



Developing Local Government Environmental Health Indicators for South Australia

A Discussion Paper



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Developing Local Government Environmental Health Indicators for South Australia
A Discussion Paper

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2. Acronyms and Abbreviations Used

CDC	The Centers for Disease Control and Prevention (CDC), a part of the U.S. Department of Health and Human Services and the primary Federal agency for public health in the United States.
CDCB	The Communicable Disease Control Branch (CDCB), Public Health and Clinical Coordination Division of SA Health.
CPI	A consumer price index (CPI) is an index number measuring the average price of consumer goods and services purchased by households.
DPSEEA	The DPSEEA (Driving Forces - Pressures - State - Exposure - Effects - Actions) model is useful in designing a system of environmental health indicators within the decision-making context.
EHA	The Eastern Health Authority (EHA) is a regional subsidiary to provide environmental health services for the City of Norwood Payneham & St Peters and the Cities of Burnside, Campbelltown, Prospect and the Town of Walkerville.
EHHE	CDC's Environmental Hazards and Health Effects Program (EHHE) promotes health and quality of life by preventing or controlling diseases or deaths that result from interactions between people and their environment
EHO	Environmental health officers (EHOs) enforce public health legislation in order to promote good health, hygiene and environmental practices.
EHPP	Environmental health paraprofessionals (EHPPs) a proposed technical stream of environmental health to perform some of the more routine environmental health tasks under the supervision of fully qualified EHOs.
enHealth	The Environmental Health Committee (enHealth) has responsibility for providing agreed health policy advice and the development and coordination of research, information and practical resources on environmental health matters at a national level in Australia.
EPA	The Environment Protection Authority (EPA) is South Australia's primary environmental regulator.
GDP	The gross domestic product, or GDP, of a country is one of the ways of measuring the size of its economy. GDP is defined as the total market value of all final goods and services produced within a given country in a given period of time.
KPI	Key Performance Indicators (KPIs) are used to help an organisation define and measure progress toward organisational goals.
LGA	The Local Government Association of South Australia Inc (LGA) provides leadership to Councils and representation to State and Federal governments and other key stakeholders.
NCEH	CDC's National Center for Environmental Health (NCEH) strives to promote health and quality of life by preventing or controlling those diseases or deaths that result from interactions between people and their environment.
NEHS	The Australian National Environmental Health Strategy (NEHS) provides a framework to bring the wide variety of stakeholders together across the range of issues that encompass environmental health.
OECD	The Organisation for Economic Co-operation and Development (OECD) brings together the governments of democratic countries from around the world to support sustainable economic growth, raise living standards, maintain financial stability and contribute to growth in world trade.
OzFoodNet	OzFoodNet is a national health network to enhance the surveillance of foodborne diseases in Australia.
SA	South Australia(n).
WHO	The World Health Organization (WHO) is the directing and coordinating authority for health within the United Nations system.

3. Introduction

The Public and Environmental Health Act 1987 and the Food Act 2001 provide the basis for Local Government public and environmental health activities and reporting in South Australia. Under these Acts, Local Government and SA Health are required to prepare and submit annual reports on their environmental health activities and on the standard of public and environmental health within their respective jurisdictions.

Although these reports have documented the environmental health activities of government, for a variety of reasons they have failed to provide useful information for planning and evaluation purposes. This is largely due to them failing to adequately measure performance and efficiency of government health departments or local environmental health standards.

This is an issue that is not confined to South Australian Governments and it has been widely acknowledged that evidentiary environmental health information is lacking at all levels of government throughout the world. As a result, Australian and other international environmental health authorities are now working to develop national or state based environmental health surveillance or tracking systems. The aim of such systems is to measure defined indicators that provide useful information to health authorities for prioritising and targeting interventions.

These systems are in various stages of development and although currently lagging behind, it is likely that a national system will ultimately be implemented in Australia. However, the information provided by such a system is unlikely to be of satisfactory resolution or relevance to inform Local Government environmental health activities.

It is hypothesised that the environmental health data collected from local government could be utilised for the preparation of well designed environmental health indicators. This would enable the evaluation of services and conditions based on local evidence and the tailoring of future activities according to local priorities. Local indicators would also complement future national and state environmental health surveillance systems. Consistent evidentiary reporting would allow for the preparation of an environmental health report similar to the State of the Environment (SoE) report (EPA 2003), as well as individual government environmental health report cards. Simple, quantifiable and easily understood reports such as these would assist state and local government environmental health departments in lobbying for funding by providing a more convincing justification of expenditure and allowing the demonstration of efficiency gains. This said, the ultimate goal is to better target and improve population health outcomes and provide greater transparency and accountability in South Australian government environmental health activities.

It is the purpose of this paper is to stimulate discussion on this issue through the provision of:

- > a brief review of the current literature;
- > a review of past Public and Environmental Health Act 1987 reports;
- > recommendations on methods for the development and application of South Australian local government environmental health indicators; and
- > important considerations to be made when doing so.

4. What is Environmental Health?

The term environmental health is somewhat counter-intuitive and often misunderstood by people who are not directly involved in the sector. It is easy to see how it could be interpreted as relating to the health and sustainability of the natural environment as a result of the impact of human activities. However, these are actually the fields of environmental management and protection.

In fact, the health component of environmental health refers to human health on the population or sub-population level. The most widely cited and accepted definition of health in this context is offered by the World Health Organization (WHO), which has defined health as “a state of complete physical, social and mental wellbeing and not merely the absence of disease or infirmity” (WHO 2008).

Environmental health is defined as those aspects of human health and disease that are determined by factors in the environment including both the direct pathological effects of chemicals, radiation and some biological agents, and the effects (often indirect) on health and wellbeing of the broad physical, psychological, social and aesthetic environment (including housing, urban development, land use and transport) (WHO 2004a). In the context of environmental health, the environment includes all aspects of both the natural and anthropogenic worlds which can affect human health as a result of physical, chemical, biological or social/psychological influences (Briggs 2003; HDA 2002).

Environmental health is also a professional discipline. According to the Australian National Environmental Health Strategy (NEHS) 1999:

“Environmental Health practice covers the assessment, correction, control and prevention of environmental factors that can adversely affect health, as well as the enhancement of those aspects of the environment that can improve human health” (Commonwealth of Australia 1999).

Environmental health practice is commonly focussed on the physical, chemical and biological environmental influences on population health. However, the Australian National Environmental Health Strategy 2007-2012 specifies that factors impacting behaviours are also within the scope of environmental health (enHealth 2007).

Environmental health is considered to be the cornerstone of the broader sector of public health that is “dedicated to preserving, protecting and promoting good health and preventing illness and injury” (Department of Health SA 2007a). There is considerable overlap between the fields of environmental health and environmental protection due to the intrinsic links between environmental sustainability, ecosystem health and human health outcomes. Therefore, the two sectors often work towards similar outcomes for different reasons (Commonwealth of Australia 1999).

5. The Impact of the Environment on Human Health

In 2007, the WHO released country profiles of the estimated environmental burden of disease for all of its 192 member states (WHO 2007a). Australia's report card suggested that 14% of our total burden of disease is preventable through the creation of healthier environments (WHO 2007b).

The surveillance, control and understanding of infectious and communicable diseases is reasonably well developed in industrialised nations. However, this is not the case with non-infectious environmental disease (CDC 2006). Environmental hazards rarely result in immediate illness and adverse health outcomes may result from an accumulation of exposures. As a consequence, the links between environment and health are mostly poorly understood making environmental health tracking far more complex than traditional infectious disease surveillance (CDC 2007).

In 2000, the Pew Environmental Health Commission reported that the American Public Health System was operating without even the most basic knowledge of health trends related to the environment, particularly with regards to chronic diseases suspected to be linked to environmental factors (PEHC 2000). The Pew Report noted that many diseases linked or suspected to be linked to environmental factors (particularly pollutants) were on the increase and include: auto-immune diseases, learning/developmental and neurological diseases, cancer, diabetes, asthma and birth defects. It was noted that although EPA pollutant tracking was well established, and communicable disease surveillance was effective in tracking infectious disease, little was known about the distribution of non-infectious and chronic disease. It was this report that initiated the development of a national environmental public health tracking programme in the United States (CDC 2005).

As a result of US\$121 million funding from 2002 to 2006, the American tracking network is now well under development and in the very near future is expected to begin providing accurate and timely intelligence to American health authorities (CDC 2005; CDC 2007). Australia is still in a similar position to where the United States was in 2000, despite a national environmental health surveillance network having been on the agenda in Australia since 1999 (Commonwealth of Australia 1999).

The impact of human behaviour and the resulting health outcomes is one aspect of the environment that has been almost completely overlooked in current surveillance systems, including the extensive American tracking system (which is highly focussed on chemical exposures).

An example to illustrate the complexity of this human behaviour/environment relationship is the excessive reliance on motor cars (the human behaviour) in developed nations having a significant influence on the emergence of the global obesity epidemic (the health outcome). The health outcome is believed to be a product of a number of related factors, including a reduction in walking and bicycling as regular means of transport and increased access to convenience 'junk food'. Fear of crime and lack of easily accessible public open space are also believed to be factors resulting in reduced outdoor activity, particularly in children (Kjellstrom et al. 2007).

6. Environmental Health History and Practice

Early in the 20th Century, much of the disease in industrialised countries resulted from outbreaks of infectious disease such as cholera, tuberculosis, smallpox, malaria and polio. By the 1950s, a dramatic transition was observed in the burden of disease from infectious diseases to diseases and conditions with at least some degree of association with environmental factors (e.g. obesity, cancer, asthma, autism, diabetes and birth defects) (CDC 2005; CDC 2007; Goldman & Coussens 2004). On the positive side, it is believed that this transition away from infectious disease resulted from the success of combined public health measures such as water disinfection, food safety regulations, immunisation and improved housing conditions. On the negative, the transition to chronic disease was impacted on by increased pollution, the ubiquitous distribution of new synthetic chemicals and dramatic changes in social structure. It is now widely recognised that most of these chronic diseases are not curable, yet in most cases are considered preventable (Government of South Australia 2007).

Chronic illness is now estimated to cause 70% of all deaths in the US and costs approximately US\$325 billion per year (CDC 2007). In Australia, asthma, cancer, cardiovascular disease, diabetes mellitus, injuries, mental health, arthritis and musculoskeletal conditions, and dementia accounted for 72.8% of the total burden of disease and injury in 2003. Cancers (32.0%), cardiovascular disease (29.0%) and injuries (11.0%) were responsible for almost three-quarters of the fatal burden. In the same year, infectious and parasitic diseases were estimated to be responsible for only 1.7% of the total Australian disease burden (AIHW 2007).

As a result of the growth of the individual and predominantly remedial (medical intervention focussed) healthcare industry throughout the 20th Century, public and environmental health was relegated to the position of poor cousin, both in popular profile and allocation of resources. In addition, because the majority of links between environment and health are poorly understood and difficult to demonstrate through traditional scientific methods, environmental health has remained narrowly focussed on specific agents (particularly biological) and environmental compartments for which standards, based on direct, substantiated and biologically plausible toxic, infectious or allergenic mechanisms exist (Goldman & Coussens 2004; Morris et al. 2006).

In Australia, administrative responsibility for public health law is divided between central (State Government) and local (Local Government) authorities. Local Government environmental health departments are largely responsible for implementing public health legislation within their jurisdictions, and State Government is responsible for policy development and ensuring that Local Government satisfactorily performs their legislative duties (Reynolds 2004). As such, Local Government environmental health officers (EHOs) operate on the 'front-line' and are the most publicly obvious and recognisable of all environmental health practitioners.

However, the agencies and practitioners involved in the broader environmental health effort are diverse and their approach is often times fragmented. Participants include: state health departments, environmental protection authorities, families and communities departments, researchers, academics, policy officers, urban planners, engineers, administrators, managers and allied health professionals to name a few (CDC 2006; Commonwealth of Australia 1999).

In hindsight, the separation of environment and health in the late 20th Century through the creation of environmental protection authorities has arguably been responsible for the greatest fragmentation of environmental health responsibilities (CDC 2007; Goldman & Coussens 2004). This appears to be a result of the accompanying creation of an artificial distinction between environmental impacts and human health. This is further compounded by the public health tradition of focussing on the prevention of disease, rather than the creation of environments that are consistent with and that promote human health (Morris et al. 2006).

7. Environmental Health Indicators

7.1 What are environmental health indicators?

Indicators are commonly used to express things that cannot be directly seen or measured and have been adopted in a variety of fields including: economics, environmental protection, ecologically sustainable development and social demographics (Briggs 2003). Some common examples of key national indicators used in Australia are gross domestic product (GDP), consumer price index (CPI) and unemployment rate (ABS 2007). Businesses and other organisations commonly define and measure key performance indicators (KPIs) in order to compare their performance to previous results and specified organisational goals. Indicators are based on data, but add value to the data by expressing it in a way that is more relevant and comprehensible to the user (Briggs 2003).

The relationships between environmental hazards (including infectious agents) and human health outcomes are complex and poorly understood. In many instances, clear and measurable links are not available (CDC 2006). As such, environmental health indicators are required to summarise, understand and monitor the complex relationships between hazards, exposures, interventions and human health outcomes (Dreyling et al. 2007; Goldman & Coussens 2004). In attempting to create indicators that condense these complex interactions, it is necessary to make certain assumptions and strike an appropriate balance between scientific certainty, feasibility and simplicity (Corvalan et al. 2000). Such trade-offs and assumptions must be well documented and taken into consideration when interpreting the results reflected by indicators.

