

ANNUAL MONITORING REPORT 2001-2002

Monitoring the Effectiveness of the HSNO Act 1996

February 2003

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Executive Summary

Introduction

Section 11(b)(i) of the Act gives the Authority the function of monitoring and reviewing the effectiveness of the Act in reducing adverse effects. A monitoring strategy has been developed to enable this function to be carried out and the strategy includes provision of an annual monitoring report. This monitoring report is also a requirement of the purchase agreement with the Minister. It is also the main basis for meeting the requirement of s148(b) for the inclusion of an assessment of the effectiveness of the Act in the annual report.

The current report comments on the status of the monitoring framework, and presents and analyses key statistics for the 2001/02 year. One of the major limiting factors in developing the monitoring framework is the paucity of relevant data. Of key interest to the Authority is monitoring effects of hazardous substances and new organisms on human health and the environment. Although the impacts on human health are reasonably well covered data on effects on the environment are essentially non-existent. Given the data limitations the annual monitoring report is very much a “qualified” commentary on the Act's effectiveness.

The monitoring strategy and framework

The current monitoring strategy is based on the use of three tools (performance indicators, case studies and targeted research) to examine effectiveness. However, practical work has focused on the establishment of the performance indicator framework and the analysis of annual data.

The indicator framework adopted is based in part on the pressure-state-response model developed by the OECD and adopted by the Ministry for the Environment for its Environmental Performance Indicators programme. However, the framework focuses specifically on the effects of organisms and hazardous substances, and has been extended to include compliance with the Act and compliance costs.

Results and analysis for 2001-2002 year for Hazardous Substances

The current hazardous substance indicators mainly cover human health and safety, reflecting the data available. There are currently few useful databases on environmental effects. The results set out below describe the status quo i.e. effectiveness of the situation pre-HSNO. This is because the majority of hazardous substances in use (>99% of the total by any measure) are existing substances which have yet to be transferred to the HSNO framework.

Key results for 2001/02 are as follows.

- 126 children aged 0-4 years old were hospitalised in association with hazardous substances

- 6 people died in association with hazardous substances
- 82 cases of diseases affecting the lungs from workplace exposure to hazardous substances were recorded
- 92 cases of poisoning or other toxic effects from workplace exposure to hazardous substances were recorded
- Hazardous substance incidents reported to ERMA New Zealand occurred mainly in workplaces (55%) or in a public place (36%). Most incidents were spills (79%)
- 59 (26%) hazardous substance incidents reported to ERMA New Zealand reported adverse human health effects. Serious incidents were associated with substances that were flammable and/or explosive or by caustic industrial substances. The substance most involved in incidents was LPG.
- 60 (26%) hazardous substance incidents reported to ERMA New Zealand reported adverse environmental effects. Serious incidents were associated with pesticides and to a lesser extent flammable substances (such as petrol or diesel)
- Grounds for reassessment were found for 3 substances

Some broad conclusions can be drawn from the results available, bearing in mind that these relate to the status quo, i.e. are not yet affected by HSNO.

- Overall acute health effects from hazardous substances have decreased or remained relatively stable over recent years, so there is some indication of improving risk management. However, the incidence of effects is still significant, so there is scope for improvement under the HSNO regime. Flammable substances, and common acids and alkalis, are a particular feature of the statistics, although this must be seen in the context of very widespread use.
- Analysis of incidents shows apparent trends over the past few years, but there is a suspicion that this is due to changes in reporting rather than real changes;
- Environmental effects as a result of hazardous substances are not being effectively captured by ERMA New Zealand's incident database.

Results and analysis for the 2001/02 year for new organisms, including GMO's

There are very few databases available which look at the effects from organisms whether new or existing. Current indicators are thus confined to those which can be tied to ERMA New Zealand's incident data, and biosecurity information collected by MAF.

The only indicators which are specific to HSNO's effectiveness are those relating to GMO's and other new organisms in containment. Organisms released so far under

HNSO are an insignificant proportion of the organism population in New Zealand.

Key results are as follows.

- No non-GMO new organism incidents reported to ERMA New Zealand led to any adverse effects to human health or the environment
- No approved new organisms were declared as unwanted organisms under the Biosecurity Act
- There were only minor GMO breaches of containment and none resulted in any adverse effects to human health or the environment
- 38% of seed seizures made by MAF were not declared

Again, some broad conclusions can be drawn from the data available, most particularly for GMOs in containment.

There have been few incidents involving new organisms in containment, and those that did occur mainly involved security against unauthorised entry. No escapes or unauthorised releases have been recorded since 1998. This indicates that very effective risk management has occurred for organisms in containment under the HSNO regime.

Border surveillance is a very important element in the new organisms regime. Trend data show that undeclared seeds have increased as a proportion of the total number seized. However, this is primarily due to an increase in the level of surveillance by MAF, not necessarily to an increased level of illegal entry. Nevertheless, the data show that illegal entry is a significant issue.

Compliance with the Act

Enforcement for hazardous substances still operates under the transitional regime, and will continue in pre-HSNO mode until the transfer of substances into HSNO occur.

Key results for 2001/02 are as follows:

- 203 compliance orders (0.01% of all total inspections made) were issued
- No prosecutions were taken under the HNSO Act

Compliance Costs

The only compliance cost currently measured is the price charged by ERMA New Zealand. Due to the low numbers of applications that have been received and individual variability, there are few clear trends as yet.

In the hazardous substances area, costs to date are generally in line with pre-HSNO

estimates. In the new organisms area, costs have decreased progressively for applications that are frequent and very similar, with the two main examples being low risk GMO developments and imports of GM mice. Costs for GMO field trials and outdoor developments have been very high and variable.

Further Development of the Strategy

There is a clear gap in the monitoring data on the effects of hazardous substances on the environment, and more generally on the effects of released organisms. Ways to address these gaps are being explored in 2002-2003.

Work to date has highlighted shortcomings in reliance on the very general pressure-state-response indicator model. This model does not provide a sufficient depth or focus to enable the evaluation of the contributions that HSNO tools and interventions are making. A revised approach is being developed that will utilise case studies to a much greater degree in the future. A risk-based approach will be used to identify areas of interest.

1. Introduction

In 2001 a monitoring strategy was developed to enable the Authority to implement one of its functions identified under HSNO which is to monitor the effectiveness of the HSNO Act (1996). Section 11(b) of the HSNO Act sets out the monitoring function as follows:

to monitor and review the extent to which the Act reduces adverse effects on the environment or people from hazardous substances or new organisms.

Section 148 (b) also requires the Authority to include in its annual report:

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 main focus of the monitoring strategy is to assess how effectively the purpose and principles of the HSNO Act 1996 are being implemented. This assessment will assist in identifying whether changes in the Act and its implementation are necessary to improve its effectiveness. The purpose and principles of the Act are as follows:

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 for hazardous substances, effectiveness of the Act cannot be fully assessed until the end of the transitional period when HSNO controls will apply to all existing hazardous substances. Until transfer has been completed the vast majority of hazardous substances in New Zealand will be managed under the requirements of pre-existing legislation. Therefore the monitoring data collected on hazardous substances will be added to the baseline against which post-HSNO data can be compared.

2. The Monitoring Strategy

2.1 The Overall Strategy

The scope of the monitoring framework covers three areas;

- The effects of hazardous substances and new organisms on the environment
- Compliance with the Act
- Compliance costs of the Act

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

There are several key principles that underpin the monitoring strategy. These are;

- a focus on indicators with further investigation and research in response to trends
- utilisation of national databases wherever possible
- a staged approach with the initial priority on readily accessible data from existing national databases
- establishment of a pre-HSNO regime baseline for hazardous substances.

As these principles underpin the monitoring philosophy adopted they have influenced the development the monitoring strategy and consequently the information presented within this report.

Three approaches to monitoring are currently being used. These are;

- performance indicators,
- surveys, modelling and research, and
- targeted case-studies

Indicators were intended to be the primary monitoring tool utilised, as they are a cost effective way in which to monitor. Trend information can be then used to help identify the need for case studies and other work to be carried out. Other information sources available to ERMA New Zealand will also contribute to this process. These will be utilised within the constraints of available resources in order to build up a more complete understanding of the Act's effectiveness. However, as indicated below this approach is being re-considered.

2.2 The Indicator Framework

The indicator framework adopted is the Pressure-State-Response model, developed by the OECD and adopted by the Ministry for the Environment's Environmental Performance Indicator's programme. By adopting this approach, ERMA New Zealand remains compatible with relevant national and international monitoring which in principle will make accessing additional relevant data in future easier.

The P-S-R model relates pressures on the environment to the state of physical and natural resources and to societal responses to prevent, reduce or mitigate the impact of activities on the environment. For the purposes of monitoring the effectiveness of the HSNO Act the P-S-R model also includes pressures on human health, the state of the public health, and the impact of activities on people and communities are included. This framework is more useful for monitoring the effects of hazardous substances and new organisms on human health and the environment compared with monitoring compliance, however it still contributes somewhat in this area also.

Indicators are developed to quantitatively measure the pressures, the states and the responses. Indicators are monitored regularly (annually) to show trends or sudden changes in particular parameters. These they then lead to more detailed investigation using other monitoring tools such as case studies, as outlined above in 2.2.

This Report

This report only addresses the initial set of monitoring indicators (section 3). Surveys and case studies were not undertaken during the 2001-2002 year. Options for using these tools in the future are discussed in section 5.

3. Monitoring Results and Analysis

3.1 Background

The monitoring strategy prepared in 2001, presented a set of 34 indicators. The indicators are predominantly incident based and cover effects on public health and safety, the environment, compliance with containment controls and compliance costs associated with applications. During the 2001-2002 year some indicators have been modified in order to more accurately reflect the information being provided. Additional indicators have also been added where new sources of information have come to light.

The updated set of indicators is included in Appendix 1. The following discussion of these indicators has been grouped in a similar fashion to the groupings made in the monitoring strategy. Individual indicators have been numbered in Appendix 1 and in the following discussion indicators will be referred to by that number.

Establishing the Baseline

Where possible baseline data had been collected so that pre and post HSNO data can be compared. The inference is that any changes in the data post-HSNO *may* be attributable to the Act. In order for such inferences to be made it is important to have as robust a baseline as possible.

In situations where baseline indicator data is lacking, the emphasis will be on monitoring trends in the data. As such it will be some time (several years) before trend information can usefully provide any indication of the effectiveness of the Act.

It is expected that indicators on their own will be of limited use, particularly in the first few years. Therefore, the intention is to use indicator information to appropriately target further monitoring work such as case studies (see section 5).

Unless otherwise specified, the monitoring year is the year ending June 30th. The period covered in this report is up until 30th June 2002.

Hazardous Substances

Unfortunately, a serious flaw in the pre-HSNO regime is that data was only systematically collected in some areas. For hazardous substances baseline information is more readily available in the area of public health. Little information has been collected on the impact of hazardous substances on the natural environment although historic data

on environmental contamination resulting from incidents has been recorded by the Fire Service. In the new organisms area little relevant baseline information is available. This is a result of both the absence of monitoring under the previous regimes and the difficulty and validity of comparing data between the old and new regimes.

An important point to note is that for hazardous substances, the baseline is still the status quo. This is because all existing substances are still in transition and being managed under the old regime. Substances in transition (existing substances) will probably comprise more than 99% of the substances in actual use for several years. Existing substances will only become 'post-HSNO' once they have been transferred. Consequently, the majority of substances will continue to be monitored as part of the baseline for some time yet.

New Organisms

Because there is no relevant baseline information against which to compare the management of new organisms, a baseline of zero has been set for all containment/incident based indicators. For GMO's, this reflects a zero tolerance to breaches in containment. There is also no relevant pre-HSNO baseline data on the effects of approved new organisms in the environment. However adverse effects of approved new organisms that have been released are being monitored as a post-HSNO indicator.

3.2 Hazardous Substances

i) Public Health

Indicators for Public Health effects from hazardous substances are based primarily on existing health related information collected by the Public Health Information Unit (PHIU) at the Ministry of Health, the Occupational Health and Safety Service (OSH), the New Zealand Fire Service (NZFS) and ERMA New Zealand's incident information.

a) Effects of Hazardous Substances on Public Health (Indicators 1 – 4)

Information on the public health effects of hazardous substances is obtained from the National Minimum Dataset's morbidity (hospitalisations) and mortality (deaths) data, which is collected by the New Zealand Health Information Service (NZHIS)¹. Morbidity and mortality data is coded using the World Health Organisation (WHO) International Classification of Diseases (ICD) system which is used internationally to

¹ NZHIS collects, classifies and codes morbidity and mortality data and present some limited data interpretation. This information is then made available to the Ministry of Health and more detail analysis is conducted by PHIU. A working relationship has been established with PHIU, so the National Minimum Dataset data is obtained from them.

classify morbidity and mortality. Up until 1998 the ICD-9 (CM II) was used, however in 1999, the 10th version of the classification system (ICD-10) was adopted. All morbidity data up to 2000 (coded as ICD-10) has been mapped to ICD-9 and provided to ERMA New Zealand in this earlier coding. However, 2001 data is provided in ICD-10. Mortality data will be presented in ICD-10 from 2000, however, as data is only currently available up to 1999, all mortality data is coded to ICD-9. Morbidity and mortality data is presented for each calendar year. ICD-10 is still comparable to ICD-9, the ICD-10 system is essentially more detailed, enabling closer scrutiny of data.

Data has been collected from 1996, as the way in which ethnicity was captured was changed in 1995 making comparisons before and after this change not valid. Data is categorised into data relating to Maori, to Other ethnicities and combined into Total (see Fig. 1). It is more meaningful to compare the Maori population with the ‘Other’ category which is all other ethnicities excluding Maori, rather than the ‘Total’ population which includes Maori data.

Hazardous Substance incidents were those that were classified within the following e-codes E860-869 excluding E865) – unintentional poisoning from “other solids and liquid substances, gases and vapours”.

