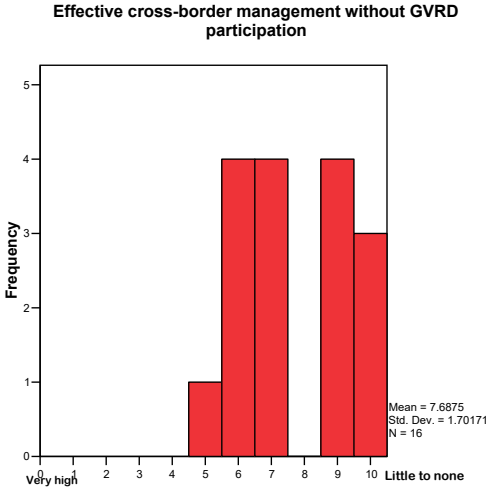
Figure one shows the histograms accompanying perceptions from round two. The first graph focuses on the border impact. By examining both the statistics and graphs for this question it is clear that by round two, the border was seen to have a slightly negative impact on solving cross border environmental issues. The histogram forms a somewhat compact and fairly symmetrical cluster, with values ranging from a 4 (some positive impact) to a 9 (highly negative impact) with a mean average of 6.8 mean and 7.0 median.

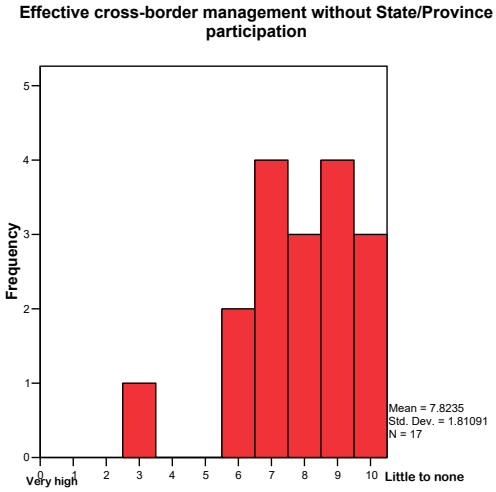
Figure 1: Distribution of Scores, Geographic Context, Round Two

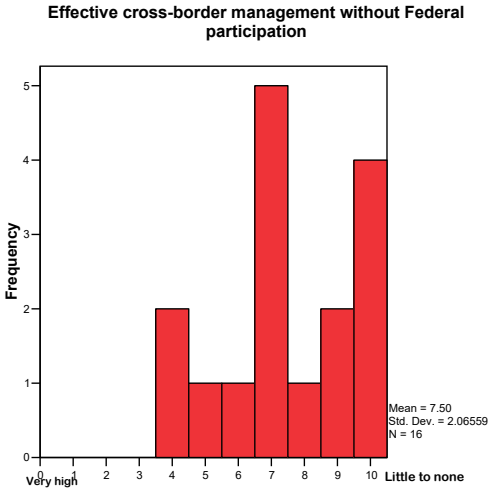

Border Impact
Frequency
Mean = 6.8235
Std. Dev. = 1.55062
N = 17
Very Positive
Very Negative


Cross border regional consciousness in 2006
Frequency
Mean = 5.7059
Std. Dev. = 2.46892
N = 17
Very high
Little to none


Cross border regional consciousness in 2016
Frequency
Mean = 5.25
Std. Dev. = 2.88675
N = 16
Very high
Little to none


Effective cross-border management without GVRD participation
Frequency
Mean = 7.6875
Std. Dev. = 1.70171
N = 16
Very high
Little to none


Effective cross-border management without State/Province participation
Frequency
Mean = 7.8235
Std. Dev. = 1.81091
N = 17
Very high
Little to none


Effective cross-border management without Federal participation
Frequency
Mean = 7.50
Std. Dev. = 2.06559
N = 16
Very high
Little to none

Based on statistical averages, cross border consciousness averages at the center of the range of values indicating it is rather moderate today (5.7 mean and 5.0 median) with not much expectation of change a decade from today (5.3 and 5.0). Bi-modality is evident in both "consciousness" histograms (ie, 2006 and 2016). There are clearly two groups of respondents, with nearly equal clusters between those perceiving a fairly high level of cross border consciousness and a nearly equal number answering that the consciousness is fairly low. A decade in the future, the year 2016, the spread of results increases slightly while migrating slightly towards an increasing cross border identity. This suggests uncertainty in how to read this response than was apparent in the descriptive statistics alone.

With regard to effective cross border management of environmental issues, it is clear that the panellists generally favoured participation with actors at broader scales: regional, provincial/state, and national (respective means were 7.7, 7.8, and 7.5 while medians were 7.0, 8.0, and 7.0). The interesting outcome here is the lack of favouring one scale over another, and a lack of desire on each side of the border for the small local region to *go it alone.* The histograms however show a slightly more complex response. The local GVRD region produces a slightly more compact and symmetrical diagram then the provincial and federal level graphs. These differences seem to raise more questions then clearly differentiate between these three scales of management.

With regard to confidence of response, it is clear by reviewing the descriptive statistics, in Table three, that on average the panel had a relatively high level of confidence in their responses across the board and generally low levels of variance, although there are the occasional outliers as should be expected. The two lowest values, though only slightly lower than the rest of the results, are for R2Identity_2016 and R2GVDR. Perhaps this is reflecting lower confidence in predicting the future rather then the present. Certainly determining the level of cross border consciousness a decade hence is much less certain then discussing the same issue today. Likewise, it is interesting that the greatest uncertainty about dealing with other levels of government is with the Vancouver GVRD, a body only established in 1967 and one yet to establish a clear track record vis-à-vis it's neighbouring Regional District, the Fraser Valley Region District [FVRD], in which Abbotsford and Chilliwack are primary players. With time this uncertainty may decline.

In summary, the following trends on "geographic context" were revealed in the opinions expressed in this portion of the Delphi:

(1) the border exerts a negative impact on environmental management issues;

(2) panellists were clearly split into two groups over the level of cross border consciousness, both current and future, resulting in averages virtually in the centre of the scale;
(3) there is broad consensus that involvement of higher levels of government, in both the United States and Canada, is key to the success of cross-border environmental management in the local area, however what actions those other scales of government should execute is not clear, and
(4) there is a moderately high level of confidence by panellists in their responses.

8. The issues:

In response to the request for environmental issues, panellists submitted approximately 80 individual suggestions. These were collated into nine distinct, but often interrelated, items. Each is identified with a short, descriptive title, and listed alphabetically below. A longer "encapsulated" description of each issue, together with extracts from questionnaires, and discussion, follows. In the encapsulated description, the investigators attempted to capture the "flavour" of comments that were included in the questionnaires.

Border security
Conversion of open space and more impervious surfaces
Economic growth
Pandemic diseases
Population growth
Spill overs
Stressed air shed
Water resources
Winter Olympics 2010

Border Security

Encapsulated description:

Increased security might be a double edged sword. It could also result in a less welcoming attitude. Both recreational and economic activities could be impacted with consequences on the regional quality of life. Walled borders could also make common habitat management more difficult.

The concern expressed was over increased levels of border security. While not explicitly an "environmental" issue, panellists expressed concern over the impact that the barrier effect of increased border security would have on reducing interaction of the two national communities in the Fraser Lowland. Efforts at joint environmental management would

clearly be impacted, but so would "neighbourliness". The Canadian panellist quoted below expresses a concern about the potential destruction of the bi-national community that has evolved over the past 150 years, potentially replaced by a greater sense of "Other".

"Since 2001, "homeland security" has dominated the political agenda of America. It has caused an extreme imbalance between "national interests" and "regional interests", and national boundaries tend to define the scope of socio-economic, environmental and urban development/land use issues. "Homeland security" measures have created very visible physical barriers to movements of people and goods, as well as a psychological barrier that keeps the Lower Mainland Canadians and their US counterparts to think inwardly – along the border, rather regionally and "globally", transcending the arbitrary national line.
The long-term impact could be the rise of "negative nationalism", one that is premised on "foreign invasion" and "threats" and insecurity, as opposed to "positive nationalism" that is built on the confidence of knowing our identity and on the security afforded by our strengths. The former tends to lead to a country to withdraw unto itself while demonizing other countries, whereas the latter fosters extension of a country's good will to, and respect for, another country. As often said after the 2001 trauma, "it is a different world we are living in." Indeed, it is a different and "worsening" world that we seem to be sliding in, and that happens when blind "nationalism" displaces "regional family-ties", i.e., our regional social, economic, cultural, environmental and urban/rural development relationships."

This American panellist ties the reduction in cross-border flow to a welcoming attitude at the border ie, "*US border crossing folks treating Canadians well",* whereas a second refers to the impact that greater regulation is having on quality of life and economic development:

Cross-border travelers, goods carriers, and goods shippers have seen their cross-border movements come under closer scrutiny since 9-11. Regulatory processes have grown more complicated and burdensome. Cross-border travel in our region has plummeted. The ability to move easily and spontaneously across our international border adds greatly to our region's quality of life. With current and pending border-related inspection changes (i.e. the Western Hemisphere Travel Initiative, land-border implementation of U.S. VISIT), a cumulative effect on travel is worth monitoring. Less travel could mean declines in emissions, road-building, store-building , etc. Economic impact

Note that this panellist sees a potential environmental benefit of less cross-border travel!

<u>Conversion of open space and more impervious surfaces</u>

Encapsulated description:

While providing for expected growth in our region, greater activity might also negatively impact on the very things that make our joint region so unique and attractive to newcomers, especially in the natural environment and resources, like salmon.

Despite the existence of the Agricultural Land Reserve north of the border, Canadian panellists lament the loss of farm land and a lack of "sustainable" land use planning practices, for example:

"Land use conflicts continue as pressures on undervalued farmland and sensitive natural ecosystems grow."

"Resource extraction, suburban sprawl, and industrial land requirements all contribute to a diminished natural environment."

"Growth projections for the next decade indicate little or no concern for sustainable practices and the well being of future generations."

The larger population base on the Canadian side of the Fraser Lowland might explain the preoccupation with suburbanization.

