NATIONAL HEALTH COMMITTEE

NATIONAL ADVISORY COMMITTEE ON HEALTH AND DISABILITY

HUNGA KAITITIRO I TE HAUORA O TE TANGATA

Incorporating the Public Health Advisory Committee
Te Rōpū Tohutohu I Te Hauora Tūmatanui

The Health of People and Communities

The effect of environmental factors on the health of New Zealanders

Public Health Advisory Committee
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COMMITTEE FOREWORD

A message from the Chair of the Public Health Advisory Committee

In 19th century London, a now-famous study on cholera was conducted by Dr John Snow. He compared the cholera mortality rates for groups of residents supplied with water from different sources. Snow showed a very strong association between contaminated water supplies and the incidence of cholera. The research led to prompt action, including the removal of the handle of the Broad Street pump, to protect the health of the residents.

In 21st century New Zealand, water quality issues are still of prime public health importance. New Zealand has one of the highest incidences of waterborne diseases, eg, cryptosporidiosis and campylobacteriosis, in the developed world. Many small New Zealand communities do not have access to safe drinking water, and these communities tend to be disadvantaged in many other ways.

In these annual reports to the Minister of Health, the Committee has resolved to focus on the wider determinants of health – social, cultural, economic and environmental – which means our focus will be on the causal factors of population ill health. This approach fits well with continuing NHC work on the fundamental underlying causes of health inequalities. Each report will address different groups of determinants in turn.

This report will highlight environmental issues which can be linked to ill health and which are likely to contribute to health inequalities. It is the first in a series of annual reports from the Public Health Advisory Committee (PHAC) that consider public health monitoring in the context of identified public health issues. The report focuses on a few significant environmental health issues, and does not attempt to comprehensively address the whole field. Other important issues not covered in the report include the workplace environment, chemical exposures, hazardous waste management, and issues associated with the built environment. The cyclical nature of this reporting programme provides an opportunity to address these issues at a later date.

This work on the environmental determinants of health dovetails with other PHAC work planned for 2002–03 on the relationship between utility services (such as water and power supplies) and health, and on the impact on health of policies in other sectors such as transport and local government.

Health status and health inequalities are strongly influenced by policies beyond the control of the health sector and it will be a challenge to keep health on everybody's agenda across all sectors. Even when responsibility for action rests elsewhere, there are opportunities for the health sector to show leadership and ensure that the full effects of policy decisions are not lost. The PHAC reporting programme aims to identify these opportunities, along with actions under the direct control of the health sector.

Finally, the Committee wishes to thank everybody who provided information and helped us to identify priority areas.

Alistair Woodward
Chair, Public Health Advisory Committee

Members of the Public Health Advisory Committee

Professor Alistair Woodward (Chair)*
Dr Cindy Kiro
Ms Lynnette Stewart
Dr Robert Logan
Mr Kevin Hague (Chair-elect)
Dr Geoff Fougere
Professor Neil Pearce (from September 2002)

Barbara Langford provided Public Health Advisory Committee secretariat support for this project with the much appreciated assistance of Louise Thornley and Keri Ratima.

Acknowledgements

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This report is available on the National Health Committee's website:
http://www.nhc.govt.nz

Further copies are available from the Public Health Advisory Committee at the address below. We welcome your feedback on this report and ideas for future work by the PHAC in this area. You are invited to send comments to:

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* Alistair Woodward was Chair of the PHAC during the term of this project. Kevin Hague took the Chair from September 2002.

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EXECUTIVE SUMMARY AND KEY RECOMMENDATIONS

Traditional environmental policy approaches have focused on the effect of people on the environment. The study of environmental health looks through another lens to examine the effect of the environment on human health, recognising that people "are entitled to a healthy and productive life in harmony with nature".[1]

Since 1986, environmental policy in New Zealand has required that full and balanced account be taken of the provisions of the Treaty of Waitangi in the management of natural and physical resources.

The environment has a significant effect on human health in a variety of ways and its effects are spread unevenly across the population. There are health inequalities between Māori and non-Māori that are partly a result of this. In considering the effect of the environment on Māori health, particular emphasis will be given to the relationship between Māori and the environment, traditional Māori approaches to environmental health, and application of the provisions of the Treaty of Waitangi to environmental health.

The Public Health Advisory Committee (PHAC) has found a number of obstacles to addressing environmental impacts on health effectively, which include:

1. a mismatch between information needed to adequately monitor the effects of the environment on health, and what information is available

2. monitoring responsibilities spread across a number of agencies, blurring accountabilities.

These obstacles have resulted in inadequate monitoring of, and responsiveness to, important environmental health issues, for instance, indoor air quality.

> ***The PHAC calls for an integrated, intersectoral approach to policy-making and monitoring that addresses adverse impacts of environment on health, and holds accountable those responsible for any identified problem. This approach must reflect the provisions of the Treaty of Waitangi.***

Indoor air quality

Poor indoor air quality is associated with the exacerbation of respiratory conditions and allergic and toxic reactions, particularly in vulnerable groups such as older people, young children and Māori. People spend about 80 percent of their time indoors but there is little or no monitoring of domestic indoor air quality. Sources of indoor pollutants include poor quality housing, unvented gas appliances and second-hand tobacco smoke. Older uninsulated housing is often damp, cold and mouldy, conditions contributing to poor health. Newer housing is often airtight with little ventilation, potentially creating damp conditions associated with toxic fungi. Unvented gas appliances and second-hand smoke release toxins and particles that aggravate respiratory and heart conditions. Intersectoral initiatives to improve poor quality housing are likely to be effective in improving the health of the occupants. People experiencing multiple

disadvantage are most likely to occupy poor quality housing and suffer poor health and should be a priority for research and action.

The PHAC recommends that the Ministry of Health takes a lead to ensure a cross-sectoral approach to indoor air quality in domestic housing, including further research and increased monitoring. Other agencies need to be provided with information about the availability of input from the Ministry of Health. This approach must take account of the effect on the health of Māori as well as obligations under the Treaty of Waitangi.

Ambient air quality

New Zealand research suggests that ambient air pollution is responsible for an estimated 970 premature deaths each year in people over 30 years of age, approximately 400 of which are from vehicle emissions. Fine particles produced in the combustion of fuel pose greater health risks than previously thought. Children, elderly people and those with respiratory diseases are more vulnerable to air pollution and areas of high deprivation have greater excess mortality from air pollution. In many parts of New Zealand domestic fires are the main contributor to ambient air pollution, with vehicle emissions being the main contributor along traffic corridors. The extent and frequency of air quality monitoring is variable. Regional Councils are primarily responsible for this monitoring, and the Ministry for the Environment (MfE) develops national indicators and strategies.

In the urban environment, areas of social disadvantage tend to be located close to major traffic routes. Thus, while there are no data on the effects of air pollution on the health of different ethnic groups, Māori would be expected to be disproportionately affected. Depositing of air pollutants on *mahinga kai*, (food-gathering areas) *wāhi tapu*, (sacred sites) *marae* and waterways are real concerns for iwi, for example, discharges from crematoriums being blown over *mahinga kai*. Iwi want the opportunity to participate in the management and regulation of air quality within their *rohe* (territory), and according to their own cultural values.

The Ministry of Health currently plays only a minor role in monitoring and policy responses to ambient air quality issues.

The PHAC recommends that the Ministry of Health examines current processes and strengthens the public health response to public health issues associated with ambient air quality. This approach must reflect the provisions of the Treaty of Waitangi.

Drinking water quality

New Zealand has a high rate of waterborne diseases compared with other similar countries. People in small rural communities are less likely to have access to safe water supplies than those in urban areas. The most deprived communities tend to be at highest risk from unsafe water supplies and Māori are over-represented in these communities. Monitoring to ensure safe water supplies in low income and isolated rural communities

is largely inadequate. A pilot in Hokianga, where water supplies were improved in partnership with the community, is being evaluated for its applicability to other similar communities. There is no statutory requirement to comply with Drinking Water Standards set by the Ministry of Health. Progress on legislative revision that will require suppliers to have a risk management plan has been slow. **The PHAC urges swift introduction of the Health (Drinking Water) Amendment Bill**.

> ***The PHAC recommends the Ministry of Health works with iwi/Māori organisations, local government and other appropriate agencies to improve the drinking water quality of small rural communities, learning from the evaluation of the Hokianga pilot.***

Surface and ground water quality

Faecal contamination from dairy farming is a major pressure on inland waterways. Agriculture is also responsible for excess nutrients causing algal blooms in inland waterways making them undrinkable and unusable for recreation. Small rural communities are more likely to experience contamination of water supplies from failed or inadequate sewage disposal systems. Indicators based on Māori traditional knowledge are being developed to assist Māori in the protection and development of their own resources. Contamination of shellfish beds may be responsible for outbreaks of hepatitis A, Norwalk-like virus and other diseases. There is no national perspective in the contamination of aquatic food-gathering areas.

> ***The PHAC recommends that the Ministry of Health works with iwi/Māori organisations and relevant agencies to improve sewage disposal systems for small rural communities and, in doing so, considers the protection of mahinga kai (food-gathering areas) from contamination.***

Emerging issues

Climate change

The health effects of climate change are likely to be significant and will be spread unevenly. The effects of climate change will be felt most by those with the fewest resources because of an unequal capacity to respond to adverse events such as weather extremes. The human health impacts of climate change need to be central to any mitigation or adaptation strategies developed.

> ***The PHAC recommends that the Government makes public health a key concern in research and policy development on the impact of climate change and interventions taken to mitigate its adverse effects. This research and policy development must reflect the provisions of the Treaty of Waitangi.***

Quality of life in urban environments

Eighty-six percent of New Zealanders now live in urban areas. Increasing urbanisation puts pressures on the environment, with increased demand for resources and utility

services, and increased generation of waste. The urban environment needs to be sustainably managed. Indicators for quality of urban life and well-being have been developed by the "Six Cities" project to inform more effective policy development.

The PHAC recommends that the Government monitors and researches urban sustainable management in New Zealand, developing a national urban sustainable management indicator framework.

SUMMARY OF RECOMMENDATIONS

The PHAC recommends that:

- **the Ministry of Health takes the lead to develop an integrated, intersectoral approach to policy-making and monitoring, which addresses adverse impacts of the environment on health, and holds accountable those responsible for any identified problem; this approach must reflect the provisions of the Treaty of Waitangi**
- the Ministry of Health examines its current processes and considers further options for working with iwi/Māori organisations and local government to address environmental health issues.
- the New Zealand National Sustainability Strategy should have the health and well-being of people and communities as a central concern.
- the Public Health Bill's development and introduction into the Parliamentary process be expedited and it be accorded a high priority on the legislative agenda.
- the Ministry of Health takes further steps to ensure that environmental health indicators are developed in close consultation within the public health sector, with Māori and with the environmental and other relevant sectors.

Air quality

The PHAC recommends that:

- **the Ministry of Health takes the lead to ensure a cross-sectoral approach to indoor air quality in domestic housing, including further research and increased monitoring; this approach must reflect the provisions of the Treaty of Waitangi**
- the Ministry of Health actively seeks further opportunities to support policies that aim to improve housing quality, specifically to improve insulation and reduce dampness in new and existing buildings and improve fire safety.
- the Minister of Health proposes to the Minister of Consumer Affairs that the evidence for the health effects of, and current exposure to, unvented gas heaters be investigated, and affordable, safer alternative forms of heating be identified.

- the Ministry of Health supports further strengthening of the Smokefree Environments Act to protect all workers and examines further options for promoting smokefree homes and cars.

- **the Ministry of Health examines current processes and strengthens the public health response to health issues associated with ambient air quality; this approach must reflect the Treaty of Waitangi**

- the Ministry of Health, in collaboration with relevant other sectors, develop a set of core human health indicators for air quality in New Zealand, with the flexibility to allow for additional regional indicators to be developed in partnership with Māori.

- the Ministry of Health conducts or commissions further publicly funded research to identify the best indicators for each major air quality concern eg, home heating, vehicle emissions, industrial emissions. This research must reflect the provisions of the Treaty of Waitangi.

Water quality

The PHAC recommends that:

- **the Ministry of Health works with iwi/Māori organisations, local government, and other relevant agencies to improve the drinking water quality of small rural communities, learning from the evaluation of the Hokianga pilot**

- the Minister of Health promotes to the Minister for the Environment the need for a joint approach to the management of catchments that are sources of drinking water

- the current Ministry of Health review of the legislation/regulation governing safe drinking water be finalised and implemented quickly [Health (Drinking Water) Amendment Bill] and that options for ensuring compliance with Drinking Water Standards be considered, including a mandatory requirement.