Environmental health indicators provide concise and useful information about the health status of a population and the environmental factors that are known or suspected to be associated with human health effects (CDC 2006; Goldman & Coussens 2004). While it would be desirable to have indicators that provide a predictive capability for emerging issues, in reality they are usually developed to monitor an existing issue as they are generally developed after a need to know is determined (Briggs 2003). Indicators are created to meet needs and as such they must be reviewed regularly and modified as these needs change (Briggs 2003).

7.2 Uses for environmental health indicators

Environmental health indicators are used for assessment or evaluation. In particular, they are used to provide information over time on status and trends in environmental hazards and exposures that are linked to health outcomes, and public health outcomes related to environmental exposures (CDC 2006).

Indicators convert data to information, and effective action requires information (Briggs 2003). The effective use of well designed environmental health indicators can strengthen the capacity for action that aims to improve the health of the target population (WHO Europe 2004). It is preferable to use quantitative data where possible, as numerical information is usually given the highest regard in western cultures (Eyles et al. 2002).

The values generated by indicators in isolation present little useful information. It is only when the same indicators are compared to historical results, to other locations or to predetermined goals or standards that they become an indispensable evaluation tool (Drew et al. 2000). Visualising indicators spatially, temporally and in relation to one another assists environmental health agencies in the prioritising of activities, interventions and public risk communication (Dreyling et al. 2007; Goldman & Coussens 2004; WHO Europe 2004).

Indicators allow conditions and achievements in different areas to be compared to target action and allocate resources, monitor the effects of interventions, raise awareness of

environmental health issues across different stakeholder groups and investigate potential links between environment and health (WHO 1999). They can also be used to track program and service delivery performance through links with goals and objectives (Briggs 2003; CDC 2006). Indicators can assist in accounting for expenditures and in the identification of opportunities for more efficient delivery of environmental health services (Drew et al. 2000). Reports generated from well designed environmental health indicators can aid in policy development, guide research, develop program initiatives and be used as instruments for lobbying and awareness raising (Briggs 2003; CDC 2006).

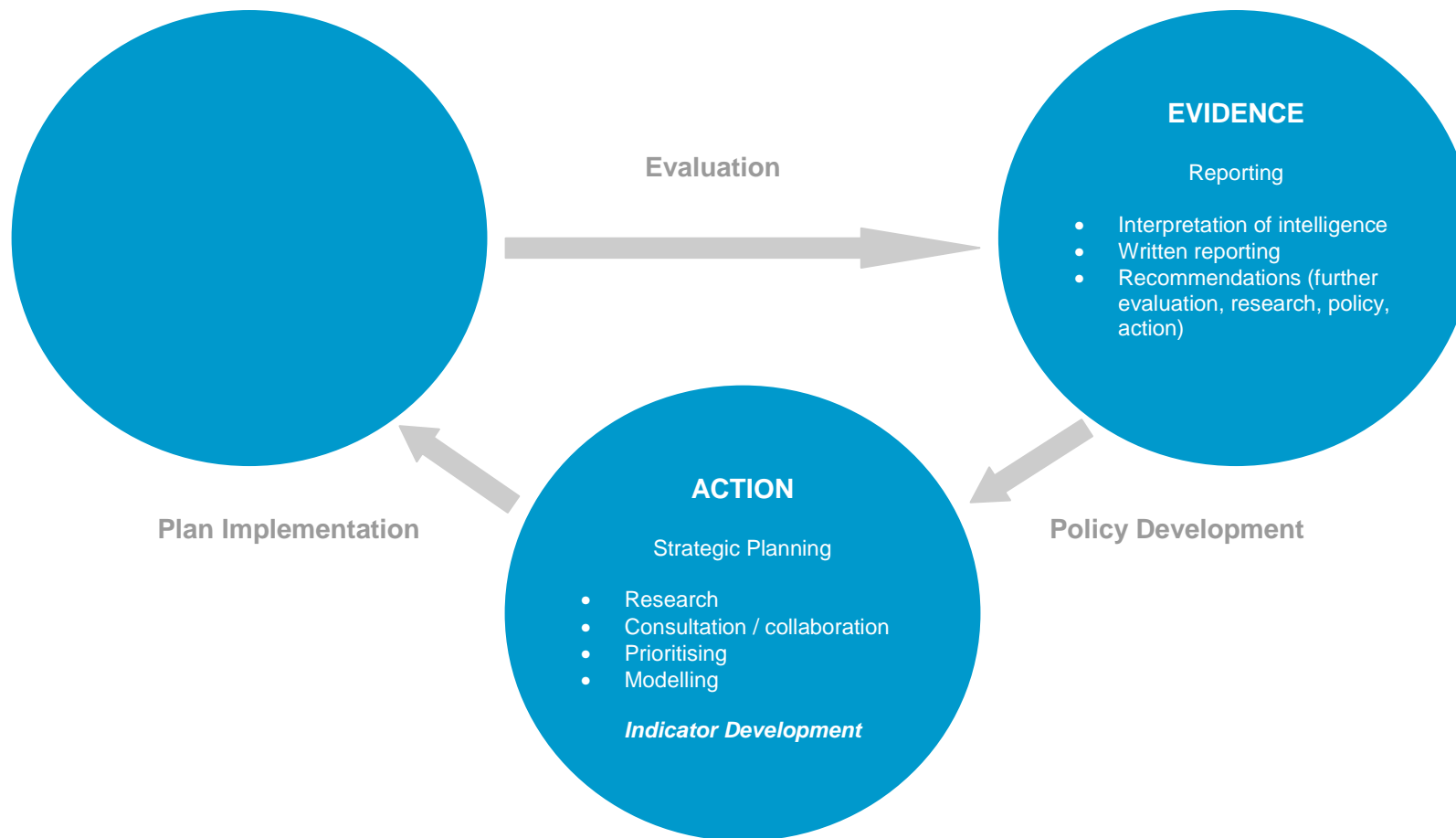
The benefits of indicators are maximised when they are built into a broader strategic planning process. Tracking is the desired outcome of indicators but this alone has limited benefit unless it provides the intelligence crucial to the strategic planning, implementation and evaluation of public and environmental health practice (Dreyling et al. 2007).

In strategic planning for environmental health, indicators should be an integral part of the strategic plan development process to allow the implementation of the strategy to be measured, evaluated and enforced. Figure 1 (pg 12) illustrates the key components and processes of a cyclic and proactive integrated strategic environmental health management system, and the position and importance of environmental health indicators within such a system.

In developing a strategy, a set of manageable priority issues (based on broad consensus) need to be chosen upon which the strategy will be built and includes positive (health promotion) and negative (disease prevention) outcomes. For each specified health priority, a map of the environmental health territory can be produced using an existing or modified model (i.e. DPSEEA – see Section 7.4). If the reporting is ignored when formulating future planning and decision making, valuable resources are wasted. In the past and still today, the mixture of environmental health services has rarely been the result of this scientifically calculated or strategically planned process (Drew et al. 2000).

Figure 1

A strategic approach to environmental health management (adapted from Morris et al. 2006 and Drew et al. 2000).



7.3 Ideal indicator attributes

Environmental health indicators should:

- > reliably predict the relationship between human health and the environment;
- > provide a relevant and meaningful summary of conditions of interest;
- > be routinely collected; and
- > have accepted definitions and data collection standards.

They should be measurable, valid, reliable, trackable over time, understood by diverse populations, informative (to the public and responsible agencies), tied to public health objectives and action oriented (CDC 2006; Drew et al. 2000; WHO 1999).

The following eight selection criteria for environmental health indicators were suggested by enHealth and adopted by the Victorian Environmental Health Indicator Project (Kingsland 2006).

- > Salient (reflect community concerns).
- > Simple (clear and measure one item).
- > Comprehensible (to users, public, policy makers).
- > Scientifically sound (well established link between exposure and outcome).
- > Sensitive to the change they are meant to track.
- > Measurable (comparable, quantifiable).
- > Viable (to collect).
- > Robust (capable of being updated regularly).

7.4 Indicator design and conceptual models

The actual model or modified model that is used for indicator design will depend on its suitability with regards to the particular issue of concern. Listing the indicators needed is the first step in defining and justifying them (Briggs 2003). Briggs (2003) compared the process of designing indicators to that of product design and development as illustrated in Figure 2 (pg 14). Corvalan et al. (2000) also provided detailed suggestions on the sequence of steps to follow when constructing environmental health indicators.

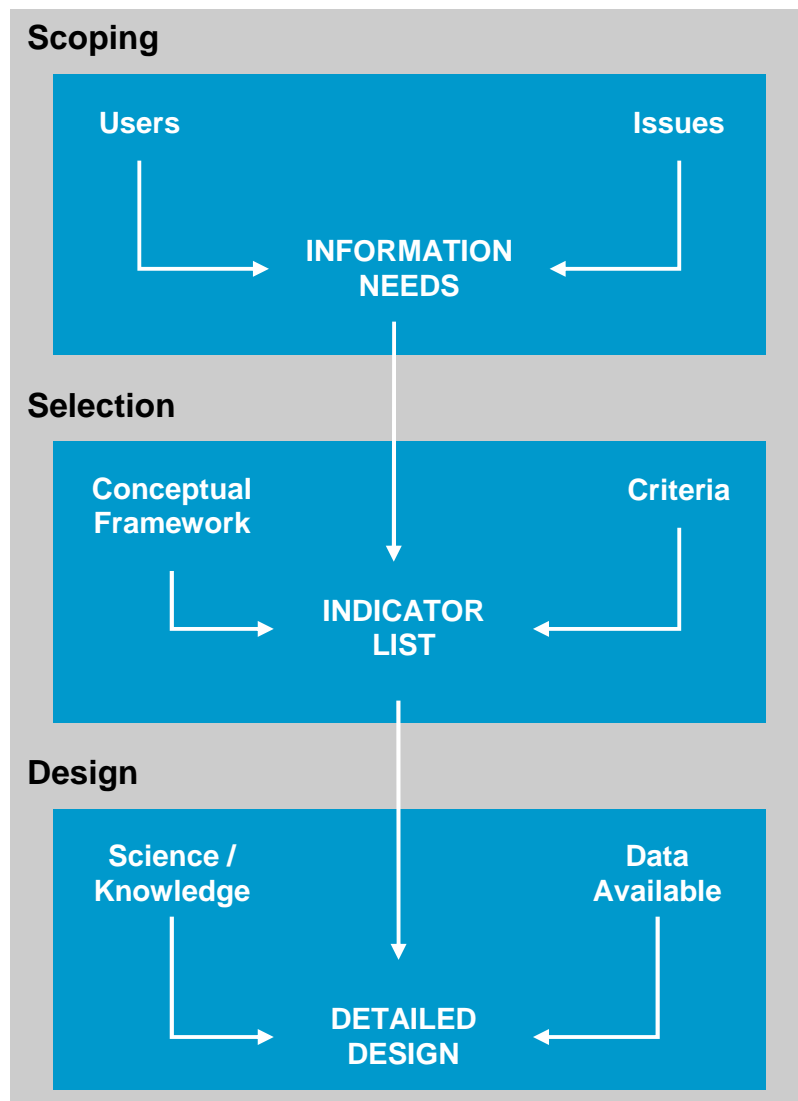
Various frameworks have been devised for use in the development of environmental health indicators. These generally adopt a systematic framework to represent the links between the environment, health outcomes and actions related to specific environmental health issues. As it is impossible and impractical to measure everything, some decisions must be made as to what areas to focus on for indicator design. This structured framework assists in the identification and design of desirable environmental health indicators by mapping out the elements conducive to measurement (Briggs 2003). When developing indicators, it is important to have a clear plan of what criteria are to be evaluated, what data must be collected, and what is the intended use of the results (Drew et al. 2000).

DPSEEA

The WHO uses the DPSEEA framework (Figure 3, pg 16), first proposed in the late 1990s (Corvalan et al. 1999). Indicators are classified according to their position in a conceptual cause-effect chain. (D) Driving forces (the social determinants behind the environmental determinants) motivate and push the environmental forces involved.

Figure 2

The indicator design process as proposed by Briggs (2003).



(P) Pressures are the human activities that change the (S) State of the environment giving rise to hazards, in turn resulting in potential for human (E) exposure to the hazards which can result in health (E) effects. (A) Actions refer to efforts to intervene at various points in the cause-effect pathway and impact positively on the determinants of health (Kjellstrom et al. 2007; WHO Europe 2004).

This model is particularly effective in illustrating risks associated with ambient environmental pollution. However, its utility is limited in respect to other hazards (home hazards, natural hazards, vector borne diseases and physical accidents), socio-environmental health issues, environmental health outcomes that result from multiple exposures or environmental hazards that can lead to multiple health effects (WHO 1999; Briggs 2003). As such, the DPSEEA model has limitations when used for some applications without also considering complex socio-environmental factors (Carneiro et al. 2006).

However, Farchi et al. (2006) managed to successfully apply the DPSEEA model to acute events (road accidents) through the addition of two extra steps (event and risk factors) between exposure and effect on the traditional model. This demonstrated that DPSEEA is a robust model that can be adapted to a range of issues outside of its original focus on ambient exposures (Farchi et al. 2006). Morris et al. (2006) also modified the DPSEEA model to allow for contextual considerations (Figure 4, pg 17).

MULTIPLE EXPOSURE-MULTIPLE EFFECT (MEME) MODEL

The multiple exposure-multiple effect (MEME) model (Figure 5 pg 18) is more effective in representing the complexity of the links between environment and health. It enables the representation of the fact that particular health outcomes may result for many different exposures and causes, and that individual hazards can result in a variety of health effects. However, it does not separate proximal causes (exposures) from distal causes (pressure & state). Actions can be viewed as preventative or remedial as well as targeting the underlying contexts (social, economic, demographic) that may influence the susceptibility of the population to the environmental health effects. This model allows for better inclusion of social/psychological influences on health in addition to physical, chemical and biological hazards (Briggs 2003).