An American panellist similarly notes the loss of agricultural land south of the border, "*[s]atellite images demonstrate the continual loss of productive land"*, whilst another refers to the loss of wildlife habitat and highlights the need for a collaborative effort: "*[the] border cuts right through this, requires cross-border coordination."*

Economic Growth

Encapsulated Description:

More industry, energy development, agriculture, and even transportation facilities, while providing increased economic benefits, could also cause greater stress on local resources such as water, air, open spaces and habitat. This can result in cross border spill over.

"Economic growth" was seen to be the force responsible for much of the undesirable impacts sustained by the environment, especially as population, cars and houses follow jobs to the region. This Canadian panellist recognizes that, with the bulk of the Fraser Lowland's population north of the border, *"[t]he Lower Mainland urban growth and traffic have certainly affected the American side as far as air quality is concerned."*

Coming on the heels of the SE2 debate, it's not surprising that energy production, as an economic sector, should be mentioned. One American puts it plainly: *"utilities (electric and natural gas) – they got 'em, we want 'em"*. This Canadian expresses concern about utility pollution from both American and Canadian sources:

"The high concentration of energy infrastructure surrounding the Sumas Hub in Abbotsford and Sumas will continue to create potential environmental impacts, including possible product leaks and spills, EMFs from transmission lines and attracting potential global terrorist activities.

"With growth in the Alberta oil sands and NE BC natural gas, there will be increased transmission of product through the valley and across the border. Similarly new potential hydro-electric power, which the Province is now desperately trying to pursue, could also be transmitted through Abbotsford. Spills and leaks have ecological impacts and human disruption effects, while increased hydro-transmission has potential human health impacts from EMFs."

Another dominant theme is not so much the potential for air pollution, but rather the implications for exogenous corporate control. This concern is present in the following quote from a Canadian:

"[T]he American rural side should … be [of] great concern to Canadian if the corporate and urban America (Seattle) looks at the Fraser Lowland as just a hinterland whose purpose of existence is to serve its interests. SE2 is a case in point."

This American panellist makes a similar point:

"[We] need to control use of natural resources, especially those we're dependent upon. Leaving control in the hands of corporate structures is not correct. Control should be within the community. This region produces more energy than it consumes; we only feel the consequences of its production. Leaving control in the hands of people who live elsewhere will lead us to total exploitation…"

Canadian panellists expressed a great concern over the environmental impact of industrial agriculture in their side of the region and, sometimes, its impact south:

"Intensification of the livestock industry continues with no comprehensive or organized mechanism to deal with the agricultural waste or by-products that would ensure some degree of quality control/quality assurance (such as there is for human sewage through sewer collection and sewage treatment plants). In Abbotsford alone manure from all livestock is equivalent to a City with a population of 14.7 Million – all essentially handled in a random and voluntary manner".

The modern face of agriculture is further expanded on by this panellist, who notes problems with environmental policy enforcement:
"Agriculture is not what it used to be. It is no longer the family farm and has morphed into more of an intense industry. The size of farms has changed little, but the livestock headcount has increased dramatically. The "Right to Farm" legislation is being abused sometimes to do whatever one wants regardless of environmental or health impacts. Compounding the problem is the fact that at least in British Columbia, there is quite inadequate monitoring or enforcement of best practices. Manure management practices need improving and enforcement."

"Growth continues in the intensive livestock sector with no QA/QC bio-waste mechanism. Water resources are becoming scarce (e.g. Nooksack River water allocations are presumably no longer available so groundwater is the only source available for Northern Whatcom county). While most of the solutions need to be applied on the Canadian side of the border increasingly Americans will feel the impact of uncontrolled bio-waste handling.."

Pandemic Diseases

Encapsulated description:

Recent experience with avian flu among poultry flocks in BC as well as "mad cow" disease demonstrates the possible cross border dimension of these threats and the need to create ways to jointly manage the threat.

The recent incidence of highly pathogenic avian influenza H7N3 in the Abbotsford area in 2004 has raised awareness of pandemic disease as an environmental issue in the Fraser Lowland, by some panellists. This Canadian panellist identifies a large part of the cause to be intensive agriculture:

"Agricultural, especially intensive livestock, waste and by-products in the Lower Fraser Valley currently pollutes and are likely to continue to cause pollution, environmental degradation and possibly even act as significant disease vectors that will impact human health (eg. "Morphed" Avian Influenza)."

According to an American panellist, "pandemic disease", through "*air, bovine and avian born transfer…impacts foreign trade and domestic markets. [It is] difficult to manage to manage and poses a huge health threat."*

Population Growth

Encapsulated description:

Being attractive can be a double edged sword. More people can mean more opportunities and also greater stress on local resources.

An underlying theme in many of the comments is the role that population pressure has played in environmental impact in the Fraser Lowland. Put plainly by an American panellist: *"[m]assive [population] growth [is the] single most important impact on the environment."* As our discussion of the final round will show below, Canadian panellists were more likely to find fault with the population "footprint", rather than absolute numbers.

Several panellists situate the population issue within a Cascadian context, where Vancouver and Seattle dominate along the I-5 corridor:

"The Georgia Basin-Cascadia Initiative (partnership between BC and Washington State) frames the urban growth issue at a broad environmental region level. It stems from a common concern of urban growth between Vancouver and Seattle, including both metropolises. The Fraser Lowland is a sub-region of that continental-scale bioregion. In that narrower context where the Lower Mainland urban communities dominate, it seems that the environmental impacts from urban growth is one-directional as few comparable US urban places exist along the border."

An American panellist notes that the draw of the Vancouver metropolis brings population to Whatcom County: *"[g]rowing center of people in Canada pulls people north out of Seattle towards Whatcom County."* Another notes that Whatcom's medial location is responsible for growth generally:

"Canada is large populated and growing. We're sandwiched between Vancouver and Seattle. Heavily influenced by people wanting to escape those areas."

These comments reveal a number of important distinctions about the integration of our study region. It is suggested above that the Fraser Valley (essentially the Fraser Valley Regional District communities) and Whatcom County are both functionally integrated with Vancouver. This is an important unifying characteristic of the cross-border region that is the focus of this study. Earlier, we termed it the "shadow" of the Vancouver metropolis.

Clearly though, Whatcom County's situation is unique in that it is also within the orbit of Seattle. If the American panellist quoted above is accurate, and Whatcom communities like Bellingham are experiencing population growth because of their proximity to Vancouver, then it suggests the international border is functioning like a "back stop". For Americans who do not wish to emigrate, or cannot, but desire proximity to Vancouver for recreation, culture, the metaphysical "vibe", or something else, living within an hours drive of the border makes sense. As border security is perceived to become more onerous, and the border "stickier", an interesting question is whether the impact on the Bellingham area would be to discourage this type of migration.

Spill over

Encapsulated description of issue

Regardless of how well one side of the border addresses or fails to address an issue, the other side can be impacted. Uncoordinated strict regulation can cause activities to flee across the border; likewise, weak regulation can attract them. In either case, the joint eco-region is impacted.

The existence of environmental "spill overs" is another theme that is inherent in many of the separate issues note by panellists in round one. To some extent, the concept is that of "externality effects", popularized in public choice theory, wherein jurisdictional boundaries act as a shield. Panellists clearly told us it was essential that this use of the international border could only be overcome through unified management, planning and policies:

"The lack of regional, cross-border systems of collaboration, management, policy and governance is a serious handicap to the Fraser Lowerland's (sic) sustainable growth, and realizing its potential."

"As far as I know, there is no joint planning on urban development, economic growth, resource development, environmental enhancement (except for Georgia Basin-Puget Sound Air Quality Strategy), rural planning, local energy planning or any broad-based regional planning."

"The anticipated Lower Mainland growth could cause substantial stress on the Fraser Lowland as a whole. A regional framework based on reality, rather than an artificial line in the sand, is needed to ensure the sustainability and liveability of the entire Fraser Lowland Region."

"The lack of systems of collaboration and governance will make the future of the region's environment highly unpredictable. At this time, we probably would come together for crisis management, such as the "Big One" (earthquake). But then, we would not know how we could act collectively as we have no cross-border system or institution to provide effective leadership."

Stressed Air shed

Encapsulated Description

The confined nature of the Fraser Lowland presents unique management issues. Increasing numbers could mean increasing use of automobiles as well as increased economic and transport activity which could result in higher levels of pollutants, or perhaps unique new ways of providing these services with less negative impact.

The topic of air quality elicited the greatest number of comments, although it was more popular amongst Canadian panellists. The following quote is representative of Canadian responses, and succinctly states the essence of the issue :

"With the region experiencing rapid population growth, meteorology conditions that restrict air movement, the existing topographic barriers such as the Coast and Cascade Mountains; this combination creates the potential for a region of high air pollution potential. Combined with the coast to the west, these landscape features form a triangular basin where air containments can be contained and increase during stagnant weather conditions."

Another added reference to the contribution of agriculture to the issue:

"In terms of air quality, ammonia is a direct result of livestock manure management (or the lack of). This results in the formation of fine particulate matter which is a significant health concern."

Also present, especially amongst the Canadians, was recognition of the potential for power generation to affect air quality:

"To me, this is an urgent and critical issue because we have created, and are rapidly expanding, an energy network here without proper regard or advance thinking of the environmental and health consequences and whether this is the appropriate location to do this. At some point, we need to stop this train and rethink this before it is too late (or is it already?)."

"Pollution from power plants, oil refineries, electro-magnetic fields, potential leaks from gas and oil lines and tank farms will overwhelm this region which is extremely rich in biodiversity."

This panellist believes that a solution to the cross-border air pollution is available:

"The need for a Cross-border air quality agreement between the Canada and the United States. Particularly due to the fact that this region is rapidly expanding an energy network linking the two countries together.
This would be an annex to the Clean Air Accord (signed in 1991), which should include ozone and particulate matter. We have been discussing this with all levels of government with both countries for several years. Part of the terms of the original Accord stated consideration of this for BC and Washington. An annex has already been signed for Ontario and the States directly below."

