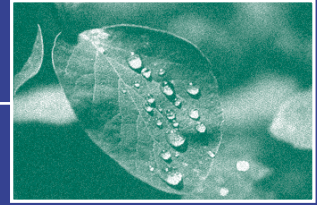


Environmental Health

The Journal of the Australian Institute of Environmental Health



*...linking the science and practice
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Environmental Health

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Call for Papers

The Journal is seeking papers for publication.

Environmental Health is a quarterly, international, peer-reviewed journal designed to publish articles on a range of issues influencing environmental health. The Journal aims to provide a link between the science and practice of environmental health, with a particular emphasis on Australia and the Asia-Pacific Region.

The Journal publishes articles on research and theory, policy reports and analyses, case studies of professional practice initiatives, changes in legislation and regulations and their implications, global influences in environmental health, and book reviews. Special Issues of Conference Proceedings or on themes of particular interest, and review articles will also be published.

The Journal recognises the diversity of issues addressed in the environmental health field, and seeks to provide a forum for scientists and practitioners from a range of disciplines. *Environmental Health* covers the interaction between the natural, built and social environment and human health, including ecosystem health and sustainable development, the identification, assessment and control of occupational hazards, communicable disease control and prevention, and the general risk assessment and management of environmental health hazards.

Aims

- To provide a link between the science and practice of environmental health, with a particular emphasis on Australia and the Asia-Pacific Region
- To promote the standing and visibility of environmental health
- To provide a forum for discussion and information exchange
- To support and inform critical discussion on environmental health in relation to Australia's diverse society
- To support and inform critical discussion on environmental health in relation to Australia's Aboriginal and Torres Strait Islander communities
- To promote quality improvement and best practice in all areas of environmental health
- To facilitate the continuing professional development of environmental health practitioners
- To encourage contributions from students

Papers can be published under any of the following content areas:

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Guest Editorials address topics of current interest. These may include Reports on current research, policy or practice issues, or on Symposia or Conferences. Editorials should be approximately 700 words in length.

RESEARCH AND THEORY

Articles under Research and Theory should be 3000-5000 words in length and can include either quantitative or qualitative research and theoretical articles. Up to six key words should be included. Name/s and affiliation/s of author/s to be included at start of paper and contact details including email address at the end.

PRACTICE, POLICY AND LAW

Articles and reports should be approximately 3000 words in length and can include articles and reports on successful practice interventions, discussion of practice initiatives and applications, and case studies; changes in policy, analyses, and implications; changes in laws and regulations and their implications, and global influences in environmental health. Up to six key words should be included. Name/s and affiliation/s of author/s should be included at start of paper and contact details including email address at the end.

REPORTS AND REVIEWS

Short reports of topical interest should be approximately 1500 words. Book reviews should be approximately 700 words and Review Articles should not exceed 3000 words in length.

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EDITORIAL

In this issue of *Environmental Health*, we continue some of the themes of the Special Issue on Sustainability in Environmental Health (*Environmental Health*, vol. 3, nos. 1 & 2) in continuing to explore environmental health monitoring, risk management, environmental health indicators, local environmental management, and how we work with the community for sustainability.

Rumchev's paper studies the relationship between indoor air quality and adverse health effects, while Bentham argues that building water systems present a significant risk of community acquired and nosocomial *Legionella* infections. The published data suggest that health risks from building water systems are peculiar to their design and operation and distinct from other sources of *Legionella* infections. Bentham uses the available evidence to assess the health risks associated with these systems and to make recommendations for risk management. Gerber et al.'s study is part of a larger research project to develop environmental health indicators for sustainable development, and focuses on the qualitative investigation of technical experts' and community members' perceptions of environmental health risks that affect people who live in a metropolitan area. These health risks include general environmental health risks, atmospheric and traffic-related health risks, and social health risks. Historically, environmental health research has neither been generously funded nor as extensive as it should have been given its importance. Stoneham makes a strong argument for a national research framework

that attempts to explain the complexities of environmental health research. In further discussion she focuses on future research challenges and potential solutions.

In the Practice, Policy and Law section of the Journal, McGufficke discusses the importance of the implementation of public health law as an important weapon in achieving public health goals. The appropriateness of tobacco compliance monitoring as an effective and efficient initiative in public health is an issue that has, perhaps, been overshadowed by other strategies. The intent of his paper is to raise the level of awareness among public health practitioners and to encourage further debate within the profession on the reasons behind compliance monitoring, its implementation and ultimate benefits to the health and wellbeing of the public, particularly those young people who are thinking about taking up smoking. As topical as smoking among the young, is the safety of seafood in Australia. Food Standards Australia New Zealand, for example, is currently working on a standard on the production and processing of seafood, which it hopes to publish in 2004. Moore's paper in this issue of the Journal looks at a case of foodborne illness in people who ate at a restaurant. Although epidemiological investigation did not demonstrate a strong association with any particular food, samples indicated the presence of non-01, non-0139 *Vibrio cholerae* in dam water where freshwater crayfish (redclaw) were grown and supplied to the restaurant. It is theorised that cross contamination occurred from the raw product to the cooked product. This

might have been further transmitted to other foods by poor food hygiene.

Many theories within sustainability and sustainable development have emerged in response to environmental problems facing humanity, argues Parissi, however, there is insufficient evidence regarding the effectiveness of the transfer from this theory into practice, as the development of environmental indicators is advancing, their application is not. He uses the example of 1998 legislation promulgated in New South Wales for annual State of the Environment (SoE) reports to become a means for local governments to implement sustainable development. Local authorities collaborate to produce SoE reports and a study was conducted in 2002 into the processes and outcomes of one such regional SoE report, issued in 2000 in the urban fringe of western Sydney. The preparation and aftermath of the report was found to involve considerable complexity, confusion, conflict and concern among those who were engaged in the report's development. The findings will be useful in evaluating the design, preparation, and implementation of future regional SoE reports. Sustainability and the community is taken up by Verrinder who explores the role of environmental health practitioners as active participants in the processes and protocols needed to design for sustainability

and health. This paper provides an overview of key principles of change, change action, and issues in working with the community as innovators and change agents. This same theme is taken up by Earl who argues that there is considerable evidence to support local government involvement in Community Wellbeing Programs, however, this involvement is reliant on internal capacity, on existing local services and on community needs.

National Conference in Hobart

The themes of indoor air quality, disease control and food issues, catchment management, and Indigenous environmental health will, among others, be taken up at the AIEH National Conference in Hobart in October. Michael Jackson, Chair enHealth, will be speaking on the status of environmental health in Australia and the emerging issues and priorities for action. Another speaker of note is Martin Riddle who will be presenting a paper on the global importance and locally sensitive nature of the Antarctic environment.

Heather Gardner
Editor

RESEARCH AND THEORY

Indoor Air Quality in University Laboratories

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In the present cross-sectional study we aimed to evaluate indoor air quality in university laboratories. For this purpose we monitored 15 different laboratory settings within Curtin University of Technology, Perth, Western Australia, for volatile organic compounds (VOCs), particulate matter (PM₁₀, PM_{2.5}) and ultrafine particles (UFP), temperature and relative humidity. The measurements were conducted during the semester and semester break in 2002. A health questionnaire was sent to tutors and technicians working in the laboratories to complete if they were willing to take part in the study. Significantly ($p < 0.05$) higher exposures for TVOCs, PM₁₀, PM_{2.5}, UFP were measured during the semester time when compared with those during the semester break. The indoor temperature was also found to be higher during the semester. Participants in the study who reported respiratory symptoms including asthma were found to have longer average time of employment in the laboratory and were exposed to higher levels of TVOCs and PM₁₀ compared with those who did not report such symptoms. A more detailed investigation to study the relationship between indoor air quality in university laboratory settings and adverse health effects among their occupants, including tutors, laboratory technicians and students is recommended.

Key words: *Indoor Air Quality; Laboratory Facilities; University Laboratories*

The quality of air inside enclosed spaces has become a matter of growing concern over the last 20 years. People spend approximately 95% of their time indoors, as for 88% they are inside buildings and for 7% in a vehicle (Robinson 1995). Further, in the last 20 years, the indoor environment in homes and offices has changed considerably with the introduction of soft furniture, carpets, and central heating. Modern buildings are designed to improve energy efficiency which makes them better insulated and frequently more airtight than older structures (Maroni 1995). All these transformations have led to more comfortable living conditions, however, they have resulted in decreased indoor ventilation and increased relative humidity

that provide an environment in which the concentrations of indoor air pollutants may build up to much higher concentrations than encountered outside (Hyndman 1994). According to the US Environmental Protection Agency (US EPA 1993) studies of human exposure indoors indicate that indoor levels of pollutants may be 2-3 times and occasionally more than 100 times higher than outdoor levels.

The pollutant levels from an individual source may not cause a significant health risk by themselves but most buildings have more than one source that can contribute to indoor air pollution. These include emissions from building materials, furnishings and appliances, consumer products, human activities and outdoor air,

which might affect human health and wellbeing. Thus, the combined effects of these sources could significantly increase the concentrations of indoor air pollutants, which might cause adverse health effects in exposed people.

