

# **Chapter 1**

## **THE STUDY AND ANALYSIS OF EMERGENCIES**

CHAPTER 1. THE STUDY AND ANALYSIS OF EMERGENCIES1.1. Objectives of the Study

This report is about one event - the derailment of a train just before midnight on Saturday, 10 November, 1979, at the Mavis Road Crossing in Mississauga, Ontario. More precisely, it is about the chain of consequences of that event - the explosions and fires in derailed propane tank cars; the leakage of chlorine from a large hole torn in a chlorine tank car; the evacuation from their homes of nearly a quarter of a million people; and the closing of most of a city for a week (Figure 1.1).

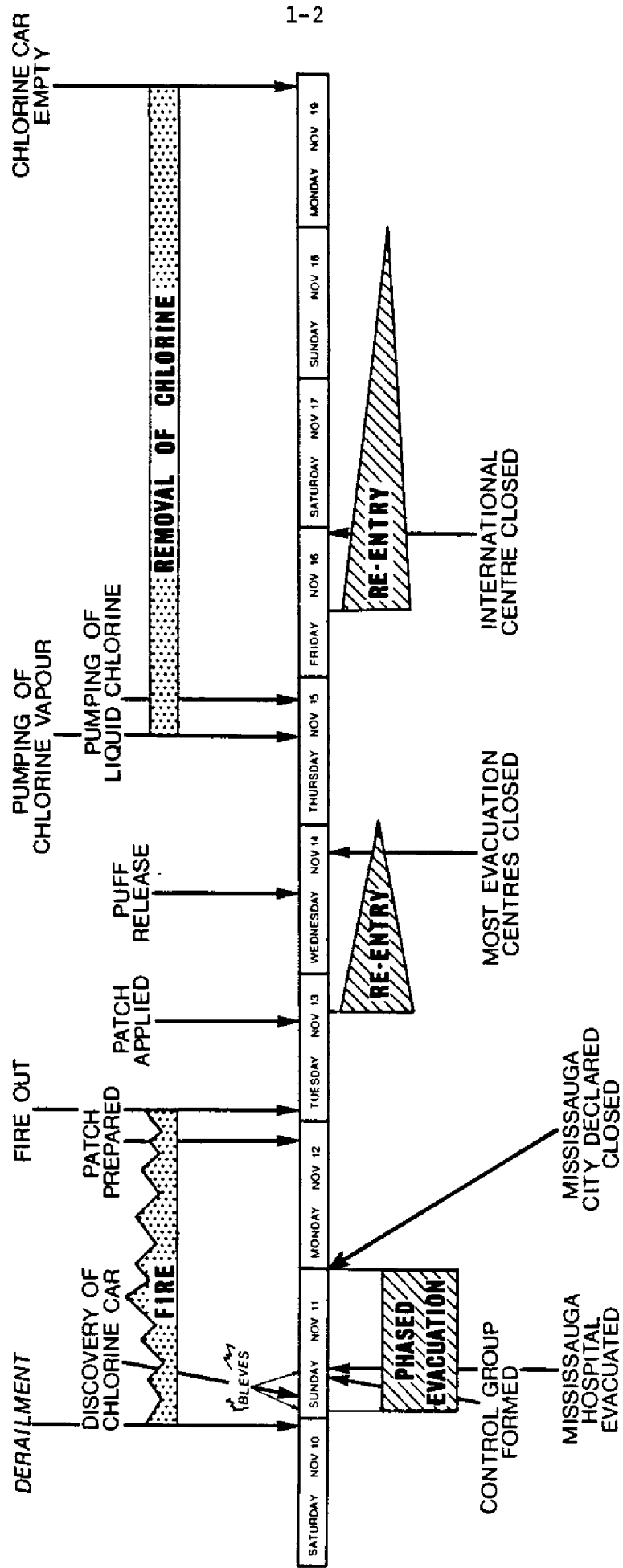
The point of departure for this study is the derailment. It is not our purpose to ask how, or why, the accident happened. Our purpose is to examine its consequences in order to suggest ways in which we, as a society, can be better prepared to prevent, and to respond to future emergencies.

For this purpose, four main objectives were set for the study:

- (a) to record accurately, and in detail, the events following the derailment;
- (b) to analyse the response to the emergency of
  - (i) government,
  - (ii) voluntary agencies,
  - (iii) private sector,
  - (iv) the public;
- (c) to assess the social, health and economic costs of the evacuation;
- (d) to examine aspects of the institutional framework surrounding the emergency, including
  - (i) emergency planning,
  - (ii) risk assessment,
  - (iii) insurance,
  - (iv) compensation.

