

TABLE: Health effects of stress

TYPES OF EFFECTS	TYPICAL EFFECTS
Emotional reactions	Depression, anxiety, shock, sense of helplessness, feelings of guilt
Behavioural problems	Moodiness, irritability, apathy, alcoholism, drug use, depression, suicide, spousal violence
Cognitive effects	Confusion, disorientation, indecision, trouble paying attention, memory problems
Physical symptoms	Tension, fatigue, insomnia, pain and distress, heart trouble, nausea, change in appetite, loss of libido, digestive problems

Did you know that...?

Shoreline erosion in Quebec

- In high-erosion areas, land loss can amount to 1 to 10 m per year.
- On the North Shore (1,825 km of coastline), 38% of the coastlines are moderately vulnerable to erosion, and 28% are highly vulnerable.
- The Lower St. Lawrence and Gaspé shorelines are practically all moderately or highly vulnerable to erosion.
 - Different shore protection structures have already been put in place along more than 100 km;
 - More than 60 km of protection structures for municipal infrastructure, roadways and railway lines have already been installed.



Saguenay flooding (July 1996)

- Tropical type storm, and highly localized rainfall owing to Laurentian relief
- 290 mm of rain fell in less than 36 hours (the equivalent of more than one month of rain in this region)
- Land already saturated with water from previous rainfall (limited water absorption capacity of soil and boreal forest)
- Communities established along riverside and downstream from artificial lakes/reservoirs
- Damage assessed at more than \$1 billion (thousands of homes were damaged, and roads, bridges and power lines carried away by the floods)
- Ten deaths and 15,825 people evacuated
- Slowdown or stoppage in industrial activities (aluminium smelters and paper mills) for one



To learn more

Brun S.E. et al. (1997). Coping with Natural Hazards in Canada: Scientific, Government and Insurance Industry Perspectives <http://www.utoronto.ca>

Etkin D. et al. (2004). An Assessment of Natural Hazards and Disasters in Canada: A Report for Decision-Makers and Practitioners. A publication prepared for the Canadian Natural Hazards Assessment Project. ISBN 0-9735436-0-4.

Studies by Danielle Maltais et al., Université du Québec à Chicoutimi. <http://www.ctsn-rcst.ca/maltais.html>

Government of Canada (2004). Climate Change Impacts and Adaptation Program: the Canadian Perspective. <http://adaptation.nrcan.gc.ca>

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The Heinz Centre (2002). Human Links to Coastal Disasters. <http://www.heinzctr.org>

In case of disaster

Public security of Québec. <http://www.msp.gouv.qc.ca>

Government of Québec. Services for citizens : What to do before, during and after a disaster (in french only). <http://www.securite.info.gouv.qc.ca>

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KEYS TO UNDERSTANDING AND COMMUNICATING ENVIRONMENTAL HEALTH ISSUES

Flooding and shoreline erosion

Quebec has thousands of kilometres of coastlines and many watercourses, which makes it particularly vulnerable to flooding and shoreline erosion.

Sources

Flooding and shoreline erosion are natural phenomena.

In eastern Canada, flooding generally occurs during heavy rainfall or as a result of ice jamming when snow melts in spring.

Shoreline erosion is caused by changing water levels, ice, freeze/thaw variations, wind (waves) and, in coastal areas, tides.

Nonetheless, various factors can accentuate the frequency, severity and impacts of these two phenomena.

Aggravating factors

Human activities can increase flooding and erosion:

- Land developments (diverting/channelling water courses, elimination of natural areas such as wetlands, artificial covering of natural surfaces, deforestation, dams)
- Navigation and recreational tourism activities (erosion triggered by wave action)
- Activities contributing to climate change.

