

Fire Research Report

School Fires in New Zealand

NZIER and CORYDON
CONSULTANTS

February 2002

The overall aim of this project was to help raise awareness of the factors contributing to school fires, and their implications for individual schools, communities, and New Zealand as a whole, raising awareness in schools of the range of possible measures to reduce risk, and to encourage an increased sense of community responsibility for the protection of public assets.

A detailed analysis of trends, drawing on NZFS *Emergency Incidents Statistics* and the Ministry of Education *Property Management Information System*, is set out in the report. The estimated cost of all fires in state schools was \$3.5 million in 2000/2001. The 25-year average cost is \$5.2 million per year. In the 1990s, 60-70% of serious fires were caused by arson, a much higher proportion than for other building types. Initial investigation suggests some correlation between the number of school fires in an area and the social deprivation of the area.

Twenty two schools were selected as the subject of case studies using face-to-face and telephone interviews. Those selected had experienced serious fires (structural damage exceeding \$20,000) in the period 1998 to 2001. The size of the sample was not sufficient to provide statistically robust results: the intention was to provide practical insights into contributing factors in, and impacts of, fires in schools, in a variety of different circumstances.

The Ministry of Education and NZFS are aware of many of the issues raised in this report, and are taking positive steps to address some of them. One issue raised by both schools and regional NZFS personnel is that some schools were unclear about whose The Ministry of Education and NZFS are aware of many of the issues raised in this report, and are taking positive steps to address some of them.

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School fires in New Zealand

Economic and social analysis

Final report to New Zealand Fire Service Commission

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Preface

Economic and social analysis of school fires in New Zealand, the subject of this paper, provided some significant challenges – both conceptual and empirical.

As researchers with limited prior knowledge of this subject matter, we were heavily dependent on a range of people who were prepared to share their knowledge and experience with us. We are indebted to:

- The New Zealand Fire Service Commission, which provided funding for this research through its Contestable Research Fund.
- The New Zealand Fire Service, whose regional and head office personnel assisted with high level guidance on the research, shared their practical front-line experience with us, and made time to provide us with data.
- Ministry of Education staff, who provided helpful comments on our report at draft stages, and provided us with data.
- The school principals, other school staff, and school trustees, who contributed to case studies and surveys.
- Australian fire service and emergency management specialists who gave us access to their research.
- Others who shared their expertise with us.

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Most of the case study work, other interviews, and data gathering were conducted in the period May to October, 2001.

Any errors of fact, interpretation, or presentation, are the responsibility of the authors.

EXECUTIVE SUMMARY

This report sets out the findings of our study, funded by the New Zealand Fire Service Commission Contestable Fund, on the topic 'School fires in New Zealand – Economic and social analysis.'

The overall aim of this project was to help raise awareness of the factors contributing to school fires, and their implications for individual schools, communities, and New Zealand as a whole. Hence, to raise awareness in schools of the range of possible measures to reduce risk, and to encourage an increased sense of community responsibility for the protection of public assets. We saw this as being consistent with and supportive of the strategic directions of the New Zealand Fire Service (NZFS).

The research, conducted in 2001, comprised:

- Case studies of state schools that had experienced serious fires in recent years.
- Interviews with NZFS and Ministry of Education personnel.
- Analyses of trends based on NZFS and Ministry of Education statistical databases.
- Reviews of the relevant New Zealand and international literature.
- An outline of an economic analysis of fire protection in schools.
- Summaries of current policy responses, including: Code Development, Business Continuity Planning, and the Fire Awareness Intervention Programme.

The report's principal findings were:

Context

School fires are a sub-set of fire risk to which all structures are exposed, and one element in the broader milieu of risk management facing society in general. As at March 2001, there were some 2,500 state schools in New Zealand with about 17,000 buildings and a capital value exceeding \$5 billion.

Nature of the problem

Schools are prominent focal points of society and vulnerable to both accidental and malicious fires. For example, school grounds and buildings are easily accessed, and often contain combustible refuse. Therefore they are easy targets and maintaining security is difficult and expensive. Complex problems, such as these, require multiple responses and ongoing vigilance.

National trends

A detailed analysis of trends, drawing on NZFS *Emergency Incidents Statistics* and the Ministry of Education *Property Management Information System*, is set out in the report. Highlights included:

- Losses to the Ministry of Education from school fires in the last four years have averaged \$3.25 million. This equates to 0.065% of its \$5 billion buildings portfolio. This compares favourably on an international basis.
- Over the 11 years to 2000/2001 the number of serious fires and costs of material damage to structures have been on a declining trend. The estimated cost of all fires in state schools was \$3.5 million in 2000/2001. The 25-year average cost is \$5.2 million per year, and costs have averaged \$4.6 million per annum since 1992.

- In the 1990s, 60-70% of serious fires were caused by arson, and this was a much higher proportion than for other building types.
- The cost to the Ministry of Education of school fires caused by arson has averaged \$2.5 million per year over the last six years. The cost of arson-related school fires was \$15.8 million in 1989/1990. Excluding this abnormally large figure, the average cost from arson since 1988/1989, when records began, is \$3.7 million.
- Initial investigation suggests some correlation between the number of school fires in an area and the social deprivation of the area, but we have not undertaken a comprehensive investigation of this aspect of causality.

Policy responses

The Ministry of Education and NZFS are aware of many of the issues raised in this report, and are taking positive steps to address some of them. One issue raised by both schools and regional NZFS personnel is that some schools were unclear about whose regulations - regarding security and fire protection measures - they needed to abide by. During the period when this report was prepared, the Ministry of Education and NZFS were working on a code that would simplify regulations, encourage further contact between schools and the NZFS, and ensure that schools are aware of their obligations under the Building Act (1991). The code, to be distributed to schools, was due to be released in March 2002.

The Ministry of Education and NZFS are also working together to produce a sprinkler policy that is logistically and financially practical. The Ministry of Education's current policy is to install sprinklers in all new schools, in new school buildings over 1000m², and in extensions to new schools. It is not economically feasible or practical for the Ministry of Education to install sprinklers in all old schools. The current policy will ensure that as the stock of school buildings depreciates and is replaced by new schools, sprinklers will become more common. This is a positive step towards reducing the number and severity of fires in schools.

Risk management perspectives

Risk is a function of **likelihood** and **consequences**. For individual schools, serious fires are low probability events, but very costly. In relative terms, break-ins, vandalism, or minor fire-setting are higher in probability, but are generally of nuisance value rather than high cost. A central risk management problem, with respect to school fires, is the difficulty in predicting which minor incidents, or patterns of such incidents, will lead to a serious structural fire.

Risk management involves taking action to increase readiness (should a fire occur), reducing the incidence and seriousness of fires, and enhancing response and recovery.

Risk management also involves trade-offs. For the Ministry of Education and individual schools, more money spent on building security, for example, means less is available for educational resources. There is also a trade-off for the NZFS. Its personnel have limited time and resources. Increased time spent on fire safety education in schools leaves less time for NZFS personnel to address other fire safety issues in the community.

In economic terms, it can be difficult to estimate the marginal expected benefits from increased investment in fire safety, because of underlying uncertainty about risk.

Case studies

Twenty two schools were selected as the subject of case studies using face-to-face and telephone interviews. Those selected had experienced serious fires (structural damage exceeding \$20,000) in the period 1998 to 2001. The size of the sample was not sufficient to provide statistically robust results. The intention was to provide practical insights into contributing factors in, and impacts of, fires in schools, in a variety of different circumstances.

The factors which contributed to the severity of fires were researched as part of the case studies. Amongst these factors were:

- Building design and materials.
- The nature of materials affected.
- Fire detection methods in place.
- Fire suppression methods.
- Time lags between fires starting and being detected, and between detection and NZFS response.

We also investigated the social costs of school fires – that is, emotional and other effects on pupils and staff. Clearly there can be quite severe effects of this sort, both immediate and lasting, and they tend to be more pronounced in the case of arson. The loss of personal effects and teaching resources can add significantly to the trauma and the workload for individual teachers and pupils.

These and other effects vary widely according to the specifics of the fire, including the area of the school affected, the availability of alternative accommodation, and the significance of what was lost.

We also discussed the practical recovery issues facing schools. For example, one important factor that could help expedite or obstruct insurance claims was the availability or otherwise of inventories of resources and equipment, and whether such inventories were held off-site.

Policy responses and programmes aimed at assisting the education sector in its risk management concerning fires, are summarised in the Appendices. Included are:

- Business Continuity Planning (BCP).
- Fires protection for schools – code development.
- The Fire Awareness Intervention Programme (FAIP).

We also provide a review of the School Total Enhancement Plan for Security (STEPS) programme, introduced in the mid-1990s, and implemented extensively in some regions, and not at all in others.

Regional analysis

As a part of this research we undertook an analysis of trends in the number of school fires in each of the eight NZFS regions, together with a distillation of telephone interviews conducted with Assistant Regional Commanders (Fire Safety) and other NZFS personnel with significant local knowledge relevant to our research.

Geocoding of the database by NZFS personnel allowed us to graph the annual number of fires, by NZFS region and territorial local authority, over the period 1991 to 1998. Because the number of fires in most regions is fairly small, it is difficult in most cases to distinguish trends clearly. In particular, we were not able to identify any clear distinction, as between regions, in trends in the number of fires over the period.

Each of the NZFS personnel interviewed had a particular set of concerns about school fire safety in their region of responsibility, and these are set out in the report. Importantly, there was also a core set of concerns which was common to most of those interviewed, and which overlapped with many of the findings of the case studies:

Trends

In general, most regions had recorded no increase in serious fire incidents in the period, or had recorded falling numbers. However, this was not seen as allowing any reduction in vigilance. School fires tend to be cyclical with a strong 'copycat' element – for that reason, publicity about serious incidents can be unhelpful.

Readiness/Reduction

The consistency between, and adequacy of, fire protection measures in schools was seen as a major issue in most regions. Combined security systems/smoke alarms were the norm. These systems are not required to be approved by the NZFS, as they are primarily designed for security reasons, rather than fire protection reasons. They successfully addressed school concerns about break-ins/damage outside of school hours, but had not always proved up to the task when fires had occurred.

The first line of response to combined alarms was often a security firm, and that and other factors sometimes introduced a significant delay between the original alarm and NZFS attendance. Other factors included problems in ascertaining exactly where on the campus the fire was burning, problems in access for emergency vehicles, and inadequate water resources.

While the STEPS programme (in place from 1993 to 1995) had been well-designed and worked well in the Wellington region, it was hard to get schools involved elsewhere. One reason was the additional administrative burden involved, on top of the ERO, OSH, Ministry of Education, and other reporting obligations.

It appears that schools do not tell the NZFS about a large proportion of fire-setting incidents on school property. The majority of these events are minor, but collectively could be indicative of a pattern leading up to a serious arson attack. This was one of the issues addressed in the STEPS programme.

The age profile and design of school buildings was a significant concern in some regions. Older buildings often had spacious ceiling cavities which contributed to the rapid spread of fires. Prefabricated buildings, used in areas where school rolls had expanded rapidly in the 1990s, could also be vulnerable to fires, for example, because of materials used.

NZFS personnel were heavily involved in programmes aimed at school pupils or other younger people at risk of involvement in arson. Current examples were the '*Firewise*' Programme, and the *Fire Awareness Intervention Programme*.

Response/Recovery

False alarms were a problem in some regions. Any school experiencing more than two false alarms in a six-month period is liable for a charge of \$1,125. This potential cost may have made schools and security firms more cautious about calling the NZFS. The frequent occurrence of false alarms also contributed to alarms being ignored by staff or neighbours of the schools.

Most schools did not undertake formal Business Continuity Planning but interest in and implementation of this was growing.

It was sometimes difficult to get schools interested in preparing evacuation procedures, partly because incidents which had the ingredients of serious health and safety consequences generally occurred outside school hours. It is recommended by the Ministry of Education that evacuation drills are conducted twice a term, although there is no legal requirement for schools to do so.¹ The NZFS is currently preparing a standard template to help schools prepare their evacuation schemes. This template will be available via the Ministry of Education's website.

Recommendations - a checklist for schools

Our report identifies some key aspects of risk management that can contribute to improved fire safety in schools. These are worth reiterating, even though they may be familiar to many readers. References (in parentheses) are made to sections in the report that contain more in-depth information on the specific issue.

We divide our checklist into two sections based on the four principles of emergency management:

- *Readiness and reduction* - issues to consider when addressing how to reduce the likelihood of a school fire, and how to ensure that a fire is dealt with efficiently if it does occur.
- *Response and recovery* - issues regarding how schools can deal with the occurrence of a fire by minimising disruption to staff, students and the community.

Checklist

Readiness and reduction issues

- **Awareness of regulations** - schools need to understand more clearly the building and fire safety regulations that apply to their buildings. The work being done jointly by the Ministry of Education and the NZFS is likely to help schools in this area (4.2 and Appendix D).
- **Fire protection** - schools may wish to address the following when considering how well they are protected against fire:
 - What is the best security option for the school?
 - How will the alarms and/or sprinklers be configured?
 - Which staff will be trained in the use of fire protection equipment? (7.5.2)
 - Who will be responsible for ensuring that adequate maintenance of fire detection/suppression equipment is carried out? (4.2.3)
 - Will fire alarms be connected directly to the NZFS, or to a security company? (4.2.3, 4.2.5, and 7.2.2 b))
 - If the latter, which security firm provides the quickest and most thorough response to an activated alarm?
 - Should the security firm be directed to notify the NZFS immediately if a smoke alarm is activated, rather than checking to confirm a fire first?

¹ See Ministry of Education (1979): 'Fire precautions in education buildings'. This document is to be replaced by the Fire Safety Code of Practice that is currently being prepared by the Ministry of Education and the NZFS. The NZFS will provide a template for preparing evacuation schemes, which is a requirement under the Fire Safety and Evacuation of Buildings Regulations (1992).

- **Litter management** - schools could look at how their litter is contained and managed. The use of non-flammable bins located away from buildings, and lockable bulk rubbish storage facilities, will reduce the risk of rubbish fires (4.3.2 and 5.4.1).
- **Water supply** - schools may want to check that there is adequate access to suitable and reliable water sources close to buildings. Backup water sources such as swimming pools or ponds should be identified (4.2.6 and 7.5.2).
- **Warning signs** - occurrences such as petty crime, vandalism, and nuisance fires are often pre-cursors to serious fires. It would be useful if schools kept track of any such occurrences, and reported them to their local NZFS fire safety officer. If the regularity or seriousness of these happenings increases, more security measures may be required to avoid a serious fire (4.3.2 and 7.2.2 b)).
- **General security measures** - in order to reduce the probability of vandalism, graffiti, and nuisance fires, schools may wish to review the lighting and fencing arrangements of their grounds and buildings (4.3.2, 7.4.2, 7.8.2).
- **Staff awareness** - school staff, including teachers and grounds staff, could be made aware of the pre-cursors to major fires. They should be encouraged to report such incidents and to refer offenders, if caught, to the *Fire Awareness Intervention Programme* (Appendix D).
- **Community involvement** - the nature of school grounds and time of day that attacks on schools occur mean that passers-by, neighbours and users of the grounds are often the first people to detect fires. These people may also be aware of problems at the school that are pre-cursors to arson. Schools may want to encourage their local community to be pro-active in keeping an eye on school grounds, and to report any loiterers, vandalism etc. as soon as possible. This will help to promote community 'ownership' and responsibility for schools (5.3.3, 5.5.1, Appendix E.3).

Response and recovery

- **Inventory management** - many schools struggle to trace all of their lost equipment and resources for insurance purposes following a major fire. Schools can speed up the recovery process by keeping detailed resource inventories. These inventories should be updated regularly, and copies stored offsite in a secure location (6.2).
- **Student records** - the loss of records in a major fire causes administrative problems during the recovery period. Schools could help to speed the recovery process by keeping copies of academic records offsite.
- **Personal teaching resources** - A potentially large cost of serious school fires is the loss of teachers' own resources, such as worksheets, posters, etc. It would save a lot of time in the recovery phase if teachers were able to store copies of their resources off-site. If copying resources is not feasible, even keeping an offsite list of personal resources would help teachers in the recovery process (1.2, 5.1.2, 5.1.3, 5.2.2).
- **Business Continuity Planning** - a major event such as a severe fire is likely to disrupt a school's day-to-day activities. Schools may like to consider how they are going to manage the return to normal operations after a serious fire. Issues to look at include where teaching will be done if classrooms are destroyed, how staff and student trauma will be dealt with, and where temporary teaching resources will be found (Appendix E).
- **Insurance claim processing** - some schools encountered difficulties when it came to preparing and processing contents insurance claims. In order to help schools recover quickly from a major fire, administrative staff should be aware of the best method of arranging and processing claims (6). The Ministry of Education may wish to provide further guidelines for schools on this issue.

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1. INTRODUCTION

1.1 Overview

School fires are a serious and multi-faceted problem in New Zealand and elsewhere. Schools are prominent focal points of society and vulnerable to both accidental and malicious fires. For example, school grounds and buildings are easily accessed, and often contain combustible refuse. Therefore they are easy targets, and maintaining security is difficult and expensive.

As experience in 2001 showed (with the serious fires in Hamilton and Mangere), even if the number of school fires appears to have been on a downward trend for some years, serious incidents still occur with little warning.

At risk are the health and safety of pupils, school staff, buildings, expensive equipment, and often irreplaceable educational material accumulated by staff and pupils. These are in addition to the risks to firefighters and the costs to society in providing these and other emergency services.

1.2 Objectives

As noted by Everson (1993):

School fires are of concern to the New Zealand Fire Service. The loss of teaching resources, children's work, administration records, and in some cases, the living history of a school cannot be measured in dollar terms. The loss of buildings and assets places a great strain not only on the Ministry of Education's resources, but on those of the school administrators and the local community.

The overall aim of this project is to help raise awareness of the social and other factors contributing to school fires, and their implications for individual schools, communities and New Zealand as a whole. Hence, to raise awareness in schools of the range of possible measures to reduce risk, and to encourage an increased sense of community responsibility for the protection of public assets.

Main topics of this research are:

Economic costs: Analysing the record of school fires in New Zealand in recent years and identifying economic costs to individual communities and in aggregate. Importantly, this aims to capture not just the loss of fixed assets (buildings and equipment) but also the consequential costs, for example in replacing teaching resources.

Social factors and impacts: Using research and case studies to examine the relationship between social factors and incidence and severity of school fires, and the social and psychological impacts on staff, students, parents and others directly affected.

1.3 Applications of this research

The mission of the New Zealand Fire Service Commission is:

To reduce the incidence and consequence of fire and to provide a professional response to other emergencies.

Hence, one of our central objectives was to produce a report with practical and lasting impacts on risk reduction in schools. As well as contributing to the body of knowledge on fires in schools, this research aims to provide some practical information for school Boards of Trustees, principals, and teaching staff.

1.4 Research approach

The research comprised two main approaches. For the first part, a sample of schools was selected for surveys and interviews to generate new primary information.¹ These case studies sought to identify the fire mitigation, preparedness and response procedures available to schools and local communities, and how well these have worked in practice. In addition, the social impacts on individuals, groups and communities (including school staff, pupils, parents, and volunteers), as well as the factors which can reduce or exacerbate these impacts, were identified and assessed.

The second part drew on existing databases to provide an aggregate picture of trends in the number and severity of school fires in New Zealand, the causes of these fires (malicious or accidental), and costs of reinstatement. We also undertook a geographical analysis of school fires, using appropriate definitions of 'regions' to establish a 'local level' analysis of trends in incidents and costs. The main databases drawn on are those maintained by the New Zealand Fire Service (NZFS) and by the Ministry of Education.

In addition to this statistical work, we conducted interviews with a range of NZFS personnel with regional fire safety responsibilities. This was to help round out our information on the practical experiences of school fires and fire prevention in different regions, and to identify common themes.

¹ The interviews were conducted on a 'no-attribution' basis, to encourage full and frank responses. For this reason, we do not identify the schools that participated in the case studies, nor the individuals interviewed. However, summary descriptions of the schools that participated are set out in Appendix B.

2. RISK MANAGEMENT APPROACHES

2.1 Overview

As indicated in section 1.3 of the Introduction, risk management is a central theme of this research. **Risk** is a function of **likelihood** and **consequence** – what is the probability of a fire in a school and what will be the costs?

Fire is just one of the physical risks facing schools. Fire and other such physical risks compete for attention and resources with other objectives, e.g. educational and social outcomes, that may be higher on the list of priorities.

The following set of crime risks is based on a UK survey, and the 'likelihood' ranking based on aggregate incidence across the sample. Arson does not register as having a particularly high incidence factor, but it is one with a wide range of potential consequences.

The figure indicates the range of probabilities of different property incidents, and the potentially differential consequences of these should fires be involved.

