WATER AND DISASTERS WORKSHOP

University of Western Ontario

13,14 Dec. 2004

DISASTER RISKS IN CANADA: VULNERABILITY, COPING CAPACITY and DISASTER RISK REDUCTION

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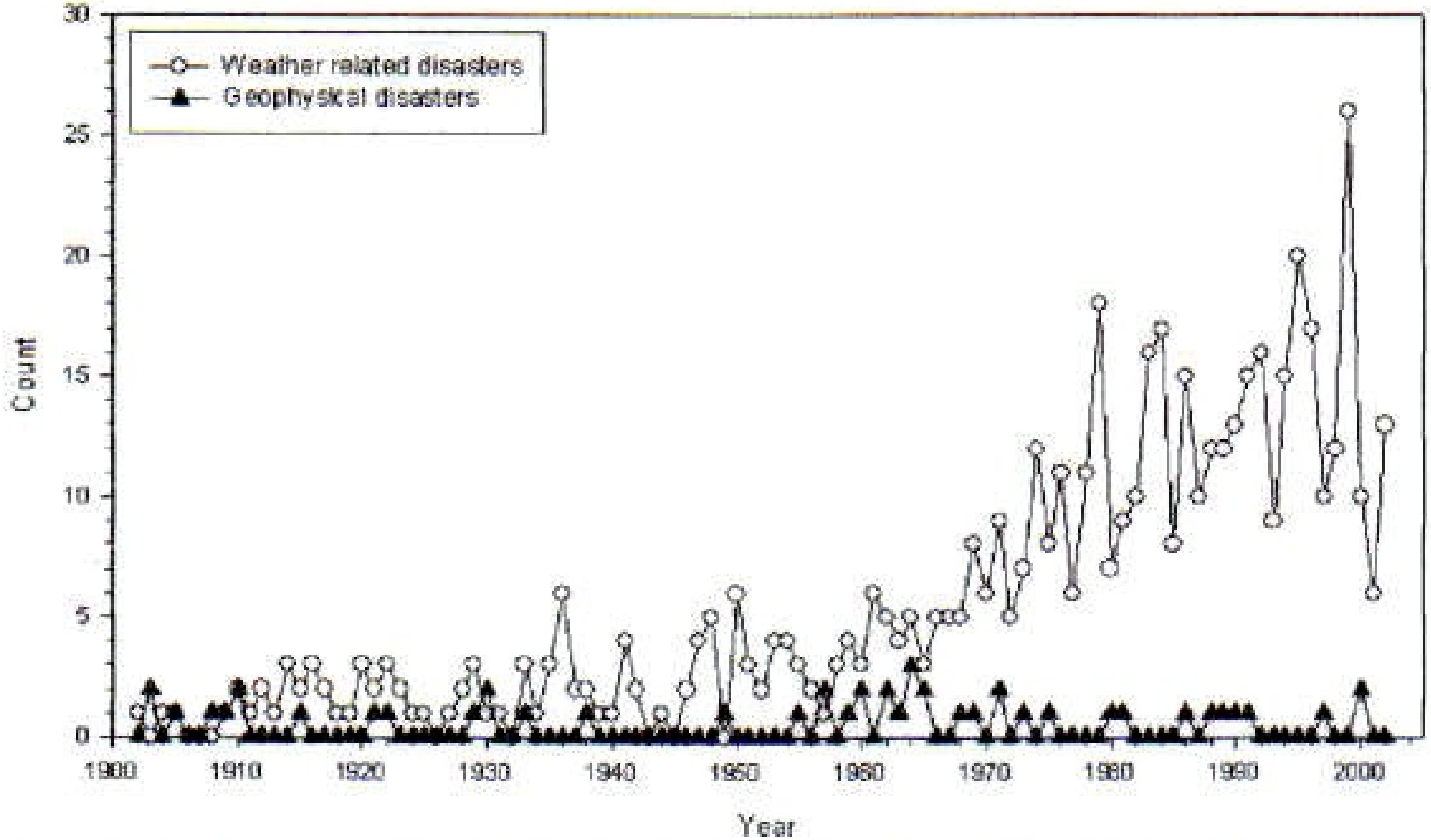
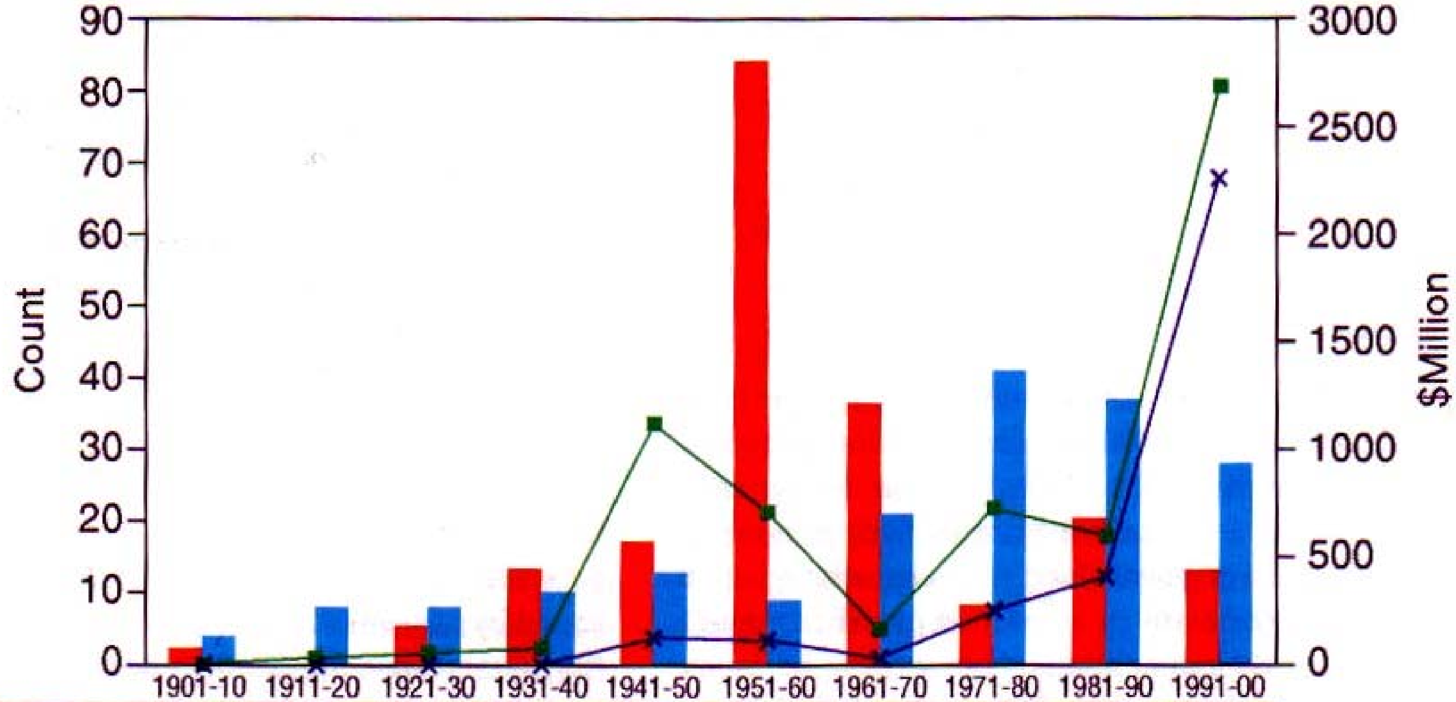
Figure 2 : Historical trends of geophysical and weather related disasters in Canada (1900-2002)

