

ANNUAL MONITORING REPORT

July 2002 – June 2003

**Monitoring the effectiveness of the
Hazardous Substances and New Organisms (HSNO) Act 1996**

October 2003

Executive summary

Introduction

Section 11(b)(i) of the Hazardous Substances and New Organisms (HSNO) Act 1996 charges the Environmental Risk Management Authority (the Authority) with monitoring and reviewing the extent to which the Act reduces adverse effects on the environment and people. A monitoring strategy was therefore developed in 2001 to assess how effectively the purpose and principles of the Act (sections 4 and 5 of the Act) are being implemented. The strategy includes provision for an annual monitoring report. This monitoring report is a requirement of the purchase agreement with the Minister. It is also the main mechanism for ensuring that an assessment of the Act's effectiveness is included in the annual report delivered by the Authority as required by Section 148(b) of the Act.

Of key interest to the Authority is the monitoring of any adverse effects of hazardous substances and new organisms on the environment, and the health and safety of people and communities. The current monitoring report therefore presents analyses and key statistics for the July 2002-June 2003 year related to a number of public health and environment based performance indicators.

However, data relating to the effects of hazardous substances on the environment, and the effects of new organisms (including genetically modified organisms) in general, are limited. It is therefore difficult to draw any firm conclusions about the Act's effectiveness at reducing adverse effects using these performance indicators alone. In addition, the effectiveness of the Act cannot be fully assessed with regard to hazardous substances until the transitional provisions of the Act have expired. The 2002/03 annual monitoring report is therefore a qualitative, rather than quantitative, commentary on the Act's effectiveness.

The existing monitoring strategy

The current monitoring strategy uses performance indicators, surveys and models, case studies, and targeted research to examine the effectiveness of the Act. The primary focus is on monitoring adverse environmental and human health effects caused by hazardous substances and new organisms, but also includes Part V approvals, and compliance with the Act. To date, practical work has focused on the establishment of the performance indicator framework and the analysis of annual data.

The indicator framework is based on the Pressure-State-Response (P-S-R) model. This model was developed by the Organisation for Economic Cooperation and Development (OECD) to highlight the cause-and-effect relationships between human activities and environmental and social conditions. This model has also been adopted by the Ministry for the Environment (MfE) for its Environmental Indicators programme.

Results and analysis for 2002-2003

Hazardous substances

Prior to the commencement of the HSNO Act few data relating to hazardous substances were collected, and only in a limited number of areas. There is a useful amount of hazardous substance information available in the area of public health. However, little has been collected on the impact of hazardous substances on the natural environment. Until the transfer of hazardous substances to the control of the HSNO Act has been completed, information relating to hazardous substances will continue to provide a baseline against which post-HSNO data can be compared. The hazardous substance component of the HSNO Act came into effect in July 2001.

The key monitoring results for 2002/03 are as follows.

Hazardous substance trade

Data source: Overseas Merchandise Trade statistics produced by Statistics New Zealand

- The gross weight of hazardous substances imported to New Zealand has increased over the last 10 years. Since 1998/99 imports have increased by 100,000-200,000 tonnes (or 6-11%) each year. In 2001/02, approximately 2.3 million tonnes of hazardous substances were imported. This was 11% more than during the previous year. This analysis excludes petroleum oils and products which is the largest component of hazardous substance imports. Data for 2002/03 could not be analysed because a number of confidential import items were still under suppression.
- The most common substances in 2001/02, and in fact since 1998/99, in the industrial sector were aluminium oxide and aluminium hydroxide. The majority of aluminium oxide imported to New Zealand is smelted into aluminium at Tiwai Point. In the primary production sector over the same period the most common substances were nitrogenous, phosphatic, and postassic fertilisers.

Hazardous substance incidents

Data sources: Fire Incident Reporting System maintained by the New Zealand Fire Service; Incidents Database maintained by ERMA New Zealand

- In 2002/03 the NZ Fire Service attended 2078 hazardous substance-related incidents, 1167 of which did not involve a vehicle. The total number of these incidents has increased each year since 2000/01 when improved incident reporting procedures were introduced. The most common substances involved in 2002/03, and in fact since 2000/01, were: petrol or gasoline; methane, compressed, or natural gas; and LPG.
- ERMA New Zealand was notified about 230 hazardous substance incidents that occurred in 2002/03. The most common substances involved were: LPG, petrol, diesel, hydrocarbons, and oil. Most incidents resulted from spills or leakage, and

occurred in the workplace and/or public places. These results are similar to those recorded in 2001/02.

- The data identifies petroleum fuels as having a consistently high incidence rate. Of this group incidents involving LPG are particularly significant in number. Further investigation of these incidents and LPG use in general will therefore be undertaken in 2003/04 to address this issue.
- In 2002/03 the NZ Fire Service attended 31 non-vehicle incidents involving hazardous substances where civilian injury was recorded. A range of substances were involved. This is 24 fewer incidents than in 2001/02, however, there is no obvious trend in either the number of incidents or the type of substances involved since 2000/01.
- The NZ Fire Service recorded one death that resulted from a non-vehicle incident involving hazardous substances. An individual died from burns caused by a reckless act involving the ignition of an unknown flammable liquid or gas. Since 1997/98 the Fire Service has recorded no more than one non-vehicle related fatality per year associated with hazardous substances.
- In 2002/03 ERMA New Zealand was notified of 48 incidents involving hazardous substances where adverse effects on human health were recorded. This is 14 fewer incidents than in 2001/02. Most involved chlorine, diesel, LPG, petrol, or ammonia. In general this distribution is similar to that recorded in 2001/02. Further work will be undertaken in 2003/04 to isolate the substances of concern and investigate incidents involving these substances.
- ERMA New Zealand was notified about one incident involving a single death in 2002/03. An individual was overcome by fumes and died when attempting to repair a leak in a sewage tanker. A total of three hazardous substance-related deaths have been recorded since July 2001.
- In 2002/03 the NZ Fire Service attended 523 non-vehicle incidents involving hazardous substances where environmental contamination was recorded. This is 16 fewer incidents than in 2001/02, however, there is no obvious trend since 2000/01. In 2002/03, and in fact since 2000/01, most contamination affected the air or the ground. The substances involved were not identified.
- In 2002/03 ERMA New Zealand was notified of 67 incidents involving hazardous substances where adverse environmental effects were recorded. This is five less than the previous year. Most involved diesel, oil, petrol, hydrocarbons, or LPG. The distribution of substances in 2001/02 and 2002/03 is varied.

Hazardous substances in the workplace

Data source: Health and Safety Accident Recording Database maintained by the Occupational Safety and Health Service

- Since 2000/01 the number of cases of diseases affecting the lungs from workplace exposure to hazardous substances has decreased. In 2002/03 there were 64 cases,

most of which involved asbestos. This is 17 fewer cases than in the previous year. Asbestos has been the most common substance associated with such incidents since 1999/00.

- Since 1999/00 the number of victims suffering from poisoning or toxic effects as a result of workplace exposure to hazardous substances has decreased. In 2002/03 there were 71 cases, most of which involved chemicals and chemical products, or lead which is separately classified. This is 21 fewer cases than in the previous year. Chemicals and chemical products have been the most common substances associated with such incidents since 2000/01.

Hazardous substances and public health

Data sources: National Minimum Dataset (Hospital events) and the Mortality Collection, both maintained by the New Zealand Health Information Service

- In 2002 the hospitalisation rate for accidental poisoning of children aged 0-4 years by a hazardous substance was: 54.4 per 100,000 for the total population (152 actual hospitalisations); 55.2 per 100,000 for non-Māori (113 hospitalisations); and 52.1 per 100,000 for Māori (39 hospitalisations). Rates for the total and non-Māori populations have decreased since 2000, while rates for Māori children have been more varied. Most hospitalisations in 2002, and in fact since 2000, were of one and two-year-old children, and involved unspecified chemicals and noxious substances.
- In 2000 the death rate for accidental poisoning by a hazardous substance was: 0.33 per 100,000 for the total population (12 actual deaths); 0.29 per 100,000 for non-Māori (9 deaths); and 0.45 per 100,000 for Māori (3 deaths). Rates for the total and non-Māori populations decreased between 1996 and 1998, but have increased since 1999. Rates for the Māori population have been more variable. A range of substances were involved. Because there is a significant delay associated with the availability of mortality data, data for 2000 are the most recent available.

Hazardous substance approvals

Data source: Hazardous Substance Register maintained by ERMA New Zealand

- 40 applications for the importation or manufacture of hazardous substances for release (HSR) were approved for 51 substances during 2002/03. Of these substances, 25 had one or more components that were persistent and/or bioaccumulative. HSR applications have only been approved since July 2001. It will therefore be several years before any reliable conclusions can be drawn about the effectiveness of controls placed on these approved substances.
- ERMA New Zealand did not receive any applications to determine if there were grounds for reassessing a hazardous substance in 2002/03. No substances were reassessed.

Hazardous substance compliance and containment

Data source: Incidents Database maintained by ERMA New Zealand

- There have been no recorded breaches of containment for any approved hazardous substance since July 2001.

Summary

A number of general conclusions can be made from the 2002/03 monitoring results:

- The increase in hazardous substances imported to New Zealand over the last ten years suggests that the potential for adverse effects from the use of such substances has also increased. Though this is difficult to confirm in the absence of comprehensive domestic production information.
- The impact of hazardous substance use on health has been variable, though the baseline data generally suggest that the situation is improving. For example, while the total number of non-vehicle incidents attended by the NZ Fire Service has increased, the number where civilian injuries were recorded has almost halved since 2001/02. The incidence of workplace related diseases and poisonings have decreased since 2000/01. The hospitalisation rate for accidental poisoning by a hazardous substance for children aged 0-4 years has decreased since 2000, though it has increased slightly for Māori children. In comparison, the death rate for accidental poisoning by a hazardous substance has increased for the total population (all ages) between 1999 and 2000, though the data are more variable because of the small numbers involved.
- While these trends are positive, there is still scope for improvement. In addition, these data relate only to acute effects. There are currently no mechanisms to detect chronic effects though this is likely to be an area of significant concern, particularly in the workplace.
- The impact on the environment is not clear, largely because of limited data. However, the number of non-vehicle incidents attended by the NZ Fire Service where contamination by a hazardous substance occurred has remained constant over the last two years.
- Monitoring the current set of hazardous substance indicators is complicated by two factors. First, improvements to data recording procedures adopted by external agencies in recent years have meant that data are now more reliable, but the detection of historical trends is limited. Second, there is a gap in the coverage of incidents where adverse environmental effects occur as a result of hazardous substance use. ERMA New Zealand relies primarily on enforcement agencies to report such incidents. However, regional councils are the primary local government organisations concerned with the environment, and they are not HSNO enforcement agencies. ERMA New Zealand is therefore receiving incident reports from a number of agencies whose primary business and expertise is not directly related to environmental protection. In addition, where information is collected by

regional councils it may be too general to be useful for monitoring the effectiveness of the HSNO Act.

New organisms and genetically modified organisms

There is no public health or environment related information available against which to compare the management of new organisms and genetically modified organisms (GMOs) under pre and post-HSNO regimes. This is the result of both an absence of monitoring under the pre-HSNO regime, and the difficulties involved with making valid comparisons between data collected under the old and new regimes. A baseline of zero has therefore been set for all containment/incident based indicators. The new organism component of the HSNO Act came into effect in July 1998.

The key monitoring results for 2002/03 are as follows.

New organism and GMO incidents

Data source: Incidents Database maintained by ERMA New Zealand

- In 2002/03, one incident involving an approved new organism that adversely affected human health was reported to ERMA New Zealand. This is the first such incident since July 1998. The incident involved an individual being mauled by a male Sumatran tiger after climbing into an enclosure at the Wellington Zoo.
- There have been no incidents involving approved new organisms (including GMOs) that adversely affected the environment reported to ERMA New Zealand since July 1998.

New organism and GMO approvals

Data sources: New Organism Register maintained by ERMA New Zealand; Unwanted Organisms Register maintained by Ministry of Agriculture and Forestry Biosecurity Authority

- There have been no approved new organisms or GMOs declared as unwanted under the Biosecurity Act 1993 since July 1998.

New organism and GMO compliance and containment

Data sources: Risk goods data collected by the Border Management Group within the Ministry of Agriculture and Forestry; Incidents Database maintained by ERMA New Zealand

- In 2001/02 there were 10,987 seed seizures at the New Zealand border. Of these, 38% were of undeclared seeds. The number that were new organisms is not known. There has been an increase in the total number of seed seizures and the proportion that are undeclared since 1999/00. However, this is likely to reflect the more comprehensive border inspection strategies adopted since 1999. Data were not available for 2002/03.

- Five breaches of containment were reported to ERMA New Zealand in 2002/03. Two of these resulted in the escape of a new organism, one of which was later returned to containment. The remaining three, two of which involved GMOs, had no adverse effects. Since July 1998 there have been 1-6 breaches per year (total of 19 breaches). Most have been minor and caused no adverse effects.
- There were no unauthorised developments of GMOs reported to ERMA New Zealand in 2002/03. The only such incidents since July 1998 occurred in 1999/00. However, the projects were low risk and there were no breaches of containment or adverse effects.
- Two intentional releases of unapproved new organisms were reported to ERMA New Zealand. Seven chameleons released during the first incident have been recovered and an individual has been convicted on HSNO Act 1996, Trade in Endangered Species Act 1989, and Biosecurity Act 1993 charges. The second incident involved the illegal importation of a baby bamboo plant (*Pogonatherum*) and is still under investigation by MAF and ERMA New Zealand.
- There were two unintentional releases of unapproved new organisms during 2002/03. These are the only such incidents since July 1998. The first incident involved the detection of genetically modified maize seeds in two harvested crops. ERMA New Zealand and MAF conducted a joint review of the incident. The second incident involved the identification of genetically modified elements in two varieties of sweet corn grown in New Zealand. This incident is still under investigation by ERMA New Zealand.