The likelihood that an individual will become ill from the presence of an air pollutant depends upon factors such as the individual sensitivity to the pollutant, the pollutant concentration, and the duration and frequency of exposure (Seltzer 1999). There is enough evidence from epidemiological studies that exposure to indoor air pollution has the potential to cause morbidity, disability, disease, and even death in some cases (Bergland 1992). Molhave (1991) reported complaints of unpleasant mucous membrane irritation among individuals exposed to a mix of VOCs at a concentration of only $8 \mu\text{g}/\text{m}^3$, while Otto (1992) found that subjects exposed to a concentration of VOCs at $25 \mu\text{g}/\text{m}^3$ reported symptoms of headache, drowsiness, fatigue, and confusion. A significant relationship between exposure to various VOCs at levels below $120 \mu\text{g}/\text{m}^3$ and nocturnal breathlessness was found by Norbäck and colleagues (1995). At concentrations as high as $188 \mu\text{g}/\text{m}^3$, VOCs such as toluene may cause symptoms of lethargy, dizziness, and confusion (Jones 1999). A recent study reported that exposure to VOCs at levels below $50 \mu\text{g}/\text{m}^3$ was associated with asthma in young children (Rumchev in press).

Epidemiological data also provide strong evidence for a significant effect of particulate matter (PM) on a wide range of health outcomes. Exposure to short-term increases in PM_{10} (particles, less than $10 \mu\text{m}$ in diameter) has been associated with the reporting of increased respiratory symptoms and acute decreases in levels of lung function in asthmatics and non-asthmatics (Ostro, B. et al. 1991; Pope, S. & Dockery 1992). Similar associations have been reported for most measures of acute respiratory morbidity, including use of

asthma medications (Pope, S. et al. 1991) and emergency room visits (Schwartz et al. 1993; Sunyer et al. 1993) or hospitalisations (Schwartz 1994) for respiratory conditions, as well as for mortality from respiratory illness (Fairley 1990).

Most buildings, including laboratory facilities are designed to protect the occupants against exposure to the chemicals frequently used within the laboratories. However, even with the most modern air-conditioning systems poor air quality can result as a product of a few factors, including "overworking" of a laboratory and re-entrainment of contaminated air from exhaust stacks (Foster 2001). These factors may result in temporary poor air quality that is difficult to trace but which can be potentially serious if left undetected and not corrected.

One of the most common approaches to monitor air quality indoors is to distribute a number of devices throughout the building (Foster 2001). The concentrations of carbon dioxide (CO_2) is usually used as a measure of ventilation quality in a building, while the measurement of total volatile organic compounds (TVOCs) is used to detect the buildup of volatile chemicals which can be emitted from carpeting, furnishings, cleaning products, and human activities.

In laboratory settings, this monitoring strategy is difficult to apply, however, continuous monitoring of a few parameters such as TVOCs, particulate matter, temperature ($^{\circ}\text{C}$), and relative humidity (RH%) should provide a reasonable picture of overall air quality in the laboratory (Foster 2001). The aim of this cross-sectional study was to evaluate indoor air quality in different laboratory facilities within Curtin University of Technology, Perth, Western Australia.

Subjects and Methods

Assessment of indoor exposure

Fifteen laboratories, five Chemistry, six Biology, three Engineering and Computing,

and one Geology, were monitored for air pollutants. Exposure levels to particulate matter PM_{2.5} (particles, less than 2.5 µm in diameter), PM₁₀ (particles, less than 10 µm in diameter), ultrafine particles (with size less than 100 nm in diameter) and VOCs were measured on two occasions, during the semester time and during the semester break in 2002. During the sampling program all laboratories operated under normal conditions, mechanically or naturally ventilated. Air monitoring was conducted at comparable locations in the laboratories using a 4h sampling period. Indoor temperature and relative humidity were also measured.

Indoor air pollutants were measured using standard sampling methods. Volatile organic compounds (µg/m³) were measured by the active sorbent method, which used a battery driven pump with an adjustable constant sample flow (1l/min). Charcoal was used as a sorbent and was desorbed with carbon disulfide before analysis with a gas chromatograph.

The DUSTRAKTM aerosol monitor was used to measure particles (µm/m³) that are 10 µm or less. Measurements from the DUSTRAKTM are recorded as a mass concentration. It is a realtime monitor that can provide data on temporal fluctuations of particulates as well as average levels for the sampling period.

The P-TRACKTM Ultrafine Particle Counter was used to measure the number of ultrafine particles (number/cm³) inside of the laboratories.

Indoor temperature and relative humidity were measured using the Tinytalk II Data Loggers, which are battery-operated devices. The operating range of the Tinytalk II Relative Humidity Logger is between 0 and 95% relative humidity while the range of the Temperature Logger is from - 40°C to 75°C.

Health survey

The participants in the study were technicians and tutors working in the laboratories. Each study subject was asked to

sign a "consent form" and to complete a questionnaire if they were willing to take part in the study. A standardised questionnaire with little modification was used to gather some details of the laboratory and also information regarding the occupant's health history and presence of respiratory symptoms including cough, wheeze, trouble breathing, itchy eyes, runny nose and skin rash or eczema in the last six months (National Institute for Occupational Safety and Health [NIOSH] 1989). The survey also asked if the occupant had ever had asthma, diagnosed by a doctor, allergy or hay fever. Questions related to an average time of employment in the laboratory and working hours per week were included in the questionnaire. Demographic information was also collected.

Statistical analysis

The Mann-Whitney U test was applied to study the relations between respiratory symptoms and exposures that were not normally distributed (VOCs, PM₁₀, PM_{2.5}, ultrafine particles, T°C, RH%). The chi-square test or Fisher's exact test, depending on the number of the cells, was used for analysis of the relationship between binary dependent and independent variables. Since the exposure levels to indoor air pollutants were not normally distributed, Spearman's rank order correlation was used as an alternative of the Person's correlation to determine the relationship between the exposures. Two tailed tests were used and a 5% level of significance was applied.

Results

Fifteen laboratories within Curtin University campus were monitored for PM₁₀, PM_{2.5}, UFP, VOCs during the semester and semester break of 2002. Indoor temperature and relative humidity were also measured. There was one observation only in the Geology laboratory; thus it was excluded from the analysis. Since the outdoor monitoring data were incomplete, they were not presented in the study.

Seven common indoor organic compounds, such as benzene, toluene, chlorobenzene, ethylbenzene, m,p-xylene, styrene, and o-xylene, were identified by comparing the retention time. The most common compounds found in the laboratories during the semester were m,p-xylene, benzene and chlorobenzene. M,p-xylene was detected in 14 laboratories, benzene in 10 and chlorobenzene in 9. The highest concentrations were measured for toluene (324.8 $\mu\text{g}/\text{m}^3$) in the Chemistry laboratory, followed by benzene (34.9 $\mu\text{g}/\text{m}^3$) in the Biology laboratory. The

median concentrations of the TVOCs and number of UFPs were higher in the Chemistry laboratory when compared with those in the Biology and Engineering laboratories, while the occupants of the Engineering laboratory were exposed to higher levels of PM_{10} (Table 1).

Of the study laboratories, 10 had air conditioning and 5 had natural ventilation. Although not significant, higher exposures to PM_{10} , TVOCs and $T^\circ\text{C}$ were measured in the laboratory settings without air conditioning (27.0 $\mu\text{g}/\text{m}^3$, 31.1 $\mu\text{g}/\text{m}^3$, and 25.3 $^\circ\text{C}$, respectively), compared with those

Table 1: Median levels (range) of exposures in different laboratory facilities (range)

Environmental factor	TVOCs ($\mu\text{g}/\text{m}^3$)	PM_{10} ($\mu\text{g}/\text{m}^3$)	$\text{PM}_{2.5}$ ($\mu\text{g}/\text{m}^3$)	UFP (n/cm^3)	$T^\circ\text{C}$	RH (%)
Chemistry	29.9 (3.4-83.4)	17.0 (8.2-46.1)	9.00 (4.2-25.1)	21694.5 (6029.2-33998.1)	23.5 (20.0-29.1)	52.5 (41.0-75.1)
Biology	22.3 (6.3-85.1)	19.5 (13.1-47.3)	10.0 (5.2-43.3)	5637 (5485.1-21740.2)	23.1 (21.5-26)	44.1 (32.5-52.1)
Engineering	13.9 (12.7-31.3)	27.0 (10.1-29.2)	8.1 (4.1-14.2)	9245 (5634.1-12019.2)	23.1 (22.8-26.1)	45.9 (37.3-53.3)