Figure 1 Risk as a function of likelihood and consequence

Property risks in UK schools			
Category	Likelihood	Consequences	
Theft of personal belongings	High		
Burglary	High		
Deliberate damage	High		
Theft of school property	Moderate		
Attempted burglary	Moderate		
Arson	Moderate		
Theft of/from staff vehicles	Low		
Notes: Percentages of schools suffering each crime per annum. Low (under 10% annual probability); moderate (20-40%); high (over 40%).			
Shading indicates consequences from minor (light grey) to potentially severe (darker).			
Source: Adapted from Burrows <i>et al</i> (1993) Figure 3.1, p. 28.			

We note that it is hard to separately assign consequences. For example, burglary or deliberate damage may shade into arson. Arson may result in a minor fire that does limited damage or may become a major disaster for the school.

The relationship between property security in general, and fire risk in particular, is an important issue facing schools, the Ministry of Education, and NZFS. It arose in the case studies, in the interview responses from regional fire safety personnel, and in the international literature.

2.2 The 4 Rs

Britton and Clark (1999) describe the "4 Rs" of emergency management as follows:

- **Reduction** of emergencies. They make a distinction between short term risk reduction (amelioration) and long term risk reduction (prevention) as follows:

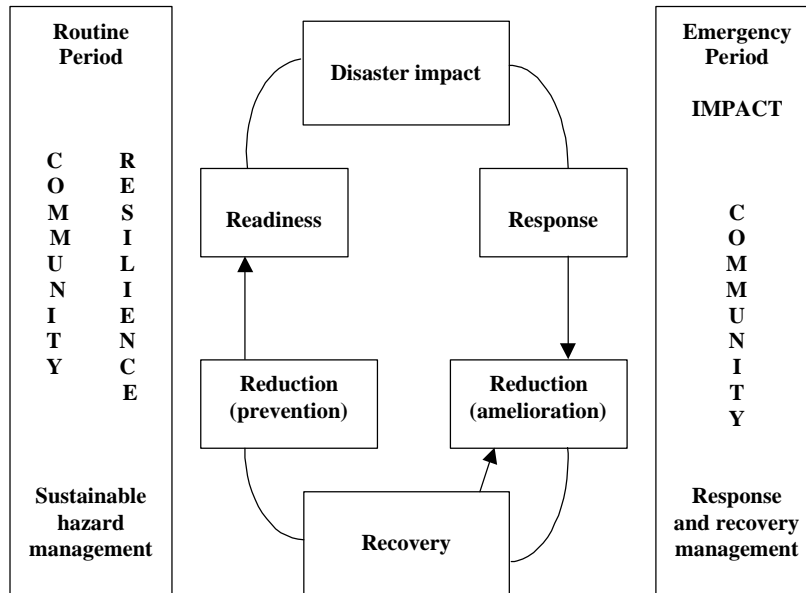
Amelioration (i.e. short term reduction) involves developing policies and programmes that help limit the magnitude of future impacts. They are introduced following disaster impact as a direct result of the damage or disruption caused by a specific impact. In this respect, they are reactive and are designed to restore the community to pre-impact levels.

Prevention (i.e. long term reduction) actions are designed to decrease existing levels of danger, enhance overall resilience and provide sustainable hazard management measures. These actions are deliberately designed to prevent or impede the occurrence of a future disaster event and/or prevent such an occurrence having harmful and long-lasting effects on communities. In this respect, they are pro-active measures.

- **Readiness** policies and programmes are usually involved with the development of response plans, identification of resources, the training of emergency services personnel, and public awareness programmes.
- **Response** policies and programmes are those that become operational once a disaster occurs or threatens.
- **Recovery** policies and programmes address the immediate problems of stabilising the affected community and assuring that life-support systems are operational. These programmes also extend into the longer-term programmes for community rehabilitation and restoration.

Figure 2 illustrates the major components of this domain and shows the relationship between the major components.

Figure 2 The risk management domain

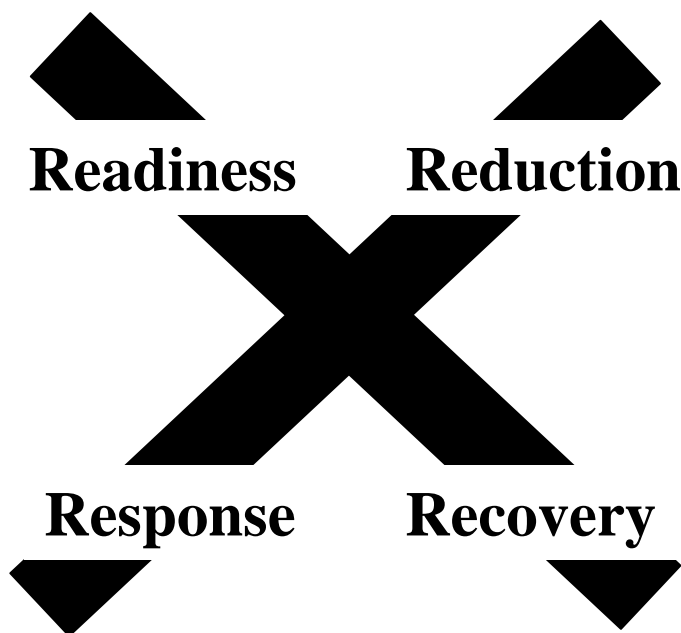


Source: In Britton and Clark, 1999. Adapted from Britton (Wellington Earthquake Lifelines Group, 1994)

As noted by Lunn (1998, p .3) "... the components referred to within the emergency management framework should not and indeed must not be regarded as separate

parts.² Each component will affect and be affected by others". The interlocking relationship between the 4 Rs is indicated in the next figure.

Figure 3: Risk management – the 4 Rs



Source: Adapted from Lunn (1998, p .3)

From the viewpoint of individual schools, risk management strategies can be seen as falling into three categories (Refer New Zealand Fire Service, 1989, p. 79):

- Risk reduction measures involving capital expenditure (e.g. on alarms) or time spent in safe-practice training.
- Spreading the cost of damage incurred through time and with other parties, e.g. through insurance arrangements (including the Ministry of Education).
- Accepting some level of risk, based on costs and benefits of mitigation, and insurance measures.

The reduction and transfer of risk for the individual school has different implications from those for society as a whole. The transfer of risk away from the individual entity does not reduce the risk for society as a whole. Certainly, insurance and international reinsurance spreads the risk over time and geographically, but ultimately the premiums paid by the Ministry of Education, businesses, and households will reflect the loss experienced in school fires.

There is considerable overlap between risk management, as summarised here, and Business Continuity Planning (BCP). BCP, as it applies to schools, is described in more detail in Appendix E. In section 9 we set out a framework for analysing the economic benefits and costs of risk reduction. As will be discussed, an important consideration in such analysis is the budget constraints on the Ministry of Education. The consequence is that trade-offs have to be made between the core business of schools (i.e. achieving educational standards) and reduced risk of fire or other such incidents.

² Refer, for example, 'The New Zealand Coordinated Incident Management System (CIMS)'. First published in 1998 by the New Zealand Fire Service Commission.

3. CASE STUDIES - METHOD

3.1 Methods

3.1.1 Literature search

A search of literature covering the social effects of school fires was undertaken. In the first instance, this information was used to identify issues to be covered in the questionnaire for schools (see below). Issues and trends identified in the literature have also been compared with the results of the fieldwork, where appropriate, throughout this report. The literature search focused particularly on:

- The ways in which schools and the wider community are affected by fires.
- The antecedent factors which increase or reduce susceptibility (particularly to arson).
- Measures that schools have taken to address the risk of fire and/or the impacts of fires.

See the References section of this report for a list of the literature consulted.

3.1.2 Scoping interviews

Prior to developing the questionnaire, staff at several schools that had experienced fires were telephoned and interviewed about their experiences. These interviews helped inform development of the questionnaire (see below).

3.1.3 Selection of schools for case studies

A search was made of databases on school fires held by the Ministry of Education and the NZFS, in order to select schools for inclusion in the study. The Ministry of Education database (see section 8 of this report) was eventually selected for use, as this gives some indication of the extent of damage by citing the cost of loss in terms of Ministry property (buildings). It was assumed that this cost would indicate the approximate scale of each fire, and that the cost of losses borne by each school would be approximately proportional to the costs borne by the Ministry.

Only those schools listed as having had fires between 1998 and 2001 were considered for inclusion. This was to ensure that the experience of dealing with the fire would be reasonably fresh in interviewees' minds. The initial criteria used to select schools was an assessed cost (of capital damage to school buildings) of at least \$20,000. From among the schools that met this criteria, we then selected a cross-section of schools from urban/rural, poor/wealthy areas, and North Island/South Island, to ensure the sample covered as wide a range of socio-economic and geographical circumstances as possible.

A total of 22 schools were included in the study, and these were distributed as follows:

Figure 4 Geographical distribution of case study schools

	City	Provincial Town	Rural	Total
North Island	12	3	2	17
South Island	4	1	0	5
Total	16	4	2	22

The predominance of urban schools that met our selection criteria may reflect the fact that larger urban areas tend to experience school arsons at a greater rate than the national average (Pratt *et al*, 1992). This was not designed to be a statistically representative sample (there are about 2,500 state schools in New Zealand). It was deliberately biased towards schools that had experienced serious fires, in order to highlight the various consequences of such fires.

3.1.4 Questionnaire and interviews

A questionnaire was developed initially as an interview guide for field visits, and later used as a self-administered questionnaire for schools that were not visited. The questionnaire sought information on the particulars of the schools and their surrounding communities, the social and economic costs of school fires, and the process of recovery.

Visits were made to ten schools from Auckland to Invercargill, including rural, provincial town and city schools. A copy of the questionnaire was sent to each school in advance of the visit to give staff time to prepare for the interviews. At least three people were interviewed at each school, including the principal, affected teachers and/or other staff, and in some cases members of the Board of Trustees. Local NZFS staff were also interviewed in some cases.

As well as the field visits, 12 schools were covered by a combination of self-administered questionnaire and telephone interview. Staff at these schools filled out a copy of the questionnaire and mailed it to the researchers. Following receipt of the completed questionnaires, each school was telephoned to clarify some of the more complicated information (particularly on the time and costs involved in the rehabilitation process), and to gather more qualitative information about the experiences of staff and students.

3.1.5 Deprivation Index

Information from the Deprivation Index compiled by the Health Services Research Centre of Victoria University was used to assess the socio-economic status of the communities surrounding the surveyed schools. The Deprivation Index is based on 1996 Census data and uses nine variables to calculate degrees of deprivation. Those variables are:

1. Communication (households without access to telephones).
2. Income (people aged 18-59 receiving a means tested benefit).
3. Employment (unemployed people aged 18-59).
4. Income (households with income below a particular threshold).
5. Transport (people without access to a car).
6. Support (people aged under 60 living in a single parent family).
7. Qualifications (people aged 18-59 without any qualifications).

8. Housing tenure (people not living in their own home).
9. Living space (people living in households above a particular bedroom occupancy threshold).

For this project, the 'local community' was defined by including all households in the Census mesh-blocks (the smallest measure of area used by Statistics New Zealand) that fall within a specified radius of the school concerned. In the case of rural schools a radius of 2km was used. In the case of urban (city and provincial town) schools a radius of 200m was used. The Deprivation Index figures for all of the mesh blocks within each circle were averaged to derive a single figure for each school.

3.1.6 Other interviews

Interviews were conducted with a range of other informants including:

- NZFS staff at several fire stations that had attended fires at the case study schools.
- Staff of the Ministry of Education's central and local offices (regarding contracted support for schools experiencing fires).

4. CASE STUDIES – FIRE CAUSES AND IMPACTS

4.1 Profile of schools and fires in study

Appendix B provides a profile of the schools covered by the survey, and the nature of the fires they experienced. As noted in section 4.2 (below), schools were selected on the basis of their having experienced serious fire damage, so it can be assumed that the damage to the property listed in the final column was significant. As shown by the table in Appendix B, 15 of the 22 schools surveyed had experienced confirmed or suspected arson, while several other fires had unknown causes. Only four of the fires were confirmed as accidental.

4.2 Factors contributing to the consequences of fire

Various factors interact with each other to increase or reduce the overall impact of fires. For example, the benefit of promptly notifying the NZFS is reduced if the school is located a long way from the nearest fire station, or if the affected buildings are built of highly flammable material. It is beyond the scope of this study to address all of these in detail. However, as indicated in the brief review below, there are many variables that interact and influence the outcome of fires.

It is stressed again here that because the schools included in the study were selected on the basis of their having experienced *serious* fires, the sample is *not* representative of all schools that have experienced fires. This caveat also applies to the following figures.

Figure 5 Characteristics of school / fire incident

Characteristic of school / fire incident	Number of schools surveyed with this characteristic (n=22)
Affected building(s) constructed of wood or wood framing with fibrolite cladding	20
Absence of fire protection/detection equipment in affected building(s)	13*
Affected building(s) were covered by monitored smoke alarm but alarm was not effective in alerting NZFS	8*
Fire starting during hours of darkness (outside school hours)	17
Fire reasonably very well advanced by the time the NZFS arrived	21
Damage to affected building(s) extensive – total	20

*Note that in only one case was an alarm system installed *and* effective in promptly alerting the NZFS to the fire. See section 4.2.3 for a discussion of the problems experienced with fire detection systems.

4.2.1 Building construction

The literature identifies building construction as a key determinant of susceptibility to fire damage. In 20 of the 22 case studies the affected buildings had been constructed of wooden framing with either wooden or fibrolite cladding. In all of these cases, the fire had rapidly established and in most cases damage to the building and contents ranged from severe to total destruction.

Internal designs that allow fire to travel unhindered between rooms are another key factor identified in the literature. Interviewees at many of the schools surveyed said that the layout of the affected buildings had contributed significantly to the spread of fire. Specific problems cited included:

- Large ceiling spaces that facilitate the spread of fire from room to room.
- Open plan designs.
- Classroom blocks with long corridors linking many rooms.
- Service ducts (e.g. in the roofs of walkways) linking buildings which spread fire and/or smoke and fumes between buildings.

4.2.2 Building contents and clean-up costs

The ease with which the affected site is cleaned following a fire depends partly on what contents were burnt. In the case of a classroom fire, the burnt materials are mostly furniture and books, and the clean-up, although protracted and messy, is not particularly complex or costly.

Clean-up becomes greatly complicated when hazardous substances are burnt or released as a result of a fire. In such cases, specialist cleaning services may be required to clean all affected surfaces, resources and equipment. Examples from the case studies include:

- A fire in a service duct with a rubber roof. The roofing material, when burnt, released dioxins and hydrochloric acid which permeated the entire administration block. The affected buildings were cordoned off for a week while cleaning was undertaken, and the school's computer infrastructure had to be replaced due to acid damage.
- A fire in an asbestos-clad building which resulted in asbestos being scattered over a wide area of the school grounds.
- A computer which caught fire and burnt inside a library, coating the entire interior and contents of the building with thick, black, toxic 'muck'. Although little else was burnt (the fire self-extinguished), the entire contents of the library had to be discarded and all surfaces within the building cleaned and repainted.

4.2.3 Presence and effectiveness of fire detection measures

The Ministry of Education currently has a policy of installing security alarms linked with smoke detectors into schools as protection against burglary, vandalism and fire (Carter, 1999). These are referred to as 'combined alarms' in this report. Among the 22 schools surveyed, 13 did *not* have these systems at the time of the fire, or at least not in the parts of the school affected by the fire. Of these 13, ten did have some form of protection against intrusion, such as electronic motion sensors (7), random surveillance checks (7) and on-site caretakers (2).

Although in nine cases the affected building was monitored by a smoke detector, in only one case was the alarm effective in terms of promptly alerting the NZFS to the fire. In the other eight cases the fire was detected and the NZFS notified by staff or students at the school, neighbours or passers-by. In these cases the effectiveness of the smoke alarms was limited or negated because of one of the following:

- The alarm was activated but the security service failed to notify the NZFS (in one case it was assumed to be a false alarm, in another the alarm was assumed to have been triggered by a break-in).

- The fire burnt through cabling, disabling the alarm.³
- A contractor working at school had failed to set the alarm after leaving the building.
- The monitoring company was slower to notify the NZFS than a neighbour or passer-by.

A serious problem identified during the interviews was the tendency of some security companies to delay notifying the NZFS when a smoke alarm was triggered. The NZFS has a policy of charging schools for false alarm call-outs after the first two such calls in any six month period (the charge for each call-out is \$1,000 plus GST).⁴ Some school staff/monitoring companies are endeavouring to avoid this charge by making a visit to the school to confirm the presence of a fire before contacting the NZFS. However any delay in alerting the NZFS can lead to a massive increase in fire intensity and damage, due to the exponential nature of fire growth, as shown in Figure 6.

Figure 6: Structural fire growth paths

Time in minutes	Size of fire compared with initial size
2	8x
4	16x
6	32x
8	64x
Source: New Zealand Fire Service (1989, p.18)	

In three of the surveyed cases, a monitored smoke alarm had been activated but the security company had failed altogether to notify the NZFS. The costs of these fires were estimated at:

1. \$19,513 plus 270 hours of rehabilitation time by school staff.
2. \$115,950 plus 2,435 hours of rehabilitation time by school staff.
3. \$351,000 plus 1,860 hours of rehabilitation time by school staff.

We were told that in the case of some early model combined alarm systems, the alarm signal made no distinction between a fire and an intrusion. This requires the security company in question to physically check the cause of the alarm. If the cause turns out to be a fire, the checking process adds a potentially significant delay before the NZFS is notified.

Our survey raised an additional problem with combined smoke/security alarm systems, i.e. that they are subject to human error. An example can be found in the case of the contractor failing to set the alarm after finishing work for the day.

A very small proportion of the schools surveyed were protected by smoke alarms linked directly to the NZFS (there is no legal requirement for them to do this). Only one of the schools surveyed had implemented such a system, following its second serious arson attack.

³ This occurred in two of the schools that we interviewed. In each case, the fire was started deliberately, and outside of the buildings themselves. The fire then moved from the exterior of the building up into the ceiling void. The cables for the smoke alarms were situated in these ceiling voids, and were burnt through by the fire, before the smoke alarms detected any smoke.

⁴ The charge applies to false alarms in the 12 month period following the second false alarm. If no false alarms are recorded, the slate is wiped clean. The aim of the charge is not to punish schools who are trying to improve their fire protection measures. The NZFS, via AFA Monitoring, may waive the charge if the school can prove that it is being pro-active in its attempts to prevent false alarms.

A direct link to the local fire station would greatly reduce the risk of a genuine fire being overlooked, but from a school's point of view, this may be impractical. As noted above, the NZFS charges \$1,125 for each false alarm after two have occurred in any six month period. If a school suffers from regular false alarms, it may prefer to be connected to a security firm, which has a far lower call-out charge.

A school that decides to install smoke or fire detection measures must choose between two options:

- (i) Have alarms that are connected directly to the local NZFS station. This reduces the risk of potentially costly delays in alerting the NZFS if a fire does occur. However, it increases the risk of false alarm call-out charges.
- (ii) Have alarms that are monitored by a security firm. This reduces the financial risk of false alarms - the security firm will only call the NZFS if a fire is present. However, our case studies suggest that delays caused by the slow response of, or errors made by, security firms have been a significant factor in determining the severity of school fires.

4.2.4 Fire suppression measures in place

Smoke detectors provide notification of a fire but do nothing to suppress it directly. Sprinkler systems on the other hand will detect the presence of a fire, transmit an alarm, and suppress or control the fire until the NZFS arrives (Carter, 1999). Ministry of Education policy is to install sprinklers in new schools, but because the cost of retrofitting buildings with sprinklers is relatively high, and because sprinklers are not always the most practical option, the Ministry does not have a programme to install sprinklers in existing buildings (Carter, 1999).⁵ None of the schools surveyed by us had fire sprinklers installed.

Some school staff are averse to installing sprinklers in certain buildings, particularly libraries, because of the potential for water damage if the sprinklers are activated accidentally. In our view, this probably reflects a misunderstanding of the way sprinklers work. Rather than being activated by smoke, modern systems activate when the temperature at the ceiling reaches 57 degrees Celsius. Furthermore, only the sprinkler heads that are activated by such a temperature will "go off", so that water damage will not be incurred in parts of the building/school away from the fire (Carter, 1999).

All schools have high pressure fire hoses installed. In most cases, however, these (and fire extinguishers) are located inside buildings because of vandalism problems. Several instances were cited of bystanders being unable to douse a fire in its early stages, because the fire was affecting the place where the hoses were located.

4.2.5 Timing of detection and brigade response

The time lag between fire establishment and the arrival of firefighters influences the extent of damage. Three factors interact to determine this:

1. *The time until detection.* Because most of the fires covered by the survey were detected by neighbours or passers-by, the time until detection was often quite long.

⁵ The Ministry of Education was discussing a new sprinkler policy with the NZFS at the time this report was in preparation.