Summary

Again only general conclusions can be made from the 2002/03 monitoring results:

- Since July 1998 the number of applications to import new organisms for release has been small. There has been only one application approved to import plants or plant material. However, the number of undeclared seed seizures at the border and the discovery of intentionally released unapproved new organisms in New Zealand indicate that the importation of new organisms is still occurring.
- Biosecurity operations are therefore an important component of new organism management in New Zealand. These operations include pre-border, border, and post-border surveillance. New border inspection standards, which are significantly more rigid and comprehensive than those undertaken previously, have been adopted during the last few years. However, it is impossible to identify all illegal imports of risk goods (plants and plant material in particular). The true scale of the problem and the potential risks to the environment are therefore difficult to ascertain.
- Since July 1998 there have been 19 breaches of containment involving approved new organisms or GMOs. Most have been minor and have had no adverse effects. They have usually only involved structural damage to facility boundaries. In most instances the problems have been quickly, and effectively, addressed by the organisations involved. This suggests that containment controls, including

contingency provisions, are effective in preventing adverse effects to people and the environment.

- To date, there have been no incidents involving approved new organisms where adverse effects on the environment were reported; and no approved new organisms declared as unwanted under the Biosecurity Act 1993. Only one incident has involved adverse effects on human health. This incident resulted from unauthorised access to a new organism containment facility, not a breach of containment by the organism.
- Monitoring the impact of new organisms on the environment is complicated by a general lack of appropriate data. It can also be influenced by under-reporting from enforcement agencies and/or the applicants themselves, particularly when their primary expertise is not directly related to environmental protection.

Actions to be taken in response

A number of issues, primarily data related, have been identified throughout the 2002/03 monitoring report that need to be addressed. The following actions will be taken during the 2003/04 monitoring year in response to these issues.

- The vast majority of hazardous substance imports are petroleum oils and products, aluminium oxide, and fertilisers. As a result any trends observed in total imports will be largely controlled by these substances, while trends associated with other less dominant substances are likely to be masked. Therefore, in addition to the analysis currently undertaken, specific substances of concern will be identified in 2003/04 and import data for these substances will be investigated in more detail.
- Further analysis of hazardous substance-related incidents will be undertaken to isolate substances of concern and identify areas for investigation. For example, analysis of incidents reported to ERMA New Zealand has identified petroleum fuels as having a consistently high incidence rate. Of this group incidents involving LPG are particularly significant. More detailed investigation of these incidents will therefore be undertaken in 2003/04.
- Additional information regarding the types of substances associated with environmental contamination recorded by the NZ Fire Service will be included for analysis in 2003/04. However, there is no useful information available about more specific contamination characteristics from this data source. ERMA New Zealand proposes to continue monitoring trends in the data currently collected, but undertake more intensive investigations should an increasing trend occur.
- It is difficult to analyse in detail the contribution of certain hazardous substances to occupational and public health. For example, the majority of hospitalisations for accidental poisoning by a hazardous substance are associated with 'other and unspecified chemicals and noxious substances'. Similarly a significant number of occupational diseases and poisonings have been attributed to simply 'chemicals and chemical products'. However, it is not possible to further investigate the types of substances involved in these cases based on the data currently collected by OSH

and the NZHIS. Should any significant changes occur in the indicator data currently analysed that are of concern; these will have to be investigated using other tools such as case studies.

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1. Introduction

In 2001 a monitoring strategy was developed to enable the Environmental Risk Management Authority (the Authority) to meet its statutory requirement to report on the effectiveness of the Hazardous Substances and New Organisms (HSNO) Act 1996. These requirements are stated in sections 11(b)(i) and 148(b) of the Act.

11. Powers, functions, and duties of Authority – The Authority may –

(b) Monitor and review –

(i) The extent to which the Act reduces adverse effects on the environment or people from hazardous substances or new organisms.

148. Additional reporting requirements – The annual report delivered by the Authority in accordance with section 41L of the Public Finance Act 1989, shall include the following matters:

(b) An assessment of the extent to which this Act has contributed to the health and safety of people and the environment, including an assessment of any reduction in the likelihood that hazardous substances or new organisms will adversely affect people or the environment.

The primary focus of the monitoring strategy is to assess how effectively the purpose and principles of the HSNO Act are being implemented. This assessment will assist in identifying whether changes to the Act and its implementation are necessary. The purpose and principles of the Act are stated in sections 4 and 5.

4. Purpose of Act – The purpose of this Act is to protect the environment, and the health and safety of people and communities, by preventing or managing the adverse effects of hazardous substances and new organisms.

5. Principles relevant to purpose of Act – All persons exercising functions, powers, and duties under this Act shall, to achieve the purpose of this Act, recognise and provide for the following principles:

(a) The safeguarding of the life-supporting capacity of air, water, soil, and ecosystems:

(b) The maintenance and enhancement of the capacity of people and communities to provide for their own economic, social, and cultural wellbeing and for the reasonably foreseeable needs of future generations.

It is important to note that the effectiveness of the HSNO Act cannot be fully assessed with regard to hazardous substances until the transitional provisions in the Act have expired. During this transitional period all hazardous substances already in use in New Zealand are being transferred from pre-existing legislation to fall under the HSNO Act. Once this transfer has been completed HSNO controls will apply to all existing substances. However, at present most hazardous substances in New Zealand are managed under the requirements of various older pieces of legislation. Monitoring data collected on hazardous substances prior to the completion of transfer will therefore be added to the baseline against which post-HSNO data can be compared.

2. The monitoring strategy

2.1 The overall strategy

The initial monitoring strategy covers four main areas:

- The effects and impacts of hazardous substances and new organisms (including genetically modified organisms (GMOs)) on the physical environment
- The effects and impacts of hazardous substances and new organisms (including GMOs) on public health
- Part V approvals
- Compliance with the Act, including containment of hazardous substances and new or genetically modified organisms

The purpose of monitoring these areas is to provide a feedback mechanism for decision-making activities, compliance, and the Act itself.

This strategy and the 2001/02 and 2002/03 annual monitoring reports are based on a number of key principles:

- A focus on indicators to provide an overview of public health and environmental conditions associated with hazardous substances and new organisms
- Further investigation and research in response to trends, or areas of concern, identified by these indicators
- Establishment of a pre-HSNO regime baseline for hazardous substances so that the significance of any post-HSNO trends, or changes, can be assessed
- A staged approach with an initial priority of obtaining readily accessible data from existing national databases
- Utilisation of national databases and other sources of national information wherever possible

Several tools were identified to achieve the purpose of the monitoring strategy:

- Performance indicators
- The use of surveys and models
- Case studies
- Other targeted research

Performance indicators were the primary method of monitoring during both 2001/02 and 2002/03. These indicators are a cost effective way of obtaining an overview of a particular situation and its development over time. Indicators allow any concerning trends, or sudden changes, to be identified. They can then be investigated in greater detail using the other tools e.g., case studies and/or additional targeted research. It was also intended that other information sources available to the Environmental Risk Management Authority New Zealand (ERMA New Zealand) would contribute to the monitoring process to increase understanding of the Act's effectiveness.

2.2 The indicator framework

The methodology of the indicator framework is based on the Pressure-State-Response (P-S-R) model. This model was developed by the Organisation for Economic Cooperation and Development (OECD) to highlight the cause-and-effect relationships between human activities and environmental and social conditions. This model has also been adopted by the Ministry for the Environment (MfE) for its Environmental Indicators programme. By taking this approach, the indicator framework developed by ERMA New Zealand ensures compatibility with relevant national and international monitoring programmes. In principle this makes accessing additional relevant data in the future an easier task.

The P-S-R model is based on the concept of causality. Human activities exert pressures on the environment both directly and indirectly (Pressure). This changes the quality of the environment, and the quality and quantity of natural resources within it (State). Society responds to these changes through environmental, general economic, and sectoral policies; and through changes in awareness and behaviour (Response).

Environmental conditions in the P-S-R model relate to ecosystems and natural environment conditions as well as quality of life and human health aspects. The core set of indicators developed by ERMA New Zealand were therefore intended to measure quantitatively public health and environmental pressures and conditions, and societal responses associated with hazardous substances and new organisms (including GMOs). These indicators are monitored annually so that trends and/or significant changes in parameters can be identified. Further, and more detailed, investigations can then be undertaken into areas of concern using other monitoring tools such as case studies. The set of indicators used in 2001/02 and 2002/03 is listed in Appendix 1.

3. The 2002/03 annual monitoring report

3.1 Indicators

The 2001/02 and 2002/03 annual monitoring reports are based on a total of 41 indicators, as listed in Appendix 1. The monitoring strategy prepared in 2001 presented a set of 34 indicators. During the 2001/02 year some indicators were modified to reflect more accurately the information being provided. A number of new indicators were added when new sources of information and/or data became available. The monitoring indicators are primarily incident based. They cover effects on public health and safety; effects on the environment; Part V approvals; compliance with containment controls; and compliance costs associated with applications.

At the time the strategy was developed in 2001 it was expected that these indicators would be of only limited use if considered individually, particularly in the first few years of the monitoring programme. However, the indicator information could still be used to target areas for further monitoring work. There were no surveys or case studies undertaken during 2002/03.

Unless otherwise specified, the monitoring year refers to the 12 months from 1 July to 30 June. This report covers the 1 July 2002 to 30 June 2003 period.

3.2 Data sources and limitations

The current set of indicators used by ERMA New Zealand to monitor the effectiveness of the HSNO Act is based on a number of pre-existing data sources, maintained either within ERMA New Zealand, or by external agencies.

Information relating to hazardous substances is obtained from the following sources:

- Incidents Database maintained by ERMA New Zealand – contains information about hazardous substance-related incidents that have occurred in New Zealand.
- Hazardous Substance Register maintained by ERMA New Zealand – contains information on applications to introduce new hazardous substances to New Zealand.
- The National Minimum Dataset (Hospital events) (NMDS) managed by the New Zealand Health Information Service (NZHIS) within the Ministry of Health (MoH) – contains public and private hospital discharge information.
- The Mortality Collection managed by the NZHIS – classifies the underlying cause of death for all deaths registered in New Zealand.
- The Fire Incident Reporting System (FIRS2000) maintained by the New Zealand Fire Service (NZ Fire Service) – records data on all call-outs attended by the NZ Fire Service.
- The Health and Safety Accident Recording Database (HASARD) managed by the Occupational Safety and Health Service (OSH) – records incidents where workers suffer serious harm as a result of their work.
- Overseas Merchandise Trade statistics produced by Statistics New Zealand (Stats NZ) – records import and export data for New Zealand.

Information relating to new organisms (including GMOs) is obtained from the following sources:

- Incidents Database maintained by ERMA New Zealand – contains information about new organism and GMO related incidents that have occurred in New Zealand.
- New Organism Register maintained by ERMA New Zealand – contains information on applications to introduce new organisms and GMOs to New Zealand.
- Unwanted Organisms Register maintained by Ministry of Agriculture and Forestry (MAF) Biosecurity Authority – contains information about organisms that have been determined unwanted by Chief Technical Officers of government departments with biosecurity interests, organisms declined importation by ERMA, and organisms listed in the second schedule of the HSNO Act.

- Declared and undeclared risk goods data collected by the Border Management Group with the Ministry of Agriculture and Forestry (MAF) at the New Zealand border.

These data sources are discussed in more detail in the internal ERMA New Zealand report ‘*Monitoring the effectiveness of the Hazardous Substances and New Organisms Act 1996: Data sources and limitations*’. There are a number of limitations associated with each of these data sets that must be considered in any analyses. These are noted throughout this report, but are also discussed in more detail in the ‘*Data sources and limitations*’ report.

3.3 Establishing the baseline

Wherever possible, baseline data have been collected so that pre and post-HSNO data can be compared. The assumption is that any changes in the data post-HSNO may be attributable to the Act. For such inferences to be made it is important to have reliable baseline data. In situations where baseline indicator data are absent, the emphasis will be on monitoring trends in the data. However, it is important to note that it will be several years before any significant trends can be confidently identified and provide an indication of the effectiveness of the Act.

Prior to the commencement of the HSNO Act few data relating to hazardous substances were collected, and only in a limited number of areas. There is a useful amount of hazardous substance baseline information available in the area of public health. However, little has been collected on the impact of hazardous substances on the natural environment. Some historic data on environmental contamination resulting from incidents attended by the NZ Fire Service are available. In the area of new organisms there is very little baseline information available. This is the result of both an absence of monitoring under the pre-HSNO regime, and the difficulties involved with making valid comparisons between data collected under the old and new regimes.

The baseline for hazardous substances is still the *status quo*. As discussed earlier this is because all existing substances are still being transferred to the control of the HSNO Act. Until this transfer is complete they are still being managed under pre-existing legislation. Substances in transition (i.e., substances currently in use in New Zealand) will probably comprise more than 99% of total substances in use for several years to come. Because existing substances will only become post-HSNO once they have been transferred, the majority will continue to be monitored as part of the baseline for some time.

There is no public health or environment related baseline information available against which to compare the management of new organisms, or genetically modified organisms (GMOs), under pre and post-HSNO regimes. A baseline of zero has therefore been set for all containment/incident based indicators. This reflects the fact that in the absence of regulatory control no incidents occurred. The adverse effects of approved new organisms that have been released are being monitored as a post-HSNO indicator.

4. Hazardous substances

4.1 Hazardous substance trade

- Trade figures for hazardous substances give an indication of the amount and type of substances circulating in the economy, and therefore the potential risk to people and the environment.

Key messages	<p>The gross weight of hazardous substances imported to New Zealand has increased over the last 10 years. Since 1998/99 imports have increased by 100,000-200,000 tonnes (or 6-11%) each year. In 2001/02, approximately 2.3 million tonnes of hazardous substances were imported. This was 11% more than during the previous year. This analysis excludes petroleum oils and products which is the largest component of hazardous substance imports. Data for 2002/03 could not be analysed because a number of confidential import items were still under suppression.</p> <p>The most common substances in 2001/02, and in fact since 1998/99, in the industrial sector were aluminium oxide and aluminium hydroxide. The majority of aluminium oxide imported to New Zealand is smelted into aluminium at Tiwai Point. In the primary production sector over the same period the most common substances were nitrogenous, phosphatic, and potassic fertilisers.</p>
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Indicator 27 Gross weight of hazardous substances imported to New Zealand

- In 2001/02 the gross weight of hazardous substances imported to New Zealand was approximately 2,275,708 tonnes (Figure 1).
- The gross weight of hazardous substances imported to New Zealand has increased over the last 10 years. Since 1998/99 imports have increased: by 165,582 tonnes (or 9%) between 1998/99 and 1999/00; by 115,573 tonnes (or 6%) between 1999/00 and 2000/01; and by a further 215,354 tonnes (or 11%) between 2000/01 and 2001/02.
- Petroleum oils and products were excluded from the analysis of this indicator. This is because these substances make up the largest component of hazardous substance imports and the quantity imported fluctuates significantly from month to month (which in turn may affect annual trends). Including this group would therefore mask any trends associated with the other, less dominant, substances.