- **the Ministry of Health works with iwi/Māori organisations and relevant agencies to improve sewage disposal systems for small rural communities and, in doing so, considers the protection of *mahinga kai* (food-gathering areas) from contamination**

- the Ministry of Health examines options for subsidies to small suppliers, to enable them to put the Water Quality Standards in place, similar to the Sanitary Works Subsidy Scheme

- the Minister of Health proposes to the Minister for the Environment that legislative solutions are sought to restrict local authorities in the development of new subdivisions, where it cannot be shown that there is adequate provision for sustainable supplies of safe, potable water or suitable sewage disposal

- The Ministry of Health works with iwi/Māori organisations and local government to ensure that information is available to individual consumers, who are not on reticulated water supplies or sewage disposal, about how to keep their drinking water safe and maintain their septic tanks safely.

Emerging issues

Climate change

The PHAC recommends that:

- **the Government makes public health a key concern in research and policy development on the impact of climate change and interventions taken to mitigate its adverse effects; research and policy development must reflect the provisions of the Treaty of Waitangi.**

Quality of life in urban environments

The PHAC recommends that:

- **the Government monitors and researches urban sustainable management in New Zealand, developing a national urban sustainable management indicator framework**

- that the Government urges local authorities to manage urban environments sustainably in partnership with iwi/Māori organisations and to use indicators developed by the "Six Cities" project to inform policy development in sustainable management.

PART I SETTING THE SCENE

1 Introduction

1.1 Introduction to the Public Health Advisory Committee

The Public Health Advisory Committee (PHAC) was established as a sub-committee of the National Health committee (NHC) in 2001 under the New Zealand Health and Disability Act 2000. Two specific tasks required by the Act are to independently advise the Minister of Health on public health issues and public health monitoring.

1.2 Planned reporting programme†

Advice to the Minister will cover these two reporting requirements together. This approach ensures that monitoring is set in the context of public health and the factors that influence it, rather than as an end in itself.

The PHAC has resolved to take a strategic approach and to concentrate on the "upstream" factors underlying the health of people and communities, that is, on the wider determinants of health. A number of recent reports have documented trends in population health and social health (see appendix four for a full summary of these reports). By focusing on the wider determinants of health, PHAC reports will complement the work that focuses on health outcomes.

For convenience, the wider determinants of health will be grouped into the following categories, acknowledging that the groupings are to some extent arbitrary and there is considerable overlap:

- social/cultural eg, social exclusion/discrimination, access to services (including education), employment, access to language and culture, land rights, belief systems, gender, ethnicity
- economic eg, income, taxation, welfare benefit system, globalisation/free trade
- environmental eg, air and water quality, wastewater disposal, quality of life in urban environments, physical housing conditions, and climate change.

A three-year reporting cycle will ensure that some issues from each of these categories are reported on regularly. Since the NHC has reported on the social, cultural and economic determinants recently (1998), this first PHAC report will focus on environmental determinants, with an emphasis on those issues where there are clear health inequalities. Coverage within each report will include trends in the determinants, progress towards the protection and promotion of public health, and monitoring issues. (See appendix one for more information about this reporting programme.)

† See also Appendix 1.

2 Environmental determinants of health

2.1 Introduction

The relationship between the environment and people is an ecological one, where humans and human activities are part of a dynamic living system. We are not only dependent upon the environment but also have an inter-dependent relationship with other species. For the human species to be healthy, we must find ways of living in balance with the earth's natural systems as well as with our own social and economic environments. The First Principle of the Rio Declaration, 1993, states:

> ***"Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature."***

The health sector must work with other sectors towards ecologically sustainable social and economic development by anticipating and preventing ecological damage. McMichael et al, 2000, state that:

> ***"the level of health attained by the world's population will be the ultimate criterion of how well we succeed."***[2]

Environmental determinants are defined in this document as "**those factors in the physical and built environments that impact upon human health**". Social environments will be addressed in subsequent reports.

The total contribution of environmental determinants to the burden of ill health has not been closely scrutinised in New Zealand, although estimates have been made for specific issues. For example, vehicle emissions and second-hand smoke have been estimated to each cause around 400 deaths in New Zealand each year.[3,4]

The relationship between human health and the environment is highly complex. It is often difficult to causally relate health outcomes to specific environmental factors. Many modern environmental hazards take a long time to manifest themselves in disease eg, chemical exposures. They also contribute to the burden of ill health indirectly and are therefore difficult to measure. For example, environmental degradation and loss of biodiversity have indirect effects on human health, by impacting on individual and community well-being and on *te taha wairua*.‡

The environment sector routinely reports on the condition of the environment. However, this reporting focuses on the effect of humans on the environment and rarely considers the effect of the environment on human health. For example, pollutants are monitored by measures in the ambient environment that have little relationship to human exposures that are the key to health impacts. There is also a lack of information on trends in environmental determinants, which in turn are affected by social and economic conditions.

However, there is increased understanding of the causal pathways between environmental factors and health and disease. The World Health Organisation (WHO) is leading an international movement, to develop environmental health indicators and

‡ Described by Durie as one of the four cornerstones of Māori health – spiritual well-being. The other three cornerstones are *te taha tinana* (physical), *te taha hinengaro* (mental) and *te taha whanau* (community and family).

this will enhance such understanding. The indicators will aid the identification and prioritisation of environmental health issues and link traditional environmental approaches with traditional health approaches.

2.2 Scope and context of this report

This report does not attempt to give a complete picture of environmental health issues in New Zealand.

The PHAC has selected several aspects of environmental health that are among the key determinants of health and health inequalities in New Zealand. The principles that guided the selection process are listed in Appendix 1. The issues chosen are among those that impact disproportionately on communities and population groups that already have poorer health status than other New Zealanders. These issues have potential for health gain but are not being adequately addressed because of gaps in activity or monitoring.

Issues covered by this report include:

- domestic indoor and outdoor air quality
- water quality including drinking water quality, contamination of fresh and marine water, and sanitation issues
- emerging issues such as the quality of life in urban environments and the health effects of climate change.

Other areas that were considered, but not chosen, include the workplace environment, built environment issues, industrial emissions and hazardous waste management. The PHAC acknowledges that these are significant public health issues. Occupational health is especially important and warrants a separate report. There are also major public health concerns about hazardous waste and industrial emissions, however these issues are not covered in this report.

The report acknowledges current work on sustainable management and adopts the DPSEEA§ framework for environmental monitoring (see appendix two). The report is strongly connected to the New Zealand Health Strategy (healthy physical environments) and inequalities work in the Ministry of Health. It also makes reference to other work in environmental health (appendix three and section 2.4 below), including:

- the review of the Health Act 1956 and the Local Government Act 1974
- work on environmental health indicators (Ministry of Health) and environmental performance indicators (Ministry for the Environment)
- the New Zealand Sustainable Development Strategy
- the State of the Environment reporting by MfE and some Regional Councils

§ The DPSEEA Framework has been adopted by WHO and covers Driving force, Pressure, State, Exposure, Effect, Action.

- the 2002 Sustainable Development Report "Creating our Future" by the Parliamentary Commissioner for the Environment (PCE).

2.3 Relationship between Māori and the environment

2.3.1 Indigenous peoples and the environment

Many indigenous peoples share a sense of unity with the environment,[5,6,7] and regard their identity as an extension of the environment within which they live. Their ancestors are to be found as much in the world around as in the lives of those who have died.[8,9]

Indigenous peoples' traditions reflect this unity with the environment and are expressed in song, custom, and approaches to healing, birthing and death.[8] An essential characteristic of indigenous peoples is a longstanding relationship with the natural world. In the Whanganui River Charter, the Whanganui River Māori Trust Board expressed this by stating 'We are the river, the river is us.'[10]

Analysis of the health status of indigenous peoples needs to take into account the broader perspective summed up by Deloria, (1994):

> ***"alienation of people from their environment – from the natural world – may be as closely linked to the host of health problems that indigenous peoples have as the risks of modern living".***[8]

2.3.2 Māori creation

Māori creation stories vary between *iwi*. However, two aspects are shared: *whakapapa* (genealogy), and the personification of natural phenomena. Most versions of creation are arranged in a genealogical order and *Rangi* and *Papa* originate from a single ancestor. After separation, *Rangi* and *Papa* became known as *Ranginui e tu iho nei*, or "sky father" and *Papatuanuku* or "earth mother".[11]

From these two primal parents came many supernatural offspring, each the guardian of particular natural phenomena. Everything in the universe has its own *whakapapa* and all things are linked via the gods to *Rangi* and *Papa*. There is no distinction in the *whakapapa* between supernatural and natural and both are part of a unified whole. The universe is holistic and dynamic and there is an ongoing process of continual creation and recreation.[11]

2.3.3 Tapu, noa and rāhui

There are traditional Māori laws that apply to public health that are used to regulate behavior to protect the community or a resource. *Tapu*, *noa* and *rāhui* are examples.

Sacredness and divine origin were traditionally used to characterise *tapu*. Although it was not confined to spiritual dimensions, it is in fact an all-pervasive force.[7] *Tapu* regulated community behaviour.[12] The underlying philosophical basis for public health was linked to a division of people, places or events as either *tapu* or *noa*. *Tapu* situations were "off limits" and, conversely, *noa* signifies a situation of casual access with no particular restrictions.

When a distinct territory of land, water, or bush requires protection or is a health risk, a *rāhui* is used. It is a conferment of *tapu* and a public statement restricting right to use a precise region.[13] A *rāhui* can be used to limit opportunities for contamination and to control the spread of disease, eg, from a contaminated water supply.

2.3.4 Kaitiakitanga

The concept of *kaitiakitanga* can be roughly translated as 'the act of guardianship'.[11]

Traditional roles of *iwi* with regard to *kaitiakitanga* differ depending on the needs in each *rohe* (territory). The way in which this role is exercised may also be different for different iwi. For example, *Kai Tahu* may choose to exercise their role as *Kaitiaki* in Otākou differently from the way it is done by *Te Atiawa* in Taranaki.

The practice of *kaitiakitanga* is influenced by the geographical nature of a *rohe*. A range of both traditional and modern strategies is used by *iwi* in order to meet these responsibilities. The Taieri River project is one example of an *iwi* using both traditional and modern methodologies in exercising their *kaitiaki* role. It was initiated by *Ngai Tahu* to address a lack of incorporation of Māori values in the management of freshwater monitoring. Detailed observations of the river and its catchment with input from *kaumatua*, led to the development of 30 indicators. These include quality of fish and bird life, vegetation, the sound of water flow and traditional place names. Project information and the indicators have been used to develop a Cultural Health Index which incorporates cultural knowledge and western science in the monitoring of freshwater.[14]

Environmental policies need to enable flexibility at a regional level so that *iwi* are able to work in partnership with local government to develop approaches that are consistent with the *tikanga* of their *rohe*. Good relationships between *iwi*, *hapū*, public health *services* and Regional Councils are crucial to this process.[15,16] An example of this is a partnership between Kai Tahu in Otago and public health services that was established to increase iwi participation in the resource consent process under the Resource Management Act (RMA). A Memorandum of Understanding formalises the partnership and has a health policy objective "to improve, promote and protect the public health of Māori within Otago and in particular assist *Manawhenua* in the sustainable management of natural and physical resources".[17] The partnership strengthens public health input into resource consent processes as the parties have complementary mandates.

Over the last 150 years, a host of factors have drawn many Māori away from their traditional environment towards urban areas – in many cases for several generations. Along with the loss of control over much of their ancestral land, this has meant increasing separation from their *kaitiaki* role. Capacity-building initiatives, such as the Taieri River project, are an important development for Māori who want to see an improvement in the ability and opportunity for *iwi* to fulfil their *kaitiaki* role.

2.4 Environmental health monitoring

2.4.1 Monitoring responsibilities

Environmental health monitoring needs to be integrated and co-ordinated. In researching this report, the PHAC identified that responsibilities for environmental

health monitoring are fragmented and spread across a number of agencies. There are varying degrees of co-operation between agencies at a local level. Much information is collected with no clear idea of who will use it and what it will be used for. Although the health sector largely bears the costs of environmental health failures, much of the monitoring and oversight is beyond the control of the Ministry of Health. Links between environmental and health monitoring are weak.

Many of the environmental health functions of the health sector are now managed by separate agencies. For example: occupational health and safety is now overseen by OSH; food safety by the new Food Safety Authority; injury by ACC; and the Environmental Risk Management Authority (ERMA), under the new HSNO Act, will manage hazardous substances and new organisms.

At a local level, Public Health Units have different boundaries from Regional Councils and this can create difficulties. Sometimes public health action is hampered by the requirement to work with two antagonistic local authorities. Often it is not clear which agency is responsible for what monitoring and there can be difficulties in reaching agreement. There may be little local government understanding of their role in public health issues or how to address them, even though specific roles are mandated by both the Health Act 1956, and the Local Government Act 1974.