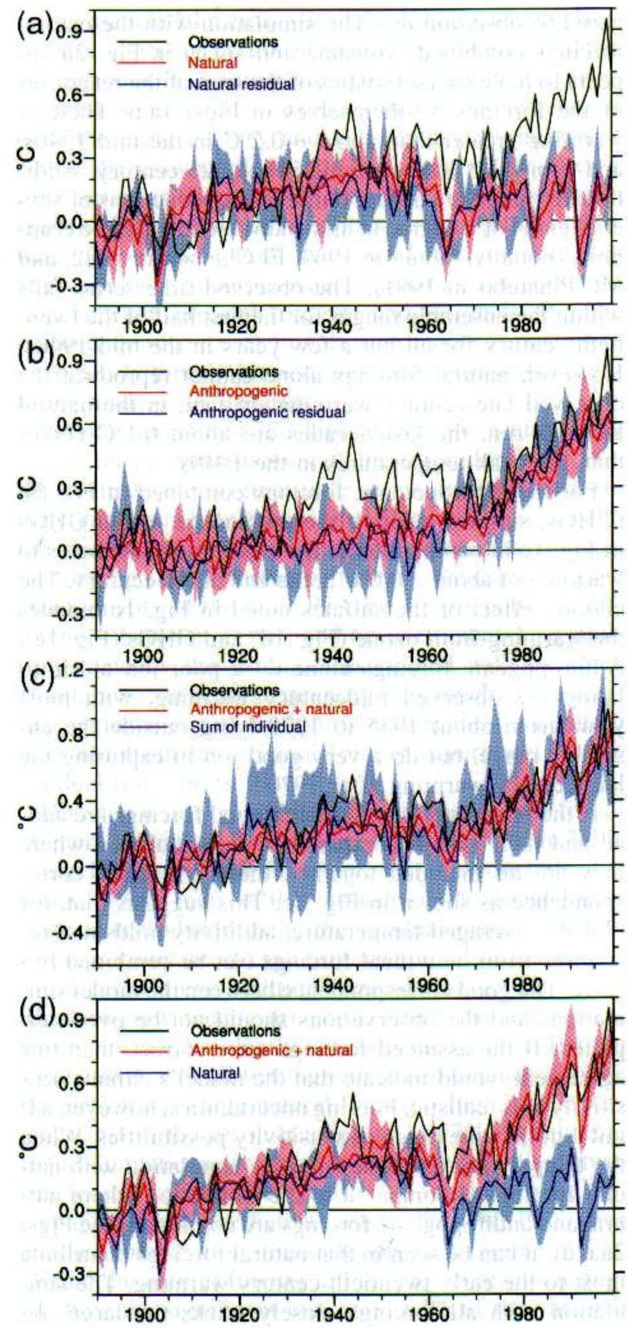


Source: Public Safety and Emergency Preparedness Canada (PSEPC) Canadian Disaster Database (CDD).