Table 2: Median concentrations (range) during semester and semester break

Environmental factor	Semester	Semester break	P-value
Relative Humidity	45.6 % (35.1 - 70.5)	44.2% (92.6 - 54.9)	0.9
Temperature ($^\circ\text{C}$)	23.3 (20 - 28.9)	22.0 (19.2 - 25.1)	<0.01
PM_{10} ($\mu\text{g}/\text{m}^3$)	17.0 (8.3 - 82.2)	10.0 (5.3 - 47.2)	<0.01
$\text{PM}_{2.5}$ ($\mu\text{g}/\text{m}^3$)	10.2 (4.2 - 72.3)	4.0 (1.0 - 43.2)	<0.01
UFP (n/cm^3)	6471 (5414 - 23998)	4676 (1112-16176)	<0.01
Benzene ($\mu\text{g}/\text{m}^3$)	7.37 (* - 35.1)	* (* - 25.5)	0.43
Toluene ($\mu\text{g}/\text{m}^3$)	7.8 (* - 325.2)	* (* - 4.8)	<0.05
Chlorobenzene ($\mu\text{g}/\text{m}^3$)	3.85 (* - 34.1)	* (*)	<0.01
Ethylbenzene ($\mu\text{g}/\text{m}^3$)	0.93 (* - 3.8)	* (* - 0.8)	<0.01
Mp-xylene ($\mu\text{g}/\text{m}^3$)	2.5 (* - 5.4)	* (* - 4.0)	<0.01
O-xylene ($\mu\text{g}/\text{m}^3$)	0.97 (* - 1.9)	* (* - 1.3)	<0.01
TVOCs ($\mu\text{g}/\text{m}^3$)	25.8 (3.4 - 373.4)	* (* - 49.1)	<0.01

* Below limit of detection

Table 3: Indoor VOCs concentrations compared with the NOHSC Adopted Standards

Compound	Median concentrations (mg/m^3)	NOHSC Time-weighted average (mg/m^3)
benzene	0.007	16
chlorobenzene	0.004	46
ethylbenzene	0.003	434
m-p xylene	0.003	350

with air conditioning (16.6 $\mu\text{g}/\text{m}^3$, 22.7 $\mu\text{g}/\text{m}^3$ and 22.9 $^\circ\text{C}$, respectively).

When the indoor concentrations of PM_{10} , $\text{PM}_{2.5}$ and VOCs were compared between those in the semester and those in the semester break, the study found significantly higher exposure levels for most of the studied environmental factors during the semester when most of the laboratories were occupied with classes (Table 2).

Although VOCs concentrations were higher during the semester time compared with those measured in the semester break,

they were well below the adopted national exposure standards for atmospheric contaminants in the occupational environment according to the National Occupational Health and Safety Commission (NOHSC 1995) (Table 3).

Environmental correlation

According to the Spearman's rank correlation, the particulate matter PM_{10} was significantly correlated with $PM_{2.5}$ ($r = 0.76$; $p < 0.01$) and UFP ($r = 0.83$; $p < 0.05$). No significant correlation was established between VOCs and PM_{10} , $PM_{2.5}$, and UFP. Indoor temperature was significantly correlated with the TVOCs with $r = 0.84$ ($p < 0.01$).

Symptoms related to environmental exposure

Eighteen technicians and tutors agreed to complete the questionnaire. Of all participants, 7 reported asthma diagnosed by a doctor, while 9 reported allergy and 8 hay fever.

The highest number of complaints by the occupants in the laboratories regarding respiratory symptoms was reported in the Chemistry laboratory ($n = 9$) followed by the Biology laboratory with 6 complaints and the Engineering laboratory with 1 complaint.

The study found that participants who reported asthma were exposed to higher indoor concentrations of PM_{10} and TVOCs, compared with those who did not have such symptoms (Figure 1), although the differences were not significant. The other health symptoms included cough, wheeze, eczema, trouble breathing, and itchy eyes. Higher exposures to PM_{10} and TVOCs were also seen among the study subjects who had these symptoms but the differences were still not statistically significant (Table 4). However, the average time of employment (in months) was significantly longer among the study subjects who reported cough, wheeze and trouble breathing compared with those who did not have such symptoms.

Figure 1: Exposure levels to PM_{10} and TVOCs (median concentrations) in asthmatic and non-asthmatic participants

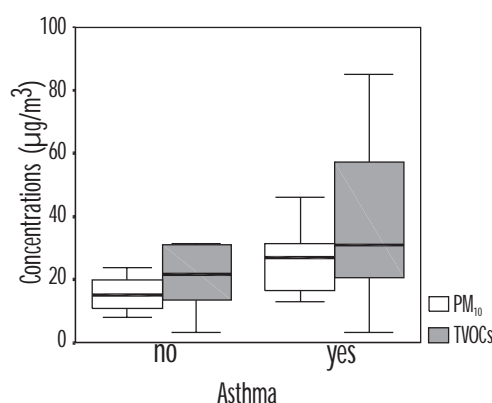


Table 4: Health symptoms related to environmental factors and history of employment

Health symptoms		PM_{10} ($\mu g/m^3$)	TVOCs ($\mu g/m^3$)	T $^{\circ}C$	Average time of employment (months)
Allergy	yes	27.0	27.9	23.5	153
	no	15.0	23.7	22.3	129
	p-value	0.2	0.1	0.5	0.6
Cough	yes	34.0	27.9	22.3	330
	no	16.0	22	21.7	49.5
	p-value	0.6	0.8	0.2	0.007
Wheeze	yes	21.5	24.8	23.6	238
	no	16.0	23.7	22.1	48
	p-value	0.6	0.8	0.1	0.05
Eczema	yes	40	14.8	22.6	186
	no	15	31.0	23.4	136
	p-value	0.005	0.5	0.7	0.4
Trouble Breathing	yes	28.0	29.5	24.6	239
	no	16.0	22.7	22.3	51
	p-value	0.4	0.5	0.08	0.005

Discussion

This study measured significantly higher concentrations of PM_{10} , $PM_{2.5}$, TVOCs and number of UFPs during the semester time when the laboratory facilities were occupied most of the day compared with the concentrations measured during the semester break.

Due to the limited data (only 18 participants), the current study could not establish a significant association between

exposure levels to indoor air pollutants and health effects. However, the higher exposure levels to air pollutants among those who reported adverse health effects compared with those who did not, can be considered as an indication that a more detailed study conducted on indoor air quality in laboratory facilities is essential.

Since a university laboratory is a working place for technicians and tutors but also a place where students learn and gain skills, the relevant question is, which exposure guidelines should be applied, the National Health and Medical Research Council (NHMRC) recommended advisory goals or the National Occupational Health and Safety Commission (NOHSC) adopted exposure standards. While the exposure to airborne contaminants at work places is regulated by the occupational exposure standards these standards do not always give sufficient basis for designing an indoor quality good enough for the comfort of all occupants. Thus, we may need to apply different indoor exposure standards to students who spend only a few hours in the laboratory when compared with tutors or technicians who may spend 8 hours or more every day. According to the study the workers who reported respiratory symptoms had a longer employment history compared with those who did not report such symptoms. Hence, the exposure time to air pollutants may play a significant role in the development of adverse health effects. Further, while some workers or students might experience mild discomfort from substances at concentrations at or below the exposure standards, others might be affected more seriously and develop illness. So, some hypersusceptible workers or students might not be adequately protected from adverse health effects due to exposure to certain chemicals at concentrations at or below the exposure standards.

All the issues and concerns mentioned above may need to be considered in setting guidelines for indoor air quality in Australia. Outdoor air pollution has long been a focus

for scientists and governments in making considerable efforts to protect human health from air pollutants through the development of exposure standards both in the occupational and outdoor environment (Short 2001). However, people spend most of their time indoors (Robinson 1995), therefore there should be similar efforts in the establishment of indoor air guidelines. While some countries such as Canada, the USA and Norway have developed standards and guidelines for some specific pollutants (Becher 1999; Health Canada 1998; Seifert 1999), Australia has taken the approach of using indicators of good air quality, rather than defining quantitative guideline values (Brown 1996). Health-based guidelines for some indoor air pollutants such as TVOCs, or suspended particulate matter are recommended but no indoor air goals are regulated. If the guidelines were used as the basis for regulation they would not only contribute to health policy development, but could provide a stronger basis for the development of ways to protect people's health from indoor environmental hazards and especially of the more susceptible members of our society. A question regarding different indoor air quality standards might emerge when comparing different settings since the indoor environments might be different. Hence, we need to consider the appropriate guideline value for indoor quality to apply in different environments including public buildings, workplaces or domestic settings.

Occupied buildings need to be designed to provide safe and comfortable environments for people to work. One of the main factors influencing the indoor concentrations of air pollutants is ventilation. Elevated contaminant concentrations are usually reduced in a building by natural or mechanical ventilation, as a high ventilation rate is advantageous in reducing indoor pollution (Maroni 1995). This is consistent with the results from the current study showing that presence of air conditioning reduces indoor temperature

and exposure levels to most of the volatile organic compounds.

Over the last few decades, efforts to improve building energy efficiency have focused attention on reducing heat loss that occurs as a result of poor ventilation. The energy cost of ventilation in terms of heating, cooling and dehumidification is one of the most important issues. Although many countries have taken measures to reduce ventilation rates to conserve energy, this practice is now disputed for health reasons (Maroni 1995). The indoor pollutant sources include continuous and variable sources, thus the ventilation system must supply a minimum flow of air continuously as well as being able to increase the air flow to compensate for increased pollutant emissions. Further, the US EPA (1987) estimates the national costs of medical care resulting from the major indoor air pollution health effects to be over \$1 billion annually.

Indoor air quality and pollution are becoming concerns not simply of scientists but also of the legal community. The legal community's focus is on efforts to control the quality of indoor air through the passage of legislation and the development of regulations (Tokarz 1994). We live in an increasingly litigious society, and the number of claims from workers who feel their health has been damaged by the contamination of their work environment is increasing. In an attempt to define acceptable safe and healthy environments, regulated standards for specific environmental factors including ventilation and indoor air pollutants need to be considered. A more detailed study on the relationship between indoor air quality in university laboratories and adverse health effects among their occupants such as laboratory technicians, tutors and students is recommended.