Hospitalisations

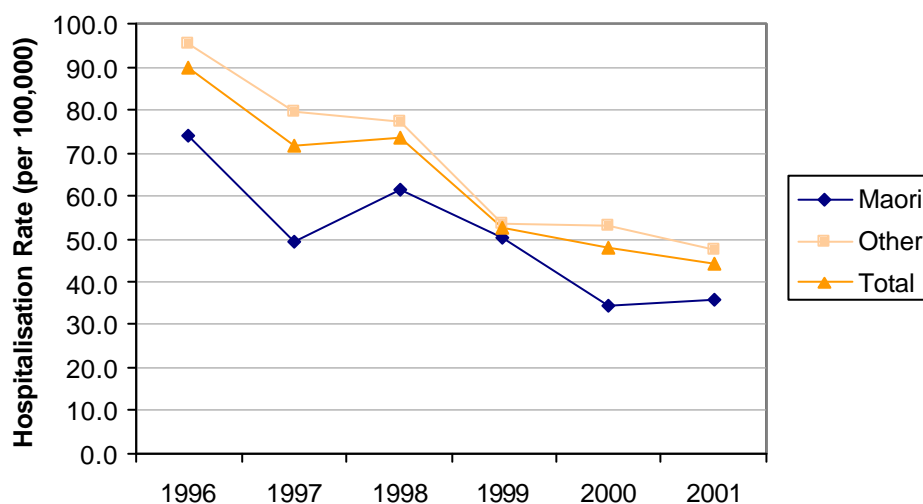


Figure 1. Hospitalisation rate (per 100,000) for Maori, Other (all ethnicities excluding Maori) and Total Populations for 0-4 year olds (Indicator’s 1 & 2).

In general, there appears to have been an overall decrease in the number of hospitalisations of children aged 0-4 since 1996 where hazardous substance codes were recorded across all three populations (Fig. 1). The rate of hospitalisations for the Maori population is slightly lower than for the ‘Other’ and ‘Total’ population and is a little more variable. This is probably due to the small numbers involved.

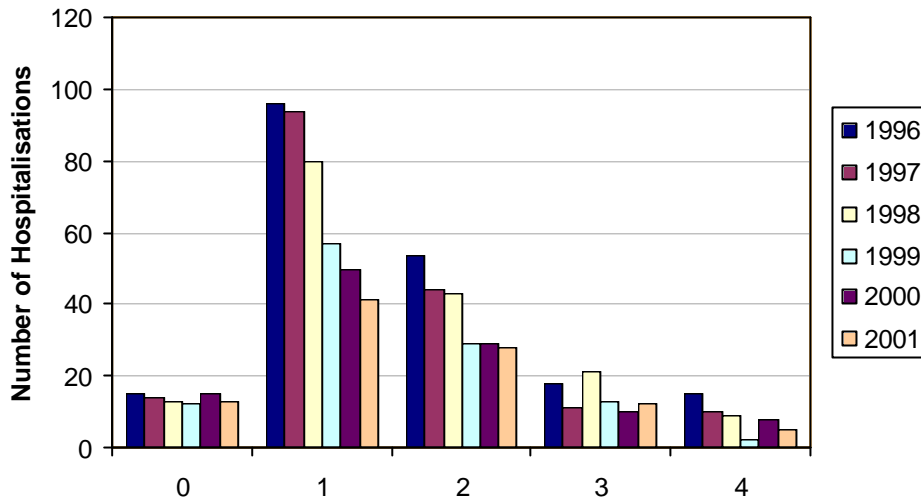


Figure 2. Number of hospitalisations for each age (0-4) for the 'Other' population (all ethnicities including European but excluding Maori) each calendar year.

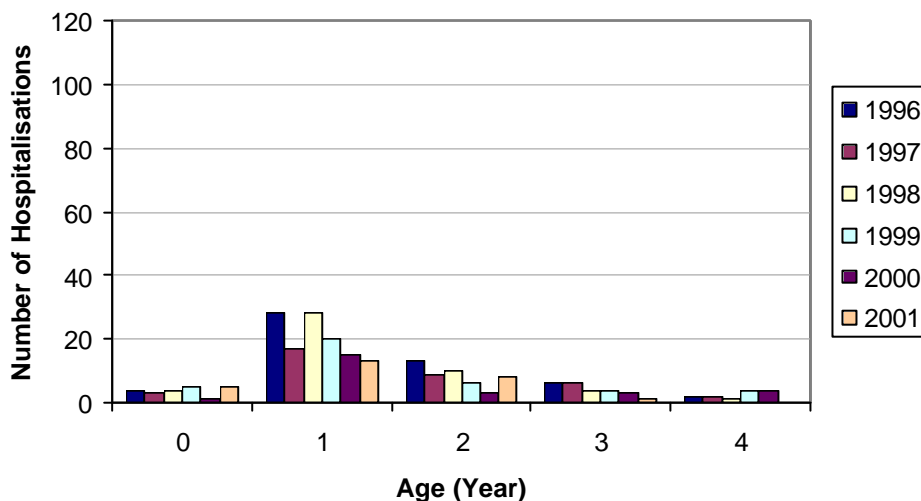


Figure 3. Number of hospitalisations for each age (0-4) for the Maori Population each calendar year (Indicator 2).

Figure's 2 and 3 show children aged one are the most likely to be hospitalised due to accidental poisoning by hazardous substances, with this decreasing at age two. Children aged zero, three and four are less likely to be hospitalised due to accidental poisoning by hazardous substances. The susceptibility of one and two year olds is probably due to their increased mobility (compared with children aged zero), without the associated learning and cognitive function of three and four year olds. As was observed in Fig. 1, there has also been a general overall decrease since 1996 in the number of hospitalisations.

Accidental poisoning by petroleum products, other solvents and their vapours not elsewhere classified (E862) and accidental poisoning by corrosives and caustics not elsewhere classified (E864) were responsible for a large number of hospitalisations of

Maori one year old children from 1996-1999. Since 1999 accidental poisoning by other solid and liquid substances (E866) has accounted for the majority of hospitalisations. This trend is the same when hospitalisations are summed across all ages each year. The trend for 'Other' children aged one is slightly different. From 1996-1999 accidental poisoning by cleansing and polishing agents, disinfectants, paints, and varnishes (E861) and E862 account for a large number of hospitalisation. However this has since switched to E866 as observed for one year old Maori Children.

Deaths

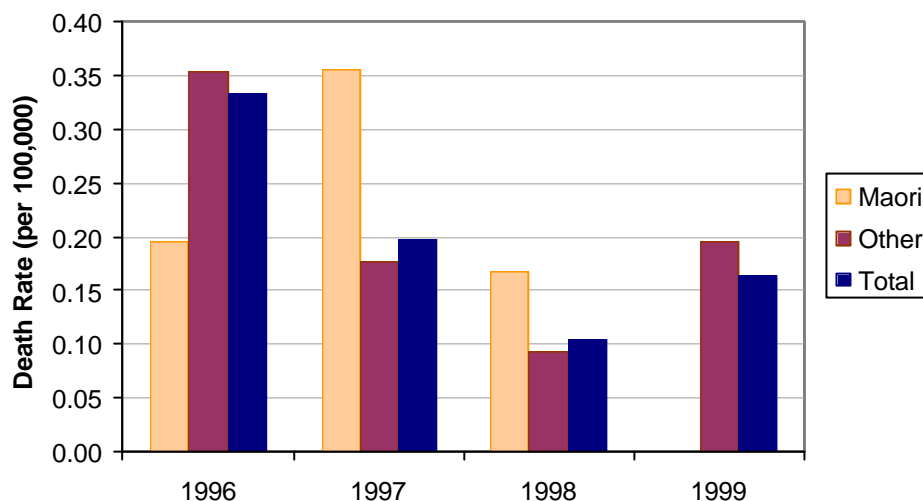


Figure 4. Death rate (per 100,000) for the Maori, Other (all ethnicities excluding Maori) and Total Populations.

The mortality data shows that deaths as a result of accidental poisoning by hazardous substances in 'Total' and 'Other' populations are decreasing, although there was an increase from 1998 to 1999 to rates similar to those in 1997. The rates for the Maori population have also decreased since 1997, with no deaths occurring due to accidental poisoning by hazardous substances in 1999. Note that the population referred to for mortality is for the whole population i.e., across all ages.

In total, there were four deaths of Maori individuals. One classified as accidental poisoning by petroleum products, other solvents and their vapours not elsewhere classified (E862) in 1996, one as accidental poisoning by other utility gas and other carbon monoxide (E868) in both 1997 and 1998, and one as accidental poisoning by other gases and vapours (E869). These low numbers results in larger variations in death rates as can be observed above (Fig. 4). Note that these ICD categorise are designed to exclude suicides.

For the 'Other' population, E868 accounts for the most deaths in 1996 and 1997. In 1999 accidental poisoning by alcohol, not elsewhere classified (E860) and E869 recorded the majority of deaths. There were a low number of deaths in 1998 with no single category recording the majority of deaths. Accidental poisoning by agricultural and horticultural chemicals and pharmaceuticals preparations other than plant foods and fertilizers (E863) has consistently recorded one death each year.

Since there were quite a small number of deaths each year, only one or two further incidents would cause a large change in the relative rate. Therefore great care needs to be exercised in interpreting these data.

b) Effects of Hazardous Substances on Occupational Health (Indicator's 5 and 6)

Public health effects as a result of occupational exposure to hazardous substances are measured by the number of victims in two categories;

1. diseases affecting the lungs, and
2. poisonings and other toxic effects

This information is captured by the HASARD database, which is utilised by Occupational Safety and Health (OSH) to record occupational injury and disease. Previously OSH used several databases to capture this information (such as the Asbestos Register and the Notifiable Occupational Disease System - NODS). These were consolidated into HASARD in the 1998-1999 year. Fig. 5 shows the number of victims suffering from diseases affecting the lungs and poisoning for 1999-2002 June years. Data is available for the 1998-1999 year, however during this year the transfer from the previous system to HASARD resulted in some erroneous results. Therefore this data is considered to be unreliable and has been excluded.

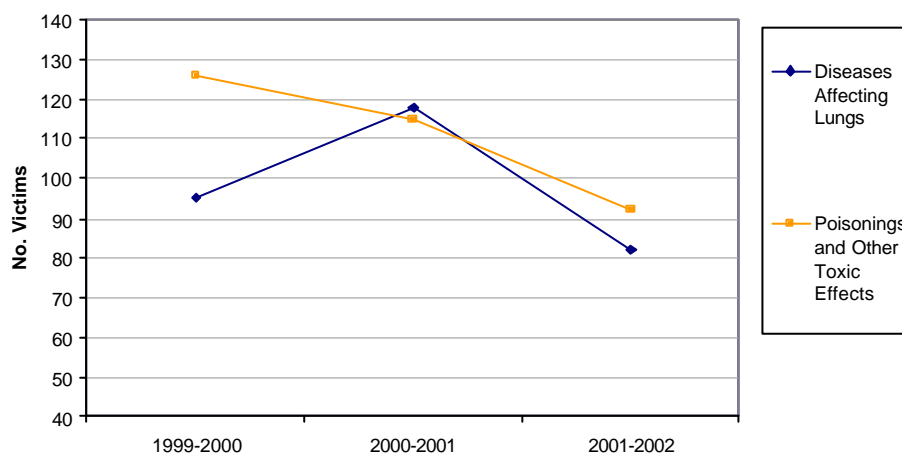


Figure 5. Number of Victims suffering from Diseases Affecting the Lungs and Poisoning as a result of occupational exposure to hazardous substances. (Indicator's 5 & 6)

Due to the short time HASARD has been operating, it is not possible to delineate a clear trend from the data above, however it may indicate a reduction in victims of these occupational injuries and diseases due to hazardous substances. Several more years of data will be needed in order to confirm or refute this.

Over 30 HASARD categories which ERMA New Zealand determined as containing hazardous substances account for diseases affecting the lungs and over 40 account for poisonings. However for both diseases affecting lungs and poisonings, only a few categories account for the majority of cases. Not surprisingly the asbestos category

accounts for the majority of diseases affecting the lungs for all three years. Five HASARD categories account for over 80% of cases of diseases affecting the lungs for all years. These are presented in Table 1.

Table 1. Categories accounting for 80% or more of diseases affecting the lungs each year.

Year	Description	No. Victims
99-00	Asbestos	59
	Industrial gases, fumes	10
	Chemical and chemical products	10
00-01	Asbestos	85
	Chemicals and chemical products	12
	Isocyanates	5
01-02	Asbestos	48
	Chemicals and chemical products	10
	Isocyanates	6
	Other chemical products (not specified)	5

A greater number of categories account for poisonings although, there is no category that consistently accounts for a majority of poisoning cases. Up to seven of nine HASARD categories have accounted for poisoning cases each year and are summarised in Table 2.

An important point to note is that data collected by HASARD relates only to acute effects from exposure to hazardous substances in the workplace. There are currently no mechanisms in place to detect chronic effects and this is an area where further work maybe needed to provide more comprehensive data.

Table 2. Categories accounting for 80% or more of poisonings or other toxic effects each year.

Year	Description	No. Victims
99-00	Industrial gases, fumes	25
	Mixed organic solvents	24
	Lead	21
	Chemicals and chemical products	14
	Paint or varnish	8
	Other chemical products (not specified)	7
	Other organic solvents (not specified)	4
	00-01	Chemicals and chemical products
00-01	Industrial gases, fumes	18
	Mixed organic solvents	13
	Lead	12
	Other chemical products (not specified)	5
	Formaldehyde	4
	Other chemicals for the treatment of plants (not specified)	3
	01-02	Chemicals and chemical products
01-02	Lead	14
	Industrial gases, fumes	10
	Mixed organic solvents	7
	Other chemicals for the treatment of plants (not specified)	4

c) Health Effects of Hazardous Substances recorded by the New Zealand Fire Service (Indicators 7 and 8)

Data was obtained from the New Zealand Fire Service FIRS database, which records details for every call out the Fire Service attends. The Fire Service records details about hazardous substances by UNSI² number.

