



Is the Delphi Process More Effective than Survey Methods in `Gap Analysis`?: Lessons from Research on Floods in the Red River Basin, Manitoba

C. Emdad Haque, M. Salim Uddin and Parnali Dhar Chowdhury

Natural Resources Institute
University of Manitoba, Winnipeg, Canada

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“Gap Analysis” and Its Implications for Disaster Management

- Expert knowledge characteristics – ‘objective’, accurate, consistent with statistical data (Rowe and Wright, 2001)
- Public knowledge – subjective, unspecified, general, random (Lazo et al, 2000).
- Gaps in worldview and perception of a specific problematique or a phenomenon between experts/specialists and the community stakeholders/lay persons have been subject of research in numerous fields including health, business management, public administration (Siegrist et . al, 2007; Beckie et al. 2001; Finlayson et. al, 2002)
- In emergency and disaster studies, such interests have been limited although the gaps in perception and knowledge among the decision-makers and the public have profound implications.

Perception of “each other”: experts vs. the public

- Experts view the public as – a) *agency* with subjective judgement and react emotionally in complex situation; b) incapable of making appropriate prediction and effective decision (Margolis, 1996; Irwin and Wynne, 1999)
- The public tend to criticize experts as – a) provider of inaccessible, technical language; b) lack local knowledge and often fail to analyze local situation and needs; c) pursue top-down, one-way process of knowledge and information dissemination (Gravin, 2001; Hinds, 1999)



Issues Concerning Floods in Manitoba

- Red and Assiniboine River basins of Manitoba experienced severe floods in 1950, 1997, 2009, 2011
- Several government departments including Manitoba Emergency Measures Organization, Manitoba Conservation, Manitoba Water Stewardship have been involved in preparedness, response, recovery and rehabilitation

Public debate emerged in areas of evacuation policies, flood forecasting methods, compensation strategies, etc.



Research experiments in Manitoba: a comparative analysis

- Three research endeavours carried out:

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- A) STUDY I (2005-6): Brian Kayes – emergency manager and citizens' (Brandon) expectation of flood response
 - B) STUDY II (2009): Graham Smith – specialists vs. rural municipality (Stuartburn) residents' knowledge and perception of climate change-induced environmental extremes and flood risk
 - STUDY III (2004): Michael Olczyk – institutional representatives vs. Red River valley floodplain residents' perception of flood risk and response

- Arguments of the present study:

- a) The outcome of the `gap analysis` depends significantly upon the selection of research method, and*
- b) An `open ended` inquiry is required to delineate the underlying of gap analysis*

`Gap Analysis` Outcomes of the Selected Studies

- Study I: emergency managers` and citizens` expectations of flood response

Two instruments were applied:

i) face-to-face interviews (n = 185) of Brandon`s residents with structured questionnaires; and

ii) self-administered structured questionnaire survey of emergency managers across Manitoba (n = 61)

Disaster Activity Expectation Model: attitudes towards evacuation

	Action expected	Result	Gap Characteristics
Emergency Manager (n = 61)	Estimates higher level of evacuation compliance and estimates agreement on evacuation accommodation	Provides estimates of lower levels of evacuation compliance & lesser understanding of citizen accommodation behaviour	Action expected = gap. <ul style="list-style-type: none"> •Citizen and emergency managers do not have similar perception •Citizen report more likely to evacuate (97.3% than emergency managers report (80.7%)) •Citizens more likely to stay with relatives (78.7%) than emergency managers report (40.8%) •Citizens report less likely to use municipal accommodations: 10.8% vs. 22% for emergency managers
Citizen (n = 185)	Reports lower level of evacuation compliance and reports agreement on evacuation accommodation	Reports higher level of evacuation compliance & strong reliance on social ties for accommodations	

Utilization of emergency preparedness information

Citizens	Rank	% yes	Emergency managers	Rank	% yes
Did you use info. from items indicated to prepare for disasters in the last year			Which of the following methods of providing info. is most effective		
a. Radio	3	7.1	a. Radio	1	36.0
b. Television	2	8.2	b. Television	4	24.0
c. Newspaper-magazine	4.5	6.5	c. Newspaper-magazine	2	30.0
d. Brochure-booklet	1	12.5	d. Brochure-booklet	3	26.0
e. Public presentation	9.5	0	e. Public presentation	5	12.0
f. Web site-internet	7	2.2	f. Website - internet	7	8.0
g. Work place	4.5	6.5	g. Work place	11	0
h. Welcome wagon	8	0.5	h. Welcome wagon	10	2.0
i. Children bring info. From school	6	2.7	i. Children bringing info. from school	6	10.0
j. others	9.5	0	j. Others (specify)	9	4.0
None used		15.7	None provided		18.0

