ENVIRONMENTAL HEALTH
INDICATORS FOR
NEW ZEALAND 2002

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by

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Client Report

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SUMMARY

This report was commissioned by the Ministry of Health under the 2001/2 ESR/MoH environmental health work programme. The goal of the project is to develop a national core set of environmental health indicators [EHI's] for New Zealand. This report assesses the WHO recommended core and extended set of indicators and its applicability in the New Zealand context.

A feasibility study assessing the availability, quality and usefulness of each indicator was conducted. The findings of this study suggest that there is a wealth of environmental health data being collected in New Zealand by a myriad of organisations. Hence, no new monitoring systems need to be developed. However, there needs to be a more concerted effort at extracting the relevant data from existing systems and transforming it to summarised, accessible information for environmental health decision making. At present, we have found that 70% of the total (core and extended) WHO indicators are available in New Zealand.

There are many benefits to be gained from the establishment of an environmental health indicator system, including the ability to benchmark internationally and promote multi-agency networking to facilitate data exchange. The EH indicator system can provide an integrated assessment of progress on selected issues relevant to sustainable development, especially in the context of human health. Areas of greater relative need can be identified objectively using EHIs in order to facilitate the setting of EH policy priorities. Data systems cannot replace policies and actions directly aimed at improving environmental health conditions but they could nonetheless form an intrinsic part of the decision making process at early stages.

1. INTRODUCTION

The goal of the project as articulated in the service description is to develop a functional core set of environmental health indicators [EHI's] for New Zealand, the major outcome being a functional interactive database, incorporating multiple data sets providing timely data to different organisations for decision making.

This process as outlined in the previous report [FW0192] has two principal phases, namely:

I. Creation of base line dataset in environment health:
* Literature review of frameworks
* Audit and report on current available data

II. Construction of a prototype set of environmental health indicators:
* Design a model database of indicators
* Identify key issues in consultation with an expert panel

The previous report addressed phase I above recommending the adoption of the WHO-Europe DPSEEA Indicators framework. This report uses that framework to address the following milestones in the 2002/3-service description:

* Form project working group and map stakeholder needs and activities. Consult on identified existing and missing data sources and data quality issues within the Environmental Health Strategy framework.

* Describe elements, structure, and process of a national environmental health indicator system in consultation with the MoH service description leader, including proposed indicators for New Zealand based on the WHO model but incorporating NZ priorities, existing data sources, and data gaps, and including incorporating appropriate recommendations of the Public Health Advisory Committee when available.

Specifically this report:

* Critically reviews the WHO indicator sets from a New Zealand perspective.
* Determines the gaps in the NZ data with respect to the WHO dataset.
* If appropriate, suggests alternative indicators and data sets.
* Describes key elements of the next phase of the work. .

2.   BACKGROUND

Agenda 21 is a comprehensive plan of action adopted by more than 178 Governments at the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro, Brazil, 3 to 14 June 1992. It explicitly identifies the inter-relationships of human health, the environment and development, and the need to improve health in order to achieve sustainable development. Thereby providing an internationally agreed framework for embedding both environmental and health information in the broader context of sustainable development.

To meet this goal, development policies and programmes need access to quality data and information on these differing areas, based on a clear understanding of the underpinning inter-relationships.

In most countries, responsibilities for the collection, collation, and analysis of environment and population health data are spread among different agencies, and the links between health effects and potential environmental impacts are rarely explicit. As a consequence preventative/remediation actions are initiated with insufficient evidence.

To help this, WHO-Europe have instigated a project to develop and test a pan-European system of environmental health indicators covering all the principal [physical] environmental issues of human health relevance. Initiated in October 1999 and aimed originally at the establishment of a comprehensive EH monitoring system within the NEHAP framework and it has resulted in a proposed common "core" set of environmental health indicators and a protocol for their pilot testing in selected countries. Eleven environmental themes were identified :

- Air quality,
- Housing,
- Traffic accidents,
- Noise,
- Waste and contaminated lands,
- Radiation,
- Water and sanitation,
- Food safety,
- Chemical emergencies, and
- Workplace.

and subsequently a set of 51 "core" indicators derived for international assessments.

Most of the core indicators are also applicable for use at a subnational level. The core set is that which all countries would have the available data whereas an extended set is also proposed for countries with more developed monitoring systems.

The revised indicators system, after the pilot evaluation, will be recommended for implementation in the European region of the WHO. The objective of the program is the development of tools to support decision-makers focussing on the establishment of a comprehensive, environmental health indicators system for integrated assessment and reporting based on comparable datasets.

A number of criteria and choices were considered in defining operational indicators. The commonly accepted cause-effect framework, DPSEEA (Driving forces – Pressures – State – Exposure – Effect – Action) was used. The scope of the indicators system was conceived to cover mainly the state of environment, population exposure, health outcomes, and to a lesser extent – pressures and driving forces.

Criteria for the selection of the indicators included sufficient evidence for a valid environmental exposure to health outcome relationship and more general ones, eg. validity, sensitivity, timeliness, etc. Nevertheless, it was acknowledged that some areas, eg. indoor air, noise, water quality, etc would require implementation of new methods for data gathering.

A number of indicators representing health protection measures and intersectoral policies actions are included to permit decision-makers to focus on specific action areas. The indicators are based as far as possible on routinely collected data from existing systems.

The consultation emphasised that in, and between, country differences do not allow the selection of one, "universally" applicable indicator set. Although initially conceived to be used for monitoring NEHAP implementation, the currently developed indicators are useful, more generally, for monitoring environmental health policies and programs. Selection of both a core and a more extended set allows individual countries greater flexibility in their use. The core set enables inter-country comparisons while the extended set can be customised for country specific reports.

It is important to note that although the fundamental inter-relationship between environmental exposure and health effects, is in the majority of cases well recognised (e.g. air quality and respiratory mortality or morbidity), health outcomes are influenced by a variety of factors, among which environmental exposures may not be the most important ones. Thus the assessment of single health outcomes (e.g. infant mortality due to respiratory disease) does not allow direct causal inference to environmental exposures.

The population attributable risk, where available, is a useful tool of assessing how much of the disease burden could be eliminated if the exposure were eliminated. The population attributable risk of the percentage of deaths and DALY's globally attributable to the environment is 25-33% and 6% respectively.[1][2] A recent study calculated that the US federal government heath care costs attributable to the environment were estimated to be 13.5 billion dollars, using a mean attributable percentage of 3.5%.[3] Knowledge of the disease burden caused by environmental exposures, and its use in health impact assessment can be extremely useful in guiding policy choices in environmental health management.