The relationship between public health agencies and different local authorities may differ in their commitment to monitoring and managing similar environmental health problems. For example, one Public Health Unit has a co-operative relationship for the monitoring and management of cyano-bacterial (blue-green algal) blooms with both District and Regional Councils in one district but not in an adjacent district. In the latter district, the Regional Council has little commitment to monitoring the lake and, when a bloom has been notified to the Medical Officer of Health the District Council is reluctant to put up warning notices for fear of affecting tourism.

2.4.1.1 Review of the Health Act 1956

The current Health Act is almost 50 years old and is now under review. The new Public Health Bill will take a risk management approach, eg, giving Public Health Units general responsibilities to identify, monitor and manage risks to public health. It will maintain and broaden the existing powers of designated officers in District Health Boards (DHBs) and local government Environmental Health Officers. The Bill will allow more flexibility in responding to public health issues, but will retain elements of prescription where necessary. Its primary focus will be on environmental health and communicable diseases, with broad potential for action wherever there are risks to public health. Other than in declared emergencies, it will not override other legislation that impacts on public health, such as the Resource Management Act, but it will allow for the health sector to advise and scrutinise other sectors to help ensure that risks to public health are well managed.

The PHAC has noted the lengthy delays experienced in reviewing the Health Act and the development of a replacement statute. Consultation with the public was undertaken in 1998 and at the time of writing this report, the drafting of the proposed Public Health Bill had not been completed. The PHAC notes the difficulty of taking a coherent approach to environmental health until the legislation has been enacted.

2.4.1.2 Sustainable development

In a recent report on sustainable development, the Parliamentary Commissioner for the Environment was critical of the lack of progress made by successive New Zealand governments since the Rio Earth Summit.[18] The Commissioner reported the problems associated with 'silo thinking', which has led to narrowly focused goals, with no account taken of the links between economic, social and environmental interests. This has resulted in poorly integrated decision-making, lack of co-operation between sectors and agencies and lack of incentives to work towards the public good.

The PHAC considers that finalising the National Sustainability Strategy should be a priority and that the strategy should reflect the health of people and communities. The PHAC also emphasises the need for ensuring that the health of people and communities is prioritised when planning for sustainable development. The impact that economic, social and environmental policies and actions have on public health is strongly documented and this should be reflected in models of sustainable management.

Prior to the World Summit on Sustainable Development at the end of August, advance texts of plans for implementation have been agreed, including a strong statement emphasising that human beings should be at the centre of concerns for sustainable development. The text states that there is an urgent need to address the causes of ill health, especially for vulnerable groups. The PHAC will be looking for this emphasis on health to be reflected in New Zealand's National Sustainability Strategy.

The Commissioner's report acknowledged that more progress was being made on sustainable development approaches at local government level. This work will be strengthened further by local government reforms (see 2.4.1.3 below).

2.4.1.3 Review of the Local Government Act 1974

The review of the Local Government Act recognises the key role that local government plays in sustainable management. The new legislation will give local authorities wider powers to address social, economic, environmental and cultural objectives and clarifies obligations under the Treaty of Waitangi. The Bill will require local government to provide opportunities for Māori to contribute to local government decision-making processes and to have appropriate processes for consulting Māori. In making significant decisions relating to land and bodies of water, local authorities will be required to take into account the relationships of Māori with their ancestral land, water, *wāhi tapu* and valued flora, fauna and other *taonga.*

The Local Government Bill will require territorial authorities to regularly assess the adequacy of the provision of drinking water, wastewater and other sanitary services within their area, including the environmental and public health impacts of those services. Local government will also retain expanded bylaw making powers relating to public health.

Local government has a key role in environmental health, making the proposed approach to sustainability and the Treaty particularly significant for public health. It also emphasises the need for public participation in decision-making, with particular implications for the way local authorities engage with the public on environmental health issues.

2.4.2 Indicators for monitoring

Environmental health indicators for New Zealand are currently being developed by the Institute of Environmental Science and Research (ESR) for the Ministry of Health, based on WHO indicators. This work is due to be completed mid-2003.

The traditional environmental approach has focused on the effects of humans on the environment. These environmental health indicators will provide a tool to measure the effect of the environment on human health and are intended for use by DHBs and Regional Councils. They also will inform policy development and contribute to a national approach to environmental health, in the form of an action plan. These two pieces of work will be key to an integrated approach to environmental health in New Zealand.

The Ministry for the Environment (with other agencies) is also developing a national system for reporting on the state of the environment – the Environmental Performance Indicators Programme. These indicators are agreed measures that help to track changes in the environment and will be used by Regional Councils as required, under the Resource Management Act. Indicators will help to assess the state of the environment and the success of environmental policies and laws. The PHAC believes that the two sets of indicators must be synergistic and complementary.

A different approach is being taken to develop environmental measures relevant and important to Māori, since a system of national indicators may not be appropriate to all *hapū* and *iwi*. The MfE is working in partnership with different *hapū* and *iwi* to identify processes and methodologies that meet different tribal expectations. Indicators being developed are based on traditional knowledge and include those for *kai moana* (seafood), *mahinga kai* (food-gathering areas), and for the health of waterways. A partnership between the MfE, *Kai Tahu* and the University of Otago is developing indicators that give an overall view of the health of a waterway. This Cultural Health Index approach is being used in the Taieri to assess the health of the river, its catchment and riparian strips. It will be used by Kai Tahu as a diagnostic tool to help in the management of their resources, but may also have wider application.

2.5 Recommendations – general environmental health issues

The PHAC recommends that:

- **the Ministry of Health takes the lead to develop an integrated, intersectoral approach to policy-making and monitoring, which addresses adverse impacts of the environment on health, and holds accountable those responsible for any identified problem; this approach must reflect the provisions of the Treaty of Waitangi**

- the Ministry of Health examines its current processes and consider further options for working with iwi/Māori organisations and local government to address environmental health issues

- the New Zealand National Sustainability Strategy should have the health and well-being of people and communities as a central concern

- the Public Health Bill's development and introduction into the Parliamentary process be expedited and it be accorded a high priority on the legislative agenda
- the Ministry of Health takes further steps to ensure that environmental health indicators are developed in close consultation within the public health sector, with Māori and with the environmental and other relevant sectors.

PART II KEY ENVIRONMENTAL HEALTH ISSUES

3 Air quality

3.1 Indoor air

It is estimated that people in New Zealand spend between 70 and 90 percent of their time indoors and five to10 percent in a vehicle.[19] Since duration of exposure to toxins is as important as the level of air pollution, any pollution of indoor air creates a risk to the occupants.

The 'rule of one in a thousand' states that:

> *"a pollutant released indoors is 1000 times more likely to reach a person's lungs than a pollutant released outdoors."*[20]

In spite of this degree of risk, there is very little information about the burden of ill health due to poor indoor air quality in New Zealand. There is little or no monitoring of indoor air quality, especially in domestic housing. Yet there are many features of New Zealand homes that are unique internationally. These include: limited insulation in older homes; high use of unvented gas heaters; and the high use of wood and coal for home heating.[3] Indoor air is often similar to outdoor air, especially where there is adequate ventilation. However, where there is an additional source of pollutants inside the home and poor ventilation, air quality can be markedly different from ambient air. This report will focus on indoor air quality in domestic situations, a setting where there is little or no monitoring currently and a paucity of research and information.

3.1.1 Importance of indoor air quality to public health

Health problems associated with poor indoor air quality include: exacerbation of respiratory conditions including asthma attacks; allergic reactions to bio-contaminants such as fungi and dust mites; and toxic reactions to non-biological contaminants such as fumes from combustion. The groups most at risk from air pollution (children, older people, and people with existing health conditions) are those who are more likely to spend a greater amount of time indoors.[21]

Known risk factors for asthma events in people who have an asthmatic condition, include second-hand smoke, nitrogen dioxide (a product of gas combustion), and dust mite allergens. In New Zealand, a large number of children share their homes with adult smokers, a high proportion of homes use unvented gas heating and New Zealand houses have one of the highest rates of dust mite allergens in the world.

There is evidence of the link between respiratory problems and specific fungi.[22] Respiratory conditions are also known to be exacerbated by the damp, cold indoor conditions typical of much of New Zealand's older housing stock, which is often occupied by disadvantaged families. Although the association between poor housing and ill health is known, the size and strength of the association is poorly understood.[23] The Housing and Health Research Programme at the Wellington School of Medicine is currently exploring this association. The first results of their research are due early in 2003.

This report addresses poor quality housing, the use of unvented gas heaters and second hand tobacco smoke, as factors that contribute to poor indoor air quality.

3.1.2 Housing Quality

Much of New Zealand's older housing stock is not insulated or inadequately insulated and central heating systems are rare. This means that our older housing tends to be damp and cold, conditions that have been strongly linked to health problems for the occupants.[24] Many older houses in New Zealand have been poorly constructed and maintained which can lead to leakages and infestations of pests such as cockroaches, mice or fleas.[25]

There are also pockets of relatively new housing stock that are in a poor state of repair. There are recent indications that newer, low cost housing (and some high cost housing) is providing optimum conditions for the establishment and growth of a variety of particularly toxic fungi. Modern homes are often airtight, poorly sited and inappropriately designed for our climate, leading to leakages and rising damp problems, creating ideal environments for toxic moulds. One of the moulds that is increasingly being reported in New Zealand homes is *Stachybotrys*.[26,27] This mould has been linked to allergic reactions and respiratory problems and possibly pulmonary haemorrhage in infants.[28,29] The problems associated with new housing may indicate the need for revision of the relevant Building Code to minimise the risk of the establishment of toxic fungi.

3.1.2.1 Current initiatives to address substandard housing

The Energy Efficiency Conservation Authority insulates houses where there is at least one occupant with a self-reported diagnosed condition that suggests a retrofit would be of immediate benefit for health.[30] The Wellington Medical School study is researching whether retrofitting insulation into a house does indeed have an effect on an occupant's health. A retrofit involves ceiling insulation, underfloor foil and moisture barrier and draught excluders on windows and doors. Depending on the material used, a retrofit can last for about 25 years and cost between $1000 and $1500, a similar amount that could potentially be saved by the prevention of one admission to hospital. Improvement in the energy efficiency of homes is likely to improve the health of the occupants, with the wider benefits of conserving energy resources and increasing their ability to spend more on heating if necessary.

Work to eliminate substandard housing in Northland, East Coast and Bay of Plenty is underway and Housing New Zealand Corporation (HNZC) has completed more than 1200 assessments of houses identified by kaupapa Māori housing and other agencies as being substandard. It is expected that around 2000 housing interventions will be targeted to high-need areas in the next five years.[31] A programme of intersectoral social development strategies to develop community well-being will complement the sub-standard housing initiatives. In addition, there has been a programme of smoke alarm installation, fire safety education and alternative accommodation provision. Such initiatives are likely to have important health benefits.

A partnership has been formed between HNZC and two Auckland DHBs to implement a 'healthy housing' initiative in areas where there are identified overcrowding problems.

Individual assessments are carried out on overcrowded houses and improvements made. HNZC is undertaking improvements such as installing ventilation systems, smoke alarms, range hoods and extra toilets and the DHB identifies health issues that need attention, eg, immunisations.

3.1.3 Impact on health inequalities

3.1.3.1 Older housing stock

Approximately 900,000 houses were built in New Zealand prior to 1977 when building standards did not require insulation. Of these, the Energy Efficiency Conservation Authority estimates 600,000 houses to be either not insulated or inadequately insulated.[32] These tend to be the houses occupied by low-income families/whanau whose members have poorer health than the general population. These houses are more likely to be damp and cold, creating indoor environments that encourage dust mites, fungal spores and average temperatures below WHO recommended minimums.** High humidity associated with mould and dust mites is exacerbated by overcrowding through excess moisture from cooking, laundry and showers. Studies show there is also a link between overcrowding and increased risk of infectious diseases. An Auckland study identified overcrowding as a major risk factor for meningococcal disease.[33] Household crowding will be addressed in more detail in the 2003 PHAC report on the social and cultural determinants of health.

A 1998 Bay of Plenty study of three Māori communities showed over 50 percent of permanent houses had no ceiling insulation.[34] These low insulation rates were found in older houses as well as those built in the 1980s. The study did not include 'temporary' residences, such as tin shacks, trailers and other non-standard structures, which are permanent residences for some people.