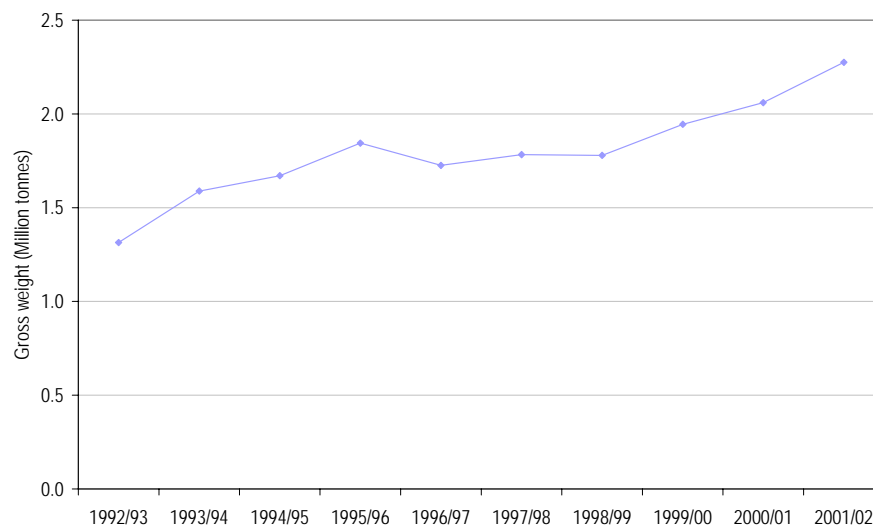


Figure 1 Gross weight of hazardous substances imported to New Zealand.

- The four most common substances (i.e., $\geq 5\%$ of imports) in 2001/02 were (Table 1):
 - Aluminium oxide and aluminium hydroxide – 597,415 tonnes (or 26% of total imports)
 - Nitrogenous fertilisers – 476,827 tonnes (21%)
 - Fertilisers containing nitrogen, phosphorous, or potassium; and other fertilisers – 365,092 tonnes (16%)
 - Postassic fertilisers – 262,304 tonnes (12%)
- A number of other substances were less common (i.e., 1-4% of imports), though still significant:
 - Sodium or potassium hydroxide or peroxide – 86,596 tonnes (or 4% of total imports)
 - Carbonates – 51,830 tonnes (2%)
 - Organic surface-active agents; surface-active washing and cleaning preparations – 39,343 tonnes (2%)
 - Sulphates – 34,054 tonnes (2%)
- These eight substances or groups of substances have consistently been the most common hazardous substance imports since 1998/99. Again it is noted that petroleum oils and products have been excluded from this analysis.
- The majority of aluminium oxide imported to New Zealand is smelted at Tiwai Point near Bluff. During 2001/02 Tiwai Point produced approximately 324,800 tonnes of primary aluminium. Production of one tonne of aluminium requires the consumption of almost two tonnes of aluminium oxide and 13,000-15,000 kilowatt-hours of electricity. Production at Tiwai Point, and as a result the amount of aluminium oxide imported, therefore varies in response to spot electricity prices in New Zealand.
- Since 1998/99 there has been a decrease in aluminium oxide or hydroxide as a proportion of total imports, though the gross weight has remained between 590,000 and 630,000 tonnes. Removing imports of aluminium oxide and hydroxide from the gross

weight of hazardous substances imported annually results in a reduction of 26-36% but does not change the overall trend observed since 1992/93 as shown in Figure 1.

- Since 1998/99 there has also been a slight decrease in the gross weight of imported sodium or potassium hydroxide or peroxide. There has been an increase in both the proportion and gross weight of nitrogenous fertilisers; and fertilisers containing nitrogen, phosphorous, or potassium, and other fertilisers.

Table 1 Substances associated with 1% or more of hazardous substance imports to New Zealand.

	1998/99	1999/00	2000/01	2001/02
Total imports (million tonnes)	1.8	1.9	2.1	2.3
<i>Substance</i>				
Sodium/potassium hydroxide/peroxide	5.5%	4.5%	4.4%	3.8%
Aluminium oxide/hydroxide	33.4%	32.5%	30.5%	26.3%
Sulphates	2.0%	2.1%	2.0%	1.5%
Carbonates	3.1%	2.9%	2.1%	2.3%
Nitrogenous fertilisers	15.4%	15.9%	16.3%	21.0%
Phosphatic fertilisers	1.3%	1.1%	3.4%	<1%
Potassic fertilisers	9.5%	12.9%	11.5%	11.5%
Fertilisers containing nitrogen, phosphorous, or potassium; and other fertilisers	11.8%	10.1%	12.3%	16.0%
Organic surface-active agents; surface-active washing and cleaning preparations	1.8%	1.7%	1.8%	1.7%

- Data for 2002/03 could not be analysed because a number of confidential import items were still under suppression.
- There is little comprehensive information available regarding the domestic production of chemicals to supplement this trade data. Care must therefore be taken in using import data as the only measure of hazardous substances in New Zealand.

Indicator 28 Gross weight of hazardous substances exported from New Zealand

- The gross weight of hazardous substances exported from New Zealand was not calculated for 2001/02 for two reasons in particular:
 - There is insufficient information available regarding the gross weight of substances produced domestically. Although exports do reduce the hazardous substances in New Zealand, it is not possible to determine the significance of this reduction in the absence of domestic production figures.
 - Approximately 80% of total exports are of methanol. The export of remaining substances is therefore not likely to significantly reduce the total quantity of hazardous substances within New Zealand.

4.2 Hazardous substance incidents

- Incidents are an undesirable outcome resulting from the use of hazardous substances. Monitoring these incidents (including the number and type) will give an indication of the risks to people and the environment.

i) Total incidents

Key messages In 2002/03 the NZ Fire Service attended 2078 hazardous substance-related incidents, 1167 of which did not involve a vehicle. The total number of these incidents has increased each year since 2000/01 when improved incident reporting procedures were introduced. The most common substances involved in 2002/03, and in fact since 2000/01, were: petrol or gasoline; methane, compressed, or natural gas; and LPG.

ERMA New Zealand was notified about 230 hazardous substance incidents that occurred in 2002/03. The most common substances involved were: LPG, petrol, diesel, hydrocarbons, and oil. Most incidents resulted from spills or leakage, and occurred in the workplace and/or public places. These results are similar to those recorded in 2001/02.

The data identifies petroleum fuels as having a consistently high incidence rate. Of this group incidents involving LPG are particularly significant in number. Further investigation of these incidents and LPG use in general will therefore be undertaken in 2003/04 to address this issue.

Indicator 21 Total number of incidents (vehicle and non-vehicle) involving hazardous substances attended by the NZ Fire Service

- In 2002/03 the NZ Fire Service attended 2078 incidents involving hazardous substances (Figure 2).
- Since 2000/01 the total number of these incidents has increased: by 370 incidents (or 25%) between 2000/01 and 2001/02; and by a further 252 (or 14%) between 2001/02 and 2002/03.
- These figures are likely to be influenced by improved incident reporting and data quality since 2000 when the Fire Incident Reporting System went online (FIRS2000). Data collected after 2000 are therefore considered to be a more accurate representation of the actual incidents attended. However, it is not yet possible to determine whether any changes or trends observed in these data are the result of an increase in reporting, an actual increase in the number of incidents, or both. These limitations apply to all data collected by the NZ Fire Service discussed in this report.

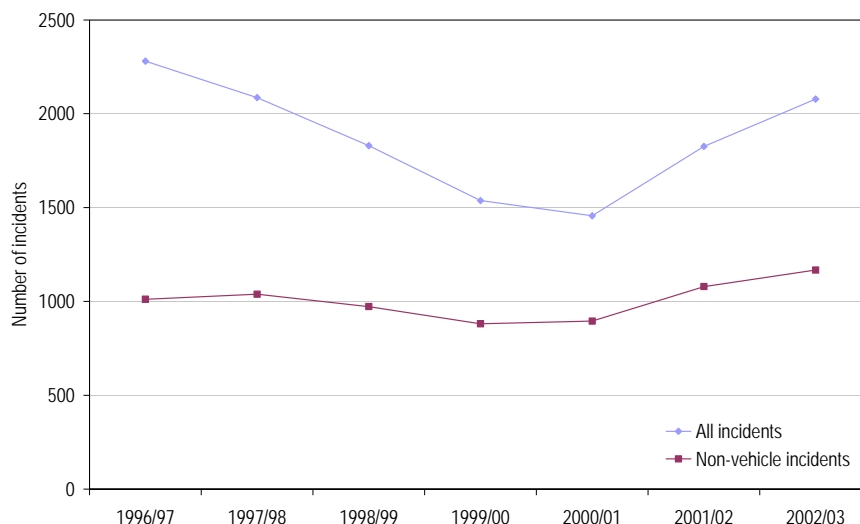


Figure 2 Incidents involving hazardous substances attended by the New Zealand Fire Service.

- The three most common substances (i.e., involved in $\geq 5\%$ of incidents) in 2002/03 were (Table 2):
 - Petrol, motor spirit, gasoline, or aviation gasoline – 1027 incidents (or 52% of total incidents)
 - Liquefied petroleum gases – 282 incidents (14%)
 - Methane, compressed, or natural gas – 255 incidents (12%)
- These three substances have consistently been the most common for such incidents since 2000/01.
- A number of other substances were less common (i.e., involved in 1-4% of incidents) in 2002/03, though still significant:
 - Flammable liquid, not otherwise specified – 68 incidents (or 3% of total incidents)
 - Gas oil, diesel fuel, or heating oil light – 31 incidents (2%)
 - Ammonia, anhydrous – 30 incidents (1%)
- Since 2000/01 there has been a decrease in the proportion of incidents involving LPG, though the actual number of incidents has been more variable. There has also been a decrease in the proportion and number of incidents involving flammable liquids, not otherwise specified. There has been an increase in the proportion and number of incidents involving petrol, motor spirit, gasoline, or aviation gasoline.
- Again it is not yet possible to determine whether these changes are the result of an increase in reporting, an actual change in the distribution of substances, or both.

Table 2 Substances associated with 1% or more of incidents attended by the New Zealand Fire Service.

	2000/01	2001/02	2002/03
Total incidents attended	1456	1826	2078
<i>Substance</i>			
Ammonia, anhydrous	1.6%	1.5%	1.4%
Liquefied petroleum gases (LPG)	22.9%	21.2%	13.6%
Gas oil, diesel fuel, or heating oil light	<1%	<1%	1.5%
Petrol, motor spirit, gasoline, or aviation gasoline	40.7%	44.0%	51.6%
Methane, compressed, or natural gas	12.4%	13.5%	12.3%
Flammable liquid, n.o.s.	9.6%	3.6%	3.3%

NB More than one substance may be recorded for a single incident.

Indicator 22 Total number of non-vehicle incidents involving hazardous substances attended by the NZ Fire Service

- Of the 2078 incidents involving hazardous substances attended by the NZ Fire Service in 2002/03, 1167 (or 56%) did not involve a vehicle (Figure 2).
- Since 2000/01 the total number of non-vehicle incidents has increased: by 184 incidents (or 21%) between 2000/01 and 2001/02; and by a further 88 (or 8%) between 2001/02 and 2002/03.
- Again these figures are likely to be influenced by improved incident reporting and data quality since 2000, and do not necessarily represent a real increase.
- The three most common substances (i.e., involved in $\geq 5\%$ of incidents) in 2002/03 were (Table 3):
 - Petrol, motor spirit, gasoline, or aviation gasoline – 386 incidents (or 33% of total incidents)
 - Methane, compressed, or natural gas – 247 incidents (21%)
 - Liquefied petroleum gases – 190 incidents (16%)
- These three substances have consistently been the most common for such incidents since 2000/01.
- A number of other substances were less common (i.e., involved in 1-4% of incidents) in 2002/03, though still significant:
 - Flammable liquid, not otherwise specified – 43 incidents (or 4% of total incidents)
 - Ammonia, anhydrous – 28 incidents (2%)
 - Gas oil, diesel fuel, or heating oil light – 21 incidents (2%)
 - Chlorine – 14 incidents (1%)
- Since 2000/01 there has been a decrease in the proportion of non-vehicle incidents involving LPG, though the actual number of incidents has been more variable. There

has also been a decrease in the proportion and number of incidents involving flammable liquids, not otherwise specified. There has been an increase in the proportion and number of incidents involving petrol, motor spirit, gasoline, or aviation gasoline.

Table 3 Substances associated with 1% or more of non-vehicle incidents attended by the New Zealand Fire Service.

	2000/01	2001/02	2002/03
Total non-vehicle incidents attended	895	1079	1167
<i>Substance</i>			
Ammonia, anhydrous	2.2%	2.2%	2.4%
Chlorine	1.0%	1.6%	1.2%
Liquefied petroleum gases (LPG)	23.6%	21.3%	16.3%
Gas oil, diesel fuel, or heating oil light	<1%	<1%	1.8%
Petrol, motor spirit, gasoline, or aviation gasoline	29.4%	30.7%	33.1%
Sulphuric acid with more than 51% acid	1.2%	<1%	<1%
Methane, compressed, or natural gas	19.1%	21.5%	21.2%
Flammable liquid, n.o.s.	10.5%	3.8%	3.7%

NB More than one substance may be recorded for a single incident.