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[1] Michaud Catherine M, Murray CJL, Bloom BR. Burden of disease- implications for future research. Journal of the American Medical Association, 2001; 285: 535-9.

[2] Smith KR, Corvalan CF, Kjellstrom T. How much global ill health is attributable to environmental factors? Epidemiology, 1999; 10: 573-84.

[3] Public Health Foundation. Return on investment of nationwide health tracking. Washington, D.C.,2001.

3.   METHODS

A standardised protocol was agreed upon by WHO to facilitate the feasibility and evaluation of the indicators both at a national and multi national level. Details of the methodology can be found at: http://www.euro.who.int/EHindicators

Using the WHO template, a questionnaire was filled out for each indicator. Three different questionnaires corresponding to the respective indicator sets (health; environmental; action) were used to identify:
- source
- reliability,
- quality,
- spatial resolution,
- degrees of aggregation and,
- geographical coverage.

Relevant information was collected by telephone interviews, e-mails, personal communication and literature reviews from the relevant sources in NZ.

The following dimensions of the data were assessed:
- Feasibility: is the indicator generally feasible or not, i.e. is the data available or can the data be collected/collated or not?
- Usefulness: is the indicator useful to support decision making?
- Possible modification of indicator: is data available on a modified form of the indicator?
- Alternative indicator: is there a more relevant indicator for New Zealand ?
- Availability: what 'work' is needed to obtain the required data for the variables?
- Accessibility: at what 'level' of an organisation can the data be collected?
- Data quality: is standardised methodology for data collection and quality assurance system in place

A coding system was developed by WHO as part of the feasibility study. It should be noted that the criteria for both quality and usefulness are to a certain degree subjective and reflect the author's personal assessment and that of data/stakeholders consulted in the process. These assessments are preliminary and it is proposed to refine the process during subsequent consultation using a Delphic process.

Availability, is the data is collected at national level? The gradations are.
>   0: currently not available at national level
>   1: currently not available, but derivable from other sources
>   2: available

Quality, of the data, represents whether there is a quality assurance/control system in place and the use of standardised methodology for data collection.
>   1: neither in place
>   2: either one in place
>   3: both in place

Usefulness, Can the indicator be used for comparisons, related to a policy objective or to existing standards and has it utility within the New Zealand context.

>   1: not useful
>   2: some utility
>   3: very useful

The results are structured by topic, namely:
- Air quality,
- Housing,
- Traffic accidents,
- Noise,
- Waste and contaminated lands,
- Radiation,
- Water and sanitation,
- Food safety,
- Chemical emergencies, and
- Workplace.

The indicators within these topics are either
- Environmental indicators: describing a driving force, pressure, state or exposure
- Health indicators: describing the health effect or,
- Action indicators: describing organisational or societal (re)actions.

The results are summarised in the following section with tables for each topic.

4. FINDINGS

4.1 Ambient Air Quality

Table 1 : Air Quality Indicators

Code	Indicator	Availability 0-2	Quality 1-3	Usefulness 1-3
Air_D1	Kilometres driven per transport mode per person	2	3	3
Air_D2	Consumption of fuel by type from road transport	1	2	3
Air_P1	Consumption of leaded gasoline	0	N/A	N/A
Air_P2	Emissions of air pollutants	2	2	3
Air_Ex1	Ambient concentrations of air pollutants (urban): population-based exposure	2	2	3
Air_E1	Infant mortality due to respiratory diseases	2	3	3
Air_E2	Mortality due to respiratory diseases, all ages	2	3	3
Air_E3	Mortality due to diseases of the circulatory system, all ages	2	3	3
Air_A1	Participation in International agreements and environmental initiatives	2	3	1
Air_A2	Policies to reduce environmental tobacco smoke exposure	2	3	3
Air_ext1	*Emissions of Lead, primary PM10, NO x and benzene in urban regions*	1	1	3
Air_ext2	*Number of hospital admissions for respiratory diseases.*	2	3	3
Air_ext3	*Number of hospital admissions for asthma*	2	3	3
Air_ext4	*Number of hospital admissions for diseases of the circulatory system*	2	3	3
Air_ext5	*DALY due to morbidity and mortality as a result of ambient air pollution*	0	N/A	3
Air_ext6	*Investments in transport infrastructure*	0	N/A	2

4.1.1 Environmental Indicators

Air_D1: Kilometres driven per transport mode per person
Availability: Available from Ministry of Transport using the National Traffic Database from 1979 to 2000
Usefulness: The impact of policies targeted at reducing the traffic as significant source of air pollution and noise can be usefully assessed.
Quality: Being modelled data, values need to be interpreted with caution.

Air_D2: Consumption of fuel by type from road transport
Availability: Available from the Ministry of Economic Development and StatsNZ from 1990 -2000.
Usefulness: Can be interpreted in terms of a measure of potential emission of air pollutants.
Quality: The numbers are estimates and represent modelled data

Air_P1 : Consumption of leaded gasoline
Availability: Not relevant since leaded gasoline is banned in New Zealand.
Usefulness: N/A
Quality: N/A

Air_P2 : Emissions of air pollutants by economic sectors
Availability: Available from NIWA. First available 1996, reviewed annually, and revised every five years. Some regional councils have conducted more detailed emissions inventory for their regions, which are revised every five years.
Usefulness: Can be used to interpret temporal trends in air pollution emissions.
Quality: National emission data are estimates based on overseas data and adjusted for New Zealand.

Air_Ex1: Ambient concentrations of air pollutants (urban): population-based) NO_2, PM_{10}, SO_2, PM_{10}, TSP, Black smoke, O_3.)
Availability: Data available from MfE, regional councils and NIWA from 1990- 2002
Usefulness: Can be used to interpret both spatial patterns and temporal trends in air pollution exposure.
Quality: Not all the pollutants that make up the indicator are monitored at all sites and each regional council measures slightly different pollutants. Number of sampling sites varies between different regional councils. Different sampling techniques are being used to measure PM_{10} throughout the country.
Comment: MfE is currently working on standardising measuring and reporting techniques.