There is general recognition that we are all in this together, and some new point sources of pollution were noted, for example,

"Increased volume of large commercial airliners and cargo planes taking off from BC airports and flying over Whatcom County at low altitude and full power. Creates a noisy and dirty invasion of privacy in Whatcom County. Pollution from jet propulsion"

Water Resources

Encapsulated description:

Recent years have seen more concerted efforts to jointly manage our shared water resources. However, more intensive/extensive land use, both private and commercial, could increase the potential for pollution, while at the same time increasing the demand for potable water.

The water quality issue was, like air, widely included by panellists although somewhat more common in American responses. Ground water contamination of the Abbotsford aquifer, which straddles the international boundary in our study area, is a common theme:

"... the agriculture sector on both sides of the border is hugely dependent on both the watercourses and the aquifer. Heavy rain seasons often create flooding on both sides of the border. As population grows development puts stress on the watercourses and flow patterns. Much of the population is dependent on the watershed for their drinking water.

Pollutants entering the aquifer negatively impact the drinking water on both sides of the border. Maintaining our waterways is also important to the tourism industry from both a recreational fishing and Eco tourism perspective. The wildlife is in many cases completely dependent on the watercourses for it's livelihood."

An American panellist notes that "ground water will be impacted by agricultural practices and growing population", and another identifies an "area of concern" to be "where streams and watersheds transverse the border." A third American calls for cross-border collaboration: "[we] need to be engaged in modelling groundwater quality with Canada."

Population pressure on the Canadian side is noted to be driving the search for more water:

"In terms of groundwater, for Abbotsford specifically, because of a rapidly expanding population, we are looking for an additional water source and will need to expand into our groundwater supply."

Although this American, while citing the lack of water standards, believes that the geography north of the border favours the Canadians in sourcing new water supply:

"[With a] lack of effective standards for quality, usage and draw [the] result [is a] steady rise in nitrate levels in urban wells. [The] greatest impact will on the U.S. side since Canada has alternate distant sources."

Winter Olympics 2010

Encapsulated description:

Exposure of the region to the outside world is an important opportunity. What should be done to prevent us from being "loved to death"?

Ironically, recognition that the 2010 Olympics in Vancouver will have an impact on the region was made entirely by American panellists. Two panellists believed that global attention on the region will potentially result in even greater population growth:

"The [2010] winter Olympics could result in another large wave of in-migration. To the present, this area is a well kept secret with a tremendously diverse region."

Another expresses concern that expansion of the American Peace Arch crossing, which is "far behind schedule already", will continue for some years yet, presumably resulting in long border delays. "Negative media coverage could have an impact on the attendance [of the 2010 Olympics] (example: Greece)."

9. Ranking the Issues:

With the core issues of "cross border environmental resource management" identified, much of the remainder of the Delphi probed panellists opinion on the relative importance of the individual issues. Panellists were asked to rank, score and further comment on the issues in rounds two and three. The results of this exercise, together with comments in round two, was shared with the group as they repeated their assessments in round three. This procedure of anonymous sharing of questionnaire results is at the heart of the Delphi methodology. Panellists thus had the opportunity to revise their opinion based on the ideas presented by others in the study. A question to be taken up in the analysis below is how much change, if any, occurred in expressed opinion, between rounds.

For the purposes of round two, panellists were presented with the nine cross border environmental issues identified from the first round, arranged randomly. They were asked to assign a rank to these issues from most to least important, and then a relative score on a scale where the number one ranked issue started at 1,000. All other issues then received a score relative to this top ranked issue. The lowest possible score of zero was only to be used on issues identified as having absolutely no importance (from all the responses, only two panellists ever used this value, and then rarely). Ties were allowed, but the relative ranking system discouraged such entries. In addition to ranking and scoring the nine issues, panellists were asked to provide a measure of the confidence that they had in their responses for each of the issues on a 10 point scale.

Table four, below, lists the ranking scores, and derived descriptive statistics in descending order of score, for both rounds one and two. Table five shows the associated confidence measures.

A more detailed statistical interpretation is presented in the final section of this report. For present purposes, it can be observed that the ordering of issues remained similar in both rounds, although several issues moved up or down one or two levels. Most noticeably, "Air shed" and "Water" exchanged position between rounds two and three, with the latter replacing the former as most important, but both virtually tied. The greatest change in position occurred with the decline in "Border security", from sixth to eighth place. The remaining discussion will focus on the round three results, given that they represent panellists' "final" selections, following their consideration of results from round two.

The most important issue refers to shared water resources, which includes everything from shared aquifers which cross the border in places like the Abbotsford-Sumas area, to streams and rivers, and even to coastal waters. The importance of clean water as well as the large variety of ways in which it exists and can impact the population may have a lot to do with such a high ranking here. A second reason could be the long running studies of the Abbotsford-Sumas aquifer, which is still the primary water source for thousands in our study region, and the presence of pollutants in it based on past economic practices.

Table 4: Major Cross Border Environmental Issues Descriptive Statistics

	ROUND 2						
Issues	*Mean*	*Median*	*Minimum*	*Maximum*	*Std. Dev.*	*Skewness*	*Responses*
R2 Airshed Score	859.7	900.0	375	1000	156.0	-2.00	17
R2 Water Score	782.4	900.0	300	1000	225.8	-0.95	17
R2 Pop Growth Score	736.5	900.0	200	1000	289.5	-0.76	17
R2 Econ Growth Score	726.1	800.0	300	1000	235.5	-0.74	17
R2 Open Space Score	706.2	650.0	275	1000	231.2	-0.09	17
R2 Border Security Score	560.9	500.0	0	1000	318.7	-0.13	17
R2 Spillover Score	540.3	500.0	75	1000	289.5	0.28	17
R2 Disease Score	526.5	500.0	100	1000	306.6	0.14	17
R2 2010 Score	342.6	200.0	0	1000	339.1	1.09	17

	ROUND 3						
Issues	*Mean*	*Median*	*Minimum*	*Maximum*	*Std. Dev.*	*Skewness*	*Responses*
R3 Water Score	883.4	930.0	600	1000	109.2	-1.52	16
R3 Airshed Score	876.3	900.0	500	1000	142.0	-1.45	16
R3 Pop Growth Score	785.0	830.0	200	1000	207.4	-1.70	16
R3 Open Space Score	763.8	775.0	500	1000	120.0	-0.13	16
R3 Econ Growth Score	671.9	740.0	100	1000	256.5	-1.06	16
R3 Spillover Score	604.7	600.0	200	950	243.2	-0.19	15
R3 Disease Score	595.3	600.0	200	1000	247.4	0.00	15
R3 Border Security Score	556.6	550.0	90	1000	308.8	-0.11	16
R3 2010 Score	349.1	210.0	1	1000	332.7	0.99	15

Table 5: Major Cross Border Environmental Issues Descriptive Statistics of Confidence in Response

	ROUND 2						
Issues	*Mean*	*Median*	*Minimum*	*Maximum*	*Std. Dev.*	*Skewness*	*Responses*

R3 Water Confidence	8.4	9.0	3	10	1.84	-1.69	17
R3 Airshed Confidence	8.7	9.0	3	10	1.79	-2.37	17
R3 Pop Growth Confidence	8.6	9.0	5	10	1.62	-0.93	17
R3 Open Space Confidence	8.5	8.0	6	10	1.28	-0.23	17
R3 Econ Growth Confidence	8.2	8.0	5	10	1.35	-0.66	17
R3 Spillover Confidence	7.0	7.0	4	10	1.94	0.29	17
R3 Disease Confidence	6.5	7.0	4	10	1.77	0.17	17
R3 Border Security Confidence	7.9	8.0	4	10	1.58	-0.54	17
R3 2010 Confidence	7.2	7.0	3	10	2.22	-0.34	17

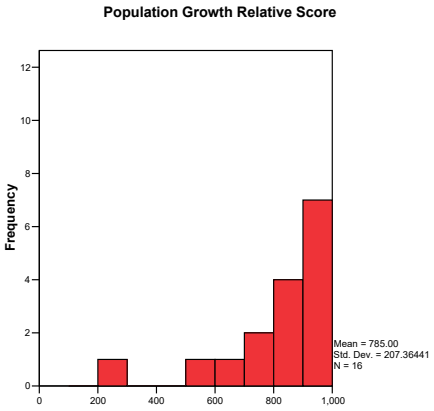
ROUND 3							
Issues	*Mean*	*Median*	*Minimum*	*Maximum*	*Std. Dev.*	*Skewness*	*Responses*
R3 Water Confidence	8.8	9.0	7	10	0.93	-0.84	16
R3 Airshed Confidence	8.7	9.0	5	10	1.33	-1.64	16
R3 Pop Growth Confidence	8.7	9.0	6	10	0.92	-1.87	15
R3 Open Space Confidence	7.8	8.0	5	9	1.45	-1.00	15
R3 Econ Growth Confidence	7.9	8.3	6	9	1.21	-0.58	16
R3 Spillover Confidence	7.8	8.0	5	9	1.29	-1.34	15
R3 Disease Confidence	8.5	8.8	7	10	0.93	-0.12	14
R3 Border Security Confidence	8.2	8.0	7	9	0.75	-0.47	16
R3 2010 Confidence	8.2	8.0	5	10	1.19	-1.26	15