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Risk Assessment for Legionella in Building Water Systems

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Building water systems present a significant risk of community acquired and nosocomial Legionella infections. Published data suggest that health risks from these systems are peculiar to their design and operation and distinct from other sources of Legionella infections. This paper uses the currently available evidence base to assess the health risks associated with these systems and to make recommendations for risk management.

Key words: *Building Water Systems; Legionella; Risk Assessment*

Legionella infections are almost exclusively associated with the built environment. A range of devices and applications have been associated with disease including building water systems, cooling water systems, spa pools, fountains and respiratory equipment. Each of these systems constitutes unique environments that carry their own risk potentials (Atlas 1999; Joseph 2002). Recent reports suggest that the incidence of disease is underestimated and a significant proportion of all Legionellosis cases identified each year are attributable to contaminated building water systems (Joseph 2002; Ruef 1998). These systems may include hot, warm and cold water systems and their outlets (showers, faucets and so on).

This paper reviews the unique characteristics of building water systems (BWS) as distinct from other water systems and their associated health risk. Haas et al. (1999) identified four key steps in assessing microbial health risks: hazard assessment, exposure assessment, dose-response analysis, and risk characterisation. They concluded that the integration of risk assessment with risk management to develop a risk assessment framework was a multidisciplinary process.

Hazard Identification

There are two proposed routes of infection associated with BWS; the inhalation of aerosol and the aspiration of contaminated water droplets (Dennis et al. 1984; Yu 2000). Generation of aerosol containing Legionella has been demonstrated from showers and faucets (Dennis et al. 1984). Aerosol is not generated in the same quantities as in cooling water systems, and is rarely transported over distances of a few metres (Bollin et al. 1985). Reports of infection and outbreaks from these sources suggest that either aerosol is not transmitted over the great distances associated with cooling water systems or that they are the result of an alternate route of infection, such as aspiration (Yu 2000). Current research data have not implicated oropharyngeal colonisation by *Legionella* bacteria as a step in the aspiration route of infection (Pedro-Botet et al. 2002).

Nosocomial infections may include wound infections from contaminated water applied to the wound site. These instances are unusual and may include a range of Legionella species not commonly associated with respiratory disease. This is presumed to be a function of the host immune status (Ampel, Ruben & Norden 1985; Lowry et al. 1991).

Until recently, reports of infection and outbreaks have predominantly been associated with health care premises (nosocomial) (Yu 2000). More recently in Europe, there have been reports of disease outbreaks associated with contaminated water systems in holiday resorts (Albrechtsen et al. 1990; Joseph 2002). In these instances *Legionella pneumophila* Serogroup 1 infection has predominated. Disease associated with hotels and holiday resorts has not been reported in Australia. Travel related clusters might be impossible to detect without adequate disease surveillance systems capable of tracking cases across national and international boundaries (Albrechtsen et al. 1990; Benin et al. 2002; Joseph 2002).

Cases of nosocomial disease have been widely reported and are more frequent than cooling tower outbreaks (Yu 2000). Some reports suggest that between 15 and 20% of all *Legionella* infections are nosocomially acquired (Ruef 1998), though more recent data from the European community suggest a lower incidence (Joseph 2002). Disease ranges from single sporadic cases to protracted outbreaks over months and years (Rangel-Frausto et al. 1999; Rudin, Wing & Yee 1984). In these instances the numbers of individuals infected are usually quite low when compared to other sources such as cooling water systems or spas. The low number of cases over a lengthy duration may delay recognition of an outbreak. Nosocomial outbreaks may also include wound infections after exposure to contaminated water (Lowry et al. 1991).

BWS-associated outbreaks of disease include a more diverse range of *Legionella* species and serogroups than other sources. Species include *L. pneumophila* SG1 and other serogroups (2, 4, 5, 6, 12) and other species such as *L. micdadei*, *L. bozemanii*, and *L. feeleii* (Ampel, Ruben & Norden 1985; Rudin, Wing & Yee 1984) this is probably due to the combination of the exposure route and, especially in the nosocomial cases the exposed susceptible

population. A number of species associated with disease contracted from building water systems have no reported association with other water systems (Fang, Yu & Vickers 1989; Wilkinson et al. 1987).

Investigations have shown multiplication of *Legionella* in sediments of water heaters and calorifiers of hot water systems. Some evidence suggests that *Legionella* multiplication may be enhanced by the presence of amoebae or other bacteria in these sediments (Fields et al. 1989; Wadowsky & Yee 1985; Wadowsky et al. 1991). Strong positive associations have been shown between amoebae colonisation of hot water systems and cases of Legionellosis (Breiman et al. 1990).

Dose Response Relationship

No infectious dose has been established for *Legionella* infections (O'Brien & Bhopal 1993). Aerosol containing *Legionella* has been shown to be generated during normal operation of shower heads and hot water faucets (Bollin et al. 1985; Dennis et al. 1984). The possibility of aspiration as an alternate route of infection to aerosol inhalation introduces a further unknown quantity regarding infectious dose from building water systems (Yu 2000). It is possible that infection via this alternate route may be initiated by lower dose concentrations in the contaminated water source (Ruef 1998). It has been argued that there is more conclusive evidence for infection from building water systems via aspiration than via aerosolisation. This viewpoint and the debate surrounding routes of transmission remain unresolved and contentious (Yu 2000).

Field studies in the US have suggested that there is no clear link between *Legionella* concentrations in water samples and incidence of infection from building water systems (Kool et al. 1999; Wadowsky et al. 1982). In these studies it was reported that the frequency of positive isolations from samples was a better indicator of risk of infection than numbers of organisms

isolated (Ruef 1998). It has also been reported that >30% of positive *Legionella* tests from a system has been associated with *Legionella* infections (Ruef 1998). This suggests that either sampling results from building water systems are not truly representative (Ruef 1998) or that the infectious dose is primarily a function of the susceptible population (Kool et al. 1999).

Exposure Assessment

Surveys of the prevalence of *Legionella* bacteria in building systems indicate that between 25 and 68% of systems are colonised (Atlas 1999). Because of the range of species represented in building related infections there is no clear differentiation between risks associated with each species or serotypes.

Water temperatures above 20°C and below 50°C present the major factor contributing to colonisation of BWS. Areas of poor circulation or stagnation also support colonisation of *Legionella* and other microorganisms (Fisher-Hoch, Smith & Colbourne 1982; Kool et al. 1999). Commonly in outbreak scenarios these areas are not maintained at the optimal thermal setting for the system (Wadowsky et al. 1982).

Colonisation of plumbing materials such as natural rubber fittings and shower hoses and roses has also been demonstrated. In some instances these fittings have been cited as contributing factors to disease outbreaks (Schofield & Wright 1984; Wadowsky et al. 1982).

Recent reports have suggested that the installation of thermostatic mixing devices with significant lengths of pipe between the valve and the hot water outlet may also inhibit disinfection and control of *Legionella* in hot water distribution systems. It has been reported that installation of thermostatic mixing devices will compromise control of *Legionella* in hot and warm water systems (Lee et al. 2002).

Risk Characterisation

Colonisation of buildings systems by *Legionella* is via the reticulated water system (Atlas 1999; Kool et al. 1999). Factors that influence the colonisation by *Legionella* include the presence of sediments and deposits within the water system, poor flows, temperatures between 20°C and 50°C, inadequate or no disinfection and, the presence of pipework, dead-legs or standby systems where stagnation can occur (Bartlett, Macrae & Macfarlane 1986; Ruef 1998)

Studies have shown that *Legionella* are continually introduced into building water systems (Rangel-Frausto et al. 1999). Once introduced a number of factors will determine whether the system becomes permanently colonised by these organisms (Rangel-Frausto et al. 1999). The colonisation of system by multiple strains of variable virulence is likely should conditions be suitable for multiplication (Rangel-Frausto et al. 1999; Zeitz et al. 2001).

Risk Management

Much attention should be focused upon system design. Low flow and stagnant areas in systems should be avoided; where possible temperatures should be maintained outside the 20-50°C temperature range throughout the system (Ruef 1998). Pipe lengths after thermostatic mixing valves should be as short as possible and routine maintenance of these fittings is essential (World Health Organization [WHO] 1990). System design should exclude materials that might be conducive to microbial colonisation, such as natural rubber compounds (Schofield & Wright 1984; Wadowsky et al. 1982).

In some systems significant volumes of water may remain below 50°C as part of normal operating procedures (e.g. after mixing valves or in shower hoses). In these applications some consideration should be given to either chemical or thermal disinfection protocols. Favourable reports have been published from field applications using temperature, halogen,

monochloramine, copper/silver ionisation and chlorine dioxide treatments (Kim et al. 2002; Lee et al. 2002). The correct design and application and pro-active maintenance systems appear to be the major factors in determining the efficacy of these treatments (Lee et al. 2002).