4.1.2 Health Indicators

Air_E1: Infant mortality due to respiratory diseases
Availability: Available from NZHIS from 1973 to 1998.
Usefulness: Shows temporal trends which, using appropriate epidemiological evidence can be correlated with local levels of ambient air pollution.
Quality: Complete, but limited in timeliness. The most recent official national mortality data available are for 1998 although 'unofficial' data are available annually.

Air_E2: Mortality due to respiratory diseases, all ages
Availability: Available from NZHIS from 1973 to 1998
Usefulness: As per Air E_1
Quality: As per Air E_1

Air_E3: Mortality due to diseases of the circulatory system, all ages
Availability: Available from NZHIS from 1973 to 1998
Usefulness: As per Air E-1
Quality: As per Air E_1

4.1.3 Action Indicators

Air_A1   : Participation in International agreements and environmental initiatives
Availability: Information on ratification available from central government.
Usefulness: Shows a countries commitment to the (inter-) national community and enables the public to view international goals and targets.
Comment: Compliance with these agreements and achievement of goals would be more useful.

Air_A2   : Policies to reduce environmental tobacco smoke exposure
Availability: Legislation exists in the form of the Smokefree Act
Usefulness: Provides a general measure of the capability to implement the relevant policies.
Comment: An indicator on actual passive smoking exposure would better help understand the relevance of action in this field.

4.1.4 Extended Set Indicators

Air_ext1: Emissions of Lead, primary PM10, NO x and benzene in urban regions
Availability: Available for some urban areas from their respective TLA's but there is no data on emissions of benzene or primary PM10. Lead and NOx is available for Christchurch, Auckland and Waikato
Quality: Variable, as different monitoring methodologies are used
Comment: One of the proposed MfE indicators is national annual ambient benzene concentration.

Air_ext2-4: Number of hospital admissions for respiratory diseases / asthma / diseases of the circulatory system
Availability: Available from NZHIS from 1967-2002, updated quarterly.
Quality: Data are counts of the episodes of inpatient care rather than individual people.

Air_ext5: DALY due to morbidity and mortality as a result of ambient air pollution
Availability: Not available
Usefulness: Potentially more useful than proposed core health indicators as incorporates disability, morbidity and mortality into one index.

Air_ext4: Investments in transport infrastructure
Availability: Not available.
Usefulness: Potentially a measure of commitment to decrease transport related pollution

4.2 Indoor Air Quality

Table 2: Indoor Air Quality Indicators

Code	Indicator	Availability 0-2	Quality 1-3	Usefulness 1-3
INAIR_ext1	Proportion of residences having a moisture problem, visible mould or mould odour	0	N/A	3
INAIR_ext2	Proportion of residences exceeding indoor air radon concentration of 200Bq/m3	2	2	2
INAIR_ext3	Sources of indoor pollution	2	3	3
INAIR_ext4	Consumption of tobacco products	2	2	3
INAIR_ext5	Capability to implement indoor air quality management.	2	2	2

There is no core set of indicators for indoor air quality, as data at a national level on indoor air quality is lacking in most countries, including New Zealand.

INAIR_ext1: Proportion of residences having a moisture problem, visible mould or mould odour
Availability: Currently unavailable.
Comment: StatsNZ is currently developing a housing indicators project. Proposed indicators including indoor housing humidity factors (such as dampness, mould, moisture stains, and musty smells).

INAIR_ext2: Proportion of residences exceeding indoor air radon concentration of 200Bq/m3
Availability: NRL did a national survey in 1986/87.
Usefulness:
Quality: Good coverage but now dated.

Comment: There was no evidence of any "hot spots" such as have been found overseas. Therefore, this indicator may not be relevant to the NZ environment.

INAIR_ext3: Sources of indoor pollution
Availability: Available from StatsNZ as part of census data from 1986-2001.
Usefulness: Measure of potential exposure to pollutants in the home.
Quality: There have been variations to the question over the years.

INAIR_ext4: Consumption of tobacco products
Availability: Available from StatsNZ, from June 1998 to 2001.
Usefulness: Useful in tracking trends in consumption.
Quality: Updated annually.
Comment: Would benefit from being able to disaggregate by groups reflecting consumption patterns, and estimates of number of household members exposed

INAIR_ext5: Capability to implement indoor air quality management
Availability: Available from various sources incl. Public Health Units, BRANZ and MoH
Usefulness: Provides a general measure of the capability to implement policies for improving indoor air quality

4.3   Housing and Settlements

Table 3 : Housing Indicators

Code	Indicator	Availability 0-2	Quality 1-3	Usefulness 1-3
Hous_S1	Living floor area per person	1	3	3
Hous_Ex1	Population living in substandard housing	1	2	3
Hous_E1	Mortality due to external causes in children under 5 years of age	2	3	2
Hous_A1	Scope and application of building regulations for housing	1	3	3
Hous_A2	Land use and urban planning regulations	1	3	3
Hous_ext1	*Percentage of the population that has no permanent domicile*	2	2	2
Hous_ext2	*Incidence of asthma incl. LRI in children*	2	2	3

4.3.1   Environmental Indicators

Hous_S1: Living floor area per person
Availability: Can be calculated using census data from 1991-2001.
Usefulness: Needs to be interpreted with caution as the relation between the size of the living area and health status depends on a number of factors.
Quality: Available every 5 years.
Comment: A better indicator could be the 'percentage of people in private dwellings living in crowded households' (currently available from StatsNZ). Stats NZ has two relevant indicators as part of their housing indicator project namely, occupancy rate and equalised crowding index.

Hous_Ex1: Population living in substandard housing
Availability: Data on populations living in substandard housing is currently being developed as part of the interagency work on substandard housing and should be available from the Ministry of Social Policy

Usefulness: Provides a measure of the condition of the housing stock, it can indicate the health risks associated with basic sanitation, poor sanitation, exposures to indoor air pollution, and access to safe water
Quality: Not representative of national data.

4.3.2   Health Indicators

Hous_E1: Mortality due to external causes in children under 5 years of age
Availability: Available from NZHIS from 1973-1998.
Usefulness: Can be interpreted as a measure of the hazards in the external environment, but is not specific to the domestic situation.
Quality: Good quality but limited timeliness. Unofficial data available annually
Comment: More useful to include specific event rates, e.g. meningococcal, tuberculosis rates or deaths/injury from fires, as they are better indicators of overcrowding.