Details on hazardous substances incidents attended by the Fire Service dates back to 1996-1997, when the FIRS database was implemented. In general, only small refinements have been made since, however these have only improved the quality of data being collected and have not significantly affected the data's integrity.

However, in October 2000, the Fire Services database went online, greatly increasing firefighters access and use of the system. This means a general increase in incidents from 2000/01 would be expected for all indicators based on the Fire Service's data. It has also lead to more accurate recording of hazardous substances when they are involved in an incident.

Figure 6 shows the number of non-vehicle incident where a civilian casualty or fatality, as well as a hazardous substance(s), were recorded.

² UNSI numbers are the UN number or the SI – Substance Identification number. SI numbers are used for substances not identified by a UN number but considered warranting a systematic identification.

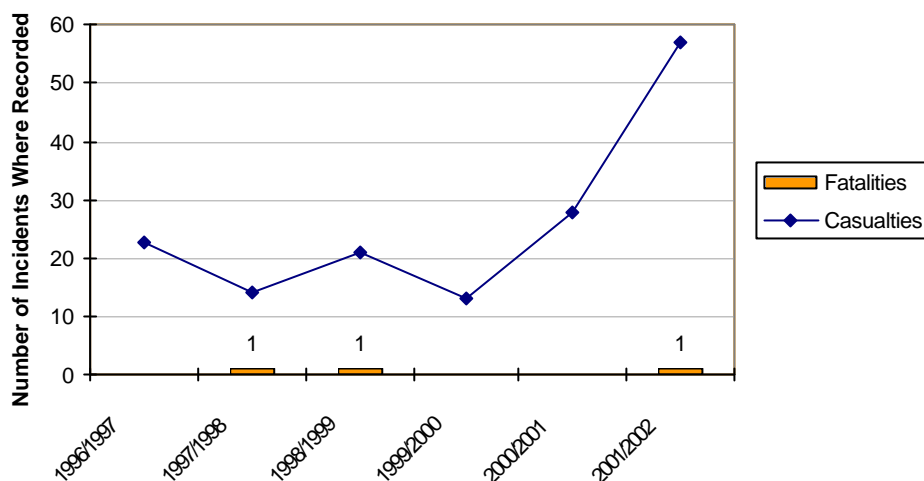


Figure 6. Number of civilian injuries and fatalities as a result of non-vehicle hazardous substances incidents attended by the New Zealand Fire Service. (Indicator's 7 & 8)

As would be expected, fatalities number much fewer than casualties. It would be expected that the number of fatalities may fluctuate in future years because of the small numbers involved. The fatality in 1997/98 was associated with petrol or motor spirit or gasoline or aviation gasoline. The death in 1998/99 was associated with methane, and the fatality in 2001/02 was associated with flammable liquids, not otherwise specified.

The trend for casualties suggests that casualties associated with hazardous substances may have increased in the last two years (Fig. 6). However as mentioned earlier this is likely to be in part a reflection of the increased use of the FIRS database. Figure 7 shows a more detailed breakdown of the top five³ hazardous substances recorded for incidents involving a civilian casualty.

³ The top five is actually the top five overall i.e., summed across all years (from 1996 – 2002). Therefore, this may not be the top five every year. This definition applies to all references to the 'top five'.

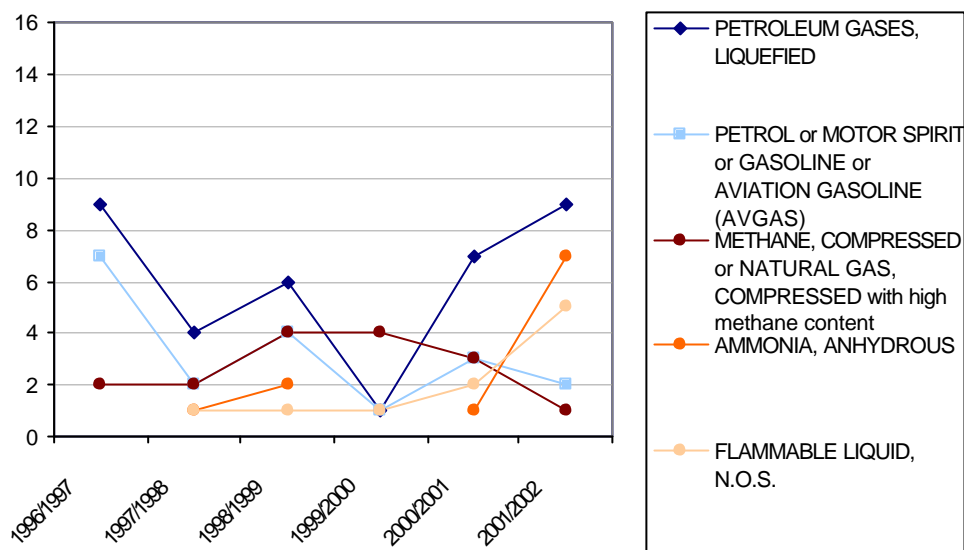


Figure 7. Number of civilian injuries for the top five substance categories of hazardous substance incidents attended by the New Zealand Fire Service.

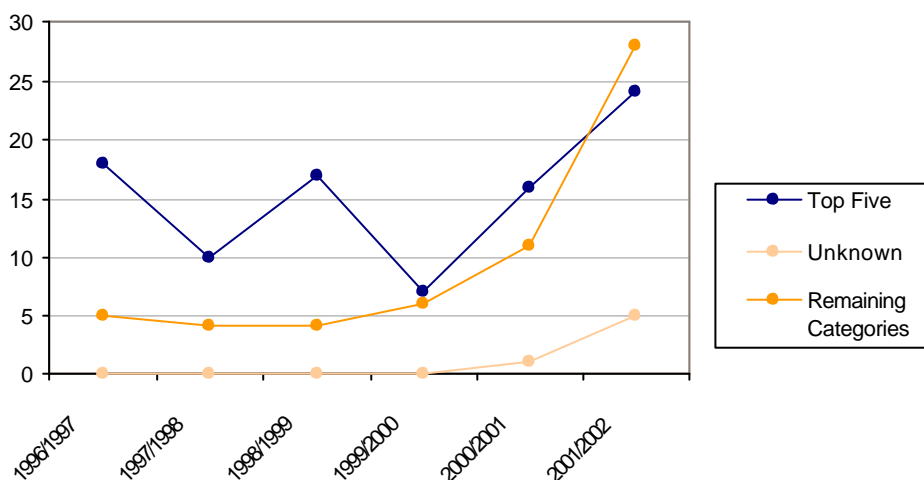


Figure 8. Number of Civilian Injuries as a result of different hazard categories. The top five refers to those in Fig. 7 above. Unknown equals the 'Unknown' category, and the 'Remaining Categories' is the sum of injuries attributed to all other categories.

Fuel and flammable type liquids account for all the fatalities, which would be expected given that these types of substances fall within the Fire Service's core business. Casualties involving hazardous substances are more variable. Figures 7 and 8 show the number of casualties associated with the 'top five' substances. These five categories account for between 70-80% of casualties from 1996-1997 to 1998/99. This percentage decreases substantially from 1999/00 onwards (54%, 57% and 42% each consecutive year from 1999/00). This decrease in the 'top five' corresponds with an increase in the number of casualties represented in other (Unknown and Remaining) categories of substances (see Fig. 8). Casualties in the 'Remaining' category are heavily represented by acids and alkalies substances such as sulphuric

acid, ammonia, hydrochloric acid, and chlorine.

It is clear that there is a greater diversity of hazardous substances being recorded in recent years. As discussed earlier, this is to some degree a reflection of a greater familiarity with the FIRS database by the firefighters. However, it is also likely that factors such as a growing economy, and an increased access and use of a variety of chemicals has also contributed to this trend. It is also interesting to note that this overall increasing trend is reflected in only three (LPG, ammonia and flammable liquids NOS) of the top five substances causing civilian injuries (Fig. 7).

d) Other Data

ERMA New Zealand received 59 hazardous substances incident reports where adverse health effects were recorded (Indicator 9). This is approximately the same number of incidents where civilian injuries were recorded by the Fire Service (57). This result is encouraging, as it indicates that ERMA New Zealand is being notified of serious incidents.

Those substances associated with significant adverse effects (where effects lasted for more than 24 hours) can be described as flammable or explosive substances, of substances that are highly caustic (such as strong acids and alkalis). This information mirrors the profile of substances associated with incidents where civilian casualties or fatalities were recorded by the Fire Service.

ERMA New Zealand's incident database recorded 2 deaths from two separate incidents as a result of hazardous substances for 2001-2002. A further two deaths (as a result of an LPG fire) were not recorded, even though the fire was due to LPG, the cause was the distribution system, which is exempt from HSNO controls under regulation 4 of the Hazardous Substances (Packaging) Regulations 2001 and regulation 5 of the Hazardous Substances (Identification) Regulations 2001.

One of the deaths was as a result of a suicide, and the second was as a result of poor workplace practice. ERMA New Zealand has conducted an internal inquiry for each of these deaths.

These data represent a baseline starting point as no trend data is available.

e) Institute of Environmental Science and Research (ESR) (Indicators 11 - 13)

Indicators 11-13 were written based on a proposal by ESR to develop a national surveillance system for injuries caused by hazardous substances. The rationale behind the proposal was to enable the Ministry of Health (MOH) to meet its requirements under section 143 of the HSNO Act, requiring injuries caused by a hazardous substance to be notified to the Minister of Health. ESR was funded by the MOH to undertake a pilot study in 2001-2002 to develop the Chemical Injuries Surveillance System (CISS) to meet reporting requirements.

As a result of this pilot study, MOH advised ERMA New Zealand that national implementation of CISS will be a few years away (and may not necessary be implemented on a fully national scale). Several technical and process issues were identified during the pilot study that must be overcome before other Public Health Services are likely to adopt the system. MOH also noted that a lack of understanding of the requirements of the HSNO Act by hospitals in general has compounded this problem. Fuller implementation of CISS may help to address this problem.

ERMA New Zealand believes the information CISS may provide would be of great benefit, and is therefore continuing to work with the MOH and ESR where appropriate, to facilitate its progress.

ii) Environment

The Fire Service's FIRS database records incidents where environmental contamination occurred at incidents. Fig. 9 shows the number of hazardous substance Non-Vehicle incidents attended by the Fire Service where environmental contamination was recorded (Indicator 15). The trend roughly follows the trend of All Incidents and Non-Vehicle Incidents (See Fig 10).

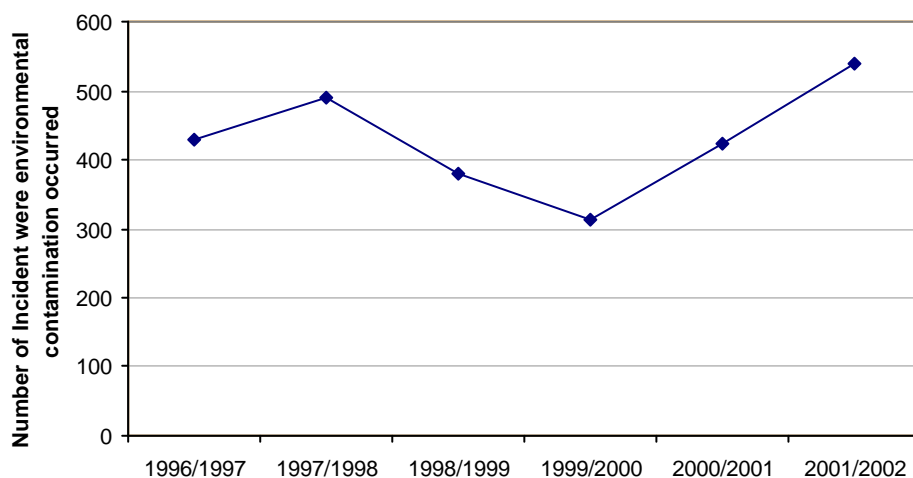


Figure 9. Number of incidents attended by the New Zealand Fire Service involving Non-Vehicle hazardous substances where environmental contamination was recorded.

Table 3 show the compartments where environmental contamination was recorded. Air and Ground recorded the greatest number of incidents of contamination. This data does not show the extent of contamination in terms of level of effect, however it gives an indication of the environmental compartments under the most pressure. One complicating factor is that 'ground' includes all paved surfaces and the data does not further distinguish between spills that may have subsequently entered waterways or contaminated soil. As such the indicator needs to be interpreted with caution.

It is interesting to note that the clear effect that the FIRS database had when it went 'online' to the human health data is not demonstrated in the environmental data. A reason for this however is not clear.

Table 3. Percentage of Incidents for each Environmental Compartment where Environmental Contamination was Recorded

Note: Some of the FIRS classifications for environmental contamination include recording contamination in several compartments, therefore the percentages across the four compartments in a given year may not sum to 100%

Year	Air	Ground	Water	Seawater
96-97	61.63%	39.53%	14.88%	3.95%
97-98	70.47%	35.85%	16.70%	2.44%
98-99	70.68%	32.72%	16.23%	2.88%
99-00	71.25%	30.35%	14.06%	3.51%
00-01	56.84%	39.86%	8.02%	2.83%
01-02	59.74%	36.55%	7.05%	1.67%

The ERMA New Zealand Incident Database has a total of 60 incidents where adverse environmental effects were recorded (Indicator 16). This is almost an order of magnitude less than the number recorded by the Fire Service (539). The profile of substances associated with incidents where significant effects were recorded (effects lasting more than 24 hours) is different to that observed for human health effects. Substances were typically pesticides or flammable substances (such as petrol or diesel).

