Research Initiatives at
Emergency Preparedness Canada
Emergency preparedness in Canada is based on the following principles:

- First, it is up to the individual to know what to do in an emergency.
- If the individual is unable to cope, the different orders of government are expected to respond.
- Local emergency response organizations are normally the first on the scene.
- If they are overwhelmed, they will seek assistance from the province or territory which, in turn, will ask the federal government for help if necessary.
On behalf of the MREP, EPC:

- develops policies and programs.
- supports provincial preparedness.
- **analyzes and evaluates risks, conducts research.**
- provides education and training.
- enhances public awareness and understanding.
- ensures continuity of constitutional government.
- establishes arrangements for provincial consultation.
- supports and coordinates the development and testing of institutional plans.
- monitors and reports potential, imminent or actual emergencies.
- coordinates and supports the implementation of civil emergency plans by government institutions.
- provides authorized financial assistance to provinces.
Director Research and Development (DRD)

- **Provides scientific consultative services** to support EPC and other federal decision makers on a wide range of emergency preparedness issues.

- **Multidisciplinary research** is carried out in partnership with OGDs, universities, private sector, NGOs and other levels of government (Canadian and international).
Natural Disaster Costs

- There have been 536 disasters in Canada from 1970-1999.
- Federal Government has responded to 17% of these disasters (90 out of 536) with Disaster Finance Assistance Arrangements (DFAA).
- DFAA is cost-shared between federal and provincial/territorial governments.
Natural Disaster Costs

Costs of Disasters to the Federal and Provincial/Territorial Governments in Canada *

* Represents audited totals of claims made under Disaster Financial Assistance Arrangements (DFAA)
Emergency Management “Cycle”

1. **Mitigation**: Reduce hazard/risk/vulnerability
2. **Preparation**: Update hazard/risk analysis
3. **Response**: Situational stabilized
4. **Recovery**: Mostly back to “Normal”
5. **Risk Assessments**: Plans, arrangements, training and exercises

- "Healing", repair and reconstruction
- No longer direct threat to life/safety and property
- Disaster/emergency situation
Natural Hazards Map

Electronic Map & Assessment Tools

NHEMATIS

Electronic Conversion or Rationalisation/Compression

Proposed Hierarchy of Risk Assessment and Natural Hazards Research within Collaborative Environment

Reports, DBs & Atlases

Snapshot

Continuously Updated, Integrated (Possibly on-line)

Long term research, by hazard
Disaster can strike as quickly as lightning, though it may evolve as slowly as geologic time, depending on its source. And sources abound. Inspired by the UN’s International Decade for Natural Disaster Reduction, more than 50 scientists from Canada, the United States, and Mexico have spent three years in a cooperative effort to map areas of potential disaster in their countries. The resulting maps, shown here, illustrate for the first time the reach of natural hazards across national borders. “We’re keen to promote awareness of vulnerability,” says project leader Chris Tucker of Emergency Preparedness Canada. Such awareness may help lessen tragic consequences when natural disasters strike.
Hawaii's greatest earthquake hazard occurs along faults on the flanks of Big Island volcanoes. A 7.9 magnitude tremor there in 1988 triggered a tsunami and landslides that killed 77 people.

Since 1900, 4,643 sizable quakes have been recorded in Canada, Mexico, and the U.S. Only 17 of those have been magnitude 8 or greater, with one off Canada's west coast and eight each in Mexico and Alaska. The apparent increase in earthquakes is due to improved reporting.

The big one. It may not be imminent, but it is inevitable. The greatest earthquake hazard exists where one tectonic plate collides with, grinds past, or dives under another. Plate subduction under Alaska and southwestern Mexico make them the continent's most quake-prone spots, with each having many more strong tremors than California. California's San Andreas Fault is also an active seismic zone. The Cascadia subduction zone potentially could produce quakes stronger than those from California's faults, threatening cities in the Pacific Northwest. The Cascadia zone also makes people on Canada's west coast that nation's most-at-risk group. Though less seismically active, the East has also felt huge quakes. Because eastern underground rock is more rigid than that in the West, seismic waves travel farther. A repeat of the 1811-12 quakes in Missouri, which ranged from 7.8 to 8.1 in magnitude, could cause damage from St. Louis to Memphis.
Natural Hazards Map

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NHEMATIS

Natural Hazards Electronic Map and Assessment Tools Information System

An integrated suite of electronic maps and assessment tools used to assess human vulnerabilities to natural hazards
NHEMATIS - Software Integration

User Interface

ArcView 3.1

Custom Scripts

GIS Data

Impact Models

Calyx IE (DLL)