Indicator 23 Total number of incidents involving hazardous substances reported to ERMA New Zealand

- ERMA New Zealand was notified about 230 incidents involving hazardous substances that occurred in 2002/03.
- ERMA New Zealand has been notified about 236 incidents that occurred in 2001/02. This figure is slightly different to that discussed in the 2001/02 monitoring report, but is the most up-to-date figure for the year.
- The hazardous substance component of the HSNO Act came into force in July 2001. Therefore 2001/02 is the first year that these data have been comprehensively recorded. This limitation applies to all hazardous substance incident data collected by ERMA New Zealand discussed in this report.
- The six most common substances (i.e., involved in $\geq 5\%$ of incidents) in 2002/03 were (Table 4):
 - Liquefied petroleum gases (LPG) – 27 incidents (or 12% of total incidents)
 - Petrol – 19 incidents (8%)
 - Diesel – 14 incidents (6%)
 - Hydrocarbons – 14 incidents (6%)
 - Oil – 13 incidents (6%)
 - Ammonia – 11 incidents (5%)

- There has been a decrease in the number and proportion of incidents involving diesel and LPG since 2001/02. In contrast there has been an increase in the number and proportion of incidents involving hydrocarbons and oil.
- These distributions are similar to that recorded by the NZ Fire Service for incidents involving hazardous substances, although the proportion of incidents reported to ERMA New Zealand involving petrol is significantly lower.
- Further analysis of hazardous substance-related incidents will be undertaken in 2003/04 to identify substances that may warrant closer attention. For example, in response to the significant number of incidents involving LPG, these incidents and LPG use in general will be investigated during 2003/04.

Table 4 Substances associated with 5% or more of incidents reported to ERMA New Zealand.

	2001/02	2002/03
Total number of incidents	236	230
<i>Substance</i>		
Ammonia	6.4%	4.8%
Diesel	9.7%	6.1%
Hydrocarbons	n/a	6.1%
Liquefied petroleum gas (LPG)	21.2%	11.7%
Oil	<5%	5.7%
Petrol	10.2%	8.3%

NB More than one substance may be recorded for a single incident.

- In 2002/03, 61% of incidents resulted from spills or leakage (Table 5). These results are very similar to 2001/02.
- 56% of incidents occurred in the workplace, 45% in public places, 16% in private dwellings, and 14% were associated with motor vehicles (incidents may be classified as occurring in more than one location) (Table 5). There has been a slight decrease in incidents occurring in private dwellings, and an increase in those occurring in public places since 2001/02.
- Approximately 14% of incidents were the result of compliance, but with a failure of controls (Table 5). 18% of incidents occurred because of non-compliance. It is difficult to draw any firm conclusion from these data because the incident circumstance was either not specified or not known for 156 incidents in 2002/03 (or 68% of total incidents). Further investigation of the compliance data is clearly warranted. This will be undertaken in 2003/04 in the form of case studies.
- The number of hazardous substance incidents reported to ERMA New Zealand in 2002/03 is only 11% of all incidents, and 20% of non-vehicle incidents attended by the NZ Fire Service.

- This is primarily because ERMA New Zealand relies on HSNO enforcement agencies to report incidents. The NZ Fire Service is not a HSNO enforcement agency. However, they are most likely to attend and record hazardous substance-related incidents. HSNO enforcement agencies may only attend an incident when the Fire Service requires assistance. The number of incidents recorded by ERMA New Zealand is therefore lower, as these rely primarily on enforcement agency reports. However, because the records of hazardous substance-related incidents held by the Fire Service are comprehensive, and are available to ERMA New Zealand, the number and type of incidents can still be monitored accurately.

Table 5 Characteristics of incidents involving hazardous substances reported to ERMA New Zealand.

	2001/02	2002/03
Total number of incidents	236	230
<i>Type of incident</i>		
Explosion	6.4%	5.7%
Fire	17.4%	15.2%
Spill/leakage	62.7%	61.3%
Other	19.5%	23.0%
<i>Location of incident</i>		
Motor vehicle	15.3%	14.3%
Private dwelling	23.7%	16.1%
Public place	32.2%	45.2%
Ship	1.7%	1.7%
Train	0.4%	0.9%
Workplace	52.5%	55.2%
Other	0.4%	3.5%
Unknown	1.3%	1.7%
<i>Circumstance of incident</i>		
Compliance, but with a failure of controls	14.8%	14.3%
Non-compliance	25.4%	17.8%
Unknown	59.8%	67.9%

NB Incidents may be classified as more than one type, or as occurring in more than one location.

ii) Incidents affecting human health

Key messages	In 2002/03 the NZ Fire Service attended 31 non-vehicle incidents involving hazardous substances where civilian injury was recorded. A range of substances were involved. This is 24 fewer incidents than in 2001/02, however, there is no obvious trend in either the number of incidents or the type of substances involved since 2000/01.
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The NZ Fire Service recorded one death that resulted from a non-vehicle incident involving hazardous substances. An individual died from burns caused by a reckless act involving the ignition of an unknown flammable liquid or gas. Since 1997/98 the Fire Service has recorded no more than one non-vehicle related fatality per year associated with hazardous substances.

In 2002/03 ERMA New Zealand was notified of 48 incidents involving hazardous substances where adverse effects on human health were recorded. This is 14 fewer incidents than in 2001/02. Most involved chlorine, diesel, LPG, petrol, or ammonia. In general this distribution is similar to that recorded in 2001/02. Further work will be undertaken in 2003/04 to isolate the substances of concern and investigate incidents involving these substances.

ERMA New Zealand was notified about one incident involving a single death in 2002/03. An individual was overcome by fumes and died when attempting to repair a leak in a sewage tanker. A total of three hazardous substance-related deaths have occurred since July 2001.

Indicator 7 Number of non-vehicle incidents involving hazardous substances attended by the NZ Fire Service where civilian injuries were recorded

- Civilian injuries were recorded at 31 (or 3%) of the 1167 non-vehicle incidents involving hazardous substances attended by the NZ Fire Service in 2002/03 (Figure 3).
- This is 24 (or 44%) fewer incidents than in 2001/02. There is no obvious trend since 2000/01. Civilian injuries were recorded at 28 non-vehicle incidents in 2000/01 and at 55 incidents in 2001/02. This is in part because of improved data reporting since 2000, but also because of the small number of incidents involved.

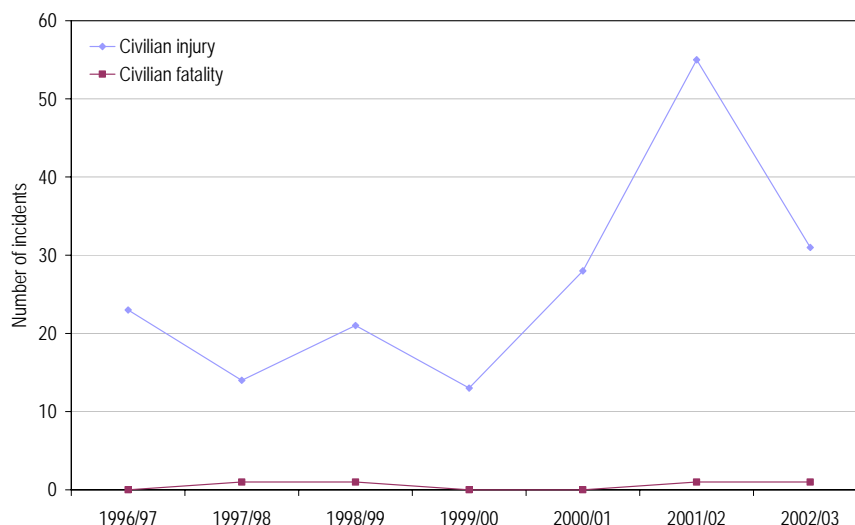


Figure 3 Non-vehicle incidents involving hazardous substances attended by the New Zealand Fire Service where civilian injury and fatality were recorded.

- The six most common substances (i.e., involved in $\geq 5\%$ of incidents) in 2002/03 were (Table 6):
 - Liquefied petroleum gases – 7 incidents (or 23% of total incidents)
 - Isopropanol – 3 incidents (10%)
 - Toluene – 3 incidents (10%)
 - Methane, compressed, or natural gas – 3 incidents (10%)
 - Flammable liquid, not otherwise specified – 3 incidents (10%)
 - Acetone – 2 incidents (6%)
- There is no obvious trend since 2000/01, again because the number of incidents is small. Incidents involving ammonia and chlorine occurred in 2000/01 and 2001/02, but not in 2002/03. Incidents involving isopropanol and toluene occurred in 2002/03, but not in 2000/01 and 2001/02.

Table 6 Substances associated with 5% or more of non-vehicle, civilian injury incidents attended by the New Zealand Fire Service.

	2000/01	2001/02	2002/03
Total non-vehicle incidents with civilian injury	28	55	31
<i>Substance</i>			
Ammonia, anhydrous	<5%	12.7%	n/a
Chlorine	<5%	9.1%	n/a
Liquefied petroleum gases (LPG)	25.0%	16.4%	22.6%
Petrol, motor spirit, gasoline, or aviation gasoline	10.7%	<5%	<5%
Isopropanol	n/a	n/a	9.7%
Toluene	n/a	n/a	9.7%
Hydrochloric acid	10.7%	<5%	<5%
Methane, compressed, or natural gas	10.7%	<5%	9.7%
Flammable liquid, n.o.s.	<5%	9.1%	9.7%

NB More than one substance may be recorded for a single incident.

Indicator 8 Number of non-vehicle incidents involving hazardous substances attended by the NZ Fire Service where civilian fatalities were recorded

- A single civilian fatality was recorded at one of the 1167 non-vehicle hazardous substance-related incidents attended by the NZ Fire Service in 2002/03 (Figure 3). An individual died from burns caused by a reckless act involving the ignition of an unknown flammable liquid or gas.
- Since 1996/97 the NZ Fire Service has only recorded four non-vehicle related deaths associated with hazardous substances, and never more than one death per year. In 1997/98 the incident involved petrol/gasoline; in 1998/99 methane, compressed, or natural gas; and in 2001/02 flammable liquid, not otherwise specified.

Indicator 9 Number of incidents involving hazardous substances reported to ERMA New Zealand where adverse effects on human health were recorded

- In 2002/03 adverse effects on humans were recorded at 48 (or 21%) of the 230 incidents involving hazardous substances reported to ERMA New Zealand.
- This is 14 (or 23%) fewer incidents than in 2001/02. In 2001/02 adverse effects on humans were recorded at 62 (or 26%) of the 236 incidents reported to ERMA New Zealand.
- The five most common substances (i.e., involved in $\geq 5\%$ of incidents) in 2002/03 were (Table 7):
 - Diesel – 4 incidents (or 8% of total incidents)
 - Chlorine – 4 incidents (8%)
 - Liquefied petroleum gas – 4 incidents (8%)
 - Petrol – 4 incidents (8%)
 - Ammonia – 3 incidents (6%)
- This distribution is very similar to 2001/02. However, in 2001/02 sodium hydroxide and sulphuric acid were each involved in five incidents where humans were adversely affected. In 2002/03 these substances were not involved in any such incidents.
- Further work will be undertaken in 2003/04 to isolate the substances of concern and investigate incidents involving these substances.

Table 7 Substances associated with 5% or more of incidents reported to ERMA New Zealand where adverse effects on humans were recorded.

	2001/02	2002/03
Total number of incidents with adverse effects on humans	62	48
<i>Substance</i>		
Ammonia	6.5%	6.3%
Chlorine	6.5%	8.3%
Diesel	<5%	8.3%
Liquefied petroleum gas (LPG)	9.7%	8.3%
Petrol	<5%	8.3%
Sodium hydroxide	8.1%	n/a
Sulphuric acid	8.1%	n/a

NB More than one substance may be recorded for a single incident.

Indicator 10 Number of incidents involving hazardous substances reported to ERMA New Zealand where human deaths were recorded

- ERMA New Zealand was notified about one incident involving a single death in 2002/03. Two individuals were attempting to repair a leak in a sewage tanker. One of the individuals climbed into the rear of the tanker through a man hole and was overcome by the fumes. He was found dead a short time later. A second individual also

passed out and suffered acute respiratory distress. At the time of this report the accident was still under investigation pending possible enforcement under the Health and Safety in Employment Act 1992.

- In 2001/02 two deaths were recorded at two separate incidents. The first involved the intentional ingestion of cyanide (suicide), and the second an explosion in a diesel and petrol fuel tank while welding repairs were being undertaken (poor workplace practice). ERMA New Zealand has conducted internal inquiries into both these deaths.

iii) Incidents affecting the environment

Key messages

In 2002/03 the NZ Fire Service attended 523 non-vehicle incidents involving hazardous substances where environmental contamination was recorded. This is 16 fewer incidents than in 2001/02, however, there is no obvious trend since 2000/01. In 2002/03, and in fact since 2000/01, most contamination affected the air or the ground. The substances involved were not identified.

In 2002/03 ERMA New Zealand was notified of 67 incidents involving hazardous substances where adverse environmental effects were recorded. This is five less than the previous year. Most involved diesel, oil, petrol, hydrocarbons, or LPG. The distribution of substances in 2001/02 and 2002/03 is varied.

Indicator 15 Number of incidents involving hazardous substances attended by the NZ Fire Service where environmental contamination was recorded

- Environmental contamination was recorded at 523 (or 45%) of the 1167 non-vehicle incidents involving hazardous substances attended by the NZ Fire Service in 2002/03 (Figure 4).
- This is 16 (or 3%) fewer incidents than in 2001/02. There is no obvious trend since 2000/01. Environmental contamination was recorded at 424 non-vehicle incidents in 2000/01 and at 539 incidents in 2001/02.
- In 2002/03, 45% of these incidents affected the air, 35% the ground, 8% fresh water, and 5% sea water. Environmental contamination was unclassified at approximately 20% of incidents (contamination may affect several components for a given incident) (Table 8).
- These results are similar to previous years, although the number of incidents where contamination is unclassified has increased significantly since 2001/02.
- Additional information is available from the NZ Fire Service regarding the types of substances involved in these incidents. However, there is no useful information available about more specific contamination characteristics. ERMA New Zealand

proposes to continue monitoring trends in the data currently collected, but undertake more intensive investigations should an increasing trend occur.