Even though HSNO enforcement agencies will not necessarily be present at all incidents attended by the Fire Service, the data suggests a gap in enforcement agency coverage for effects on the environment. Regional Councils who are the primary agencies concerned with the environment are not HSNO enforcement agencies. ERMA New Zealand receives incident reports from enforcement agencies whose core business and expertise is not concerned with environmental protection. Therefore, it is possible that even where environmental contamination occurs, it is not picked up by enforcement agencies in the incident reports.

iii) General Pressure Indicators

This category of indicators looks to capture information on the pressure that hazardous substances are placing on public health and the environment. As pressure indicators, they do not measure direct effects, but do indicate the circumstances where the level of potential risk from hazardous substances may be increasing or decreasing. The main pressure indicator is the volume of hazardous substances imported and exported.

Data in this section is based on the FIRS database, ERMA New Zealand's own information, and Statistic's New Zealand's Overseas Merchandise Trade (Import and Export) data. For convenience data on numbers of incidents is included under this

heading, although strictly speaking incidents are a result of pressure, not an indicator of it. Incidents data are not a good fit with the PSR framework.

a) Number of Substances with Bioaccumulative and or persistent properties

Indicator 18 monitors the number of new hazardous substances with components that are bioaccumulative and or persistent that have been approved for release. In the 2001-2002 year, a total of 5 hazardous substance release applications were decided. Of these, two had either bioaccumulative or persistent properties. It is likely to be some time before any reliable trend information can be generated for this indicator.

b) Number of Hazardous Substance Incidents (Indicators 21 – 23)

Figure's 10, 11 and 12 summarise All hazardous substance incidents and Non-Vehicle incidents attended by the Fire Service and the number of these incidents accounted for by the 'top five' substances.

These indicators differ from indicators 7-10 in that they include incidents when no adverse effects occurred. These values therefore give an indication of the potential for adverse effects to occur. In this regard they can be considered pressure indicators. However, they can also give some indication as the extent that there has been a failure to control and manage a substance. They can therefore in this context be considered a good indication of the state of failure to adequately manage a substance.

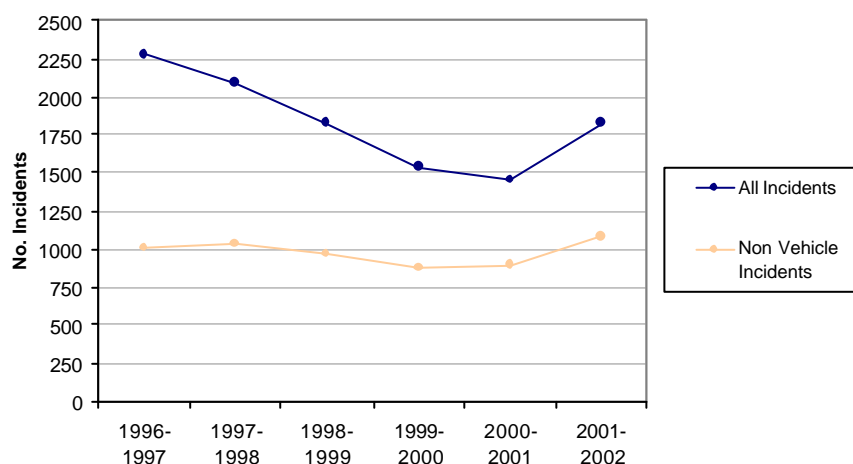


Figure 10. Number of Incidents attended by the New Zealand Fire Service. All Incidents (includes those incidents involving vehicles) and non-vehicle incidents. (Indicators 21 and 22).

Figure 10 shows All Incidents have decreased steadily since 1996, but, have increased in the 2001-2002 year. Non-Vehicle Incidents have shown a more stable trend, but

have also increased in 2001-2002, which again may be attributable to the database going 'online' (see section 3.2.1. i) c) pp. 12-13).

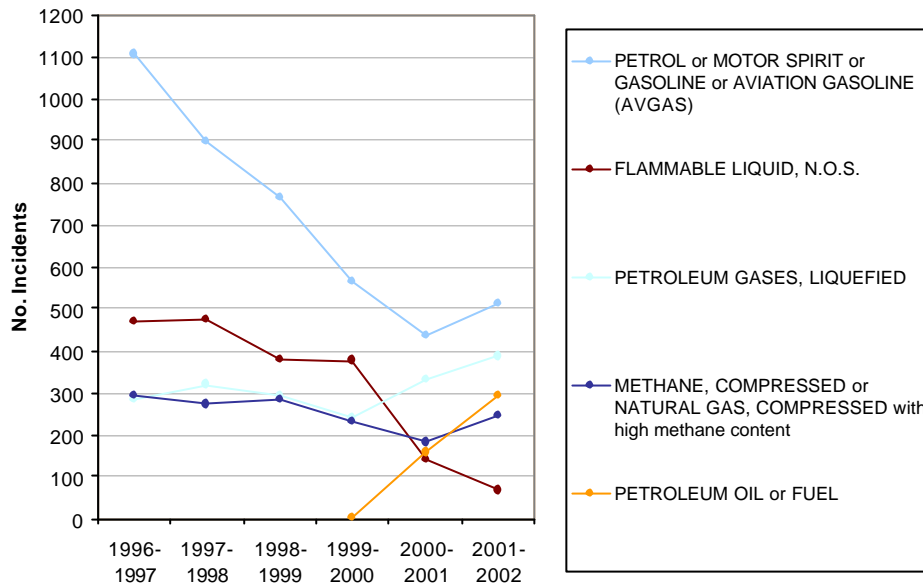


Figure 11. Number of All Incidents attended by the New Zealand Fire Service for the top five substance categories (summed over all years).

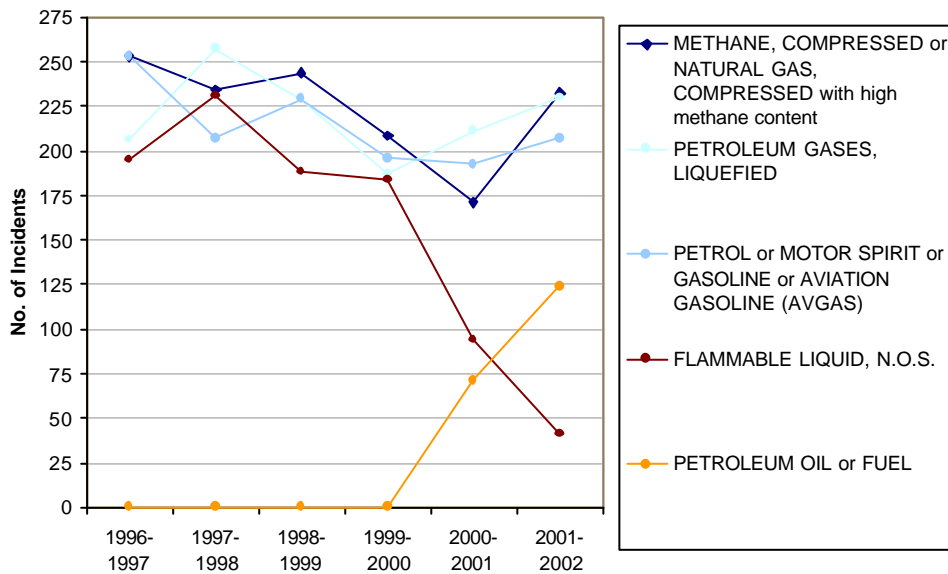


Figure 12. Number of Non-Vehicle Incidents attended by the New Zealand Fire Service for the top five substance categories.

Figure's 11 and 12 show the breakdown of the top five hazardous substances for All Incidents and Non-Vehicle Incidents. The trend in the top five substances follows a similar one to that observed for civilian casualties. The top five account for approximately 90% of incidents until 1998-1999. From the 1999-2000 year this dropped to just over 80% for All incidents, and 77% for Non-Vehicle incidents in 2001-2002.

Of those categories above, flammable liquids not otherwise specified (NOS) is the only category to have declined since 1996, particularly in the last two years. This may reflect the enhancements made to the FIRS database and its accessibility enabling better categorisation of substances involved. The rest of the categories all roughly follow the overall trend observed in the number of hazardous substance incidents attended by the Fire Service (Fig. 10), where there has been an increase in the last two years which again is probably attributable to the FIRS database going 'online'. In future it will be desirable to be the monitoring of FIRS data from this 2000-2001 period, to eliminate the artificial impact the system change has had on the data.

The numbers of incidents where petrol or other motive fuels is higher for All Incidents (which includes incidents where vehicles were involved) (Fig. 11), whereas for Non-Vehicle Incidents associated with these motive fuels the trend is more similar to the trend for flammable gases (Methane and Natural Gases etc and LPG) (Fig. 12). This difference is probably due to the fact that motive fuels are associated with vehicles incidents, which are included in All Incidents.

ERMA New Zealand received 227 hazardous substance incidents (Indicator 23). The top five substances recorded by ERMA New Zealand's Incident database were LPG (50 incidents), diesel (24 incidents), petrol (23 incidents), ammonia (14 incidents) and then cyanide, sulphuric acid and sodium hydroxide that were all recorded at 8 incidents. This profile is very similar to the FIRS data. The FIRS data does not have the deadly or caustic substances included in their top five, however this most likely due to the nature of the Fire Services work. Overall, widely available flammable substances contribute the most to incidents, with the other dominant substances can be categorised as largely industrial chemicals.

The majority of incidents occurred at workplaces (55%, 124 incidents), then public places (82 incidents) followed by private dwellings (58 incidents) and Motor Vehicles (37 incidents). Incidents were typically caused unintentional (150 incidents), however a notable number were associated with non-compliance (25% 59 incidents). This is of direct concern to ERMA New Zealand. 36 incidents were associated with compliance but failure of controls, and 30 were intentional. An examination of the situation and the circumstances of incidents will be important in designing enforcement strategies.

The number of hazardous substance incidents received by ERMA New Zealand (227) is approximately $\frac{1}{4}$ of Non-Vehicle Incidents attend by the Fire Service (1079). This discrepancy probably reflects the nature of HSNO enforcement. The Fire Service is not a HSNO enforcement agency but because of the nature of the service they provided, attend the majority of incidents regardless of whether other enforcement agencies attend. HSNO enforcement agencies, particularly Public Health Unit's and Territorial Local Authorities are frequently only contacted where advice is being sought. An example of the kind of incidents HSNO enforcement agencies may not attend would be incidents at private dwellings where a hazardous substance has been spilt and the attending fire-fighters are able to decontaminate the incident appropriately without assistance. It is therefore likely that the data in Indicator 23 is already contained within Indicators 21 and 22.

Of all the emergency services, the Fire Service is mostly likely to attend hazardous

substance incidents, as they are equipped to deal with stabilising hazardous substances incidents. Therefore, the Fire Service FIRS database is intended to be used as a proxy of the true number of hazardous substance incidents occurring. It is therefore not surprising that they have recorded a higher number of injuries than ERMA New Zealand's incident database has.

c) Volume of Hazardous Substances in the New Zealand (Indicator 27 and 28)

The volume of imports and exports of hazardous substances has been obtained from Statistics New Zealand's Overseas Merchandise Trade data.

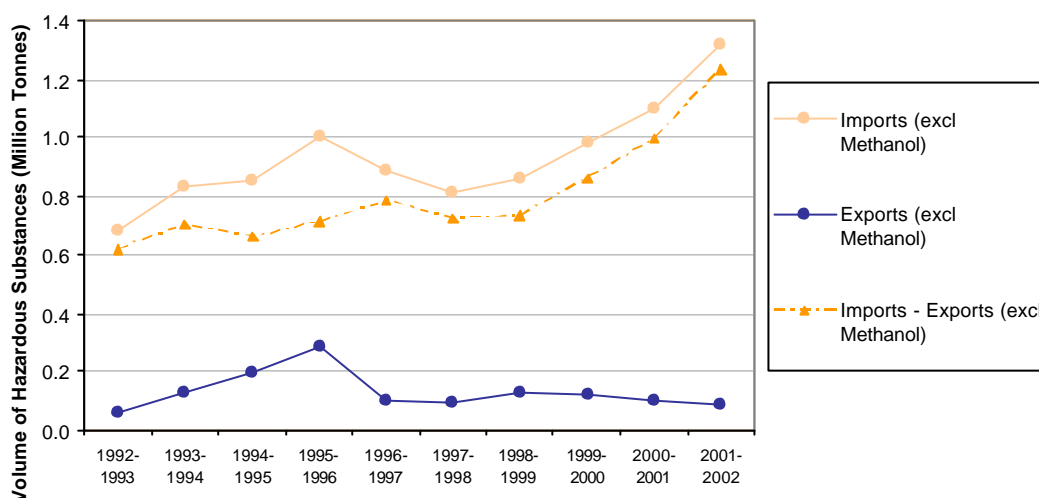


Figure 13. Volume of Hazardous Substances Imported and Exported into New Zealand.

Methanol has been deliberately excluded from this analysis as it distorts the figures, accounting for in excess of 95% volume imported and exported. It creates a somewhat artificial illusion that New Zealand is a net chemical exporter where in fact these values only reflect the fact New Zealand is a net exporter of methanol.

Figure 13 shows imports of hazardous substances (excluding methanol) have increased steadily since 1992-1993. For all years two categories account for over 80% of imports. These are:

1. Inorganic chemicals, organic and inorganic compounds of precious metals, rare earth metals, radio-active elements and isotopes, and
2. Fertilisers

The majority of hazardous substance exports are also dominated by those categories above, as well as cleaners and chemical products N.O.S. Imports minus exports show a trend which mirrors the inverse of exports. Therefore the 'net' volume of hazardous substances will be dictated mainly by the trends in exports, assuming the trend in the import of hazardous substances continues.

There is a lack of data available for domestic production of chemicals, therefore some caution must be exercised interpreting the pressure from the volume of hazardous substances in New Zealand.

iv) General Response Indicators

a) Substances Reassessed (Indicators 24 – 26)

In the 2001-2002 year grounds for reassessment were found for 3 substances; 1080, Methanol, and Thiomersal (Indicator 24). However none of these substances has proceeded through the full reassessment process. Consequently there were no substances approved with stricter controls (Indicator 25) or declined (Indicator 26) in 2001-2002.