Figure 3

A representation of the DPSEEA framework adopted by the WHO (adapted from: WHO 1999; Briggs 2003; Carneiro et al. 2006).

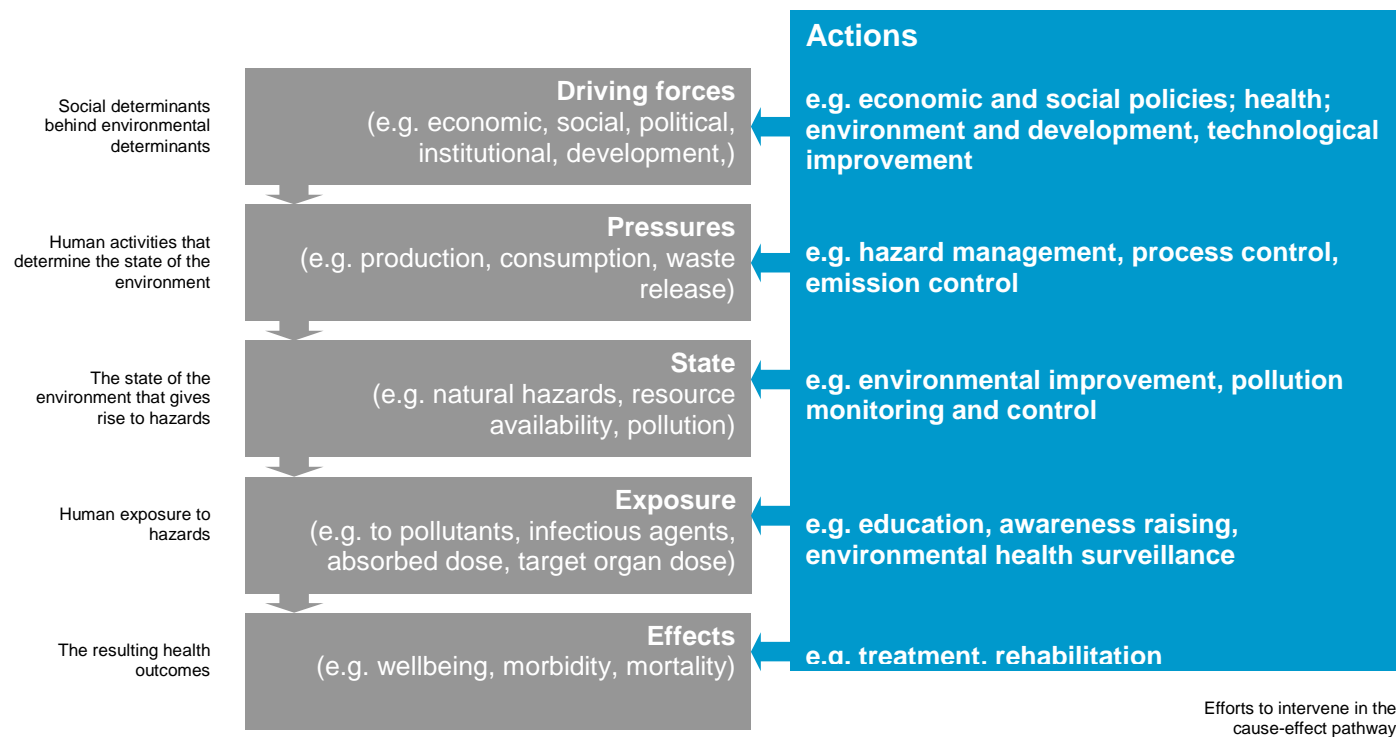


Figure 4

A Modified DPSEEA model including the contextual importance of external influences in determining environmental health outcomes (adapted from Morris et al. 2006).

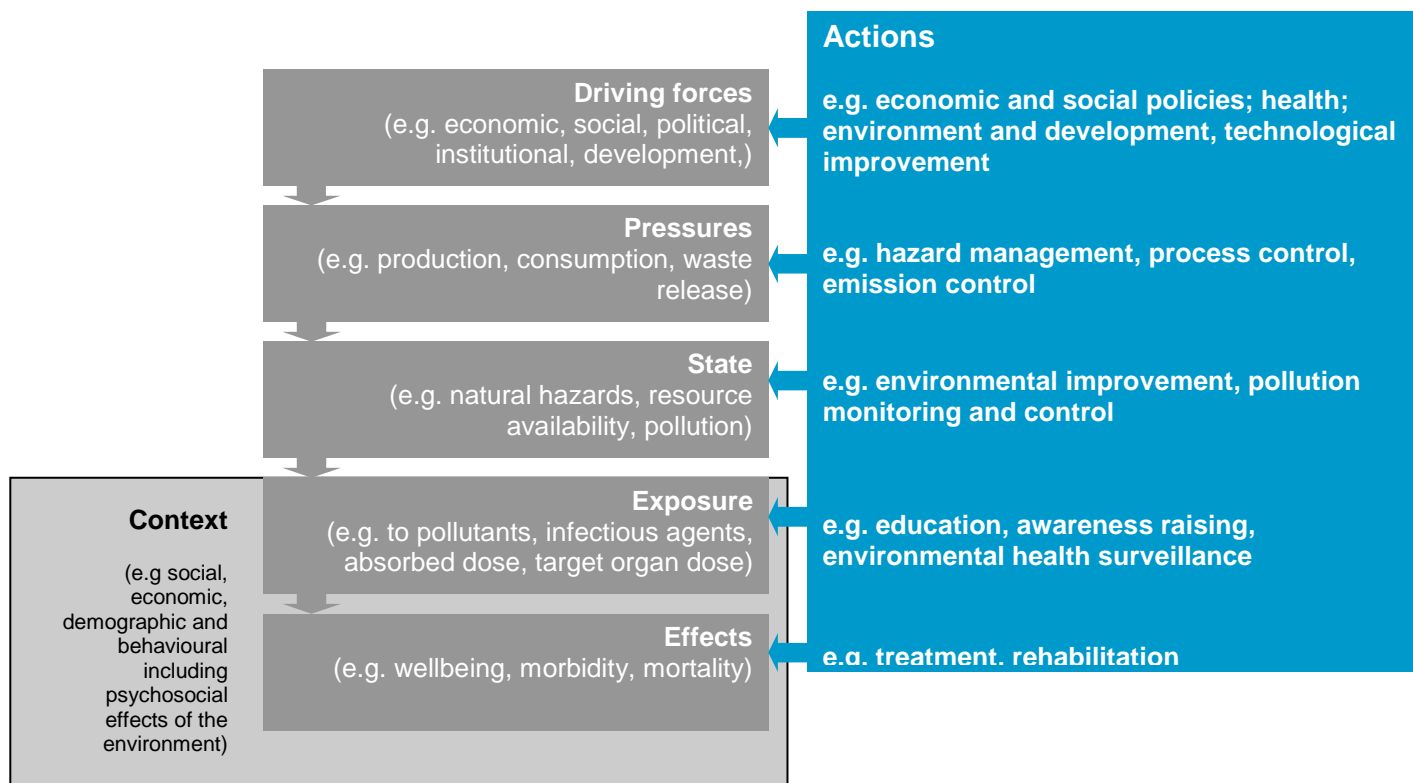
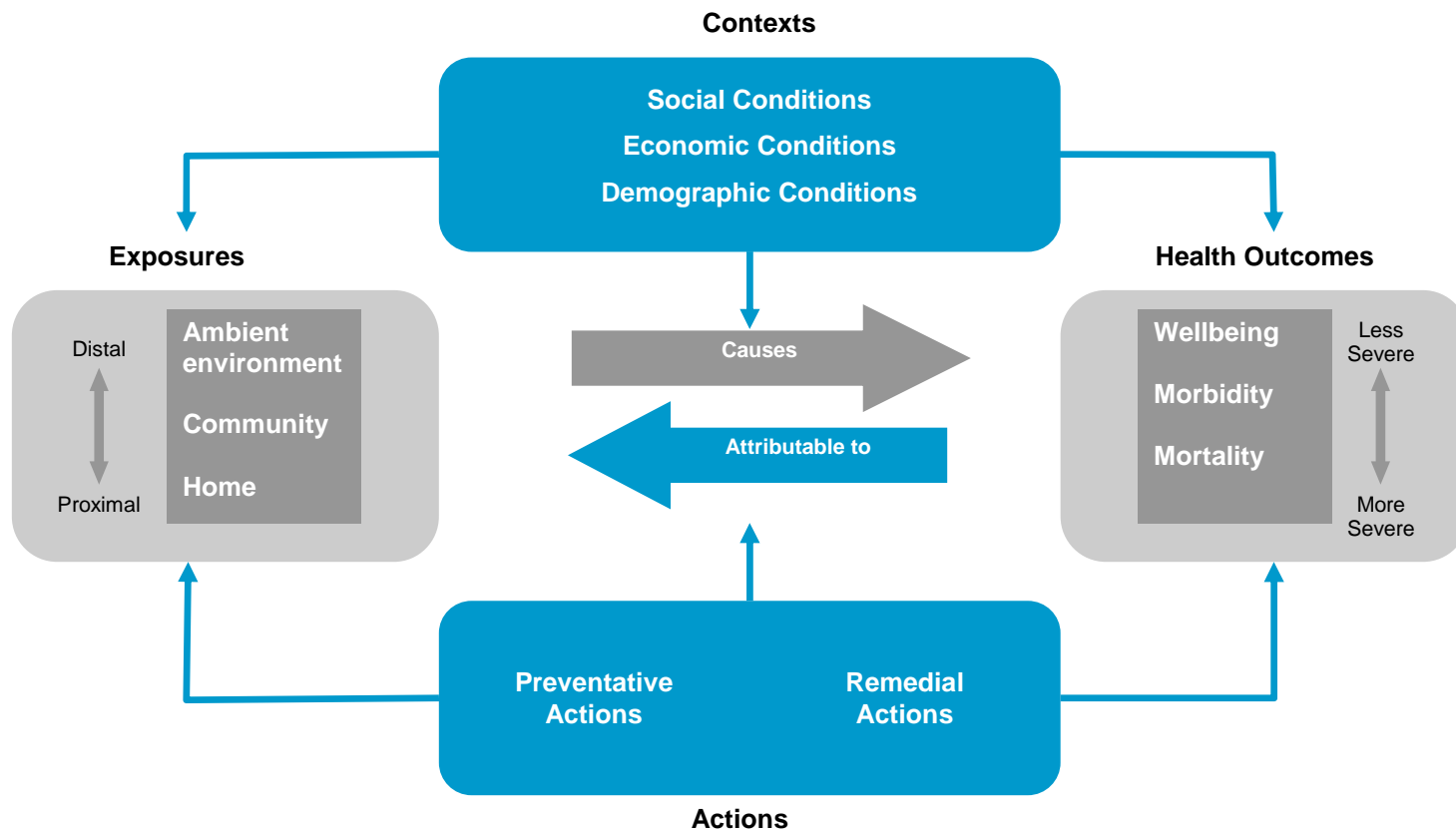


Figure 5

The MEME model is both a simplification and extension of the DPSEEA model (Briggs 2003).



7.5 Indicator development challenges

Local Government environmental health indicators can only be effective if they are well designed for their purpose, widely supported and part of an overall integrated system which includes planning, reporting and regular review processes. The rationale behind indicators should be explained to those people expected to collect the data, otherwise they may see it as unnecessary work. It is important to recognise that indicators are rarely able to provide definitive answers. However, they will often suggest the questions to ask that will deliver the desired answers (Pencheon 2008).

The development of indicators is particularly challenging. Indicators must provide a relevant and meaningful summary of the conditions of interest, but condensing these complex environmental relationships into a quantifiable measure is difficult. Indicators must be transparent, testable and scientifically sound, but the links between environmental exposures and health outcomes they are intended to reflect are poorly understood. Indicators must be cost effective to compile and apply, yet the existing data collection practices they often utilise are not ideal as they are usually collected for a different purpose (WHO 1999). Although not an exhaustive list, the following three areas must be considered in indicator development.

Data

Well designed indicators produced from poor quality data will have little value and therefore it is crucial that indicators be fed with the best possible data available (Pencheon 2008). Before aspiring to develop and use indicators, it is necessary to be prepared to invest in the data collection and processing required to effectively utilise them (Briggs 2003). The comparability of indicators over regions is often limited by deficiencies in data collection and reporting methodologies (WHO Europe 2004).

Evaluation

Although indicators are intended to simply summarise activities or outcomes for monitoring and evaluation purposes, many people are reluctant to participate in their development or use as they feel that they are being judged under circumstances they cannot control (Pencheon 2008). In such circumstances, there is a risk that service activities will only focus on the criteria that are subject to indicator measurement. As part of the indicator development process, emphasis on the educational aspect of evaluation goes a long way towards reducing confrontation and increasing collaboration between those being evaluated and those doing the evaluating (Drew *et al.* 2000). When designing and using indicators it should be highlighted that their purpose is to increase understanding, not to find fault or direct blame (Pencheon 2008).

Gaming

The imposition of indicators can also result in a phenomenon known as 'gaming'. This is where people manipulate the system to meet the target set by the indicator, rather than addressing the underlying issue that the indicator is designed to measure (Pencheon 2008).

7.6 Indicator projects

For the purposes of this project, a sample of indicators projects across the world were examined. These are not the only indicator based environmental health surveillance projects worldwide. Other countries including Brazil, Cuba and Canada are also working on and/or using environmental health indicators (Carneiro *et al.* 2006).