	1901-10	1911-20	1921-30	1931-40	1941-50	1951-60	1961-70	1971-80	1981-90	1991-00
deaths	2	0	5	13	17	84	36	8	20	13
Number of Floods	4	8	8	10	13	9	21	41	37	28
Cost ($ Millions)	0.13	2.65	5.80	7.58	126.80	109.30	30.29	253.35	410.98	2264.88
Cost Adjusted	2.16	30.25	53.26	79.78	1119.60	714.21	163.92	724.60	597.92	2690.55

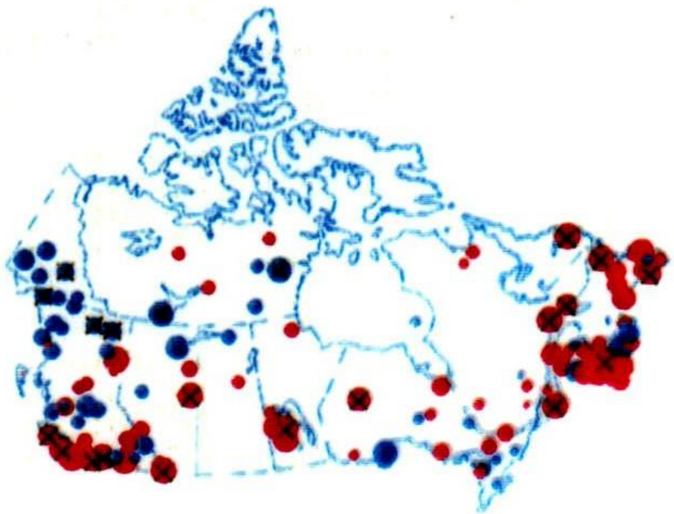
Fig. 1. Flood damages in Canada (after Brooks et al., 2001). Adjusted values based on Construction Price Index (Kulshreshtha, 2003).

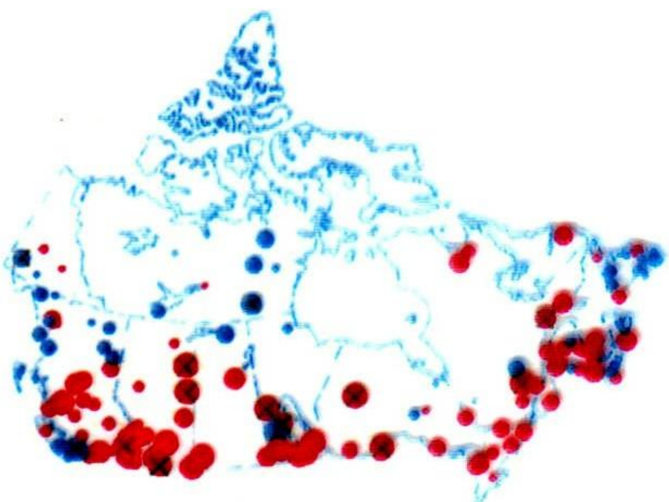


(Meehl et al. J. of Climate 1 Oct 2004)