Temporary housing is in high need of further research. The number of people affected is not trivial; at the time of the 1996 census around 1,800 children under 15 years were living in temporary accommodation such as tents, garages, caravans and motor camp cabins.[35]

Recent fatal house fires in sub-standard housing, caused by unsafe use of open flames for heating and lighting, has focused attention on housing conditions in rural areas. Nationally, the age-standardised death rates for Māori in unintentional house fires exceed rates for non-Māori by a factor of almost 7, and over half the children who died in fatal fire incidents between 1991 and 1997 were Māori.[36]

3.1.3.2 Newer low-cost housing

The design and construction of airtight houses is a relatively new phenomenon and particularly affects low-cost housing of simple design. The Building Code does not currently address this issue adequately, since its solution to adequate ventilation is the opening of windows. This approach ignores issues such as security and protection from noise. It is essential that preventive measures be promulgated now to ensure healthy

** *WHO recommended minimum average indoor temperature –16–18°C for healthy people with an additional 3°C for elderly, sick or disabled people.*

housing stock for the future. Guidelines are being developed for ventilating small buildings, but requirements incorporated into the Building Code would help ensure that the guidelines are adhered to.

3.1.4 Unvented gas appliances

Unvented gas appliances, which use either natural or bottled gas, emit the products of gas combustion directly into the home environment. These by-products include:

- oxides of nitrogen which are associated with exacerbation of respiratory conditions, eg, asthma in young children[37]
- carbon monoxide, which even at low concentrations can cause fatigue in healthy people and provoke symptoms in people with heart disease[38]
- fine particles, which can compromise lung function
- sulphur dioxide, which at low concentrations can cause eye, nose and respiratory tract irritation and at high levels can cause wheezing and breathing problems especially in people with asthma
- water in large amounts, contributes to optimum conditions for the growth of moulds, dust mites, viruses and bacteria if released into a poorly ventilated home environment.

Indoor pollutants from gas combustion have also been associated with increased sensitisation to allergens and may play a role in the development of atopic asthma.[39]

Emissions depend on how efficiently the heater is burning. Where combustion is incomplete, high concentrations of carbon monoxide may be released which can cause death where there is little ventilation.

Studies in Australia and other countries, have indicated that homes with unflued gas heaters are more likely to exceed guidelines for ambient air quality.[40,41,42] This is concerning because exposure periods are likely to be longer indoors than outdoors. Several studies have linked the use of unvented gas cookers with respiratory problems, especially among women.[43,44] An incremental increase of approximately 30 $\mu g/m^3$ (two-week average) of nitrogen dioxide is associated with a 20 percent increase in lower respiratory illness in children aged five to 12 years.[45]

New Zealand houses have a very high rate of unvented gas heating, due to the lack of central heating systems and the low cost of these appliances. According to the 1997/98 New Zealand Official Year Book, 30.6 percent of New Zealand homes use unvented gas heaters.[46] A 1993 New Zealand study of indoor air quality found nitrogen dioxide levels close to, or above, WHO guidelines, in homes with unvented gas heaters. Homes with no unvented gas heaters had levels similar to ambient air.[47] The study also found indoor environments that exceeded the New Zealand standards for carbon dioxide, and some had elevated carbon monoxide levels. As a result of this work, the Ministry of Health recommended that the sale of unvented gas heaters be disallowed. This recommendation

was not accepted but appliances are now expected to carry labels recommending good ventilation. Such a recommendation is clearly impractical as ventilation negates the effect of a heater.

Many people on low incomes heat their houses with unvented heaters that use gas bottles, to help them to ration the household spending on heating. The health risks associated with this type of heating therefore fall disproportionately on lower socio-economic groups, particularly older people who spend most of their time at home. The Ministry of Social Development commonly provides advances to beneficiaries for unvented gas heaters, as they are considered to be a cheap way to heat homes. Some schools also use unvented gas heating, which means that children are unnecessarily exposed to particles and toxins that are known to cause respiratory problems. A 1992 Australian study found that children in schools or homes with unvented gas heaters had significantly higher rates of absenteeism, sore throats, and lower respiratory tract episodes, which are related directly to the degree of exposure to nitrogen dioxide.[48]

The large amount of moisture such heaters can generate causes further dampness in the home. They are often used alongside dehumidifiers that use substantial amounts of energy and are therefore costly to run.

Environmental health agencies, including the U.S. Environmental Protection Agency and New Zealand's ESR recommend that gas appliances should be flued or carry an obvious warning.[47] Unvented gas heaters are banned in some jurisdictions, eg, in Canada, California, Montana and Massachusetts in the USA, because of their known contribution to chronic respiratory conditions.

With strong international evidence for the negative impacts on health, the PHAC questions why New Zealand continues to allow the sale of unvented gas appliances with few or no warnings to consumers of the increased risks to health. The PHAC also notes the lack of information about the effect of other forms of home heating on indoor air quality and supports further research on this.

3.1.5 Second-hand tobacco smoke

Evidence of the harmful effects of second-hand smoke is now overwhelming. An estimated 250 people die in New Zealand each year from exposure to second-hand smoke at home and in their cars, including 50 infants from cot death.[4] Long-term exposure is also shown to increase the risk of heart and respiratory diseases and lung cancer.[49] Children are particularly susceptible to the health effects of second-hand smoke. Second-hand smoke is estimated to cause more than 500 hospital admissions of children under two years with chest infections, almost 15,000 episodes of childhood asthma, 1,500 hospital operations for glue ear and more than 27,000 GP consultations for asthma and other respiratory problems in New Zealand children.[49]

Smoking rates are higher in the low socio-economic groups and among Māori than in the general population. Thus, low-income households are more likely to include smokers, and other occupants, particularly children, are more at risk of exposure to second-hand tobacco smoke. Māori are more severely affected than non-Māori, since they are more commonly exposed to second-hand smoke and background rates of disease are higher than in the non-Māori population.[49]

The Smokefree Environments Act 1990, signals that smoking in enclosed places has the potential to harm others. The PHAC supports the intent of the Smokefree Environments Act to protect non-smokers from second-hand smoke. However, this legislation does not currently go far enough to protect workers and should be strengthened. The PHAC believes that all indoor workplaces should be smokefree without exception.

The PHAC acknowledges that domestic environments cannot be legislated for. However, more information could be made available, to both individuals through health professionals and to the general public.

3.1.6 Monitoring of indoor air quality

Indoor air quality is guided by Standards New Zealand. No regular monitoring is done in New Zealand on domestic indoor air quality other than some formaldehyde checks on newly built houses by Building Research Association of New Zealand (BRANZ). No monitoring is done on the levels of tobacco smoke in home environments. The exposure rate for children is thought to be high, since 25 percent of New Zealand adults still smoke. The risk for Māori children is even higher because 45 percent of Māori adults are smokers.

The only current focus for Ministry of Health efforts to prevent illness associated with poor domestic indoor air quality is education about the harmful effects of second-hand smoke. There is considerable scope for further action.

Indoor Air Quality – summary of key points:

- Poor quality indoor air is associated with respiratory conditions, particularly in vulnerable groups.
- In New Zealand, people spend about 80 percent of their time indoors but there is very little monitoring of domestic indoor air quality.
- Sources of indoor pollutants include cold, damp conditions in poor quality housing, unvented gas appliances and second-hand tobacco smoke.
- Older uninsulated housing is typically damp, cold and mouldy, which creates risks to health.
- Newer housing is often airtight with little ventilation, creating damp conditions associated with toxic fungi.
- Intersectoral initiatives to improve the quality of housing are likely to be effective in improving the health of the occupants.
- Those experiencing multiple disadvantage are most likely to occupy poor quality housing and be exposed to the associated health risks.

3.1.7 Recommendations – indoor air quality

The PHAC recommends that:

- **the Ministry of Health takes a lead to ensure a cross-sectoral approach to indoor air quality in domestic housing, including further research and increased monitoring; this approach must reflect the provisions of the Treaty of Waitangi**
- the Ministry of Health actively seeks further opportunities to support policies that aim to improve housing quality, specifically to improve insulation and reduce dampness in new and existing buildings and improve fire safety
- the Minister of Health proposes to the Minister of Consumer Affairs that the evidence for the health effects of, and current exposure to, unvented gas heaters be investigated, and affordable, safer alternative forms of heating be identified
- the Ministry of Health supports further strengthening of the Smokefree Environments Act to protect all workers and examines further options for promoting smokefree homes and cars.

3.2 Ambient air quality – urban environment

Despite New Zealand having a 'clean and green' image, air pollution in Auckland can be worse than in London, with levels of carbon monoxide and nitrogen dioxide exceeding WHO and MfE guidelines.[50] Smog levels (particulates) in Christchurch, Timaru, Alexandra and Nelson sometimes equal those in the worst polluted cities in the world.[51] An estimated 970 people aged over 30 years die prematurely each year in New Zealand from fine particle (PM_{10}) air pollution derived from all sources.[3]

Household fires are the main contributor to ambient air pollution in many towns especially during winter, while motor vehicles are the main contributor to traffic corridor air pollution in congested cities like Auckland.[52] Recent monitoring has revealed that air pollution levels in some urban areas exceed New Zealand's air quality guidelines. Such levels are likely to pose important risks to people's health, leading to the exacerbation of asthma and respiratory illnesses and contributing to premature death. These instances occur most often in traffic corridors but also occur over wider areas, especially during still winter months.

Funding has recently been announced for research into the health effects of outdoor pollution from transport, home heating, and natural and industrial sources.[53] The fund has been jointly established by the Ministry of Transport, the Ministry for the Environment and the Health Research Council. This will address some of the existing knowledge gaps.

3.2.1 Vehicle emissions

Motor vehicle exhaust emissions release contaminants into the environment contributing to environmental and health problems at a local level, as well as to global climate change. Vehicle emissions are increasing in New Zealand, especially in cities such as Auckland where congestion is a major issue. Vehicle emissions contribute between 50 percent

and 100 percent of the carbon monoxide, 80 to 95 percent of the nitrogen dioxide, 70 to 80 percent of the benzene and 40 to 80 percent of fine particles (depending on other sources such as domestic fires) produced in New Zealand.[54] Of the particles produced by transport, around 90 percent are likely to come from diesel vehicles.[55] The Ministry of Transport's *Vehicle Fleet Emissions Control Strategy* (based on 1997/98 information), stated that carbon monoxide and nitrogen oxide levels in New Zealand at times exceed international air quality guidelines, particularly around busy intersections and congested roadways within urban networks.[54]

A recent New Zealand study suggests that the health effects of particles contained in vehicle emissions are more significant and pose greater health risks than previously thought.[3] The study estimates that 400 people over the age of 30 years die prematurely each year due to particle air pollution from vehicle emissions. This equates to about 80 percent of the number of deaths annually from road traffic injuries. It is likely that the research findings underestimate the full health effects, because the study did not include morbidity such as illness or asthma attacks associated with vehicle emissions, nor did it consider health effects in those less than 30 years of age. The study also estimated that 64 percent of the increased premature mortality due to vehicle emissions occurs in the greater Auckland region.

The report concludes that air pollution from vehicle emissions in New Zealand is a significant, but under-recognised, cause of ill health and premature death. The report recommends that the Ministry of Transport revisits vehicle emission policies in light of the research finding, since current policy is based on 1997/98 information when the magnitude of the risk to health were not known. This work has commenced and the Ministry of Transport is reconsidering policies such as emissions testing at warrant-of-fitness checks, requirements for in-service maintenance, and requirements for second-hand imported vehicles.

A new regulation was introduced in March 2001 to identify and remove the worst offending vehicles in terms of emissions. Known as the 'ten second rule', it stipulates that vehicles are not allowed to emit a continuous stream of visible smoke for ten seconds or more. Vehicle emissions standards for new vehicles entering the country will also be finalised in 2003. In May 2002 the outcomes of the fuel specifications review were announced. The major change is the gradual reduction of the sulphur level in diesel. This will have a positive impact in terms of reducing air pollution. Moves have also been made to reduce the benzene levels in petrol.

Since 1986 when lead in petrol was reduced, lead levels in New Zealand have been dropping. Leaded petrol was banned in 1996. Apart from exposure to lead during removal of lead-based paint, airborne lead is now a negligible problem.[52]

3.2.1.1 Impact on health inequalities

Children, older people and people suffering from asthma and other respiratory diseases are particularly sensitive to air pollution. People in lower socio-economic groups are also more exposed to traffic-related air pollution as cheaper housing is often located along motorways or heavily congested areas.

No work has been done specifically on the effects of air pollution on different ethnic groups in New Zealand. However, Māori and Pacific people would be expected to be worse affected than the general population because they are disproportionately represented in lower socio-economic groups and have a higher prevalence of chronic cardio-vascular and respiratory diseases.