- Citizen and emergency managers make use of different communication means to receive and provide information
- 36% of emergency managers reported radio as most effective means vs. 7% of citizen respondents used info. from radio
- 85% of emergency managers provided info. to citizens whereas citizens made use of 46.2% of the information received

Gaps identified in areas:

- Role of first responder`s in emergency response
- Governmental allocation of funds
- The use of evacuation accommodation
- Fatalistic attitude towards risk
- The provision & use of emergency preparedness information

`Gap Analysis` Outcomes of Study II: Climate Change-Induced Environmental Extremes including Floods

A 4 tier method applied:

- a) mental model formulation (n = 12)
- b) face-to-face interviews (n = 20)
- c) confirmatory questionnaire survey (n = 400)
- d) expert feedback workshop (n = 10)



Extent of agreement of Stuartburn residents with experts

Relationships	% agreed with expert knowledge
An increase in GHG concentration leads to a rise in mean atmospheric temperature	59.5
Changes in the hydrological condition including extreme rainfall lead to flooding conditions	90.2
Human activities in the floodplain leads to increased risk to flooding	73.2
Extreme flood exposure can lead to significant loss to property and individuals may face economic hardships	73.2
Loss of capital due to flooding can lead to psychological stress and cause harm to mental health	75.6

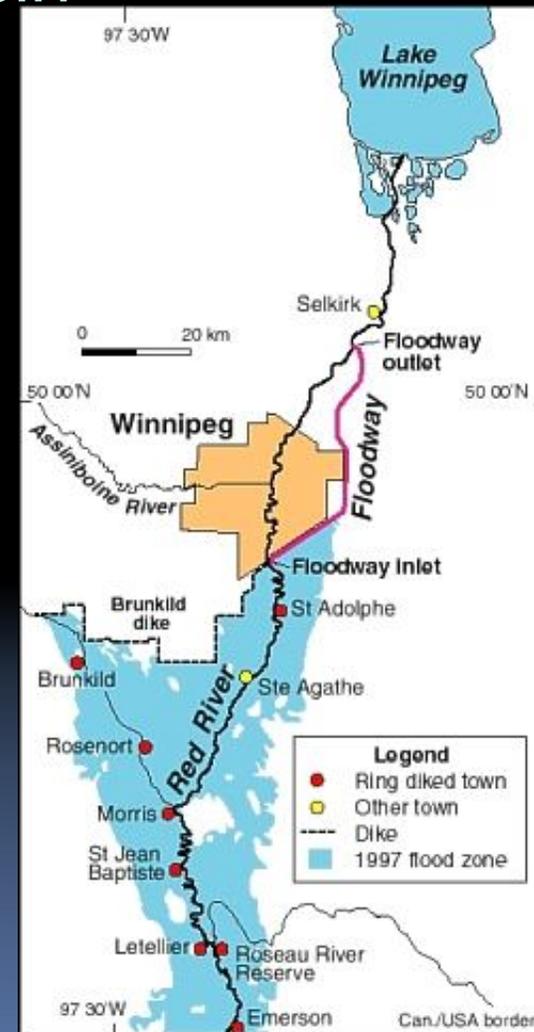
- Larger gaps between experts and community residents in hydro-meteorological areas
- Community residents knowledge is more divergent than experts, particularly concerning the relationships between GHGs and the rise of atmospheric temperature
- However, Stuartburn residents concede that floods are caused by the changes in hydrological conditions

Concluded that:

- Large risk knowledge gaps among the male, younger members
- Risk perception with no relationships with the level of education
- a feature of `risk denial` is at work

`Gap Analysis` Outcomes of Study III: Flood Risk Perception in the Red River Basin

- A 3-stage Delphi Process was applied
- Stage 1: Face-to-face interviews with *Idea Generation Strategy* (IGS) of floodplain residents and institutional representatives
- Stage 2: Critical issues were summarized and validated by an iterative process
- Stage 3: Only selected issues were pursued where the potential for additional in-depth examination existed



“The Delphi technique is a method for structuring communication in a process that allows a group of individuals to deal with a complex problem and reach consensus.

The process involves the use of a series of questionnaires designed by a monitor group and then sent by mail in several rounds to a respondent group of experts who remain anonymous.