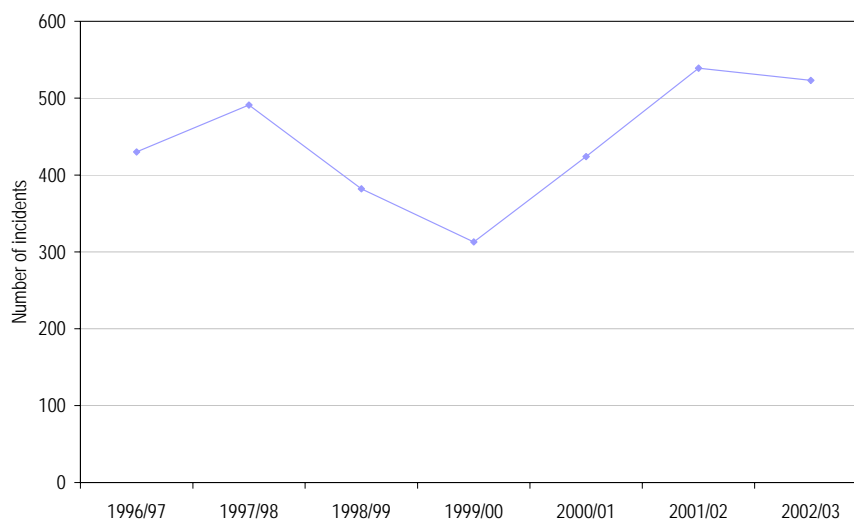


Figure 4 Non-vehicle incidents involving hazardous substances attended by the New Zealand Fire Service where environmental contamination was recorded.

Table 8 Distribution of environmental contamination recorded at non-vehicle incidents attended by the New Zealand Fire Service.

	2000/01	2001/02	2002/03
Total non-vehicle incidents with environmental contamination	424	539	523
<i>Component</i>			
Air	57.1%	60.1%	44.9%
Ground	40.1%	36.9%	35.4%
Fresh water	3.8%	4.5%	7.5%
Sea water	2.8%	1.7%	5.4%
Unclassified	3.1%	3.0%	19.5%

NB Environmental contamination may affect several components for a given incident.

Indicator 16 Number of incidents involving hazardous substances reported to ERMA New Zealand where adverse effects to the environment were recorded

- In 2002/03 adverse environmental effects were recorded at 67 (or 29%) of the 230 incidents involving hazardous substances reported to ERMA New Zealand.
- This is only five (or 8%) fewer incidents than in 2001/02. In 2001/02 adverse environmental effects were recorded at 62 (or 26%) of the 236 incidents reported to ERMA New Zealand. This figure is slightly different to that discussed in the 2001/02 monitoring report, but is the most up-to-date figure for the year.

- The five most common substances (i.e., involved in $\geq 5\%$ of incidents) in 2002/03 were (Table 9):
 - Diesel – 9 incidents (or 13% of total incidents)
 - Oil – 8 incidents (12%)
 - Petrol – 7 incidents (10%)
 - Hydrocarbons – 6 incidents (9%)
 - Liquefied petroleum gas – 4 incidents (6%)
- The substance distributions for 2001/02 and 2002/03 are varied. There has been a decrease in the number and proportion of incidents with adverse environmental effects involving ammonia, diesel, and petrol since 2001/02. In contrast there has been an increase in the number and proportion of incidents involving hydrocarbons and oil. In fact, there were no incidents involving hydrocarbons in 2001/02.
- The number of incidents reported to ERMA New Zealand is approximately an order of magnitude less than those attended by the NZ Fire Service. As discussed this is primarily because ERMA New Zealand relies on enforcement agencies to report incidents. The NZ Fire Service is not a HSNO enforcement agency, but they are more likely to attend such incidents. It is therefore expected that they would have a more comprehensive record of incidents affecting the environment.

Table 9 Substances associated with 5% or more of incidents reported to ERMA New Zealand where adverse environmental effects were recorded.

	2001/02	2002/03
Total number of incidents with adverse environmental effects	62	67
<i>Substance</i>		
Ammonia	6.5%	<5%
Diesel	19.4%	13.4%
Hydrocarbons	n/a	9.0%
Liquefied petroleum gas (LPG)	8.1%	6.0%
Oil	<5%	11.9%
Petrol	25.8%	10.4%

NB More than one substance may be recorded for a single incident.

4.3 Hazardous substances in the workplace

- The use of hazardous substances in the workplace is widespread. Monitoring the number of people suffering from exposure to hazardous substances in the workplace is an important component of identifying the overall risk to humans, and of assessing the management of hazardous substances.

Key messages Since 2000/01 the number of cases of diseases affecting the lungs from workplace exposure to hazardous substances has decreased. In 2002/03 there were 64 cases, most of which involved asbestos. This is 17 fewer cases than in the previous year. Asbestos has been the most common substance associated with such incidents since 1999/00.

Since 1999/00 the number of victims suffering from poisoning or toxic effects as a result of workplace exposure to hazardous substances has decreased. In 2002/03 there were 71 cases, most of which involved chemicals and chemical products, or lead which is separately classified. This is 21 fewer cases than in the previous year. Chemicals and chemical products have been the most common substances associated with such incidents since 2000/01.

Indicator 5 Number of cases of diseases affecting the lungs resulting from hazardous substance use in the workplace

- In 2002/03, 64 victims suffered from diseases affecting the lungs that resulted from hazardous substance use in the workplace (Figure 5).
- Since 2000/01 the number of victims has decreased: by 37 victims (or 31%) between 2000/01 and 2001/02; and by a further 17 (or 21%) between 2001/02 and 2002/03.

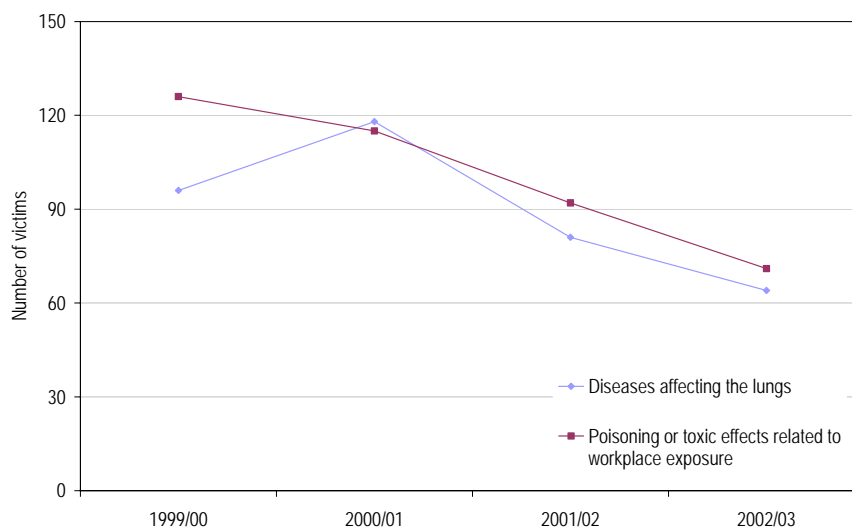


Figure 5 Number of victims suffering from ‘diseases affecting the lungs’ and ‘poisoning or toxic effects related to workplace exposure’ where hazardous substances were involved.

- The three most common substances (i.e., associated with $\geq 5\%$ of victims) in 2002/03 were (Table 10):
 - Asbestos – 43 victims (or 67% of total victims)
 - Chemicals and chemical products – 6 victims (9%)
 - Industrial gases, fumes – 5 victims (8%)

- Asbestos has been associated with approximately 60% or more of victims suffering from diseases affecting the lungs since 1999/00. The actual number of victims has decreased in the last three years from 85 in 2000/01, to 48 in 2001/02, and 43 in 2002/03. The remaining substances have been associated with less than 12 victims in any year.

Table 10 Substances associated with 5% or more of victims suffering from 'diseases affecting the lungs'.

	1999/00	2000/01	2001/02	2002/03
Total 'disease affecting the lungs' victims	96	118	81	64
<i>Substance</i>				
Chemicals and chemical products	10.4%	10.2%	12.3%	9.4%
Isocyanates	<5%	<5%	7.4%	<5%
Industrial gases, fumes	10.4%	<5%	<5%	7.8%
Other chemical products (not specified)	5.2%	<5%	6.2%	n/a
Asbestos	61.5%	72.0%	59.3%	67.2%

Indicator 6 Number of cases of poisoning or toxic effects relating to workplace exposure to hazardous substances

- In 2002/03, 71 victims suffered from poisoning or toxic effects from exposure to hazardous substances in the workplace (Figure 5).
- Since 1999/00 the number of victims has decreased: by 11 victims (or 9%) between 1999/00 and 2000/01; by 23 (or 20%) between 2000/01 and 2001/02; and by a further 21 (or 23%) between 2001/02 and 2002/03.
- The five most common substances (i.e., associated with $\geq 5\%$ of victims) in 2002/03 were (Table 11):
 - Chemicals and chemical products – 29 victims (or 41% of total victims)
 - Lead – 12 victims (17%)
 - Other chemical products (not specified) – 6 victims (8%)
 - Mixed organic solvents – 5 victims (7%)
 - Industrial gases, fumes – 4 victims (6%)
- Chemicals and chemical products have been associated with approximately 30-40% of victims suffering from poisoning or toxic effects since 2000/01. The actual number of victims has decreased from 38-40 in 2000/01 and 2001/02, to 29 in 2002/03. There has been a decrease in the number and proportion of incidents involving industrial gases and fumes since 1999/00. Since 2000/01 there have been 12-14 cases involving lead each year. The remaining substances have been associated with less than 10 victims in any year.
- It is not possible to further investigate the types of substances involved in these cases based on the data currently collected by OSH and provided to ERMA New Zealand.

Should any significant changes occur in the occupational health indicator data that are of concern; these will have to be investigated using other tools such as case studies.

Table 11 Substances associated with 5% or more of victims suffering from 'poisoning or toxic effects related to workplace exposure'.

	1999/00	2000/01	2001/02	2002/03
Total 'poisoning or toxic effects related to workplace exposure' victims	126	115	92	71
<i>Substance</i>				
Chemicals and chemical products	11.1%	33.0%	43.5%	40.8%
Lead	16.7%	10.4%	15.2%	16.9%
Industrial gases, fumes	19.8%	15.7%	10.9%	5.6%
Paint or varnish	6.3%	<5%	<5%	<5%
Mixed organic solvents	19.0%	11.3%	7.6%	7.0%
Other chemical products (not specified)	<5%	<5%	<5%	8.5%

4.4 Hazardous substances and public health (morbidity and mortality)

- Monitoring the effects of hazardous substances on children is important for two reasons. First, the potential health effects of such substances are likely to be more severe than in older persons. Second, the incidence among the younger age group is influenced by interventions such as child-resistant packaging and storage requirements. Deaths associated with hazardous substances are important because they represent the extreme of adverse effects.

Key messages In 2002 the hospitalisation rate for accidental poisoning of children aged 0-4 years by a hazardous substance was: 54.4 per 100,000 for the total population (152 actual hospitalisations); 55.2 per 100,000 for non-Māori (113 hospitalisations); and 52.1 per 100,000 for Māori (39 hospitalisations). Rates for the total and non-Māori populations have decreased since 2000, while rates for Māori children have been more varied. Most hospitalisations in 2002, and in fact since 2000, were of one and two-year-old children, and involved unspecified chemicals and noxious substances.

In 2000 the death rate for accidental poisoning by a hazardous substance was: 0.33 per 100,000 for the total population (12 actual deaths); 0.29 per 100,000 for non-Māori (9 deaths); and 0.45 per 100,000 for Māori (3 deaths). Rates for the total and non-Māori populations decreased between 1996 and 1998, but have increased since 1999. Rates for the Māori population have been more variable. A range of substances were involved. Because there is a significant delay associated with the availability of mortality data, data for 2000 are the most recent available.

Indicator 1 Number (and rate) of hospitalisations for accidental poisonings from other solid and liquid substances, gases, and vapours (ICD-9); and by, and exposure to, noxious substances (ICD-10); excluding foodstuffs and plants, for children aged 0-4 years

Indicator 2 Number (and rate) of hospitalisations for accidental poisonings from other solid and liquid substances, gases, and vapours (ICD-9); and by, and exposure to, noxious substances (ICD-10); excluding foodstuffs and plants, for Māori children aged 0-4 years

- In 2002 (calendar year) the hospitalisation rate was 54.4 per 100,000 for all children aged 0-4 years; 55.2 per 100,000 for non-Māori children; and 52.1 per 100,000 for Māori children (Figure 6).
- Hospitalisation rates for the non-Māori 0-4 year old population are similar to those for the 0-4 year-old population as a whole and have decreased in the last three years.
- Hospitalisation rates for Māori children are generally much lower, and more variable. Between 1998 and 2001 rates decreased from 61.8 to 44.4 per 100,000 children. In 2002 they increased again to 52.1 per 100,000. This variation is in part because of the smaller population involved.

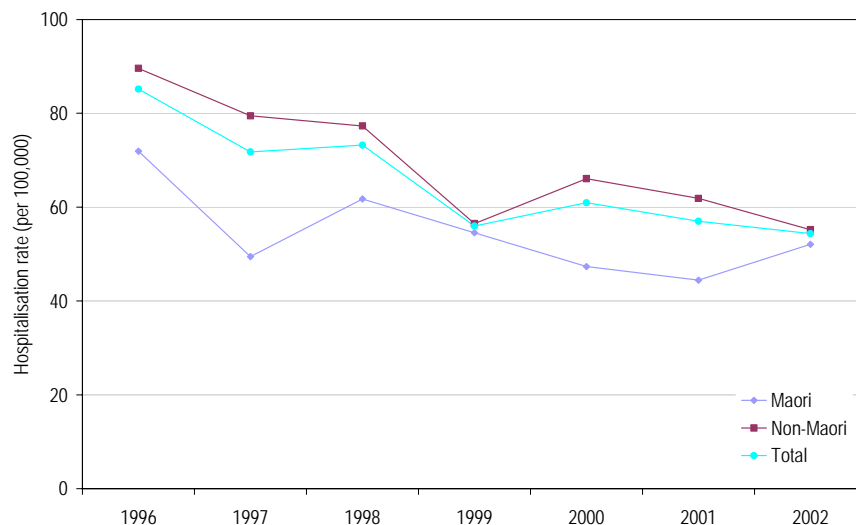


Figure 6 Hospitalisation rates (per 100,000) for accidental poisoning by a hazardous substance for Māori, non-Māori, and total populations aged 0-4 years.