The study was not asked to make formal recommendations to government on its findings, but to identify what lessons have been and can be learnt; and to make the experience of the evacuation

FIGURE 1.1 THE MISSISSAUGA EMERGENCY



of virtually an entire city available to a wider audience. There are valuable lessons to be learnt from Mississauga and these are drawn together in the last Chapter.

## 1.2. INTRODUCTION TO THE REPORT

### 1.2.1. Event Reconstruction

History is always selective. It is never possible to record everything exactly as it happened. Consider the assassination of President John F. Kennedy in 1963. This took place in full view of thousands of observers. Film cameras recorded the event from several angles. Tape recorders recorded the sounds. The Warren Commission, a Senate investigation and the work of numerous independent investigators have so far failed to dispel uncertainty about what took place. This is not a peculiarity of this one event. It is characteristic of all past events. The innate complexity and unfathomable character of the past is only made evident when it becomes vitally important to know what happened. In this report, the main reconstruction of the events that followed the Mississauga derailment focusses on the activities of the Control Group, and on those who were advising on, and implementing the Control Group's decisions (Chapter 2). Elsewhere in the report, other perspectives are given, including the experiences of the evacuees themselves. Some of these are presented as 'vignettes' of peoples' experiences presented, as far as possible, in their own words (to be found on the green pages throughout the report). They provide their own synthesis of the events that took place.

### 1.2.2. Response to the emergency

The management of the emergency and the large-scale evacuation required the input of many agencies and individuals. Through the evacuation, many members of the public also became directly involved. Analysis of organisational behaviour in terms

of sector (such as governmental, non-governmental, business); or levels of government (municipal, provincial, federal); or of jurisdiction (Health, Environment, Labour, etc.) is less useful for the study of emergency response than is an analysis of inter-agency behaviour. In emergencies, the response is defined by the interaction of sectors, levels of government and ministries.

In the Mississauga emergency, three critical nodes of interaction developed:

- (a) within the central decision-making body, known as the Control Group, and the larger advisory "think tank";
- (b) within the social service agencies, many of whom are voluntary organisations, which looked after the community and health needs of the evacuees;
- (c) between the evacuees themselves, and their families, relatives, and friends.

These three areas of response are discussed in Chapter 3 (the Control Group decisions); Chapter 4 (Meeting Community Needs) and Chapter 5 (Public Response to the Evacuation).

### 1.2.3. Impact Assessment

The Mississauga emergency is unusual in its distribution of costs between direct and indirect damage. The amount of physical property damage was relatively slight (except to the train and track). There were no deaths and only a few minor injuries. The major costs resulted from the dislocation of 226,000 people from their homes and the complete cessation of all businesses and normal public sector activities in the city for several days.

The emergency, therefore, represents something of a challenge to researchers to first, define what can reasonably be included as a cost, and second, to try to measure it. Intangible costs, such as anxiety and loss of amenities, are always the most contentious, and most difficult impacts to measure in any assessment. In the Mississauga emergency, intangible costs and a large number of relatively small economic losses, spread over 75,500 households, form a major part of the impacts to be assessed.

The social and health impacts of the emergency are presented in Chapter 6 and the economic costs of the evacuation in Chapter 7.

#### 1.2.4. Institutional framework of the Emergency

The report discusses four aspects of the institutional framework of the emergency but does not deal with them in detail. They are included because they raise issues about emergency planning and response in Canada, and about the Canadian approach to low probability-high magnitude risks, which the Mississauga accident exemplifies.

Chapter 8 discusses risk analysis for major transportation accidents, especially those involving chlorine, and compares the results of such analyses to the Mississauga emergency. It also discusses the ways in which companies can insure themselves against large-scale losses. Without admitting liability, CP Rail provided immediate compensation for out-of-pocket expenses to evacuated households; Chapter 8 presents the public response to this gesture.

One of the fortunate aspects of the Mississauga derailment is that it happened in a municipality that had experience of previous major emergencies, and which had developed expertise in emergency planning and response. This important context to the management of the emergency is presented at the beginning of Chapter 3.