2. *Notification of emergency services.* Failure to notify the NZFS immediately following detection (as in the case of some security firms responsible for monitoring combined alarms) can also lead to significant delays.
3. *Response time of emergency services.* This depends largely on the distance of schools from the nearest fire station, but also on the co-ordination between the 111 call centre and the fire stations (see second quote below). A further factor that determines the speed of response is whether the responding fire station is manned full-time by professional firefighters, or is a volunteer station where the volunteers have to get to the fire station from their workplaces or homes before driving to the fire. Some schools were very impressed with the rapidity of response; others were not, as illustrated by the following quotes:

"It was only because the fire brigade arrived so quickly that we managed to save the other two rooms. If it had been another five minutes we would have lost our library and another classroom". – Teacher at a rural school, 16 km from the local (volunteer) fire station.

"Our nearest fire station is at [name of town], which is 36 kilometres away. But the 111 service sent the call to [another town]. That's 47 kilometres away, over a much slower road. It took 40 minutes for the brigade to get here. By the time they arrived, the whole lot was gone. If they had sent the call to the right place, we might have saved something at least". – Principal of a small rural school almost totally destroyed by fire.

4.2.6 Availability of reticulated fire fighting water

The availability of on-site reticulated fire fighting supplies is of great assistance to firefighters. Unfortunately many schools lack these, particularly rural schools. When such supplies are not available firefighters must rely on alternatives such as pumping water from the school pool (if available and located near enough to the fire) or water tankers, all of which take longer to deploy.

4.3 Factors contributing to probability of structural fires in schools

4.3.1 Socio-economic status of the local community

Our review of the literature tended to support a view that schools located in poor areas are predicted to be at higher risk of structural fires in general and arson in particular (Leech, 1992; Burrows *et al*, 1993). This general pattern is supported by the findings of this research: of the 22 schools surveyed, 17 were located in communities of below-average socio-economic status, according to the Deprivation Index (DI) data used (see section 3.1.5 for an explanation of the source of this data).

The DI and Ministry of Education decile rating data (which reflect the Ministry's own assessment of the socio-economic status of schools' local communities) were compared with the causes of fires in the schools surveyed. According to the DI and Ministry of Education figures, 11 and eight (respectively) of the 14 schools that had experienced confirmed arsons were located in communities with below-average socio-economic status. However, the small sample size and the bias towards schools experiencing serious fires make it impossible to draw a link between socio-economic status and the likelihood of arson in the case of the schools surveyed.

4.3.2 Other arson-related factors

a) Visibility

According to Pratt *et al* (1992), the more difficult a school's buildings are to observe from the surrounding roads/houses, the more likely it is that the school will be a target for arson/vandalism. Of the 14 schools affected by confirmed arsons, four were not clearly visible from the street. Of the others six could be described as 'clearly observable' from the street and/or neighbouring houses, and four as 'reasonably clearly observable'. However, 11 of the attacks occurred late at night when the likelihood of detection would have been minimal.

b) Lighting

Quality of lighting in school grounds is another factor identified as influencing the likelihood of arson (Burrows *et al*, 1993). In 11 of the 14 confirmed arson cases, the school grounds as a whole could be described as at least 'reasonably well lit' to 'well-lit'. In all cases, however, there were certain areas which were not well lit. As noted above, most arson attacks were late at night.

c) Security measures

The quality of security measures, including fencing and surveillance, are reported to influence the susceptibility of schools to arson (Leech, 1992; Pratt *et al*, 1992). All but one of the 14 schools in question had had some form of security on-site at the time of the fire: ten had electronic motion sensors/alarms and the remaining three relied on random surveillance checks by security staff. However in most cases electronic systems did not cover the entire school, and the fires often affected unmonitored buildings. None of the schools were securely fenced at the time of the fire.

d) History of vandalism and local property crime

Leech (1992) and Burrows *et al* (1993) point out that schools with a history of malicious incidents (including vandalism and attempted arson) are considered to be at high risk. Staff at seven of the 14 schools concerned considered their school to have had a history of malicious incidents.⁶ Common problems included graffiti, petty vandalism, and the lighting of small fires (often using rubbish from the school's bins).

Several of these schools were used regularly by local youths as places to congregate at night. The Ministry of Education is aware of the link between petty crime and school fires, and has provided advice to schools on techniques to reduce susceptibility to such incidents via the *Education Gazette* and property visits.

A related predictor of arson (Burrows *et al*, 1993) is the level of property crime in the community surrounding the school. Of the 14 schools, eight were regarded by survey respondents to be located in areas *without* high rates of property crime. Note, however, that these judgements were highly subjective.

⁶ It is important to note that school staff tended to make these judgements relative to the perceived levels of crime in the surrounding community. For instance, they often tended to downplay the significance of petty vandalism if the school was located in a city location with a reputation for high rates of crime. In smaller rural or provincial communities, such acts appeared to be regarded as more significant.

5. CASE STUDIES – SOCIAL COSTS OF SCHOOL FIRES

5.1 Types of cost

5.1.1 Emotional trauma – teachers and students

Teachers we interviewed reported that, in the days following the fire, children were often very upset at the loss. Common reactions were:

- Shock ("we didn't believe it could happen to us").
- Sadness.
- Fear and anxiety (about the possibility of another fire).
- Anger (towards the perpetrator in the case of arsons).
- Resentment at not being able to do the things they normally would do (such as playing with toys, visiting the library, using sports facilities).
- Annoyance at the waste of money imposed on their school.
- Grief at the loss of their work, belongings, and their 'place' within the school.

"In this area, a lot of kids have unstable lives. School is the only stable, secure thing in their lives. Some kids prefer school time to the holidays because it gives them that stability. To see their security burnt is very upsetting".

Staff typically suffered significant stress following a fire. For teachers, the trauma relating to the fire itself is compounded by having to deal with disruption and the re-establishment process on top of their normal duties.

"You feel like chucking the job in. Walking in and seeing [the damage] is just devastating".

"You just feel powerless to do anything about it. I cried a lot. I lost sleep. I lost my appetite. I tried to tell myself that it wasn't that bad, that there are worse things that happen in life. But it's still a big loss".

Teachers also found themselves in the position of having to deal with the effects on students.

"Managing the kids was really difficult. I was devastated by the fire but I still had to front up to the kids. They could see that I had been crying and that upset some of them".

Most teachers reported that children usually got over the initial trauma quite quickly. This was probably due to the efforts of staff, who worked extremely hard to ensure that children experienced minimal disruption, and to keep students focused on the positive perspective.

5.1.2 Additional workload

Staff can face a huge burden in terms of time spent on re-establishment following a fire. Depending on which areas of the school were affected, re-establishment included:

- Identifying what was lost and preparing lists for insurance claims.
- Sourcing replacement resources and equipment.
- Processing replacement materials as they arrived and checking them off against the insurance claim.
- Remaking teaching resources (built up over the course of a teacher's career and often irreplaceable).
- Cleaning smoke-damaged resources and equipment.

The re-establishment process can last for a significant period. At 18 of the 22 schools surveyed, the fire had resulted in the closure of one or more buildings key to the functioning of the school (including classrooms, libraries, administration blocks). Of these,

- One was closed for less than one month.
- Eight were closed for between one and six months.
- Eight were closed for between six and 12 months.
- One was closed for 18 months.

In most cases teachers and principals had to cope with re-establishment on top of their regular duties, which often meant giving up significant amounts of personal time. This added significantly to the stress and fatigue they already faced as a result of dealing with the fire. In severe cases, this extra workload lasted one to two years after the fire event, as teachers rebuilt their teaching resources.

"You teach all week, then you spend all weekend making new resources. In the evenings you sort out your teaching programmes [which often have to be modified to cope with the limited resources available]. And on top of that, you've got to have a life".

"There was a year and a half where I would go home from work and spend every evening working to prepare replacement resources. Even now [two years after the fire] there are still units to be written. I can see the light at the end of the tunnel but I need a couple of years off to recuperate". – Maori studies teacher, all of whose resources were hand-made and lost in the fire.

"I'll never get back to where I was – you just get sick of it [replacing lost resources]. And I wasn't even the worst off – my room was only damaged; some people lost their whole room".

5.1.3 Loss of personal effects and work

The loss of personal items and school work is particularly upsetting for staff and students alike. These items are often of great personal significance, which increases the sense of loss on a personal level. Many items, such as the 'personal' teaching resources owned by teachers, are also irreplaceable.

"In the beginning it was a real struggle. All the resources I had from seven years of teaching were lost. I had to remake them all again. I found starting the following year really difficult. Usually I just start the year off with the same resources each time but this time I had nothing".

Losing school work can be devastating for children, especially when they have put a lot of effort into it:

"The children had been working on a huge mosaic; it was a group exercise. They had been working on it for two weeks or more and were just about to finish it when the fire happened".

5.1.4 Disruption of schooling

Disruption of teaching often resulted when classrooms were burnt, necessitating relocation of the class to temporary accommodation. In most cases, two moves are involved: one to temporary accommodation, and a second back to a replacement or repaired classroom. In one case, the administration block was badly affected by a fire at the beginning of term, and the entire school had to be closed while temporary arrangements were made. In all cases, staff worked very hard to ensure that disruption for students was minimised, and teaching of all classes generally resumed after a maximum of a few days. This was never easy, as the following quote illustrates.

"It was difficult trying to maintain regular routines and teach in the middle of chaos, while people were emotionally upset and grieving".

5.1.5 Impacts on learning

Most teachers reported that the quality of education was affected (sometimes significantly) in the short term, but that after two to three weeks things were back to normal. The limited impacts on education reflected the minimal disruption to school operations commonly reported. Impacts on students' education were minimised because teachers worked extremely hard to keep classes running smoothly while simultaneously rebuilding resources and classrooms.

Three cases were noted where learning was significantly affected:

- A small rural school which lost everything except its assembly hall had to rebuild everything from scratch. Teachers struggled to adapt the curriculum to suit what little they had in the way of books and resources. In addition, classes had to share alternative classroom space which proved very disruptive.
- An Auckland high school lost its library for four months (until a temporary library was available). For many of the pupils attending the school, the loss of the library made it very difficult to study, because they lacked the space and/or resources to study at home.
- A teacher from an urban intermediate school said many of her students became disheartened and unmotivated as a result of losing almost an entire year's work. She said that this noticeably affected the performance of some students for the remainder of the year (one term).

5.2 Factors influencing the severity of social costs

5.2.1 Parts of school premises affected

The part(s) of the school affected by the fire have a strong bearing on the impact on learning. Generally speaking the most significant impacts resulted from fires in classrooms, resource rooms and libraries, because these fires impacted directly on the school's core function: education. The greatest impact occurs when core teaching/reading resources are lost, such as when a library or resource room is burnt. The replacement process can take a very long time (up to two years in the case of schools surveyed). Until new resources were acquired, teachers had to make do with resources borrowed from the National Library or donated by neighbouring schools, etc. Fulfilling the requirements of the syllabus without the correct resources presented great difficulties for some teachers. Fires in administration blocks can also severely disrupt the running of a school.

5.2.2 Time of the year

The time of year that the fire occurs has an influence on the severity of emotional trauma faced by children. If it occurs during the holidays then children have a chance to prepare themselves for a changed school environment, and the worst of the damage may be rectified before they return. With a term time fire, children have no warning and are suddenly confronted with the destruction and loss. Fires during holiday periods give teachers more time to prepare ahead of the start of term and minimise disruption for students. Fires during term time give teachers no such opportunity. The following quotes illustrate the range of possible experiences. The first relates to a fire that happened during the Christmas holidays; the second to a fire that occurred during a school day.

"The saving grace was the fact that the fire happened during the holidays. That really limited the effect on the kids".

"A number of children were very upset, had nightmares, wet beds, etc. Some shifted from the school to get away from the bad memories".

Time of year also influences the degree to which staff are able to cope with the extra workload. If it occurs during term time then the process has to be dealt with on top of normal teaching duties. If it occurs during the holidays (particularly during the Christmas holidays) then staff are able to concentrate on re-establishment without having to teach as well (although they do still have to prepare for the coming term). However this means that staff lose their holidays, and as a result many begin the following term very tired.

Time of year partly determines the likelihood of losing personal items. If the fire occurs during the Christmas holidays then losses will be minimal for students as they will have taken their possessions and work home following the end of year. If the fire occurs during term time and late in the year, the potential for losses is highest. In any case, the loss to a teacher from a classroom fire is likely to be high because their 'personal' teaching resources tend to be stored in the classroom.

5.2.3 Responsiveness of contractors

Each local office of the Ministry of Education has a contract with one or more emergency contractors, charged with responding to major events such as fire, storm damage, etc. When a fire occurs in a school the NZFS notifies the appropriate emergency contractor who then makes an assessment of the damage, arranges for the site to be secured, and arranges sub-contractors to repair the damage (if necessary).

The speed with which contractors (either emergency contractors or sub-contractors) were able to start on rehabilitation work, and the degree of help they were able to provide, seemed to vary widely between the schools surveyed. This probably reflects several factors:

- The location of the school (the range of available contractors is greater in large urban centres and more limited in rural areas).
- The extent of damage (e.g. a builder is more likely to be able to respond quickly to a small repair job than a major one).
- The nature of what has been lost/damaged (damage to buildings is handled by Ministry of Education contractors while damage to school resources has to be addressed by staff).

5.2.4 Availability of alternative accommodation

The availability of alternative accommodation is a key determinant of the extent of disruption. Some schools were fortunate enough to have sufficient spare classroom space available to accommodate the displaced classes. Others had to use alternatives such as:

- The school assembly hall.
- Prefabs brought on-site by the Ministry of Education.
- Special purpose teaching space (e.g. special needs teaching units).

In one case, three classes from one school relocated to classrooms in a nearby vacant school. This situation was very difficult for the teachers concerned because they were isolated from the administrative support services of the school. In effect, they had to run their own miniature school as well as teaching their classes.

Delivering quality education was very difficult for teachers whose classes had to use cramped or crowded accommodation (as in the case of two classes that had to share a hall, and others that found themselves crammed into inadequately sized prefab units). Teachers found these circumstances very trying, and reported that children became stressed, frustrated and unsettled.

"The kids found living in the pre-fabs really stressful. They didn't have anything to play with on wet days. They had nowhere to go and no games to play... It was hard for us too. We are usually quite social during the holidays but by the end of the year we couldn't stand the sight of each other. We had nowhere to go for peace and quiet. We had to help each other, look after each other, bite our tongues when we got annoyed. Because we were stressed, the kids picked up on it and got stressed as well".

"I felt very unsettled for the whole term because I was sharing a room with another teacher. There was nowhere to leave my stuff – I was always having to cart it back and forth. I didn't even have a desk! It was very frustrating. It took me a long time to settle into planning because I didn't have my own resources. I was always having to borrow and buy stuff".

5.2.5 Significance of what was lost

The significance of the building affected has a large bearing on the degree of trauma experienced by children and staff. In the case of a classroom, some children are likely to have significant emotional attachment to it as part of their 'world', and to have their own possessions and work stored there. If a library is burnt then students from the entire school are affected and some will be very upset.

"Some of the children used to love going to the library. For some of them, it was the highlight of going to school. They were very disappointed when they couldn't use it any more".

One of the most traumatic cases covered by this study was that of a Maori studies unit. The unit had been the centre of the Maori community at the school, and had very significant spiritual significance for the school pupils and the wider community. The loss of the unit through arson 2 ½ years previously was a devastating blow, as the following quote from the teacher illustrates:

"Emotionally, I still can't face dealing with some of the materials that were rescued from the fire. Some of the tukutuku panels and other stuff are still sitting in a shed at the school – I just can't face going down there".

5.2.6 Arson or accident?

The severity of emotional impact is influenced by the fire's cause. Staff reported that in the case of an accidental fire, children are better able to accept it and 'move on' than in the case of an arson. Arson was often perceived by children as an attack on them and/or the things they valued. Children who had experienced an arson were often angry, wanting to know why they had been attacked in this way. The trauma associated with arson was generally more long-lived than in the case of an accidental fire.

5.2.7 Proportion of the school affected

If a large school loses a relatively small proportion of its buildings, chances are that the staff can spread the workload associated with re-establishment. On the other hand a small rural school we visited (three teaching staff and 40 pupils) had lost all of its classrooms, its library and its administration block. All of the staff had to be heavily involved in the rehabilitation process, which lasted about two years. In the meantime there had been changes to the curriculum and they had fallen behind:

"We lost two years of curriculum development. There were new areas of the curriculum in health and art which we were supposed to be doing. We just didn't have time to deal with the new areas on top of everything else we had to do".

5.2.8 Actively dealing with the trauma

Several of the schools visited had, immediately following the fire, initiated a process of discussion among the school community about the fire and the way forward. Those that had done so regarded this as essential to a quick recovery from the emotional trauma, as well as creating a positive outlook among staff and students regarding the future. Important steps included:

- Holding an assembly to explain what had happened and what the staff planned to do to address the damage.
- Giving the children a chance to ask questions and express their feelings about the fire (some schools had the children draw pictures and/or write stories about their experiences of the fire).
- Providing one-on-one counselling to those children who needed it.

"The first thing we did was write stories about the fire – what we'd lost and how we felt. We made sure it was discussed. We talked about it a lot".

5.2.9 Strength of leadership

Some principals said they and other staff had consciously worked to create a positive attitude among the school's pupils, staff and wider community about the recovery process and prospects for the future. They were convinced that this had greatly eased the process of adjusting to the loss, and of getting stuck into the recovery process.

"I think the principal needs to take an up-front leadership role in the recovery process, to demonstrate that things are under control, that progress is being made, etc. There is a need to recognise that there will be short term pain, but if you hang in there, the long term will be OK. It might even be better. You need to think about the opportunities that have been created. How can you improve the future?"

"Right from the start we made sure we demonstrated to the kids that things were going to be alright. We called the recovery Project Phoenix – rising from the ashes. The focus was on what we could do to make the school even better than it had been, rather than on what had happened".

5.3 Issues relating to recovery

5.3.1 Replacement of damaged or destroyed resources

Buying replacement books after a library or resource room fire is complicated by whether the titles that were lost are currently available. Often the books that were lost had gone out of print, so staff had to research appropriate substitutes, which takes considerably longer than simply buying replacement books.

5.3.2 Wealth of the school

Cash on hand, in combination with the value of items lost, can influence a school's ease of recovery. For example, the items lost by a 'poor' school may be worth little in monetary terms and are therefore not worth claiming on insurance. At the poor school, books and equipment are more likely to be old and worn, and teaching resources are

likely to be hand-made rather than purchased. Staff are faced with the task of remaking new resources, and fundraising to buy new equipment:

"Our lawnmower was a real old dunger, but it worked OK because the caretaker kept it going. It wasn't worth anything so we couldn't claim for it after the fire. We had to scrape around to find the money to buy another one."

5.3.3 Wider community response

The degree to which the local community (including parents and others such as Board of Trustees members) got involved in the rehabilitation process was quite variable. Some schools experienced overwhelming levels of support, while others said they had virtually no offers of help. Support provided included donations of time (assistance) and (less frequently) donations of money/resources.

There appeared to be little relationship between the level of day-to-day involvement by parents and others in school affairs and the level of support offered following a fire.⁷ Nor is it possible, using our data, to draw a link between the socio-economic status of the surrounding community (using either the Ministry of Education decile rating or the Deprivation Index data) and the level of support offered by the community (either in terms of assistance or resources).

The main factor influencing the level of community involvement in the rehabilitation process appeared to be the particulars of the loss. Assistance was generally greatest in the case of library and classroom fires where the process of rehabilitation involved a great deal of time and the tasks could be more easily delegated to volunteer helpers. In some cases where buildings were affected but resource losses were limited, parents and others from the community had offered to help with rehabilitation, but there was little they could do.

Similarly, there appeared to be a link between the perceived human cost of a school fire and the expression of support from the wider community. Fires affecting the performance of core school functions (classrooms, libraries, administration blocks) seemed to attract the most offers of assistance and expressions of condolence.

The ways in which parents and Boards of Trustees members provided assistance included:

- Cleaning up the fire site.
- Cleaning up materials and resources rescued from the fire.
- Making inventories for insurance claims.
- Sorting/classifying/processing new books/resources claimed on insurance.
- Moving classes into alternative accommodation.

⁷ We had expected that in the case of rural schools, community involvement in school activities would be higher than in the case of urban schools, but this was not necessarily so. In the case of the smallest rural school visited, the local community was hardly involved at all, and no after-hours use was made of school grounds. Improvements to road travel had made it easier for local people to travel to larger towns nearby and so local people no longer socialised in the local community. This reflects a general trend recognised by social geographers: the notion of 'community', once synonymous with geographical settlement, can now be applied to a wide range of contexts. People today are more likely to describe their communities in terms of networks of people with whom they share something in common. This may be a residential location such as an apartment building, suburb or a town. But it can also be a common field of work as in 'the science community,' or a common ethnicity as in 'the Pacific Island community'.

- Planning replacement building(s).
- Providing emotional support to staff.