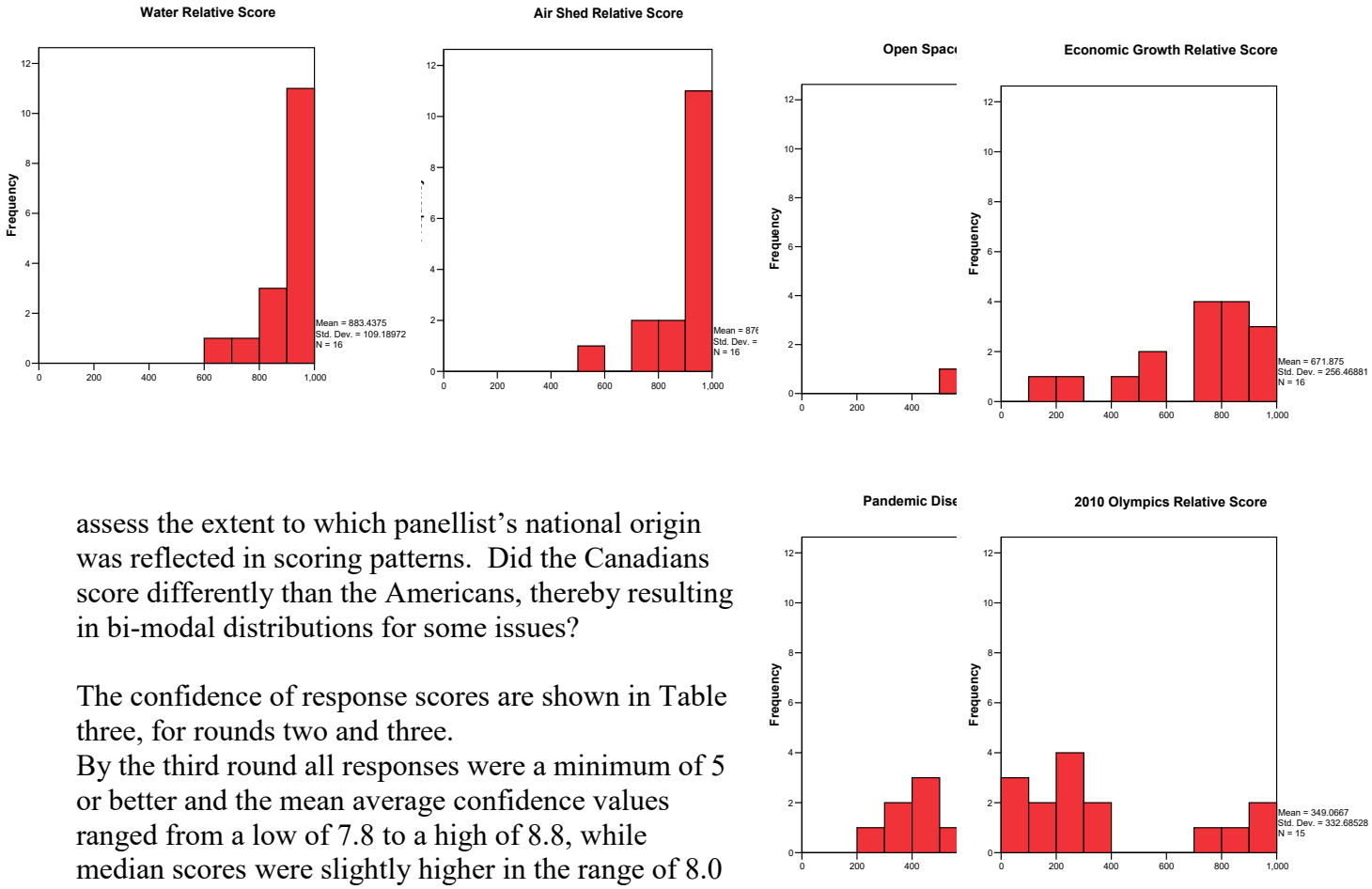
Since the SE2 controversy sparked this study, and many panellists were direct actors in this issue, it is no surprise to find the air shed so highly represented. If anything is surprising it is that this ranks second and not first in the panellists eyes. Next, since population growth on both sides of the border has been extremely high during the past decade or so and since it is an important contributor to many environmental consequences, its inclusion should be expected. Open space is one of the most visible aspects of a changing or protected environment. Both sides of the border have quite different institutional methods for addressing this issue, and there certainly is the potential for pressures on open space to spill across the border or even reflect back. This is especially true based upon the cross border variations in management approach.

Economic sustainability is now recognized as a critical part of the overall issue of sustainability along with environmental and cultural sustainability. As might be expected from a panel that included planners, politicians, business people, and environmentalists (and several wearing multiple hats), the vision of where future economic growth should head was not singular. However, this was recognized as a worthy issue to address. Given the cross border nature of this study, it is both interesting that spill over of impacts was seen as an issue, but also (as will be discussed below) it falls fairly well down the list (ranked 6th out of 9 items). Pandemic disease seems to be an issue that has recently received greater public scrutiny, especially on the Canadian side of the border after a recent bout with a type of avian flu. Some would question the inclusion of border security in a study focusing on cross border environmental issues. However, as noted above, panellists that proposed this issue made the point that border security in the post 9/11 era made cross-border relations in the Fraser Lowland a greater challenge. The recent return to greater concern with border security definitely needs to be part of the mix. However it received a relatively low rank, especially in round three. Finally, rounding out the list is the only truly local and somewhat ephemeral issue, the impact of the 2010 Winter Olympics. With the spurt of growth that followed Expo 86 fresh in the minds of many panellists, this is an issue to consider, but one that is seen as least important.

As an aid to analysis, histograms showing the distribution of scores for each issue are shown in Figure two, below. There is a relationship between "peakiness" (known as the measure of kurtosis) of the histograms, with average score value. Issues that received high average scores, notably "Water" and "Air shed", display prominent histogram peaks (are said to be "leptokurtic") in the high end of the horizontal axis. This is because of agreement amongst panellists that these merit very high scores. As we move down the list, to issues that received lower average scores, the histograms gradually become flatter, indicating a greater range in opinion. For example, with "Economic Growth", the majority of panellists (11) have entered a score at the high end of the spectrum (>700), while two have scored the issue at the lower end (<200), with three in between. The result is a mid-level score of 671.9. The overall shape of the histograms therefore provides important information on the "mechanics" of the score. In some cases, a histogram will show two distinct peaks, or groups of scores, at different ends of the measurement spectrum. This bi-modal distribution is apparent with both the "Pandemic disease" and "2010 Winter Olympics" scores. Later, in the analysis section, we will

Figure 2: Distribution of Scores, Environmental Issues, Round Three





assess the extent to which panellist's national origin was reflected in scoring patterns. Did the Canadians score differently than the Americans, thereby resulting in bi-modal distributions for some issues?

The confidence of response scores are shown in Table three, for rounds two and three.
By the third round all responses were a minimum of 5 or better and the mean average confidence values ranged from a low of 7.8 to a high of 8.8, while median scores were slightly higher in the range of 8.0 to 9.0. In addition, with the exception of two issues, economic growth and spillover, confidence had increased between the earlier and later round. These results appear to confirm a great deal of satisfaction by the panellists with their inputs and careful reconsideration of their responses in later rounds.

The following observations summarize the environmental issue portion of the Delphi study:

1) The shared physical resources of water and air are highest in the minds of local actors, with means in the very high 800's.

2) Population growth, a prime mechanism for stress, and the physical resource of open space, a resource impacted by such stresses as more people congregate in a confined area, represent the second cluster of issues with means in the very high 700's.

3) Economic growth, a key precursor and resultant of population growth as well as impacting the physical environment, follows the above in the high 600's. Much of the discussion surrounding this issue by panellists focused not on growth itself but on type of growth and its footprint.

4) The impact of cross border spill over in general and pandemic disease in particular, clustered together around the value of 600. This seems to show a lower level of concern that events on either side of the border will inordinately spread across. However, it does indicate that such issues are important and cannot be ignored.

5) Border security, perhaps a surprising issue to raise in the context of the environment, demonstrates that the border itself remains an important factor in searching for solutions. However, the relatively low mean of roughly 550, indicates that this is hardly the most critical area the local actors feel they face, but it cannot be completely ignored.

6) Finally the very low value assigned to the 2010 Winter Olympics, at less then 350, indicates that this one time event although not inconsequential, is dwarfed by far more pressing and longer term issues in the region.

10. Solutions

The final round of the Delphi turned to topics related to potential solutions to the top five issues of cross-border environmental management that were identified in previous rounds: air shed, water, population growth, economic growth and open space. Part one of round four asked panellists to respond to three questions about each of the top issues:

1. How local or international is this issue?
2. Expected level of success in addressing this issue over the next decade?
3. Potential degree of impact if this issue is not addressed over the next decade?

The answer range for each question is presented in table six and the descriptive statistics are shown in table seven. The fifteen individual histograms associated with this question are found in Figure three.

The two issues that topped the earlier list, air shed and water, are identified by panellists as most in need of an international solution, as reflected in the average scores to question one (scores of 7.53 and 6.41 respectively). By contrast, the issues of population growth and open space are seen to be much more local (scores of 4.47 and 4.12 respectively). Panellists here recognize that the geography of air and water "resources" vis-à-vis the international border, are qualitatively different than the others on the list. This appears to reflect both the nature of the phenomenon, and how it is governed. As one panellist phrased it:

"*[The air shed] is a 'local' problem that coincidentally straddles an 'international' border. It is local, but can only be addressed at an International level."*

When asked to assess the "potential degree of impact if this issue was not addressed over the next decade", air shed received the highest average score, 8.06. Not unexpectedly, the ordering of scores for this question largely matched the ranking of issues that was produced in rounds two and three.