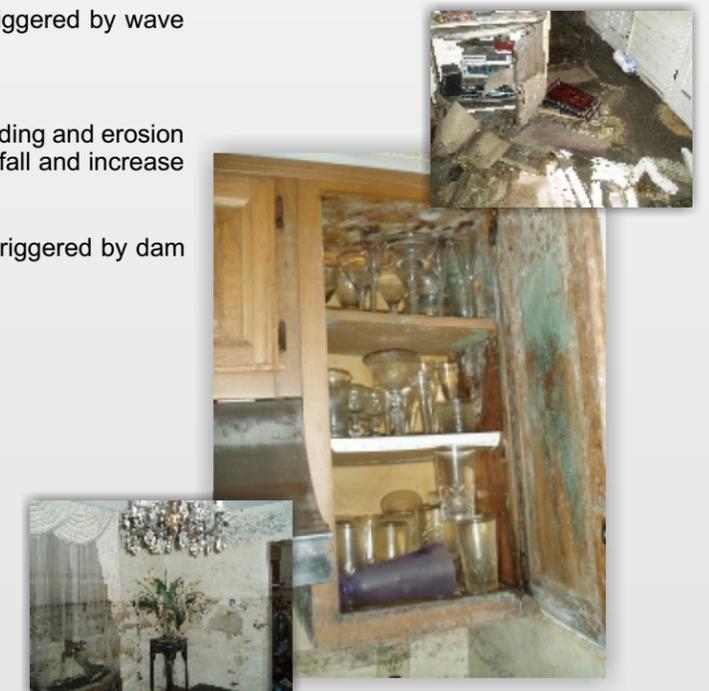
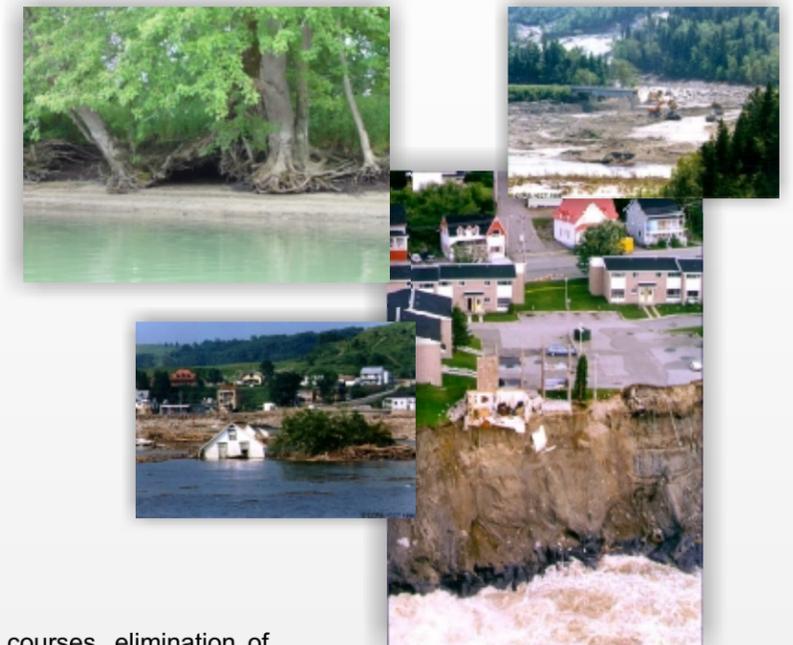
Climate change is considered an aggravating factor for flooding and erosion because it can increase the frequency and intensity of rainfall and increase the ocean level (higher tides).

In an entirely different context, devastating floods can be triggered by dam failure.

Potential impacts on human health

The health impacts associated with flooding and shoreline erosion include psychosocial and physical health impacts (accidents, disease caused by infectious agents or waterborne chemicals).

Generally, many more people suffer psychosocial than physical effects. The two, however, are inextricably linked. For example, physical health problems such as diabetes, asthma, heart disease and ulcers can be exacerbated by stress (see table).



FLOODING AND SHORELINE EROSION

ENVIRONMENT

Aquatic environment

- ▶ Has the drinking water supply been affected?
 - Contamination?
 - Water system failure?
- ▶ Has there been an increase in suspended solids?

Healthy environment

- ▶ Dissemination of chemical or biological agents in stagnant waters.
- ▶ Presence of debris/waste in water.
- ▶ Spread of infectious diseases (promoted by poor hygiene or promiscuity of evacuees).
- ▶ Conditions that promote development of disease vectors (e.g., mosquitoes carrying the West Nile Virus).
- ▶ Electric power supply?