United States of America

The Centres for Disease Control and Prevention (CDC), National Centre for Environmental Health (NCEH) and Division of Environmental Hazards and Health Effects (EHHE) in the United States, have developed a set of core environmental health indicators in eleven broad categories for further evaluation (CDC 2006).

In total, 36 indicators have been proposed by the project, in categories of: hazards, exposure, health effect and intervention, a model that adapted structural components and concepts from the Organisation for Economic Co-operation and Development's (OECD's) Pressure State Response (PSR) model and the WHO's DPSEEA model. Indicators are further classified as core, optional or developmental (CDC 2006).

WHO

In 1999 the WHO proposed a framework and methodology for environmental health indicators. Their framework listed 48 indicators divided into twelve broad categories (WHO 1999).

In 2004, a project co-funded by the WHO and European Union identified seventeen core European community environmental health indicators that were ready and recommended for immediate implementation. The indicators were divided into seven broad categories, and included indicators on exposure, effects, and actions from the DPSEEA model (WHO 2004b).

New Zealand

New Zealand is also working towards a National Environmental Health Information system based on indicators. The first report was produced in 2004, utilising 25 indicators based on the DPSEEA framework, which were grouped within five broad categories (Khan *et al.* 2004).

Australia (Victoria)

In 2006, Victorian Public Health published a discussion paper, claiming to be the first attempt at a state level to introduce a comprehensive environmental health surveillance system in Australia (Kingsland 2006). The proposed Victorian system used the modified DPSEEA model developed by the CDC, with indicator categories of: hazards, exposure, health effect and action. Sixteen indicators were proposed for immediate use in seven categories. A further 56 indicators, categorised as future or developmental, were also proposed.

Table 1 (pg 21) lists the broad indicator categories used in the five different environmental health indicator projects that were reviewed.

Table 1

The broad categories used in or proposed for various worldwide environmental health indicator systems.

Environmental Health Indicator Categories (CDC Indicator Project)		
Air, Ambient (Outdoor)	Noise	Toxics and Waste
Air, Indoor	Pesticides	Water, Ambient
Disasters	Sentinel Events	Water, Drinking
Lead (Pb)	Sun and Ultraviolet Light	
Environmental Health Indicator Categories (WHO Framework)		
Socio-demographic context	Access to safe drinking water	Food safety
Air pollution	Vector-borne disease	Radiation
Sanitation	Solid waste management	Non occupational accidents/injuries
Shelter	Hazardous/toxic substances	Occupational health risks
Environmental Health Indicator Categories (For European Implementation)		
Air quality	Noise and health	Water and sanitation
Housing and health	Traffic accidents	Chemical emergencies
Radiation		
Environmental Health Indicator Categories (New Zealand)		
Air quality	Drinking water quality	Recreational water quality
Traffic	Radiation	
Environmental Health Indicator Categories (Victoria)		
Water quality	Air quality	Climate and geography
Built environment	Food safety	Land contamination
Vector-borne disease		

7.7 The suitability of proposed indicators for SA local government

Of the indicator based environmental health surveillance systems investigated, only the American CDC system is intended to meet the information needs of local government environmental health agencies and local communities. The other systems would be of primary benefit for the development of state or national policies and interventions, but they lack the resolution to provide targeted interventions or drive priorities and expenditure at a local government level.

However, while many of the CDC indicators (CDC 2006) may be suitable for an Australian state or national environmental health surveillance system, most are still beyond the capacity and jurisdiction of local government. The data to construct many of these indicators may already be collected in Australia (Census, EPA, CDCB, and OzFoodNet). However, the resolution of the data in most cases would not be at the Local Government level and monitoring does not always occur consistently state-wide.

Many of the WHO indicators (WHO 1999) are more applicable to developing rather than industrialised nations, or are more suited for use as national or state-wide indicators. However, some may be suitable for use in Aboriginal communities where sanitation, disease and other health standards often mirror those of developing nations. Some of the WHO socio-demographic indicators (e.g. poverty, population density, dependent population and population growth rate) would be worth including, as correlations between these indicators and exposures/health outcomes may be recognised over time.

Some other WHO indicators that may be useful at a local level are the: percentage of population receiving piped water to the home, incidence of outbreaks of water borne disease, tonnage of waste collected per annum per capita, effectiveness of official systems for the identification, management and clean up of contaminated land and incidence/outbreak rate of food-borne illness per capita.

Most of the European WHO indicators would be more suited for state-wide analysis and are beyond local government scope (WHO 2004b). Similarly, New Zealand's indicators are more suitable for state/national analysis and unlikely to be feasible with local government area resolution (Khan *et al.* 2004).

Most of Victoria's indicators also have state-wide focus with unlikely data resolution available for local use. However, some of their suggested indicators have local potential (with some modification), including: illness associated with swimming pools, access to fluoridated water, hot days > 35C, km of dedicated cycle/walking trails, public open space, distance to open space, noise complaints, foodborne outbreaks and land contamination. Indicators such as number of harmful algal blooms and beach/river water quality may also be applicable in some areas (Kingsland 2006).

8. SA Local Government Environmental Health

8.1 South Australian Local Government

There are 68 local councils in South Australia (19 metropolitan, 47 regional and 2 outback). The remainder of the state, which includes approximately 85% of the geographical area, remains unincorporated (LGA 2008). Figures 6 and 7 (pg 24) illustrate the council borders and regions.

8.2 Local Government Environmental Health Obligations

In South Australia, the key statutory environmental health obligations of Local Government are specified in three South Australian Acts of Parliament (*Public and Environmental Health Act 1987*, *Food Act 2001* and *Local Government Act 1999*) and associated regulations. Table 2 (pg 25) quotes the relevant sections. There are three other pieces of legislation under which some local government EHOs operate. However, they only apply to a small number of councils (*Supported Residential Facilities Act 1992*), are used to rectify some insanitary conditions (*Housing Improvement Act 1940*), or the relevant provisions are administered by councils on a voluntary basis (*Environment Protection Act 1993*).

Figure 6

A map indicating the relative locations of the 47 South Australian regional local councils. The two outback councils are not indicated (LGA 2008).

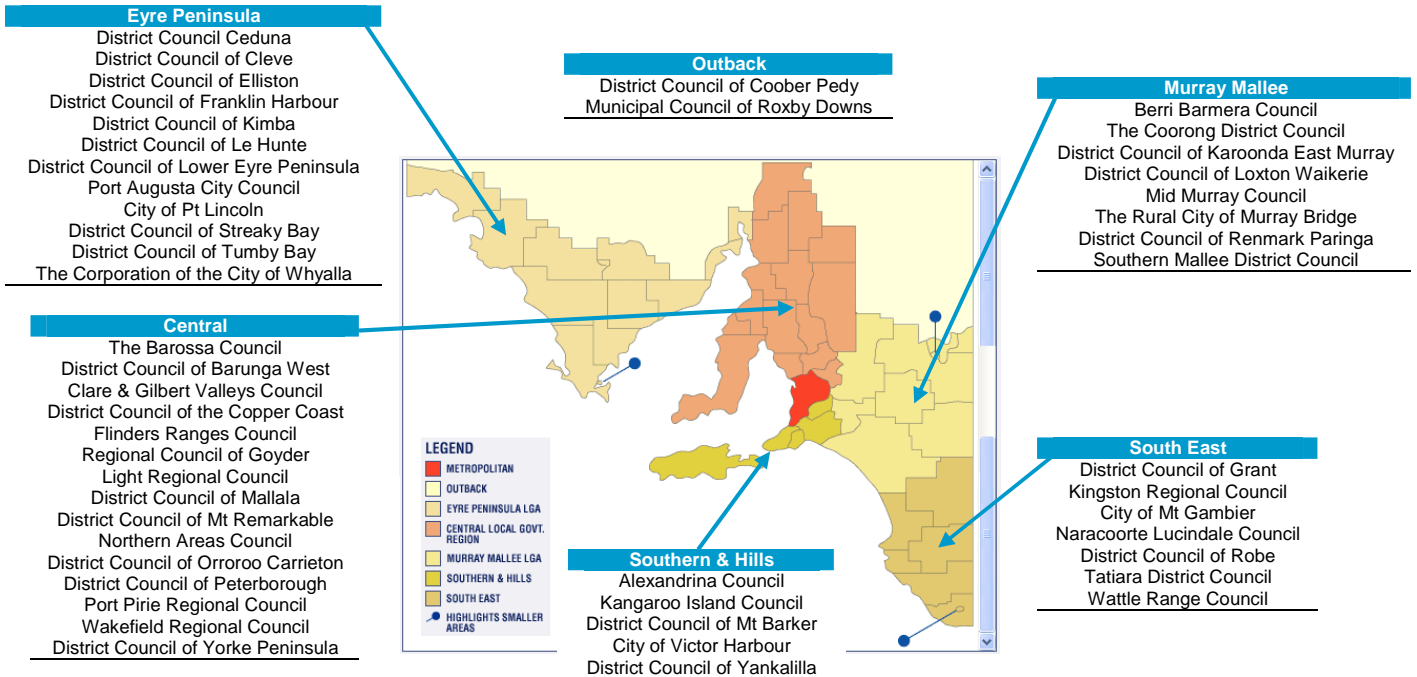


Figure 7

A map indicating the boundaries of the 19 South Australian metropolitan local councils (red area). *The five councils serviced by the Eastern Health Authority (EHA) are also highlighted (darker red) (LGA 2008).

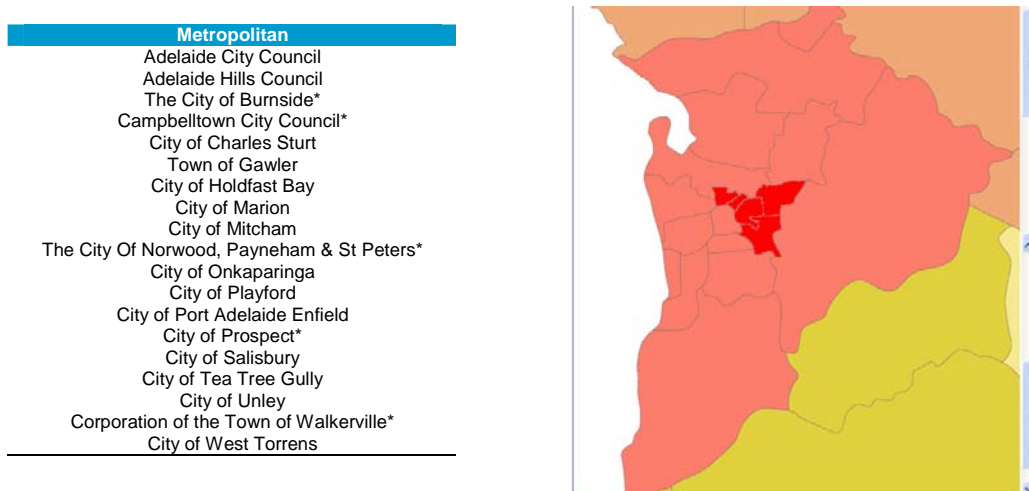


Table 2

A summary of the key statutory environmental health obligations of local councils in South Australia.

Legislation	Relevant Section/Details
Public and Environmental Health Act 1987	<p>12A—Powers and duties of relevant authorities</p> <p>(2) Subject to this section, it is the duty of a local council—</p> <ul style="list-style-type: none"> (a) to promote proper standards of public and environmental health in its area; and (b) to take adequate measures to ensure that the provisions of Part 3 (<i>provisions relating to: prevention of insanitary conditions, control of offensive activities, discharge of wastes in a public place, cleanliness of private thoroughfares, provision of adequate sanitation, and protection of water supplies</i>) are observed in its area; and (c) to take reasonable steps— <ul style="list-style-type: none"> (i) to prevent the occurrence and spread of notifiable diseases within its area; and (ii) to prevent any infestation or spread of vermin, rodents or other pests within its area.
Food Act 2001	<p>In May 2003, a memorandum of understanding (MOU) between the Minister for Health and the Local Government Association of SA Inc (LGA) was signed, specifying local councils' enforcement responsibilities within their jurisdictions (LGA 2003a). The MOU specifies that local councils have the responsibility for the enforcement of the following provisions in appropriate circumstances:</p> <ul style="list-style-type: none"> s.13 Handling of food in unsafe manner s.14 Sale of unsafe food s.16 Handling and sale of unsafe food s.17 Handling and sale of unsuitable food s.21 (1) and (2) compliance with Chapter 3 (Food Safety Standards) of the Food Standards Code
Food Regulations 2002 (under the Food Act 2001)	<p>Part 2—Provisions relating to administration of Act</p> <p>4—Prescription of enforcement agencies</p> <p>(1) For the purposes of the definition of <i>enforcement agency</i> under the Act—</p> <ul style="list-style-type: none"> (a) the Department; and (b) all municipal and district councils under the Local Government Act 1999; and (c) all relevant regulatory subsidiaries, are prescribed.
Local Government Act 1999	<p>6—Principal role of a council</p> <p>A council is, under the system of local government established by this Act, established to provide for the government and management of its area at the local level and, in particular—</p> <ul style="list-style-type: none"> (a) to act as a representative, informed and responsible decision-maker in the interests of its community; and (b) to provide and co-ordinate various public services and facilities and to develop its community and resources in a socially just and ecologically sustainable manner; and (c) to encourage and develop initiatives within its community for improving the quality of life of the community; and (d) to represent the interests of its community to the wider community. <p>7—Functions of a council</p> <p>The functions of a council include—</p> <ul style="list-style-type: none"> (a) to plan at the local and regional level for the development and future requirements of its area; (b) to provide services and facilities that benefit its area, its ratepayers and residents, and visitors to its area (including general public services or facilities (including electricity, gas and water services, and waste collection, control or disposal services or facilities), health, welfare or community services or facilities, and cultural or recreational services or facilities); (c) to provide for the welfare, well-being and interests of individuals and groups within its community; (d) to take measures to protect its area from natural and other hazards and to mitigate the effects of such hazards; (e) to manage, develop, protect, restore, enhance and conserve the environment

9. The Rationale for Developing Local Environmental Health Indicators

9.1 Local Government Environmental Health Activities

Although it is now well recognised that the environment plays an increasingly significant role in a substantial fraction of the overall burden of chronic human disease and poor health, Local Government environmental health services have remained primarily focussed on the traditional sanitary or infectious disease approach of enforcement of legislated standards. It has been suggested that the manipulation of the physical environment to improve health has remained largely unpursued, due to a prevailing status quo mentality, a lack of strategic thinking and a critical lack of evidence for the effectiveness of current environmental health work (Burke *et al.* 2002; Morris *et al.* 2006).