After each round, the results are summarized and assessed by the monitor team and used to develop a questionnaire for the next round.

The assessment document and new questionnaire are then sent to all members who responded.

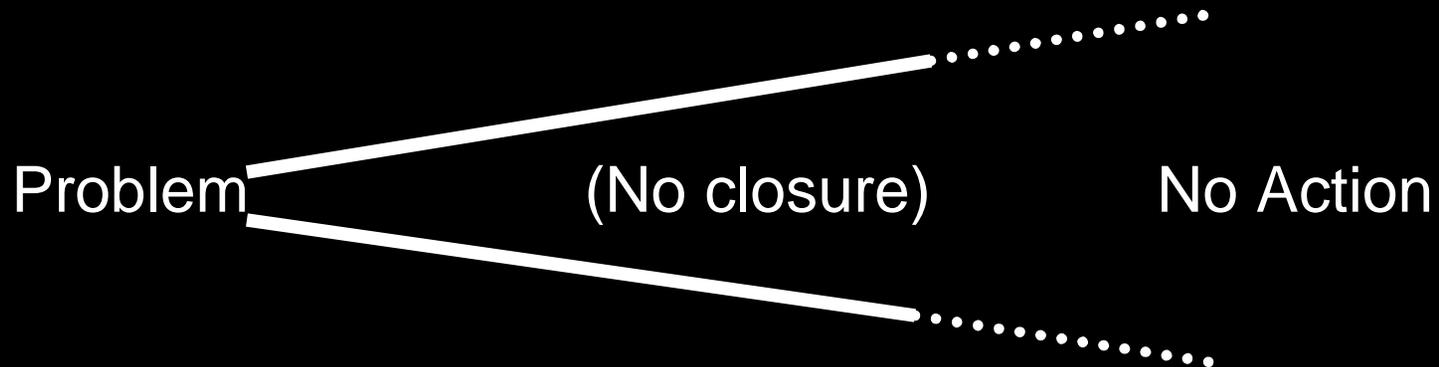
A Delphi survey is considered complete when a convergence of opinion occurs or when a point of diminishing returns is reached.”

TELECAT (1998)

Groupthink



Debating Society



Ideal Group Process



Divergent thinking
(gathering intelligence)

Convergent thinking
(coming to conclusions)

Russo and Shoemaker (1989)

Modernist Delphi

Expertise
Data
Insights
Judgments

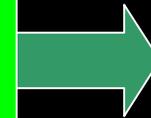
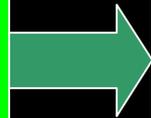
INPUTS

Analytic
Normative
Rational
Metrical
Positivist

METHODS

Forecasts
Consensus
Accuracy
"Truth"

OUTPUTS



Postmodernist Delphi



What's the Purpose of Delphi?

Conclusion { Consensus?

Decision support { Structured brainstorming?
Present options and supporting evidence?
Explore options?

Learning { Participants' education?
Dispute resolution?

Insight { Explore attitudes?

The Delphi method can be employed using various forms of question format or style:

- Binary (yes/no)
- Ranking
- Rating scales (Likert *et al.*)
- Numerical responses (e.g., dates)
- Multiple choice
- Semantic differential
- Checklists
- Narratives

Questionnaires

- face-to-face
 - mailed
 - computer-aided
 - Web
- Structured interviews
- Unstructured interviews

Differ in:

- preparation and cost
- information content
- ease of interpretation and analysis
- ease of communication
- response rates