Currently these indicators are not very meaningful, due to resource constraints on this area of work, and due to the early stage of the implementation of the hazardous substances component of the HNSO regime. They will become more valuable indicators of the effectiveness of the regime in future, as a more substantial reassessment programme is introduced.

3.3 New Organisms

i) Public Health

There have been no adverse public health effects reported as a result of approved new organisms or genetically modified organisms since the implementation of the new organisms' component of the HSNO Act (Indicator 14).

ii) Environment

Since the implementation of the new organisms component of the HSNO Act, there have been five new organism release applications for eight new organisms. None of these have been declared unwanted under the Biosecurity Act (Indicator 19).

There have been no new organism or genetically modified organism incidents since the implementation of the new organisms' component of the HSNO Act where adverse environmental effects have been recorded (Indicator 20).

3.4 Compliance Monitoring

i) New Organisms Compliance

a) MAF undeclared seed seizures (Indicator 30)

As part of its border management operations, MAF collects data on declared and undeclared risk goods at each point of entry (primarily mail, aircraft and vessel passengers and crew, air and vessel cargo and personal effects - of private individuals cargo). This indicator focuses on the seed seizures, as seeds represent the highest risk and the most commonly used pathway for new plant imports. Undeclared seizures are used because this is the clearest indicator of intent to import illegally. The indicator reflects a concern that the HSNO Act may be discouraging the legal importing of new plants because of the high cost and robustness of the approval process.

The very low number of new plant import applications received by the Authority since commenced in July 1998 (two applications, one of which was not approved under rapid assessment and the applicant did not proceed to full assessment; and the second of which was approved and related to two ornamental species) suggest that either new plants imports have effectively ceased or, they are being imported illegally. This indicator should provide information on the extent of the later.

Figure 14 shows the percentage of undeclared seed seizures as a proportion of the total seed seizures. The rationale for this indicator is that it is a proxy to determine if the HSNO Act is having a deterrent effect due to its compliance cost, resulting in an increase of non-compliant activity. Fig. 14 also includes the total number of seizures.

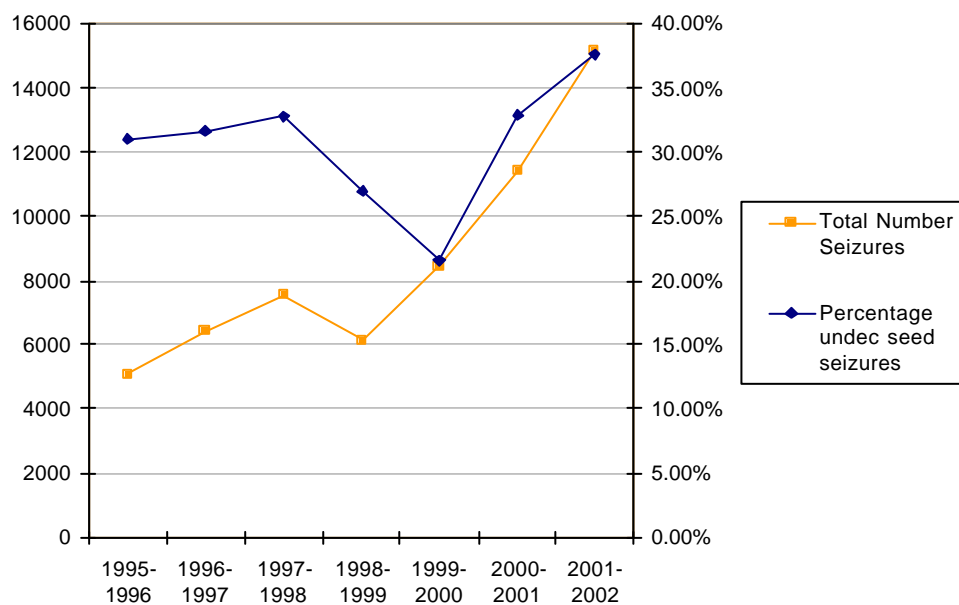


Figure 14. The percentage of undeclared seeds seizures as a proportion of the total (declared + undeclared) seed seizures. (Indicator 30)(Scale to the right) and the total number of seizures made (Scale to the left).

Figure 14 show that the percentage of seed seizures remained steady from 1995/96 to 1997/98. The proportion of undeclared seizures then decreased until 1999/00, at which point the proportion of undeclared seed seizures has increased steeply. The proportion of undeclared seizures seems to follow to some degree the trend in total number of seizures. This relationship seems to have become closer since 1999/00. Such an increase in the proportion of undeclared seeds would not be necessarily be expected, as the total seed seizures can increase independently of a failure to declare seeds.

Air passengers and crew and mail account for well in excess of 90% of seed seizures every year (except 1995-1996 where they account for over 85%) and this data has been summarised below in Fig. 15.

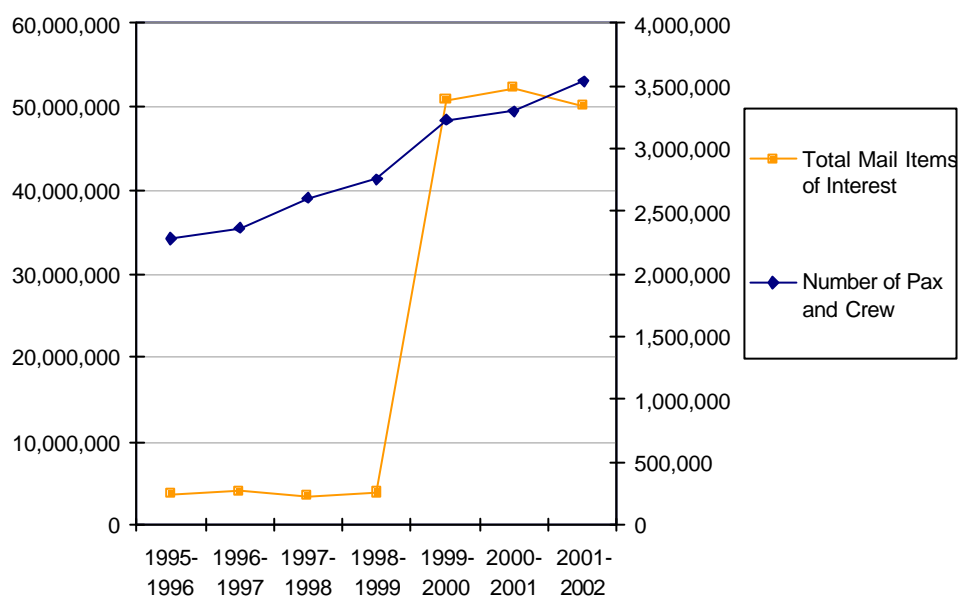


Figure 15. Number of Air Passengers and Crew arriving (scale to the right) and the number of mail items of interest to MAF arriving (scale to the left).

Figure 15 shows that the number of passengers and crew has increased gradually since 1995/96. The number of mail items of interest to MAF remained steady from 1995/96 to 1998/99 at which point a large jump in the number of mail items of interest can be observed. Since then, the number has remained relatively constant. The large increase observed in 1999/00 is as a result of a shift in MAF's surveillance. Up until 1998/99 only parcels were of interest, however since July 1999, all first class letters have been included in MAF's surveillance, explaining the large jump in 1999/00 (as letter mail account for the majority of mail items of interest).

When Fig.'s 14 and 15 are compared, it is clear that although the number of passengers and crew and mail items has remained relatively stable since 1999/00, there has been a sharp increase in both the total number of seed seizures, and the proportion of undeclared seizures. The inference is that since 1999/00, there has been both an increase in the amount people are attempting to bring into the country, as well as an increase in the amount people are attempting to bring in unlawfully (this may be

intentional or unintentional).

If the numbers in Fig.14 were only influenced by the number of passengers and crew and mail items, it would have been expected that in 1998/99 a large increase in the total number of seizures would have been observed due to the change in mail surveillance (this would not necessarily correspond with an increase in the proportion undeclared) with a levelling of since. This is clearly not the case, as explained above.

Because both mail surveillance and air passenger and crew surveillance (due to the BSE crisis) has increased, the levels observed for the last 2-3 years theoretically represent the 'true' level of activity. Because the surveillance at the two primary routes of seed seizures has increased to levels where further increases are unlikely or not possible (i.e., are already 100%), ERMA New Zealand would expect to see the levels observed in Fig. 14 to plateau or decrease. If increases continued, particularly for the proportion of undeclared seeds, this would indicate a problem which may warrant further investigation.

ii) HSNO Enforcement Activities (Indicator 31 – 35)

These data are based on annual reports of enforcement activities the enforcement agencies are requested to complete. ERMA New Zealand received 67 responses from a total of 81 enforcement agencies, a response rate of 82% response rate. Enforcement agencies are either central or local government agencies. 85% of Territorial Local Authorities (TLA's) responded (n = 74), and 57% of central agencies responded (n = 7).

This discussion will be broken into a discussion of central agencies and TLA's for the purposes of a more meaningful analysis of the data provided.

Local Government

Of the TLA's who responded, 73%⁴ of inspections reported required no further action to be taken, however less than 2% of inspections resulted in a compliance order being issued. These figures suggest there are a large number of inspections being followed up to ensure compliance but do not result in formal compliance orders being issued. This may reflect that a co-operative and supportive approach in facilitating compliance is being adopted. Observations of differences in figures between councils certainly suggests that different approaches may be adopted. The low rate of compliance orders may also represent a reluctance to use HSNO compliance orders as a result of unfamiliarity with the legislation, however this would only be able to be discerned if comparable data was available, as under the Dangerous Goods Act 1974 'orders' were not issued (although specification for action could be made in writing).

⁴ This value was calculated by dividing the total number of inspections made summed over all TLA's divided by the number of inspections made that did not require further action. In some cases values were provide for one but not both. These TLA's were therefore excluded from this calculation. This approach was also adopted for the overall calculation provided in Appendix One, and for the value stated for central agencies.

No prosecutions were made under the HSNO Act by any TLA. This probably reflects a reluctance to conduct prosecutions given the cost. Further, in most cases where the outcome of an incident is so severe a prosecution is warranted, it is likely that another agency (such as OSH or the Police) becomes involved, and pursues a prosecution under other relevant legislation. The lack of prosecutions may also illustrate that a supportive approach is being adopted by TLA's.

Central Agencies

Only the Police provided sufficient data to calculate the proportion of inspections made where no further action was required in relation to the total number of inspections made. This agency accounted for nearly 95% of the total number of inspections made reported by all central agencies that responded, although 'inspections' are just stopping trucks, they are not targeted to HSNO. They reported that 99% of inspections made required no further action. The remaining resulted in prosecutions. Although they reported 345 HSNO related prosecutions, none of these were actually taken under the HSNO Act, instead they were taken under the Dangerous Goods Transport Rule. OSH has also indicated that they use their own legislation rather than HSNO. Overall there were no compliance orders issued or prosecution taken under the HSNO by central agencies.

iii) Monitoring of Containment Compliance (Indicators 36 – 39)

ERMA relies on the detection and reporting of non compliance by either enforcement agencies as a result of routine enforcement activities, or by applicants themselves where such notifications are required in controls set on their approval(s).

There were 4 breaches of new organism containment during the 2001-2002 year (Indicator 36), however as Indicator 37 shows, none of these resulted in the escape or release of organisms. These breaches all involved issues regarding security measures and where appropriate, improvements were recommended by ERMA New Zealand. No breaches were recorded for hazardous substances in containment (Indicator 38). ERMA New Zealand is not aware of any unauthorised developments of genetically modified organisms (Indicator 39).

iv) Monitoring Releases of New Organisms (Indicator 40)

ERMA New Zealand is aware of two intentional releases of unapproved new organisms during 2001-2002 (Indicator 40). One involved the illegal importation of a Crimson Bellied Conure (a parrot) and MAF is prosecuting the individual involved under the Biosecurity Act 1993. A second incident was obtained from a media report, where a woman received 22 Japanese Bantam eggs by mail. She was also prosecuted and found guilty under the Biosecurity Act.

3.5 Compliance Costs (Cost of HSNO Applications to Applicants)

In this section, cost refers to the amount invoiced to an applicant (i.e. revenue generated) after any subsidy has been subtracted. Applications are grouped into June years based on the date the Authority's decision has been notified. (Note that further details on application costs are contained in Appendix 2)

In general, application costs vary significantly each year. This tends to reflect some important points:

1. Applications can vary greatly in their complexity. Applications that have been prepared poorly, or that must address a wide range of issues all lead to increased cost.
2. ERMA New Zealand changed its pricing policy resulting in significant effects on application costs (up front subsidies given to all applications were removed with greater emphasis placed on subsidising public participation – notified applications). These costs are reflected in applications processed from 2000.
3. ERMA New Zealand is now recovering a much greater proportion of costs, which has led to an increase cost to applicants.
4. For many applications there are still relatively small number being processed. This results in increased variability in costs.

Consequently it is extremely difficult to discern clear trends for much of the application cost data. However, in general, rapid assessments are achieving their aim of being a less costly application route, whereas applications that do not proceed as rapid assessments seem to demonstrate a trend of increasing costs.

i) New Organisms - Non-Genetically Modified

Importation into Containment Applications (NOC)

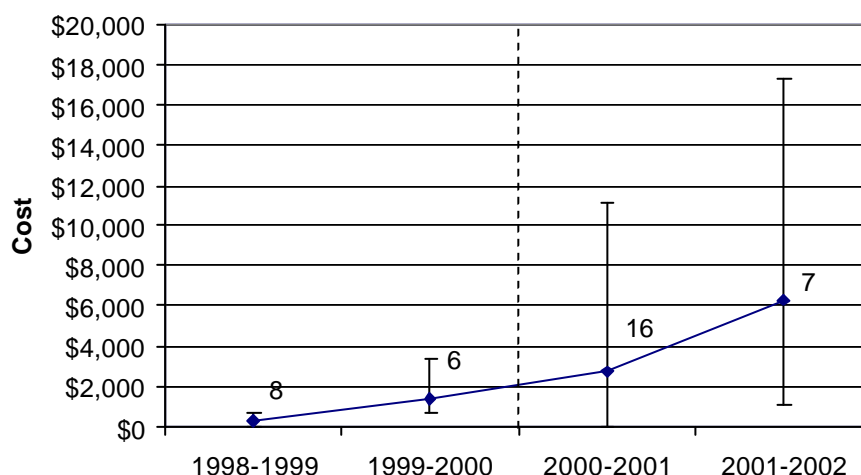


Figure 16. Average Cost of New Organism Containment Applications. Error Bars denote the maximum and minimum application costs for that year. The number is the number of applications decided and the dashed line indicates approximately when the new pricing policy was implemented.