Due to the well publicised uncertainties surrounding Legionella culture methods and results, sampling for the bacterium should not be misinterpreted as a means of monitoring system control (Bentham 2001; Boulanger & Edelstein 1995). Monitoring of simply, readily, and reliably obtained parameters such as water temperature, and attention to system performance and operating parameters are of more practical value in determining the level of control in the system. Daily and even hourly assessment of system performance can be made based on these identified control measures.

Routine monitoring of building systems for Legionella has been recommended in those facilities where high risk populations are likely to be exposed (e.g. organ transplant units, Kool et al. 1999; Yu 2000). Direct exposure may occur through use of the contaminated water system or appliance (e.g. showering). Culture has been implemented as a routine monitoring tool and frequency of sampling has varied between weekly and quarterly intervals. It has also been proposed that fittings and appliances should be swabbed for biofilm (Yu 2000). This suggestion is derived from the knowledge that intermittent use of water systems may cause dislodgement of Legionella colonised biofilms causing sudden release of large numbers of organisms. Swabbing of biofilm cannot easily be used to provide quantitative data on Legionella colonisation, and overgrowth

of swab samples on culture media may result in false negative results (Bentham 2001). Once Legionella has colonised a BWS system it may be controlled but not eradicated (Lee et al. 2002). Primary emphasis should be placed upon control measures rather than sampling for the organism (Ruef 1998).

Numbers of positive samples have been shown to be better indicators of risk than the numbers of organisms cultured. Sampling regimens should be designed in response to system size and design (Kool et al. 1999). The numbers of positive results obtained as a proportion of the total samples taken, regardless of species or concentrations, should be used as a means of validating control measures. Positive culture results should be used as indicators for reassessment of system design, performance, and adequate monitoring of established control measures in the system. As with the control measures it is critical that Legionella sampling protocols be extensive enough to be representative, and should include areas of highest identified risk and areas of lowest identified control (Kool et al. 1999; Ruef 1998).

It should be stressed that health risk management of building water systems for Legionella is a multidisciplinary process, requiring input at all levels of system management. The establishment of a broad base of expertise and involvement with the system will be critical in identifying appropriate and reliable control measures (Haas, Rose & Gerba 1999). Implementation of a simple proactive plan with well established communication and feedback between those involved will be more likely to succeed than reactive responses to routine Legionella culture results.

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Towards Environmental Health Indicators for Sustainable Development: An Inductive Qualitative Perspective

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This study is part of a larger research project to develop environmental health indicators for sustainable development. Although the larger project has a multi-method design, this paper focuses on the qualitative investigation of technical experts' and other community members' perceptions of environmental health risks that affect people who live in a metropolitan area - Brisbane. By using a series of focus groups with health and environmental experts, and interested community members, we found both that technical experts and community members identified directly and indirectly similar sets of health risks. These health risks include general environmental health risks, atmospheric and traffic-related health risks, and social health risks. Both groups appreciate the range of complex impacts of these risks on human health in a metropolitan environment, with the experts having a deeper understanding of these impacts. Both groups suggested a few actions that can be implemented to enhance the sustainability of the environment for living. We identified the different environmental hazards, health impacts and relevant actions that should be taken to link health with a specific environmental context. These understandings offered an inductive window into the views of different groups of people about environmental health indicators. A range of specific narratives highlights the widespread community awareness of the need to develop environmental health indicators from a qualitative perspective.

Key words: *Environmental Health Indicators; Focus Groups; Qualitative Perspective; Sustainable Development*

There are fundamental links between population health, environment and economic development (Tong et al. 2002). The ultimate goal of economic development is to improve the quality of life, increase human longevity, and "meet the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development 1987). Challenges to human health arise frequently from the expansion of economic activities. Emerging and resurgent diseases, and more insidious environmental pollutants and hazards, are evident in both developed and

developing worlds to hasten the need for the promulgation of effective, forward-looking policies. There is also the need for smarter strategies for reducing human exposure to health risks (Carvalan, Briggs & Kjellstrom 2000). Basic to these policies and strategies being developed is the need to develop a sensible set of environmental health indicators (EHIs), which can be applied at a local level using meaningful data, including the views of the people who live in the relevant environment.

An Environmental Health Indicator may be defined as: "an expression of the link between environment and health, targeted

at an issue or management concern and presented in a form which facilitates interpretation for effective decision-making” (Briggs, Zielhuis & Corvalan 2000). This definition focuses on the need to establish links between some aspect in the physical environment and the exhibition of health by people who live in that environment. It implies directly that human health cannot be isolated from the environments in which people live. Therefore, it is important that the voices of the people who live in that particular environment are taken into consideration along with the numerous health and environmental statistics when EHIs are being developed. Additionally, the Driving forces-Pressures-State-Exposures-Health Effects-Actions framework (DPSEEA) of the World Health Organization has been proposed for the development of EHIs in the context of sustainable development (von Schirnding 2002). Within this framework, the focus on the production of useful outcomes to improve environmental health in selected areas is seen as an essential component in the formulation of EHIs.

In calling for human viewpoints to be considered in the development of EHIs, we recognise that it will be necessary to adopt an approach that draws primarily on the perceptions and experiences of different groups of people in a community. Some of these people will possess technical expertise concerning environmental-health links, whereas others will base their thinking on common sense and experiences of specific events. We understand that people in the wider community do hold differing perceptions of health risks in their local environment (Langford et al. 2000). It may be argued that EHIs should be developed on the basis of scientifically valid and politically relevant criteria (Corvalan et al. 2000). We do, however, believe that it is vital to involve community members in the development of EHIs as they will play key roles in addressing each of these indicators once they have been identified (Sahani 2000).

This article, therefore, focused on the perceptions and understandings of technical experts and ordinary community members of environmental health risks as they exist in an Australian metropolitan area, Brisbane, a sub-tropical, East Coast, metropolitan city of some 1.3 million people who live astride the Brisbane River. The region occupies a river basin to the east of the Eastern Highlands and is influenced by atmospherics from both land and sea. Substantial temperature inversions occur during the winter months that cause bouts of moderate atmospheric pollution. Summers are characterised by rains and moderate to high humidity. The city blends road, rail, water and air transport. A belt of radial arterial roads dominates the transport network and vehicular pollution is considerable. High pollen counts occur in spring that affect people’s health, especially respiratory systems. Industrial development is concentrated in several zones across the city, including near the mouth of the river. Strong policies are in place to minimise the pollution from these industrial areas. Brisbane’s moderate climate attracts many people to move to the region. Urban growth is among the highest in Australia along the northern and southern margins, and urban sprawl is evident. The city area experiences environmental health challenges in terms of: atmospheric pollution; vehicular noise and pollution; natural hazards including bushfires, droughts and floods; industrial odours/smells and wastes; and water pollution. The environmental health risks have various impacts on the local inhabitants. The research seeks to understand what environmental health risks they perceive to be important in that area; what impacts these risks have had on the local population; and what actions the local health authority could consider to address or minimise these risks to make the Brisbane area a more sustainable environment.

Methods

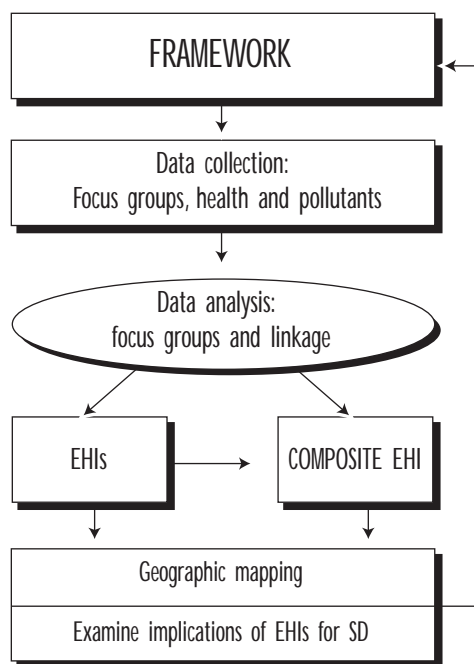
Practical framework

The development of environmental health indicators (EHIs) is a complex process that involves collecting a range of data from key industries, government departments, and various sources of official statistics, and from relevant people living in the affected area - both technical experts and interested citizens. These data consist of a mix of statistical records, survey information and interview transcripts from focus groups. Separate analyses are made of separate data sets and transcripts. These outcomes are triangulated to find points of convergence that form the bases of the EHIs. The derived EHIs are mapped and spatially correlated to establish implications for the region. Consequently, the implications of these EHIs for the sustainability of the region will be investigated. This practical framework, which is illustrated in Figure 1, is the one that has been used in the overall study from which this paper has been derived.

Focus groups: approach and composition

Focus groups were the main focus of this paper. There have been various proposals theorising on the process for developing EHIs. They have generally focused on utilisation of statistical data (Eyles & Furgal 2002; Hancock 2002; Hoek et al. 2002). In addition, there have been fewer studies that have adopted varying qualitative approaches (Cole et al. 1999) to ascertain personal perspectives about EHIs or to obtain appropriate reactions to specific EHIs. On other occasions, surveys have been conducted to obtain widespread perceptions of people's beliefs on what constituted a health risk in their environments (Starr et al. 2000). What varies among these studies is the degree to which the people participating in the data-gathering exercises were able to present their own views in an inductive way, as opposed to only reacting to specific questions or stimuli. In this part of the larger study, the idea was to act in an open

Figure 1: Schematic diagram for the development of environmental health indicators



inductive manner and not to prejudice people's thoughts about EHIs in their environment. An approach was used to allow the people who live in the Brisbane environment to express their views about EHIs.