In eight cases, the community (parents, PTA, community groups) had donated resources. Resources donated by the wider community were mainly cash (through fundraising initiatives) and second-hand books. In one case, a local Lions Club donated a replacement photocopier, and in another, the local RSA gave the affected teacher and her husband a meal, and contributed money towards the cost of her lost personal items. In another, a local hotel provided space and office equipment for the administration staff to use during the school's enrolment week.

In nine cases neighbouring schools had provided significant support to the affected school. Assistance included:

- Donation or loan of replacement books/resources.
- Fundraising.
- Practical assistance with processing replacement resources.
- Provision of food for staff (morning and afternoon teas, lunches).

5.4 Adoption of improved practices

Of the 22 schools surveyed, 13 had no fire detection equipment installed (in the affected building or in the school as a whole) at the time of the fire. Of these, eight had installed combined smoke/security alarms since the fire, either throughout the entire school or in previously unprotected areas (one of these was now linked directly to the local fire station).

Of the eight schools that had been protected by combined alarms which failed to work (see section 4.2.3), two had since fenced their grounds, and one had changed to a different monitoring company offering a better level of service. Four other schools had made changes to their security arrangements including upgrading of monitoring systems and having more frequent patrols.

In addition to the measures noted above, some schools had made changes to their own fire safety management practices, as discussed in the following sections.

5.4.1 Litter management

Several of the schools that had been targeted by arsonists had responded by relocating rubbish bins away from buildings. Another common response was to replace plastic bins with galvanised steel ones to minimise the likelihood that any fires started inside the bins would spread further.

One school, where a fire had been started by an arsonist setting fire to the contents of a rubbish bin, had installed new detachable rubbish bins which were put out at 8.00 a.m. each day, then emptied and locked away at 1.30 p.m. All classroom rubbish bins were also emptied daily. All rubbish was put into a locked skip, located far away from any school buildings. Any flammable debris such as fallen branches was also gathered regularly and removed from the site. In this way, potential fire-starting material was kept to a minimum near the school buildings.

5.4.2 Taking records home

Some teachers at schools that had experienced particularly serious fires had adopted a habit of taking important student records home with them each night. The volume of

material involved was quite substantial: one individual carried the equivalent of three foolscap filing boxes of material practically everywhere she went.

5.5 Positive outcomes

Virtually all of the school staff members interviewed referred to positive outcomes which had accrued to the school as a result of the fire. Losing buildings creates the opportunity to design a new facility that meets the current needs of the school. In many cases principals and teachers felt that, despite the pain of the initial loss and the tremendous amount of work involved with rehabilitation, the school had somehow gained from the whole affair. Examples of the opportunities afforded by a fire included:

- The chance to update the school's book collection following a library fire.
- Freeing up the capital works budget to use on other projects, rather than maintaining old buildings lost in the fire – all maintenance/upgrading work was effectively taken care of at once and paid for by insurance.
- The chance to remodel parts of the school to suit modern requirements.

"The good side is that now we have really nice classrooms. The fire got rid of a lot of 'dead wood' resources. Now we have better resources".

"The whole experience has given the kids a positive message: even if you lose everything, if you pick up the pieces and work together, you can make it work again".

Some schools took the opportunity to involve teachers (and in some cases students) in the design of replacement buildings, which had helped to build a sense of ownership of the school among the school community.

5.5.1 Social cohesion

Some schools reported that the experience of dealing with the fire had positively impacted on the degree of cohesion among the local community and between the community and the school. In 12 of the 22 cases, respondents considered the fire had provided a focus for action that had helped to draw the community together (to some extent at least) For example, the principal of a school that prior to the fire had experienced little community involvement in the school had this to say:

"The level of community investment in the school has increased. Most local people had input into the rebuilding process. Now the community feels that this is their school... The Board [of Trustees] now has a greater sense of ownership as well: they got to do something positive rather than just 'chugging along' with the usual admin. The Board is now inspired to be more involved in the school".

Another principal highlighted the lessons learned by the wider community as a result of the fire:

"The fire made people more aware of the dangers of fire – how easily they start, how quickly they spread, how difficult it is to put them out".

6. CASE STUDIES - INSURANCE ASPECTS

6.1 Introduction

School buildings are owned by the Crown. Insurance of these buildings is therefore compulsorily arranged by the Ministry of Education. State-owned schools may, however, insure their *contents* with private insurers.

The buildings of private schools (100% privately owned) and State Integrated Schools (e.g. Catholic schools) are not the Ministry of Education's responsibility. These schools must purchase insurance for buildings from a private insurer.

Most of the schools surveyed had taken out their own contents policies.

All of the schools surveyed had prepared insurance claims after the fire. In most cases things had gone relatively smoothly. In all but one of the cases where the claim had been received, the amount received was equivalent to that sought, minus the excess. A few schools had experienced difficulties with the claims process, as detailed below.

6.2 Difficulties in preparing insurance claims

The ease with which staff were able to identify the items lost in a fire for insurance claims varied greatly between schools. The key factor appeared to be whether or not the school had current inventories of resources and equipment at the time of the fire. Those that lacked an inventory of items stored in each room struggled to prepare lists of what they had lost. Generally speaking, good inventories simplified the claims process from the point of view of both claimant and insurer.

However, some schools that had up-to-date inventories still had difficulty identifying everything that was lost because, in addition to those items normally stored in the room(s) affected, other things that had been temporarily stored there were also lost. Examples included books borrowed from the school library or resource rooms. In addition, teachers' 'personal' teaching resources, and the personal effects of staff and students, were never listed on inventories. Many teachers reported that, years after the fire event, they would think of things they needed for an up-coming class, only to discover that they had been lost in the fire.

"A fire is like a burglary. You don't know that something is missing until you look for it".

6.3 Disagreements over value

In most cases the claims process had gone smoothly. Many interviewees remarked on how helpful the insurance agents had been in providing advice on claim preparation and how promptly the claim had been settled. One school, however, had had a lengthy argument with the insurer over the value of the lost resources. The fire had destroyed the contents of the school's library. The argument was over whether the replacement books should be hard- or soft-covered. The school had obtained a quote for replacement of the books in a variety of hard and soft covers, but the insurer argued in favour of replacing all books with soft covers. The school's preference eventually prevailed, but the argument significantly delayed the rehabilitation process.

6.4 Difficulties keeping track of what had been replaced

Some schools struggled with the task of checking replacement resources off against the claim and keeping a running tally of what was still to come in (particularly in the case of extensive fires). Others had developed very clear cataloguing systems which made this task relatively straightforward. It was suggested that the Ministry of Education could provide guidance for schools on how best to deal with this process.

6.5 Need for bridging finance

Most schools said that their insurance claims had been settled quite promptly - an initial payment was usually available within a few days, with the remainder of the claim being settled within a few months. In three cases, insurers had been slower to pay out and this had created difficulties for the school trying to re-establish its resources.

One school, that had lost all of its classrooms and its library in a fire during term time, needed to start buying furniture and resources immediately in order to resume teaching. The school principal asked the insurer and the Ministry of Education for bridging finance to start the process of re-establishment ahead of preparing the insurance claim, but none was forthcoming.⁸ The school chequebook was used to purchase initial items, and this led to problems for the school in its later dealings with the insurance company (the company was reluctant to pay out on some items that the school had already replaced). It was suggested that the Ministry of Education could assist schools in this position by making an emergency fund available. Another option would be for schools to include provisions in their contents insurance policies so that a certain level of funds would be made immediately available in such situations.

According to the Ministry of Education, bridging finance has been provided in the past for some large claims. In cases where the purchase of replacement items is urgent, the Ministry and its insurer advise that schools can replace these items, but that they may not get paid the full replacement cost in the resultant insurance claim.

⁸ This contrasted with the experience of at least one other school, where the insurer released a down-payment immediately following the fire, and ahead of the insurance claim being filed, which enabled the school to begin the process of re-establishment while simultaneously preparing the claim.

7. REGIONAL TRENDS

Sections 4 to 6 of the report were based on individual case studies – 'snapshots' of a small sample of state schools that had experienced serious fires. In this section we put school fires in a broader context, through analysis focused on the eight NZFS regions. The analysis comprises:

Data analysis

Trends in the number of structural fires in schools are set out, for the period 1991 to 1998, drawing from NZFS's *Fire Incident Reporting System (FIRS)* database. Two levels of disaggregation are shown:

- For the NZFS regions, which are quite extensive.
- For individual Territorial Local Authority (TLA) districts, based on geocoding of the data by NZFS, and as set out in Appendix A.

The national trends section (section 8), shows that number of serious fires in schools has fallen slightly over the 1990s. We would expect that trends in some of the major regions would show similar patterns.

Interviews

In order to gain further insights into regional trends and issues, we conducted phone interviews with the Assistant Region Commander (Fire Safety) in each of the eight NZFS regions (see preface).⁹ These interviews were conducted in the period from September to October 2001. They addressed issues such as:

- Changes in the number/severity of fires in schools in the region in the last couple of decades.
- Factors in the region (e.g. social, physical location and layout, age of schools, fire protection measures, etc.) that might make certain schools particularly vulnerable to fires (either accidental or deliberate).
- Fire protection measures adopted by schools in the region currently. Were these measures changing over time? How could schools in the region improve their fire safety measures?
- Preparedness of schools in the region for the possibility of a fire:
 - Evacuation procedures.
 - Property protection measures.
 - Business Continuity Plans.
- Strategies that the NZFS had implemented and/or is implementing to make schools more aware of the risk of fire. How successful have these strategies been?

However, these were only a guideline for the discussions. The aim was to get a cross-section of views on fire safety in schools.

⁹ The Transalpine region had no Assistant Region Commander (Fire Safety) at the time of the research.

7.1 Northland region

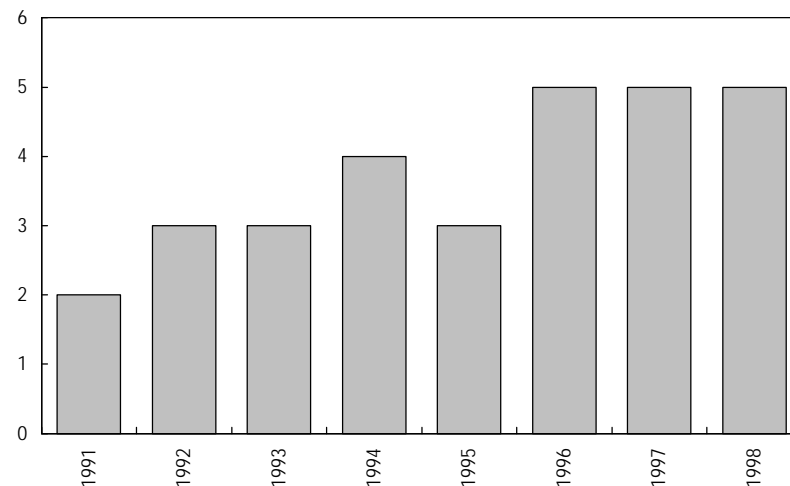
7.1.1 Trends

The TLAs in the Northland region are: Far North District, Rodney District, and the Whangarei District.

Total NZFS Northland region

Figure 7 School fires in NZFS Northland region

Number of structural school fires



Source: NZFS

There is no clear trend observable in this data. However, the low number of school fires - between two and six a year in the 1990s - suggests that school fires were not a major problem in the Northland region in that period.

7.1.2 Discussion points

Our interview with the Assistant Regional Commander (Fire Safety) generated the following insights:

- In the preceding three years there had been very few serious fires in schools in the region. This is confirmed by the FIRS data, which shows that in the July 1995 to December 1998 period, there were only two structural school fires in the Whangarei District, four in the Rodney district, and three in the Far North region. The most serious fire in recent years was the electrical fire at Hukerenui primary school in August 2000, which had an insurance cost to the Ministry of Education of around \$327,000.
- Contributing to the low numbers of school fires is the respect that communities have for the schools in the Northland region. Schools are often the focal point of these communities, with sporting and cultural activities taking place at nights and weekends. Often, generations of family members and whanau have attended a certain school, and each new generation is made aware of the importance of the school in their family's development. This leads to students having a healthy respect for their schools. Graffiti and petty vandalism are also fairly minimal in schools in the region.

- Many schools in the region had very little fire protection in place. There had been a recent move towards smoke detector installation.
- The NZFS in the region was trying to get more schools involved in the 'Firewise' educational programme, in order to make students, and hence their family and whanau, more aware of the risks of fire.

7.2 Auckland region

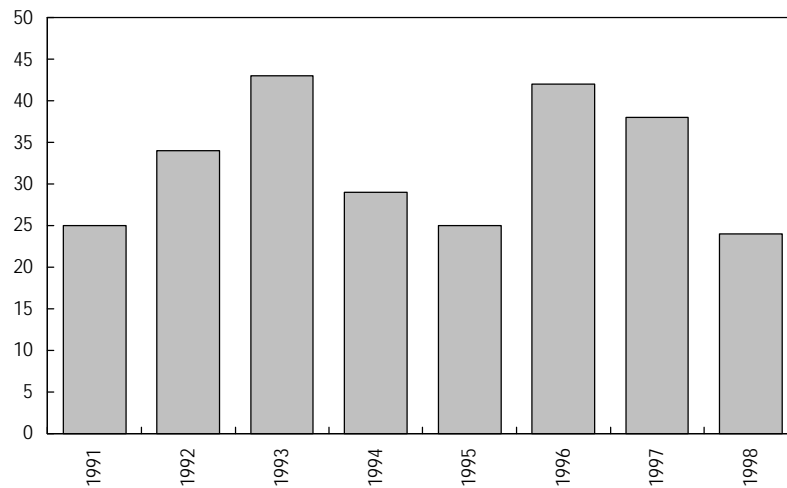
7.2.1 Trends

The Auckland region includes the following TLAs: Auckland City, Hauraki District, Kaipara District, Manukau City, North Shore City, Papakura District, and Waitakere City.

Total NZFS Auckland region

Figure 8 School fires in the NZFS Auckland region

Number of structural school fires



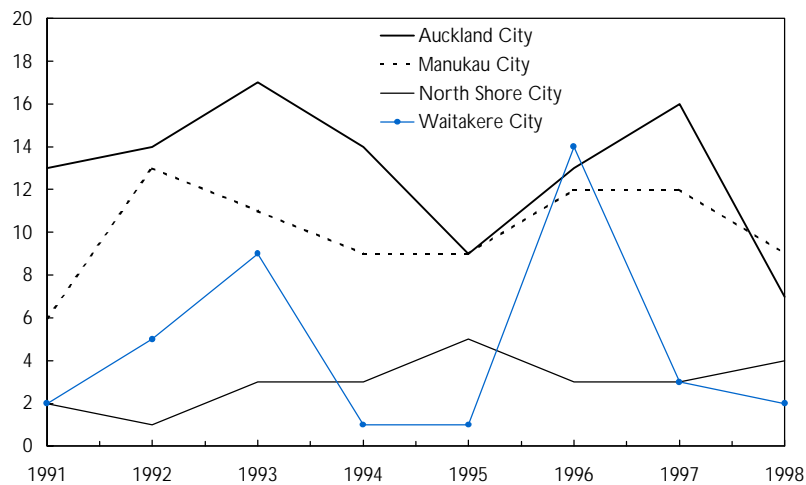
Source: NZFS

The number of structural school fires in the Auckland region reached a peak of 43 in 1993. After dropping slightly in the mid-90s, there was a pick-up in 1996, before numbers started to drop again. Experience in the region was that school fires followed a cyclical pattern.

Auckland TLAs

Figure 9 School fires in Auckland TLAs

Number of structural school fires



Source: NZFS

The figure above shows the pattern in school fires in the major TLAs in the Auckland region. The spike in the 1996 Auckland regional data was caused by a spate of fires in Waitakere City.

7.2.2 Discussion points

a) Auckland region

Discussion with the Assistant Region Commander (Fire Safety) for the Auckland region provided the following points of particular interest:

- Although the number of school fires had remained fairly steady in recent years, the severity of these fires had decreased.
- School fires tended to occur in a cyclical manner, with quiet periods being followed by a spate of fires (possibly due to 'copycat' actions).
- The use of plastic wheely bins, kept outside school buildings, had increased the opportunity to start small fires, which had a tendency to spread easily.
- Over the last decade, schools have become more aware of the risk of fire. However, there might have been a tendency to place too much faith in the combined security/smoke alarm systems. According to the NZFS staff member interviewed, many of these systems suffered from a lack of proper maintenance, resulting in them working less than efficiently. For example, batteries were not checked and replaced regularly, and some systems were affected by moisture problems due to leaks in the buildings.¹⁰
- Sprinklers had not been installed by schools for the reasons discussed earlier in this report: the decision by the Ministry of Education not to retrofit; a misconception that

¹⁰ The responsibility for the maintenance of security/smoke alarm systems lies with the Ministry of Education's service provider, Argest Technical Services Limited. This maintenance is required to ensure that school buildings have a current building warrant of fitness, as required by the Building Act (1991). The Ministry believes that this maintenance has been carried out where necessary. This may well be true. However, it may have been the case that some schools were simply unaware that problems existed, and thus did not contact the service provider.

if one sprinkler is activated, the rest also go off; and the belief that sprinklers cause too many false alarms.

- The STEPS programme was not popular in the Auckland region.¹¹ This may have been due to a lack of willingness of schools to take on additional paperwork.
- Many schools were more concerned about security risks in general than the risks of fire specifically. The attitudes of schools towards increased security measures were quite different to their attitudes towards fire protection.
- Many of the region's schools were built in the 1950s, resulting in Auckland having quite an old 'age profile' of school buildings. A large number of schools were also erected in the 1990s during the more recent period of strong population growth. As schools have expanded, a large number of pre-fabricated classrooms have been used to house students. These provide a greater fire risk than classrooms constructed out of mortar and bricks.
- Fire awareness was being promoted via the students in the schools (with the 'Firewise' programme), rather than via principals and Boards of Trustees.
- It is difficult to persuade schools to invest in and practice evacuation procedures. Schools are advised by the Ministry of Education to hold trials twice a term. The lack of interest in investing time and resources into evacuation schemes is because the majority of school fires occur outside of regular school hours, hence the perceived risk to life from fires is low.

b) South Auckland area

A discussion with the Fire Safety Officer for South Auckland resulted in the following points of discussion:

- Most schools in the South Auckland areas did not have NZFS-approved evacuation schemes (note that there is no legal requirement for such schemes to be approved). One college had not had a trial evacuation for at least six years.
- There was a great deal of inconsistency between, and inadequacy of, fire protection measures in schools in South Auckland.
- Delays between the activation of combined alarms and the arrival of the NZFS have had huge consequences in the region recently. These delays have often been caused by the slow response of security firms. For example, there had been two serious fires at Mangere (South Auckland) college in September. In the first, there was a 7 minute delay between the combined alarm activating and the security guard getting to the college and subsequently calling the NZFS. In the second fire, the delay was around 20 minutes.
- A further problem with some alarm systems was that, unless the fire was clearly visible to the NZFS upon arrival, they often had no immediate way of finding out exactly where it was situated. They frequently did not have access to the alarm's control and display panel, which showed the whereabouts of the fire. One suggestion was that all fire alarm systems should be linked to a box at the main school gate, to which the NZFS has access.
- Based on NZFS experience, there may be ways that schools and communities can help identify the level of fire risk facing a school. It was estimated by the NZFS that only 17 - 19% of all fires in schools were reported to the NZFS. The fires that were not reported presumably went out by themselves, or were attended to by staff using hose and/or fire extinguishers.

¹¹ See Appendix C for a review of the STEPS programme.

- The NZFS tended not to find out about these fires until they attended a serious fire in the same school. It would be beneficial if schools contacted their local community fire officer to report these issues. If all fires were reported to the NZFS, they could gain some idea of recent patterns of fire-starting, and could advise the relevant school as necessary on their fire safety precautions. This reporting could also apply to petty vandalism, which could be reported to the police, who could then identify the level of risk facing a school from such intruders. This was important, as "it has been generally recognised through local and overseas research that major fires in schools are often preceded by a series of vandalism attacks" (NZFS, 1993).
- The NZFS tries to keep media attention to a minimum on school fires in the South Auckland area, in order to prevent 'copycat' crimes. Many arsonists light fires to try to get recognition or mana from their peers. If media coverage is minimal, then the recognition that the arsonists gain is lessened, and there is less risk of copycat fires.