4.3.3   Action Indicators

Hous_A1, A2: Scope and application of building regulations for housing / Land use and urban planning regulations
Availability: Available from TLA's and the Building Industry Authority.
Usefulness: General measure of the scope and application of housing standards and building regulations.
Comment: Needs to be interpreted with caution, better to measure implementation and enforcement.

4.3.4   Extended Set Indicators

Hous_ext1: Percentage of the population that has no permanent domicile
Availability: Available from StatsNZ from 1986-2001.
Usefulness: Debatable as fluctuates significantly over that time period.
Quality: Estimate from census data – every 5 years.

Hous_ext2: Incidence of Asthma incl. Lower Respiratory Infection in children
Availability: Hospitalisation data available from NZHIS.
Usefulness: More useful than other non specific mortality and morbidity data
Quality: Underestimated as based on hospitalisations only, and does not include GP and other health provider encounters.

4.4   Traffic Accidents

Table 4: Traffic Accidents

Code	Indicator	Availability 0-2	Quality 1-3	Usefulness 1-3
Traf_E1	Mortality from traffic accidents	2	3	3
Traf_E2	Rate of injuries by traffic accidents	2	3	3
Traf_ext1	Quality of traffic control	0	NA	2

4.4.1 Health indicators

Traf_E1: Mortality from traffic accidents
Availability: Available from LTSA from 1970 to 2002.
Usefulness: Relatively easy to interpret, as link between cause and health effect is explicit.
Quality: Updated monthly.
Comment: Changes in the indicator may reflect different factors, e.g. traffic volume, traffic speeds, access to care.

 Traf_E2: Rate of injuries by traffic accidents
Availability: Available from LTSA from 1970 to 2002
Usefulness: As per TrafE-1
Quality: As per TrafE-1
Comment: As per TrafE-1

4.4.2 Extended Set Indicators

Traf_ext1: Quality of traffic control
Availability: Not available.
Usefulness: Debatable

4.5   Noise

Table 5: Noise Indicators

Code	Indicator	Availability 0-2	Quality 1-3	Usefulness 1-3
Noise_E1	Population annoyance by certain sources of noise	0	N/A	3
Noise_E2	Sleep disturbance by noise	0	N/A	2
Noise_A1	Application of regulations, restrictions and noise abatement measures	1	3	3
Noise_ext1	Noise levels distribution	0	N/A	3
Noise_ext2	No. of people exposed to noise levels above a standard in noise level categories	0	N/A	3
Noise_ext3	No. of people exposed to noise levels >80db(A) (8hr) at work place	1	1	3

4.5.1 Health Indicators

Noise_E1, E2: Population annoyance by certain sources of noise/ Sleep disturbance by noise
Availability: Not available
Usefulness: Provides a proxy measure of the long-term health effects related to exposure to some sources of environmental noise.
Quality: Subjective, episodic and not systematically collected**.**
Comment: There is a proposed citizen noise survey as part of the next quality of life in big cities publication. Alternative indicator could be the number of noise complaints, which some city councils keep.

4.5.2   Action Indicators

Noise_A1: Application of regulations, restrictions and noise abatement measures
Availability: Available from TLA's as well as PHU's
Usefulness: This indicator provides a general measure of the capability to implement policies for reducing environmental noise.
Comment: Measures capability rather than enforcement or application.

4.5.3   Extended Set Indicators

Noise_ext1: Noise levels distribution
Availability: Not available.
Usefulness: Potentially useful in mapping hazard distribution .

Noise_ext2: No. of people exposed to noise levels above a standard in noise level categories
Availability: Not available.
Usefulness: as per Noise_ext1.

Noise_ext3: No. of people exposed to noise levels >80db(A) (8hr) at work place
Availability: Potentially available from OSH.
Usefulness: Good direct measure, useful for workplace policy and practice.
Quality: Coverage not consistent with regard to place or time.

4.6   Waste and Contaminated Lands

Table 6: Waste and Contaminated Lands Indicators

Code	Indicator	Availability 0-2	Quality 1-3	Usefulness 1-3
Waste_P1	Hazardous waste generation	0	N/A	3
Waste_S1	Contaminated land area	1	2	3
Waste_Ex1	Blood lead level in children	2	2	2
Waste_A1	Hazardous waste policies	2	3	3
Waste_A2	Municipal waste collection	1	1	2
Waste_ext1	Amount of hazardous waste disposed and exported	0	N/A	3
Waste_ext2	Existence for a register for contaminated lands	1	2	3

4.6.1   Environmental Indicators

Waste_P1: Hazardous waste generation
Availability: Currently, there is no national registry of hazardous waste. The data on imports of hazardous substances is available from Stats New Zealand. Some regional councils have conducted hazardous waste surveys.
Usefulness: Indicates risk to both the environment and human health
Quality: Inconsistent in respect of content and time.
Comment: One of the proposed MfE environmental indicators includes the quantity of hazardous waste generated, stored and discharged.

Waste_S1: Contaminated land area
Availability: There is no national data regarding contaminated land area but there is data on the number of contaminated sites for each regional council. Available for 2000 only from MfE.
Usefulness: Measures the extent of risk posed by contaminated sites
Quality: The data collected by MfE is based on data on sites for which records are held. Additional sites may exist for which no data is held.
Comment: The area of contaminated land can be estimated from the individual regional council records.

4.6.2 Health Indicators

Waste_E1: Blood lead level in children
Availability: Currently only available through the national notifiable disease system.
Usefulness: Indicates exposure but only indirectly health effect
Quality: Not systematically tested for and data only available when suspected, tested and notified.
Comment: Population levels can be extrapolated to expected health effects

4.6.3 Action Indicators

Waste_A1: Hazardous waste policies
Availability: Available from ERMA NZ
Usefulness: Simple, yet reasonably robust measure of the scope, strength and effectiveness of policies and legislation on hazardous wastes.

Waste_A2: Municipal waste collection
Availability: No national data - can be calculated from TLA data.
Usefulness: Measures the adequacy of waste removal services.
Quality: Variable as no standardised monitoring or reporting system.