ACCESS Database

Crystal Reports
Estimation of Damage Rates

Damage Rate

Hazard Intensity
Estimation of Damage Rates

Hazard Intensity

Mean Damage Rate
Estimation of Damage Rates

- Damage Rate Distribution
- Mean Damage Rate
- Hazard Intensity
NHEMATIS Benefits

- A tool for planning emergency exercises.
- A means of integrating diverse types of knowledge and data.
- Vehicle for sharing knowledge related to emergency preparedness.
- A research tool, with analytical and forecasting functionality.
- An educational tool.
Modified Mercalli Index: MMI 12-4
Historic Quakes: MMI 3 to 4 (yellow dots)
MMI 4 to 5 (purple dot)
Research Projects FY2000-01 Operations

- The Role of Remote Sensing for Disaster Management: Definition and Demonstration of Approaches for GIS Integration (Noetrix Research Inc.)
- Emergency Weather Net - BC (R. Stull, University of British Columbia)
- Enhancing Canadian Emergency Information Exchange Through New Media Applications (P. Anderson, Simon Fraser University)
- Regional Application of the NHEMATIS Technology in British Columbia (RiskWorks Consulting Inc.)
- Automated Emergency Response Planning for Municipalities Susceptible to Flood Hazards (B. Robert, École polytechnique de Montréal)
Emergency Management-Related Civilian Applications.
HALE-Based and Satellite Remote Sensing in the Emergency Management Cycle

EMERGENCY MANAGEMENT CYCLE.

MITIGATION

PREPARATION

RESPONSE

RECOVERY

RELATIVE VALUE OF SATELLITE AND HALE REMOTE SENSING.

SATELLITES

HALE

UNIQUE HALE CAPABILITY

TIME
## Research Projects FY2000-01

### Risk Assessment

- Assessment and Prediction of Prairie Severe Thunderstorm Weather Phenomena (G. Strong, consultant)
- Assessment of Urban Climate and Weather Extremes in Canada (L. Bellisario, Environment Canada)
- Weather-Related Road Transportation Hazards: Risk Assessment and Response (J. Andrey, U. of Waterloo)
- Mapping Flowslide Risk in Eastern Canada for Decision Support (D. Perret, Commission géologique du Canada, Québec)

*cont’d*
Research Projects FY2000-01
Risk Assessment

- National Assessment of Emergency Planning in Canadian General Hospitals (N. Ferrier, City of Toronto)
- A Community-wide Vulnerability and Capacity Assessment (R. Kuban, Turning Point Group Inc.)
- Community Differentials in Hazard Perception and Emergency Response Needs (M. Rahman, University of Manitoba)
- Computer-Based Behavioural Model for Emergency Planning (Slobodan P. Simonovic Consulting Engineer Ltd.)
- Linking Vulnerability and Assessment Criteria Responses: A Review and Pilot Study (D. Shrubsole, U. of Western Ontario)
Research Projects FY2000-01
Risk Assessment

- Seismic Hazard Assessment and Mitigation for Buildings: A Canadian Perspective (M. Saatcioglu, University of Ottawa)
- Earthquake Hazard and Risk in Southwestern British Columbia (J. Clague, consultant)
- Canadian Workshop on Geotechniques and Natural Hazards: an IDNDR Perspective (R. Couture, Canadian Geotechnical Society)
- National Assessment of Natural Hazards and Disasters in Canada (D. Etkin, Environment Canada)
Research Projects FY2000-01 Policy

- Flood Hazard Assessment and Response in Canada: The report of an independent Expert Panel (I. Burton, Environment Canada)
- An Investigation of Efforts to Create Safer Communities – Experiences in Canada and the United States (John Newton Associates)
- Research on the Enterprise Model for Canadian Disaster Management Stakeholders (FirstMark Technologies Ltd.)
- Summary Document and Action Plan for 5th Asia-Pacific Conference on Disaster Medicine (W. Greene, U. of British Columbia)
Research Projects FY2000-01
Public Awareness and Training

- NHEMATIS.hazard.net Rollout (P. Bailey, Nobility Environmental Software Systems Ltd.)
- Application of NHEMATIS in the QUEST Model (Envision Sustainability Tools Inc.)
National Disaster database

Use the identify tool to view the national disaster database contents. Hold the mouse pointer over any tool button, and the function of the tool will be shown in the status bar at the bottom of the map. (You may need to scroll down to see the whole map viewer applet on your screen.)
Risk Assessment for Contiguous United States (hurricanes, earthquakes, tornadoes and hail)
Natural Hazards Map

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Web Sites

Emergency Preparedness Canada
http://www.epc-pcc.gc.ca

NHEMATIS

Emergency Preparedness Information Exchange (EPIX)
http://hoshi.cic.sfu.ca/epix/