Soils

- ▶ Potential soil contamination by chemical or biological agents.
- ▶ Transfer of soil contaminants to water (e.g., animal dung).

Air

- ▶ Indoor air: accidental accumulation of carbon monoxide (generators) and mould growth (long-term).
- ▶ Volatile chemicals, reconstruction-related dust.

Potential effects on ecosystems

- ▶ Death of wildlife and livestock (e.g., drowning).
- ▶ Devastation of habitats.
- ▶ Elimination of spawning grounds (disruption of reproduction).
- ▶ Impacts of salt water on flora and crops (maximum tides).
- ▶ Contribution of nutrients to soils (beneficial effect on soil fertility).

Visual changes in landscape

- ▶ Dévastation.
- ▶ Land slides.
- ▶ Land losses.

Nuisances (flooding)

- ▶ During event.
- ▶ During reconstruction.

HUMAN HEALTH

How could human beings be exposed?

- ▶ By ingestion of contaminated water or food.
- ▶ By inhalation of indoor and outdoor air.
- ▶ By dermal contact with water or soils.

What are the potential effects?

- ▶ Stress (emotional response, behavioural problems, physical symptoms and cognitive effects).
- ▶ Infectious diseases (e.g., gastro-enteritis triggered by *E.coli*, viral hepatitis, tetanus, leptospirosis, etc.).
- ▶ Respiratory problems caused by moulds and the release of mycotoxins.
- ▶ Consequences of an accident.
- ▶ Vector-borne diseases.
- ▶ Disease caused by chemical agents (e.g., skin irritation).

Accidents (public safety)

- ▶ Accidents caused directly by flood.
- ▶ Accidents resulting from land slide or shore erosion.
- ▶ Carbon monoxide poisoning (inappropriate use of generator).
- ▶ Technological risks (connected with presence of industrial facilities).
- ▶ Accidents associated with reconstruction activities.

COMMUNITY

What are the socio-economic effects?

- ▶ Loss of revenues (e.g., damage to facilities or job losses).
- ▶ Permanent or temporary job creation (e.g., for clean-up and reconstruction).
- ▶ Damage/loss of physical assets, property devaluation (land slides, land losses, or vulnerable areas).
- ▶ Cost of repairs.
- ▶ Damage to/destruction of road, rail or navigation infrastructure.
- ▶ Changes to commercial, tourism or industrial activities (e.g., navigation altered).
- ▶ Restricted access to local resources.

What are the socio-cultural effects?

- ▶ Restricted use of or access to sites (e.g., hazards associated with shore erosion).
- ▶ Disrupted communication links (e.g., evacuation, breakdown in communications systems).
- ▶ Short-, medium- or long-term lifestyle changes (e.g., relocating).
- ▶ Difficulty accessing health services.

What are the psychological factors?

- ▶ Stress before, during and after the event.
- ▶ Permanent or specific loss of environment/assets (e.g., house, personal effects, or farm).
- ▶ Bereavement or illness.
- ▶ Family or social disputes.
- ▶ Having to abandon significant personal plans.

What are the most vulnerable groups?

- ▶ Senior citizens who have a disability, are suffering from a chronic disease or a psychologically sensitive.
- ▶ Children.
- ▶ Women and single-parent families.
- ▶ Low-income people and people whose revenues are tied to local activities (e.g., farmers or fishers).

COMMUNICATING HAZARDS

Sending out a clear message

- ▶ Clearly explain the hazards and their sources.
- ▶ Present the facts (e.g., extent of at-risk areas and potential damage).
- ▶ Ensure advisories are issued by the responsible authorities?
- ▶ What is the level of perceived risk?

Inform and reassure

- ▶ Explain how people should respond and how they can protect themselves.
- ▶ Describe what they can do to reduce property damage.
- ▶ Keep the population well informed (stay in contact with established organizations) and provide straightforward answers to their questions/concerns.
- ▶ Track information conveyed by the media (level of perceived risk).

"We're taking care of you."

- ▶ Is the population safe?
- ▶ Should a warning system or emergency plan be initiated?
- ▶ Get people involved (do not make decisions for them).
- ▶ Provide post-disaster support (e.g., working with insurers).