- In 2002, 152 children aged 0-4 years were hospitalised because of accidental poisoning by a hazardous substance. Of these, 113 were non-Māori and 39 were Māori (Table 12).
- Most of the non-Māori children hospitalised were one-year-olds (44%), two-year-olds (32%), or children younger than a year (12%). This distribution is similar to that of previous years, although the actual number of children aged one and three has decreased since 2000.

- Most of the Māori children hospitalised were also one-year-olds (44%), two-year-olds (21%), or children younger than a year (18%). The actual number of one-year-old Māori children hospitalised since 2000 has decreased slightly. The number of two-year-old children, and those aged less than a year, has increased. This variation is again influenced by the smaller population involved.

Table 12 Age distribution of non-Māori and Māori children hospitalised as a result of accidental poisoning by a hazardous substance.

	2000		2001		2002	
	Non-Māori	Māori	Non-Māori	Māori	Non-Māori	Māori
Total number of children	137	37	126	35	113	39
0 years	10.2%	2.7%	12.7%	14.3%	11.5%	17.9%
1 year	50.4%	62.2%	40.5%	45.7%	44.2%	43.6%
2 years	23.4%	8.1%	28.6%	34.3%	31.9%	20.5%
3 years	10.9%	13.5%	14.2%	5.7%	6.2%	10.3%
4 years	5.1%	13.5%	4.0%	0.0%	6.2%	7.7%

- In 2002 the most common substances associated with accidental poisoning of non-Māori children were (Table 13):
 - Other and unspecified chemicals and noxious substances – 75 hospitalisations (or 66% of total hospitalisations)
 - Organic solvents, and halogenated hydrocarbons and their vapours – 15 hospitalisations (13%)
- In 2002 the most common substances associated with accidental poisoning of Māori children were (Table 13):
 - Other and unspecified chemicals and noxious substances – 22 hospitalisations (or 56% of total hospitalisations)
 - Pesticides – 7 hospitalisations (18%)
- Other and unspecified chemicals and noxious substances include:
 - Corrosive aromatics, acids and caustic alkalis
 - Glues and adhesives
 - Metals including fumes and vapours
 - Paints and dyes
 - Plant foods and fertilisers
 - Poisonings not otherwise specified
 - Soaps and detergents
- These results are similar to previous years, although the number of non-Māori and Māori children hospitalised as a result of accidental poisoning by, or exposure to, other and unspecified chemicals and noxious substances has decreased since 2000.
- There is only limited further information that can be drawn from this data source. Should there be significant changes in any trends, further investigation of the causes and specific chemicals involved will need to be undertaken.

Table 13 Distribution of hazardous substances associated with the hospitalisation of children as a result of accidental poisoning.

	2000		2001		2002	
	Non-Māori	Māori	Non-Māori	Māori	Non-Māori	Māori
Total number of children	137	37	126	35	113	39
<i>Substance</i>						
Alcohol	7.3%	0.0%	5.6%	17.1%	8.0%	10.3%
Organic solvents, and halogenated hydrocarbons and their vapours	21.3%	32.4%	18.3%	34.3%	13.2%	10.3%
Other gases and vapours	3.6%	0.0%	4.0%	2.9%	1.8%	5.1%
Pesticides	10.9%	8.1%	15.8%	8.6%	10.6%	17.9%
Other and unspecified chemicals and noxious substances	56.9%	59.5%	56.3%	37.1%	66.4%	56.4%

Indicator 3 Number (and rate) of deaths from accidental poisonings from other solid and liquid substances, gases, and vapours (ICD-9); and by, and exposure to, noxious substances (ICD-10); excluding foodstuffs and plants, for the total population

Indicator 4 Number (and rate) of deaths from accidental poisonings from other solid and liquid substances, gases, and vapours (ICD-9); and by, and exposure to, noxious substances (ICD-10); excluding foodstuffs and plants, for the Māori population

- In 2000 (calendar year) the death rate for accidental poisoning by a hazardous substance was 0.33 per 100,000 for the entire population; 0.29 per 100,000 for non-Māori; and 0.45 per 100,000 for Māori (Figure 7).
- Death rates for the non-Māori population are similar to those for the population as a whole. Rates decreased between 1996 and 1998, but increased again between 1999 and 2000.
- Death rates for Māori show greater variability, in part because of the smaller population involved. The death rate for Māori has been higher than for non-Māori between 1997 and 2000.
- There is a significant delay associated with the availability of mortality data because of investigations into causes of death. Data for 2000 are therefore the most recent available. Data for 1999 presented in this report differ to that discussed in the 2001/02 annual monitoring report, but are the most up-to-date. This is because a number of coroner's reports were filed after the 2001/02 report was completed and so some deaths were not able to be included.

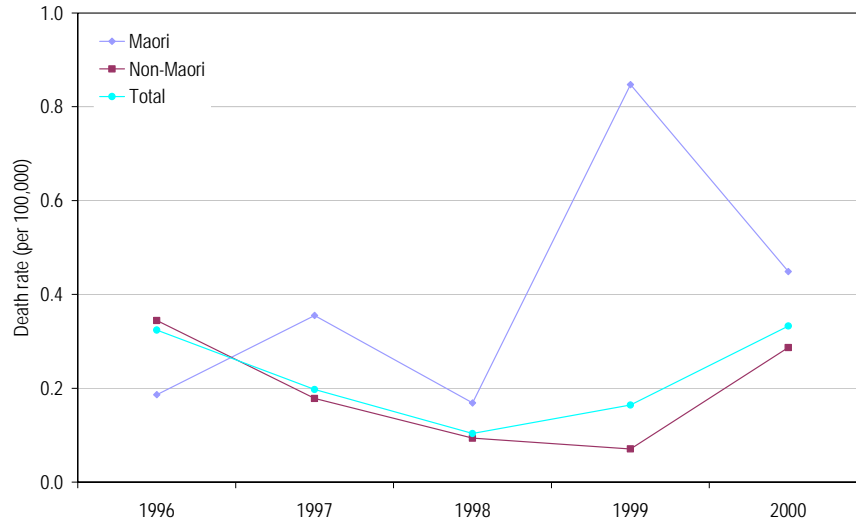


Figure 7 Death rates (per 100,000) for accidental poisoning by a hazardous substance for Māori, non-Māori, and total populations.

- In 2000, 12 people died as a result of accidental poisoning by a hazardous substance. Nine were non-Māori and three were Māori (Table 14).
- The most common substances associated with death via accidental poisoning of non-Māori were other gases and vapours (associated with five deaths). This category includes nitrogen oxides, sulphur dioxide, Freon, tear gas, and other and unspecified gases and vapours.
- Two of the three Māori deaths were via accidental poisoning by alcohol, and one was via accidental poisoning by agricultural and horticultural chemical and pharmaceutical preparations other than plant foods and fertilisers.
- Because there are only a small number of deaths recorded each year, it is not possible to identify any trends.

Table 14 *Distribution of hazardous substances associated with death via accidental poisoning.*

	1998		1999		2000	
	Non-Māori	Māori	Non-Māori	Māori	Non-Māori	Māori
Total number of deaths	3	1	2	4	9	3
<i>Substance</i>						
Alcohol	0	0	1	1	2	2
Agricultural and horticultural chemical and pharmaceutical preparations other than plant foods and fertilisers	1	0	0	1	1	1
Unspecified solid and liquid substances	0	0	0	0	1	0
Gas distributed by pipeline	1	0	0	0	0	0
Other utility gas and other carbon monoxide	1	1	0	0	0	0
Other gases and vapours	0	0	1	2	5	0

4.5 Hazardous substance approvals

- The HSNO Act provides a number of tools to manage hazardous substances within New Zealand. Monitoring whether these tools are aiding in the effective management of any adverse effects is critical.

Key messages 40 applications for the importation or manufacture of hazardous substances for release (HSR) were approved for 51 substances during 2002/03. Of these substances, 25 had one or more components that were persistent and/or bioaccumulative. HSR applications have only been approved since July 2001. It will therefore be several years before any reliable conclusions can be drawn about the effectiveness of controls placed on these approved substances.

ERMA New Zealand did not receive any applications to determine if there were grounds for reassessing a hazardous substance in 2002/03. No substances were reassessed.

Indicator 18 Number of hazardous substances approved for release with any component that has bioaccumulative and/or persistent properties

- In 2002/03, 40 applications for 51 substances were approved for importation or manufacture for release.
- Of the 51 substances approved, 25 had one or more components that were bioaccumulative and/or persistent.

- Persistence refers to the length of time it takes a chemical to break down, and bioaccumulation refers to the ability of a substance to collect in the tissues of a living organism and to be passed up the food chain.
- This indicator refers to substances that are ecotoxic (capable of causing ill health, injury, or death to any living organism), rather than toxic (capable of causing ill health in, or injury to, human beings). It therefore monitors environmental rather than human health effects.
- Because release applications have only been approved since July 2001 when the hazardous substance component of the HSNO Act came into effect it will be several years before any useful and reliable conclusions can be drawn.

Table 15 Hazardous substance release approvals.

	2001/02	2002/03
Hazardous substance for importation or manufacture for release (HSR) applications approved	6	40
Total number of substances approved in HSR applications	8	51
Total number of approved hazardous substances with any component that is persistent and/or bioaccumulative	2	25

Indicator 24 Number of hazardous substances reassessed

- No substances were reassessed in 2002/03.
- During 2001/02 grounds for reassessment were found for 1080, clopyralid, and methylated spirits. The application for the reassessment of clopyralid has since been withdrawn. The remaining applications have been deferred because of a current inability to set user-related controls for the substances in question.

Indicator 25 Number of hazardous substances reassessed and stricter controls imposed

- No substances have been approved with stricter controls since July 2001 when the hazardous substance component of the HSNO Act came into effect.

Indicator 26 Number of hazardous substances reassessed and declined

- No approvals have been withdrawn/declined since July 2001.

4.6 Hazardous substance compliance and containment

- Compliance with approval controls, including the containment of hazardous substances, is crucial to the effective implementation of the HSNO Act. Monitoring these elements is therefore also important.

Key message There have been no recorded breaches of containment for any approved hazardous substance since July 2001.

Indicator 38 Number of breaches of containment involving approved hazardous substances

- 13 hazardous substance in containment applications (HSC) were approved for 31 substances during 2002/03 (Table 16).
- There have been no breaches of containment recorded for any approved substance since the hazardous substance component of the HSNO Act came into effect in July 2001 (Table 16).

Table 16 Hazardous substance containment approvals.

	2001/02	2002/03
Hazardous substance in containment (HSC) applications approved	3	13
Total number of substances approved in HSC applications	9	31
Breaches of containment	0	0

5. New organisms and genetically modified organisms

5.1 New organism and GMO incidents

- Incidents are an undesirable outcome resulting from the use of new organisms or genetically modified organisms (GMOs). Monitoring these incidents (including the number and type) will give an indication of the risks to people and the environment.

i) Incidents affecting human health

Key messages	In 2002/03, one incident involving an approved new organism that adversely affected human health was reported to ERMA New Zealand. This is the first such incident since July 1998. The incident involved an individual being mauled by a male Sumatran tiger after climbing into an enclosure at the Wellington Zoo.
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Indicator 14	Number of incidents involving approved new organisms (including GMOs) reported to ERMA New Zealand where adverse effects on human health were recorded
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- In 2002/03, one incident involving an approved new organism that adversely affected human health was reported to ERMA New Zealand. The incident involved an individual (with a history of psychiatric illness) being mauled by a six-year-old male Sumatran tiger after climbing into an enclosure at the Wellington Zoo. At no time did the tiger leave the enclosure.
- This is the only such incident since the new organism component of the HSNO Act came into effect in July 1998.

ii) Incidents affecting the environment

Key message	There have been no incidents involving approved new organisms (including GMOs) that adversely affected the environment reported to ERMA New Zealand since July 1998.
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Indicator 20	Number of incidents involving approved new organisms (including GMOs) reported to ERMA New Zealand where adverse effects to the environment were recorded
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- In 2002/03 there were no incidents involving new organisms or GMOs reported to ERMA New Zealand where adverse environmental effects were recorded.
- There have been no such incidents reported to ERMA New Zealand since the new organism component of the HSNO Act came into effect in July 1998.

5.2 New organism and GMO approvals

- The HSNO Act provides a number of tools to manage new organisms and GMOs in New Zealand. Monitoring whether these tools are aiding in the effective management of any adverse effects is therefore critical.

Key message There have been no approved new organisms or GMOs declared as unwanted under the Biosecurity Act 1993 since July 1998.

Indicator 19 Number of approved new organisms (including GMOs) declared as unwanted organisms under the Biosecurity Act 1993

- There were no applications approved in 2002/03 for the importation or release of new organisms or genetically modified organisms (Table 17).
- There have been a total of five applications for nine organisms approved since July 1998 when the new organism component of the HSNO Act came into effect. Of these five applications, one has been for plant or plant material.
- In 2002/03 there were no approved new organisms or genetically modified organisms declared as unwanted under the Biosecurity Act 1993. There have been no such organisms since July 1998 (Table 17).

Table 17 New organism and GMO release approvals.

	1998/99	1999/00	2000/01	2001/02	2002/03
GMOs for importation or release (GMR) applications approved	0	0	0	0	0
Total number of GMOs approved in GMR applications	0	0	0	0	0
Importation of new organisms for release (NOR) applications approved	0	2	3	0	0
Total number of new organisms approved in NOR applications	1	3	5	0	0
Number of NOs and GMOs declared as unwanted under the Biosecurity Act 1993	0	0	0	0	0

5.3 New organism and GMO compliance and containment

- Compliance with approval controls, including the containment of new and genetically modified organisms, is crucial to the effective implementation of the HSNO Act. Monitoring these elements is therefore also important.