4.6.4 Extended Set Indicators

Waste_ext1: Amount of hazardous waste disposed and exported
Availability: Data on exports of hazardous waste available from Ministry of Economic Development. There is no data for the amount of hazardous waste disposed of.
Usefulness: Indicates risk to the environment and human health.
Quality:

Waste_ext2: Existence of a register for contaminated lands
Availability: No national data. Some regional councils are coordinating a register of contaminated land sites for their respective regions.
Quality: variable as no standardised methodology used.
Usefulness: Provides a general measure of the status of control activities

4.7   Radiation

Table 7: Radiation Indicators

Code	Indicator	Availability 0-2	Quality 1-3	Usefulness 1-3
Rad_Ex1	Cumulative radiation dose	2	3	2
Rad_Ex2	UV light index	2	3	3
Rad_E1	Incidence of skin cancer	2	3	3
Rad_A1	Topicality of permits on the use of radioactive substances	2	3	3
Rad_A2	Effective environmental monitoring of radiation activity	2	3	3

4.7.1   Environmental Indicators

Rad_Ex1: Cumulative radiation dose
Availability: Available from National Radiation Laboratory.
Usefulness: enables estimates of the population exposure.
Quality: quality assurance guidelines exist
Comment: a very small proportion of the population receives 5mS per year

Rad_Ex2: UV light index
Availability: Monitored by NIWA and is updated daily for three sites i.e. Lauder, Leigh, and Invercargill.
Usefulness: Direct measure of the cumulative levels of exposure to UV radiation.
Quality: Predicted forecast values modelled on available satellite ozone data.
Comment: The relationship between the levels of UV radiation and health outcome are confounded by lifestyle factors (such as sunscreen use).

4.7.2   Health Indicator

Rad_E1: Incidence of skin cancer
Availability: Available from the cancer registry from 1948 but more complete data from 1995 till present.
Usefulness: Needs to be interpreted cautiously as an indirect health effect of UV exposure.
Quality: available annually, complete for cases presented and investigated.
Comment: Better to focus on specific skin cancers known to be more directly related to UV exposure, eg melanoma and SCC

4.7.3   Action Indicators

Rad_A1: Topicality of permits on the use of radioactive substances
Availability: Available from NRL.
Usefulness: provides a measure of the scope and implementation of legislation
Quality: quality is maintained through the provisions of the Radiation Protection Act

Rad_A2: Effective environmental monitoring of radiation activity
Availability: Available from NRL**.**
Usefulness: Provides a useful measure of the effectiveness of monitoring activities.

Comment: The indicator does not describe the actual radiation risk but the level of compliance with standards.

4.8 Water (Drinking and Recreational) and Sanitation

Table 8: Water and Sanitation Indicators

Code	Indicator	Availability 0-2	Quality 1-3	Usefulness 1-3
WatSan_P1	Waste water treatment coverage	2	2	3
WatSan_S1	Exceedance of recreational water limit values for microbiological Parameters	2	3	3
WatSan_S2	Exceedance of WHO drinking water guidelines for microbiological parameters	2	2	3
WatSan_S3	Exceedance of WHO drinking water guidelines for chemical parameters	2	2	3
WatSan_Ex1	Access to safe drinking water	2	3	3
WatSan_Ex2	Access to adequate sanitation	1	1	1
WatSan_E1	Outbreaks of water-borne diseases	2	2	3
WatSan_E2	Diarrhoea morbidity in children	0	N/A	1
WatSan_A1	Effective monitoring of recreational water	2	3	3
WatSan_ext1	Proportion of coastal or freshwater bathing sites for recreational use.	2	3	3
WatSan_ext2	Mortality rate due to drowning	2	3	3
WatSan_ext3	Capability of management of enclosed water generally available for bathing	1	2	3
WatSan_ext4	Intensity of recreational water quality monitoring	2	3	3
WatSan_ext5	Mean and percentile concentrations of selected chemical contaminants	2	3	3
WatSan_ext6	Percentage of population receiving piped water at home.	1	2	2
WatSan_ext7	No. of discontinuities of public drinking water supply for > 12 hours.	1	3	2
WatSan_ext8	Number of cases of water borne diseases	2	2	3
WatSan_ext9	Intensity of drinking water quality monitoring	2	3	3
WatSan_ext10	Capability of water resources quality management	2	3	3
WatSan_ext12	Good practice to drinking water management	2	3	3

4.8.1 Environmental Indicators

WatSan_P1: Waste water treatment coverage
Availability: Available from ESR [from 2001] and from regional councils, Neptune, Water Industry NZ and the Ministry of Economic Development.
Usefulness: Measures environmental load and health risk from exposure to untreated or partially treated wastewater.
Quality: Covers 95% of TLA's; doesn't include educational institutes, camping grounds, marae, government organisations and private institutions.

WatSan_S1: Exceedance of recreational water limit values for microbiological parameters
Availability: Available from Regional Councils, who monitor beach water quality at a number of sites throughout New Zealand, from November until March and monthly during the rest of the year. Data is posted on the MfE website and weekly on the relevant individual council websites during the monitoring period.
Usefulness: It is a measure of the microbiological quality of bathing waters.
Quality: Councils use standard guidelines developed by MfE and MoH. Different councils started monitoring from different time periods.

WatSan_S1: Exceedance of WHO drinking water guidelines for microbiological parameters
Availability: Available from ESR from1991 to 2001.
Usefulness: Direct measure of the safety of drinking water [microbiological]
Quality: Only 87% of the population water supply is registered, hence there is no information on the water quality of the remaining 13%. Updated annually

WatSan_S2: Exceedance of WHO drinking water guidelines for chemical parameters
Availability: Available from ESR from 1986 - updated approximately every five years
Usefulness: Measure of the state of the drinking water contamination.
Quality: same as WatSan_S1

WatSan_Ex1: Access to safe drinking water
Availability: Available from ESR from 1986-2001.
Usefulness: Good indicator of health risk from unsafe potable water.
Quality: Same as WatSan_S1.

WatSan_Ex2: Access to adequate sanitation
Availability: Not routinely available but can be obtained with some effort.
Usefulness: Good indicator of access to but not quality of sanitation facilities
Quality:

4.8.2   Health Indicators

WatSan_E1: Outbreaks of water-borne diseases
Availability: Available from EpiSurv from 1996 to 2002. The data is updated weekly and published monthly.
Usefulness: Measure of health effects due to exposure to contaminants in water.
Quality: Underreporting is common.
Comment: Clearly distinguishing between water borne and food borne outbreaks can be difficult.

WatSan_E2: Diarrhoea morbidity in children
Availability: Not available
Usefulness: Good measure of health status of children, especially under conditions of inadequate water or food hygiene and basic sanitation. Not envisaged to be very relevant to NZ.
Quality: Not systematically collected.
Comment: Alternative indicator could be the number of children notified with an enteric disease corrected for known levels of underreporting.