### 1.3. THE STUDY OF EMERGENCIES

Emergencies, particularly where they result in loss of life and injury or large-scale property damage, have received considerable study. The assessment of damages has been a major area for investigation. Studies of emergency management have tended to focus on pre-emergency planning; or the behaviour of communities and individuals to warnings and during the crisis; or on later reconstruction activities and long-term trends in social adjustment to hazards.

These phases in emergencies can be shown diagrammatically (Figure 1.2). Thus, emergency planning, crisis management, and rehabilitation and reconstruction, are all parts of a positive feedback system through which organisations and individuals learn how to cope with risks. Compared with the emergency system shown in Figure 1.2, the derailment at Mississauga was:

- (a) a single event; which
- (b) happened without warning;
- (c) required little reconstruction of buildings and services; and
- (c) through this, and other reports, will influence pre-event planning.

This report, therefore, concentrates on the system components that are shaded in Figure 1.2.

#### 1.4. METHODS

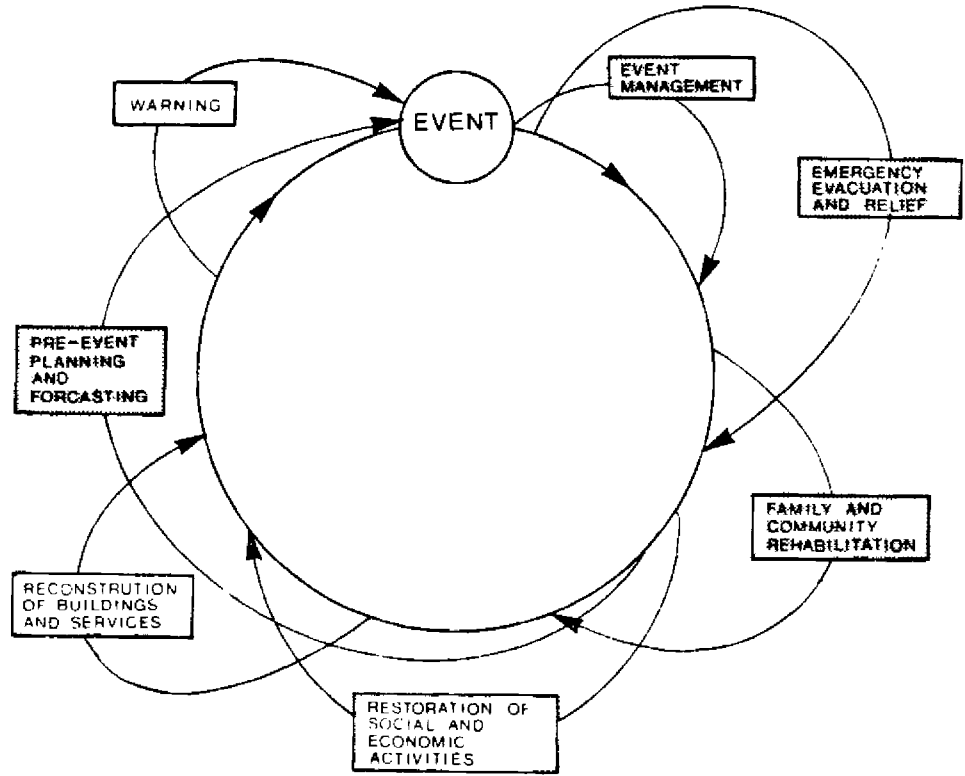
The analysis of the Mississauga emergency is based on three main data sources:

- (a) six public questionnaire surveys conducted by the study team;
- (b) interviews with selected decision-makers, agency officials, and householders;
- (c) reports on the emergency and transcripts of meetings.

Whenever possible, cross-referencing of data sources was carried out, and the surveys were designed to meet the needs of several study components at the same time. Chapters 2 - 4 are primarily dependent on interviews and reports, including transcripts of meetings, while Chapters 5 - 7 draw heavily on the statistical survey results, supported by more in-depth interviewing. Chapter 8 is based mainly on personal interviews with survey data about the public response to compensation.