Key messages In 2001/02 there were 10,987 seed seizures at the New Zealand border. Of these, 38% were of undeclared seeds. The number that were new organisms is not known. There has been an increase in the total number of seed seizures and the proportion that are undeclared since 1999/00. However, this is likely to reflect the more comprehensive border inspection strategies adopted since 1999. Data were not available for 2002/03.

Five breaches of containment were reported to ERMA New Zealand in 2002/03. Two of these resulted in the escape of a new organism, one of which was later returned to containment. The remaining three, two of which involved GMOs, had no adverse effects. Since July 1998 there have been 1-6 breaches per year (total of 19 breaches). Most have been minor and caused no adverse effects.

There were no unauthorised developments of GMOs reported to ERMA New Zealand in 2002/03. The only such incidents since July 1998 occurred in 1999/00. However, the projects were low risk and there were no breaches of containment or adverse effects.

Two intentional releases of unapproved new organisms were reported to ERMA New Zealand. Seven chameleons released during the first incident have been recovered and an individual has been convicted on HSNO Act 1996, Trade in Endangered Species Act 1989, and Biosecurity Act 1993 charges. The second incident involved the illegal importation of a baby bamboo plant (*Pogonatherum*) and is still under investigation by MAF and ERMA New Zealand.

There were two unintentional releases of unapproved new organisms during 2002/03. These are the only such incidents since July 1998. The first incident involved the detection of genetically modified maize seeds in two harvested crops. ERMA New Zealand and MAF conducted a joint review of the incident. The second incident involved the identification of genetically modified elements in two varieties of sweet corn grown in New Zealand. This incident is still under investigation by ERMA New Zealand.

Indicator 30 Seizures of undeclared seeds as a proportion of total seed seizures

- In 2001/02 the total number of seed seizures at the New Zealand border was 10,987. Of these, 4129 (or 37.6%) were undeclared (Figure 8). The number that were new organisms is not known.
- These data are collected for air cargo, aircraft and passengers, mail, personal effects, sea cargo, and vessels (direct and coastwise).
- Data were not available for 2002/03 at the time this report was completed.
- Since 1999/00 there has been an increase in the total number of seed seizures, and the number and proportion of those that were undeclared. This increase has been influenced by several factors:
 - MAF began searching or x-raying 100% of passenger baggage in April 2001.
 - Between 1998/99 and 2001/02 there has been an increase in air passengers of 350,000 (or 11%).
 - Since July 1999 international mail of interest to MAF has included first class letters, as well as parcels. This has increased the number of mail items inspected 13-fold.

- Because the data for 2000/01 and 2001/02 are the result of more comprehensive inspection strategies they are considered better estimates of the intention to illegally import seeds than data for previous years. Further increases in inspections of aircraft, sea cargo, and vessels may affect these estimates in the future.
- The format in which seed seizure data are provided to ERMA New Zealand changed in 2001/02. To ensure data consistency seed seizure data were recalculated for all years. They may therefore differ slightly to those published by ERMA New Zealand in earlier monitoring and annual reports.

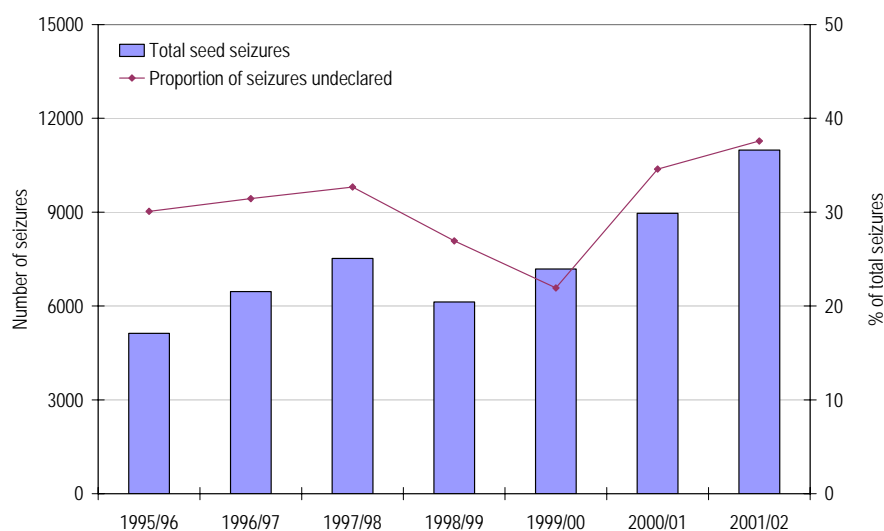


Figure 8 Total number of seed seizures and the proportion of those that were undeclared.

Indicator 36 Number of breaches of containment involving approved new organisms (including GMOs)

Indicator 37 Number of breaches of containment that resulted in the release or escape of an approved new organism (including GMOs)

- In 2002/03, seven applications for 23 GMOs were approved for importation into containment; 15 applications for 72 GMOs were approved for development in containment; and two applications for five new organisms were approved for importation into containment (Table 18).

Table 18 New organism and GMO containment approvals.

	1998/99		1999/00		2000/01		2001/02		2002/03	
	Appl ⁿ s.	Orgs.	Appl ⁿ s.	Orgs.	Appl ⁿ s.	Orgs.	Appl ⁿ s.	Orgs.	Appl ⁿ s.	Orgs.
GMC	0	0	7	70	32	1029	11	73	7	23
GMD	0	0	7	53	28	70	14	140	15	72
GMF	5	19	4	4	4	16	0	0	0	0
NOC	8	100	6	601	16	1410	7	158	2	5
NOF	0	0	0	0	0	0	0	0	0	0

NB GMC = GMOs for importation into containment; GMD = GMOs for development in containment; GMF = GMOs for field testing in containment; NOC = NOs for importation into containment; NOF = NOs for field testing in containment.

- In 2002/03, five breaches of containment were reported to ERMA New Zealand (Table 19).
- Of these, two resulted in the release/escape of a new organism.
- Breaches where no release/escape occurred:
 - Structural damage to GMO greenhouse at a Forest Research Institute facility in Rotorua. No transgenic material is thought to have left the site.
 - Structural damage to boundary of GMO field site at a Forest Research Institute facility in Rotorua. No transgenic material is thought to have left the site.
 - An individual with a history of mental illness climbed into the enclosure of a six-year-old male Sumatran tiger at the Wellington Zoo.
- Breaches where release/escape occurred:
 - Escape and subsequent recapture of a Macaw that was being free-flight trained at Auckland Zoo.
 - Disappearance of a Cotton Top Tamarin from the Wellington Zoo that has not yet been recovered.
- Of the 19 breaches that have occurred since the new organism component of the HSNO Act came into effect in July 1998:
 - 11 are not considered to have any adverse effects; seven of these involved structural damage to the facility boundary only.
 - Four involved unauthorised access to, and damage of, GM containment facilities but no material is thought to have left the site.
 - Four resulted in the permanent release of a new organism.
- These data suggest that the level of non-compliance is low and that containment controls, including contingency provisions, are effective in preventing adverse effects.
- The data relating to incidents involving new and genetically modified organisms contained in this report are considered to be the most accurate and up-to-date. They may differ slightly to those contained in earlier monitoring and annual reports published by ERMA New Zealand for two reasons:
 - There can be a significant delay between the time an incident occurs and the time it is reported to ERMA New Zealand.

- There have been a number of incidents where an initial lack of information has prevented proper classification of the incident.
- A more detailed record of new organism and GMO incidents is contained in the ‘*Data sources and limitations*’ report discussed earlier.

Table 19 New organism (including GMOs) breaches of containment reported to ERMA New Zealand.

	1998/99	1999/00	2000/01	2001/02	2002/03
Breach of containment	1	3	6	4	5
Subsequent release or escape of a NO or GMO	0	2	3	0	2

Indicator 39 Number of unauthorised developments of GMOs

- There were no unauthorised developments of GMOs reported to ERMA New Zealand in 2002/03 (Table 20).
- To date, the only such incidents of which ERMA New Zealand is aware occurred in 1999/00. Most of these resulted from changes in the technical nature of the modification that went beyond the bounds of the original approval. All the projects were low risk, and there were no breaches of containment or adverse effects.

Indicator 40 Number of intentional releases of unapproved new organisms (including GMOs)

- There were two intentional releases of unapproved new organisms in 2002/03 that were reported to ERMA New Zealand.
- The first incident involved the illegal importation of seven baby chameleons into New Zealand. The chameleons have been recovered by MAF and have been relocated to a zoo in the United Kingdom. An individual has been convicted on a HSNO Act 1996 charge of importing a new organism, and a Trade in Endangered Species Act 1989 charge of trading a threatened species; and convicted and discharged on the Biosecurity Act 1993 charge of possession of unauthorised goods. This is the only HSNO prosecution to date. As guilty pleas were entered there was no challenge.
- The second incident involved the illegal importation and distribution of a baby panda bamboo plant (*Pogonatherum*). The current position of MAF and DoC is that *Pogonatherum* is unlikely to be an invasive species or survive in unprotected environments. At the time of this report MAF had not yet declared the plant as an unwanted organism. This incident is still under investigation by MAF and ERMA New Zealand.
- Since July 1998 there have been a total of eight intentional releases of unapproved new organisms. Only one of these has involved GMOs. The incident involved the release of a GM oral cholera vaccine that was approved under the Medicines Act 1981 but not under the HSNO Act.

- Again these data may differ slightly to those contained in earlier monitoring and annual reports published by ERMA New Zealand, but are considered to be the most accurate and up-to-date.

Table 20 Intentional releases of unapproved new organisms and GMOs reported to ERMA New Zealand.

	1998/99	1999/00	2000/01	2001/02	2002/03
Intentional releases of new organisms or GMOs	0	1	3	2	2

- Unintentional releases of unapproved new organisms (including GMOs) are not specifically addressed by the current monitoring indicators. However, two such incidents have occurred since July 1998, both during 2002/03:
 - Genetically modified maize seeds were detected in two crops harvested in Gisborne and Pukekohe. All the maize has since been destroyed. A joint review of the incident was conducted by ERMA New Zealand and MAF.
 - Identification of genetically modified elements in two varieties of sweet corn grown in New Zealand. The source of the contamination is most likely to have been the seed imported from the United States rather than cross-pollination in New Zealand. At the time of this report the incident is still under investigation by ERMA New Zealand.
- Such incidents may need to be monitored more closely in the future because even though they were unintentional the potential risk to humans and the environment needs to be managed.

6. Hazardous substances and new organisms

6.1 Hazardous substance and new organism compliance

- Enforcement activities are an essential part of the HSNO regime. Monitoring these activities will give an indication of whether the incidence of non-compliance is increasing or decreasing over time, and what measures are undertaken to deal with any issues.

Indicator 31 Number of compliance orders issued by enforcement agencies

Indicator 32 Number of prosecutions taken

Indicator 33 Number of inspections where no further actions were required as a proportion of total inspections made

Indicator 34 Number of inspections where a compliance order was issued as a proportion of total inspections made

Indicator 35 Number of inspections where a prosecution was taken as a proportion of total inspections made

- These indicators were not addressed during the 2002/03 year for a number of reasons:
 - The transfer of enforcement activities from previous legislation to the control of the HSNO Act has meant that the roles of enforcement agencies are currently in a transitional stage. Changes relate to both the range of premises, and the range of substances/properties under an agency's responsibility.
 - The controls under the new HSNO regulations have only been applied to a few substances.
 - The annual enforcement activity reports for 2002/03 submitted to ERMA New Zealand were not available at the time this report was completed.
- It may be several years before the indicators based on the new HSNO enforcement regime will be an effective monitoring tool.

Indicator 41 Average cost for an application under Part V of the Act, subdivided by approval type: rapid assessment; containment/development; containment/field trial; release.

- This indicator is currently under review and is therefore not included as part of this report.

7. Summary

1. The primary focus of the monitoring strategy is to assess how effectively the purposes and principles of the HSNO Act are being implemented. The strategy is currently based on the use of performance indicators to provide an overview of public health and environmental conditions associated with hazardous substances and new organisms. To date, the focus has been on establishing a pre-HSNO baseline for hazardous substances, and analysing hazardous substance and new organism (including GMO) incident information.
2. The effectiveness of the HSNO Act cannot be fully assessed with regard to hazardous substances until the transitional provisions in the Act have expired. During this transitional period all hazardous substances already in use in New Zealand are being transferred from pre-existing legislation to fall under the HSNO Act. Once this transfer has been completed HSNO controls will apply to all existing hazardous substances. However, at present most hazardous substances in New Zealand are managed under the requirements of various older pieces of legislation. Monitoring data collected on hazardous substances prior to the completion of transfer will therefore be added to the baseline against which post-HSNO data can be compared. Baseline data do, however, provide useful information on substances of concern that may warrant close attention throughout the HSNO process.
3. Prior to the commencement of the HSNO Act few data relating to hazardous substances were collected, and only in a limited number of areas. There is a useful

amount of information available in the area of public health. However, little has been collected on the impact of hazardous substances on the natural environment.