1967-1996

Zhang et al. 2000





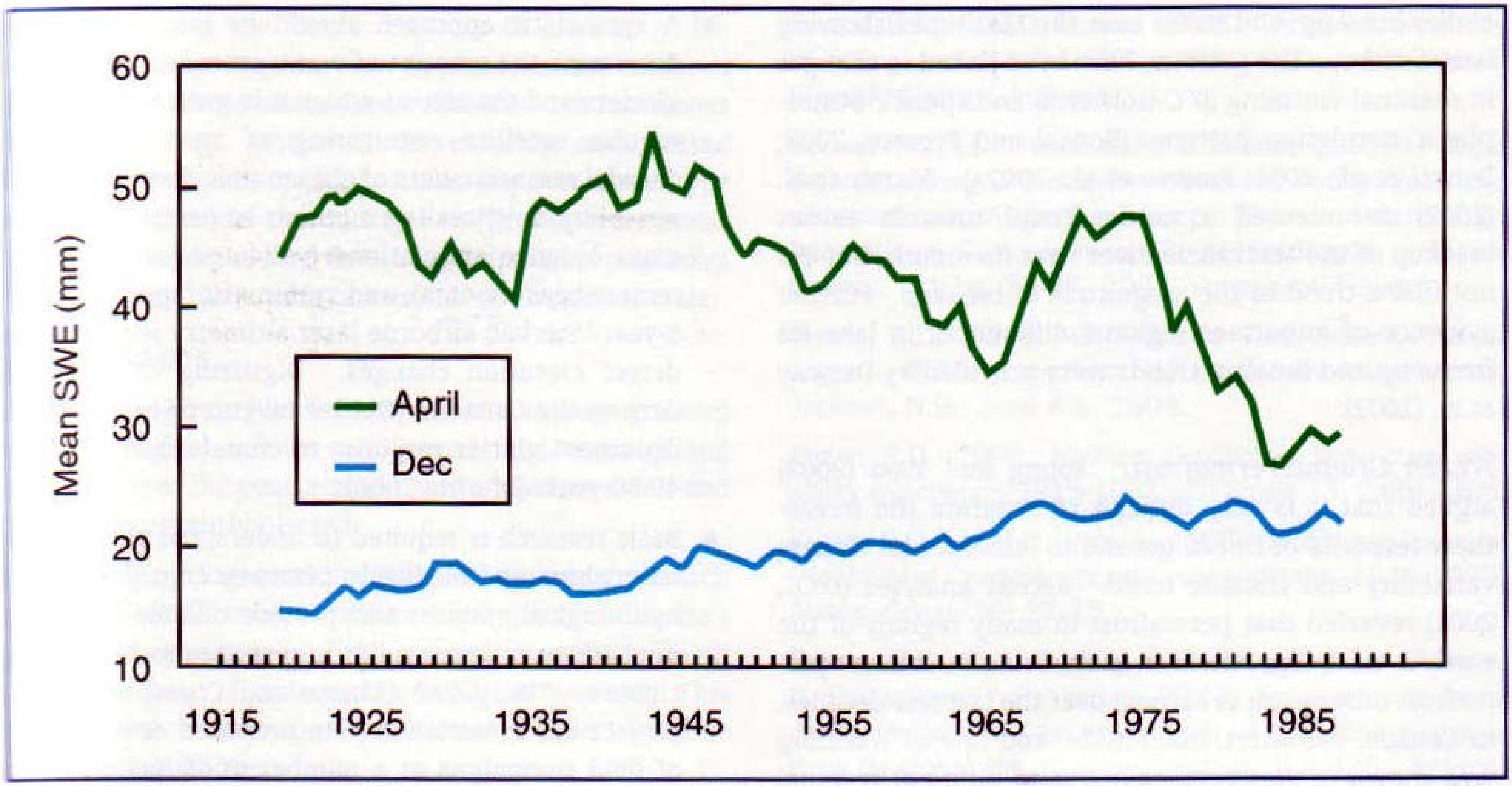