4.8.3   Action Indicator

WatSan_A1: Effective monitoring of recreational water
Availability: Available from MfE and regional councils
Usefulness: General measure of local authority control over bathing water safety

4.8.4   Extended Set Indicators

WatSan_ext1: Proportion of coastal or freshwater bathing sites for recreational use
Availability: Available from MfE and the regional councils during the summer monitoring period from November to March.
Usefulness: Indicates potential exposure to water quality problems of bathing sites.
Quality: Good records from monitoring sites

WatSan_ext2: Mortality rate due to drowning
Availability: Available from NZHIS from 1973 to 1998
Usefulness: Indirect health effect of water safety.
Quality: Complete, but limited in timeliness

WatSan_ext3: Capability of management of enclosed water generally available for bathing
Availability: The variables required to construct this composite indicator are available from regional councils.
Usefulness: Demonstrates the capabilities of authorities to enforce compliance

WatSan_ext4: Intensity of water quality monitoring
Availability: Available from regional councils during the summer monitoring period
Usefulness: Indicates level of action being taken to reduce exposure
Quality: monitoring intensity may depend on the water quality of the area.

WatSan_ext5: Mean and percentile concentrations of selected chemical contaminants
Availability: Available from ESR and MoH from 1996-2001.
Usefulness: Measures the state of drinking water (chemical).
Quality: Updated approximately every five years**.**

WatSan_ext6: Percentage of population receiving piped water at home.
Availability: Available from ESR and MoH
Usefulness: indirect measure of access to safe drinking water
Quality: estimates as information is only known for 87% of the population

WatSan_ext7: Number of discontinuities of public drinking water supply for > than 2 hours.
Availability: Available from regional councils.
Usefulness: Proxy measure of exposure to unsafe water.
Quality: No standardised methodology.

WatSan_ext8: Number of cases of water borne diseases
Availability: Available from ESR/MoH, only for those diseases, which are notifiable.
Usefulness: Measure of health effects due to exposure.
Quality: Underreporting/ ascertaining mode of transmission problems.

WatSan_ext9: Intensity of water quality monitoring
Availability: Available from ESR/MoH.
Usefulness: Indicates level of action being taken to reduce exposure.

WatSan_ext10: Capability of water resources quality management
Availability: Available from ESR/MoH.
Usefulness: Demonstrates capability of authorities to manage water quality.

WatSan_ext11: Good practice to drinking water management
Availability: Available from ESR/MoH.
Usefulness: Capabilities of authorities to ensure safe drinking water.

4.9   Food safety

Table 9: Food Safety Indicators

Code	Indicator	Availability 0-2	Quality 1-3	Usefulness 1-3
Food_Ex1	Monitoring chemical hazards in food: potential exposure	2	3	3
Food_E1	Outbreaks of food-borne illness	2	2	3
Food_E2	Incidence of food-borne illness	2	2	3
Food_A1	General food safety policy	2	3	2
Food_A2	Effectiveness of food safety control	2	2	3
Food_ext1	Dioxins and PCB levels in human milk	2	2	3
Food_ext2	Incidence of human zoonoses	2	2	3
Food_ext3	Incidence of animal zoonoses	2	2	3
Food_ext4	Rate of official food control	1	2	3
Food_ex5	Progress in implementation of HACCP system	1	3	2
Food_ext6	Population awareness of food safety rules in households	2	2	3

4.9.1   Environmental Indicators

Food_Ex1: Monitoring chemical hazards in food: potential exposure
Availability: Available from ESR/MoH for 1987/88, 1990/91 and, 1997/8.
Usefulness: Measure of the level of contamination and potential exposure.
Quality: Quality control assured as part of international programme (GEMS)**.**

4.9.2   Health indicators

Food_E1: Outbreaks of food-borne illness
Availability: Available from ESR/MoH from 1996 to 2002.
Usefulness: Informative for interventions.
Quality: Under-reporting is a problem.
Comment: Can be difficult to distinguish between food borne or waterborne diseases.

Food_E2: Incidence of food-borne illness
Availability: Available from ESR/MoH
Usefulness: Informative for the magnitude of the overall problem
Quality: As per Food E-1 above

4.9.3   Action Indicator

Food_A1: General food safety policy
Availability: Available from MoH, ESR, and PHU's.
Usefulness: Provides a general measure of the status of food control activities and the
implementation of internationally recognised HACCP based principles in food control.

Food_A2: Effectiveness of food safety controls
Availability: Available from ESR and PHU's
Usefulness: Quantitative assessment of the follow-up of food control measures performed by competent authorities.
Quality: Varies regionally

4.9.4   Extended Set Indicators

Food_ext1: Dioxins and PCB levels in human milk
Availability: Data available from MfE survey in 1987 and 1997.
Usefulness: Indicates early exposure of vulnerable groups to dioxin. Episodic survey data indicate the trend for body burdens of organochlorines
Quality: Some pooling of samples.

Food_ext2: Incidence of human zoonoses
Availability: Available from ESR/MoH.
Usefulness: Measure of health effect due to exposure to contaminated food.
Quality: Significant under reporting as with other notifiable diseases.

Food_ext3: Incidence of animal zoonoses
Availability: Available from MAF
Usefulness: Potential exposure to zoonotic diseases.
Quality: As per Food ext_2 above .

Food_ext4-5: Rate of official food control / Progress in implementation of HACCP system
Availability: Can be calculated from PHU data and FoodNet.
Usefulness: Measure of local authorities control over food safety.
Quality: Variable data collation systems.

Food_ext6: Population awareness of food safety rules in households
Availability: Available from MoH as part of national food safety awareness campaign.
Usefulness: Determines knowledge and awareness of households in regards to food safety
Quality: Only 2000 people were sent postal questionnaires
Comment: Difficult to extrapolate. The questionnaire assessed the effectiveness of the campaign.