It is with regard to "expected level of success in addressing this issue over the next decade", that panellists show the greatest diversity in opinion. This is evident in the consistently higher standard deviations (see table seven), and also in the shape of the histograms, with responses spread over a wider range, together with multiple modes. On average, panellists expect to see at least "some" success in addressing all of the top five environmental issues over the next decade. Given the importance that it has attained throughout this study, it is significant that air shed received the highest score for this question (6.03). This somewhat optimistic interpretation of the results must be tempered with the fact that the "expected success" scores are nevertheless still only moderate, and are the product of divergent opinion. For example, the air shed histogram (Figure three) shows a minority group of four pessimists clustered around the scale value of five, with the remainder spread throughout the upper half of the scale. In fact, with the exception of

Table 6: Evaluation of Top Five Issues Measurement Scales

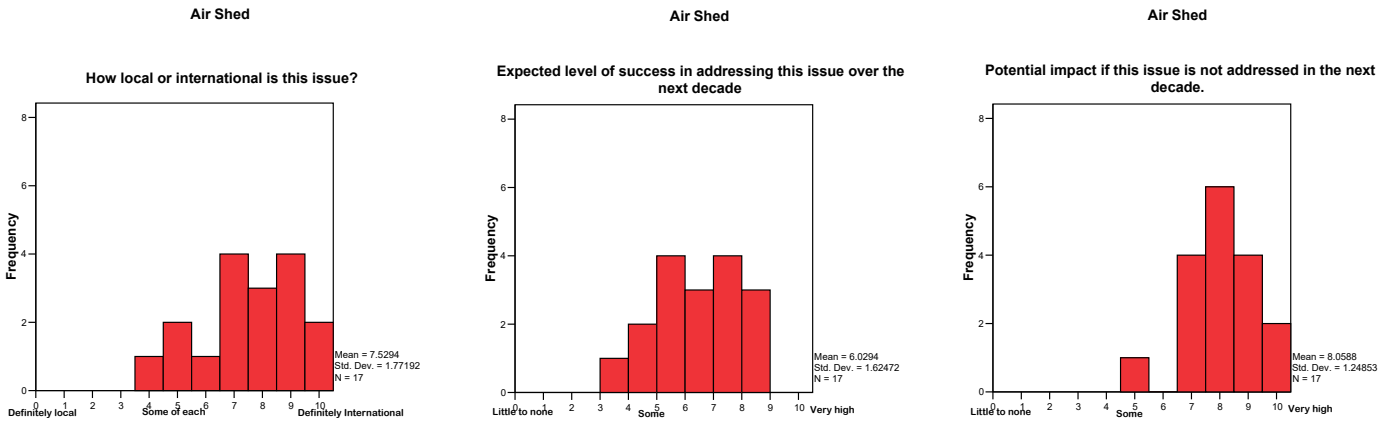
Variable	*Question*	*Answer Range*
R4 Local versus International	1. How local or international is this issue (local solution vs. international solution).	1= Definitely local, 5= Some of each, 10= Definitely International
R4 Expected level of success	2. Expected level of success in addressing this issue over the next decade.	1= Little to none, 5= Some, 10= Very high.
R4 Impact in ten years.	3. Potential degree of impact if this issue is not addressed over the next decade.	1= Little to none, 5= Some, 10= Very high.

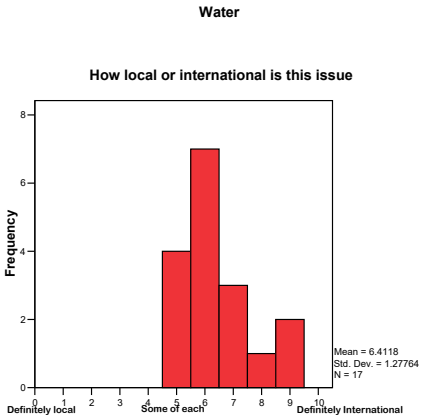
Table 7: Descriptive Statistics for Evaluation of Top Five Issues

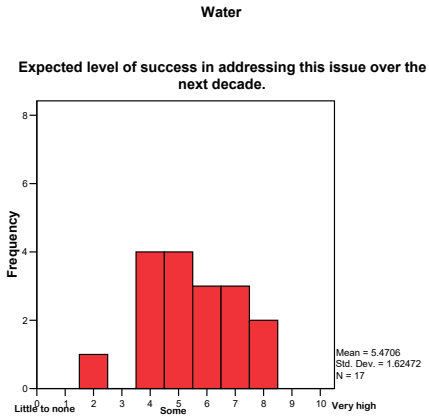
VARIABLES	*Mean*	*Median*	*Minimum*	*Maximum*	*Std. Dev.*	*Skewness*	*cases*
1. Local vs International							
Air Shed	7.53	8	4	10	1.77	-0.48	17
Water	6.41	6	5	9	1.28	0.94	17
Population Gr.	4.47	4	2	7	1.18	0.21	17
Economic Gr.	5.41	5	4	7	0.80	0.75	17
Open Space	4.12	4	2	7	1.54	0.60	17
2. Expected Success							
Air Shed	6.03	6	3	9	1.60	-0.60	17
Water	5.47	5	2	8	1.62	-0.19	17
Population Gr.	4.29	5	1	8	2.02	-0.05	17
Economic Gr.	5.18	5	3	8	1.59	0.20	17
Open Space	5.71	6	3	8	1.65	-0.32	17
3. Potential Impact							

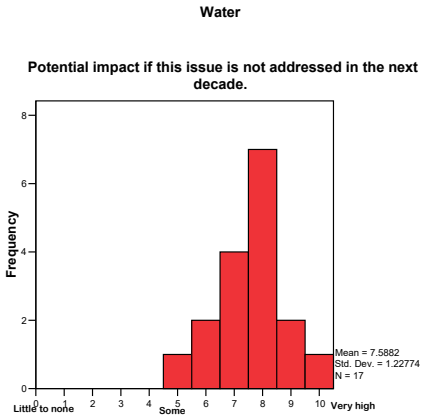
Air Shed	8.06	8	5	10	1.25	-0.56	17
Water	7.59	8	5	10	1.23	-0.23	17
Population Gr.	6.76	6	5	10	1.64	0.52	17
Economic Gr.	6.41	7	5	9	1.37	0.29	17
Open Space	6.35	7	3	8	1.62	-0.55	17

Figure 3: Distribution of Scores, Evaluation of top five issues, Round four, Air Shed



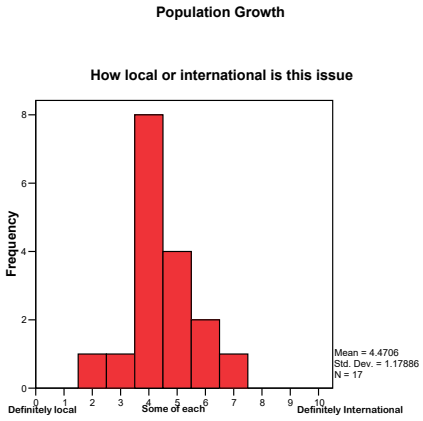


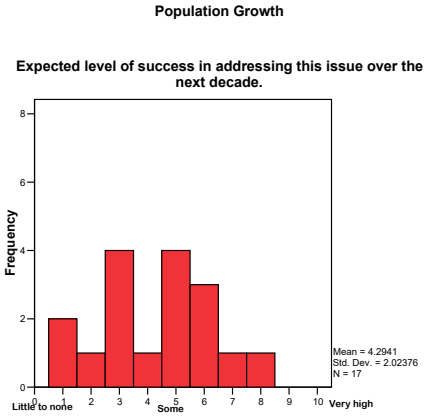




Water

Population Growth





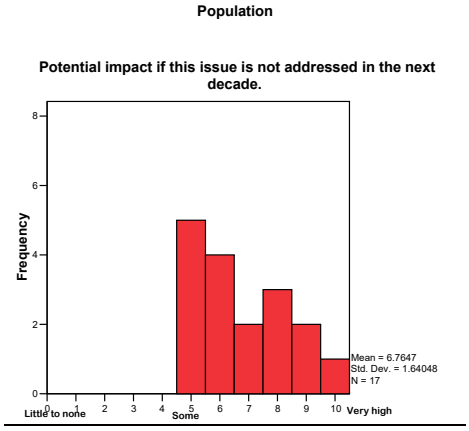
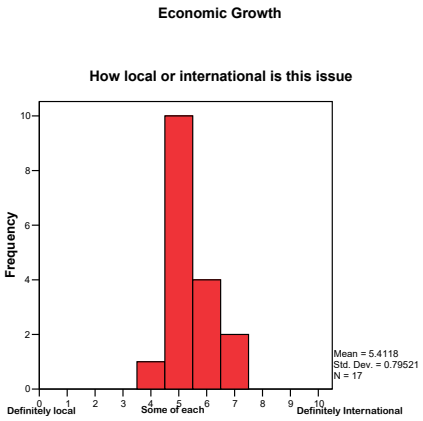
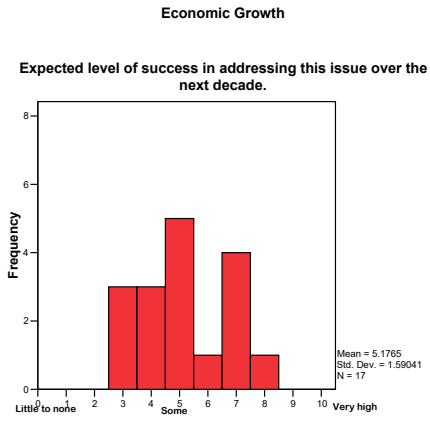
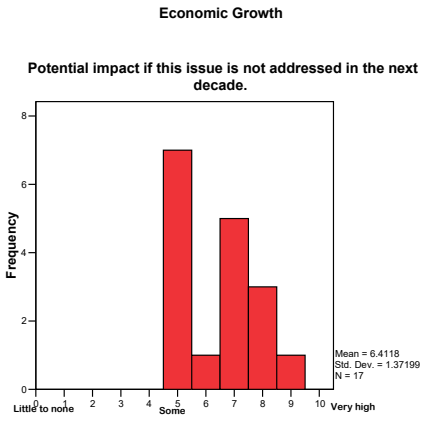


Figure 3: Distribution of Scores, Evaluation of top five issues, Round four, cont'd

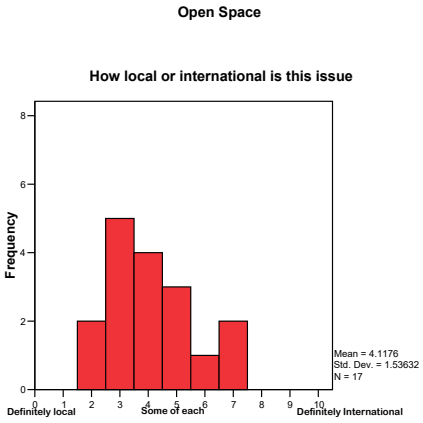
Economic Growth

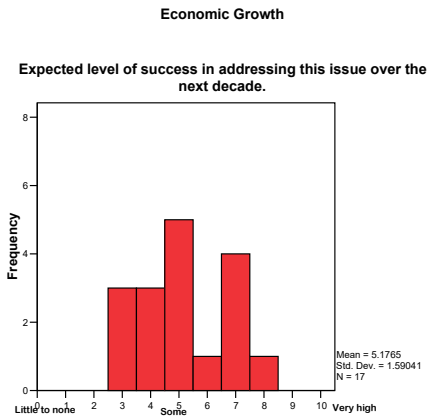


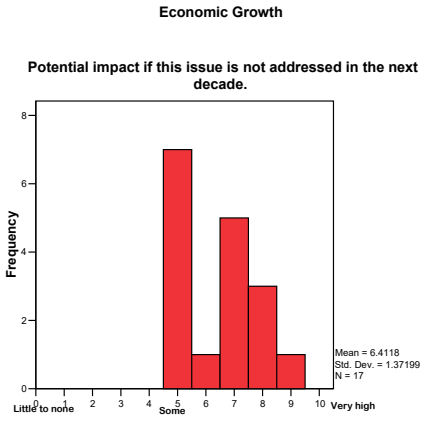




Open Space







water, the existence of distinct optimist and pessimist groups is visible in all of the histograms for this question.