Therefore, the primary functions of most Local Government Environmental Health Officers (EHOs) today are still regulatory in the traditional areas of sanitation, food safety and the control and prevention of infectious diseases. Table 3 (pg 27) provides a summary of the key activities of Local Government EHOs, compiled from the environmental health management plans of five South Australian councils. This table is intended to highlight the fact that the majority of Local Government environmental health activities still relate to the prevention of infectious diseases that only account for an estimated 1.7% of the total disease burden (AIHW 2007).

A 2002 report on environmental health in the United Kingdom made similar observations, claiming that the narrow focus of Local Government EHOs was responsible for a deskilling of many in the profession, and had led to dissatisfaction among existing EHOs and difficulty in attracting students to the profession (Burke *et al.* 2002). In an Australian context, some EHOs who attended focus groups as part of the Victorian Workforce Review reported feeling 'duped' as their actual job focus was far narrower than they had anticipated (Windsor & Associates 2005).

Local Government EHOs tend to be relatively isolated from the broader environmental health workforce as a result of this narrow focus. It is now increasingly evident that Local Government needs to adopt a more collaborative approach involving all of the relevant stakeholders and practitioners (internally and externally) in order to address the diverse range of environmental health issues now facing Australian communities (City of Port Adelaide Enfield 2007).

In an effort to illustrate the current distribution of activities undertaken by council EHOs in SA, three documents were examined:

- > South Australian EHO Workforce Review (Department of Health SA 2004) – as part of this review, South Australian EHOs were asked to divide the percentage of their total EHO work time into four categories (food, public health, development applications and other)
- > 2005 Victorian EHO Workforce Review project (Windsor and Associates 2005) – as part of this review EHOs were also asked to estimate the percentage of their time spent on specific EHO activities; and
- > a business plan from a large South Australian metropolitan council was reviewed, and the listed work plan estimates (largely based on activities in previous years) provided a more detailed breakdown of their annual anticipated environmental health activities.

Table 4 (pg 28) shows the workload estimates from all three documents.

Table 3

A summary of the primary functions of council environmental health departments in South Australia (Adelaide Hills Council 2004; City of Holdfast Bay 2006; City of Mitcham 2006; City of Port Adelaide Enfield 2007; City of Whyalla 1999).

Functional Area	Activities*	Primary hazard type	Primary health concerns	Comments
Food safety	I, En, C, Ed	Biological	Infectious disease	Also physical contamination concern
Pests and vermin	En, C, Ed, M	Biological	Infectious disease, annoyance	Also physical stings
Immunisation	Ed, M	Biological	Infectious disease	EHO mainly administrator
Health inspections	I, En, C, Ed	Biological	Infectious disease	Cooling towers, pools, skin penetration etc
Insanitary conditions	En, C, Ed	Biological	Infectious disease, amenity	Harbourage of pests also a concern
Notifiable disease	C, Ed	Biological	Infectious disease	Minor investigations
On site waste control	I, En, C, Ed	Biological	Infectious disease	Primarily in un-sewered council areas
Residential facilities	I, En, C, Ed, L	Various	Susceptible population	Lodging houses and SRFs
Mosquito control	C, Ed, M	Biological	Infectious disease, annoyance	Greater concern in some locations
Waste control	C, En, M	Biological	Infectious disease, amenity, environment	Solid waste, hazardous waste
Sharps management	C, M	Biological	Infectious disease, amenity	Used syringe collection
Noise	C, En, Ed	Physical	Annoyance, amenity	Limited power – unless EPA administering
Air pollution	C, En, Ed	Physical, Chemical	Respiratory, annoyance, amenity	Limited power – unless EPA administering
Stormwater pollution	C, En, Ed	Biological, Chemical	Infectious disease, toxic chemicals, environment	Limited power – unless EPA administering

* I Routine Inspection, En Enforcement, C Complaint investigation, Ed Education, L Licensing, M Management.

Table 4

An indication of the breakdown of activities of council environmental health departments in Australia (Dept of Health SA 2004; Windsor and Associates 2005).

Activities	% of total environmental health activities while on the job		
	SA Review 2004	Victorian Review	SA Local Council EH work Plan 2006-2007 estimates
Food	38%	46%	36.3%
Inspections/Audits	-	-	21.6%
Enforcements/complaints	-	-	4.7%
General Advice	-	-	1.1%
Other services (e.g. sampling)	-	-	6.8%
Education/promotion	-	-	2.1%
Public & Environ. Health	35%	44%	47.6%
Health premises inspections	-	9%	5.3%
Enforcements/complaints	-	9%	31.6%
General advice	-	-	1.3%
Other services	-	19%	7.9%
Education/promotion	-	2%	0.5%
Immunisation	-	5%	1.1%
Other	18%	10%	16.1%
Management/strategic initiatives	-	-	8.7%
Corporate issues	-	-	3.9%
Other activities	-	-	3.4%
Development applications	9%	-	-

It is not claimed that these figures are entirely representative of the distribution of environmental health activities in all South Australian Local Government. However, as the Local Government estimates do not significantly disagree with the state-wide averages from the workforce reviews, it is likely that they are useful as a rough guide.

Figure 8 (pg 30) presents the same Local Government estimates broken down by activity type only (without division amongst various issues). This gives a clearer representation of what council EHOs do. It appears that investigating complaints (reactive) is a primary function, followed by routine and follow up inspections (regulatory). These combined activities account for over 60% of the total environmental health activities. Consistent with this finding, the local council forecast for the 2006-2007 year was that only 2.6% of their EHOs time would be spent on proactive educational/health promotion activities.

This and anecdotal evidence demonstrates that the general scope of Local Government EHO activities are regulatory and reactive with a narrow focus on predominantly infectious disease. This approach raises a number of issues including:

- > Does this narrow focus on 1.7% of the disease burden mean that Local Government is not meeting their legislative responsibilities to maintain adequate standards of health?
- > Are there more efficient ways of delivering the same and new services?
- > Could these highly trained individuals (EHOs) be better utilised tackling big picture emerging issues and overseeing a lesser trained workforce of inspectors and complaints investigators?
- > Are Local Government EHOs getting good results as far as health outcomes are concerned in the areas on which they focus?

Without a sound evidence base, it is difficult to answer these questions as nobody really knows. This emphasises the need for a consistent and simplified evidence base to target and evaluate environmental health services.

Environmental health services are particularly hard to evaluate as they generally aim to produce a non-event or reduce the risk of a particular adverse health outcome. Demonstrating that a particular service or intervention prevented an undesirable situation from occurring is problematic and open to dispute as to whether that particular intervention was effective. Levels of complaint are often used as a proxy measure of service effectiveness in this regard but these are highly variable and subjective. The vagaries of these measures affect the ability to make convincing arguments to justify current or increased services levels or funding for interventions.

Figure 9 (pg 31) attempts to explain the factors that have resulted in and perpetuated the current narrow focus of local government environmental health services. It is proposed that there are three main factors involved.

- > **ACTION** - In the absence of evidence, the focus and current activities of such services are predominantly determined by meeting perceived legislative requirements and responding to complaints.
- > **PROFILE** - As a result, Local Government environmental health has an identity problem. Unable to prove the efficiency of their current activities, EHOs are undervalued in the community and within government.
- > **FUNDING** - As a result, resources are only provided to maintain existing activities ('because that's how we do it') and the status-quo is maintained.

Figure 8

The breakdown of forecast activities of council environmental health officers in the 2006-2007 financial year at a large metropolitan council in South Australia.

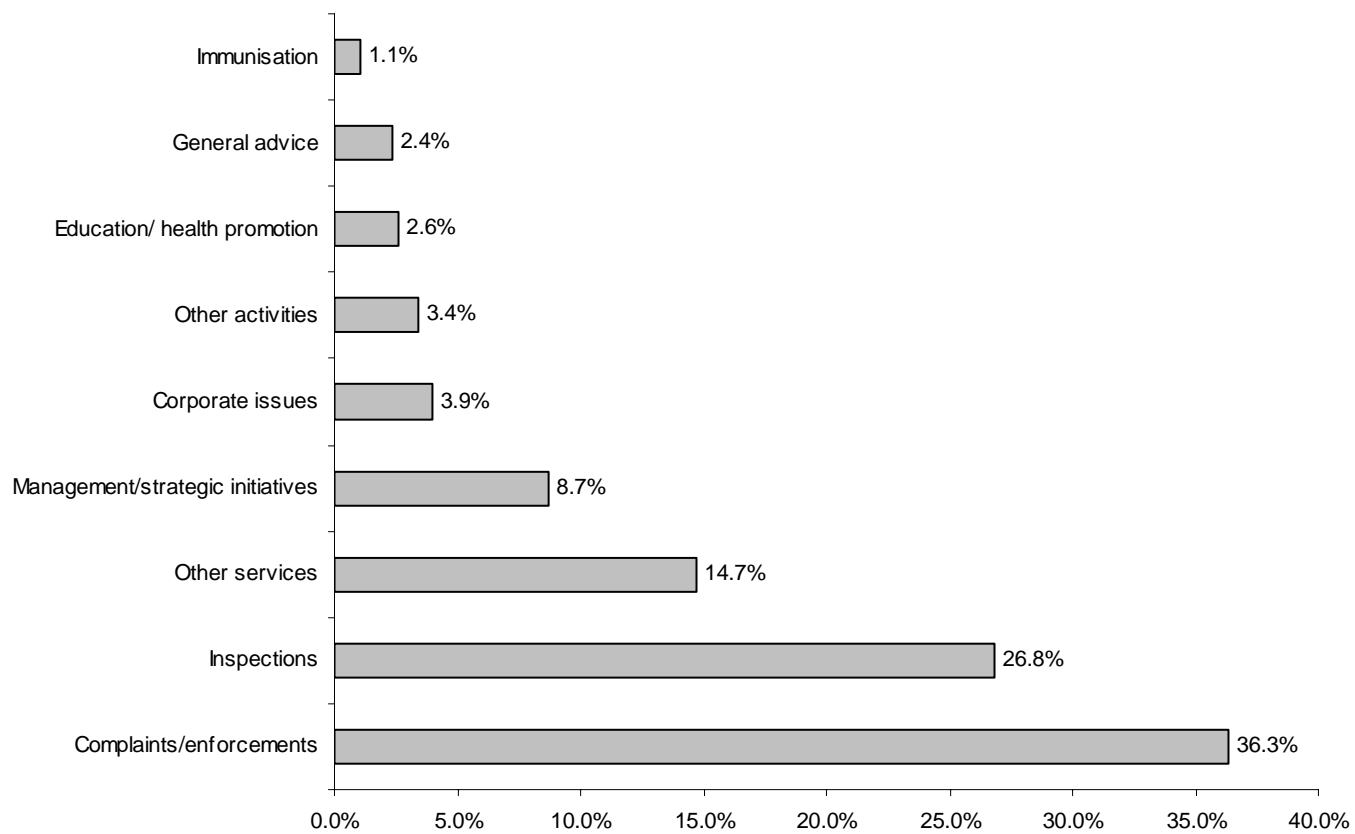
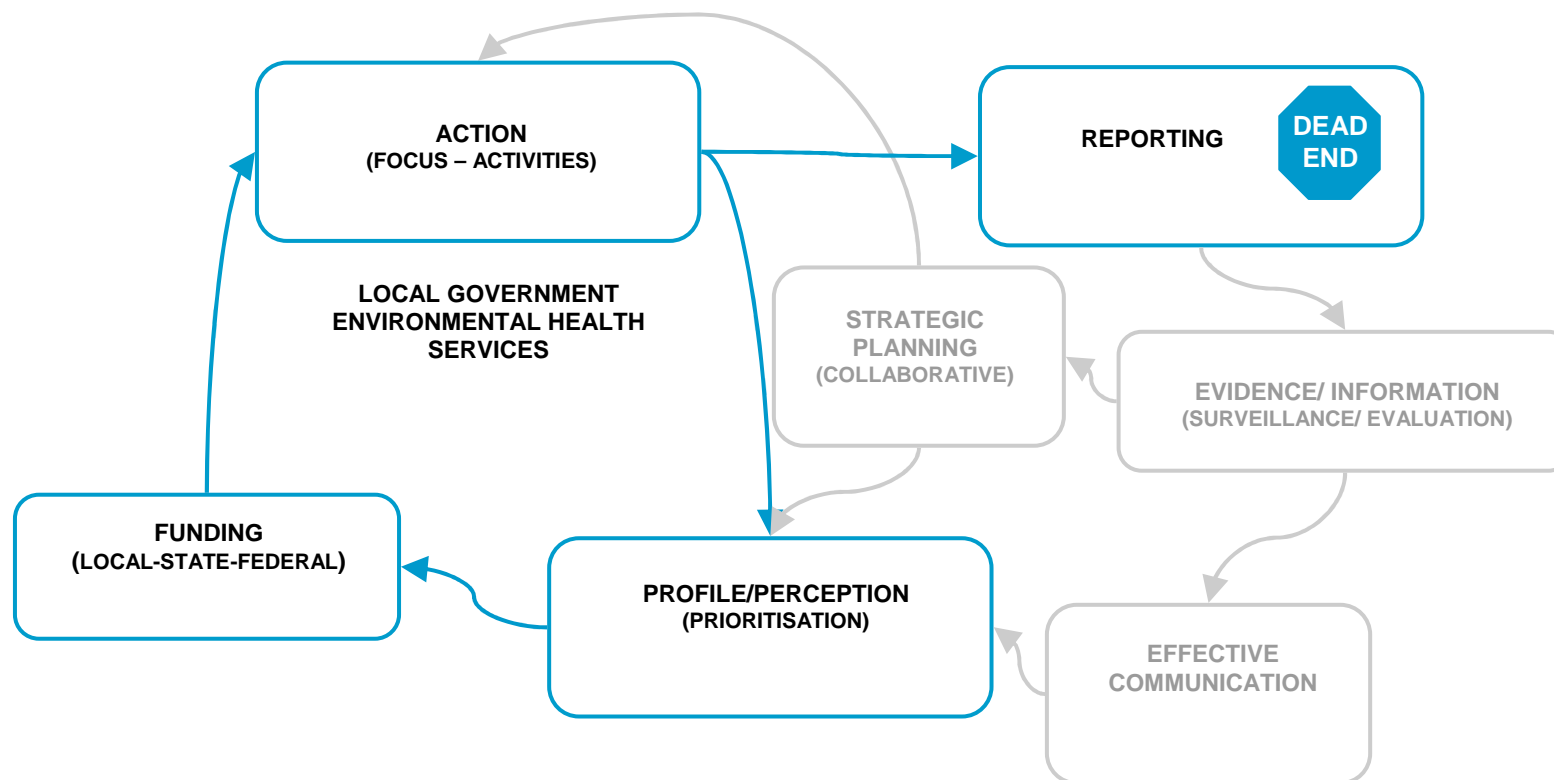