The cost of new organism containment applications has increased steadily since the implementation of the new organisms component of the HSNO Act in 1998 from an average of \$284.05 (n=8) up to an average cost of \$6,297.78 (n=7) in 2001-2002. This increase is largely due to the change in the pricing policy. The range has also increased over the previous 4 year's, increasing from a maximum application cost of \$763.51 in the 1998-1999 year to \$17,302.20 in 2001-2002. The most containment applications were decided in the 2000-2001 year with 16 applications.

The high cost applications in 2000-2001 and 2001-2002 both involved very large collections of micro-organisms and thereby resulting in increased evaluation and decision making costs as a result of the complexity of the applications.

Importation for Release Applications (NOR)

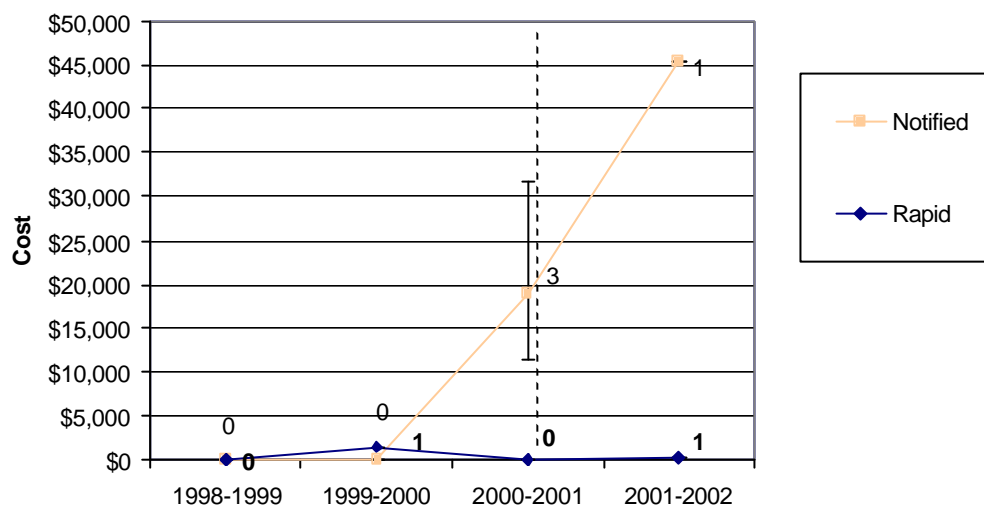


Figure 17. Average Cost of New Organism Release Applications. Error Bars denote the maximum and minimum application costs for that year. The number is the number of applications decided and the dashed line indicates approximately when the new pricing policy was implemented.

The costs of new organism release (NOR) applications are clearly lower if conducted by rapid assessment. This observation is encouraging, as it reflects the policy that rapid assessments application costs should reflect the reduced complexity of the applications. It should be noted however, that these figures are based on only two applications, one made in 1999-2000 and one in 2001-2002. There were no NOR rapid assessments made in 1998-1999 or 2000-2001.

Notified applications are clearly more costly than rapid assessments, however, again these are based on very low numbers of applications (zero in the first two years, 3 in 2000-2001 and 1 in 2001-2002). Until application numbers build up, little can be concluded from this cost data.

The high cost observed in 2001-2002 resulted from only one NOR application. This application involved a bio-control agent resulting in higher evaluation and decision

making costs as a result of the complexity and significance of the application. Another bio-control application was decided in 2000-2001 and was responsible for the maximum cost in 2000-2001, being approximately \$20,000 higher than the other two applications decided.

ii) New Organisms - Genetically Modified Organisms

Development in Containment Applications (GMD)

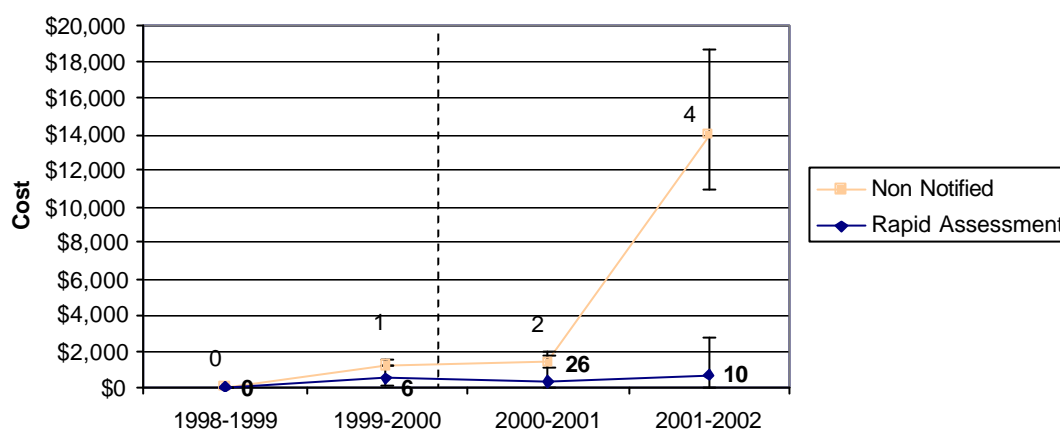


Figure 18. Average Cost of Genetically Modified Organism Development Applications. Error Bars denote the maximum and minimum application costs for that year. The number is the number of applications decided and the dashed line indicates approximately when the pricing policy was implemented.

As observed for NOR applications, rapid assessments are clearly a less costly approval route. There has been a much larger number of GMD applications processed by rapid assessment route, with a maximum of 26 in 2000-2001 and 10 in 2002-2002 compared with NOR rapid assessments. This high number in 2000-2001 is most likely a reflection of the response to investigations into unauthorised developments of genetically modified organisms in April 2000. Costs in 1999-2000 and 2000-2001 are artificially low as a number of historic applications of existing developments were processed, at low or no cost.

There has been a sharp increase in the average cost of non-notified GMD applications. There was however a larger number of such applications processed in 2001-2002 (four applications, up from two in 2000-2001, one in 1999-2000 and zero in 1998-1999). Therefore this increase may simply better reflect the true cost of such applications to applicants but it is more likely due to the nature of the applications. All the applications processed in 2001-2002 were not low-risk (as apposed to applications decided in previous years), which resulted in higher decision making costs.

Importation into Containment Applications (GMC)

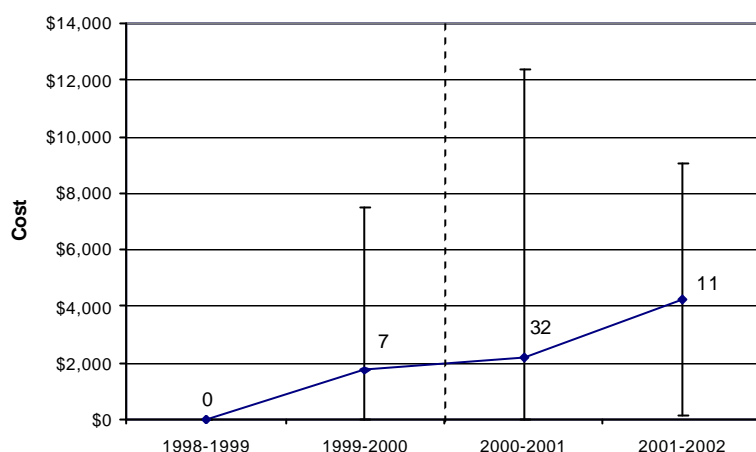


Figure 19. Average Cost of Genetically Modified Organism Containment Applications. Error Bars denote the maximum and minimum application costs for that year. The number is the number of applications decided and the dashed line indicates approximately when the pricing policy was implemented.

Imports of genetically modified organisms into containment are also showing a general increase in cost to the applicant. Further, a wider range in application cost is associated with larger numbers of applications being processed (i.e., the most were processed in 2000-2001 (n=32), secondly in 2001-2002 (n=11), thirdly in 1999-2000 (n=7) and lastly in 1998-1999 (n=0)), which would therefore seem to show that figures for 2000-2002 are the most accurate reflection of what an average GMC application will cost. GMC applications are also, in general, less costly than NOC applications.

As with other types of applications, the outliers (high cost applications) were typically for applications involving large numbers of organisms or complex applications resulting in higher decision making costs (both in preparation of the Evaluation and Review Reports and the consideration).

Field Testing in Containment Applications (GMF)

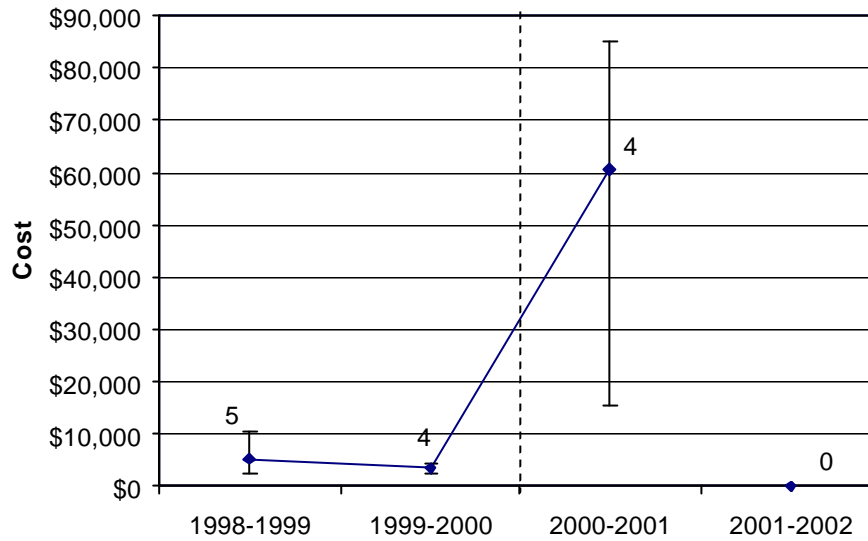


Figure 20. Average Cost of Genetically Modified Organism Field Trial Applications. Error Bars denote the maximum and minimum application costs for that year. The number is the number of applications decided and the dashed line indicates approximately when the pricing policy was implemented.

The cost of GMF applications has increased substantially since 1998-1999, however this increasing cost is also associated with much greater variation in the cost of applications. However, the minimum cost in 2000-2001 was still higher than 1998-2000, which may indicate an overall increase in the cost of GMF applications to applicants. Further the number of applications decided does not differ greatly between each year, which would further confirm that the true cost of applications is being reflected in 2000-2001. Note that there were no GMF applications in 2001-2002 year due to the GM moratorium. GMF applications are generally more costly than NOR applications.

The large rise in cost in 2001-2002 is largely due to the change in pricing policy. The lowest cost application decided in 2000-2001 was charged under the previous pricing policy. Higher application costs were also due to much greater public participation and higher consideration costs.

iii) Hazardous Substances

The 2001-2002 year was the first year for hazardous substances applications, and therefore there is no baseline for the cost of these types of applications. Further, many of the applications received in 2001-2002 were later in the year, and therefore, will not be decided until 2002-2003.

Containment Applications (HSC)

There were 5 HSC applications decided in 2001-2002. The average cost for these applications to applicants was \$5,294.64, with a minimum application cost of \$3,447.30 and a maximum of \$8,637.71. This average cost is slightly less than NOC applications (\$6,297.78, N=7) and slightly more than GMC applications (\$4,260.44, N=11) in 2001-2002. However, the range in the cost of HSC applications was less than NOC and GMC applications (See Appendix 2 for further detail).

Importation or Manufacture (Release) Applications (HSR)

HSR applications decided by rapid assessment followed the trend of NOR and GMD rapid assessment applications, with the average cost being substantially less than notified applications (\$2,034.53, N=5 for a HSR rapid assessment compared with \$7,705.63, N=2 notified HSR application). However, the maximum cost of an HSR rapid assessment (\$7,739.62) was comparable with the cost of both HSR notified applications.

A larger number of applications are required before any trend in hazardous substance release applications can be made. HSR rapid assessment applications cost more than NOR and GMD rapid assessments, but this is probably due to the fact that only very few of such applications have been processed. It is still very early in the start up phase for hazardous substances, the inference being that organisational efficiencies and therefore decreased costs will develop as institutional learning is accrued as more of these are applications are processed.

4. Other Activities

The main monitoring activities in 2001-2002 were the development and implementation of the monitoring strategy with the focus on establishing data supply for the indicators. There were however, two additional activities undertaken associated with the further development of the strategy.

A study was undertaken to assess the feasibility of establishing a tracking register of those substances which trigger the Hazardous Substances (Tracking) Regulations 2001. International examples of similar systems were examined, as well as work completed by the Ministry for the Environment in 1998 investigating the possibility of introducing a Toxic Release Inventory. It was identified in all examples that both significant legislative and financial support is necessary for the effective functioning of such a system. These two factors do not exist at the present time therefore such a system is not currently feasible.

ERMA New Zealand also co-hosted a one day workshop on pesticide risk reduction strategies with MfE. This coincided with the discussion document 'Towards a Pesticide Risk Reduction Policy for New Zealand' prepared by MfE. One outcome of the workshop was a submission to FRST on research priorities in this area (see Appendix 3). This workshop provided a starting point for the further development of monitoring work scheduled for 2002-2003.