Characteristics of participants

The inductive approach used here was to invite, through personal invitation and public advertisement, groups of technical experts (professionals in the environmental and health fields who were operating in the Brisbane area) and interested community members to participate in one of the four focus groups (two groups for professionals and two groups for community members). The characteristics of these groups of participants are summarised in Table 1.

Table 1: Composition of focus groups participants

Technical Experts	Number	Male	Female
City Council Air and Energy	2	1	1
Environmental Protection Agency	7	6	1
Environmental Consultants	2	2	0
Environmental Engineers	2	1	1
University Scientists	2	2	0
Government Environment Advisor	1	1	0
Queensland Health	2	1	1
Queensland Transport	2	1	1
Total	20	15	5
Community Members*	Number	Male	Female
Residents	6	5	1
Community action group	7	4	3
Total	13	9	4

Note: * They cover a range of suburbs including those in eastern, southern and western; Community action groups included traffic control groups and neighbour watching groups.

The 20 technical experts were identified by the researchers through their contacts in different professional groups, including environmental consultants and engineers, government technical experts (e.g. Health and Transport Departments, Environmental Protection Agency and City Council experts), and University scientists. Specific experts in different areas were invited to participate in focus group discussions to ensure a balance amongst the expertise in the focus groups.

The community members in the study were 13 people who answered an advertisement in the local press. All people participated in the study voluntarily, and they comprised citizens who were concerned with environmental health challenges in the Brisbane area and those who were members of identified community action groups (e.g. a traffic control group).

Data transcription and analysis

The specific issues that were discussed in the focus groups included:

- What are the major risks to health in the Brisbane area?
- Why are they important to environmental planning and management?
- What sorts of impacts do they have on the people?
- How have you experienced air pollution as a health risk?
- How does road vehicular traffic contribute to environmental health issues?
- Are there seasonal variations to these issues?
- Who should determine or identify these health risks?
- Are we collecting the right data to develop the link between the pollution and the risk?
- Who decides an acceptable level of health risk for a community?

Participants in the discussions raised these questions after the researcher/facilitator introduced each focus group with a statement of the purpose of the meeting, that is, to consider the indicators of environmental health that people in Brisbane experienced. Air pollution and its potential impact on health was emphasised because previous research found a significant association between air pollution and health outcomes in Brisbane (Simpson et al. 1997).

The data from the four focus groups were audiotaped, transcribed, checked by participants, and then finalised by the researchers as the data for analysis. The analysis of the data was conducted using a process of interpretive triangulation (Denzin & Lincoln 1994) - a common approach for analysing qualitative data.

In order to preserve the quality of the data, we employed a set of interpretative rules (Gerber 1996) as follows:

1. Orienting the analysis toward the phenomenon, for example, what are the health risks, impacts and actions in the Brisbane area?
2. Describing the phenomenon, for example, environmental health risks, as they appear to the participants rather than how the researchers observe them.
3. Treating all aspects of the responses as being of equal importance, that is, horizontalisation of the data.
4. Checking the data for structural features that demonstrate the linkages among the different variations or the general similarities.
5. Testing the clarity of the meanings of the participants' experiences of environmental health risks through invited feedback from individuals.

Results

A range of themes emerged from the transcribed focus group data concerning the perception of environmental health risks and key local aspects concerning these risks. Importantly, the participants' understanding of these themes is reported in their own words to preserve the inductive methodology that was employed in this study. These understandings are presented in a variety of quotations from the transcript of the focus groups. An investigation of these themes provides a basis for identifying environmental health indicators. The main themes that emerged were: the common perception and experience of health risks by technical experts and other members of the Brisbane community; the perception of health hazards versus health risks; the nature of the contexts in which the health risks

occurred; and how these risks were measured.

The perception and experience of health risks

The participants in the focus groups spoke of health risks in two ways: what risks they have perceived and what impacts they observed from these risks on the Brisbane community. They also briefly spoke about desirable actions that they believed should be taken to minimise these risks in the wider community. Their responses are summarised in Table 2. For ease of comparison, the results for the technical experts and the wider community members have been kept separate to reflect the similarities and differences that become evident when adopting a whole-community approach to environmental health issues.

The range of health risks that both technical experts and wider community groups perceived in the Brisbane area reflected their understanding of these risks. These risks were classified into the following main categories: general environmental health risks; atmospheric, traffic-related health risks that focus on noise, odour and dust; mixtures of pollutants; and other health risks. Both groups identified a broad range of general health risks and traffic-related risks. The technical experts identified a broad range of specific atmospheric risks, while the community members identified a range of generic environmental health risks. This variation in perceptions appeared to be based largely on the knowledge or experience that different groups had derived from living in the Brisbane environment.

The impacts of these risks were classified into atmospheric, social, and health clusters based on the data from the transcripts of the focus groups. Both groups drew attention to a range of social and health impacts from these risks, and the technical experts highlighted some atmospheric impacts. These views are illustrated in the following

Table 2: Perceived environmental health risks and impacts in the Brisbane area

Technical Experts	Community Members
Risks	Risks
*Atmospheric variables/factors:	*Atmospheric variables/factors:
Ultra fine particles	Atmospheric movement
Greenhouse effects	General air pollution
Other climate effects	*Traffic-related noise, odour, dust
Ultraviolet radiation	*General health risks:
*Traffic-related noise, odour, dust	Pesticides
*General health risks:	Bad odours/smells
Pesticides	Ambient noise levels
Farming practices	Sewage vent pipes
Cyanobacteria proliferation	Noxious waste industries
Toxin production	Shipping pollution (water, air)
Bad odours/smells	*Others:
*Others:	Asbestos
Bushfires	Wood smoke
Mixtures of pollutants	Swimming pool filter noise
Impacts	Impacts
*Atmospheric impacts:	*Social impacts:
Atmospheric issues	Social exclusion (Children, Elderly)
Indoor air quality	No sleep from pool filter noise
*Social impacts:	*Health impacts
Family breakdowns	Death (Infants, Aged people)
Stress from living near a main road	Asthma
*Health impacts:	Lung cancer
Asthma	Chemical corrosion
Death	Respiratory problems
Respiratory problems	
Hospital admissions	
Allergies	

Note: * Categories

statements - the first from the technical expert group and the second from the wider community group.

A member of the expert group drew attention to an industrial area near the mouth of the Brisbane River, which had changed when a major industry closed down. He said:

I think that you could look at Murarrie as a good example. One company was moved from there. And if you drive around it now you can see a lot of houses have been freshly painted and people there have a different approach to life. I think that's a measure of

their environmental health. It might not be easy to quantify, but as far as stress goes, the way that people lived with their children and things have changed there. In a previous era, there were a lot of oddball families ... living in that suburb ... The atmosphere around the place used to contribute to the social breakup of families. We had regular reports of it and you'd go and visit places and see children in pretty odd situations. You don't see that these days.

The examples from the wider community reflect experiences that are both insidious and damaging. In the first instance, a person commented on the insidious impact of swimming pool filters on the life of a shift worker in a suburban area. He said:

I'm a shift worker and I used to sleep in a very peaceful room at the back of my house where I used to read a lot and write. Since the pool filter fiasco started up two years ago, we've abandoned that room. The pool pump goes off at 6 o'clock at night when my neighbour arrives home. All day, you can hear the noise in the bedroom quite loud, in the downstairs patio, and in the kitchen... All you can hear is this 'Weeaaa'. And the Council is reluctant to enforce the legislation and I'm waiting to see if they can enforce the Australian Standards on noise pollution.

The second community example refers to a street that has become a "road tunnel" (that is, a heavily used thoroughfare) for heavy transport vehicles. As the person reported, the impact of the amount of heavy transports using this street has been one of the health risks and social dislocation. She commented:

Our street forms a tunnel. And sometimes you think the houses are on fire, the smoke is so bad - it's not the smoke, of course, it's the pollution haze. It's ruined the area. It was a popular low cost area for families. All of the young ones have moved out. You never see kiddies on the streets any more. The oldies are isolated in their homes. I work in the community centre. You can't talk to your neighbours in the street as the heavy trucks thunder past. In terms of health problems, there's an awful lot of non-smokers in our street who go down with cancer... All the Venetian blinds, the plastic blinds that you used to buy, are all eaten away. But, we were assured by the Environment Minister

that diesel exhaust is not dangerous. The fact is that our blinds get eaten away in our street but not in other streets.

These examples reflect the type of impact that has been experienced in the Brisbane area, and they do provide an indication of environmental health risks that can be converted into an environmental health indicator.

While both groups in the study mentioned actions that could be taken to address these health risks, they did not specify how these would be actually achieved. For example, the community members did believe in the merits of community action groups, such as Smogbusters, who are interested in traffic pollution in suburban areas. The technical experts were more attracted to offering general solutions including health promotion. Both groups believed that more needs to be done by regulators and citizens to address these impacts.