4.10   Chemical Emergencies

Table 10: Chemical Emergency Indicators

Code	Indicator	Availability 0-2	Quality 1-3	Usefulness 1-3
Chem_P1	Sites containing large quantities of chemicals	1	1	3
Chem_E1	Mortality from chemical incidents	2	3	3
Chem_A1	Regulatory requirements for land-use planning	1	3	2
Chem_A2	Chemical incidents register	0	N/A	3
Chem_A3	Poison centre service	2	3	3
Chem_A4	Medical treatment guidelines	2	3	3
Chem_A5	Government preparedness	2	3	3
Chem_ext1	No of chemical incidents	2	2	3
Chem_ext2	No of exposed people to chemicals	0	N/A	3
Chem_ext3	Annual incidence of people hospitalised for more than 1 day due to chemical incidents	1	N/A	3
Chem_ext4	Communication with the public	1	1	3

4.10.1 Environmental Indicators

Chem_P1: Sites containing large quantities of chemicals
Availability: No national database but some councils keep an inventory of the sites in their region. The Fire Service also keeps local records.
Usefulness: Has a degree of resonance with potential public health damage.
Quality: Variable as no standardised methodology used.
Comment: Does not define size of potential contamination.

4.10.2 Health indicators

Chem_E1: Mortality from chemical incidents
Availability: Available for 2001 on from ESR/MoH.
Usefulness: Represents direct health effect of exposure to chemical hazards.
Quality: Coronial data therefore good quality – delays of up to one year in reporting.

4.10.3 Action Indicators

Chem_A1: Regulatory requirements for land-use planning
Availability: Available from TLA's under the Resource Management Act.
Usefulness: Useful as an instrument to evaluate the distance between hazardous installations and vulnerable objects.
Comment: This indicator is based on the Seveso II directive and as such needs redefinition.

Chem_A2: Chemical incidents register
Availability: Unavailable.
Usefulness: As with any register may be real changes or ascertainment artefacts.

Chem_A3: Poison centre service
Availability: Available.
Usefulness: Indicates presence or absence only and not function or performance.

Chem_A4: Medical treatment guidelines
Availability: Available from national poison centre and hospitals.
Usefulness: Provides information on the potential for effective treatment.
Quality: Good if based on evidence and updated in a timely fashion.

Chem_A5: Government preparedness
Availability: Available from civil defence.
Usefulness: Indicates a country's the level of sophistication.

4.10.4 Extended Set Indicators

Chem_ext1: No of chemical incidents
Availability: Available from ERMA (1 July 2000 to 1 July 2001)
Usefulness:

Quality: Under reporting is likely to be more significant in the initial start up period
Comment: Alternative source is the Fire Service.

Chem_ext2: No of exposed people to chemicals
Availability: Currently unavailable
Usefulness: Good population measure of exposure
Comment: In the future, could be calculated using ERMA and ESR data.

Chem_ext3: Annual incidence of people hospitalised for more than 1 day due to chemical incidents
Availability: Currently unavailable, but initial pilot study results indicate that the data could be obtained if resources are flagged for this.
Usefulness: Better sensitivity and precision as a measure of health effects than morbidity or mortality
Comment: From 2003, this can be calculated using the Chemical injuries surveillance system.

Chem_ext4: Communication with the public
Availability: This composite indicator would require some work to be calculated.
Usefulness: Assesses the capability and resources to mitigate risk
Quality: Subjective and without consistent survey methodology difficult to make meaningful comparisons.

4.11   Workplace

Table 11: Workplace Indicators

Code	Indicator	Availability 0-2	Quality 1-3	Usefulness 1-3
Work_E1	Occupational fatality rate	2	1	3
Work_E2	Rates of injuries	1	2	3
Work_E3	Standardised mortality ratio (SMR) by occupation	2	2	3
Work_E4	Sickness absence rate	0	na	3
Work_E5	Statutory reports of occupational diseases	2	2	3
Work_ext1	self reported work related illness	1	1	3
Work_ext2	voluntary reporting systems	2	2	3
Work_ext3	good occupational services coverage	1	2	3

4.11.1 Health indicators

Work_E1: Occupational fatality rate
Availability: Available from NZHIS (1973-1998), OSH (1990-2001), and ACC (1992-2001).
Usefulness: Provides potentially useful measure of workplace health risks.
Quality: Occupational fatality rates are significantly under-reported.

Work_E2: Rates of injuries
Availability: Available from both NODS (1990-2001) and ACC (1992-2001).
Usefulness: Useful measure of the health risk associated with the occupational environment.
Quality: NODS data collection voluntary therefore underreported.

Work_E3: Standardised mortality ratio (SMR) by occupation
Availability: Available from New Zealand Environmental and Occupational Health Research Centre, University of Otago, as a survey from 1985-94.
Usefulness: A single summary measure comparing mortality rates between the general population and a particular occupational group
Quality: Debatable, as limited data on attribution of the cause of death and accurate description of occupation.

Work_E4: Sickness absence rate
Availability: Not available.
Usefulness: Potentially useful measure of the overall well being of the work force.
Quality: Problems of data consistency and availability

Work_E5: Statutory reports of occupational diseases
Availability: Available from NODS
Usefulness: Can be used to infer deterioration in the quality of the working environment and control of workplace health risks.
Quality: Occupational diseases are very significantly under-reported.

4.11.2 Extended Set Indicators

Work_ext1: Self reported work related illness
Availability: some data is available from NODS but it is a voluntary reporting system
Usefulness: debatable
Quality: underreporting is common

Work_ext2: Voluntary reporting systems
Availability: NODS is a voluntary system that anyone can use to notify a health- related condition which is suspected to arise from work.
Usefulness: Any voluntary system has inherent problems with completeness.

Work_ext3: Good occupational services coverage
Availability: Some data is available from OSH.
Usefulness: provides a measure of the workplaces complying with good practices
Quality: difficult to derive national figures

5.   DISCUSSION

5.1   General

The proposed WHO indicator set would provide a useful initial benchmark for NZ internationally and in so doing, a focus for the consolidation of data on environmental exposure, health outcome and public health action. It potentially provides a springboard for refining action on data collection, collation and analysis and making better evidence based decisions for public health locally, regionally and nationally.

There already exists a wealth of data, collected at various levels in New Zealand to establish appropriate indicator sets for environmental health. There is little justification for establishing new monitoring systems. The ability of users to understand and apply EHI's depends on enhancing the process for their utilisation in decision making.

The current analysis illustrates two main data gaps, in the areas of indoor air quality and noise. There needs to be further discussion on whether these need further consideration with regard to the setting up of monitoring systems.

The set of indicators discussed in this report are primarily developed for international benchmarking and as such other indicators need to be developed to reflect the crown's obligations under the Treaty of Waitangi, the cultural diversity of the country and other unique health or environmental issues.