7.3 Waikato/Bay of Plenty region

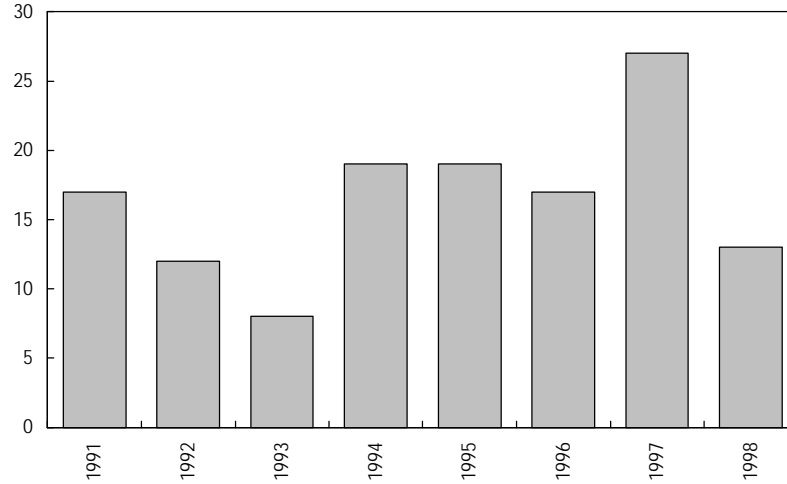
7.3.1 Trends

The Waikato/Bay of Plenty region contains the following TLAs: Hamilton City, Kawerau District, Matamata-Piako District, Opotiki District, Otorohanga District, Rotorua District, Ruapehu District, South Waikato District, Taupo District, Tauranga District, Thames-Coromandel District, Waikato District, Waipa District, Waitomo District, Western Bay of Plenty District, and the Whakatane District.

Total NZFS Waikato/Bay of Plenty region

Figure 10 School fires in the NZFS Waikato/Bay of Plenty region

Number of structural school fires



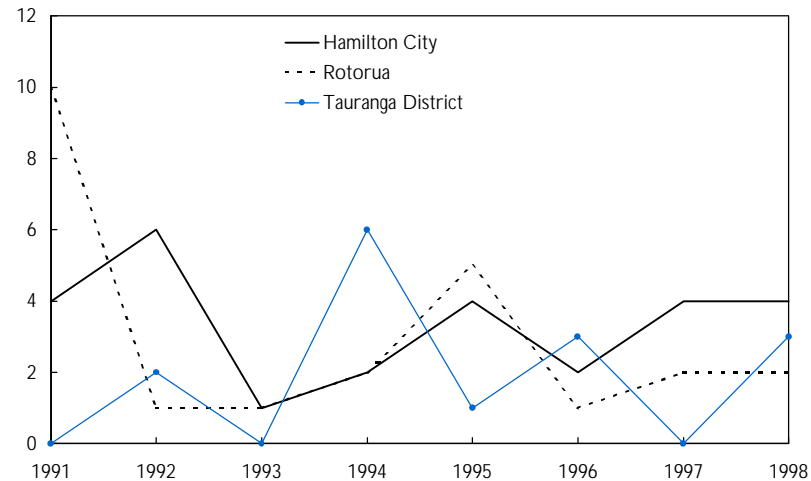
Source: NZFS

The number of structural school fires in the Waikato/Bay of Plenty region peaked at 27 in 1997. There does not appear to have been a discernible trend in school fires in the region over the period.

Waikato/Bay of Plenty TLAs

Figure 11 School fires in Waikato/Bay of Plenty TLAs

Number of structural school fires



Source: NZFS

School fires in the region have been dominated by the Rotorua, Hamilton and Tauranga TLAs, which are the largest population centres.

7.3.2 Discussion points

A discussion with the staff member responsible for specialist technical fire safety advice in the region yielded the following points:

- Very few of the fires in schools in the region are non-suspicious. Recent high profile cases such as the gym fire at Fraser High School and the fire at Hamilton Boys' High School were both caused by arson. In both of these cases, the fire took hold too quickly for the NZFS to do anything other than limit the spread of the fire.
- Combined alarms are the most common systems present in schools, and are becoming increasingly popular. Very few have alarms connected directly to the NZFS, and virtually none have sprinklers.
- The NZFS in the region actively educates schools regarding the myths surrounding sprinkler systems. However, the cost of installing and maintaining the systems deters schools from installing sprinklers. It is also recognised that sprinklers may not be the optimal solution in all schools.
- Evacuation procedures for schools are very strongly promoted in the region, and most schools who need them now have procedures that satisfy NZFS regulations. The NZFS in the region do not wish to be responsible for any loss due to poorly designed/administered evacuation schemes, and so are pro-active in their efforts to ensure compliance.
- Business Continuity Planning is less common, and is partly dependent on the principal of the school. If he/she comes from a commercial background, BCP is more likely to be employed in the school for which they are responsible.
- The 'Firewise' programme has been promoted strongly in the region, and is now being taken to secondary schools. The take-up rate by schools wishing to use the programme is higher than the national average.

7.4 Eastern region

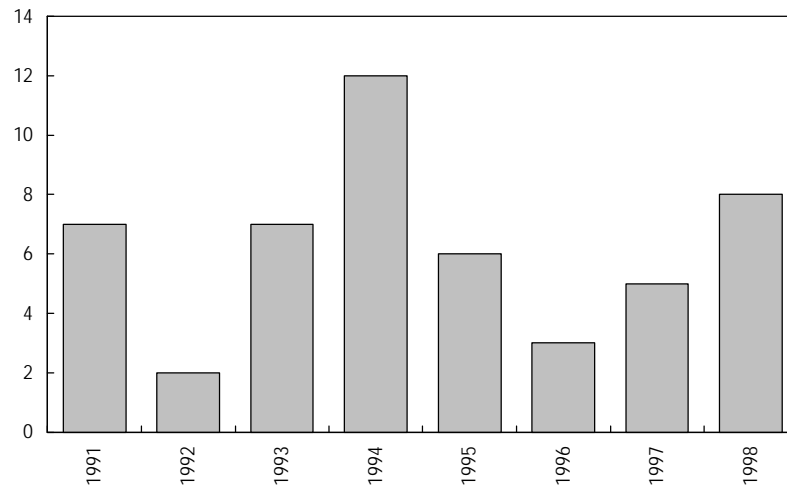
7.4.1 Trends

The Eastern region contains the following TLAs: Central Hawke's Bay District, Gisborne District, Hastings District, Napier City, and the Wairoa District.

Total NZFS Eastern region

Figure 12 School fires in the NZFS Eastern region

Number of structural school fires



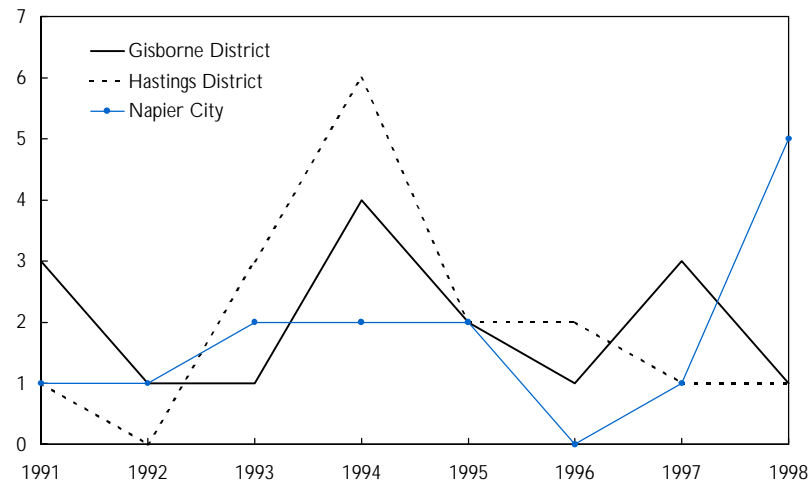
Source: NZFS

School fires do not appear to have been a large problem in the Eastern area. This explains why the focus of fire safety advice has been on commercial and residential property (see Discussion points below).

Eastern TLAs

Figure 13 School fires in Eastern TLAs

Number of structural school fires



Source: NZFS

School fires in the Eastern region are centred on the largest centres of Hastings, Napier and Gisborne, and follow no obvious pattern, although the peaks in 1994 in Gisborne and Hastings suggest possible 'copycat' fires.

7.4.2 Discussion points

Issues resulting from a discussion with the Assistant Region Commander (Fire Safety) for the Eastern region were:

- The focus in the Eastern region for promoting fire safety was on residential and commercial property.
- STEPS had been promoted in the region in the mid-1990s, but was not applied across all parts of the region. Resource constraints in the region dictated that focus was directed towards high-risk (in terms of risk to life) buildings such as residential property.
- Schools had been fairly unenthusiastic about the STEPS programme, and needed a great deal of prompting to maintain their vandalism registers, etc. The programme had not been particularly effective in the region.
- There was a huge demand from various agencies for the FAIP programme dealing with youths with fire behavioural problems. However, the NZFS was not actively advertising this programme, due to concerns about being overwhelmed with responses. At the time of our discussion, the region did not have enough trained FAIP practitioners, although courses were being planned in order to increase the number of trained practitioners.
- In some lower socio-economic areas in the regions, there had been an above-average incidence of arson attacks, affecting schools as well as other buildings.
- Many of the schools in the Eastern region had improved their security arrangements, had better lighting at night, and had made their buildings and grounds smarter and tidier in recent years.
- As part of this improvement, many schools had installed security alarms. In some instances, when these alarms were activated, a list of phone numbers (usually the numbers of the principal and/or the Board of Trustees) was automatically dialled in a certain order by the system. This system could have contributed to the delays in attending the scene of a school fire, especially when some people on the list could not be reached.
- It was thought that one possible way to enhance fire safety measures would be to make teachers and caretakers more aware of fire safety issues during the OSH courses in which they are required to participate. This would make them more aware of the factors that may potentially contribute to school fires (e.g. the proximity of paper rubbish containers to buildings).

7.5 Western region

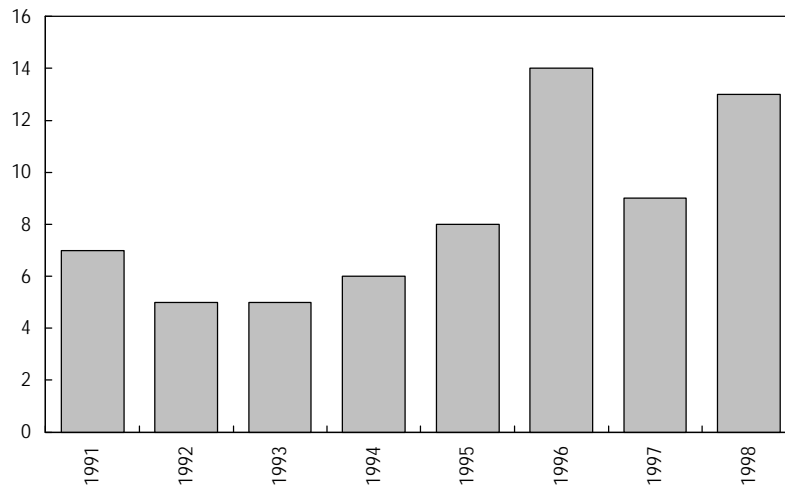
7.5.1 Trends

The Western region contains the following TLAs: Horowhenua District, Manawatu District, New Plymouth District, Palmerston North City, Rangitikei District, South Taranaki District, Stratford District, Tararua District, and the Wanganui District.

Total NZFS Western region

Figure 14 School fires in the NZFS Western region

Number of structural school fires



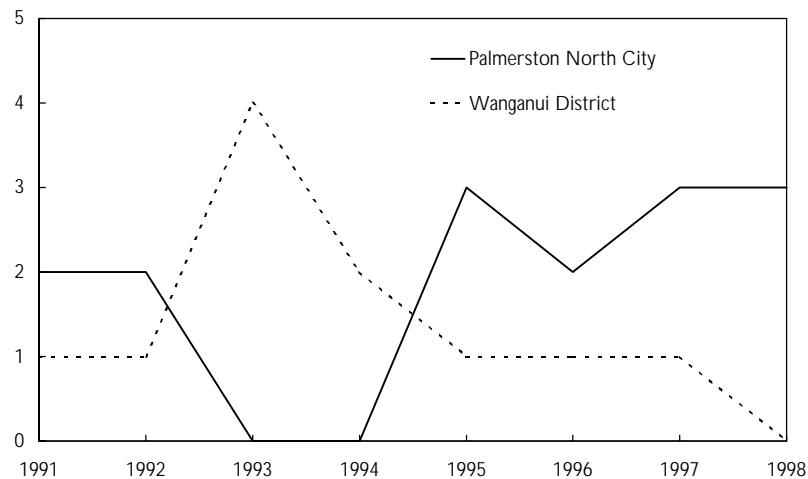
Source: NZFS

The number of structural school fires in the Western region rose between 1992 and 1998, but remained at a fairly low level.

Western TLAs

Figure 15 School fires in Western TLAs

Number of structural school fires



Source: NZFS

School fires are spread around the Western region, with no individual area being particularly prominent.

7.5.2 Discussion points

The following points arose from a discussion with the Assistant Region Commander (Fire Safety):

- The focus of fire safety education and fire protection in the region was on areas which presented a high risk to life, such as housing in some lower socio-economic

localities. The risk to life from fires in schools was seen as minimal, as most fires occur outside of normal school hours.

- Many schools in the region had installed combination alarm systems after the STEPS programme was implemented in the mid-1990s.
- Initially, many of the alarms were not well maintained, and suffered from having dead batteries, etc. (see section 7.2.2 also). Some of the buildings in which the systems were located were also not maintained well - leading to problems such as leaks, which can cause false alarms via short circuits in the systems. In addition, the smoke detector heads in some combined systems were not always of the highest quality. The resultant high number of false alarms led to a situation where people were ignoring alarms.
- The interviewee suggested that the Ministry of Education had done a much better job of maintaining their properties in general in recent years than has been the case in the past. Grounds were better maintained, and the school buildings in general were tidier than in previous years.
- There also appeared to have been a lack of knowledge in schools about how to use the alarms effectively. For example, in one case the 'dry ice' produced by a smoke machine at a school disco activated the alarm. The organisers were not aware that certain areas covered by the systems could be de-activated for such occasions.
- The NZFS in the Western region had only recently made a concerted effort to reduce the number of false alarms, not only in schools, but in buildings in general. Under current legislation, if an organisation experiences more than two false alarms in a six-month period, it is sent a bill of \$1,125 for each additional false alarm by the NZFS. In the case of schools in the Western region, when this happens, a NZFS member visits the school with information about fire safety and false alarms. The aim is to persuade schools suffering from problematic false alarms to invest in improved fire safety measures, rather than spending money on false alarm call-out charges.
- One issue that was seen as important for the NZFS in the Western region was that of access to schools for NZFS appliances, and the ability of these appliances to find adequate water sources. Many schools in the region were built in the 1950s and 1960s, and these schools often had access problems. Secondary water supplies (such as swimming pools) were often difficult to access, and access roads were mainly to the school offices and teachers' car parking areas. These schools often had few other internal access roads.
- A factor contributing to poor access was that as schools had expanded, a lot of pre-fabricated classrooms had been employed. These classrooms were usually installed in the summer, when large trucks could drive across the dry school fields in order to put the classrooms in place. Once winter arrives, however, these classrooms become very difficult to reach by NZFS appliances should a fire occur, as the fields become softer, and unable to support the weight of the trucks.
- Newer schools in the region often had better access roads for fire appliances and other vehicles needing to get close to classrooms and other buildings.
- A further issue with pre-fabricated buildings is that many of them did not arrive fully wired. As wiring these buildings was quite costly, there was little money available for the installation of fire protection measures. Since such buildings were often temporary 'fixes' to cope with increased rolls, substantial investment in improvements was not justified.

- Turnover in school Board of Trustees membership may contribute to the absence of long term fire safety policy in some schools. A lack of continuity of personnel on the Board makes long term planning a fragmented process, as new Board members are required to be brought up to speed. In addition, the principal plays a key role in participating in long term planning, and when the principal moves on, the planning may lose its focus.
- The FAIP programme was up and running in the Western region, but was not specifically focused on schools.

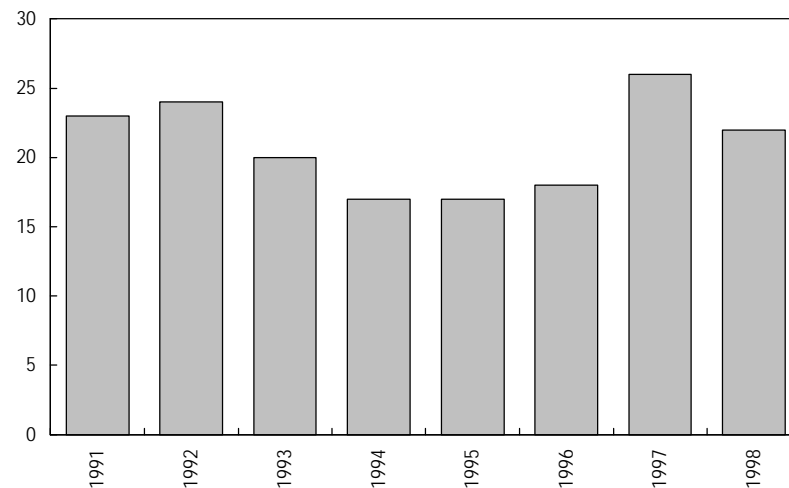
7.6 Arapawa region

7.6.1 Trends

The Arapawa region contains the following TLAs: Carterton District, Grey District, Kapiti Coast District, Lower Hutt City, Marlborough District, Masterton District, Nelson City, Porirua City, South Wairarapa District, Tasman District, Upper Hutt City, and Wellington City.

Total NZFS Arapawa region

Figure 16 School fires in the NZFS Arapawa region
Number of structural school fires



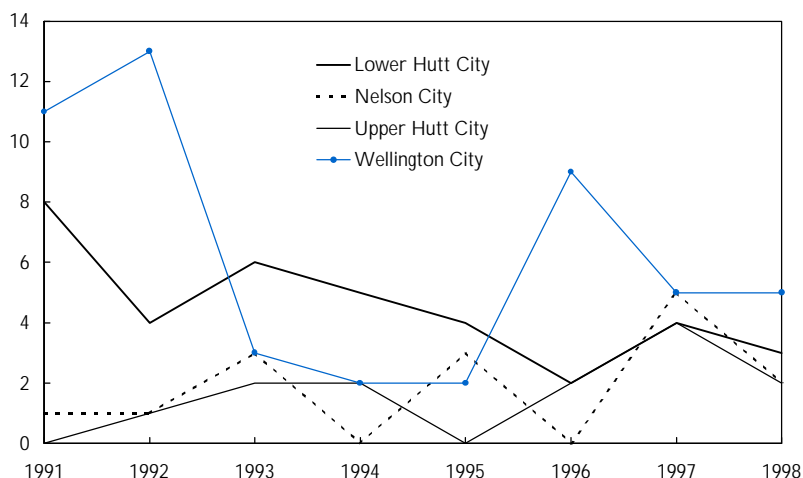
Source: NZFS

The number of structural school fires in the Arapawa region stayed fairly steady over the 1990s, fluctuating between 17 and 26 structural fires per year. Up to the 1995/96 period, there had been some major fires in schools, with some severe losses. In more recent years, both the number and severity of school fires had fallen.

Arapawa TLAs

Figure 17 School fires in Arapawa TLAs

Number of structural school fires



Source: NZFS

Wellington tends to dominate in terms of numbers of fires in the Arapawa region. The impact of the STEPS programme is not easy to see in this data, although it may be that the programme was successful in reducing the number of nuisance (scrub, rubbish, etc.) fires in schools.

7.6.2 Discussion points

The issues that arose during the discussion with the Assistant Region Commander (Fire Safety) and the region's Fire Engineer were:

- In the NZFS, there are two main ways to approach fire safety education and implementation:
 - (i) The regional offices take responsibility for the entire region, and educational programmes and visits are run from a centralised point.
 - (ii) Responsibility for fire safety issues is delegated to the stations in each of the districts within the region, as occurred in Arapawa. This system effectively says that each district has 'ownership' of the fire risk in their district, and that it should be treated differently in each district, depending on the specific characteristics of the area.
- There appears to have been a paradigm shift in terms of which NZFS personnel should deal with fire safety issues. Previously, these issues were dealt with primarily by fire safety personnel. More recently, the operational arm of the NZFS (i.e. the firefighters themselves) had taken on more responsibility for learning about fire safety, had upskilled in this facet of the job, and were promoting fire safety in their day to day activities. This had taken some of the strain off of the fire safety staff, and the idea has received a great deal of positive feedback from both the fire safety and operational staff.
- The aim in the region was to create a tailored database, so that when questions were asked about issues such as school fires, they could quickly extract relevant information. At the time of the discussion, we were told that there was a lot of information from various sources on each issue, but that information was not centralised or easily accessible.