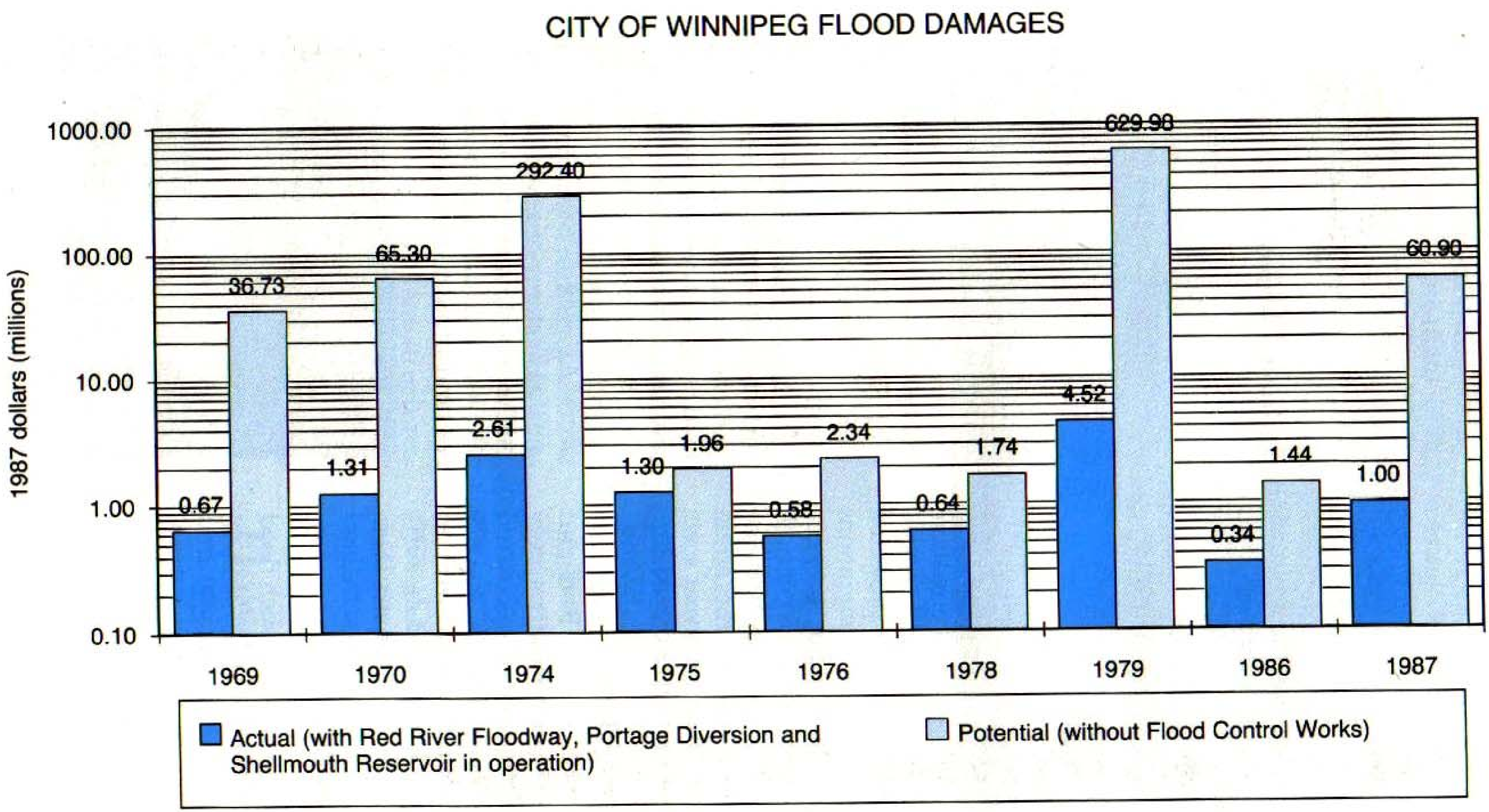
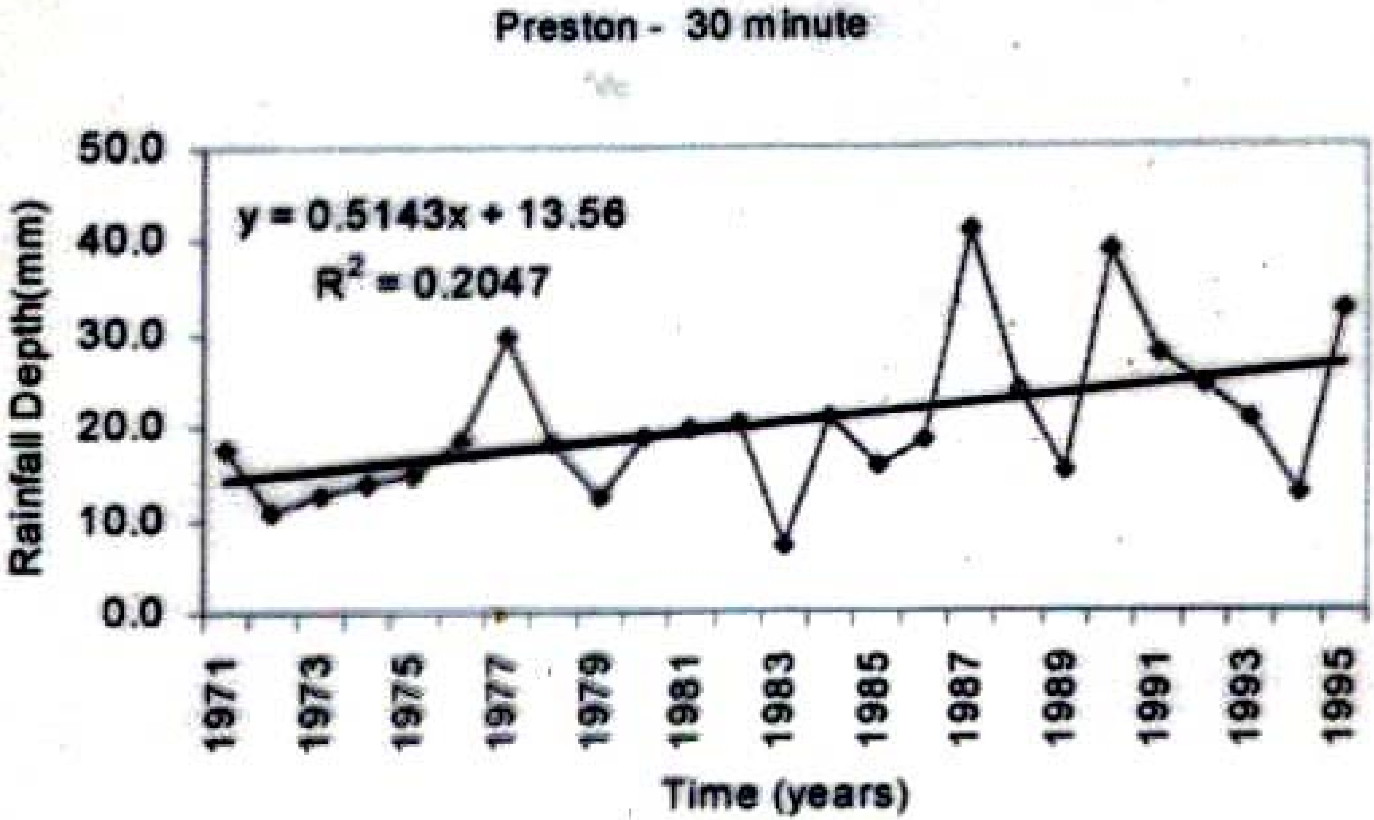