Three additional questions in round four explicitly addressed the topic of "how to address the issues". Panellists were asked:

1. To what degree should existing versus new organizations be used to address the issue?
2. To what degree should public versus private organizations be used to address the problem? Or do we need a public-private partnership?

Table 8: How to Address the Issues, Measurement Scales

3. To what degree should the organization be informal and voluntary versus formal?

An explanation of the scales used for these questions is presented in table eight and the associated descriptive statistics are shown in table nine. The relevant histograms are contained in Figure four.

Generally, panellists favour the use of existing, formal organizations that combine public and private representatives. As one panellist stated:

> "*It should be 'agreement-based' where objectives and obligations are well-defined and focussed. Existing organizations are preferred, as new organizations tend to be detached from the existing bureaucracy. Most likely, the latter will be the one to implement adopted (international) agreements and a 'two solitudes' situation will only lead to inertia, incommunication (sic), or worse, power struggle. A 'culture of new solutions' or 'new era' must start with the existing bureaucracy, which also happens to be where the resources and expertise are readily available."*

The diversity of opinion is most evident with the question of using public vs. private organizations. A second strong mode exists in the bottom half (ie, the "public" side) of the scale. Opinion on the "voluntary vs. formal" question is even more divergent with two clear groups, although weighted to the "formal" side.

In summary, the following trends in opinion on the top five environmental issues were evident in the final round of the Delphi:

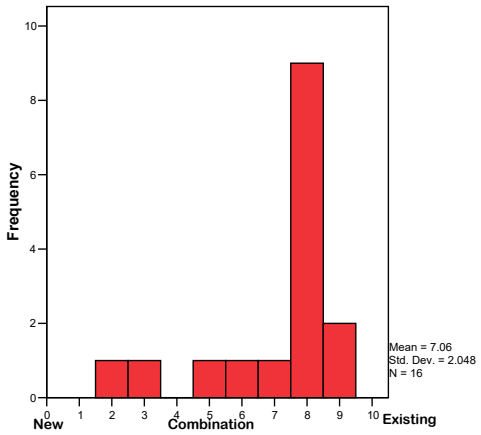
Variable	*Question*	*Answer Range*
R4 Existing vs New	1. To what degree should existing versus new organizations be used to address the issue?	1= New, 5= combination, 10= Existing
R4 Public vs Private	2. To what degree should public versus private organizations be used to address the problem? Or do we need a public-private partnership?	1= Public, 5= Partnership, 10= Private.
R4 Voluntary vs Informal	3. To what degree should the organization be informal and voluntary versus formal (such as a government agency, business associations, national environmental group…)?	1= Voluntary, 5= Combination of actors, 10= Formal.

Table 9: How to Address the Issues, Descriptive Statistics

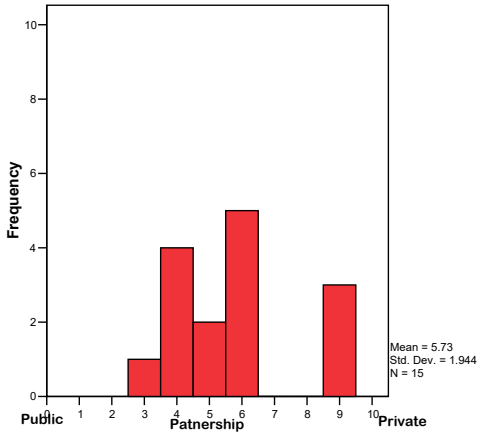
	ROUND 4						
Issues	*Mean*	*Median*	*Minimum*	*Maximum*	*Std. Dev.*	*Skewness*	*Responses*
R4 Existing vs New	7.06	8.0	2	9	2.048	-1.638	16
R4 Existing vs New Confidence	7.60	8.0	4	10	1.502	-1.097	15
R4 Public vs Private	5.73	6.0	3	9	1.944	.702	15
R4 Public vs Private Confidence	7.60	8.0	4	10	1.404	-.950	15
R4 Voluntary vs Formal	7.56	8.0	5	10	1.548	-0..257	16
R4 Voluntary vs Formal Confidence	7.86	8.0	5	10	1.231	-.553	14

Figure 4: Distribution of Scores, How to address the issues, Round four.

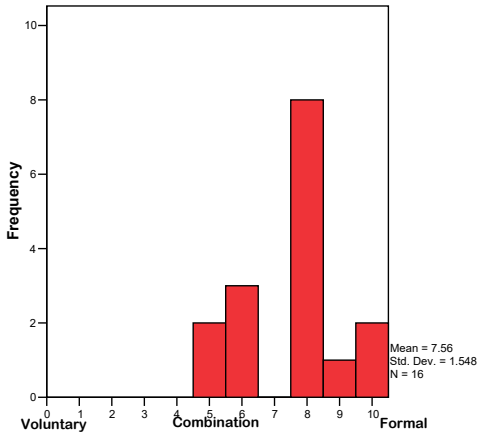
To what degree should existing versus new organizations be used to address the issue?



To what degree should public versus private organizations be used to address the issue?



To what degree should the organziation be informal and voluntary versus formal?



1. The most serious cross border environmental issues in the Fraser Lowland vary in how international they are. This has major implications on the extent to which international collaboration is necessary and/or possible in management of the issue. "Air shed" and "water" were judged to be most international whereas "population growth" and "open space" were seen to be more local.

2. Generally, panellists expect some progress to be made in management of the top five issues.

3. Despite the potentially greater challenges inherent in cross border issues, managing the air shed was judged to have the "highest potential of success" over the next decade, compared to other top five issues.

4. For effective cross border management, panellists tend to favour the use of existing, formal organizations that combine public and private sector organizations.

11. Final Questions

The round four questionnaire concluded with a final set of questions that were intended to shed light on several themes that appeared in the comments of previous rounds. These themes relate to the "attractiveness" of the region, the role this plays in creating the environmental issues which are the subject of this study, and the source and timeliness of "solutions". Most of the questions in this section were phrased as declarations that summarized opinions expressed implicitly or explicitly by a number of panellists, throughout the Delphi. The objective in this section is to determine how widely held they are.

Panellists were asked to respond to the following statements:

1. Environmentally, the Fraser/Nooksack Lowland is one of the most attractive regions in the world.
2. This region is one of the most liveable regions in the world.
3. Our region has become a major magnet for in-migration nationally/internationally.
4. Globalization will accelerate this attraction.
5. The primary engine fuelling stress on the environment of the Fraser and Nooksack Lowland is more people in a confined area.
6. Surprisingly, each time we do successfully address environmental stress issues, we become even more attractive to additional in-migration.
7. Given all of the above, the decision makers ten years from now in our region will be a considerably different group than those how made the decisions in the past.
8. Unless we (both Americans and Canadians) work together on issues placing stress on the environment, they will not be solved.

They were also asked,

9. In your opinion, how many years are we away from successfully addressing the major cross border environmental issues identified in this study?

In the Likert scale used for the statements, "completely disagree" was made equivalent to a value of "1", with "completely agree" equivalent to a value of "10". (see Figure five).

Panellists are in general agreement on the environmental attractiveness and livability of the Fraser Lowland, within a global context. The results of the related questions, shown in Figure five produced average scores of 7.5/10 and 8.1/10. In the words of one panellist,

> *The open space is the defining feature. Even if it is farmland (changed by human activities), its lush green colours and diverse patterns and textures have created a picturesque landscape, which is further enhanced by the snow-capped Coast Mtns, with the Pacific Ocean not far below the horizon. Our cities in the Lower Mainland are not necessarily better than other world cities but they are perceived as "most attractive" because of their "green" settings.*