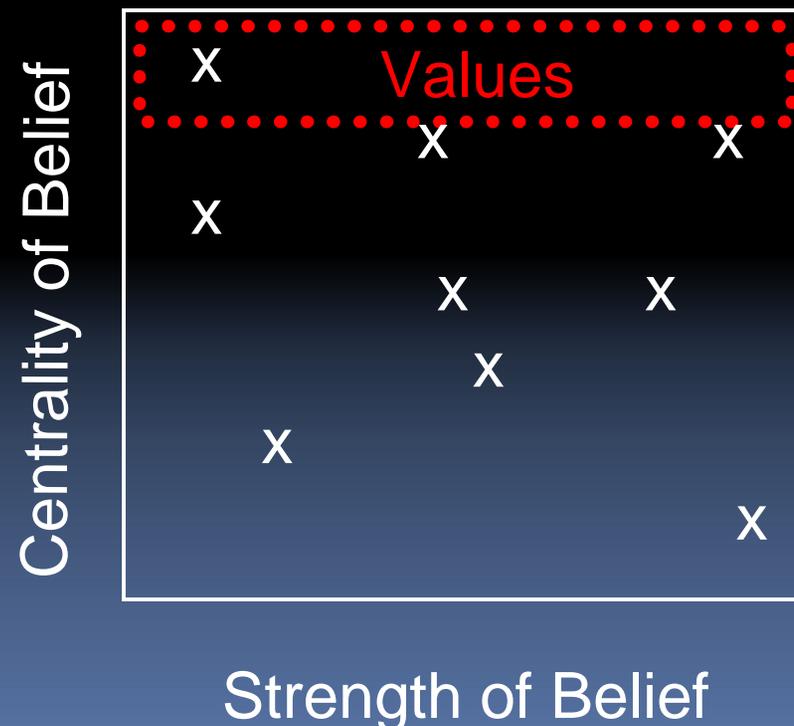
Beliefs: Fishbein's Concept

What do you mean when one states: "I believe...."?

What are the implications?

What are beliefs?

- multitudinous
- dimensional



Attitude

$$A_o = f(\Sigma[b_1, b_2, b_3, \dots b_n])$$

Expressed attitude

$$A_e = f(\Sigma [b_1, b_2, b_3, \dots b_n]) + A_s$$

A_o : “attitude toward object”

b_n : belief

$\Sigma [b_1, b_2, b_3, \dots b_n]$: belief system

A_e : expressed attitude

A_s : “attitude toward situation”

$[A_1, A_2, A_3, \dots A_n]$



Behaviour

Questionnaire



Infer



Behaviour (e.g., questionnaire response)

Distribution of Delphi Respondents, Red River Basin

Stratification of respondents of Red River Basin Study, 2002-3	
<u>Group A: Flood Area Residents</u> City of Winnipeg	15
Southern Manitoba	15
Total Flood Area Residents	30
<u>Group B: Institutional Representatives</u>	
Senior Government Departments	6
Local Government	3
Non-Government Organizations (NGOs)	3
Total Institutional Representatives	12
Total Respondents	42

Response rates for Delphi Policy Process			
<u>Delphi – Phase Two</u>	42	38	91%
Flood Area Residents	30	28	93%
Institutional Reps.	12	10	83%
<u>Delphi – Phase Three</u>	38	36	95%
Flood Area Residents	28	28	100%
Institutional Reps.	10	8	80%
<u>Total: Both Phases</u>	42	36	86%
Flood Area Residents	30	28	93%
Institutional Reps.	12	8	67%

Outcomes of the Delphi Process

An example of Stage 2 – survey of floodplain residents

“Experts in floodplain management (e.g. personnel with specialized knowledge) view the problem of flooding from very narrow perspectives because many of them do not live the flooded area (i.e., lack experiential knowledge)”

Percentage distribution of responses

	Winnipeg Residents	Rural residents	Total
Strongly Agree	7 (1)	36 (5)	21 (6)
Agree	36 (5)	36 (5)	36 (10)
Disagree	36 (5)	21(3)	29(8)
Strongly disagree	0	0	0
No comment	21 (3)	7(1)	14(4)
Total	100 (14)	100(14)	100(28)

Outcomes of the Delphi Process

Another example of Stage 2 – survey of institutional representatives

“Flood frequency is not easily understood by some floodplain residents. For example, the 1997 flood, which has return period of 1 in 100 years is often misinterpreted to mean that it will not take place for another 99 years, whereas in reality there is a 1% that such a flood could place in any year”

Percentage distribution of responses

	Frequency	% Distribution
Strongly Agree	2	20
Agree	6	60
Disagree	2	20
Strongly disagree	0	0
No comment	0	0
Total	10	100(28)

- Flood area residents' perception of flood risk

- To reduce anxiety, individuals deny the uncertainty (the use of heuristics)
- Institutional reps. – do not appear to be entirely 'objective' –judgements involved

- Institutional reps. Perception of local residents

- too complex about risk communication
- distortions in flood risk perception

Flood plain residents' perception of government/inst. Reps

- Too narrow understanding of flood problems
- One-way communication

Concluding comments

a) *The outcome of the `gap analysis` depends significantly upon the selection of research method, and*

b) *An `open ended` inquiry is required to delineate the underlying of gap analysis*

- Structured, closed interview methods limit the scope significantly
- Open ended methods can encapsulate underlying factors
- Iterative process is more effective as they allow validation as well as convergence

The End