Fig. 1. Historical variation in estimated snow water equivalent (SWE) for December and April over the mid-latitude region of North America. Source: Brown (2000).



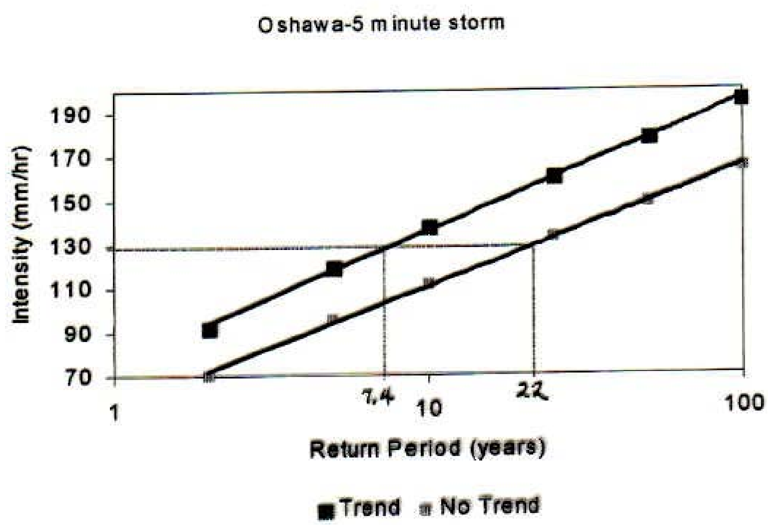
Courtesy of Manitoba Department of Natural Resources, Water Resources Branch; data provided by A.A. Warkentin.

Figure 1: Station 6146714 (Preston) fitted with linear trend:

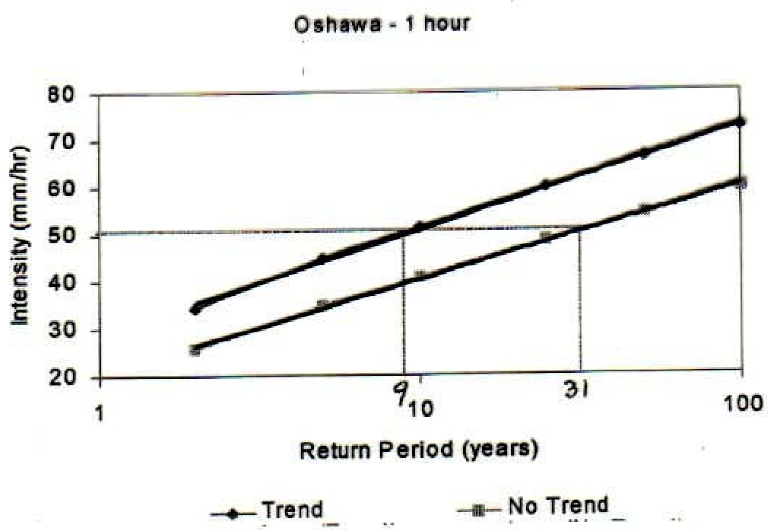


a) linear trend

Figure 5: IDF curves with and without trend for Oshawa



a) station 6155878 (Oshawa) for a 5 minute storm duration
1970 – 1998

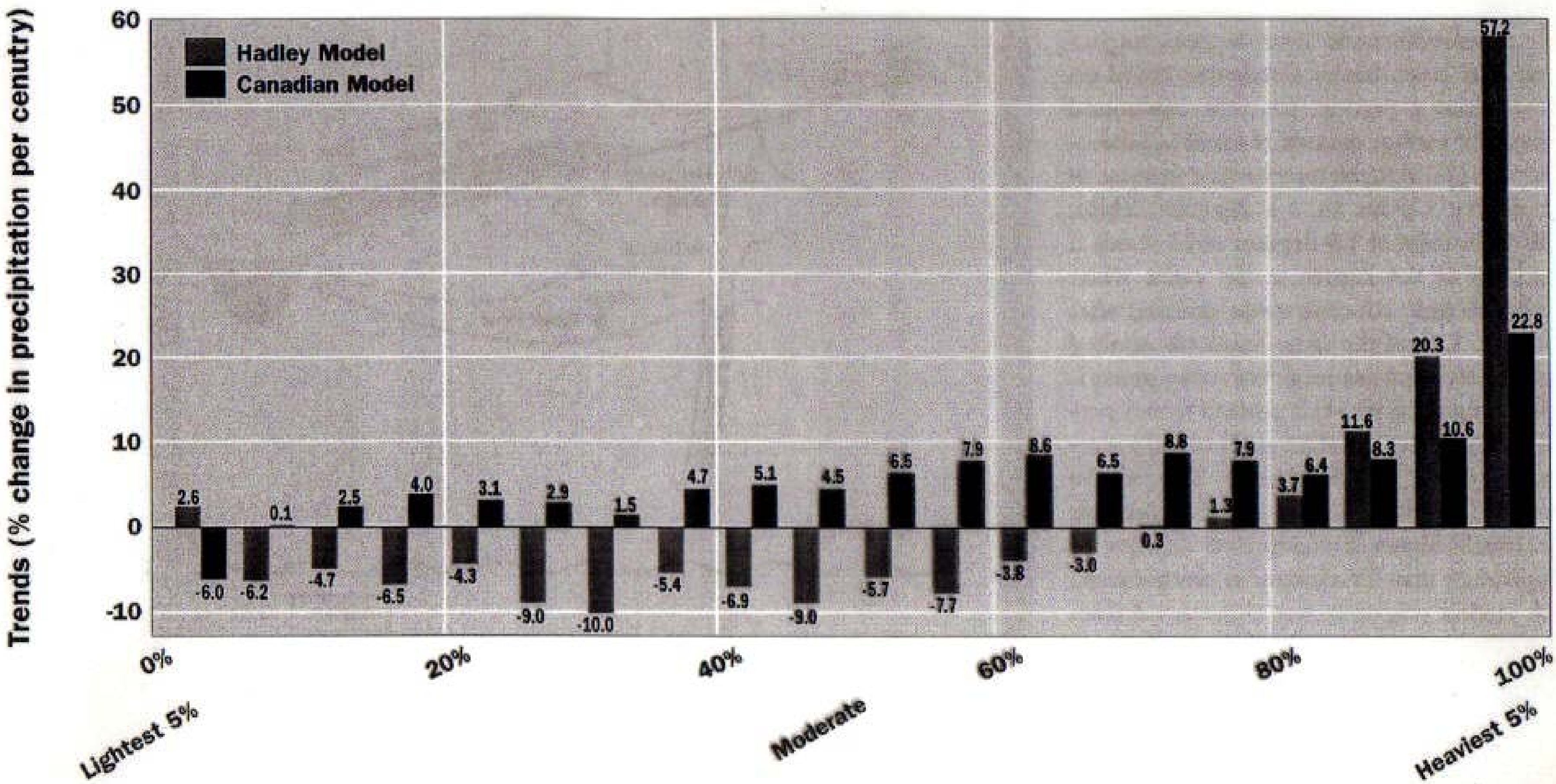


b) station 6155878 (Oshawa) for a 1 hour storm duration
1970 – 1998

Adamowski, et al. (2003)

Figure 2

Projected changes in intensity of U.S. precipitation for the 21st century.



The projected changes in precipitation over the United States as calculated by two models indicate that most of the increase is likely to occur in the locally heaviest categories of precipitation. Each bar represents the percentage change of precipitation in a different category of storm intensity. For example, the two bars on the far right indicate that the Canadian Centre model projects an increase of over 20 percent in the 5 percent most intense rainfall events in each region, whereas the Hadley Centre model projects an increase of more than 55 percent in such events. Because both historic trends and future projections from many global climate models indicate an increase in the fraction of precipitation occurring during the heaviest categories of precipitation events in each region, a continuation of this trend is considered likely. Although this does not necessarily translate into an increase in flooding, higher river flows are likely to be a consequence.

Source: U.S. Department of State, 2002.

SUMMARY – PROJECTIONS

1.	In southern Canada, the average flood peak on moderate to large rivers in spring will continue to decline, due to more frequent winter melt episodes.
2.	Paradoxically, the incidence of very large floods with heavy early spring rains and ice jams will increase, especially eastern Canada and west coast.
3.	On small watersheds, increased flash floods expected.
4.	More coastal and estuary flooding as sea level rises.
5.	With less attention to flood damage reduction, and more infrastructure exposed to risk, damages continue to increase.