5. Future Development and Implementation of the Strategy

Progress has been made in implementing the monitoring strategy and further developments have already been made to the set of indicators to more fully utilise relevant information available to ERMA New Zealand. This being said, it is acknowledged that the current strategy represents only the beginning of what needs to be eventually a more comprehensive approach to monitoring the effectiveness of the Act.

Currently the indicators in use are dominated by hazardous substances and their health effects. There is a clear gap in the information on the environmental effects of hazardous substances as well as a need to further develop new organism indicators. These have been identified as priorities in the 2002-2003 monitoring work programme.

Although HSNO's purpose is to protect human health and the environment from the effects of hazardous substances and new organisms, it provides a framework for achieving this within a specific context and with specific tools.

The P-S-R model is most effective for monitoring general trends in areas of concern such as human health and the environment. It is less valuable as a tool to directly measure the linkages between HSNO interventions and effects on the environment and human health. It also does not adequately capture other aspects of HSNO such as compliance and effectiveness of enforcement. The monitoring strategy therefore needs to take a broader approach by monitoring the full range of interventions in addition to monitoring effects of the environment and human health.

The work programme in 2002-2003 will focus on developing the strategy in two main areas. The first is to focus on monitoring more directly the impact of HSNO interventions. Secondly work will be conducted to address those monitoring gaps identified above; identifying the effects of hazardous substances on the environment and more general work on monitoring the effects of (non GM) new organisms.

In doing this attention will be given to:

- Defining effectiveness in practical terms which will then guide the selection of monitoring activities.
- Focusing on substances and organisms which present significant risk (rather than examining hazardous substances and new organisms in general)
- Assessing the contribution of the different elements of HNSO activity to overall effectiveness (decision-making and application of controls, enforcement, and public education and awareness, particularly but potentially also, economic instruments such as user charges).
- Assessing the contribution of different elements of life cycle activity to risk (e.g. import, storage, transport, use and disposal) in the case of hazardous substances

Due to the general paucity of relevant data that may be used for indicators, it is anticipated that case studies will significantly contribute to the future programme, although the extent to which they are conducted will be very strongly influenced by resource availability. It is expected that case study work will be driven by a risk based approaches suggested above.

6. Conclusions

1. The focus of the Authority's monitoring efforts has been on establishing a pre-HSNO baseline where possible and recording and analysing predominantly incident based information.
2. The regime set up by the HSNO Act is still very much in the establishment phase for hazardous substances. A significant component of this is the transfer of the many thousands of substances from old legislative regimes to the new HSNO regime. Because so many substances are covered by the transitional provisions virtually all of the hazardous substances monitoring information collected can only be recorded as baseline information. This will continue until substances have been formally transferred and new HSNO provisions start applying to these substances.
3. Baseline data collected so far for hazardous substances suggests that fatalities, hospitalisations and workplace injuries appear to be either stable or slightly decreasing. There appears to be a change in the profile of the kinds of hazardous substance incidents attended by the Fire Service. This may be worth investigating in greater detail if this trend continues. ERMA New Zealand received significantly less incident reports than the number of incidents the Fire Service attended. This does not necessary indicate a problem, but may suggest that obtaining this data will be useful for ERMA New Zealand in the short to medium term.
4. A feature of the hazardous substance data is the absence of a stable baseline, both because of variability and existing trends. At the least this suggests that raw indicator data will need considerable analysis to give useful results.
5. In the case of new organisms, although the Act has been in operation for four years, overall, the number of organisms released under HSNO represents an extremely small proportion of organisms entering New Zealand. It is therefore virtually impossible to draw any conclusions regarding the effectiveness of the Act in managing general releases of new organisms until application numbers build up. However, the very low number of new plant import applications received by the Authority continues to be of concern. Anecdotal evidence suggests that new plant imports (as seeds) are occurring and that the cost and robustness of the HSNO approval process may be a factor influencing people's decision to import illegally.
6. The role that ERMA New Zealand and HSNO play in the sphere of the management of effect of new organisms is within the broader biosecurity scope. If there are in fact illegal attempts to import new organisms without the Authority's approval, but they are still being prevented from entering the country by MAF, then the effects from new organisms are being managed. However, if un-approved new organisms are being successfully brought into the country, then the management regime is not being effective. Unfortunately data are not available to enable such an analysis to be performed and it is therefore difficult to assess the effectiveness of not only the biosecurity regime

in managing new organisms, but more particularly, HSNO's success or otherwise in protecting human health the environment.

7. New organism containment indicators suggest that in general containment controls are being effective in preventing effects of contained organisms on people and the environment thereby indicating that effective risk management is being achieved. Although there have been a low number of breaches of containment, these have been primarily minor security issues at the perimeter of containment facilities and have been addressed by the facilities involved where appropriate. There were no adverse effects on human health or the environment. No escapes of organisms occurred. No unauthorised developments of organism were reported during the year.
8. Surveillance by MAF of illegal seed imports confirms that total seed seizures and the proportion of these which are undeclared have risen sharply since 1998-99. The increase in total seed seizures may be explained by increased surveillance by MAF, however this does not explain the sharper rise in undeclared seed seizures. This could indicate an increasing trend of unlawful importing, however, further investigations would be necessary to determine if illegal importing is due to lack of knowledge or deliberate attempts to circumvent the legal requirements.
9. The main conclusions from the monitoring of application costs are that costs vary significantly depending on the complexity of the application although in the new organism area rapid assessments are consistently proving to be a lower cost route for approval. Overall it is too early to draw any firm conclusions as application numbers are still low for the majority of application types, particularly for hazardous substances and genetically modified organism field trials and new organism releases.

Appendix 1. Indicators

Theme	Indicator short description	Data source	Indicator	Level
Public Health Hazardous Substances			Number refers to the year 1 July 2001 to 30 June 2002 unless otherwise specified	P -Pressure S -State R -Response
1	Number (and rate) of hospitalisations for unintentional poisoning from other solid and liquid substances, gases and vapours (excluding foodstuffs and plants)(ICD-9 codes E860-E864, E866-E869) in children aged 0-4 years	NZHIS	<ul style="list-style-type: none"> • 126 children • 44.4 hospitalisations per 100,000 <i>1 January to 31 December 2001</i> 	S
2	Number (and rate) of hospitalisations for unintentional poisoning from other solid and liquid substances, gases and vapours (excluding foodstuffs and plants)(ICD-9 codes E860-E864, E866-E869) in Maori children aged 0-4 years	NZHIS	<ul style="list-style-type: none"> • 27 children • 35.6 hospitalisations per 100,000 <i>1 January to 31 December 2001</i> 	S
3	Number (and rate) of deaths for unintentional poisoning from other solid and liquid substances, gases and vapours (excluding foodstuffs and plants) (ICD-9 codes E860-E864, E866-E869) in the total population	NZHIS	<ul style="list-style-type: none"> • 6 deaths • 0.16 deaths per 100,000 <i>1 January to 31 December 2001</i> 	S
4	Number (and rate) of deaths for unintentional poisoning from other solid and liquid substances, gases and vapours (excluding foodstuffs and plants) (ICD-9 codes E860-E864, E866-E869) in the Maori population	NZHIS	Zero <i>1 January to 31 December 2001</i>	S
5	Number of cases of diseases affecting the lungs from hazardous substances	OSH	82	S
6	Number of cases of poisoning and other toxic effects relating to workplace exposure from	OSH	92	S

	chemicals			
7	Number of people injured associated with hazardous substance incidents attended by the NZFS	FIRS	57	S
8	Number of deaths associated with hazardous substance incidents attended by the NZFS	FIRS	1	S
9	Number of hazardous substance incidents where adverse effects on human health were recorded	ERMA NZ	59	S
10	Number of hazardous substance incidents resulting in death	ERMA NZ	2 incidents (with 2 deaths)	S
11	Number (and rate) of hazardous substance injury hospitalisations	ESR	Data not currently available	S
12	Number (and rate) of hazardous substance injury hospital emergency department attendances	ESR	Data not currently available	S
13	Number (and rate) of deaths related to hazardous substance injury	ESR	Data not currently available	S
New Organisms				
14	Number of incidents involving new organisms with reported adverse health effects notified to ERMA	ERMA NZ	0	S

Environmental Effects				
Hazardous Substances				
15	Number of incidents hazardous substance incidents attended by the NZFS where environmental contamination was recorded	FIRS	1249	S
16	Number of hazardous substances incidents resulting in adverse environmental effect notified to ERMA New Zealand	ERMA NZ	60	S
17	Number of hazardous substances incidents resulting in adverse environmental effect by hazard classification	ERMA NZ	Data not currently available	S
18	Number of new hazardous substances approved for release with any component that is bio-accumulative and/or persistent properties	ERMA NZ	2 from a total of 5 approvals given in 2001-2002	P

New Organisms				
19	Number of approved new organisms declared as unwanted organisms under the Biosecurity Act	ERMA NZ	0	P
20	Number of incidents resulting in an adverse environmental effect involving approved new organisms	ERMA NZ	0	S
Public Health & Environmental Effects				
Hazardous Substances				
21	Number of all hazardous substance incidents attended by NZFS	FIRS	1826	P and S
22	Number of hazardous substance non-vehicle incidents attended by the NZFS	FIRS	1079	P and S
23	Number of incidents involving hazardous substances notified to ERMA	ERMA NZ	227	P and S
24	Number of substances reassessed	ERMA NZ	3	R
25	Number of substances reassessed and stricter controls imposed	ERMA NZ	0	R
26	Number of substances reassessed and declined	ERMA NZ	0	R
27	Volume of hazardous substances imported	Statistics NZ	1,321,355 tonnes	P
28	Volume of hazardous substances exported	Statistics NZ	89,105 tonnes	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%	P
31	Number of compliance orders issued	ERMA NZ	203	R
32	Number of prosecutions taken	ERMA	0	R
33	Number of inspections where no further actions are required as a proportion of total inspections made	ERMA NZ	98%	R
34	Number of compliance orders issued from inspections as a proportion of total inspections made	ERMA NZ	0.01%	R

35	Number of prosecutions taken from inspections as a proportion of total inspections made	ERMA NZ	0	R
36	Number of breaches of containment involving new organisms	ERMA NZ	4	P and S
37	Number of breaches of containment resulting in the release or escape of a new organism	ERMA NZ	0	P and S
38	Number of breaches of containment involving hazardous substances	ERMA NZ	0	P and S
39	Number of unauthorised developments of genetically modified organisms	ERMA NZ	0	P and S
40	Number of intentional releases of unapproved new organisms	ERMA NZ	2	P and S
Compliance Costs				
41	<ul style="list-style-type: none"> • 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	See Appendix 2	S

Appendix 2. Cost to Applicant of Applications

Table 1. Cost of New Organisms Importation into Containment (NOC) Applications

Year	Statistics		Range		N
	Average	Standard Deviation	Minimum Cost	Maximum Cost	
1998-1999	\$0.00	\$0.00	\$0.00	\$0.00	0
1999-2000	\$1,460.00	\$0.00	\$1,460.00	\$1,460.00	1
2000-2001	\$0.00	\$0.00	\$0.00	\$0.00	0
2001-2002	\$300.00	\$0.00	\$300.00	\$300.00	1

Table 2. Cost of Importation of New Organisms for Release Applications (NOR) decided by Rapid Assessment

Year	Statistics		Range		N
	Average	Standard Deviation	Minimum Cost	Maximum Cost	
1998-1999	\$0.00	\$0.00	\$0.00	\$0.00	0
1999-2000	\$1,460.00	\$0.00	\$1,460.00	\$1,460.00	1
2000-2001	\$0.00	\$0.00	\$0.00	\$0.00	0
2001-2002	\$300.00	\$0.00	\$300.00	\$300.00	1

Table 3. Cost of Notified Importation of New Organisms for Release (NOR) Applications

Year	Statistics		Range		N
	Average	Standard Deviation	Minimum Cost	Maximum Cost	
1998-1999	\$0.00	\$0.00	\$0.00	\$0.00	0
1999-2000	\$0.00	\$0.00	\$0.00	\$0.00	0
2000-2001	\$18,824.67	\$9,175.31	\$11,334.96	\$31,746.00	3
2001-2002	\$45,506.50	\$0.00	\$45,506.50	\$45,506.50	1

Table 4. Cost of Genetically Modified Organisms for Importation into Containment (GMC) Applications

Year	Statistics		Range		N
	Average Cost	Standard Deviation	Minimum Cost	Maximum Cost	
1998-1999	\$0.00	\$0.00	\$0.00	\$0.00	0
1999-2000	\$1,691.23	\$2,539.90	\$0.00	\$7,476.74	7
2000-2001	\$2,175.49	\$3,176.51	\$0.00	\$12,344.75	32
2001-2002	\$4,260.44	\$2,335.05	\$140.00	\$9,017.64	11

Table 5. Cost of Genetically Modified Organisms for Development in Containment (GMD) Applications decided by Rapid Assessment

Year	Statistics		Range		N
	Average	Standard Deviation	Minimum Cost	Maximum Cost	
1998-1999	\$0.00	\$0.00	\$0.00	\$0.00	0
1999-2000	\$507.81	\$515.79	\$50.00	\$1,597.91	6
2000-2001	\$245.54	\$377.75	\$0.00	\$1,945.00	26
2001-2002	\$663.00	\$1,056.02	\$0.00	\$2,710.00	10

Table 6. Cost of Non-Notified Genetically Modified Organisms for Development in Containment (GMD) Applications

Year	Statistics		Range		N
	Average	Standard Deviation	Minimum Cost	Maximum Cost	
1998-1999	\$0.00	\$0.00	\$0.00	\$0.00	0
1999-2000	\$1,157.46	\$0.00	\$1,157.46	\$1,157.46	1
2000-2001	\$1,392.50	\$337.50	\$1,055.00	\$1,730.00	2
2001-2002	\$13,943.99	\$3,090.43	\$10,880.00	\$18,586.18	4

Table 7. Cost of Genetically Modified Organism Field Testing in Containment (GMF) Applications

Year	Statistics		Range		N
	Average	Standard Deviation	Minimum Cost	Maximum Cost	
1998-1999	\$5,187.29	\$3,027.86	\$2,563.78	\$10,627.25	5
1999-2000	\$3,258.51	\$523.72	\$2,513.32	\$3,994.36	4
2000-2001	\$60,584.45	\$26,818.14	\$15,392.02	\$84,978.60	4
2001-2002	\$0.00	\$0.00	\$0.00	\$0.00	0

Table 8. Cost of Hazardous Substances in Containment (HSC) Applications

Year	Statistics		Range		N
	Average	Standard Deviation	Minimum Cost	Maximum Cost	
2001-2002	\$5,294.64	\$1,832.10	\$3,447.30	\$8,637.71	5

Table 9. Cost of Hazardous Substances for Importation or Manufacture (release) (HSR) Applications decided by Rapid Assessment

Year	Statistics		Range		N
	Average	Standard Deviation	Minimum Cost	Maximum Cost	
2001-2002	\$2,034.53	\$1,401.30	\$950.00	\$7,739.62	4

Table 10. Cost of Notified Hazardous Substances for Importation or Manufacture (release) (HSR) Applications

Year	Statistics		Range		N
	Average	Standard Deviation	Minimum Cost	Maximum Cost	
2001-2002	\$7,705.63	\$33.99	\$7,671.64	\$7,739.62	2

Appendix 3. Submission to FRST regarding Pesticide Risk Reduction

Pesticides & Sustainability The Big Messages to FRST

1. Pesticide Risk Reduction Strategy and the ATMAC

In December 2000, The Government agreed with the Green Party that there should be funding for a national pesticide reduction programme. In May 2001, the Minister for the Environment announced two initiatives to deliver on this agreement. The first of these was the formation of an Agrichemical Trespass Ministerial Advisory Committee [ATMAC] to look at problems arising from off-target exposure to agrichemicals and to propose practicable and workable solutions. The second was that policy work had begun on a pesticide risk reduction strategy and that the Ministry for the Environment would prepare a public discussion document.