The perception of health hazard and health risk

The range of health risks listed in Table 2 gives an indication of the views from both technical experts and community residents. However, some participants wanted to differentiate between environmental health hazards and environmental health risks. They saw this distinction as being important in the development of EHIs because some local people do not believe that health hazards are necessary elements of these indicators because the people do not experience any exposure to them. Rather, they believe that only health risks should be considered when developing EHIs. As one person noted:

Let's be certain of differentiating between hazard and risk here. Hazard is just the fact that something is there. The fact it's there doesn't mean there's a risk unless there's a clear definition of exposure. So, if you're going down the track of defining risk, you must define exposure. The person on the street has very limited knowledge of whether exposure is taking place, unless measures are available to establish concentrations of these

compounds in given biological media. So, in these circumstances what we're probably talking about is perceptions of hazard: something that happens to be there, for which there may be no risk whatsoever because there's no exposure.

Another person emphasised that the perceived environmental health risk is more significant for some people if it affects their senses directly or if they know that it is out there in the atmosphere but they cannot see, hear or smell it. As he described:

Most people you speak to have a much greater awareness of things that impact directly on their senses than other things that we cannot measure, although you do get a range of levels of concern amongst any community in any situation. And you get some people that are basically scared of anything that's floating around that they can't see. So, you get a range of opinions in any group of people.

Further, participants raised the issue of the need to distinguish between short- and long-term impacts of any health risks. The tendency is for community members to focus on not only short-term impacts but also long-term impacts. As one person noted:

I guess that it depends on the area where you come from. Certainly, coming from an industrial area, the major focus seems to be more on the long-term. People become accustomed to some of the short-term aspects. The question is about some of the long-term aspects, some of the air toxins in particular, and the lack of information available on these.

Other participants drew attention to health impacts of traffic-related air pollution such as asthma and lung cancer. Clearly, the participants were concerned with both short- and long-term impacts of air pollution.

The contexts in which health risks occur

Members in these focus groups emphasised that while these health risks can be enumerated and that they occur within a particular physical environmental context, there is another set of contexts that needs also to be considered when thinking about

EHIs for an urban area such as Brisbane. In this investigation, they drew attention to the social, political and economic contexts as being important. The social context for health was mentioned in the earlier case where people were talking about a particular street being a “valley” for heavy transport vehicles. Here, one form of social isolation was emphasised. However, another person drew attention to the fact that such isolation can be a real health hazard. They pointed out that these outer suburbs might look very attractive and they do not appear to have apparent health risks. Such is not the case. Crime rates could be higher due to the isolation and the physical isolation could produce a sense of fear in the community. Some of these social impacts are quite insidious, unlike the measurements that can be made of atmospheric pollutants that are monitored regularly by the Environmental Protection Authority. As one person noted:

There's another aspect to health, what we call the social context of health, and that takes into account all of those things that we've mentioned, but also other things. Look at the ... [name of a newer outer Brisbane suburb], as far as the aesthetics are concerned, you drive through those suburbs - beautiful - trees, green, all the rest of it. But, the social isolation there, with the lack of public transport and the rate of crime, are incredible. That installs a sense of fear in the community, particularly for the elderly and those who aren't free in their own transport mode, and that has a big impact on their health and how they feel. These are things that we do not measure.

Economic and political contexts were also viewed as important when thinking about the environmental health in an area. These comments reflected the view that health policies are implemented within particular economic and political climates. As one person in the focus groups noted:

What government policies, or local government policies, are there that don't consider the impact on human health in fact may be adversely impacting on human health. If we're going to look at the big picture, we need to consider that environmental health is not just physical,

chemical and biological things that impact on health, but it's also the social, the political and the economic.

Ultimately, this holistic view towards environmental health is the reason for thinking of EHIs in the context of sustainable development. Good health is one of the key outcomes in sustainable development (von Schirnding 2002). As these people mentioned, it cannot be achieved unless there is a “sustainability mind” across the society extending from the political leaders to the community residents.

Measuring health risks

Members in the focus groups raised the interesting question of how health risks should be measured for them to be meaningful. It is well known that the Environmental Protection Agency or its equivalent conducts extensive measurements of specific indicators, for example, atmospheric pollutants and water contaminants, on a regular basis. However, for the wider community, it is the perception of risk that is most important. One participant in the focus groups made the following statement:

I think there're two problems. Firstly, health risks are so relative to the individual - if you're an asthmatic, or some of the people that we deal with in the community have allergies, so they're going to be highly interested about their level of exposure, and it becomes a focal point to them. Secondly, if you are living close to an industry or something which is causing you either odour nuisance or other air quality impacts - so it's relative to where you are situated, like your residence. I think there's such a variation in the community, it would be very difficult to establish a universally accepted level of risk across this community.

Some of the experts in the focus groups also drew attention to variations in the scales used for measuring indicators of health risk, for example, as “relative risks and lifetime risks.” This might be an issue for the scientific community to address when framing EHIs, but to have most effect in a community in a sustainable way, these

measurements should make sense to the people who live in the community. One participant reflected on work done by the Brisbane City Council to develop an indicator of potential health impacts based on emissions. He concluded that: "You really need to calibrate against the community by survey. So, you can make all the assumptions that you like, but it may not reflect what the community actually perceives. You have to go out and directly measure that".

A further difficulty in measuring pollutants and other health risks is that many of them do not occur singly and so affect people in communities as a mixture of risks. This is important to experts and community members alike because they believe that it is difficult to isolate actual particular pollutants before anyone can assign an environmental health impact for each one. As one person noted:

The other point that I made was the obvious one about impacts being associated with mixtures of pollutants. You're never dealing with one pollutant on its own. There might be a dominant pollutant, but it'll never be in complete isolation. So, you have the difficult job of trying to dissect out effects in invariable mixtures of pollutants where each of the individual components may well have its toxicity reasonably well defined, but the interrelationships between the components and the consequent toxicity of the mixture is seldom defined.

Even if such variations can be dissected, some of the participants in these focus groups still believed that the evidence does lack sensitivity. They are referring to their beliefs in the quantitative significance of data analyses that have been computed using data gathered from environmental monitoring stations and health statistics. Therefore, in terms of dangerous traffic corridors in the Brisbane area, they argued that it is not possible to answer the question "Is there a place in Brisbane where it's dangerous to live because of the traffic?". This is because there is not sufficient information available and the research methods we use at present (for example,

cross-sectional surveys and case-control studies) are not sensitive enough to address this issue.

Discussion

Qualitative research provides rich and in-depth information on people's perceptions, attitudes, and beliefs towards specific issues (Gerber 1996). This study with groups of local technical experts and community members in Brisbane was aimed at understanding what the environmental health risks are in their city, how these risks impact on the people living in this area, and what actions should be taken to address these risks. The data from the transcribed discussions revealed that professional experts and community members had a good understanding and profound experience of a range of health risks that are evident in the Brisbane area. Although the participants mentioned a few actions to address these risks, they were unsure what actions might be effective. Our results confirm that the participants in this study hold a similar set of environmental health risks to those identified in the recent national study of health risks in Australia (Starr, Langley & Taylor 2000). This finding is important because these environmental health risks were derived from both an inductive qualitative process and a quantitative survey.

Variations between these two studies were the inclusion of bushfires, swimming pool filter noise, asbestos, and wood smoke in the Brisbane data, and mobile phone towers and high-voltage powerlines in the national survey. Clearly, many of these risks are localised and perceived differently by different people. Therefore, the results from qualitative and quantitative studies might be not directly comparable. It is our contention, however, to highlight the need to consider qualitative data as an important source of information when dealing with the development of EHIs for specific communities, such as Brisbane. The concept of integrating the results from the

qualitative studies with the quantitative analyses (for example, linkage analysis of air pollution and health) could be a sensible approach. It is a multi-method approach that derives from the accepted qualitative method of triangulation that will enable more robust indicators to be developed and applied to specific contexts.

The importance of contextualising the health risk data and the appropriateness of the measurements that are employed to obtain such data are two aspects that need to be considered when developing EHIs. The context in which the health risk occurs is crucial because the physical environmental setting, and the relevant social, political and economic conditions pertain directly on the extent to which the perceived health risk is applied. We suspect that if similar environmental health risk studies were conducted in different areas within countries and across countries, variations in the outcomes are likely to occur. Similarly, the issue of measurement of the health risk

is important while there is no clear set of internationally agreed EHIs yet. Obviously, more research is needed to build up the methodology for the development of EHIs.

Two limitations of this study are acknowledged. First, the sample was small and it is unlikely to cover comprehensively a metropolitan view. Second, researchers were unable to explore some issues in-depth (for example, the relationship between environmental health and sustainable development) due to the limits of time for the focus groups.

Despite these limitations, the initial investigation does reveal that an inductive qualitative approach can be helpful in uncovering information regarding environmental health risk and impact from an experiential perspective. We expect that further refinement of this approach will occur as the larger study unfolds, and the method derived from this study is applied to wider contexts than that of Brisbane.

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Developing an Environmental Health Research Framework

Melissa Stoneham

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This article is dedicated to Beau Martin, a young and talented environmental health research student from the Queensland University of Technology who was tragically taken by a shark in December 2002.