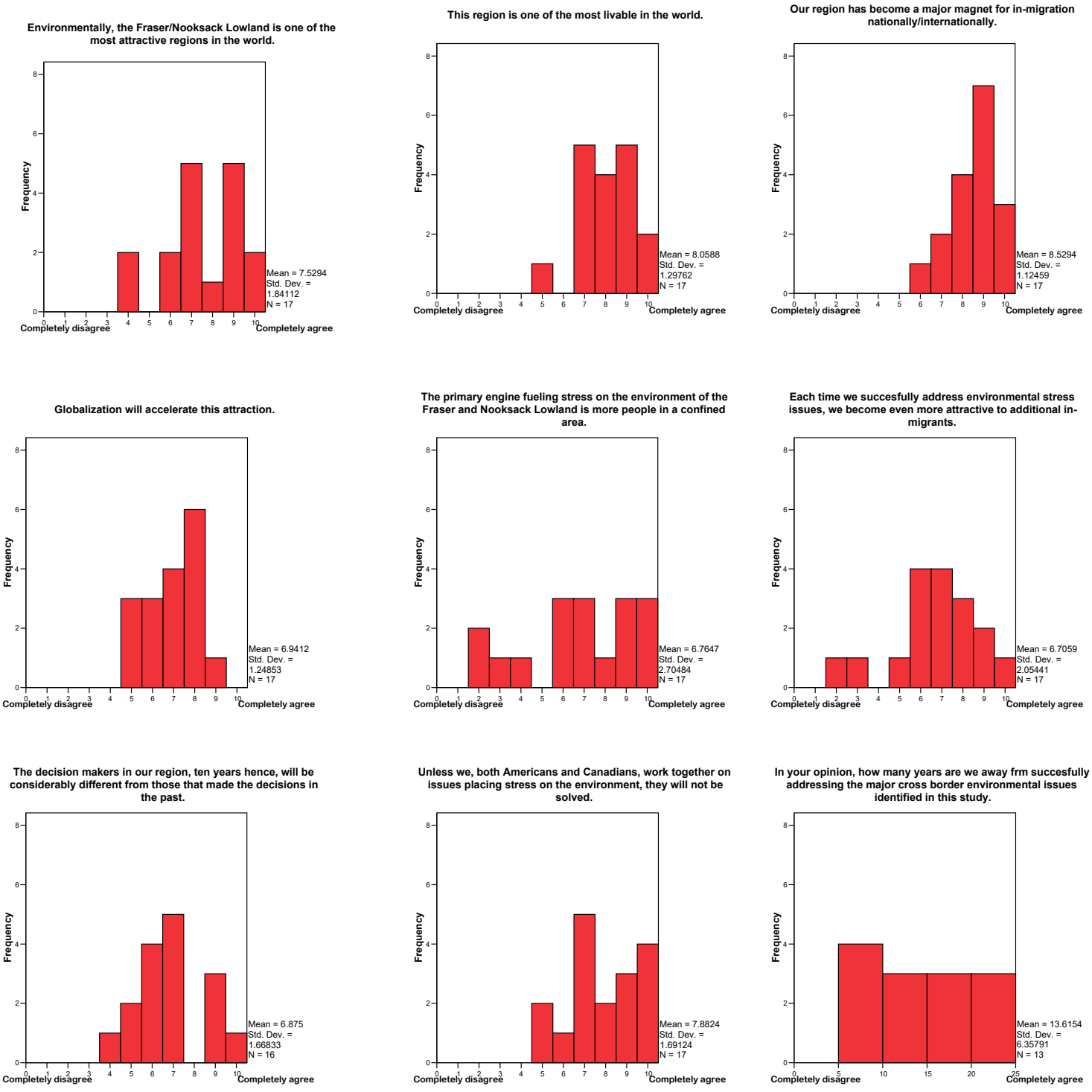
The same writer added the following caveat, repeated by others in this section:

> *"Look" may not be everything, but it surely gives the Fraser Valley an enviable reputation – if only we would slow down to smell the roses.*

In a similar vein, there is a tone of cautiousness that accompanies the high marks that many panellists have awarded the region on liveability:

> *The Fraser Valley is a liveable region, especially when we compare it with many cities in Global South that are overwhelmed by poverty, or even with the "world cities" in Global North where crime, social unrests and insecurity (terrorism) have weighted heavily on the minds of their citizens. However, the Fraser Valley is not a Shangri-La. Our problems are our inefficiencies in building our settlements and economies, and our misplaced priority on "mobility freedom". Basically, we have to travel long distances daily, within or between our cities, for work, business transaction, recreation and visiting friends and relatives. At the same time, we demand our right to be able to travel anywhere, anytime, and at a low cost. The sprawling land uses and highway systems have resulted in communities that are car-dependent, and much time is expended on travelling – long distances. Within towns and cities, 5 to 10 miles or longer trips are quite standard. Out of town commuting, three to four hour round trips are just part of the daily life of a Fraser Valley commuter. Liveability is basically defined by our leisure/social/family time. The more time we spend on the roads, the less liveable is our community. The Fraser Valley has much to improve in making itself independent and its residents to do most of their "living" in their own communities and travel by foot, cycling and transit. Unfortunately, there are no strong indications that we are moving in that direction.*

Figure 5: Final Thoughts, Round four.



As well, there is widespread agreement with the idea that "our region has become a major magnet for in-migration, nationally and internationally" (average score: 8.5, see Figure

9.c) and that "unless we, Americans and Canadians, work together on issues placing stress on the environment, they will not be solved." (average score: 7.9, see Figure 9.h)

The remaining opinion questions generally exhibited a greater diversity of opinion, and lower average scores. For example, although the majority of panellists were positively disposed to the statement that, "the primary engine fuelling stress on the environment of the Fraser and Nooksack Lowland is more people in a confined area" (ie, selected a score greater than five), nevertheless there was a wide range in scores, reflected in a high standard deviation of 2.7. (see Figure 9.e) The theme illustrated in the following quotes was widespread, regardless of score:

> *Population alone is not the problem, it's how we live, how we move, which industries we encourage.*
>
> *It is not solely numbers but rather how we conduct our daily living (ecological footprint) ie, monster home on a postage size, mountainside lot with a SUV for access.*
>
> *It's not people alone – it's anthropogenic activity (their behaviour, their economic*
> *activity) eg, Abbotsford has manure from livestock equivalent to 14.7 million persons.*
>
> *It is not the growing population number that causes the most stress on the environment, but it's settlement footprint (compact or sprawled) and lifestyle (resource consumptive or resource conserving) that will have the most impact.*

Finally, when asked to estimate "how many years are we from successfully addressing the major cross border environmental issues identified in this study", panellists selected an average of 13.6 years, although individual estimates varied widely from 5-25 years.

12. Analysis:

Besides the desire to discover common views amongst key decision makers in the Fraser Lowland, this study was also designed to determine if these views differed by nationality. Thus far, the statistics presented treat the panellists as an undifferentiated, single group. In this section, we examine this assumption by conducting several statistical tests of comparison. These tests allow us to determine, for example, whether the Canadian panellists rate the nine environmental issues differently from the American. A second focus of comparison testing in this section is on the change, if any, in rating that occurred between questionnaire rounds. The Delphi methodology promotes reflection on the ideas of fellow panellists, that are summarized in succeeding rounds. Thus panellists are frequently asked for comments and revised scores. Is there any evidence that individual scores varied significantly between rounds?

In order to obtain reliable test results it is essential that an appropriate test for the data be applied. Given, 1) the small sample size and 2), that the data is ordinal, we were led to non-parametic tests of comparison. The Mann-Whitney U test was used for national comparisons and the Wilcoxon signed ranks test for Delphi round comparisons. Such "tests of significance" are organized as a hypothesis test. For each comparison, for example with the scores that American and Canadian panellists assigned to the nine environmental issues, it is assumed that there is no difference between the groups. In order for this null hypothesis to be rejected, sufficient "evidence" must be presented. In our case, evidence consists of the collected data ie, the scores produced by the panellists in rounds two and three. Each type of test uses a different technique to measure the degree of difference between groups. Whatever the method, as this difference increases, so too does the probability that the null hypothesis does not hold, and that the difference is real. This study uses a threshold probability ("alpha") level of five percent, which is common practice in the social scientific community. Thus, if the calculated probability of a test (known as the "significance value") is 0.05 or less, we conclude that there is real difference between the two groups.

Two additional technical considerations must be outlined. In order to further "err on the side of caution", analysis will focus on the values of "exact significance". Such methods provide accurate results when sample sizes are small and non-normal. Finally, the tests are "2-tailed" in that we do not specify a "direction" of difference in the alternative hypothesis. That is, we are testing for general difference, rather than for which group has, on average, higher scores. Nevertheless, if significant difference is discovered, we can return to the data in order to determine the "direction of difference" between the two groups.

Does Nationality make a difference?

The general answer to this question is, no. This conclusion is based on data presented in Tables 8-11, which provide statistics derived from the comparison of scoring and confidence values for rounds two and three of the Delphi. The only exception to this conclusion is with the round two Air shed score (see table 8) and related Air shed confidence score (see Table 9). The tests for these two comparisons produce significance values ("Exact Sig (2-tailed)) of less than 0.05 and therefore the probability of being wrong when rejecting the null hypothesis is at or below the five percent threshold. In both cases, the Canadian average was significantly higher than the American (13.7 vs. 6.82 for Air shed score and 12.64 vs. 7.50 for Air shed confidence score).

A national comparison was also conducted with the "final thoughts" questions from round four, using the same tests and procedures as described above. The statistical output is presented in Table 12. Again, with most of the questions (7 of 9), there was no significant difference in opinion between the two national groups. One exception occurs with responses to the statement that, "[t]he primary engine fuelling stress on the

Table 8 :Comparison of American and Canadian Environmental Issue Scores, Round Two.(b)

	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)	Exact Sig. [2*(1-tailed Sig.)]	Exact Sig. (2-tailed)	Exact Sig. (1-tailed)	Point Probability
R2Airshed_Score	9.000	75.000	-2.729	.006	.006(a)	**.005**	.003	.001
R2Water_Score	37.000	103.000	-.137	.891	.930(a)	.930	.465	.036
R2Pop_Growth_Score	21.500	49.500	-1.561	.119	.126(a)	.123	.063	.004
R2Econ_Growth_Score	30.500	96.500	-.733	.464	.479(a)	.489	.246	.018
R2Open_Space_Score	28.500	56.500	-.909	.363	.375(a)	.387	.193	.011
R2Border_Security_Score	30.000	58.000	-.774	.439	.479(a)	.462	.231	.013
R2Spillover_Score	23.000	89.000	-1.407	.159	.179(a)	.171	.085	.007
R2Disease_Score	19.500	85.500	-1.730	.084	.085(a)	.089	.044	.005
R22010_Score	20.500	48.500	-1.640	.101	.104(a)	.107	.054	.005

a Not corrected for ties.
b Grouping Variable: Country_1US_2Canada

Table 9:Comparison of American and Canadian Confidence in Environmental Issue Scores, Round Two.(b)

	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)	Exact Sig. [2*(1-tailed Sig.)]	Exact Sig. (2-tailed)	Exact Sig. (1-tailed)	Point Probability
R2Airshed_Confidence	16.500	82.500	-2.094	.036	.044(a)	**.028**	.016	.004
R2Water_Confidence	38.500	66.500	.000	1.000	1.000(a)	1.000	.506	.010
R2Pop_Growth_Confidence	31.500	59.500	-.658	.510	.536(a)	.549	.276	.026
R2Econ_Growth_Confidence	30.500	96.500	-.742	.458	.479(a)	.493	.253	.035
R2Open_Space_Confidence	37.000	65.000	-.139	.889	.930(a)	.948	.477	.060
R2Border_Security_Confidence	19.500	47.500	-1.792	.073	.085(a)	.084	.047	.021
R2Spillover_Confidence	36.000	102.000	-.230	.818	.860(a)	.839	.418	.013
R2Disease_Confidence	24.500	90.500	-1.298	.194	.211(a)	.209	.106	.010
R22010_Confidence	24.500	52.500	-1.287	.198	.211(a)	.210	.106	.007

a Not corrected for ties.
b Grouping Variable: Country_1US_2Canada

Table 10:Comparison of American and Canadian Environmental Issue Scores, Round Three.(b)