Figure 9

A flow diagram showing the factors which are proposed to drive the current self-perpetuating, narrow (status-quo) focus of council environmental health services. The potential for evidence based surveillance to convert local practice from reactive to proactive with an expanding focus is also illustrated.



Although council reporting exists, the cycle depicted in Figure 9 reflects the fact that it currently represents a dead-end. In this current system, changes will only occur if forced by new legislation or in the case of disasters and emergencies resulting in a public demand for action.

The potential for evidence generating surveillance to convert this system to a strategic proactive one, with a self-perpetuating drive for improvement and ever changing strategic focus is also illustrated. It is proposed that well communicated evidence will raise the profile and public and organisational perceptions/expectations of Local Government environmental health services. In turn, a greater share of funding can be justified, resulting in a broader focus that will provide opportunities to raise the profile further. In parallel, evidence can be used to strategically plan activities in collaboration with all stakeholders, in order to deliver efficient, measurable and tailored services that meet local needs and expectations. This too will broaden the focus and raise the profile of local environmental health services. This clearly illustrates that the missing link in environmental health strategic planning is a clear and defensible evidence base.

9.2 Reporting

State and Local Government in South Australia is required by legislation to prepare annual reports relating to environmental health. As is the experience internationally, the information derived from obligations to report contained within existing legislation has mostly concerned compliance rather than policy making (WHO Europe 2004). It is likely that this has contributed to the current lack of evidence and has promoted the observed narrow status-quo focus of most local government environmental health services.

Each year, the Public and Environmental Health Council receive a total of 65 reports, representing the 68 local councils created under the *Local Government Act 1999*, and the unincorporated areas (85% of the geographical area of the state). SA Health is responsible for administering and reporting on environmental health in the unincorporated areas (Department of Health SA 2007b). The Eastern Health Authority (EHA) provides environmental health services (and a combined report) for five metropolitan councils; the City of Burnside, the City of Campbelltown, the City of Norwood, Payneham and St Peters, the Town of Walkerville and the City of Prospect.

As part of this investigation, the four most recent reports (including 03-04 to 06-07 financial years) submitted to the Public and Environmental Health Council by Local Government were reviewed. This was in order to determine if any of the data previously collected would be useful to the retrospective creation of environmental health indicators. However, it soon became obvious that while some of the previously requested data fields may be useful in the design of future indicators, there would be little likely benefit to be gained from analysis of the data in past reports.

This was due to a number of reasons, including:

- > The bulk of the information provided in past reports was qualitative and generally not suitable for indicator generation.
- > The report format changing frequently, resulting in little continuity over the four years that were reviewed.
- > Many councils simply failed to provide answers to some questions.
- > Many councils provided identical 'cut and paste' answers to questions that were repeated over years.
- > Some answers provided by councils failed entirely to answer the question asked or made no sense at all.
- > Some councils were unable or unwilling to provide quantitative data in the format requested.

Overall, it was evident that despite continual changes, little thought had gone into how the information that was collected would actually be used. It was also apparent that a significant number of councils held the report with disinterest and little regard. This was based on the prevalence of inexact responses, inconsistencies, errors, blatant cutting and pasting over years and general poor quality.

However and perhaps more importantly, it is the factors related to the reporting process itself that have contributed to this behaviour that are of concern. These factors include:

- > a lack of a cohesive strategic direction for the broader public and environmental health effort provided by State and Commonwealth Government;
- > the current reporting format repeatedly requesting the same qualitative information;
- > useful feedback not being provided to Local Government by SA Health after submitting the report; and
- > no rationale being provided for the questions asked.

It is no surprise that over time the report has most likely come to be considered to be a time wasting exercise to many in the industry.

9.3 Practice

The review of the reports also highlighted a key consideration in the adoption of indicators, the consistency of practice. A superficial assessment of potential indicators would suggest that measures such as the number of food complaints recorded, inspection numbers or improvement or expiation notices served may be of use. This assessment presupposes that each council and each officer responds to situations in the same way time after time. The review of the reports indicate otherwise, with reports indicating that food complaints often exceeded the number of food complaint inspections and a stark difference in the use of improvement notices and expiations between councils (Table 5 shows some examples from a sample of councils pg 34).

It was noted that for the councils analysed, follow-up food inspections comprised a substantial amount of the total food inspections (15.8% - 45.5%) and in one case, more follow-up inspections were recorded than routine inspections. It was noted that several authorities issued far more improvement notices and expiations than others as a percentage of total inspections. It is questionable whether this data means that food premises are worse in those areas and consumers are at higher risk or if officers in those areas are more prepared or empowered to use the legislative tools available to them in order to achieve compliance. It is evident that for this type of quantitative data to be useful for the construction of indicators, consistent regulatory practices must be prescribed and followed by all authorities.

These results prompt questions concerning how practices influence the utility of indicators. For example, how councils determine the necessity of follow-up inspections if improvement notices are not commonly issued. This has important implications for resourcing and the current practice of user-pays for some inspections.

Table 5

Food inspection information provided by some South Australian metropolitan councils for the 2005-2006 financial year.

Food Inspections 2005 2006 Financial Year											
Council	Routine	% of total	Follow up	% of total	Complaint	% of total	Total	Imp. Notice	% of total	Expiation	% of total
1	692	69.5	157	15.8	147	14.8	996	5	0.5	2	0.2
2	289	78.1	65	17.6	16	4.3	370	0	0.0	1	0.3
3			no breakdown provided				1080	85	7.9	85	7.9
4			no breakdown provided				1014	23	2.3	5	0.5
5	700	79.5	140	15.9	40	4.5	880	2	0.2	1	0.1
6	172	40.6	193	45.5	59	13.9	424	1	0.2	0	0.0
7	247	61.6	106	26.4	48	12.0	401	0	0.0	1	0.2

Currently, most councils only charge for routine food inspections, yet consume a substantial amount of their finite environmental health resources performing follow up inspections on food businesses that are presumably not meeting their legal obligations (non-compliant) and are not being penalised for failing to do so. As such, it could be argued that those businesses not doing the right thing (in the process of making profit) are subsequently creating a community health risk and consuming valuable council environmental health resources that could be otherwise directed towards alternative and much needed community environmental health activities. It should be noted that the Local Government Association (LGA) food inspection guidelines recommend that councils do not charge for follow up inspections (LGA 2003b). The rationale provided is that councils have mechanisms to achieve compliance (expiations and notices). However, that does not sufficiently address the costs involved, particularly when those options are rarely exercised.

When investigating the number of complaints received compared to notices and expiations issued under the *Public and Environmental Health Act 1987*, a similar pattern emerged. With the exception of a few councils, reports indicate a general reluctance by Local Government EHOs to use the tools that the legislation has provided. From the perspective of indicator development, this is a significant limitation on the utility of complaints or expiation based data. However, notices and expiations indicate the presence of significant and specific issues and therefore are more useful in the creation of indicators if their use is consistent.

9.4 Issues, Awareness, Prioritising and Strategic Planning

In the 2006/2007 Public and Environmental Health report proforma, South Australian councils were asked four questions in relation to awareness and prioritisation of public and environmental health issues and strategic planning. The following summarises the responses given to each of these questions were summarised from all of the 65 reports.

Question 3.1: List the more significant environmental health issues currently facing the local community and what is being done to address them.

Of the 65 reports, 16 claimed they had no specific issues or failed to answer the question. Of the remaining 49 reports, 25 listed one significant issue and the remainder gave 2-6 significant issues, resulting in a total of 97 issues. These responses were sorted into 29 categories. The results are shown in Table 6 (pg 36).

It was interesting to note that wastewater control, including failing on-site systems, illegal disposal of effluent and a need to upgrade STEDS was considered a significant issue by 59% of the 49 councils that responded to the question. Other commonly listed issues were food safety, potable water and insanitary conditions. These results raise a key question of whether current environmental health services are failing to adequately deal with these issues or if they are considered significant because they are the major focus of current service provision. This highlights the importance of an objective evidence base to eliminate the difficulties encountered when attempting to obtain useful information from highly qualitative data.

Question 3.2.1: How was council made aware of these priority issues (e.g. investigation, research, complaint)?

Of the 65 reports, only 49 answered this question. 25 gave one response and the remainder gave 2-3 responses for a total of 81 responses. These responses were sorted into 8 categories and the results are shown in Table 7 (pg 37).

It is evident that Local Government environmental health departments are highly reactive as indicated by the fact that 59% of councils reported that they were made aware of significant issues as a result of complaints. It appears that because complaints are the closest thing to evidence that council EHOs currently have, it is complaints that determine activities in the majority of cases. This again highlights the need for evidence based strategic planning in order to establish a greater balance between environmental health practice that is reactive and proactive.

Table 6

Significant environmental health issues in the 2006-2007 financial year, as indicated by South Australian council environmental health services.

Significant issue	Number	% of responding councils
Wastewater control issues	29	59.2
Food	7	14.3
Insanitary conditions - excluding wastewater	6	12.2
Potable water	6	12.2
Solid waste/ landfill	5	10.2
Ageing population	4	8.2
Emergency planning/mgmt.	4	8.2
Mosquitoes	4	8.2
Pools and cooling towers	3	6.1
Stormwater pollution	3	6.1
Vermin	3	6.1
Water restrictions and grey-water reuse	3	6.1
Blue Green Algae	2	4.1
Burning	2	4.1
Pests - inc. flies, wasps	2	4.1
Air pollution - industry/transport	1	2.0
Chronic disease/lifestyle factors	1	2.0
Dust	1	2.0
Housing	1	2.0
Lead	1	2.0
Low SES	1	2.0
Medical waste disposal	1	2.0
Norovirus	1	2.0
Odour	1	2.0
Q fever	1	2.0
Resource issues	1	2.0
Site and groundwater contamination	1	2.0
Sun exposure	1	2.0
Urban planning	1	2.0

Table 7

How councils became aware of stated significant environmental health issues in the 2006-2007 financial year.

How council was made aware of significant issues	Number	% of responding councils
Complaints/Enquiries/Issues noted by employee/Notification by external agencies	29	59.2
Research/Investigation/Investigative survey	17	34.7
Routine Inspections/Surveillance/Monitoring/Intelligence/Legislative responsibilities	12	24.5
Community engagement/consultation/survey/feedback	11	22.4
Local knowledge/Historical experience	5	10.2
Risk Assessment/Analysis	3	6.1
Action Plan/Management Plan	3	6.1
Common Sense	1	2.0

Question 3.2.2: How were these issues prioritised (number of people affected, risk, politics)?

Of the 65 reports, only 49 answered the question. 31 gave one response and the remainder gave 2-3 responses for a total of 71 responses. These responses were sorted into 12 categories and the results are shown in Table 8 (pg 39).

The results presented in these tables demonstrate that councils predominantly become aware of significant local environmental health issues as a result of complaints, and that they generally respond to such complaints based on an 'on the fly' risk assessment as issues present themselves. In addition to demonstrating a lack of service planning, this highly responsive approach can lead to inconsistency and inequitable decision making such as the distribution of considerable resources towards satisfying the expectations of a 'vocal minority' rather than the broader needs of the community.

Question 5.1: Does Council have a current Public & Environmental Health Management Plan or Strategic/Corporate Plan that forward plans the environmental health activities of Council?

Table 9 (pg 40) shows the breakdown of the responses from the 65 reports.