3.2.2 Domestic fires

By-products for the combustion of solid fuels for home heating is the major cause of ambient air pollution in many towns throughout New Zealand. Although coal generates more particulate matter than wood, most emissions come from wood-burning fires, as they are more common than coal fires. The use of open fires nationally has been declining while the use of slow combustion fires, such as woodburners, is increasing.[52]

Towns that experience seasonal and diurnal temperature inversions, for instance, Christchurch, Timaru and Nelson, are particularly badly affected by air pollution from domestic fires, since the polluted air is trapped below a layer of warm air.

Several studies have shown an association between particulate air pollution in Christchurch and increased mortality and morbidity.[56,57,58] Harre et al (1997) found increased particulate levels were associated with night-time chest symptoms, high levels of nitrogen dioxide were associated with increased use of inhalers, and high levels of sulphur dioxide were associated with eye irritation.[58] On about 30 days a year suspended particulates in Christchurch exceed ambient air quality guidelines. An estimated 40–70 deaths and 75–100 hospital admissions per year have been associated with these days of high air pollution.[57,59,60]

Other pollutants from domestic fires include: oxides of sulphur, which can cause breathing difficulties especially for people with asthma; benzene, which is a cancer-causing substance; and oxides of nitrogen, which irritate existing respiratory conditions.[61]

The PHAC notes that little is known about the impact of solid fuel heating on indoor air quality. It supports research to collect information, particularly on the levels of particulates in homes where there are open fires, and any association with increased respiratory problems.

3.2.3 Impact on health inequalities

A recent study has shown that areas of high social deprivation in Christchurch have greater increases in daily mortality for a given average PM_{10} (fine particles) level than areas of low deprivation.[62] Air pollution adversely affects people with existing respiratory conditions and will increase risks for older people.

The trend away from open fires towards slow combustion burners is not uniform, with wide variations. For example, a study of 14 Christchurch suburbs found that the percentage of homes using coal or wood ranged from 17 percent in one suburb to 57 percent in another. It is likely that the majority of open fires and sub-standard burners are confined to older housing stock, where occupants are more likely to be low income families/whanau.

3.2.4 Monitoring

Air quality monitoring in New Zealand has recently increased substantially but is still variable from district to district. Regional Councils are responsible for managing air quality through regional air quality plans. Yet some Regional Councils still have not determined the extent of air pollution locally and its potential risks to health. While the health sector picks up the consequences of poor ambient air quality, it has very little involvement in its monitoring and management.

There have been few studies on the links between high air pollution levels and increased incidence of ill health.[56,57,58,59] While monitoring has been sporadic and focused mainly on Auckland and Christchurch, results from Nelson, Gisborne, Te Kuiti, Tokoroa, Taupo, Alexandra, Dunedin, Queenstown and Whangarei also indicate pollution problems in smaller urban centres.

The Resource Management Act 1991 requires Regional Councils to monitor air quality to identify issues that require management. The Ministry for the Environment is also encouraging monitoring through the 'air' strand of the Environmental Performance Indicators Programme. Most Regional Councils have developed or are developing air quality plans and all of the 16 regions are currently involved in some type of air monitoring, mainly of particulate matter and nitrogen dioxide (NO_2).[52]

Initiatives by Environment Canterbury and Nelson City Council are likely to see a reduction in the number of homes using solid fuel heating. In Christchurch, no new open fires have been installed since 1982 but this has not decreased air pollution. New proposals for Christchurch will see the banning of open fires in 2008 and the phase out of high emission burners by 2015. Wood or coal burners will not be permitted in new homes from 2004. Similar proposals look likely for Nelson.

The MfE has revised the Ambient Air Quality Guidelines to bring them up to date with the latest overseas and national research.[63] A 'Particle Action Plan' may develop national environmental standards under the RMA that focus on ambient air quality standards for particles or design criteria, eg, standards for wood-burners.

Environmental performance indicators have been developed by the MfE and include indicators for air quality. Examples of air quality indicators developed include carbon monoxide levels in Auckland, Canterbury and Waikato, and changes in 24-hour average PM_{10} (small particle) concentrations over time. Kjellstrom (1999) recommends that development of air quality indicators is based on the DPSEEA model.[64] (See Appendix two)

The MfE has also developed performance indicators for transport, to measure how well the pressures that the transport system places on the environment are being managed. Examples of transport indicators are changes in vehicle fleet composition, changes in usual mode of journey to work, and road congestion.

Although the Ministry of Health has done some work on ambient air quality at national level, the PHAC believes that, given the burden of ill health attributable to ambient air pollution, the Ministry of Health should take a more active role in the development of national policies and monitoring.

3.2.5 Māori and air quality

The air is an integral part of the environment. Air and air quality can both be described as *taonga*.[63] *Hui* in 1999 and 2001 between the Ministry for the Environment and Māori highlighted the need for the MfE to integrate its programmes on guidelines and standards to reflect the holistic view of the environment traditionally held by Māori.[63]

General discussions at *hui* focusing on ambient air quality emphasised the need to minimise discharges to air by: applying the best practicable option; supporting national environmental standards to protect the air; recognising Māori values in making decisions about air discharges (especially around areas such as *mahinga kai* and waterways); and involving Māori in local planning processes. Air pollution was acknowledged as contributing to health inequalities, eg, Māori are more likely than non-Māori to be hospitalised for asthma.[63]

Depositing of air pollutants on *mahinga kai, wāhi tapu,* waterways and *marae* were identified as other concerns. Contaminants may impact on important or valued sites, eg, discharge material from the flue of a crematorium can be blown over *mahinga kai*.

Māori want to see an improvement in the ability and opportunity for *iwi* and *hapū* to effectively participate in the management and regulation of air quality within their *rohe* and according to their own cultural values.[63]

Ambient air quality – summary of key points:

- New Zealand research has estimated that ambient air pollution is responsible for 970 premature deaths in people over 30 years of age, 400 of which are from vehicle emissions.
- Fine particles produced in the combustion of fuel pose greater health risks than previously thought.
- Children, older people and people with existing respiratory diseases are more vulnerable to air pollution, and areas of high deprivation have greater excess mortality from air pollution.
- Domestic fires are the main contributor to ambient air pollution, with vehicle emissions being the main contributor along traffic corridors.
- Air quality monitoring is carried out variably by Regional Councils. The Ministry for the Environment is developing national indicators and strategies. The Ministry of Health does not take a very proactive role in ambient air quality issues currently.

3.3 Recommendations – Ambient air quality

The PHAC recommends that:

- **the Ministry of Health examines current processes and strengthens the public health response to health issues associated with ambient air quality; this approach must reflect the Treaty of Waitangi**

- the Ministry of Health, in collaboration with relevant other sectors, develop a set of core human health indicators for air quality in New Zealand. A flexible national approach is required to allow for additional regional indicators to be developed in partnership with Māori

- the Ministry of Health conducts or commissions further publicly funded research to identify the best indicators for each major air quality concern, eg, home heating, vehicle emissions, industrial emissions. This research must reflect the provisions of the Treaty of Waitangi.

4 Water quality

4.1 Drinking water

4.1.1 Public health importance of drinking water quality

Safe drinking water is essential for life and health and everyone has the right to expect their water supply to be safe for drinking. Contamination can rapidly lead to widespread outbreaks of disease. Historically these diseases included cholera, dysentery and typhoid, which are still prevalent in developing countries.

Contamination of water supplies by pathogenic organisms can infect a large number of people very quickly. For example, in the early 1990s, Peru stopped chlorinating its water supplies with the result that 3,600 people died of cholera and a further 535,000 were infected; and a 1993 *Cryptosporidium* contamination of Milwaukee's water supply killed 120 people and infected 400,000. The possibility of contamination of large urban supplies, with the potential for widespread illness, was also highlighted by the failures of the Sydney water supply in 1998 with *Cryptosporidium* contamination.

In New Zealand, the average number of notifications of food and waterborne disease between 1996 and 2002 was 15,100 per year,[65] known to be a dramatic under-representation due to under-reporting. There is a worldwide problem of under-reporting of waterborne (and food-borne) disease, making assessment of rates very difficult. This is further complicated by the fact that it is often difficult to determine the source, as the same organisms may cause food and waterborne illnesses. The most frequent source of waterborne diseases in New Zealand include: bacteria such as *Salmonella*, *Campylobacter*, and increasingly, toxigenic *E.coli* (VTEC); and Protozoa such as *Giardia* and *Cryptosporidium*.

New Zealand is known to have a high rate of campylobacteriosis compared with other similar countries (twice that of England and three times that of Australia and Canada),[66] with overall costs to the country of around $40 million per annum.[67] An association has been shown between the incidence of enteric disease and water quality, that is, the lower the drinking water quality, the greater the number of notifications of enteric diseases.[68] However, the reporting rate is so low that these rates may only represent between one and 10 percent of actual cases. Research is required to more accurately estimate the burden of such diseases to New Zealand.

There is an increased risk of campylobacteriosis following heavy rain when the water source is close to grazing animals. This highlights an increasing pressure on the

environment from agricultural sources. The recent trend away from sheep farming towards cattle farming, especially dairying, is leading to increasing contamination of waterways.

The PHAC believes that intervention will be at its most effective when it looks beyond reducing human exposure towards reducing the risks of contamination at source.

4.1.2 Drinking water source protection

It is widely acknowledged that the best way of achieving healthy water supplies is to put in place multiple barriers that keep water contaminants from reaching people.[69] The first barrier is the integrated management of water catchments to protect the quality of pre-treated water. An April 2002 paper summarising the causes of 19 outbreaks of waterborne disease in six countries concluded that 14 of the 19 outbreaks resulted from the pollution of source waters.[70]

There have also been recent incidents in New Zealand that have been traced to water sources. A major outbreak in Queenstown in 1984 was caused by contamination at source of the municipal drinking water supply. The source was unprotected and the water used without treatment. In 2001, a New Zealand educational institution had its water supply contaminated by cattle in the catchment area. One hundred and eighty people fell ill out of 250 and only two cases were notified by GPs. Had those two cases not been notified there would have been no knowledge of the incident or of its extent.[71]

In New Zealand, the intention of the proposed new drinking water legislation (Health (Drinking Water) Amendment Bill) is a "source to tap" risk management approach. However, catchment management is the responsibility of the Ministry for the Environment and Regional Councils, whereas the Ministry of Health is responsible for drinking water supply. So far there has been little progress in the integration of these two functions. It is essential for the sustainable management of drinking water supplies, that the two Ministries jointly address this issue.

4.1.3 Quality of New Zealand drinking water supplies

Drinking water quality in New Zealand is generally good. The Ministry of Health drinking water goal for New Zealand is that:

> ***"by 2008, 95 percent of all New Zealanders, even in small communities in remote rural areas, shall have access to an adequate supply of drinking water that has been demonstrated to consistently meet or surpass internationally accepted drinking water quality standards and is produced by suppliers that implement effective risk management plans."***[68]

During 2000, water supplies to 86 percent of people served by registered community water supplies complied with microbiological standards, an increase of about 16 percent since 1994.[72] Schools had also improved their water supplies overall, although half the schools with their own water supplies are still not monitoring the safety of the water supplied to pupils to drink.

Drinking water quality in New Zealand is less compromised by chemical contamination than by organic and microbiological material, but there is a high degree of public concern

and some gaps in information. There is a lack of toxicological data to enable standardised maximum allowable values to be assigned for many chemicals.[68] The PHAC understands that annual reporting of chemical contamination is to be introduced in 2003, which will be a useful move.

4.1.4 Impact on health inequalities

While drinking water quality is good overall, there is a large variation in quality between water supplies, with people in small rural communities being less likely to have access to a safe, regularly monitored water supply than people in large urban centres. There were approximately 460,000 people in New Zealand in 2000, comprising 14 percent of the population served by registered water supplies, who were supplied with drinking water that failed to comply with microbiological standards.[72] A further 13 percent of the population have unregistered supplies where the water quality is unknown. Most of these people live in small rural communities and could be experiencing multiple disadvantage in the quality of their housing and services. Some will have poorly maintained septic tanks and effluent pipes, adding to the risk of contamination of water supplies.

The Housing New Zealand initiatives in Northland, East Coast and Bay of Plenty to improve the quality of rural housing have found that many small communities have no reticulated wastewater systems. Often the houses are overcrowded putting pressure on septic tanks and "long drops" that were designed for smaller *whanau*. This has led to contamination of ground water, which is often the main drinking water source.

Communities at highest risk from unsafe water supplies are among the most deprived and Māori are over-represented in these communities. Although this report will cover generic water supply issues, it is those in small communities where Māori and other low-income rural people often experience multiple disadvantage, where the PHAC's interest most lies.