- There were problems reconciling organisations' legislative requirements under the Building Act with NZFS regulations regarding evacuation schemes, etc. It would have been simpler for organisations, including schools, to have had a single set of regulations/legislation to follow and satisfy.
- One contributing factor to the severity of some school fires in the Arapawa region had been the poor construction of schools, and in particular, older schools. These schools often have unseparated ceiling voids, which encourage the spread of fires.
- The STEPS programme was a success in Wellington. It was co-authored by a Wellington principal who had experienced the devastation that a major school fire can cause. A key impact of the programme was that schools were checking for, and monitoring more thoroughly, the pre-cursors to school fires, such as vandalism, graffiti, and petty theft.
- The NZFS in the region do not have a great deal of confidence in the ability of combined security/smoke alarm systems to do the job which they were designed to do. It was suggested that some security firms, to which these systems were connected, did not always have the correct street addresses for the schools, as they had not carried out sufficient checks after being given the address by the system's installer.
- One of the key problems with combined systems is that schools are trying to address fire risk issues using security measures. It was suggested that security risks and fire risks are two different issues, with different drivers, and need to be addressed separately.
- On a positive note, it was suggested that attitudes towards fire risk and protection measures were changing in the region. Schools were starting to take a longer term view of these issues, and are more aware of the risk that they faced. Much of this increased awareness was due to NZFS fire safety education programmes. Business Continuity Plans were becoming more common.
- The 'Firewise' programme, targeted at school children, had been used extensively in the education of the community about fire risks. The downstream effects of this programme were yet to be observed.

7.7 Transalpine region

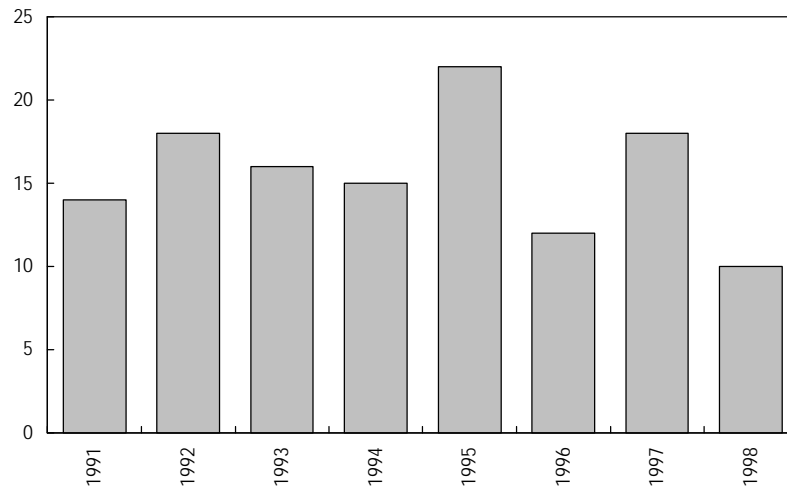
7.7.1 Trends

The Transalpine region contains the following TLAs: Ashburton District, Banks Peninsula District, Buller District, Christchurch City, Hurunui District, Kaikoura District, Mackenzie District, Selwyn District, Timaru District, Waimakariri District, Waimate District, and the Westland District.

Total NZFS Transalpine region

Figure 18 School fires in the NZFS Transalpine region

Number of structural school fires



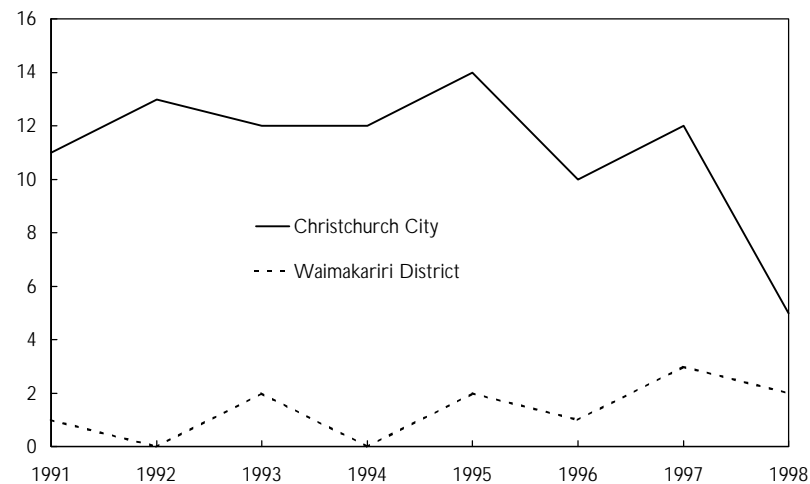
Source: NZFS

From 1992, the number of school fires in the Transalpine region tended to fall, but there were two small spikes in 1995 and 1997.

Transalpine TLAs

Figure 19 School fires in Transalpine TLAs

Number of structural school fires



Source: NZFS

School fire numbers in the Transalpine region had not surprisingly, been dominated by those in Christchurch City. The number of fires in Christchurch appears to have been falling.

7.7.2 Discussion points

Points arising in discussion with a member of the Fire Safety team:

- The NZFS in the Transalpine region had been very pro-active in their education of schools and tertiary institutions about the risk of fire.

- The FAIP programme had been heavily promoted in the region. More juveniles with fire behavioural problems in the Transalpine area were dealt with via the FAIP than in Auckland in the last financial year (see Figure 20).
- A large number of agencies (including schools, Police Youth Aid, the ADHD group, etc.) had been made aware of FAIP, and had been told to refer juveniles with fire behavioural problems to the FAIP programme as soon as they displayed the slightest signs of having problems.
- School Boards of Trustees were also targeted heavily via the STEPS programme in the mid-1990s, and were taught how to recognise the signs that may lead to a school fire (increased graffiti, petty vandalism, etc.).
- The FAIP and STEPS programmes were thought to have been important contributing factors in the low number of fires in schools in the region. NZFS statistics show that in the January 1991 to June 1995 period, there were 40 structural school fires in the Christchurch city area. In the July 1995 to December 1998 period, there were only 13.

Figure 20 Juveniles through the FAIP

Number in June year 2001

NZFS region	Number of juveniles
Northland	32
Auckland	228
Waikato/Bay of Plenty	110
Eastern	14
Western	101
Arapawa	109
Transalpine	276
Southern	25
Source: NZFS, Transalpine, personal communication	

7.8 Southern region

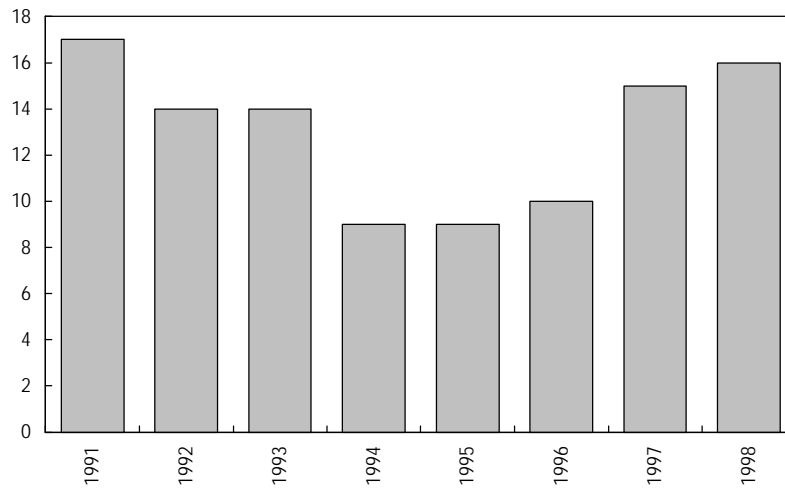
7.8.1 Trends

The Southern region contains the following TLAs: Central Otago District, Clutha District, Dunedin City, Franklin District, Gore District, Invercargill City, Queenstown-Lakes District, Southland District, and the Waitaki District.

Total NZFS Southern region

Figure 21 School fires in the NZFS Southern region

Number of structural school fires



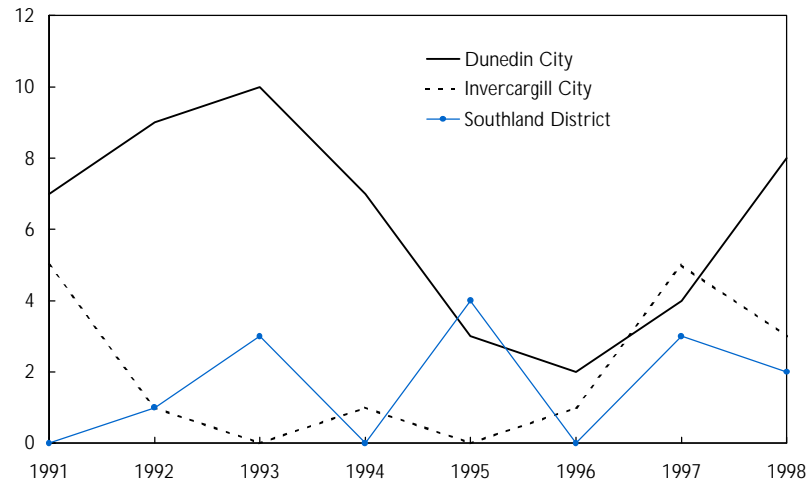
Source: NZFS

The number of structural school fires in the Southern region started to rise again in the late 1990s, after falling in the earlier part of the decade.

Southern TLAs

Figure 22 School fires in Southern TLAs

Number of structural school fires



Source: NZFS

The number of fires in schools in the Dunedin City TLA dropped quite sharply from a peak of 10 in 1992, to a low of just 2 in 1996, but rose subsequently.

7.8.2 Discussion points

Discussions with the Assistant Region Commander (Fire Safety) for the Southern region and the Deputy Chief Fire Officer/Fire Safety Officer for Invercargill yielded a number of points of interest:

- A great deal of effort by the NZFS in the region had been put into promoting and maintaining the STEPS programme. The programme continued to be used in the

region, whereas its use had diminished or stopped in other regions, such as Auckland.

- One reason for the low uptake of the STEPS programme in some regions (outside of the Southern area) was that it was not a legal requirement. Without a great deal of education and prompting from the NZFS, it is likely that some schools viewed STEPS as an additional burden, creating more paperwork on top of their OSH and ERO requirements.
- Communities had been strongly encouraged to be involved in the STEPS programme in the Southern region. Therefore, the partnerships between schools and their communities were strong. Parents had formed volunteer patrols which kept an eye on schools during holidays and weekends.
- Schools had increased their security measures - in order to deter potential intruders who may have the intention of lighting fires - by building better fences, improving the lighting in the school grounds, locking skip bins, and even placing old video cameras in prominent areas to give the impression that there is some form of closed circuit television in place.
- Most schools in the Southern region had little or no fire protection measures in place. Of those with protection, most employed security systems, and many of these provide only partial coverage of the schools (such as in blocks containing many computers, etc.). A few schools had sprinklers, but this was uncommon.
- The NZFS was taking every opportunity to promote fire safety in schools. Often after a minor fire in a school, NZFS personnel visited that school and explained what could have happened if they had experienced a larger fire.
- The scope for problems with joint security/smoke alarm systems was illustrated by the experience of one school where the fibre-optic cables connecting the alarm to the security company were burnt through. The company was not alerted, and the fire caused \$500,000 of damage.
- A further issue is that the alarmed areas are labelled A, B, C, D, etc. on the alarm system's panel, and these areas are lit up when a fire/security breach is detected. However, the labels do not often correspond with the outline of the school buildings - that is, Block A of the school building may not correspond with Area A on the alarm panel. This causes confusion for arriving firefighters.
- The NZFS in the Southern region is rating every building to assess its risk of fire. This is to enable the NZFS to prioritise their efforts towards preventing fires in the most susceptible areas.

8. NATIONAL TRENDS

This section sets out and discusses national trends in school fires, and puts them into the wider context of fires in general. We have used mainly summary charts and tables with more detailed supporting data in the Appendices.

8.1 Data sources

Our analysis on school fires focused on databases from the NZFS and the Ministry of Education. We realised at an early point that there are inevitable inconsistencies between the two databases. Some school fires were recorded in only one of the databases, and the information in the two databases differed.

It is important therefore to document what data is contained in each source, and the method by which it is collected, coverage, and definitions used.

8.1.1 The NZFS database

The NZFS *Fire Incident Reporting System* (FIRS) database provides the following information:

- Date/time of fire.
- Computer Aided Dispatch Number.
- Station attending fire.
- Incident type.
- Specific property use.
- Fire cause.
- Heat source.
- Occupant of property.
- Percentage of property saved.
- Street.
- Suburb.
- Fire detector type.
- Fire detector performance.
- General property use.
- Status.
- Exposure.
- Avenue of flame travel.
- Avenue of smoke travel.

All NZFS fire data is collected by the firefighters themselves at the scene of the school fire. It is then entered into a computerised national database using PC technology and custom-designed software and reporting tools.

Any Communication Centre alert will be recorded as an event. This includes any alarm raised by a monitored-alarm system, a 111 call, a smoke detection system, etc. In short, all fires, provided the school has an appropriate call-system, are attended and recorded in the database.

It is important to note that there is no financial information in the NZFS database (e.g. dollar costs of damage). We used this database to analyse trends in the number and causes of fire by structure type and region.

8.1.2 The Ministry of Education database

The Ministry of Education's *Property Management Information System* provides the following data on fires:

- Date of incident.
- Institution identification number.
- Project identification number.
- Institution name.
- District.
- Type of claim.
- Cause.
- Flinders amount (see explanation below).
- Actual cost to Ministry of Education.
- Difference between the Flinders amount and Ministry of Education amount.

The Ministry of Education school fire statistics are collected for insurance purposes. Any fire incident after which schools have to make an insurance claim to the Ministry is recorded in the *Property Management Information System* (PMIS). The schools report to their assigned 'network facilitator', who in turn reports to the Ministry.

One difference between the NZFS and Ministry of Education databases is that the NZFS database records all school fires which they attend. The Ministry of Education database records only those incidents which result in a claim for damage to buildings, and will thus be likely to contain fewer incidents than the NZFS database. For example, a small rubbish fire that causes minimal damage would be unlikely to result in an insurance claim, and would therefore be 'missing' from the Ministry of Education's database, whereas it would be on the NZFS database if the NZFS attended the incident.

If the claim by a school after a fire is over \$10,000, then the Ministry's loss adjusters are called in to evaluate the costs of the necessary repairs. These are the 'Flinders' amounts referred to in the list above. They basically ensure that the claims and reparation costs of the school accurately reflect the losses suffered.

The 'Actual' amounts refer to the sum of the bills received by the Ministry for repairs after a claim is lodged - i.e. the actual cost of the insurance claim, ex-post. This is the variable that should be used for any numerical analysis.

8.1.3 Reconciling the two databases

For our analytical purposes, both databases have their strong points:

- The NZFS database is useful as it provides details on the number and causes of school fires, by building type and locality, and the performance of sprinkler systems, etc.
- The Ministry of Education database, whilst containing little background on the fires, contains actual dollar costs which we require for our analysis, although the dollar amounts recorded only include losses of Ministry property (i.e. buildings and not contents, which are the responsibility of the school concerned and are mostly dealt with by private insurers). Ideally, we would have merged the two databases to

encompass all of the relevant information, but this would have been prohibitively time-consuming.

The NZFS fire incidence statistics are usually classified by regions, as indicated in section 7).¹² This level of aggregation prevented any meaningful regional analysis of the incidents data. In order to aid our analysis, staff of the NZFS geocoded the fire incidence data for structural fires in school, and for all structural fires. A table of geocoded NZFS data is set out in Appendix A.

8.2 The capital value of New Zealand's state schools

Following is a summary of capital values (mainly structures) of publicly-owned or funded schools. The total is about \$5.3 billion, with the average per school ranging from \$870,000 (first category of primary schools) to over \$9 million (secondary schools, years 9-15). Within each campus will be individual buildings varying across a wide range of capital values.

Figure 23 Capital value by school type

Dollars, as at March 2001

School type	Total capital value	Number of schools	Average value
Primary (years 1 - 8)	986,490,342	1135	869,154
Primary (years 1 - 6)	1,464,860,239	855	1,713,287
Primary (years 7 & 8)	543,055,704	139	3,906,876
Special school	50,740,770	69	735,373
Composite (years 1 - 15)	126,326,377	54	2,339,377
Secondary (years 7 - 15)	203,267,841	50	4,065,357
Secondary (years 9 - 15)	1,945,088,907	210	9,262,324
TOTAL	5,319,829,369	2512	2,117,766
Notes: (1) This data refers to state-owned schools only			
Source: Ministry of Education, EDUMIS database, April 2001			

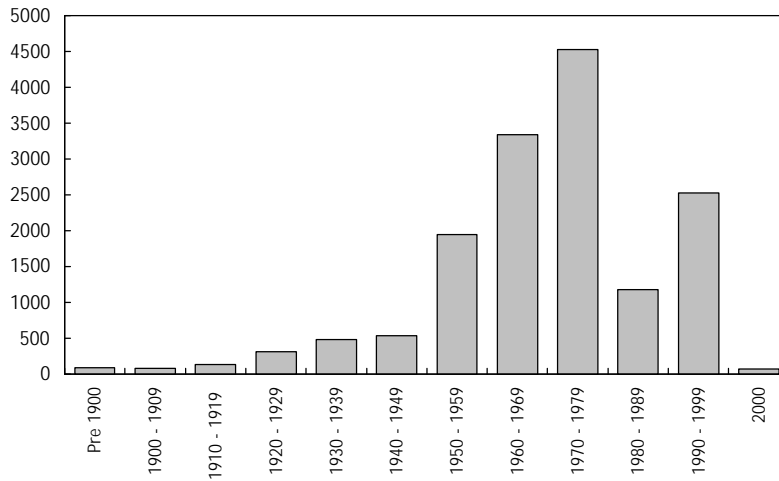
8.3 Age profile of state-owned school buildings

The majority of state-owned school buildings were constructed between 1950 and 1979, with another construction burst occurring in the 1990s when New Zealand experienced strong population growth via migration inflows.

¹² The NZFS regions are Northland, Auckland, Bay-Waikato, Eastern, Western, Arapawa, TransAlpine, and Southern.

Figure 24 Age profile of schools

Number of buildings



Source: Ministry of Education (2001)

This suggests that the vast majority of schools were built before state-owned buildings were subject to the Building Act (1991).

8.4 Direct costs of school fires

The following table shows summary data from the Ministry of Education regarding school fires which caused over \$500 of damage. Note that this table refers only to the insurance costs from building damage - the cost of contents damage is not included.

Figure 25 Insurance costs of school fires

June year	Fires causing material damage (>\$500)	Arson or suspected arson	% of school fires caused by arson or suspected arson	Estimated cost of all fire losses in schools (\$million)	Estimated cost of fire losses in schools caused by arson (\$million)
1976/77	67	29	43	2.0	n/a
1977/78	86	39	45	1.5	n/a
1978/79	82	47	57	1.7	n/a
1979/80	75	36	48	1.9	n/a
1980/81	64	29	45	2.2	n/a
1981/82	85	43	51	2.0	n/a
1982/83	103	58	56	2.7	n/a
1983/84	114	68	60	2.9	n/a
1984/85	124	72	58	3.7	n/a
1985/86	115	77	67	6.0	n/a
1986/87	106	72	68	7.9	n/a
1987/88	112	82	73	9.0	n/a
1988/89	94	69	73	9.4	7.0
1989/90	71	61	86	23.4	15.8
1990/91	74	49	66	7.0	4.9
1991/92	82	51	62	6.7	4.5

1992/93	66	45	68	5.6	2.8
1993/94	76	51	67	7.4	6.4
1994/95	70	44	63	4.3	3.9
1995/96	63	37	59	3.4	1.8
1996/97	70	40	57	5.1	2.4
1997/98	68	47	69	2.9	2.7
1998/99	65	39	60	3.3	2.2
1999/00	83	63	76	3.3	3.0
2000/01	69	44	64	3.5	2.5

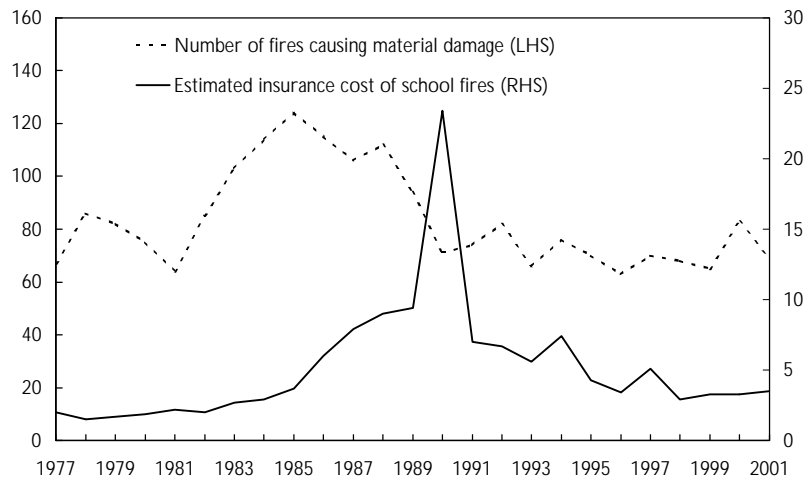
Source: Ministry of Education *Property Management Information System*

For the year 2000/01, the value of school buildings lost to fire accounted for around 0.07% of the Ministry of Education's buildings portfolio.