	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)	Exact Sig. [2*(1-tailed Sig.)]	Exact Sig. (2-tailed)	Exact Sig. (1-tailed)	Point Probability
R3Airshed_Score	20.000	86.000	-1.705	.088	.104(a)	.091	.045	.002
R3Water_Score	30.500	96.500	-.739	.460	.479(a)	.483	.242	.015
R3Pop_Growth_Score	27.500	55.500	-1.005	.315	.328(a)	.338	.169	.013
R3Econ_Growth_Score	34.500	100.500	-.363	.716	.724(a)	.743	.372	.022
R3Open_Space_Score	30.500	96.500	-.731	.465	.479(a)	.492	.245	.013
R3Border_Security_Score	30.000	58.000	-.771	.440	.479(a)	.465	.233	.015
R3Spillover_Score	29.000	95.000	-.864	.388	.425(a)	.413	.207	.014
R3Disease_Score	24.000	90.000	-1.319	.187	.211(a)	.198	.098	.004
R32010_Score	32.500	60.500	-.545	.585	.596(a)	.610	.305	.016

a Not corrected for ties.
b Grouping Variable: Country_1US_2Canada

Table 11:Comparison of American and Canadian Confidence in Environmental Issue Scores, Round Three(b)

	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)	Exact Sig. [2*(1-tailed Sig.)]	Exact Sig. (2-tailed)	Exact Sig. (1-tailed)	Point Probability
R3Airshed_Confidence	27.500	93.500	-1.046	.296	.328(a)	.320	.153	.006
R3Water_Confidence	33.000	99.000	-.523	.601	.659(a)	.657	.327	.027
R3Pop_Growth_Confidence	28.000	56.000	-1.021	.307	.375(a)	.330	.157	.023
R3Econ_Growth_Confidence	37.500	65.500	-.094	.925	.930(a)	.949	.482	.038
R3Open_Space_Confidence	32.000	60.000	-.603	.547	.596(a)	.574	.287	.013
R3Border_Security_Confidence	23.500	51.500	-1.414	.157	.179(a)	.170	.095	.008
R3Spillover_Confidence	36.000	64.000	-.233	.816	.860(a)	.852	.440	.057
R3Disease_Confidence	23.000	51.000	-1.435	.151	.179(a)	.157	.081	.015
R32010_Confidence	19.500	47.500	-1.762	.078	.085(a)	.078	.042	.004

a Not corrected for ties.
b Grouping Variable: Country_1US_2Canada

Table 12: Comparison of American and Canadian "Final Thoughts" Scores, Round Four, Section 3 (b)

	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)	Exact Sig. [2*(1-tailed Sig.)]	Exact Sig. (2-tailed)	Exact Sig. (1-tailed)	Point Probability
F#V#_Envr#_Most_Attractive	34.500	89.500	-.050	.960	.962(a)	.995	.501	.021
F#V#_Envr#_Most_Livable	27.000	55.000	-.806	.420	.475(a)	.464	.220	.036
Major_magnet_InMigration	28.000	56.000	-.715	.475	.536(a)	.502	.243	.011
Globalization_accelorates_pop_attraction	33.500	88.500	-.151	.880	.887(a)	.963	.487	.083
Primary_envr_stress_engine_more_pop	15.000	43.000	-1.972	.049	.055(a)	.051	.026	.005
Addressing_envr_stress_increases_attract	18.000	46.000	-1.685	.092	.109(a)	.094	.050	.010
@10yrs_hence_different_decision_makers	24.500	52.500	-.761	.447	.470(a)	.464	.227	.016
Can__US_must_work_together_on_envr_stress	15.500	70.500	-1.946	.052	.055(a)	.056	.031	.009
How_many_years_from_addressing_stress	19.500	40.500	-.217	.828	.836(a)	.810	.405	.009

a Not corrected for ties.
b Grouping Variable: Country

environment of the Fraser and Nooksack Lowland is more people in a confined area." The exact 2-tailed significance is 0.051, the same as the threshold value. With this question, Americans have a significantly higher level of agreement than Canadians. The opposite is true of the second exception. This occurred with responses to the statement, "[u]nless we (both Americans and Canadians) work together on issues placing stress on the environment, they will not be solved." The Canadian panellists have a significantly higher level of agreement with this statement than Americans.

Did the Delphi procedure cause panellists to revise their thinking?

In order to answer this question, a comparison was made of scores provided to questions in rounds two and three. Panellists were asked to assign a "relative score", from 0-1000 to the nine environmental issues that were identified from the brain storming session in round one. They were also asked to provide a "confidence" value, between 0-10 for each of their issue scores. Comments from the round two questionnaire were provided with round three. The results of a Wilcoxon signed ranks test run on the score data is presented in Table 13, and the confidence data is shown in Table 14. Otherwise, the same parameters used in the Mann-Whitney U test, above, were utilized here.

Generally, there was very little significant difference between rounds. The only exception is with the confidence scores associated with the scoring of the bottom two environmental issues, "pandemic desease" and "2010 Olympics". There was a significant increase in the average confidence for these two between rounds two and three.

The following summary points are derived from the above discussion and tables:

1. With few exceptions, nationality appears to have no bearing on how panellists assessed key environmental issues in the Fraser Lowland. Americans and Canadian decision-makers essentially share a single mind on the issues raised in the study.

2. One exception concerns the score awarded to the air shed "issue", and related confidence score, in round two. Clearly, this was a greater concern for the Canadians, and likely reflects the wider awareness and concern over the SE2 proposal in British Columbia. *It must be noted, however, that the difference in opinion was no longer significant by round three*.

3. A second exception, possibly related to the first, was noted with opinion expressed on the need for joint Canada-United States action to tackle environmental issues. The Canadians were significantly more disposed to this than the Americans, again likely a carry-over from the protracted SE2 debate.

4. There is greater American support for the notion that population pressure is at the root of environmental stress. As noted above, from their comments, Canadians believe the

problem lies more with the way in which the population is arranged, rather than with absolute size.

5. Although some "changes of opinion", evidenced by revised scoring, did occur, there were virtually no statistically significant changes.

13. Discussion

This study of the Fraser Lowland has sought to clarify the nature of environmental issues that characterize it according to the perceptions of those directly involved in its management ie, planners, elected officials (past and present) and activists. Although concern about the environment is long standing in the region, the SE2 "saga", which immediately preceded this study, raised consciousness at least about air quality, to a heightened level, and ultimately led to its abandonment.

Given the unexpected twists and turns of the saga, with the border alternately playing the role of a shield and sword, an uneasy calm has ensued now that the power plant proposal has been withdrawn. In the continuing absence of any policy mechanisms that explicitly handle trans-border environmental issues in the Fraser Lowland, there is a sense that a vacuum exists which should be filled by regulatory mechanisms before the next inevitable crisis occurs. In this light, the goal is to remove the border as a player in the saga. As a unified bio-region, environmental management of the Fraser Lowland must be unified.

Cast in this light, the present study is an exploration of the vacuum we now find ourselves in. The Delphi technique has been utilized as a tool to obtain the data which forms the foundation of the report. Through four rounds, panellists answered questions about the 1), important environmental issues that exist in the Fraser Lowland, together with a relative scoring and an assessment of their future 2), geographic context ie, the role played by geography and the border in environmental management 3), kind of organizations needed for effective management and 4), wider national and global context of the regions' environmental future. Through statistical analysis, we also compared opinions of the two national groups that comprised the expert panel. The purpose of this discussion is to highlight important trends in the data, rather than repeat detailed findings that are found in the body of the report, and outlined in the executive summary.

Throughout this report, air and water resources emerge as the dominant environmental themes. This should come as no surprise in a study of cross-border environmental issues. Simply, they are the most obviously trans-boundary within the unified bio-region. What is notable, however, is the unity shown in the opinions of the bi-national panel with regard to the issues and, indeed, the entire range of topics covered in the Delphi. The evidence is that a Fraser Lowland regional consciousness exists to the extent that these expert panellists share virtually identical opinions on the critical environmental issues

that confront the region. As we face a future of "more", and in the wake of SE2, the implication of such a finding is potentially immense.

The panellists have provided a sober assessment of both the usefulness and ability to overcome the border in order to manage the environment. The good news is the relatively high degree of confidence expressed in an international solution to management of the air shed. Extrapolating from responses to a question in the final round, we might expect progress in the next decade and a half. An apparent contradiction to these findings is the national difference of opinion on the question of whether a bi-national effort is required to relieve stress on the environment. Given the inherent limitations of the Delphi technique, we need to be cautious with interpretations.

The nine environmental issues that have been proposed by panellists should be viewed as a complex network rather than as independent topics. There is a high degree of overlap; for example, "economic growth" that focuses on expansion of the Abbotsford BC airport results in "spill over" effects in Lynden WA from noise and stress on the "air shed" from exhaust. The effect of the international boundary in this example, and countless others, is to create an "other" and remove them from consideration within our perceptual realm. This effect of the border has grown more powerful as it continues to express national security priorities. The single-mindedness of the bi-national panel provides hope for the Fraser Lowlands' environmental future.

References

1. All Canadian population statistics are derived from Statistics Canada, 2006 Census, Community Profiles.

2. The individual figures, from which this average was derived, are:

Abbotsford CMA	7.9 percent
Chilliwack CA	9.3 percent
Mission CA	10. 3 percent

3. All United States population statistics are 2006 estimates, derived from U.S. Census Bureau, Population Finder.

4. Calculated on the basis of United States Census Bureau reported population values for Whatcom County of 166,814 (2000) and 185,953 (2006).

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