Although nine councils claimed to have a specific public and environmental health strategic management plan, only five of those councils had them publicly available on their websites. Of those five, four were current and one was dated 1999 and would appear overdue for review. All of the five publicly available plans included goals, objectives and strategies, with performance measures or indicators listed. However, while these performance measures may be useful in the design of Local Government environmental health indicators, most of those listed were not clearly defined. The five plans are all based on 'snapshot' research and community consultation, generally with five year review periods (Adelaide Hills Council 2004; City of Holdfast Bay 2006; City of Mitcham 2006; City of Port Adelaide Enfield 2007; City of Whyalla 1999). It was also noted that all but one of the plans were focussed on the traditional environmental health functions as listed in Table 3 (pg 33). The one notable exception was the City of Port Adelaide Enfield Plan (City of Port Adelaide Enfield 2007), which is an all of council plan with a much broader focus, including contemporary and chronic environmental health issues. However, it was noted that even at the City of Port Adelaide Enfield, the environmental health services section was predominantly allocated the primary role in implementing strategies in the traditional areas of infectious disease control. Regardless of that, it is a groundbreaking document and a step in the right direction.

9.5 New legislation

The *Public and Environmental Health Act 1987* is currently under review and a draft Bill for a replacement Act is now well developed. It is currently anticipated that the new Act will come into effect some time in 2009, with some new measures to be implemented over several years. It is interesting to note that should the new Act be approved in its anticipated format, it will address many of the issues that have arisen in this discussion. For example, some of the proposed inclusions are:

- > Clear defined roles for local councils in public health.
- > Mandated strategic environmental health planning requirements for local councils in conjunction with other stakeholders.
- > Prevention and monitoring of identified chronic conditions.

Table 8

How councils prioritised significant environmental health issues in the 2006-2007 financial year.

How significant issues were prioritised ?	Number	% of responding councils
Risk/Number of people affected	21	42.9
Risk based complaints response	11	22.4
Management/Action Plan	8	16.3
Available Resources/User Pays	8	16.3
Risk based routine inspections	6	12.2
Politics	6	12.2
Community Feedback	3	6.1
Environmental significance	3	6.1
Risk determined from investigations	2	4.1
No prioritisation	2	4.1
Common sense	1	2.0

Table 9

The extent of strategic environmental health planning in South Australian local government.

Public and Environmental Health Strategic Planning	Number	% of councils
YES - Have produced specific P&EH Management Plan	9	13.8
YES - Have a non-specific plan (strategic/business plan) that suitably addresses P&EH	21	32.3
NO - Do not have a plan for P&EH and do not intend to produce one in next 2 years	21	32.3
NO - Do not have a plan for P&EH but do intend to produce one in next 2 years	13	20
Did not answer question	1	1.5

10. Local Environmental Health Indicators – A Worked Example

Despite the difficulties detailed in previous sections, it is considered that the development of Local Government environmental health indicators for South Australia is necessary and, given time and resources, feasible. To illustrate how such indicators may be developed, this section provides a worked example and is intended to highlight the contextual issues and considerations that are likely to arise when attempting to develop environmental health indicators.

The issue of microbiological foodborne disease acquired out of home (e.g. at a restaurant) is used in this example. This environmental health issue is one most people would identify with and at first glance would probably be perceived by most as a relatively simple one to evaluate.

The first step in the process was to conceptualise the cause-effect chain using a framework. In this case, the DPSEEA framework was considered suitable (Figure 10, pg 42). In this instance, the existence of adequate standards/legislation was considered the driving force, and the knowledge and intent of food handlers with respect to compliance was considered the pressure. The state was related to the practices of food handlers which determine the likelihood that contaminated food is served. Exposure is the serving of potentially contaminated meals to customers, and health effects are foodborne disease resulting from the consumption of contaminated food. Possible actions to intervene in the cause-effect chain are also highlighted.

A conceptual framework for developing possible indicators for the various actions and cause/effect points is given in Figure 10 (pg 42) with specific examples provided in Table 10 (pg 43). Issues and contextual concerns that apply to each suggested indicator are also listed in order to highlight the issues involved, even for what at first appears to be a relatively simple issue.

These are intended as examples and are not an exhaustive or clearly defined list, nor are they the result of the necessary collaborative development process. They are provided purely as an illustration of the issues that can be expected when attempting to reach consensus on core indicator sets. However, despite being a difficult process, the potential benefits are great and worth pursuing. Starting small is a good idea, as successes can be demonstrated and then built upon. If the initial aim is too ambitious, the process may be undermined from the start, as the individuals involved will be overwhelmed by the enormity of the goal and may lose interest.

Figure 10

An example showing the conceptualisation of the cause-effect chain (using the DPSEEA model) applied to the issue of microbiological foodborne disease acquired out of home.

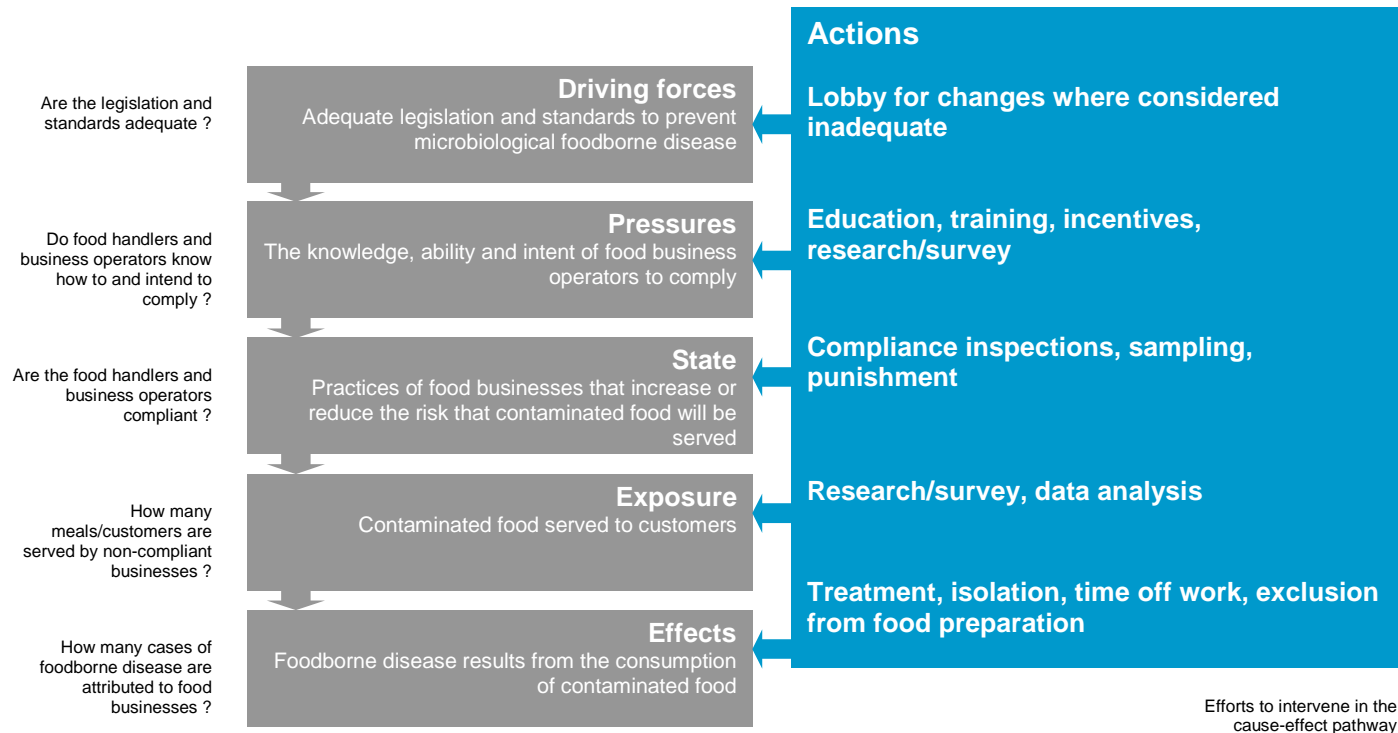


Table 10

Examples of some possible local government environmental health indicators which may be applied to the issue of microbiological foodborne disease.

Cause effect chain	Summary	Possible indicator(s)	Details	Data Source	Issue(s)
(D)iving forces	Standards/ legislation	none suggested	n/a	n/a	
(P)ressures	Knowledge/ intent	Operator awareness of standards/legislation	Survey/interview score	Survey/Interview	Standardised method of assessment required. Which member of staff to survey. How many/how frequent.
(S)tate	Practices	Poor compliance	Follow-up inspections, notices, expiations etc.	Inspections – council records	Standard assessment practices necessary. Detailed resolution required to highlight specific non-compliance issues.
		Complaints	Confirmed complaints	Investigation – council records	Need to identify justified complaints only. Detailed resolution required to highlight specific issues.
(E)xposure	Consumption	Total meals served per week - non compliant	Meals/Customers served per week by non-compliant high risk business.	Self reporting	Incorrect information. May need to legislate for food business to provide this information.
(E)ffect	Disease	Confirmed outbreaks	Outbreaks/Number of food businesses in area	CDC/Council records	Often difficult to confirm cause. Issues with non-notification.

Interventions	Actions	Possible indicator(s)	Details	Data Source	Issue(s)
(D)iving forces	Lobby for change	none suggested	n/a	n/a	
(P)ressures	Education, training.	Training provided	Number of training sessions or businesses represented	Training provider records.	Standardised suitable training required (successful completion records).
(S)tate	Inspections, sampling.	Routine inspections completed as due.	Percentage of routine inspections completed when due (monthly).	Council records	Standardised inspection regime necessary. Need division by risk status. Potential for gaming. Monthly reporting important.
	Complaint response	Average response time. Satisfaction rate.	Confirmed complaints	Council records	Break down of complaints by specified categories.
(E)xposure	Food business activity determined.	Percentage of businesses that have provided activity information	Activity information provided (annually)	Council records	Seasonal variations. Self reporting errors. Change of ownership. Non-notification.
(E)ffect	Treatment	None suggested	n/a	n/a	

11. Conclusions

It is evident that environmental health practice in Australia is highly fragmented and desperately in need of strategic reform. At present, Local Government environmental health activities appear isolated from the wider environmental health community and is narrowly focussed on infectious disease control. As such, Local Government EHOs are a highly skilled yet greatly underutilised and undervalued resource.

Resources and their utilisation are a key factor in this situation, as is the profile of environmental health services within Local Government and the broader community. It is evident that the majority of Local Government executives are currently allocating the minimum resources possible to meet only what they perceive to be (or they are advised to be) their mandated responsibilities under legislation. This has resulted in the long term maintenance of the status-quo. A lack of good evidence and minimal useful feedback from State Government authorities has enabled this to continue, despite new issues emerging and becoming significant concerns to governments and the wider community.

Legislative reform is important in addressing these issues. However, legislation alone will not result in the co-ordinated effort required to drive the action necessary to push the local government environmental health sector into the 21st Century.

Co-ordinated and co-operative leadership from State Government and Local Government environmental health practitioners has the potential to generate the momentum that will bring this field greater public profile and an appropriate government health funding. Greater consistency and transparency, strategic planning, workforce reform and evaluation using well designed and accepted indicators are all part of the solution. However, these factors are co-dependent and none will have the desired results operating in isolation.

If Local Government EHOs can use evidence to coordinate and collaborate with the wider environmental health community internally and externally, they have the opportunity to participate in the change that will result in significantly better population health outcomes in the local communities that they serve.

It was the health inspectors of the past that improved the health of millions through the introduction of proper sanitation and enforcement of standards. In the future, today's local government environmental health officers could be remembered as the professionals who contributed to saving industrialised nations from an insatiable and unsustainable dependence on curative clinical healthcare, or alternatively, if they fail to embrace change, they may not be remembered at all.

12. Recommendations

12.1 Indicator development and strategic planning

- > SA Health (Food Policy and Programs Branch and Applied Environmental Health Branch) and Public and Environmental Health Council should instigate, lead and fund a working group or groups, to commence work on the development and application of Local Government environmental health indicators. Local Government EHOs should be encouraged to see this process as a step towards an improvement in their position and profile, not as a threat.
- > A working group or groups should also be created to select, create, define and establish state environmental health indicators for issues that are beyond the capacity of Local Government, or in circumstances where the required data is not feasible to collect or cannot be obtained with Local Government area resolution.

The following points detail the processes, goals and terms of reference recommended for the Department and the working groups:

- > Important stakeholders should be identified and included in the working groups, including relevant sections within Local Government, within SA Health, representatives from the LGA and Environmental Health Australia and other relevant government departments (particularly EPA).
- > The working groups should initially select a manageable number of issues and sub-issues to develop indicators for. It is anticipated that most will be within the traditional Local Government environmental health areas (infectious disease). However, the initial issues should include several emerging/chronic diseases with a focus on prevention and healthy environment creation.
- > The working groups should engage and communicate with all relevant stakeholders and the media wherever possible, in order to highlight the importance of the issues, and inform the community on their progress.
- > Various models should be examined and the most suitable model or a modification thereof be selected as the most suitable for each issue in question. As far as possible, the model and indicators it developed should be compatible with existing information management practices in Local Government.
- > A rationale should be provided for all indicators designed.
- > Where necessary and recognising the diversity of Local Government, the working group(s) should also aim to create and promote the use of standard operating procedures to ensure consistency of the data needed to construct the defined and

accepted indicators, particularly where statutory enforcement or complaint data is used as a component of an indicator.