As can be seen in Figure 26, both the number of school fires causing material damage, and the direct insurance cost of those fires trended downward during the 1990s.¹³ A serious fire at Avondale College, which resulted in a large claim, caused the spike in insurance costs in 1990. The 25-year average cost of building damage from school fires is \$5.2 million. The average cost in the last ten years is \$4.6 million, and was just \$3.25 million in the four years to March 2001.

Figure 26 Number and aggregate cost of school fires causing material damage

Number of fires (LHS), cost, dollar millions (RHS),



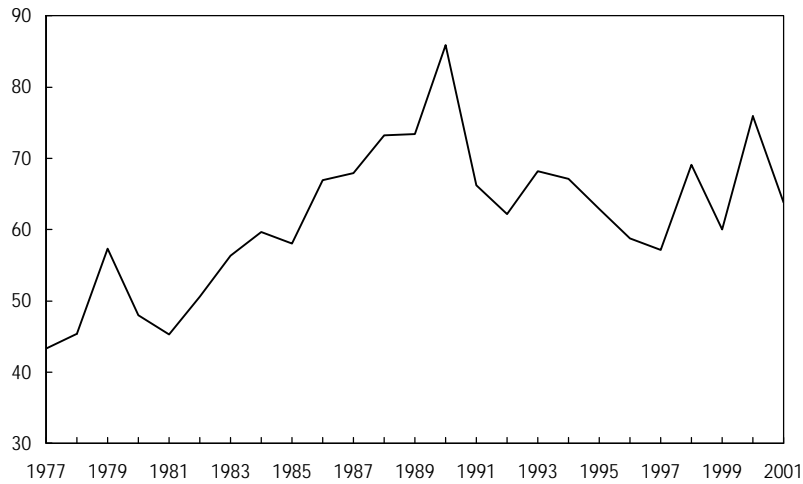
Source: Ministry of Education

Figure 27 shows that that the proportion of material school fires caused by arson increased steadily in the 1980s, peaking at 86% in 1989/90. This proportion then dropped in the early 1990s, before fluctuating around the 65% mark for the rest of the past decade.

¹³ Only fires that resulted in over \$500 of material damage are included.

Figure 27 Proportion of material school fires started by arson

Percent of total material school fires

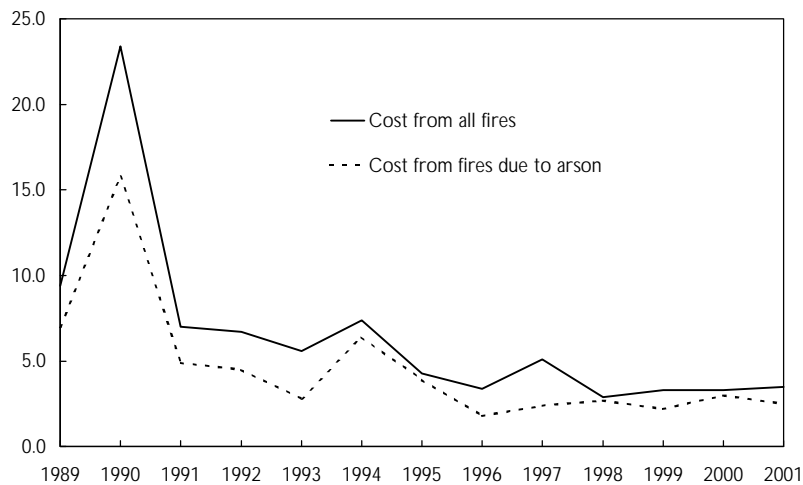


Source: Ministry of Education

In terms of monetary amounts, the cost of school fires due to arson has dropped from a peak of \$15.8 million in 1989/90, to average around \$2.4 million over the last six years. The average since records for arson losses began in 1988/89 is \$2.6 million. It is likely that this decrease in insurance costs is partly due to the installation of more security systems in schools.

Figure 28 Insurance costs of school fires

Dollar millions, contents insurance costs excluded



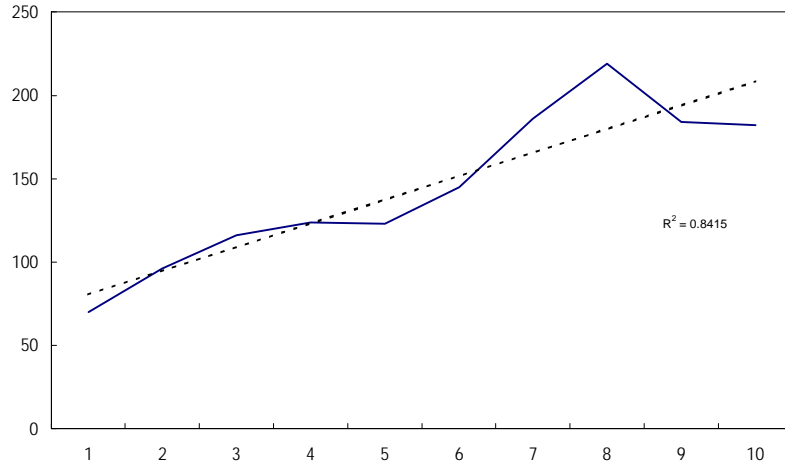
Source: Ministry of Education

8.5 School fires and socio-economic status

It has been suggested that socio-economic factors contribute to the likelihood of a school experiencing a serious fire. The NZFS provided us with data on the number of school fires by decile of the social Deprivation Index.

Figure 29 School fires and the deprivation index

Number of structural school fires 1991 - 2001 (y axis)
Deprivation Index (x axis)



Source: NZFS; Health Services Research Centre, Victoria University

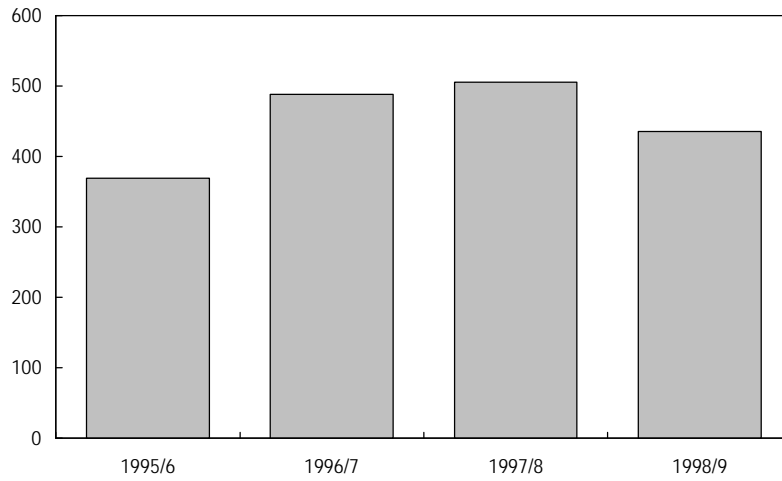
This chart suggests that there is a relationship between the number of school fires and the socio-economic profiles of areas in which they occur. This correlation is only strong at a national level. At a regional level, there is likely to be significant variation relative to the national trend, due to some of the reasons that contribute to the likelihood of fires starting in schools (as discussed in section 4). Sample sizes would often be too small to determine a conclusive relationship between the DI and number of school fires. (See section 3.1.5 for an explanation of the Deprivation Index).

8.6 Number of school fires

The annual number of fires in schools fluctuated between 370 and 500 in the 1995/96 to 1998/99 period. These include rubbish fires and other minor fires, so these numbers are larger than in the Ministry of Education data, which only includes fires that led to insurance claims for structural damage.

Figure 30 Number of school fires

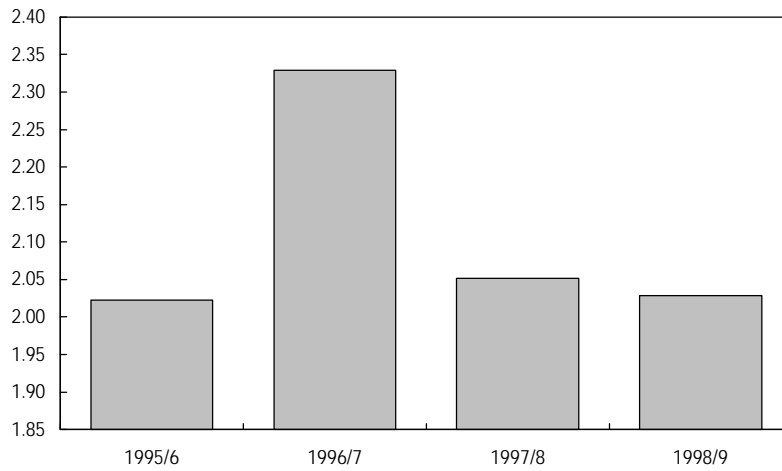
Annual number



Source: NZFS Emergency Incident Statistics

School fires accounted for between 2.0% and 2.3% of the total number of fires in New Zealand since 1995/96.

Figure 31 School fires as a percentage of total fires in New Zealand



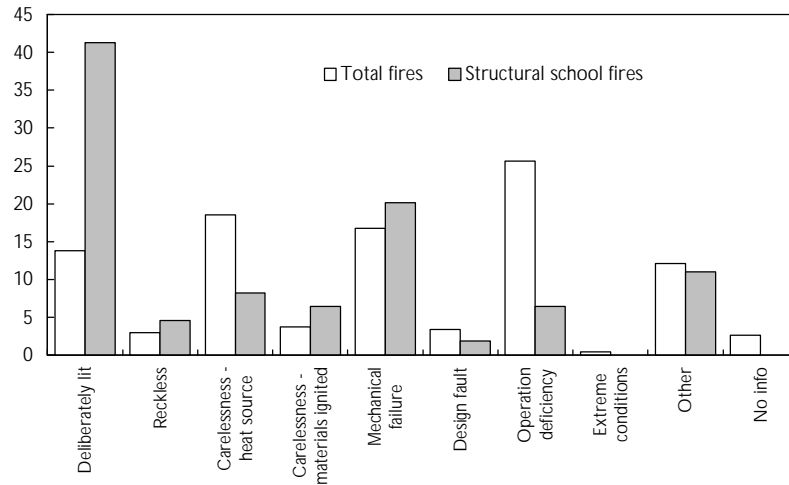
Source: NZFS Emergency Incident Statistics

8.7 Cause of structural fires

Figure 32 shows the causes of school fires with structural damage compared with the causes of all fires. The most obvious result is that the proportion of fires that are deliberately lit is far greater in school fires than in general.

Figure 32 Causes of fires 1998/1999

Percent of total

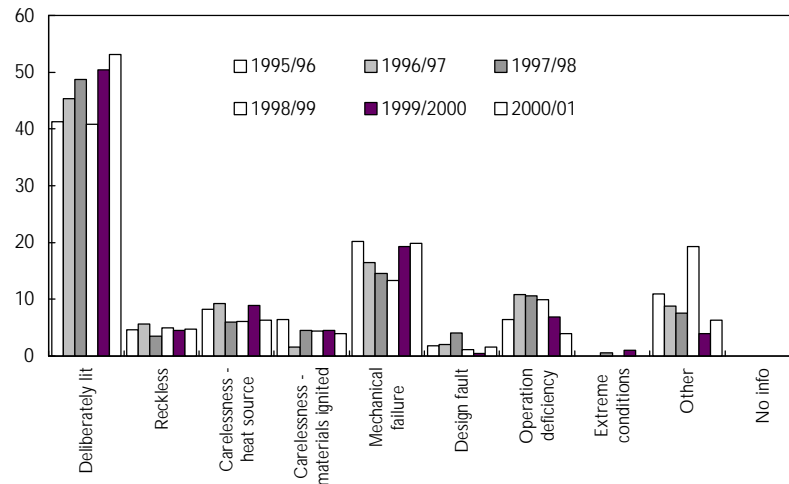


Source: NZFS Emergency Incident Statistics

The data suggests that the proportion of school fires that are deliberately lit has been increasing over the last six years. This will differ from the trends shown in the Ministry of Education data (see 8.4), as the NZFS database used here includes scrub fires, nuisance fires, etc. These would not be recorded in the Ministry's database unless they resulted in an insurance claim. The majority of small, nuisance fires are likely to have been started by arson.

Figure 33 Causes of school fires 1995/96 – 2000/01

Percent of total



Source: NZFS Emergency Incident Statistics

9. ECONOMIC ANALYSIS OF FIRE PREVENTION MEASURES

9.1 Overview

Current building code development for schools is summarised in Appendix D. The finished code is due to be released in March 2002. A comprehensive economic evaluation of fire sprinkler technology was published in 1989.^{14,15} We draw on this to outline the basis of a modified assessment based on the information gathered for our current study, and focusing on **fire prevention measures in general in the context of schools**.

1. Sprinklers are one of a number of measures to reduce the risk (likelihood and consequence) of fires. Sprinklers may not be the most practical solution in all schools. Other risk-reduction measures include the NZFS's educational efforts, insurance, fire drills, building design, security alarms etc. In a Cost Benefit Analysis (CBA), the **benefit** of reduced *expected risk* of fire would be set against the **cost** of these measures.
2. Each of these measures spans its own part of the *readiness, recovery, response, recovery* risk management matrix. This refers to the physical risk part of the spectrum, which is only one of a list of concerns for most schools. Educational and social outcomes of pupils, staff welfare etc., are primary accountabilities.
3. The various measures also have distinct cost implications for the education sector. For example, there is no **direct** cost to a school in calling the NZFS to attend a fire (provided the school is not charged for having too many false alarms). But retrofitting sprinklers or purchasing security services is a significant direct cost impost on the Ministry of Education or the school.
4. Arguably too, the range of **benefits** to schools varies quite widely (e.g. per dollar of risk reduction expenditure) depending on their inherent risk levels. For example, some are located in communities that may render them more exposed to arson. Others are more at risk because of the age and configuration of their buildings.
5. The damage/costs caused by fires and the benefits of early intervention are time sensitive.

Sprinklers do not reduce the probability of fires occurring, but may offer the best prospect of preventing serious structural damage, i.e. preventing high cost fires once a fire has started. However, the fact that sprinklers are technically superior in this sense does not mean that they are economically the rational choice in every case (New Zealand Fire Service, 1989, pp. 24 - 88).

In contrast, combined security and smoke alarms may reduce the probability of fires occurring, but are likely to be less effective (than sprinklers) in preventing serious damage once a fire has started.

¹⁴ *Fire Sprinkler Technology: Costs and Benefits* (1989) – A study carried out for the New Zealand Fire Service Commission by Strategos Consulting Limited and M & M Protection Consultants.

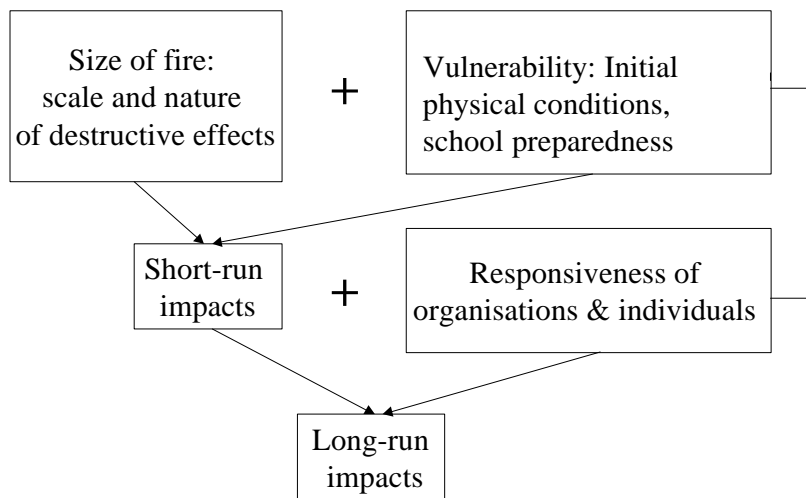
¹⁵ It should be noted that the report referred to was written prior to more recent developments in sprinkler technology, which have reduced the cost of sprinklers. These low-cost sprinklers have only been developed for residential properties so far. If they were to be made available for non-residential buildings, the cost portion of a CBA would be reduced.

6. Once a risk reduction or readiness strategy is adopted, costs have to be incurred. But the resultant benefits, that is, damage avoided, are uncertain. The results of CBA depend very much on the assumed probability of, and damage caused by, fires in a given period. The comparison would be between probabilities and consequences **with** security measures, or sprinklers, and probabilities and consequences **without** them.

9.2 Economic costs of school fires

The following is a simplified structure for thinking about the economic risks attached to school fires.

Figure 34: Assessing the economic effects of school fires



Source: NZIER

Responsiveness includes institutional flexibility and physical flexibility. The former refers to the responsiveness of emergency services, and insurers such as the Ministry of Education and private insurers. Physical flexibility refers to the speed with which the school can undertake the construction or reconstruction necessary to restore it to previous levels of operability.

The costs of fires, as documented by the Ministry of Education, are largely based on the replacement costs of the buildings destroyed or badly damaged by fires. This is an 'insurance cost' concept which is only part of the total economic costs associated with fires.

Here we are using the term economic cost in the 'welfare sense' that would be used in CBA. CBA is concerned with the welfare of society as a whole; the net sum of the economic benefits and costs borne by all those affected by measures to reduce the risk of fires in schools. CBA recognises that there may be costs (in terms of opportunities foregone) which do not figure in financial flows.

Hence a summary of the costs we should include is:

Figure 35: Economic costs of fires

	<i>Insurable costs</i>
1.	Assessed damage to or loss of structures
2.	Assessed damage to or loss of equipment
3.	Assessed damage to or loss of materials
	<i>Personal effects</i>
4.	Value of teachers' and pupils' personalised input into teaching resources, the physical environment, which are lost as a result of fires
5.	Emotional trauma for pupils, teachers, parents etc.
	<i>Immediate response and clean-up costs</i>
6.	Costs of professional service organisations i.e. NZFS and Police
7.	Time costs of others including school staff, other volunteers
	<i>Recovery and reinstatement costs (including time)</i>
8.	Teaching disruption required by relocation, rescheduling
9.	Reinstatement of school records
10.	Insurance processes
11.	Rebuilding

An outline of the potential distribution of such costs is as follows.

Figure 36: Fires in schools - economic costing

Paid 'costs to society'	Labour	Materials	Equipment
NZFS professionals	Attendance		
Police	Attendance, investigation		
Ministry of Education/schools	Overtime – principals, administrative staff, teachers	Building modifications	Sprinklers, alarms, extinguishers
Insurance premiums			
Volunteer costs			
NZFS volunteers	Attendance		
Principals/ Teachers	Additional non-paid time e.g. recovery of teaching resources		
Boards of trustees	Additional time input		
Other parents	Clean-up, fund raising		

The case study results (Section 4) indicated that there will be large variations, from fire to fire, in the relationship between 'insured' costs and total economic costs of fires. For example, if a gymnasium were to be destroyed by fire, the assessed costs would be high, but the degree of disruption to the general operation of the school might not be large. In contrast, destruction of classrooms containing teaching material, pupil records, might result in lower insured costs, but relatively large disruption and economic costs.

For these reasons, and because of the small number of case studies, it is difficult for us to impute a representative 'average relationship' between insurance costs and total economic costs of school fires in New Zealand. All we can say is that the economic cost will always be higher than the insured cost, but the margin could be 10% or 100%.

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10.2 Databases

Ministry of Education *Property Management Information System*

New Zealand Fire Service *Emergency Incident Statistics 1999-2000*.

New Zealand Fire Service *Fire Incident Reporting System*.