4. The existence and use of hazardous substances within New Zealand, and therefore the potential for adverse effects, has generally increased since 2000/01. Though it is difficult to draw any firm conclusions because of a lack of comprehensive data regarding the domestic production of hazardous substances, and the influence of improved data recording in other areas since 2000.
5. The impact on public health described by individual indicators has been more variable. However, if these baseline data are considered together they do suggest that the situation in general has improved. For example, the number of non-vehicle incidents attended by the NZ Fire Service where civilian injuries were recorded has almost halved since 2001/02. The incidence of workplace related diseases and poisonings have decreased since 2000/01. Since 2000 the hospitalisation rate for accidental poisoning by a hazardous substance for all children and non-Māori children has decreased, but it has increased slightly for Māori children. In comparison, the death rate for accidental poisoning by a hazardous substance has increased for the total and non-Māori populations (all ages) between 1999 and 2000, but it has decreased for Māori. To determine whether any of these trends will be significant in the long-term will require close monitoring.
6. While these trends are positive, there is still scope for improvement. In addition, these data relate only to acute effects. There are currently no mechanisms to detect chronic effects, though this is likely to be an area of significant concern, particularly in the workplace.
7. The impact on the environment is not clear, largely because of limited data. To date, the only reliable source of information is that collected by the NZ Fire Service. However, this too is limited in its scope. The data do not show the degree of contamination; there is no distinction between spills on pervious or impervious ground; and there is no provision for recording the longer flow paths of any spills. This area clearly requires significant development in the future.
8. Monitoring the current set of hazardous substance indicators is complicated by two factors. First, improvements to data recording procedures adopted by external agencies in recent years have meant that data are now more reliable, but cannot be compared to previous years. This specifically affects the total number and classification of hazardous substance-related incidents attended by the NZ Fire Service; and the total number and classification of work related diseases and poisonings involving hazardous substances.
9. Second, HSNO enforcement agencies do not attend all incidents where human health and/or the environment are affected. However, ERMA New Zealand relies primarily on enforcement agencies to report such incidents. Because the comprehensive records held by the NZ Fire Service are available to ERMA New Zealand, incidents in general and those specifically affecting human health can still be monitored accurately. However, there is still a gap in the coverage of incidents where environmental effects occur as a result of hazardous substance use. This is because regional councils are the primary local government organisations concerned with the environment, but they are not

HSNO enforcement agencies. ERMA New Zealand is therefore receiving incident reports from a number of agencies whose primary business and expertise is not directly related to environmental protection. In addition, where information is collected by regional councils it may be too general to be useful for monitoring the effectiveness of the HSNO Act.

10. There is no public health or environment related information available against which to compare the management of new organisms and GMOs under pre and post-HSNO regimes. This is the result of both an absence of monitoring under the pre-HSNO regime, and the difficulties involved with making valid comparisons between data collected under the old and new regimes. A baseline of zero has therefore been set for all containment/incident based indicators.
11. ERMA New Zealand has only received six applications to import new organisms for release since July 1998 when the HSNO Act came into effect for new organisms. Two of these were to import plants or plant material, one of which was subsequently withdrawn. If this information is considered in isolation it suggests that the importation of new organisms has effectively ceased. However, the number of undeclared seed seizures made each year at the border, and the discovery of intentionally released unapproved new organisms within the country, indicate that this is not the case.
12. Biosecurity operations are therefore an important component of new organism management in New Zealand. These operations include pre-border, border, and post-border surveillance. New border inspection strategies have recently been adopted by MAF that are significantly more rigid and comprehensive than those undertaken previously. However, identifying all illegal imports of risk goods (plants and plant material in particular) at the border is an extremely difficult, if not impossible task. The true scale of the problem and the potential risks to the environment are therefore difficult to ascertain.
13. The risks or adverse effects from illegal importations are considered managed under the HSNO regime if they are intercepted before being released in New Zealand. If unapproved new organisms are being detected within the country then the management regime is not being effective. It is not possible to accurately determine what effect, if any, the requirements of the HSNO Act are having on this situation. However, anecdotal evidence does suggest that the HSNO approval process may be influencing the decision to import illegally.
14. New organism (including GMO) containment indicators suggest that containment controls, including contingency provisions, are effective in preventing any adverse effects to people and the environment. Most breaches of containment have been minor and are not considered to have any adverse effects. The majority of incidents have involved either structural damage to facility boundaries only or unauthorised access to GMO facilities where no transgenic material was taken off-site. In most instances the problems have been quickly, and effectively, addressed by the organisations involved.
15. To date, there have been no incidents where adverse effects on the environment were reported; and no approved new organisms declared as unwanted under the Biosecurity Act 1993. Only one incident has involved adverse effects on human health. This

incident resulted from unauthorised access to a new organism containment facility, not a breach of containment by the organism.

16. ERMA New Zealand relies on enforcement agencies and/or the applicants themselves to detect and report non-compliance with approval controls. It is therefore expected that there will be a degree of under-reporting, particularly where the agency's or applicant's expertise is not directly related to environmental protection. This must be considered in any interpretation.
17. There is clearly insufficient information available to allow an assessment of the effects of hazardous substances on the environment and the effects of new organisms (including GMOs) in general. This is largely because data already being collected by other agencies/institutions in New Zealand are either too specific, or too focused on outcomes not connected with the HSNO Act. Cultural, social, and economic issues are also not adequately addressed. In addition, the broad range of hazardous substances and new organisms covered by the Act further complicates monitoring activities.
18. A revised monitoring strategy was prepared in 2002/03 to address these issues. The new strategy is broader in focus. It includes monitoring the state of the environment and human health; and monitoring the effectiveness of tools provided by the HSNO Act. These tools include controls, reassessments, the compliance and enforcement regime, and public awareness. The monitoring coverage is also extended to include Māori; social, ethical, and cultural; and economic and compliance issues. The strategy is based on the principle that if HSNO interventions are functioning effectively then any risks to human health and the environment are being managed successfully.
19. It is intended that monitoring will occur via a four step process. First, general background monitoring is undertaken. This monitoring includes the use of new and existing indicators based on incident, effect, and compliance data; risk indicators, where the direct measurement of effects is not possible; and other information. Second, where areas of priority or concern are identified more detailed monitoring will be initiated. This will focus specifically on the effects observed following a HSNO intervention. Third, the success of interventions will then be evaluated using the before-and-after monitoring. Finally, analyses and assessments will be reported in the annual monitoring report.
20. The revised strategy will allow a more comprehensive assessment of the effectiveness of the HSNO Act. However, some data are still required from areas where they are currently limited or non-existent. It will therefore be several years before any definite conclusions can be drawn regarding the Act's effectiveness.

8. Actions to be taken in response

A number of issues, primarily data related, have been identified throughout this monitoring report that need to be addressed. The following actions will be taken during the 2003/04 monitoring year in response to these issues.

- Hazardous substance imports
 - Import data currently provide information about the overall amount and type of

hazardous substances circulating in the economy. However, while these data do provide a good indication of the potential risk to people and the environment, more detailed analysis is also useful. This is because the vast majority of these imports are petroleum oils and products, aluminium oxide, and fertilisers. As a result any trends observed in total imports will be largely controlled by these substances, while trends associated with other less dominant substances are likely to be masked. Therefore, in addition to the analysis currently undertaken, specific substances of concern will be identified in 2003/04 and import data for these substances will be investigated in more detail.

- Hazardous substance-related incidents reported to ERMA New Zealand
 - Further work will be undertaken to isolate substances of concern and investigate incidents involving these substances. For example, analysis of incidents reported to ERMA New Zealand has identified petroleum fuels as having a consistently high incidence rate. Of this group incidents involving LPG are particularly significant. More detailed investigation of these incidents will therefore be undertaken in 2003/04.

- Incidents involving environmental contamination attended by the NZ Fire Service
 - Additional information is available from the NZ Fire Service regarding the types of substances associated with environmental contamination. These data will be included for analysis in 2003/04. However, there is no useful information available about more specific contamination characteristics from this data source. ERMA New Zealand proposes to continue monitoring trends in the data currently collected, but undertake more intensive investigations (e.g., case studies, alternative/supplementary data sources) should an increasing trend occur.

- Occupational and public health
 - It is difficult to analyse in detail the contribution of certain hazardous substances to occupational and public health. For example, the majority of hospitalisations for accidental poisoning by a hazardous substance are associated with 'other and unspecified chemicals and noxious substances'. While a number of substances are contained in this group, they are not individually identified in the data. Similarly a significant number of occupational diseases and poisonings have been attributed to simply 'chemicals and chemical products'. However, it is not possible to further investigate the types of substances involved in these cases based on the data currently collected by OSH and the NZHIS and provided to ERMA New Zealand. Should any significant changes occur in the indicator data currently analysed that are of concern; these will have to be investigated using other tools such as case studies.

Appendix 1 Indicators

Theme	Indicator short description	Data source	Indicator	Level
Public health Hazardous substances			Number refers to the year 1 July 2002 to 30 June 2003 unless otherwise specified	P -Pressure S -State R -Response
1	Number (and rate) of hospitalisations for accidental poisoning from other solid and liquid substances, gases, and vapours (ICD-9); and by, and exposure to, noxious substances (ICD-10); excluding foodstuffs and plants, for children aged 0-4 years	NZHIS	<ul style="list-style-type: none"> • 152 children • 54.4 hospitalisations per 100,000 <i>1 January to 31 December 2002</i>	S
2	Number (and rate) of hospitalisations for accidental poisoning from other solid and liquid substances, gases, and vapours (ICD-9); and by, and exposure to, noxious substances (ICD-10); excluding foodstuffs and plants, for Māori children aged 0-4 years	NZHIS	<ul style="list-style-type: none"> • 39 children • 52.1 hospitalisations per 100,000 <i>1 January to 31 December 2002</i>	S
3	Number (and rate) of deaths from accidental poisoning from other solid and liquid substances, gases, and vapours (ICD-9); and by, and exposure to, noxious substances (ICD-10); excluding foodstuffs and plants, for the total population	NZHIS	<ul style="list-style-type: none"> • 12 deaths • 0.33 deaths per 100,000 <i>1 January to 31 December 2000</i>	S
4	Number (and rate) of deaths from accidental poisoning from other solid and liquid substances, gases, and vapours (ICD-9); and by, and exposure to, noxious substances (ICD-10); excluding foodstuffs and plants, for the Māori population	NZHIS	<ul style="list-style-type: none"> • 3 deaths • 0.45 deaths per 100,000 <i>1 January to 31 December 2000</i>	S
5	Number of cases of diseases affecting the lungs resulting from hazardous substance use in the workplace	OSH	64	S
6	Number of cases of poisoning or toxic effects relating to workplace exposure to hazardous substances	OSH	71	S
7	Number of non-vehicle incidents involving hazardous substances attended by the NZ Fire Service where civilian injuries were recorded	NZFS	31	S
8	Number of non-vehicle incidents involving hazardous substances attended by the NZ Fire Service where civilian fatalities were recorded	NZFS	1 incident (with 1 death)	S

9	Number of incidents involving hazardous substances reported to ERMA New Zealand where adverse effects on human health were recorded	ERMA NZ	48	S
10	Number of incidents involving hazardous substances reported to ERMA New Zealand where human deaths were recorded	ERMA NZ	1 incident (with 1 death)	S
11	Number (and rate) of hospitalisations for hazardous substance related injuries	ESR	Data not currently available	S
12	Number (and rate) of hospital emergency department attendances for hazardous substance related injuries	ESR	Data not currently available	S
13	Number (and rate) of deaths related to hazardous substance injuries	ESR	Data not currently available	S
New organisms				
14	Number of incidents involving approved new organisms (including GMOs) reported to ERMA New Zealand where adverse effects on human health were recorded	ERMA NZ	1	S
Environmental effects				
Hazardous substances				
15	Number of non-vehicle incidents involving hazardous substances attended by the NZ Fire Service where environmental contamination was recorded	NZFS	523	S
16	Number of incidents involving hazardous substances reported to ERMA New Zealand where adverse effects to the environment were recorded	ERMA NZ	67	S
17	Number of incidents involving hazardous substances reported to ERMA New Zealand where adverse effects to the environment were recorded, by hazard classification	ERMA NZ	Data not currently available	S
18	Number of new hazardous substances approved for release with any component that has bio-accumulative and/or persistent properties	ERMA NZ	25 from a total of 51 approved substances	P
New organisms				
19	Number of approved new organisms (including GMOs) declared as unwanted organisms under the Biosecurity Act 1993	ERMA NZ	0	P

20	Number of incidents involving approved new organisms (including GMOs) reported to ERMA New Zealand where adverse effects to the environment were recorded	ERMA NZ	0	S
Public health and environmental effects				
Hazardous substances				
21	Total number of incidents (vehicle and non-vehicle) involving hazardous substances attended by the NZ Fire Service	NZFS	2078	P and S
22	Total number of non-vehicle incidents involving hazardous substances attended by the NZ Fire Service	NZFS	1167	P and S
23	Total number of incidents involving hazardous substances reported to ERMA New Zealand	ERMA NZ	230	P and S
24	Number of hazardous substances reassessed	ERMA NZ	0	R
25	Number of hazardous substances reassessed and stricter controls imposed	ERMA NZ	0	R
26	Number of hazardous substances reassessed and declined	ERMA NZ	0	R
27	Gross weight of hazardous substances imported to New Zealand	Stats NZ	2,275,708 tonnes <i>1 July 2001 to 30 June 2002</i>	P
28	Gross weight of hazardous substances exported from New Zealand	Stats NZ	Not completed in 2002/03	P
29	Development of a hazardous substances tracking register	ERMA NZ	Not currently feasible	
Compliance monitoring				
30	Seizures of undeclared seeds as a proportion of total seed seizures	MAF	37.6% <i>1 July 2001 to 30 June 2002</i>	P
31	Number of compliance orders issued by enforcement agencies	ERMA NZ	Data not currently available	R
32	Number of prosecutions taken	ERMA	Data not currently available	R
33	Number of inspections where no further actions were required as a proportion of total inspections made	ERMA NZ	Data not currently available	R
34	Number inspections where a compliance order was issued as a proportion of total inspections made	ERMA NZ	Data not currently available	R
35	Number of inspections where a prosecution was taken as a proportion of total inspections made	ERMA NZ	Data not currently available	R
36	Number of breaches of containment involving approved new organisms (including GMOs)	ERMA NZ	5	P and S

37	Number of breaches of containment that resulted in the release or escape of an approved new organism (including GMOs)	ERMA NZ	2	P and S
38	Number of breaches of containment involving approved hazardous substances	ERMA NZ	0	P and S
39	Number of unauthorised developments of GMOs	ERMA NZ	0	P and S
40	Number of intentional releases of unapproved new organisms (including GMOs)	ERMA NZ	2	P and S
Compliance costs				
41	Average cost for an application under Part V subdivided by approval type: <ul style="list-style-type: none"> ○ Rapid assessment ○ Containment/development ○ Containment/field trial ○ Release 	ERMA NZ	Data not currently available	S

NB ERMA NZ = Environmental Risk Management Authority New Zealand; ESR = Institute of Environmental Science and Research; MAF = Ministry of Agriculture and Forestry; NZFS = New Zealand Fire Service; NZHIS = New Zealand Health Information Service within the Ministry of Health; OSH = Occupational Safety and Health; Stats NZ = Statistics New Zealand.