ADAPTATION MEASURES – CLIMATE CHANGE & FLOODS

1. RESTORE MONITORING PROGRAMS

2. REVISE FLOOD PLAIN MAPPING IN VIEW OF:
   a) upstream developments
   b) changing climate

3. REVIEW BOUNDARY AND TRANSBOUNDARY WATERS AGREEMENTS

4. SET-BACKS WHERE COASTAL FLOODING AND EROSION LIKELY

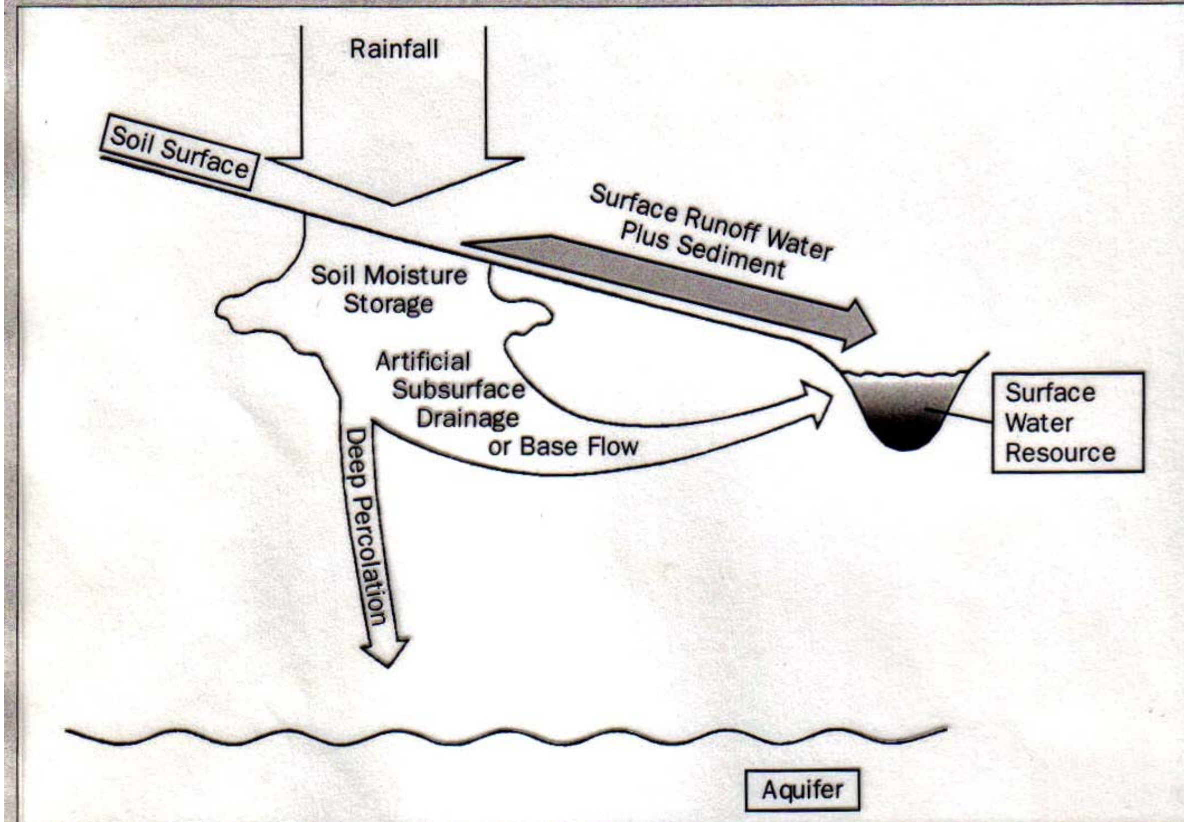
5. REVISE DESIGN CRITERIA FOR DRAINAGE FACILITIES, EROSION CONTROL

POTENTIAL EFFECTS ON SOIL EROSION AND RUNOFF FROM CROPLAND OF OBSERVED CHANGES IN PRECIPITATION (SWCS)

	Increase in Mean Annual Precipitation			
	5%	**10%**	**20%**	**40%**
Change in Erosion				
Increase only frequency of precipitation	4%	9%	17%	34%
Increase only intensity of precipitation.	**12%**	**24%**	**48%**	**95%**
Increase frequency and intensity equally	8%	17%	33%	66%
Change in Runoff				
Increase only frequency of precipitation	6%	13%	26%	51%
Increase only intensity of precipitation	**13%**	**25%**	**50%**	**100%**
Increase frequency and intensity equally	10%	20%	39%	79%

Source: Derived from Pruski and Nearing 2002.

Erosion, Runoff, and Water Pollution



There are four major pathways through which pollutants are delivered to surface water and groundwater from cropland. Sediment and sediment-adsorbed pollutants, such as phosphorus, ammonium, and strongly adsorbed pesticides, can be transported to surface water by erosion. Soluble pollutants, such as nitrates, soluble phosphorus, and highly soluble pesticides, can be transported to surface water dissolved in runoff water. Soluble pollutants also can be transported to surface water in subsurface flow through the soil profile. Finally, soluble pollutants can be transported to groundwater through subsurface flow to underlying aquifers.

SWCS 2003

WALKERTON PROBLEMS

- INADEQUATELY TRAINED TREATMENT OPERATORS
- RUNOFF FROM AGRICULTURAL WASTES – e.g. E-COLI
- HEAVY RAIN EVENTS – MORE FREQUENT WITH CLIMATE CHANGE

Self-Perception of Emergency Preparedness in Communities by Categorized Size					
Level of Preparedness	**Very Small**	**Small**	**Medium**	**Large**	**Overall**
Prepared for a major Emergency	0.0%	0.0%	0.0%	50.0%	5.5%
Somewhat Prepared for a Major Emergency	28.6%	64.7%	65.0%	50.0%	49.3%

Senate Standing Committee on National Security and Defence, March 2004