APPENDIX A: GEOCODED NZFS DATA

Figure 37: Structural school fire incidence data by local authority area

Territorial local authority	1991	1992	1993	1994	1995	1996	1997	1998	Total
Ashburton District	1	3	0	0	4	1	0	0	9
Auckland City	13	14	17	14	9	13	16	7	110
Banks Peninsula District	0	0	0	0	0	0	0	0	0
Buller District	1	2	0	1	0	0	1	0	5
Carterton District	0	0	0	1	0	0	0	0	1
Central Hawke's Bay District	2	0	1	0	0	0	0	1	5
Central Otago District	0	2	1	0	0	1	0	0	4
Christchurch City	11	13	12	12	14	10	12	5	94
Clutha District	0	1	0	0	0	0	0	1	3
Dunedin City	7	9	10	7	3	2	4	8	58
Far North District	0	2	1	1	0	3	2	1	11
Franklin District	2	0	0	0	0	2	0	0	4
Gisborne District	3	1	1	4	2	1	3	1	17
Gore District	2	0	0	1	0	0	2	1	7
Grey District	0	1	1	0	0	0	0	1	4
Hamilton City	4	6	1	2	4	2	4	4	31
Hastings District	1	0	3	6	2	2	1	1	17
Hauraki District	0	0	1	0	0	0	1	1	4
Horowhenua District	0	0	0	1	1	2	2	4	14
Hurunui District	0	0	1	0	0	0	0	0	1
Invercargill City	5	1	0	1	0	1	5	3	19
Kaikoura District	0	0	0	0	0	0	0	0	0
Kaipara District	1	0	0	1	0	0	0	0	2
Kapiti Coast District	0	1	1	2	0	1	1	2	10
Kawerau District	0	0	1	1	1	0	0	0	3
Lower Hutt City	8	4	6	5	4	2	4	3	39
Mackenzie District	0	0	0	0	0	0	0	0	0
Manawatu District	1	1	1	1	0	4	0	1	10
Manukau City	6	13	11	9	9	12	12	9	90
Marlborough District	0	0	2	4	2	0	2	0	10
Masterton District	0	0	1	0	2	0	3	1	8
Matamata-Piako District	0	0	0	1	0	0	0	0	1
Napier City	1	1	2	2	2	0	1	5	19
Nelson City	1	1	3	0	3	0	5	2	17
New Plymouth District	2	0	0	0	1	2	2	1	9
North Shore City	2	1	3	3	5	3	3	4	28
Opotiki District	0	0	0	1	0	1	2	0	4
Otorohanga District	0	0	0	0	0	0	0	0	0
Palmerston North City	2	2	0	0	3	2	3	3	18
Papakura District	1	1	2	1	1	0	3	1	11

Porirua City	3	2	0	1	2	2	1	5	21
Queenstown-Lakes District	0	0	0	0	0	0	0	0	0
Rangitikei District	0	1	0	1	2	1	0	1	7
Rodney District	1	0	0	1	1	2	1	2	10
Rotorua District	10	1	1	2	5	1	2	2	26
Ruapehu District	1	0	0	0	1	1	1	1	6
Selwyn District	0	0	0	0	0	0	0	0	0
South Taranaki District	1	0	0	0	0	1	0	1	4
South Waikato District	1	1	1	1	0	1	4	1	11
South Wairarapa District	0	0	0	0	0	0	0	0	0
Southland District	0	1	3	0	4	0	3	2	15
Stratford District	0	0	0	0	0	0	1	1	3
Tararua District	0	0	0	1	0	1	0	1	4
Tasman District	0	1	1	0	2	2	1	1	9
Taupo District	1	0	0	0	2	1	3	0	7
Tauranga District	0	2	0	6	1	3	0	3	18
Thames-Coromandel District	1	1	1	0	1	1	0	0	5
Timaru District	0	0	1	2	0	0	1	1	6
Upper Hutt City	0	1	2	2	0	2	4	2	15
Waikato District	0	1	0	1	0	0	5	2	11
Waimakariri District	1	0	2	0	2	1	3	2	13
Waimate District	0	0	0	0	2	0	0	0	2
Waipa District	0	0	0	1	0	4	4	1	11
Wairoa District	0	0	0	0	0	0	0	0	0
Waitakere City	2	5	9	1	1	14	3	2	39
Waitaki District	1	0	0	0	2	4	1	1	10
Waitomo District	0	0	0	1	0	1	0	0	2
Wanganui District	1	1	4	2	1	1	1	0	11
Wellington City	11	13	3	2	2	9	5	5	55
Western Bay Of Plenty District	0	0	2	0	1	0	1	0	4
Westland District	0	0	0	0	0	0	1	2	5
Whakatane District	0	0	1	2	4	2	2	0	11
Whangarei District	1	1	2	2	2	0	2	2	14
Totals	113	112	116	111	110	122	144	112	1052

Source: NZFS

Note: This data is for structural fires only

APPENDIX B: CASE STUDIES - PROFILE OF SCHOOLS

Figure 38 Profile of schools in case studies

Location / Type of School**	Age of school (yrs)	No. of pupils	No. of class-rooms	SE status local community*	SE status pupils	Decile rating	Cause	Areas affected
North Island								
Northland Primary (P)	45	175	9	9	Low	1	Arson after break-in. Perpetrator unknown	Caretaker's shed + electrical supply to entire school.
Northland Full primary (R)	46	145	6	6	Moderate	5	Accidental	2 class-rooms
Auckland Primary (C)	37	320	17	4	Moderate	9	Arson after break-in – perpetrator not associated with the school	Changing shed/sports equipment complex
Auckland Primary (C)	46	666	26	4	Moderate - high	7	Suspected arson – perpetrator unknown. No break-in	1 classroom
Auckland Secondary (C)	45	1,450	70	6	Moderate	4	Semi-arson – fire play that got out of hand. No break-in	Library
Mangere Primary (C)	31	440	22	9	Low	1c	Arson after break-in – perpetrator relative of pupil	1 classroom
Hamilton Intermediate (C)	47	640	21	7	Low-moderate	4	Arson – perpetrator unknown. No break-in	3 classrooms
Hamilton Secondary (C)	30	1,379	70	7	Moderate	9	Arson after break-in – perpetrator not associated with the school	Student common-room
Bay of Plenty Primary (R)	47	40	2	6	Moderate	8	Accidental	All class-rooms, administration block, library
New Plymouth Intermediate (C)	43	577	28	6	Moderate	5	Arson – perpetrator unknown. No break-in	Metal-craft and other rooms in technicraft block
Taranaki Secondary (P)	100	535	32	8	Low-Moderate	4	Arson by unknown perpetrator. No break-in	Maori studies department building

Location / Type of School**	Age of school (yrs)	No. of pupils	No. of class-rooms	SE status local community*	SE status pupils	Decile rating	Cause	Areas affected
Hawkes Bay Full primary (P)	165	135	14 (use 7)	7	Low	3	Unknown	5 classrooms + roof of office/resource room
Upper Hutt Secondary (C)	39	960	56	5	Low-Moderate	7	Arson by unknown perpetrator. No break-in	Dean's centre
Lower Hutt Intermediate (C)	44	581	29	8	Low	2	Arson by ex-student. No break-in	5 classrooms
Porirua Primary (C)	47	188	13	9	Low	3	Arson after break-in. Perpetrator ex-pupil	Cloakroom bay, passageway, 3 classrooms
Porirua Full primary (C)	26	320	15	7	Low	2	Accidental	3 class-rooms
Wellington Secondary (C)	115	930	50	7	High-moderate	8	Arson after break-in. Perpetrator unknown	Sports pavilion
South Island								
Christchurch Full primary (C)	124	175	8	9	Low	1B	2 fires: both arson, both following break-ins. 1 lit by ex-pupil, 2 nd lit by person unconnected with school	First: 2 classrooms + resource room; second: 1 classroom.
Christchurch Full primary (C)	41	160	8	3	High	8	Unknown	1 classroom
Sth/Central Canterbury (P)	135	390	20	3	Moderate	10	Accidental	Library
Dunedin Secondary (C)	40	641	38	4	Moderate - high	9	2 fires: both arson – perpetrator unknown. No break-in	First: school hall and admin block; second: entranceways to classrooms + admin block
Invercargill Intermediate / secondary (C)	30	800	60	9	Low	2	Arson by ex-student. No break-in	Walkway awning/cabling duct, admin block, library and classroom block

*Calculated from Deprivation Index data (see section 4.1.5 for an explanation of how these figures were derived). On the Deprivation Index scale, 1 indicates the highest socio-economic status and 10 represents the lowest.

** (C) = city; (P) = provincial town; (R) = rural location.

APPENDIX C: THE STEPS PROGRAMME

The data analysis in the body of the report appears to show a drop off in the number of structural school fires since 1995. One factor contributing to this decrease in serious school fires may have been the introduction and subsequent implementation of a programme titled *Schools Total Enhancement Plan for Security (STEPS)*.

STEPS was developed in 1992 by the NZFS, in conjunction with the Ministry of Education, the Schools Trustees Association, and the New Zealand Police. The programme was developed partly in response to an increase in the number of school fires in the Wellington region. After a number of pilot programmes were conducted in the Wellington region in 1993, STEPS was adopted by the NZFS on a national basis.

The STEPS programme aimed to provide schools with a progressive plan to recognise trends in both vandalism and fires in their school, and to implement procedures to protect their school from further damage. It contained a series of stages which could be implemented, ranging from the 'no-cost' level, through to the NZFS's ultimate fire protection measure - the installation of sprinklers. A summary is presented below:

- Stage One - no cost measures aimed at establishing vandalism/fire registers and monitoring these relative to a baseline scenario.
- Stage Two - the installation of combined security and smoke alarms, awareness schemes, liaising with police and the NZFS, and introducing a community support system with a cluster of other local schools.
- Stage Three - long term programmes, including the installation of sprinkler systems.

The STEPS programme involved schools attending local seminars, and those who wished to pursue it were given a kit to enable the implementation of the programme.

When the programme was adopted by the NZFS, the directive for NZFS personnel was to visit *all* schools in New Zealand to explain the project and discuss fire safety issues with each school. It has been suggested by some NZFS employees that the programme was useful, but should have been directed at those areas where there had been increased evidence of school fires and vandalism.

STEPS was successful in the Wellington area, but less so in other regions. The success in the Wellington region may be attributable to the fact that a principal from Wellington was involved in writing the programme, after he had experienced significant losses following a school fire. His personal contacts may have ensured that a greater degree of action was taken in the region.

The programme was phased out in 1995. Reasons behind the end of the programme that have been suggested by NZFS staff include the following:

- Visiting every school in New Zealand soaked up valuable time, money and resources, and many of these schools had no obvious problems with security or fire safety. This resulted in the "it will never happen to us" attitude being displayed, and the STEPS programme being rejected.
- There was no regional focus to the programme. No considerations were made for the characteristics of different regions with regards to the vulnerability of schools to fires. The broad nature of the scheme was not relevant to every school.
- Despite the good intentions of the programme, and the large amount of resources that the NZFS had invested in STEPS, some schools were not keen to adopt the programme. Meetings with Boards of Trustees and principals were difficult to co-

ordinate, and communication between Boards of Trustees, principals and the NZFS was fragmented.

APPENDIX D: FIRE PROTECTION FOR SCHOOLS: CODE DEVELOPMENT

As noted in Section 2.2, there are four key components of emergency management:

- Reduction of emergencies.
- Readiness for emergencies.
- Response to emergencies.
- Recovery from emergencies.

The NZFS and the Ministry of Education have taken steps to address these components in the context of school fires. As part of their ongoing efforts to improve fire safety in schools, the NZFS and the Ministry of Education have recently formed a working group designed to develop a memorandum for schools which will cover the following issues:

- The development of a fire safety manual for school Boards of Trustees (BOTs).
- Fire safety training by NZFS.
- Fire safety inspections by NZFS.
- The development of an evacuation scheme template for ease of use by BOTs.
- A guide to statutory compliance for BOTs.
- Submission of fire evacuation schemes to NZFS.
- A fire alarm specification and alarm standard.
- Fire and smoke detection.
- Sprinklers policy.

The memorandum is due to be released in March 2002, and will go some way to addressing a number of the issues raised in this report.

APPENDIX E: BUSINESS CONTINUITY PLANNING

Our case studies provided some key insights into the ability of these schools to respond to a serious emergency. Some schools had problems identifying exactly what was lost in the fire, were not sure where students would be relocated to, had no backups for learning resources. These schools were not well prepared for the consequences of a fire. These schools could have responded more quickly and efficiently to the fire if they had been aware of the importance of Business Continuity Planning (BCP).

E.1 What is business continuity planning?

The primary objective of BCP is to enable an organisation to survive a disaster and to re-establish normal business operations.¹⁶ Other definitions of BCP include "a set of procedures that defines how a business will continue or recover its critical functions in the event of an unplanned disruption to normal processing", and "a methodology primarily designed to avoid or mitigate risks, to reduce the impact of a disaster condition, and to reduce the time to restore business as usual".¹⁷ Whilst BCP literature is usually directed at private firms, the principles behind BCP equally apply to organisations such as schools. In the context of this report, the objective of BCP would be to allow a school to resume its normal teaching activities as quickly as possible after a serious fire.¹⁸ BCP is also known as emergency risk management, business contingency planning and disaster recovery planning, but these all deal with the same issues - how well can organisations cope with a serious disruption to normal service?

E.2 What does BCP involve?

It is outside of the scope of this report to provide a detailed framework for BCP for schools to follow. However, this section provides a brief BCP outline, in order that readers may gain an insight into the tasks involved in creating such a plan. There are seven key steps that school should address when creating, implementing and maintaining a BCP:¹⁹

E.2.1 Project initiation and management

Prior to starting this process, it is vital that the senior management of the school (the Board of Trustees, the Principal, senior teachers, etc.) are fully supportive of the project. Since developing a BCP is not a quick process, a fair amount of time and resources are required, and senior management must be prepared to accept and endorse this. Once this support is ensured, the designated BCP developer should establish a planning team to develop the necessary recovery procedures.

¹⁶ Source: "Disaster recovery planning", available at <http://www.utoronto.ca/security/drp.htm> .

¹⁷ Sources: Goggins (1999), Glenn (2001).

¹⁸ Of course, BCP for schools could also deal with responses to earthquakes, floods, etc.

¹⁹ Much of this material is taken from Goggins (1999).

E.2.2 Risk or vulnerability analysis

The first step in developing a BCP for a school is to identify the risks which are present in that particular establishment. The planning team should try to think about which incidents are more likely, and how the school is currently prepared for such occurrences. For example, this step could involve checking what fire safety procedures are currently in place, and determining if there are any possible problems with the current system. This step is required as a school cannot develop a plan to deal with an emergency until it knows which emergencies it must consider.

E.2.3 Impact analysis

Once potential risks to the school are identified, the BCP team should then consider what sort of impact each risk would have on the school. Things to consider include the financial impact, the impact upon operational procedures, the social impact, the emotional impact on staff and students, etc. During this phase of the business contingency planning process, the planning team will need to identify the critical functions within the school. These can be identified by listing all functions performed, determining the impact an incident would have on that function, and an estimate of the loss for the duration of an outage. Once the team has determined the impact of an incident on a critical function, it can determine the recommended recovery timeframe for the function.

E.2.4 Plan recovery strategies

Once the critical operational school functions have been identified and their recovery requirements known, the next step is to establish the resources that are required to continue to perform those functions. During this phase of the BCP process, the planning team will use the information gathered in the earlier impact analysis to identify potential recovery options and their associated costs; present the options to management; and get agreement on the approach to be taken and to spend the required amount. For example, the BCP team could explore different options for temporary teaching rooms should a classroom be burnt down.

One issue that arose in our case studies is that many did not have adequate backup and protection of the vital administrative documents required to run the day to day operations of the school. The backup and protection of all vital/critical records is necessary to ensure their availability after a disaster occurs. The storing of vital/critical records offsite allows school management to have information with which to rebuild the school's important functions. During this phase of the planning process the BCP team needs to determine:

- What is included in the school's vital records?
- What *should* be included in the vital records?
- Where are they stored?
- Are they backed up? How?
- How frequent are the backups?
- What is included in the backups?
- How can you obtain the backups?
- Who is authorised to retrieve them?
- How long will it take to retrieve them?
- Where will they be delivered?
- How long will it take to restore them?

- Who will restore them?

By addressing these issues, the speed and efficiency of recovery after a school fire may be improved significantly.

E.2.5 Documenting the plan

Once the recovery strategies have been agreed on, the BCP must be defined and documented. The BCP should be flexible enough to respond to any type of incident (fire, earthquake, flood, hurricane, etc.). The two major scenarios that the team must plan for are as follows:

- The school building normally used is not available, and contingency operations must recover at an alternate site.
- The key services the school needs to function are not available and the school must continue the critical functions without them.

The plan must include the following:

- An introduction, explaining why the BCP is necessary and detailing its scope, which staff, students and other people are included, and the range of events covered.
- A definition of the crisis management structure, giving details on the roles and responsibilities of everybody included.
- Procedures to be followed in the event of the disaster. These would include an alert process when an incident is first discovered (such as an evacuation alarm), incident or damage assessment, declaration procedures, notification procedures, and team procedures.

This initial plan should be distributed to all interested parties (staff, students, community members, police, NZFS, etc.), and feedback obtained. A final document can then be designed. Once the plan has been approved by senior school management and other parties, a general action plan that summarises the tasks to be executed to implement the recovery process should be included in the plan. In addition, a checklist for each team member, detailing recovery procedures for each critical school function needs to be developed.

Procedures for handling insurance and finance issues must also be included in the plan, along with human resource issues such as dealing with staff and student injuries, fatalities, family issues, trauma, etc. Appendices can be used to contain common procedures, alternate site locations and directions, and any other information that may be useful in a disaster.

The BCP is now complete, and should be implemented in the school.

E.2.6 Maintenance of the plan

Once the BCP is in place, it must not be left sitting on a shelf in the school's office. Risks change over time, and as a consequence, the BCP should be a 'living' document. Regular reviews should be carried out to make sure that the BCP remains relevant and up to date.

E.2.7 Training and awareness

There is little point in developing and maintaining a BCP if no one knows about it. There should be regular training seminars for existing and new members of staff, and students should be reminded frequently of the importance of being aware of what to do in case of an emergency.

E.3 Involving the community in BCP

Our survey of fires in schools confirmed the view that "when a hazard impacts on a community, the social and material infrastructure is damaged ... and this impact has a disruptive effect that places stress on individuals and communities" (Cronan, 1998, p. 20). By developing and implementing an effective BCP in a school, the social and economic impacts of a school fire may be reduced. The community surrounding the school has an important role to play in developing a BCP, as "the development of [a school's] counter-disaster capability depends on an informed and aware community and a local government that is involved in, and supportive of, disaster prevention and preparedness measures" (Australian Counter Disaster College, 1986). Obtaining community input in a school's BCP will be beneficial, as the community is often uniquely positioned to assist in the recognition of risks (Boughton, 1998, p. 4).

As Boughton also suggests, "the solution to a problem that affects a community will be found with their active participation at all stages of the process ... not only does this participation make the solution one that the community will own, but they will also own and defend the process by which the decision was made". Schools could involve the community in their BCP by holding open seminars and workshops for the community.

APPENDIX F: THE FIRE AWARENESS INTERVENTION PROJECT

The Fire Awareness Intervention Project (FAIP) is run out of the NZFS in Auckland.²⁰ Funded out of the general operational budget, the project deals with youngsters and juveniles with behavioural problems regarding fires. FAIP was initiated in Auckland in 1992, and moved to become a semi-national scheme in 1996.

FAIP provides one-to-one education for juveniles who are referred to the NZFS by concerned parents who have witnessed displays of fire-starting, operational NZFS crews who have apprehended the arsonist at the scene of the fire, the police Youth Aid section, and the Child, Youth and Family Service. These juveniles usually have behavioural problems such as Attention Deficit Hyperactivity Disorder (ADHD), Tourettes Syndrome, learning disabilities, etc. For these youngsters, general fire education programmes in schools, such as the "stop, drop, and roll" programme, are not effective – they require individual attention at home to curb their arson tendencies.

FAIP aims to get to the underlying factors behind the juveniles' behavioural problems. These factors include physical, sexual and emotional abuse, peer pressure, deep-set anger, and coming from a dysfunctional family background. The NZFS make referrals to the appropriate government agencies where necessary.

Since the project started, 906 juveniles have been educated – 801 males, and 105 females. These gender proportions are consistent with international comparisons of young arsonists. These 906 juveniles were responsible for over \$7 million dollars worth of property damage. The project reports a 95% success rate – "success" being defined as the juvenile refraining from starting another fire.

In his dealings with fires in schools in Auckland and juveniles from FAIP, Ray Coleman noted a number of observations:

- The occurrence of school fires seemed to display a cyclical nature. The cycle seemed to revolve around the underlying 'mood' of the community surrounding the school. If the level of petty crime in the community was quiet for a period – in terms of vandalism, graffiti, petty theft, small burglaries, etc. – then there seemed to be few school fires. If incidents of this nature started to occur more regularly, then they appeared to be pre-cursors to school fires.
- Many school fires are started without the intent of causing major damage. Rather they are a 'natural progression' from small acts of vandalism designed to partially destroy the school.
- Many schools do not report small fire incidents in schools, such as rubbish bin fires, pupils setting toilet rolls alight, etc. It was suggested to us that this was partly due to a lack of willingness to get the police or NZFS involved. Apart from the additional paperwork of reporting such small fires, it was suggested that if they are reported frequently, then the school might start to suffer negatively in terms of its image and standing in the community. No school wants to be known as experiencing a large number of fires, as this makes it less attractive to the families of potential pupils, including lucrative fee-paying international students.

²⁰ The majority of the information in this section is sourced from a phone interview with Ray Coleman of the NZFS on 13 September 2001.

The reasons for not reporting small fires (e.g. in order not to lose social status) could potentially have huge costs if a serious fire follows from these minor incidents.

- There are other significant implications of schools *not* reporting small fires. Pupils starting such fires are not exposed to the disciplinary measures that may be taken by the police or NZFS, and may not appreciate the seriousness of their actions. Without clearly defined behavioural boundaries, these pupils will be tempted to start new, possibly larger, fires. Hence, by not reporting small incidents, schools place both their own staff and students at risk from repeat arsons, and also place the wider community at risk, as officials such as the police and the NZFS are not able to build a picture of the pattern of fires in that community.