- > Once an initial set of indicators is designed and agreed upon, a simplified data recording/reporting tool should be designed. This may be a simple spreadsheet or web based form.
- > Reporting requirements should be simplified to include only the required data to construct indicators, once they have been implemented for specific issues. This should be in a quantitative format where possible, with only limited space provided to include contextual comments.
- > A simple strategic plan proforma should be designed as a starting point, and all Local Government environmental health sections should be encouraged to set initial goals with respect to the initial set of indicators. Assistance should be provided where necessary, particularly to rural councils. Where possible, the strategic plan should be linked to existing strategies and policies (international, national, state and local).
- > The working groups should continue to create and implement indicators for more diverse and complex issues. Existing indicators should also be reviewed on a regular basis and adjusted or eliminated as required.
- > Once the first year's data is compiled, the Department should produce and distribute (to government, councils and the public) a quantitative annual 'State of the Environmental Health' report with Local Government resolution where possible. This report should also include clarification of any contextual issues to be taken into consideration when interpreting the results.

12.2 Legislative review

The following recommendations related to indicators are for consideration by the review of the *Public and Environmental Health Act 1987*.

- > It is recommended that the reporting requirements be made more specific so as to enable SA Health to require councils to collect and provide data in a specified format. It would also be desirable to require data to be submitted on a more frequent basis than annually, to enable seasonal trends to be observed and to limit the scope for 'gaming'.
- > It is recommended that legislative provisions be made that enable SA Health to adopt standard operating procedures with regards to the use of regulatory enforcement powers such as orders, expiations, and prosecution. Such operating procedures would specify circumstances when enforcement powers would and should be utilised by all authorities, resulting in greater consistency.

13. References

- ABS 2007, Australian Bureau of Statistics, *Key National Indicators*, [online] Available: <http://www.abs.gov.au/websitedbs/d3310114.nsf/Home/Key%20National%20Indicators> [Accessed 7 April 2008].
- Adelaide Hills Council 2004, *Public and Environmental Health Strategic Plan 2005 – June 2010*, [online] Available: http://www.ahc.sa.gov.au/webdata/resources/files/050824_Public_Env_Health_Strategic_Plan_05-2010.pdf [Accessed 21 April 2008].
- AIHW 2007, Australian Institute of Health and Welfare, *The burden of disease and injury in Australia 2003*, [online] Available: <http://www.aihw.gov.au/publications/hwe/bodaiia03/bodaiia03.pdf> [Accessed 9 April 2008].
- Briggs, D. 2003, *Making a Difference: Indicators to Improve Children's Environmental Health*, [online] Available: <http://www.who.int/phe/children/en/cehindic.pdf> [Accessed 2 April 2008].
- Burke, S., Gray, I., Paterson, K. & Meyrick, J. 2002, *Environmental Health 2012: A key partner in delivering the public health agenda*, [online] Available: http://www.cieh.org/library/About_the_CIEH/Our_vision/environmental_health_2012.pdf [Accessed 23 April 2008].
- Carneiro, F.F., Oliveira, M.L.C., Netto, G.F., Galvao, L.A.C., Cancio, J.A., Bonini, E.M., & Corvalan, C.F. 2006, 'Meeting report: Development of Environmental Health Indicators in Brazil and Other Countries in the Americas', *Environmental Health Perspectives*, Vol. 114, No. 9, pp. 1407-1408.
- CDC 2005, Centers for Disease Control and Prevention, *CDC's Strategy for the National Environmental Public Health Tracking Program – Fiscal Years 2005-2010*, [online] Available: <http://www.cdc.gov/nceh/tracking/pdfs/strategy.pdf> [Accessed 8 April 2008].
- CDC 2006, Centers for Disease Control and Prevention, *Environmental Public Health Indicators*, [online] Available: <http://www.cdc.gov/nceh/indicators/pdfs/ephi.pdf> [Accessed 2 April 2008].
- CDC 2007, Centers for Disease Control and Prevention, *Keeping Track, Promoting Health...*, [online] Available: <http://www.cdc.gov/nceh/tracking/pdfs/healthtracks.pdf> [Accessed 8 April 2008].
- City of Holdfast Bay 2006, *Public and Environmental Health Management Directions Plan 2006-2011*, [online] Available: http://www.holdfast.sa.gov.au/webdata/resources/files/P_EH_Directions_Plan.pdf [Accessed 11 April 2008].
- City of Mitcham 2006, *Environmental Health Management Plan 2005-2010*, [online] Available: http://www.mitchamcouncil.sa.gov.au/webdata/resources/files/EHMP_Final.pdf [Accessed 11 April 2008].
- City of Port Adelaide Enfield 2006, *Environmental Health Management Plan Stage 1 Research*, [online] Available: http://www.portenf.sa.gov.au/webdata/resources/files/PAdelEnfld_EHMP_FINAL_with_maps.pdf [Accessed 21 April 2008].
- City of Port Adelaide Enfield 2007, *Public and Environmental Health Plan 2007-2012*, [online] Available: http://www.portenf.sa.gov.au/webdata/resources/files/Final_PublicandEnvironmentalHealthPlan_FINAL.pdf [Accessed 26 March 2008].

- City of Whyalla 1999, *Public and Environmental Health Management Plan 1999 (1st Edition)*, [online] Available: http://www.whyalla.sa.gov.au/webdata/resources/files/pehmp_pdf1.pdf [Accessed 11 April 2008].
- Commonwealth of Australia 1999, Commonwealth Department of Health and Aged Care, *The National Environmental Health Strategy 1999*, [online] Available: [http://www.health.gov.au/internet/wcms/Publishing.nsf/Content/C642C824473E84D3CA256F190004250C/\\$File/envstrat.pdf](http://www.health.gov.au/internet/wcms/Publishing.nsf/Content/C642C824473E84D3CA256F190004250C/$File/envstrat.pdf) [Accessed 25 March 2008].
- Corvalan, C.F., Kjellstrom, T. & Smith, K.R. 1999, 'Health, Environment and Sustainable Development: Identifying Links and Indicators to Promote Action', *Epidemiology*, Vol. 10, No. 5, pp. 656-660.
- Corvalan, C., Briggs, D. & Zielhuis, G. 2000, *Decision-making in Environmental Health – From evidence to action*, E & FN Spon, New York.
- Department of Health SA 2004, *Environmental Health Officer (EHO) Workforce Review 2004*, [online] Available: http://www.lga.sa.gov.au/webdata/resources/files/Environmental_Health_Officer_Workforce_Review_2004.pdf [Accessed 9 April 2008].
- Department of Health SA 2007a, *SA Health Public Health Directorate Strategic Plan 2007-2009*, [online] Available: <http://www.health.sa.gov.au/PEHS/publications/07-public-hlth-strat-plan.pdf> [Accessed 25 March 2008].
- Department of Health SA 2007b, *Food Act Report – Year Ending 30 June 2006*, [online] Available: <http://www.dh.sa.gov.au/pehs/PDF-files/food-act-report-0506.pdf> [Accessed 4 April 2008].
- Drew, C.H., van Duivenboden, J. & Bonnefoy, X. 2000, *Environmental health Services in Europe (5) – Guidelines for evaluation of environmental health services*, WHO Regional Publications, European Series, No. 90.
- Dreyling, E., Dederick, E.J., Chari, R., Resnick, B., Malecki, K.C., Burke, T. & Neff, R. 2007, 'Tracking Health and the Environment: A Pilot Test of Environmental Public Health Indicators', *Journal of Environmental Health*, Vol. 70, No. 5, pp. 9-16.
- enHealth 2007, Environmental Health Committee, *National Environmental health Strategy 2007-2012*, [online] Available: <http://www.health.gov.au/internet/main/publishing.nsf/Content/ohp-environ-envstrat.htm> [Accessed 3 April 2008].
- EPA 2003, Environment Protection Authority SA, *State of the Environment Report for South Australia 2003*, [online] Available: <http://www.environment.sa.gov.au/soe2003/report.html> [Accessed 7 April 2008].
- Eyles, J. & Furgal, C.M. 2004, 'Indicators in Environmental Health: Identifying and selecting common sets', *Canadian Journal of Public Health*, Vol. 93, No. 5, pp. S62-S67.
- Farchi, S., Molino, N., Rossi, P.G., Krzyzanowski, M., Dalbokova, D., Kim, R., & the European Road Accident Working Group 2006, 'Defining a common set of indicators to monitor road accidents in the European Union', *BMC Public Health*, Vol. 6, No. 183, [online] Available: <http://www.biomedcentral.com/content/pdf/1471-2458-6-183.pdf> [Accessed 8 April 2008].
- Goldman, L. & Coussens, C.M. 2004, *Environmental Health Indicators: Bridging the Chasm of Public Health and the Environment – Workshop Summary*, National Academic Press, Washington DC, [online] Available: http://books.nap.edu/openbook.php?record_id=11136&page=23 [Accessed 14 April 2008].

Government of South Australia 2007, *South Australia's Health Care Plan 2007-2016*, [online] Available: <https://www.library.health.sa.gov.au/Portals/0/south-australias-health-care-plan-2007-2016.pdf> [Accessed 23 April 2008].

HDA 2002, Health Development Agency, *Environmental Health 2012: A key partner in delivering the public health agenda*, [online] Available: http://www.cieh.org/library/About_the_CIEH/Our_vision/environmental_health_2012.pdf [Accessed 9 April 2008].

Khan, R., Voice, T., Fowles, J. & Phillips, D. 2004, *Environmental Health Indicators for New Zealand – Towards a national environmental health information system*, [online] Available: http://www.surv.esr.cri.nz/PDF_surveillance/EHI/EHI_AnnualReport_2003.pdf [Accessed 7 April 2008].

Kingsland, S. 2006, *The Victorian Environmental Health Indicator Project – A discussion paper on the development of environmental health indicators for Victoria*, [online] Available: <http://www.health.vic.gov.au/healthstatus/downloads/vehip.pdf> [Accessed 7 April 2008].

Kjellstrom, T., Friel, S., Dixon, J., Corvalan, C., Rehfuess, E., Campbell-Lendrum, D., Gore, F. & Bartram, J. 2007, 'Urban Environmental Health Hazards and Health Equity', *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, Vol. 84, No. 1, pp. i86-i97.

LGA 2003a, Local Government Association of SA Inc, *Memorandum of Understanding for Exercise of Functions under the Food Act 2001*, [online] Available: http://www.lga.sa.gov.au/webdata/resources/Files/Food_MOU_LGA_MoH_2003_pdf1.pdf [Accessed 3 April 2008].

LGA 2003b, Local Government Association of SA Inc, *Guidelines prepared by LGA for councils: Inspection fees – Food Act 2001*, [online] Available: http://www.lga.sa.gov.au/webdata/resources/Files/Food_Inspection_Fee_Guidelines_LGA_2003_pdf1.pdf [Accessed 23 April 2008].

LGA 2008, Local Government Association of SA Inc, *Council Maps*, [online] Available: <http://www.lga.sa.gov.au/site/page.cfm?u=209> [Accessed 4 April 2008].

Morris, G.P., Beck, S.A., Hanlon, P. & Robertson, R. 2006, 'Getting strategic about the environment and health', *Public Health*, Vol. 120, pp. 889-907.

PEHC 2000, Pew Environmental Health Commission, *America's environmental health gap: why the country needs a nationwide health tracking network*, [online] Available: <http://healthyamericans.org/reports/files/healthgap.pdf> [Accessed 7 April 2008].

Pencheon, D. 2008, *The good indicators guide: Understanding how to use and choose indicators*, [online] Available: <http://www.apho.org.uk/resource/view.aspx?RID=44584> [Accessed 23 April 2008].

Reynolds, C. 2004, *Public Health Law and Regulation*, The Federation Press, Sydney, Australia.

WHO 1999, World Health Organization, *Environmental Health Indicators: Framework and Methodologies*, [online] Available: http://whqlibdoc.who.int/hq/1999/WHO_SDE_OEH_99.10.pdf [Accessed 7 April 2008].

WHO 2004a, World Health Organization, *What is environmental health?*, [online], Available: http://www.euro.who.int/eprise/main/WHO/Progs/HEP/20030612_1 [Accessed 2 April 2008].

WHO 2004b, World Health Organization, *Development of Environment and Health Indicators for European Union Countries*, [online] Available:

http://ec.europa.eu/health/ph_projects/2002/monitoring/fp_monitoring_2002_frep_01_en.pdf [Accessed 7 April 2008].

WHO 2007a, World Health Organization, *Quantification of the disease burden attributable to environmental risk factors*, [online] Available:

http://www.who.int/quantifying_ehimpacts/summaryEBD.pdf [Accessed 11 April 2008].

WHO 2007b, World Health Organization, *Country profiles of Environmental Burden of Disease: Australia*, [online] Available:

http://www.who.int/quantifying_ehimpacts/national/countryprofile/australia.pdf [Accessed 11 April 2008].

WHO 2008, World Health Organization, *Frequently asked questions*, [online] Available:

<http://www.who.int/suggestions/faq/en/index.html> [Accessed 25 March 2008].

WHO Europe 2004, World Health Organization Europe, *Environmental Health Indicators for Europe – A pilot Indicator Based Report*, [online] Available:

<http://www.euro.who.int/document/E82938.pdf> [Accessed 7 April 2008].

Windsor and Associates 2005, *AO/ EHO Workforce Review Project (Vic)*, [online] Available:

[http://www.mav.asn.au/CA256C320013CB4B/Lookup/EHO%5fWorkforce%5fReview%5fProject%5fReport%5f2005/\\$file/EHO%20Workforce%20Review%20Project%20Report%202005.pdf](http://www.mav.asn.au/CA256C320013CB4B/Lookup/EHO%5fWorkforce%5fReview%5fProject%5fReport%5f2005/$file/EHO%20Workforce%20Review%20Project%20Report%202005.pdf) [Accessed 14 April 2008].

14. Legislation

Environment Protection Act 1993

Food Act 2001

Food Regulations 2002 (under the Food Act 2001)

Housing Improvement Act 1940

Local Government Act 1999

Public and Environmental Health Act 1987

Supported Residential Facilities Act 1992