FIGURE 1.2

### EMERGENCY MANAGEMENT SYSTEM





#### 1.4.1. Questionnaire surveys

The results of six, specially designed surveys are presented in this report. These are:

- (a) a mailed questionnaire survey of 991 households in the evacuation zone conducted within two weeks of the accident (first reported in Whyte, Liverman and Wilson, 1980);
- (b) a mailed questionnaire survey of a further 999 households, conducted 9 months after the derailment (July 1980);
- (c) a mailed questionnaire survey of 500 people who were registered in Evacuation Centres (July 1980);
- (d) a telephoned questionnaire survey of 500 households located just outside the northern perimeter of the evacuation zone (July-August, 1980);
- (e) a telephoned questionnaire survey of 500 households designated as a control group and matched for socio-economic characteristics and distance from a main railway line (August-September, 1980);
- (f) a mailed questionnaire survey of 606 businesses located within the evacuation zone.

These surveys were designed to represent systematic random samples of evacuated households, people using Evacuation Centres, households on the northern perimeter and a control group. For the two main samples of evacuees, conducted 2 weeks and 9 months after the derailment, the surveys investigated the public's:

- (a) immediate response to the emergency;
- (b) evacuation behaviour (including selection of temporary shelters and travel between destinations);
- (c) short and longer term costs and benefits (both economic and social);
- (d) response to information, and communication channels;
- (e) perception of risks;
- (f) claims and attitudes towards compensation.

In addition, the survey of evacuees registered at Centres probed their experiences at, and their evaluations of, the

Evacuation Centres. The control group was used to test:

- (a) the change in risk perceptions of the evacuees;
- (b) the difference in attitudes to compensation before and after suffering a loss;
- (c) communications between households inside and outside the evacuation zone.

The sample of businesses was used to study how, and to what degree, the evacuation caused losses to different kinds of enterprises.

The design of the samples, sampling procedure, and the response rates are discussed in Appendix 1; and the questionnaires are shown in Appendices 2 to 6. A description of the Chi-square test and the results of selected statistical tests are given in Appendix 7.

#### 1.4.2. Interviews

Unlike the surveys, which were designed as systematic random samples of the study populations, the interviews were conducted with purposively selected people. Many of these people were individuals with key roles and special knowledge of the emergency. These, and the organisations they represent, are listed in the Acknowledgements.

Other people, particularly members of the public, were selected because they represented a relevant sub-section of a larger population. For example, from among those households who responded to the questionnaire survey, people were chosen for an interview who represented one or more of the following groups:

- (a) Evacuation Centre users;
- (b) people living near the accident site;
- (c) people living on the northern perimeter of the evacuation zone;
- (d) the elderly, handicapped and others who have special difficulty in moving;
- (e) families with young children or pregnant mothers;
- (f) people who did not evacuate;
- (g) people who tried to enter the evacuation zone.

These interviews were semi-structured; that is, they covered a specific set of topics, but not necessarily in a set order. The person being interviewed was encouraged to provide any other information and detail that he or she considered relevant. The interviews were conducted in peoples' homes or offices and were deliberately conversational in tone. For some interviews, several members of a household were present. Some interviews were tape-recorded; others were recorded in note-form by the interviewer.

In addition, semi-structured (and usually shorter) interviews were conducted by phone. These were done for one or more of several purposes:

- (a) to check up on specific points of information;
- (b) to obtain the names of other contacts for interview;
- (c) to arrange for a fuller, personal interview later;
- (d) to verify information from one detailed interview by enlarging the number of observations.

#### 1.4.3. Reports and Transcripts

The study has also drawn upon several reports on the emergency, both published and unpublished, as well as transcripts of meetings. The official inquiry into the derailment was conducted for the Government of Canada by the Honourable Mr. Justice Samuel G.M. Grange of the Supreme Court of Ontario (Canadian Transport Commission, 1980). The Inquiry lasted for 127 days and produced 23,594 pages of transcript. The report (known as the Grange Report) is itself 212 pages in length.

Transcripts of the Control Group meetings and the Peel Regional Police transcripts and log of the emergency response were among those made available to the study team. In-house reports of ministries, voluntary agencies, and the Mississauga Hospital also provided important information.

Other reports on the Mississauga emergency include a United States consultant report (NUS, 1980), and one written for the Canadian Police College (Scanlon, 1980). The Ontario government prepared a report called 'Derailment - the Mississauga Miracle' (Havey, Dickie and Allen, 1980). A more popular book is 'Hot Box' (Cahill, 1980).

Extensive use of written reports and transcripts was made in Chapters 2 and 3 of this report. Where accounts of events differed, the study team tried to identify the correct version, through interviews with those involved and through close examination of transcripts. The results are contained in the Event Reconstruction that follows.