4.1.4.1 The Hokianga Pilot

Following extensive damage in January 1999 to already compromised water supplies by flooding in Northland, the Ministry of Health made funding available to pilot a scheme to upgrade community water supplies. The pilot was implemented in order to minimise the incidence of preventable waterborne diseases in low income, rural, predominantly Māori communities by upgrading water supplies.

Hokianga Health used *kaumātua* to consult with the small communities that were involved in choosing what form the upgrade would take. Most chose to improve *marae* water supplies, but some elected to install reticulated supplies for small clusters of housing. Voluntary labour and local sponsorship money augmented Ministry funding. Evaluation is nearing completion and will cover the appropriateness of technical choices, consultation processes, and any resulting health gains to the community.

In addition to improving the water quality for communities in the region, the pilot created a situation where communities feel ownership in the project by their participation,which resulted in strengthened relations between people and communities (*whānaungatanga*). It is an excellent model of participation, partnership and protection in action.

The PHAC supports the model of the Hokianga pilot and believes it has applicability to other small rural Māori communities that currently have poor quality water.

4.1.5 Drinking water systems management and monitoring

In 2000 in New Zealand, 82 percent of the population was serviced by 114 water supplies. Over 1,900 supplies, each of which serves fewer than 5,000 people, service the remaining 18 percent of the population. Almost all (98.7%) of the water supplies that failed to comply with the microbiological standards in 2000 fell into this latter group.[73]

Current legislation to protect the public health safety of drinking water is fragmented and outdated. There is no statutory requirement to comply with Drinking Water Standards set by the Ministry of Health and administrative responsibilities are spread across a range of agencies:

- The Ministry of Health administers a programme of non-legislative intervention by setting standards and publishing a register of community drinking water supplies, guidelines to suppliers and an annual report on the microbiological quality of drinking water, soon to be expanded to include chemical quality as well. It also contracts services from ESR for analysis and other scientific advice.

- The water suppliers monitor water quality and provide data to the public health services.

- The local authority monitors the quality of the drinking water that it supplies, sometimes monitors the quality of drinking water from private suppliers (such as schools, hospitals and factories), and provides data to the public health services.

- The public health services grade water supplies, investigate public health problems arising from drinking water supplies, carry out surveillance, ensure monitoring is carried out and provide advice to water suppliers and public.[74]

The safety of drinking water is also covered by 36 Acts and Regulations, the primary ones being the Building Act 1991, the Consumer Guarantees Act 1993, the Health Act 1956, the Local Government Act 1974, the Resource Management Act 1991, the Water Supplies Protection Regulations 1961 (under the Health Act), and the Building Regulations 1992 Building Code Clause G12 Water Supplies.

Even collectively these laws do not adequately protect the public health, although the intent is there. They are therefore supplemented by non-legislative intervention such as standards and guidelines. However, these are dependent on local commitment and compliance to the standards. There is high compliance by local government suppliers but low compliance by small, privately-owned suppliers.

Households with an unregistered water supply are not served well by either legislation or non-legislative intervention. Many rural households rely on rooftop rainwater collection for drinking water supply, which is vulnerable to contamination by windblown dust, sprays, leaf mould, bird droppings and decaying animal and plant material in the tank. Others rely on artesian supplies, which are vulnerable to contamination from faecal material from agriculture and failed septic tank systems.

Finally, there is very little provision by local authorities for restricting housing development where a sustainable supply of safe drinking water is inadequate.

4.1.6 Revision of the legislation covering drinking water

An amendment to the Health Act 1956 has been drafted to strengthen and clarify the scope of existing drinking water legislation, defining more clearly roles and responsibilities [Health (Drinking Water) Amendment Bill]. The new legislation will require all drinking water supplies to be registered with the Ministry of Health and suppliers will be required to develop and implement risk management plans. It will place duties on drinking water suppliers to take all practicable steps to comply with drinking water standards, which will be set in a statutory framework. However, it will emphasise the opportunity for small suppliers to make small improvements to reduce risk rather than either pass or fail a compliance test.

Smaller suppliers may need assistance in meeting the requirements of the legislation and work is being done to assess the level of need and what assistance may be needed. The PHAC considers that assistance should extend to subsidies for small communities to upgrade water supplies, using the Hokianga pilot as a model.

Progress on the introduction of Drinking Water legislation has been slow and the PHAC urges the Government to give it a higher priority.

Drinking water – summary of key points

- New Zealand has a high rate of waterborne diseases compared with other similar countries.
- The protection of source water is the first barrier to the contamination of drinking water supplies.
- People in small rural communities are less likely to have access to safe water supplies than people in urban areas.
- Communities at highest risk from unsafe water supplies are among the most deprived in other respects, and Māori are over-represented in these communities.
- Monitoring to ensure safe water supplies in low income and isolated rural communities is inadequate currently.
- A pilot in Hokianga where water supplies were improved in partnership with the community is being evaluated for its applicability to other similar communities.
- There is no statutory requirement to comply with Drinking Water Standards set by the Ministry of Health.
- Progress on legislative revision, which will require suppliers to have a risk management plan, has been slow. The PHAC urges swift introduction of the Bill.

4.2 Recommendations – Drinking Water

The PHAC recommends that:

- **the Ministry of Health works with iwi/Māori organisations, local government, and other relevant agencies to improve the drinking water quality of small rural communities, learning from the evaluation of the Hokianga pilot**
- the Minister of Health promotes to the Minister for the Environment the need for a joint approach to the management of catchments that are sources of drinking water
- the current Ministry of Health review of the legislation/regulation governing safe drinking water be finalised and implemented quickly [Health (Drinking Water) Amendment Bill] and that a statutory power be added to require compliance with Drinking Water Standards.

4.3 Surface water and ground water contamination

The main pressure on microbial water quality in New Zealand comes from agricultural run off, especially faecal material from dairy farming. With a recent trend away from sheep farming towards dairying, this pressure has been increasing and is causing increased contamination of sources of drinking water, recreational water and aquatic food supplies. According to the Ministry for the Environment's (MfE) 'State of the Environment Report', livestock populations produce about 40 times more organic waste than New Zealand's human population. Results of this contamination include many New Zealand river swimming sites and food-gathering areas, which no longer comply with current health guidelines. The Resource Management Act offers little control as currently implemented and reduction of contamination of waterways relies on farmers adopting guidelines published by the Ministry of Agriculture and Forestry.[75] These include the application of effluent to the land to minimise run off into waterways, the creation of riparian buffer zones to filter out contaminants and two-pond oxidation systems that reduce the impact of dairy waste on waterways. The MfE is also training advisors in riparian management and is developing a partnership with industry to produce a national action plan for farmers.

Agriculture also contributes to nitrate contamination of ground water from animal waste, nitrogen fertilisers and clover-based pasture. Potential health risks include toxicity to infants even at relatively low concentrations. High nitrate content of water supplies may cause a form of cyanosis (blue baby syndrome) in bottle-fed infants in their first six months of life.[76,77] Ground water, once contaminated with nitrogen may take years to recover. Ground water is also vulnerable to contamination from pathogens, pesticides and from contaminated industrial sites.

The Government's 'Sustainable Land Management Strategy' puts the onus on individual farmers to respond to problems caused by agricultural practices. While land users are generally responsive to information about the quality of waterways on their land, they often do not have access to the information in an understandable form. MfE 'Recreational Water Quality Guidelines' are available to assist in implementing the Resource Management Act. These guidelines cover marine and fresh water recreational activities

and recreational shellfish-gathering. Regular monitoring by Regional Councils is variable currently.

Any monitoring carried out by Regional Councils is based on scientific indicators such as *E.coli* counts. This approach measures faecal bacterial levels but does not provide information about other factors that impact on human health, such as nutrient levels and chemical residues, eg, pesticides.

The PHAC believes there should be national oversight and management of the agricultural contamination of our waterways.

The MfE is working with Māori at a local level to develop indicators based on traditional knowledge that give an overall view of the health of a waterway. This Cultural Health Index approach is being used in the Taieri to assess the health of the river, its catchment and riparian strips, as discussed in section 2.3.4.

The PHAC believes that this Cultural Health Index approach will complement scientific methods of monitoring.

4.4 Pressures on water quality from wastewater

Most urban areas with more than 5,000 people have a sewerage system that pipes wastewater to a disposal point. After being treated to varying extents, most sewage ends up in the sea or in rivers. Large urban areas are more likely to fully treat sewage, producing relatively pure effluent. However, there are still a number of larger towns discharging raw sewage that has only been milliscreened, directly into the sea, eg, Gisborne, or into rivers, eg, Masterton.

A recent survey of community sewerage needs showed that upgrading or new sewage treatment plants were required across the country especially in small communities.[78] Smaller communities are more likely to have inadequate treatment facilities and effluent will only be partly treated in many cases. For example, the Ruamahanga River in the Wairarapa receives partially treated sewage directly from Masterton, Martinborough and Rathkeale School, and indirectly from Carterton and Greytown. A decrease in the quality of effluent from these sewage treatment plants since 1999 has been noted, with a consequent decline in water quality.[79] Resource consents for local discharge into rivers do not appear to take other activities and downstream effects into account. This highlights the need for a river ecosystem approach where the whole river system is sustainably managed.

Sewage pollutants of the most concern include rotting organic matter, disease-causing organisms, excess nutrients and suspended solids. Human health can be negatively ‘affected by eating contaminated animals or plants, or swallowing the water.

Small communities rely largely on septic tanks that can fail through inappropriate siting, lack of maintenance or undue pressure from overcrowded housing. Some districts have allowed developers to install septic tanks in unsuitable soil conditions leading to regular seepage, eg, Waikare Inlet (see section 4.1.7.1 below).

Septic tank failures can cause contamination of drinking water supplies and consequent ill health for the occupants. This situation is fairly common in areas of substandard rural housing. It is essential that the health sector, territorial local authorities and local communities work together to improve this situation. Wastewater disposal upgrades for substandard housing should be integral to the housing upgrades being carried out in rural areas. Septic tank failure can also contaminate waterways with implications for recreational food-gathering areas, eg, Waikare Inlet.

The Government has announced the implementation of a sanitary works subsidy scheme for small communities with populations between 100 and 10,000 people. The PHAC supports such subsidies and believes that they will benefit the public health of small communities.

Little is known about the levels of residues, such as hormones, antibiotics and agricultural chemicals in treated wastewater. Concern has been raised in Britain that undetectable levels of female hormones released into rivers are feminising fish.[80] The hormones, mainly from the urine of women taking the contraceptive pill, survive water treatment. The first scheme to reuse already treated wastewater has been implemented, where water is taken from the Waikato River and piped to Auckland to augment drinking water supplies. There has been some public concern about the possibility of post-treatment residues in this water that are not, or cannot be, tested for.

4.5 Māori and water quality

Māori have a holistic view of health that clearly integrates the environment with the spiritual, mental, social and physical well-being of individuals and communities. A key feature of Māori belief is that all elements of the natural environment (including people) are believed to possess a *mauri* (life force) which Māori endeavour to protect.[81]

Consistent with the Māori view of health, water contains a *mauri* (life force) that must be respected and cared for and which cannot be abused without expecting some consequences.[82] Any contamination is considered abuse of a *taonga*.

The well-being of an iwi is linked to the condition of the water in its *rohe* (territory) and water provides important *mahinga kai* (food collected from marine and freshwater areas). Supply and exchange of *mahinga kai* forms part of the social fabric of Māori life.

Water acts as a link between the spiritual and physical worlds of Māori. Consequently many bodies of water are associated with *wāhi tapu*. Responding to these cultural values may present a considerable challenge to water suppliers. They will require guidance on how to manage water and develop practical methods that reflect the values of *mahinga kai*, *wāhi tapu* and *mauri*, and incorporate these values into outcomes and actions. At this stage, water managers need to take account of existing legislation, regulations and guidelines and work in partnership with iwi, hapū and Māori organisations, to forge new ground in this area.[83]

Poor surface and ground water quality in wetland areas where watercress and flax are gathered creates potential risks to health. Eeling is another activity where water quality may affect health. These are whānau activities which include children.

4.5.1 Contamination of traditional food sources (mahinga kai)

Protection of the environment for sourcing *mahinga kai* is paramount to *kaitiakitanga*, or stewardship, for future generations. Sometimes *iwi* have had to go to great lengths to exercise *kaitiakitangi* over *mahinga kai*, including claims to the Waitangi Tribunal.