The ATMAC - a committee of 10 people representing a broad range of interests and expertise and chaired by Robert Priest, Deputy Chief Executive of Environment Waikato - forwarded its final report to the Minister for the Environment in March 2002. When approved by Cabinet, the report will be posted on the Ministry's website.

The discussion document – entitled Towards a Pesticides Risk Reduction Policy for New Zealand – was released in April 2002. It outlined how pesticides are controlled at the moment and detailed the risks involved in their use in particular areas. It also gave examples of some of the measures that could be introduced to deal with the risks of pesticide use, including some that have proved successful overseas.

Around 105 submissions were received by the closing date, Friday 21 June 2002. Officials are now developing a policy options paper for the in-coming government to consider in August/September this year. Operational-level science aimed at risk reduction is at present funded through both the Sustainable Management Fund and the Sustainable Farming Fund. One option is to increase funding at this level.

2. Drivers for the ERMA-hosted workshop

The June 5th workshop drew together:

1. policy and policy delivery agencies at both local and central government level:
 - MfE
 - ERMA New Zealand
 - FRST
 - ATMAC
 - Auckland and Hawkes Bay Regional Councils
2. and science providers (representatives from CRIs)
 - NIWA
 - Landcare Research
 - AgResearch

- Forest Research
- Hort Research

The rationale and/or drivers behind such a workshop were as follows:

- As part of the consultation programme on its discussion paper, MfE needed to meet with the ERMA and science providers. There is also a connection with the Ministry's National Environmental Indicators programme. The "confirmed" list of environmental performance indicators does not include any measure of pesticide use or effects. A 1998 MfE report⁵ had suggested an inventory of pesticide use as a suitable pressure indicator.
- ERMA is mandated to manage the risks associated with all hazardous substances. However, it recognizes that pesticides have high public interest and are also a relatively information-poor group of hazardous substances with regards to risk. ERMA has recently developed a set of indicators to track the performance of the HSNO legislation and would like to better track its performance in the effective management of pesticides.
- Regional councils have to date focused mainly on pesticides in the terrestrial environment and ground water. Some of this work has had a contaminated sites angle. Some have been involved in the development of decision support tools (pesticide selection models) in partnership with science providers, aimed at enabling growers to reduce the risk to aquifers.
- Some science providers have, over the past 10-15 years put a major investment into the development of Integrated Pest Management (IPM). Much has been achieved, particularly in the horticultural sector. More recently, funding cuts have been signaled by the Foundation. There was a need to consider the implications of this change of direction.
- The body of work researching the risks around effects and fate of vertebrate pest poisons in conservation environments will come under close scrutiny in the upcoming 1080 review.

⁵ Ministry for the Environment (1998). *Review of Environmental Performance Indicators for Toxic Contaminants in the environment – air, water and land*. Environmental Performance Indicators. Technical Paper No. 37 Toxic. Ministry for the Environment, Wellington.

3. Key Research Messages

The workshop took place over a single day. Given the large number of presentations it was not possible to spend adequate time identifying and exploring common themes. Additionally, the idea of forming an Independent Working Group to make a submission to the Foundation evolved during the day rather than being part of the original purpose of the meeting.

The following “big picture” issues came from the presentations, and we have also attempted to summarize these in a pictorial diagram, which is attached.

1. Need for ‘basic’ research to enable current international models of pesticide fate to be tailored for New Zealand Conditions (i.e., develop parameters so they are relevant to the New Zealand environment)

Workshop participants expressed some concern that some models rely on parameters derived from international work. Most models that have been used under NZ conditions often rely on input parameters that have been extrapolated from overseas data. For instance important variables (such as partitioning coefficients in soil and organic matter) for NZ soils need to be measured under laboratory conditions, as well as the degradation rate constants, which often play an important role in the ultimate fate of these compounds in our environment. In absence of these measured parameters for the range of pesticides under NZ conditions, models either underestimate or overestimate when overseas data are used. Many NZ soils are derived from volcanic soils and have high allophane content, which has strong sorption affinity for a number of pesticides currently used in this country. Furthermore, the nature of organic matter and its role at the molecular level needs to be investigated so that proper data can be obtained before using them for model simulation.

It is also vital to be able to predict the movement of pesticides into the more mobile environmental compartments (such as water). Movement in these compartments may result in unpredictable and/or synergistic outcomes, as a result of their more dynamic nature. Diffuse sources of uncontrolled entry of pesticides into the environment, leading to pollution of water and soil, are the subject of much scientific research and policy interest in Europe at the present time. European regulators will expect New Zealand to have similar problems and to have broadly similar research programmes with the eventual aim of policy interventions to prevent such pollution. If these matters are not researched, we may be faced with non-tariff trade barriers for our agricultural exports at some future date. By examining the environmental compartments, the risks from pesticide use can then be assessed allowing better targeted monitoring.

There is also a paucity of information relating to New Zealand species, and the effects of pesticides. Currently pesticide assessment work frequently uses international models to test toxicity and ecotoxicity (daphnia/algae). However, New Zealand has an unquestionably unique environment. It is important to consider the applicability of standard toxicity and ecotoxicity tests in the New Zealand context.

There is a need to recognise some conceptual differences in the area of vertebrate pest poisons. Research issues include: specificity; efficacy; fate and non-target effects.

One area that will affect the effectiveness of modelling is pesticide use or spray accountancy information. Such information is not collected in any systematic way, but in order to determine the effects of the application of pesticides it is important to have such information. Therefore there may also be an opportunity to determine 'typical' application data, thereby providing a 'standard' to use when modelling.

Because New Zealand has its own characteristics, if these are not captured adequately in the parameters of models, then the models' effectiveness is limited. As models are a cost-effective way to examine the environment and to explore the effects of interventions, then it seems crucial that the basic information is available so 'more bang can be bought with the research buck'. Therefore research in this area in the years to come is required, utilising proper models with appropriate input parameters in order to get a clear and correct picture of the fate and behaviour of these chemicals in NZ environment for framing a better risk assessment.

2. Continue and develop those areas of research including IPM that provide a means to explicitly reduce risk from pesticide use

Intensive agricultural farming is increasingly being challenged, as the UK BSE crisis demonstrated. There is a clear need and demand for more sustainable agricultural techniques to be employed. IPM embodies the principles of sustainable management, acknowledging that some use of pesticides may be required, but it asks the fundamental question 'what is the least harmful way of achieving the desired outcome, including consideration of non-chemical alternatives'. An area of research such as this is a crucial area of future development, as it directly influences the risks as a result of pesticide use.

There are a number of non-horticultural sectors where IPM programmes have never been developed, and to make any significant changes in the use trends a much greater development of IPM is required, as has been done in other sectors (such as pip fruit). For example, the study completed by Holland & Rahman (1999)⁶ into pesticide use found that around 70% of the pesticides used in New Zealand are herbicides used on farms. Farming in New Zealand consists mainly of sheep and beef farming, and dairy farming. These two sectors use very similar quantities of herbicides, however, in the dairy industry, this is concentrated on a land mass of approximately 10% of that occupied by sheep and beef farming. Therefore, herbicide use on dairy farms represents a huge potential for pesticide reduction. The implementation of an IPM programme in this sector would surely result in very desirable reductions in pesticide use.

Even within existing IPM programmes, there are key pesticides at risk of being withdrawn in the near future, such as the Insect Growth Regulators (IGRs), creating a need for alternative pesticides/management systems. Another issue to be addressed is exotic pests, for instance Painted Apple Moth. If eradication proves impossible, an IPM approach may become necessary. As trade and visitor numbers continue to increase, then so does the risk of the introduction of such pests. A number of

⁶ Holland . P. and Rahman. A. (1999). *Review of Trends in Agricultural Pesticide Use in New Zealand*. MAF Policy Technical Paper 99/11. Ministry of Agriculture and Forestry, Wellington.

strategies need to be developed in advance so that they are immediately available to address such threats when they arise.

3. Support research that identifies priorities for monitoring between environmental compartments on the basis of risk from pesticide use

As mentioned above, modeling may assist in the identification of the movement of pesticides into various environmental compartments. This then allows a more accurate assessment of the risks associated with pesticide use in each of these compartments. By identifying the most at-risk compartments, research dollars can be better targeted to monitor the areas most 'at risk'. Better targeted monitoring should then allow research dollars to support an integrated national approach, as such an approach is currently lacking. Identifying 'environmentally sensitive areas' (by models or from other research) will further refine monitoring targets.

4. Research into the factors underpinning social perception of risk from pesticide use, thereby allowing scientists and regulators to better address and manage those concerns.

The workshop acknowledged that social science is important, investigating (in particular) perception of risk. However risk can only be firstly calculated, and secondly managed, when there is sufficient knowledge; this can only be provided by basic and applied science.

There is a gulf between perceptions regarding controversial areas of science (such as GM and pesticide use) and the knowledge held by scientists. In order to better address society's perceptions, research identifying what are the areas of concern and how to address them is important, so better targeted education (of both scientists and society) may be initiated to manage the flow of information between science and society.

If society becomes excessively risk-averse concerning the assessment of new pesticides, it will be difficult to achieve risk reduction through technological progress. Growers will not have access to the more selective, "green chemistry" generation of pesticides. They will have no alternative to the older, broad spectrum (non selective) and environmentally damaging pesticides, such as, for example, the organophosphates.

Workshop Agenda

“Visioning”

Don Hannah	Welcome and introduction	9.30
Dave Brash	Where do we want to be	
Ellen Blake	The ATMAC	
Ian Cairns	Pesticide Risk Reduction Three policy scenarios outlined	

“Taking Stock”

Ajit Sarmah	Landcare	Pesticide degradation & leaching in soils
Brent Clothier	HortResearch	Modelling and IPM for Pesticide RR
Jerzy Zabkiewicz	Forest Research	Spraydrift modelling
Kathy OHalloran	Landcare	Vertebrate pesticides Biomarkers
Chris Hickey	NIWA	Aquatic Exposure Risks
Anisur Rahman	AgResearch	Pesticides and Pastoral Farming
Jenny Steven	FRST	Foundation directions
Mary Manastyrski	ARC	Current ARC Initiatives
Nigel Ironside	HBRC	Current HBRC Programmes
Kara Scally	ERMA	Indicators
Maryanne Macleod	MfE	Indicators

“Chewing the Fat”

Don Hannah	Rapporteur	Themes/gaps identification
	All	Exploration of the above

Conference Participants

Firstname	Surname	Organisation
Donald	Hannah	ERMA New Zealand
Mary	Manastyrski	Auckland Regional Council
Ian	Cairns	Ministry for the Environment
Dave	Brash	Ministry for the Environment
Maryanne	MacLeod	Ministry for the Environment
Peter	Cameron	Wellington
John	Maxted	Auckland Regional Council
Chris	Hickey	NIWA, Hamilton
Robert	Burgess	Ministry for the Environment
Brent	Clothier	HortResearch
Kathryn	O'Halloran	Landcare Research
Anis	Rahman	AgResearch
Graeme	Dick	ERMA New Zealand
Nigel	Ironside	Hawkes Bay Regional Council
Louis	Schipper	Landcare Research
J A	Zabkiewicz	Forest Research
Ajit K	Sarmah	Landcare Research, Hamilton
Max	Suckling	HortResearch
Jim	Waters	Ministry of Health
Ellen	Blake	Ministry for the Environment
Paul	Dansted	Ministry of Health
Anwar	Ghani	AgResearch
Simon	Buckland	Ministry for the Environment
Grant	Northcott	HortResearch
Jenny	Steven	Foundation for Research, Science and Technology
Kara	Scally	ERMA New Zealand
Hamish	Wilson	Ministry for the Environment

Issues

- Info In – Conclusions Out, but also Rubbish In → Rubbish Out
- Focus of models particularly on the ‘mobile’ environment compartments (e.g. ground and receiving water)
- Balance between international approaches and validity for the NZ environment (e.g. NZ species sensitivity issues)