Given the current focus and content of data collection systems locally and internationally, the cost of setting up new systems and other factors, issues raised in this document, be they differing constructs of health, such as Hauora, would best be explored as part of a number of case studies and subsequently reflected within a national framework.

5.2   Data Availability

For the total WHO set including both extended and core set, the data is available for 70% of the indicators. Data is available currently for 74% of the core WHO indicators, being respectively
- 70% for environment indicators,
- 82 % for health indicators and
- 81% for action indicators.

By topic area the relevant figures are:
- air quality (85%),
- indoor air quality (80%),
- housing (60%),
- traffic (100%),
- noise (17%),
- workplace (70%),
- chemical emergencies (71%),

- food safety (100%),
- water and sanitation (83%),
- radiation (100%), and
- hazardous waste (60%).

The significant data gaps [both nationally and regionally] are in the areas of housing, hazardous waste and noise. Some of the other data gaps, for instance in hazardous waste and contaminated land, air quality and housing are already being addressed by the respective agencies.

5.3   Data Quality

The data, especially environmental data is often limited to one particular time period or location, and gathered using different methods in different areas. The lack of standardised methods and a consistent monitoring network is another problem. Hence, data such as air quality data or beach water quality data is only representative of the sites monitored and not of New Zealand as a whole.

Mfe has been working to standardise monitoring methods and developing a set of environment based classification system that can be used to interpret indicator data consistently across the whole country.

The overall quality of the core indicators is 73% and for the core and extended set, 65%. The average quality of the environmental indicators was 69% with the highest scores in radiation and food safety and the lowest in hazardous waste. The average quality of the health indicators was 71% with the highest scores in housing, traffic, chemical emergencies and radiation and the lowest in water and sanitation and workplace. The average quality of the action indicators was 91%.

5.4   Data Usefulness

Interpretation is generally straightforward although the degree of attribution of exposure, effect and action needs exploration and clarification, as do the item and place for the [comparative] use of varying data sets. The overall usefulness of the total core and extended set and the core set alone was found to be 90% each. The traffic and workplace indicators were found to be most useful (100% each) whereas the water (78%) and food(81%) indicators were found to be the least useful.

5.5   Relationship to Other Initiatives

The EHI project has two sets of complimentary links i) with MoH and other ESR projects and ii) with other national and regional organisations.

(i)   National EH Action Plan

The EHI project is closely interlinked with the environmental health action plan project currently being developed. The EHI's would play a role in priority setting and policy formulation. Once the environmental health action plan is established, the indicators can be incorporated as an evaluative framework for action plan.

The EHI's can be linked with other tools like health impact assessment, burden of disease, risk management plans, and economic analysis to provide a more complete picture of the environmental health risk situation in New Zealand and the priority action areas where action needs to be taken.

(ii)   Regional Environmental Health Initiatives

There are several indicator based reporting programmes in New Zealand, the principal ones are:
- Quality of Life in the Six Big Cities
- Ministry for the Environment's Environmental Performance Indicators
- Stats NZ Socio-Economic Indicators
- Ministry of Social Policy Social Report
- ERMA's Hazardous Substances and New Organisms Act effectiveness monitoring
- Regional Councils State of Environment Reporting.
- Stats NZ Sustainability Indicators
- Stats NZ Housing Indicators Project

For a more detailed list of the common indicators between these programmes and the current EHI project, refer to appendix 2. There are also a large number of local initiatives either primarily of a research nature [e.g Taeri Valley project] or relating to other health promotion or community development initiatives.

It is essential to ensure any national initiative adds value by providing the appropriate linkages [including methodology] which are currently lacking in many of these programmes.

5.6   Information Systems

The integration of the various data sets is currently being piloted by WHO in Europe using a novel piece of software called *EuroIndy.* This is a specialised piece of software that enables the user to establish a database system on key environment and health statistics using the above indicators sets, and in so doing present the data and report to users on environment and health links.

5.7 Objectives for Next Phase

The objectives for the next phase are:
* Stakeholder mapping and analysis
* Prioritisation of indicators
* Conducting pilot study
* Describe elements, structure and process of a national EHI system

They are further outlined in the Appendix 3.

7.7.1 Stakeholder Mapping and Analysis
There has been keen interest by other organisations (Mfe, ERMA, Regional Councils, City Councils) in this project. As discussed earlier there are several national and regional indicator projects currently being undertaken and it is important to maintain contact with these organisations throughout the project in order to maximise the value to all parties.

In particular there is a need to develop consensus as to:
* Definition of indicators
* Quality assurance methods
* Data technologies [incl. data transfer]
* Utility of indicators for decision making
* Long term sustainability of environmental health surveillance

7.7.2. Indicator Prioritisation

The prioritisation of the indicators will be finalised through a Delphi process. From the stakeholder analysis, a group of both data holders/providers and end users will be defined. A questionnaire with a summary of this report will be sent to this group for them to assess the quality and utility of the WHO indicator set and invite comment. The next stage would be to assess and prioritise which ones provide the most utility for benchmarking and decision making.

Pilot Study

A national pilot study of two of the sets of environmental health issues is proposed to assess the feasibility of such a system on a national basis. 15 indicators are suggested for piloting, namely air quality and water and sanitation indicators. These two are proposed because they originate largely from regional councils and this will be a good opportunity to trial the transfer of data from a local to a national database and the ability to collate data from disparate sources. This would enable assessment of the information systems as well as the utility of the indicators.

The pilot will also enable us to assessment of the utility of the *Eurindy* software for New Zealand. This pilot study will provide more detailed practical data on data flows, resources needed, the required skill base, and the necessary processes that would be needed for a national roll out.

7.7.4   Elements, structure and process of a national EHI system

The following elements of the system will be described in detail:

- The process to develop and select the final set of indicators outlined
- Detailed data management protocol
- Roles and responsibilities of various stakeholders clearly defined.
- Data analysis and dissemination options

Expected Outcomes

The expected outputs will be:

- Evaluation report of stakeholder needs
- Modified list of both priority and new indicators
- Pilot Study protocol
- Evaluation report of pilot study
- Report on proposed model for national roll out with guidance documents
- Guideline document on integrated environment and health assessments and indicator based reporting
- Case studies to illustrate the development of local indicator initiatives and how they can be integrated into the national set