The first of these was a claim relating to the *Te Atiawa* fishing reef off the Taranaki coast, which provided an abundant source of seafood. These reefs are referred to "in the songs and legends of *Te Atiawa* people and were a source, not only of food, but of tribal pride and prestige".[84] By the 1980s many of these reefs were a public health hazard as sewage and other industrial waste had polluted the reefs, particularly from the Waitara Borough outfall. In 1981, the New Zealand synthetic fuels plant at Motunui was given permission to build another outfall. This would have discharged more sewage and industrial waste into the sea around the reefs and particularly affected the Motunui Reef, one of the few safe reefs left for collecting seafood. It was at this point that *Te Atiawa* made their claim to the Waitangi Tribunal. Their claim was upheld.[84]

The Kaituna River claim to the Tribunal one year later also related to the right to exercise *kaitiakitanga*. The *Ngati Pikiao* people had concerns over the Kaituna River pipeline scheme and this claim included medical objections to the effluent from the Rotorua sewage works being discharged into the local rivers. This had been sanctioned by the local council and Ministry of Works. The Tribunal recommended the pipeline did not proceed and that there were other practical alternatives. The Crown subsequently abandoned this scheme, and announced its support for a combined treatment plant and land disposal option for Rotorua's effluent.[85]

There is no national perspective on the contamination of aquatic food-gathering areas. Some local authorities carry out some monitoring of shellfish and watercress gathering areas but no data are collected nationally. Hepatitis A outbreaks associated with contaminated shellfish are common and there is potential for diseases like cholera, which survives in seawater, to be brought in to areas like Northland where there is a high number of visitors.[86]

A recent outbreak of Norwalk-like virus in Northland's Waikare Inlet oyster farms has been identified and monitored.[86] The virus has also contaminated natural shellfish beds. The source of contamination has been traced to a small community where there is widespread seepage from septic tanks installed in an unsuitable clay substrate.

Local authorities have a responsibility to monitor and protect *mahinga kai* from contamination. Contamination of *kai moana* has implications for Māori who may depend on shellfish as part of their diet. Local interpretation of the Resource Management Act has to date led to a failure to protect these beds and the health of local people. For example, the Northland Regional Council does not have a regional bacterial water quality monitoring programme for recreational shellfish-gathering.[87]

Although there are MfE Guidelines designed to help Regional Councils address water quality in recreational shellfish-gathering areas, the PHAC believes that more can be done to protect traditional Māori food-gathering areas. Regional and district councils should identify potential problem areas, monitor and manage them to protect the public health.

Surface water contamination– summary of key points

- Faecal contamination from increasing dairy farming is a major pressure on inland waterways.
- Agriculture also contributes to excess nutrients in inland waterways resulting in algal blooms that make them undrinkable and unusable for recreation.
- Small rural communities are more likely than urban centres to experience contamination of water supplies and waterways from failed or inadequate sewage disposal systems.
- Indicators based on Māori traditional knowledge are being developed to assist Māori in the protection and development of their resources.
- Contamination of shellfish beds may be responsible for outbreaks of hepatitis A, Norwalk-like virus and other diseases. Monitoring and management of aquatic food-gathering areas by local authorities is variable.

4.6 Recommendations – Surface/Waste water quality

The PHAC recommends that:

- **the Ministry of Health works with iwi/Māori organisations and relevant agencies to improve sewage disposal systems for small rural communities and, in doing so, considers the protection of *mahinga kai* (food-gathering areas) from contamination**
- the Ministry of Health examines options for subsidies to small suppliers, to enable them to put the Water Quality Standards in place, similar to the Sanitary Works Subsidy Scheme
- the Minister of Health proposes to the Minister for the Environment that legislative solutions are sought to restrict local authorities in the development of new subdivisions, where it cannot be shown that there is adequate provision for sustainable supplies of safe, potable water or suitable sewage disposal
- The Ministry of Health works with iwi/Māori organisations and local government to ensure that information is available to individual consumers, who are not on reticulated water supplies or sewage disposal, about how to keep their drinking water safe and maintain their septic tanks safely.

5 Other significant and emerging environmental health issues

5.1 Climate change††

There is now widespread agreement among climate scientists that the earth is warming. The impact of climate change on human health is predictable to some degree, although

†† This section is based on information in Woodward A, Hales S, and de Wet N. 2001. Climate Change: Potential effects on Human Health in New Zealand. A report prepared for the MfE as part of the New Zealand Climate Change programme.

difficult to quantify. Human health is dependent on the sustainability of natural systems and there are clear indications that the natural environment will change as the climate changes.

The PHAC believes that the human health impacts of climate change needs to be central to any mitigation or adaptation strategies developed. Woodward, Hales and de Wet 2001, in acknowledging the adaptability of the human species, point out that *"natural systems that sustain human health are subject to thresholds and complexities that we understand very poorly."* The PHAC supports more research on the effects of climate change on health in New Zealand, eg, vector-borne disease modelling, impacts on vulnerable groups, effects on water quality and availability, assessment of the public health impacts of mitigation strategies and so on.

There is a range of potential implications of climate change for health in New Zealand.

- An increase in extreme weather events will increase flooding, compromise water quality and security, and may result in an increase in rates of waterborne diseases.
- The recovery of the ozone layer may be delayed due to the increased efficiency of ozone-destroying reactions in a cooler stratosphere. This may lead to an increase in the adverse health effects of ultra-violet radiation, such as skin cancers.
- Global warming increases the risk of disease-carrying mosquitoes becoming established in New Zealand, such as those carrying dengue fever. Northern areas of New Zealand are most at risk.
- Warmer seas may lead to an increase in toxic algal blooms that can have an adverse effect on health.

The effects of climate change will be felt most by people with the fewest resources because of an unequal capacity to respond to adverse events such as weather extremes. There will also be geographical differences in the effects of climate change where regions with low average income may be further disadvantaged by their increased vulnerablity to factors such as vector-borne infections (Northland) and drought (East Cape).

Other indirect effects, particularly the mental health effects of economically important activities, eg, farming, being curtailed through adverse weather events are difficult to predict or quantify. It is also difficult to predict the knock-on effects of climate change impacts in more vulnerable countries elsewhere in Asia and the Pacific. It is reasonable to expect that increased migration, both planned and forced, will occur. Collaborative research should be strengthened to identify ways of reducing vulnerability and increasing adaptive capacity in these countries.[88]

It is imperative that awareness of climate change and its likely impact on human health is embedded into environmental management to ensure that future stresses are anticipated where possible, and appropriate actions taken. For example, climate change will jeopardise the quality and amount of water security at risk in some areas and this should be predicted and planned for.

Climate change – summary of key points

- The health effects of climate change are likely to be significant and will be spread unevenly.
- The effects of climate change will be felt most by those with the fewest resources because of an unequal capacity to respond to adverse events such as weather extremes.
- The human health impacts of climate change need to be central to any mitigation or adaptation strategies developed.

5.1.1 Recommendation – climate change and health

The PHAC recommends that:

- **the Government makes public health a key concern in research and policy development on the impact of climate change and interventions taken to mitigate its adverse effects; research and policy development must reflect the provisions of the Treaty of Waitangi.**

5.2 Quality of life in the built environment

New Zealand has become increasingly urbanised with 86 percent of New Zealanders now living in urban areas. This trend has put enormous pressures on the environment as the demand for land, housing, energy, transport and the disposal of waste has increased. These pressures in turn, affect the quality of urban life with adverse effects on the health and well-being of people and communities.

In 1998 the Parliamentary Commissioner for the Environment issued a "wake up call" for improving the management of urban New Zealand and progressing sustainable urban development.89 He reported that, with a few exceptions at city level, the sustainability of urban development is largely ignored in New Zealand. The Commissioner recommended a strong national sustainable management strategy, which recognised the need to create more sustainable urban environments and which supported local government efforts through improved partnerships. Five years later, the national strategy is still in draft form.

A project involving the six largest cities in New Zealand has developed a set of indicators covering quality of life and well-being, which can be used locally in different cities. These indicators have been used to monitor and report on demographic changes, housing, community safety, health, education, employment, economy, democracy community cohesion and the urban environment. The project works across sectors, departments and levels of Government to plan, implement and monitor solutions and to identify areas of common concern such as pockets of poverty, household crowding and income polarisation.[90] The project makes an important contribution to knowledge about the quality of New Zealand urban life.

Urban development must be sustainably managed to improve the efficiency of resource use and reduce waste. The approach should be integrated to incorporate economic, environmental, social and cultural objectives.

The PHAC believes that the following principles need to be central to urban development if it is to enhance the health and well-being of the community. Urban development should:

- be sustainable by minimising demand for resources and encouraging creative local approaches to improving ecological and economic efficiency
- be people-focused, involving the community in decision-making and forming partnerships with *tangata whenua* and urban Māori
- provide a well-maintained, sustainable infrastructure, funded in part by the 'polluter-pays' principle, with incentives for people to walk, cycle or use public transport systems rather than private vehicles
- provide a safe and healthy environment, including safe and good quality housing, high quality air, and safe water supplies
- value historic and cultural heritage, sense of place and community and amenity values (open space, design, vegetation)
- encourage a healthy lifestyle by providing opportunities for physical activity and recreation.

Quality of urban life – summary of key points

- Eighty-six percent of New Zealanders live in urban areas.
- Increasing urbanisation puts pressures on the environment with increased demand for resources and utility services and increased generation of waste.
- The urban environment needs to be sustainably managed.
- Indicators for quality of urban life and well-being have been developed by the six cities project to inform more effective policy development.

5.2.1 Recommendation – quality of urban life

The PHAC recommends that:

- **the Government monitors and researches urban sustainable management in New Zealand, developing a national urban sustainable management indicator framework.**
- that the Government urges local authorities to manage urban environments sustainably in partnership with iwi/Māori organisations and to use indicators developed by the "Six Cities" project to inform policy development in sustainable management.

APPENDIX 1 THE PLANNED PHAC REPORTING PROGRAMME

Conceptual Framework

This project utilises a model of the determinants of health based on the Dahlgren and Whitehead model (Fig. 2). It represents a continuum of influences ranging from 'downstream' factors (age, sex and hereditary factors), to 'upstream' factors, the wider determinants of health: social, cultural, economic and environmental. This reporting cycle will focus on this 'upstream' level.

Figure 2. A model of the main determinants of health

Source: Dahlgren and Whitehead (1991).

Principles on which reports to the Minister of Health will be based

- Emphasis will be upstream on the wider determinants of health, recognising that the greatest influences on health come from outside the health sector.
- The PHAC will take a strategic view, presenting the big picture and looking especially for gaps, risks and opportunities for improvement. The PHAC is concerned not only with what changes have taken place, but what arrangements are in place to track these changes and respond to them.
- Particular attention will be given to those factors that contribute to health inequalities.

- A cross-sectoral approach will be taken, including government agencies along with the public health and community sectors.
- Treaty of Waitangi issues will have a high profile in this work.
- The reports will focus on issues where there is potential for gain but currently little activity or where systemic problems have been identified.
- The PHAC will look at monitoring in the context of each particular public health issue, addressing monitoring responsibilities and how they are managed.

Timeframe for reporting to the Minister of Health

October 2002	– environmental determinants of health
June 2003	– social/cultural determinants of health
June 2004	– economic determinants of health

APPENDIX 2 CONTEXT OF ENVIRONMENTAL DETERMINANTS REPORT

Sustainability

Ecologically sustainable development has been described as development that meets the needs of the present generation without compromising the needs of future generations.[91] It is "getting more, for less, for longer".[89] We live in a global ecosystem, the destabilisation of which threatens human health. Clearly, for the human species to be healthy we must find ways of living in balance with our ecosystem. McMichael et al suggest that the level of health attained by the world's population will be the ultimate criterion of the success of sustainable management.[92]

The concept of sustainability takes environmental, social, cultural and economic issues into account in decision-making and is reflected in local government reform and the draft 'National Sustainability Strategy'. Thus, effective action must be cross-sectoral, with the health and well-being of people central to policy-making.[93] This creates both challenges and opportunities for the health sector to provide leadership and to demonstrate best practice in decision-making.

The PHAC's concept of public health integrates the challenges of sustainability into a goal of sustainable health. This report therefore places issues raised, firmly in this context.

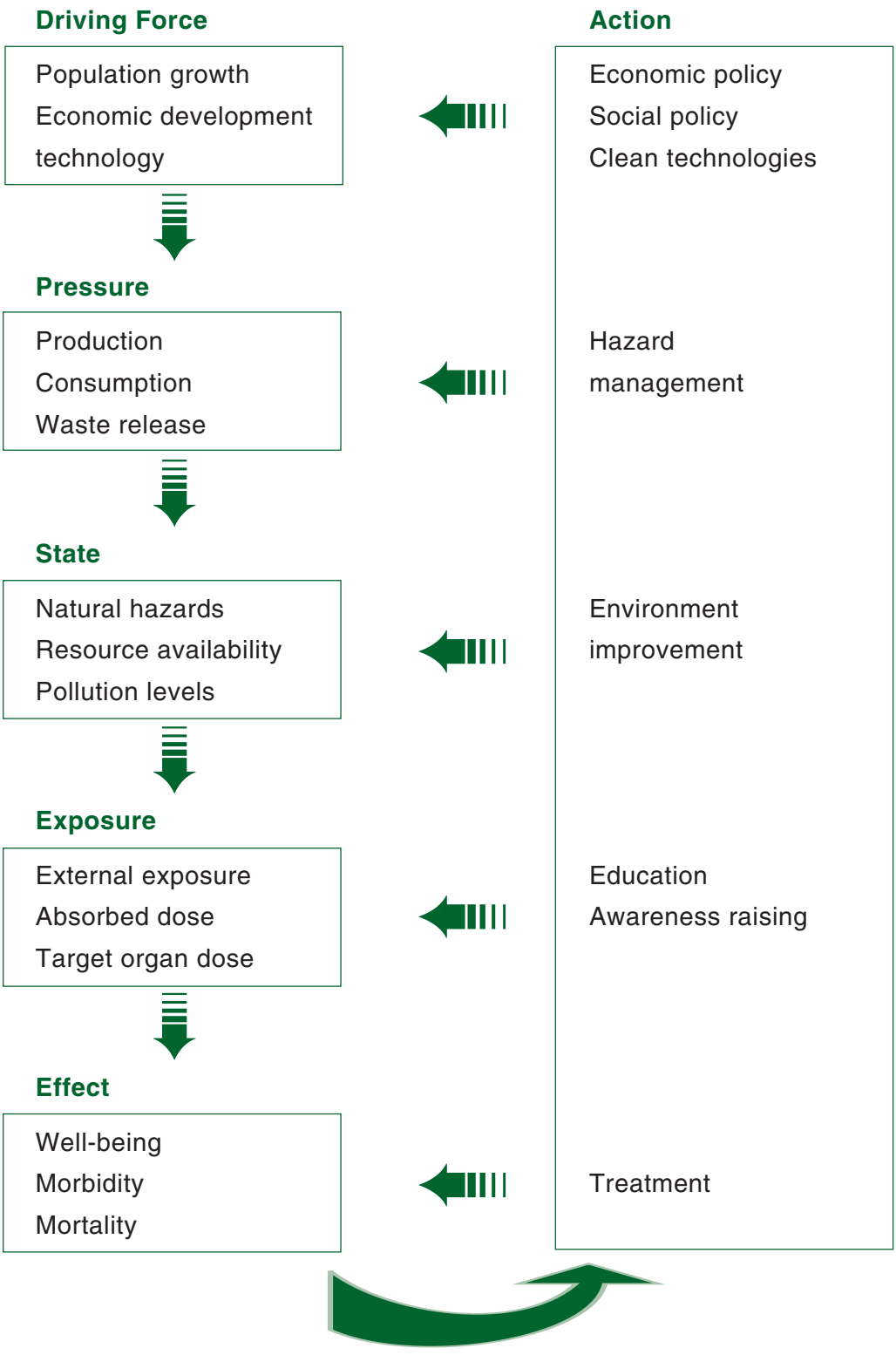
The DPSEEA framework for environmental health monitoring

This model represents the causal relationships between the environment and human health.[93] It includes the driving force, pressure, state, exposure, effect and action (see Fig. 2). The *driving force* is the upstream factor that puts *pressure* on the environment, creating a *state* that *exposes* people to factors that can cause ill health (the *effect*), resulting in *actions* being taken. The driving forces and pressures leading to environmental degradation may be the most effective intervention points for controlling the hazard.

The World Health Organisation has adopted this framework for the context in which to develop a core set of environmental health indicators as a tool for public health policy and decision-makers.[20] Although the indicators focus "downstream" on the state of the environment, population exposure and health outcomes, "upstream" driving forces and pressures are acknowledged as of primary importance.

It is acknowledged that many of the driving forces that create pressures on the environment are social and economic. These driving forces will be addressed in succeeding reports, but this paper will focus on the pressures they create and their effects on human health.

Figure 2. The DPSEEA framework for environmental health



Adapted from Kjellstrom T. Preliminary Assessment of Potential Human Health Indicators of Air Quality. Technical Paper No. 55 *Air Quality*. Ministry for the Environment, 1999.

APPENDIX 3 LINKAGES WITH OTHER HEALTH AND ENVIRONMENTAL WORK

New Zealand Health Strategy

This report builds on Goal 4 of the New Zealand Health Strategy – *"a healthy physical environment"*. Objectives of particular relevance include:

- "Supporting policies and developing strategies and services that ensure affordable, secure and safe housing
- Supporting policies and developing strategies and services that ensure all people have access to safe water supplies and effective sanitation services
- Reducing the adverse health effects of environmental hazards."[94]

The PHAC notes that the objectives of the Health Strategy reflect some of the wider determinants of health, but the priority population objectives focus "downstream" on behavioural risk factors (smoking, nutrition, physical activity, etc) and disease outcomes (diabetes, cancer, cardio-vascular disease). The PHAC will concentrate its reporting programme on the wider determinants of health as this is where the greatest gains can be made.

Health for all people, Te pai me te oranga o ngā iwi: A Framework for Public Health Action for the New Zealand Health Strategy (Draft)

This framework sets out goals for public health action across the health and other sectors to enable implementation of the public health dimension of the NZHS. It acknowledges the integral use of monitoring (along with surveillance and epidemiology) for effective public health. It emphasises the need to ensure equitable distribution of health resources in relation to health inequalities, and the need to monitor health inequalities and social determinants of health.

Ministry of Health framework to address health inequalities

This framework provides a guide for the development and implementation of strategies to reduce health inequalities. It is designed to be used by DHBs and other providers both nationally and locally. It is accompanied by a training package.

He Korowai Oranga Māori Health Strategy (Draft 2001)[95]

The overall aim of He Korowai Oranga is whānau ora: healthy Māori families supported to achieve their maximum health and well-being. The proposed framework sets out four pathways to achieving this.

- Pathway One is for whānau, hapū, iwi community development by working with the Crown collaboratively to identify what is needed to encourage health, including the environmental determinants of health.

- Pathway Two is Māori participation in the Health and Disability Sector and expresses the goal of active participation by Māori at all levels of the health and disability sector including the environmental issues.

- Pathway Three is the provision of effective health and disability services for Māori, incorporating Māori cultural values, beliefs and practices.

- Pathway Four is working across sectors and this would include the environmental sector.

Links with other work in environmental health

National Sustainability Strategy

Work on a national sustainability strategy is underway although the PHAC notes that progress is slow. However, sustainable management is being practised by local authorities to varying degrees, with triple bottom-line reporting (economic, social/cultural and environmental impacts) gaining currency, especially in the context of local government reform. The PHAC believes that environmental health indicators will enhance the process of assessing the sustainability of any proposal.

State of the environment reporting

In 1997, the Ministry for Environment published a 'State of the Environment' report. It is following this report with an annual reporting cycle focusing on different environmental issues. Some of those planned include water quality (2002), air quality and transport links (2003), and waste disposal, water allocation, biodiversity (2004), all of which have been addressed to some degree in this report.

Parliamentary Commissioner for the Environment

In June 2002, the Parliamentary Commissioner for the Environment reported on progress on sustainable development since the Rio Earth Summit in 1992.[18]

APPENDIX 4 NZ REPORTS ON THE STATE OF THE NATION'S HEALTH

TITLE	DATE OF MOST RECENT PUBLICATION	PUBLISHED BY	COVERAGE
The Social, Cultural and Economic Determinants of Health Background Papers: 1. Social, Cultural and Economic Determinants of Health 2. Why should we reduce health inequalities?	June 1998 March 1998 March 1998	National Health Committee	Advice to the Minister on practical strategies that will improve health and reduce socio-economic inequalities in health. 1. Identifies social, cultural and economic factors which have the greatest influence on the health of New Zealanders. 2. Justifies the need for New Zealand to act to reduce inequalities in health caused by social, cultural and economic conditions. *All of these have an upstream focus.*
Taking the Pulse 1996/97 Health Survey	April 1999	Ministry of Health	1996/97 Survey of 7862 people over 15 years of age. Provides information on selected risk factors; self-reported health status, prevalence of certain diseases and incidence of injuries; utilisation of health services and prescriptions; experience and knowledge of health services and satisfaction levels. *Focus on outcomes, ie, downstream.*
Our Health, Our Future 1999	Dec 1999	Ministry of Health	Part of the state of the public health reporting cycle (approx five-yearly). Describes population health status in terms of quality and quantity, integrating both dimensions using health expectancy and health gap measures. The scope for health gain is analysed. *Focus on outcomes, ie, downstream.*

TITLE	DATE OF MOST RECENT PUBLICATION	PUBLISHED BY	COVERAGE
Social Inequalities in Health 1999	Sept 2000	Ministry of Health	First report designed to monitor the impact of social and economic inequalities in health in New Zealand. Describes New Zealand evidence about inequalities in health and new analyses based on recent data. It emphasises identifying policy options that will minimise inequalities and increase community and individual well-being. It does not cover gender or regional differences where social inequalities clearly exist, nor does it address level of control in the workplace or institutional racism. Part of a five year reporting cycle on health status and health inequalities . *Focus on upstream factors.*
Progress on Health Outcome Targets 1999 (7th and last, although updated on the website)	Dec 2000	Ministry of Health	Monitoring of progress against specified public health targets which were intended to monitor the strategic direction for public health outlined in Strengthening Public Health Action. Discontinued in a published form. *Focus on outcomes, ie, downstream.*
The Social Report	2001	Ministry of Social Policy	Indicators to measure desirable social outcomes, used to provide a snapshot of the social health of the nation. *Focus on upstream factors.*
Priorities for Māori and Pacific health – Evidence from epidemiology	May 2001	Ministry of Health – Public Health Intelligence	A study of the burden of disease experienced by Māori and Pacific peoples in New Zealand using disability adjusted life years (DALYs) calculated for 85 diseases and injuries and eight risk factors. *Focus on outcomes, ie, downstream.*

TITLE	DATE OF MOST RECENT PUBLICATION	PUBLISHED BY	COVERAGE
Towards an Inclusive Economy	July 2001	Treasury	Implications for policy of the relationship between a productive economy, high level of social cohesion and their combined impact on well-being. *Focus on upstream factors.*
The Health and Independence Report	Nov 2001	Director-General, Ministry of Health	Brings together information from a range of publications. Chapter on public health includes changes in the sector, finance, workforce and public health outcomes. *Focus on outcomes, ie, downstream.*
Implementing the NZHS	Dec 2001	Minister of Health	First report on progress in implementing the NZHS. Covers initiatives taken since its launch as well as reporting on initiatives already underway – Improving the health status of the population; Improving health services; Reducing inequalities; Ensuring quality services; Investing in the future. *Focus on outcomes, ie, downstream.*
Indication of New Zealander's Health	2002	Ministry of Health (PHI)	Provides a tool for an overview of the population's health through a set of indicators, to help identify areas for health action. Updated annually. Only wider determinant assigned an indicator is unemployment rate. *Focus on outcomes, ie, downstream.*

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GLOSSARY

Hapū		subtribe
Iwi		tribe
Kaimoana		seafood
Kai Tahu		a South Island Tribe
Kaitiaki	(verb)	to guard; to protect
	(noun)	guardian: protector
Kaitiakitanga		the act of guardianship
Kaumātua		senior elder(s), male or female: usually head of a whānau
Mahinga kai		food-gathering area
Manawhenua		people with authority to speak and act with respect to a particular part of the land.
Marae		significant gathering area of whānau, hapū or iwi, usually connected with an ancestor.
Mauri		spiritual life force
Ngati Pikiao		a sub-tribe of Arawa (a central North Island iwi).
Noa		free from *tapu*
Papa/Papatuanuku		Earth Mother
Rahui		temporary restrictions or prohibitions
Rangi / Ranginui / Ranginui e tu iho nei		Sky father
Rohe		tribal area or region
Tangata whenua		first people of the land (*Tangata*=people; *whenua*=land)
Taonga		valued, treasured possessions (not necessarily material possessions)
Tane		child of Rangi and Papa; Guardian of the standing forest including plants, insects, birds
Tangaroa		child of Rangi and Papa; Guardian of the sea and of all sea creatures
Tapu		restricted;sacred
Te Atiawa a Taranaki		a Taranaki tribe
Te taha wairua-		the spiritual dimension of health
Tikanga		customary practices. Culturally correct customs and practices
Wāhi tapu		sacred sites
Wairua		spirit; spirituality
Whakapapa		geneology
Whānau		family

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