Historically, environmental health research has not been rigorously funded. It has had the reputation of being fragmented, poorly diffused, and with findings under-utilised. There are many reasons for this phenomenon including the absence of a national environmental health research agenda, the under-developed research capacity of the traditional environmental health workforce, and the diverse nature of environmental health research methodologies utilised. The National Environmental Health Strategy recognises many of these gaps. This paper proposes a national environmental health research framework that attempts to explain the complexities of environmental health research. Further discussion focuses on future research challenges and potential solutions.

Key words: *Environmental Health Research; National Environmental Health Strategy; Environmental Health Priorities.*

The Australian National Environmental Health Strategy ([NEHS] Department of Health and Aged Care 1999) was launched in 1999. It was the first document to provide a national direction for environmental health in Australia. The Strategy was developed in response to widespread concern that current environmental health management practice is fragmented across a range of jurisdictions and organisations. The Strategy recognises that environmental health covers a broad range of disciplines and aims to provide a national framework for cooperation between all sectors. The development of a national framework serves to increase the ability and capacity of those providing environmental health services in Australia by outlining clear processes for improving the assessment, prevention, control, and management of environmental health hazards.

One of the keys to improving environmental health outcomes is through the identification and development of a strong research agenda. However, the

agenda must consider environmental health research at basic, applied and strategic levels, and ensure that it is directed not only at scientific and technological matters, but also to areas such as management systems and service delivery. In addition, research is vital for developing the capacity to identify and respond effectively to newly emerging hazards, and to provide the evidence base for environmental health best practice.

What Is Environmental Health Research?

In this paper, environmental health research refers to the investigation and interpretation of environmental factors that affect human health. It encompasses:

- Basic research in environmental health. Basic research is defined as investigator driven, which explores issues such as exposure effect relationships. Examples would include hazard characterisation related to chemical toxicity or the effects of climate change.

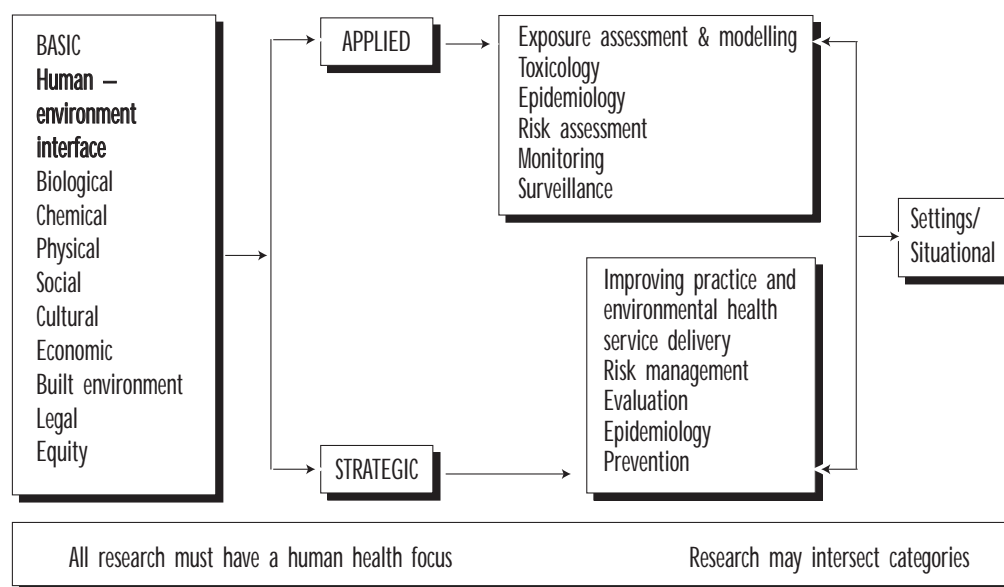
- Applied research in environmental health. Applied research is often aimed at providing solutions that recognise the multidisciplinary nature of environmental health and strategies to influence other spheres or government. It also includes identified problems, including remediation options and risk analysis, and the identification of public health issues within planning processes.
- Strategic research in environmental health. Strategic research is defined as being priority driven, yet needs to be linked more effectively to research that informs policy. An example would be paper-based exercises that synthesise existing knowledge or the development of healthy public policies that address environmental health issues.

These levels of environmental health research can be further explained diagrammatically as in Figure 1.

Environmental health has evolved into a complex area that is seeking to address the

impacts of societal changes on human health and environmental sustainability (Nicholson 2001). While many of the traditional environmental health hazards and associated risks remain, new hazards are emerging, requiring a balanced approach. One of the differences between traditional and contemporary environmental health hazards is that the former is often rapidly expressed as a disease. Contemporary hazards, however, may have long latency periods and are often related to urbanisation and an unsustainable consumption of natural resources. Any environmental health research framework must recognise these different hazards that interface between humans and their environments and provide avenues for differing and in some cases, innovative research methods. Using basic, applied and strategic methods is one approach to describing environmental health research. Basic methods could be referred to as the more traditional approaches that consider direct links between health and environment. Examples could include issue mapping with an environmental health research paradigm, the development of methods for detecting pathogens, and the development of biomarkers of immunotoxicity. The aim of basic environmental health research would

Figure 1: Environmental health research framework



primarily be to increase environmental health knowledge to enable a better understanding of the interactions between humans and the environment.

Applied environmental health research advances the knowledge learned from basic environmental health research through processes such as risk assessment, monitoring, epidemiology, and modelling. Examples may include the monitoring and mapping of mosquito populations and the development of a hazard inventory for enabling improved health risk assessment. The aim of applied environmental health research would be to accumulate and gather useful data that would support strategic environmental health research objectives.

Strategic environmental health research focuses more on qualitative methods, having principles such as prevention, quality of life, equity, and intersectoral cooperation as core elements. A primary aim of strategic environmental health research would be the integration of knowledge learned from basic and applied research into environmental health practice and service delivery. The knowledge resulting from the basic and applied research is extremely valuable. However, knowledge is only a tool and it needs to be applied constructively for appropriate action. This concept is supported by the NEHS (Department of Health and Aged Care 1999). The research objectives within this document state that it is important to develop procedures to provide a framework for the management and implementation of priority driven environmental health research programs. The NEHS also advocates for research to be forthcoming from a wide range of sources and that it is fostered and actively used in evidence based decision making in environmental health. As part of this approach, mechanisms need to be established to transfer research based knowledge into practice and to monitor outcomes. Examples of strategic environmental health research would include the use of skin cancer incidence data

to provide a rationale for the development of locally based shade creation policies that incorporate many sectors, and the community, and create supportive environments for health. Additional examples include the evaluation of systems that incorporate sustainability concepts into policy frameworks, the development of mechanisms for incorporating health impact assessment into local and state government development assessment procedures, and an investigation into the efficiency and effectiveness (cost and program effectiveness) of specific environmental health programs.

Despite which category the research falls under, many of the results will influence settings or situations. Settings refer to every aspect of our surroundings and environment. It encompasses people, their local communities, their homes, where they work and spend their leisure, as well as flora and fauna.

The framework presented is one approach to reflect on the environmental health research agenda. It does not advocate that one type of research is more important than another. It recognises the importance of all levels of research and how they must be developed further to ensure that better health is achieved. The identification of, and protection from, environmental health hazards is a key element for the development of guiding policies that have support and an active contribution from government agencies, commercial enterprises, and the community.

The Challenges

Historically, environmental health research has not been rigorously funded. It has had a reputation for being fragmented, poorly diffused, and with findings under-utilised. The issue of failing to meet funding bodies' requirements also needs to be addressed. The NEHS (Department of Health and Aged Care 1999) identified how applications for funding from traditional government research programs such as the

National Health and Medical Research Council (NHMRC) and the Australian Research Council (ARC) have met with little success. The Wills Report also stated that highly relevant funding proposals often fail to meet the requirements of major funding programs because they straddle health and non-health disciplines (e.g. environment, housing, transport, and engineering). This issue of intersectorality will continue to be a common problem in environmental health due to its diverse and broad nature.

A lack of research capacity among some environmental health practitioners has also hindered the research agenda in Australia. The NEHS (Department of Health and Aged Care 1999) recommends the development of postgraduate research training for environmental health practitioners and states that when comparing environmental health research to other disciplines, it is particularly obvious that environmental health postgraduate research is underdeveloped in Australia. The development of new courses that focus on research, together with strategies such as mentoring programs would encourage new researchers into environmental health.

Another challenge is the development of a national environmental health research agenda or research centre. Although the NEHS has been influential in improving awareness about environmental health in government circles, it has failed to provide a framework for the management and implementation of priority driven research programs. The process of selecting priorities is well documented. Criteria such as the number of people affected, the severity of the issue, the existing strength of evidence, the efficacy of control measures, the public's perception of the issue and short term versus long term outcomes could be used to develop environmental health research priorities. An existing body, the enHealth Council, is in an excellent position to facilitate this process. The benefits of having a nationally accepted priority-driven research agenda are two-fold.

First, it would guide researchers in areas that might be more likely to be funded and second, it could assist the enHealth Council to seek support for, and to promote, environmental health research needs to existing funding bodies such as the NHMRC, the ARC and the Public Health Education and Research Program (PHERP). The importance of priority-driven research is clearly supported by the Wills Report (Commonwealth of Australia 2000) and needs to be addressed in Australia.

Future Directions

All Australians are entitled to live in safe and healthy environments. Yet our environments are constantly evolving and new environmental health hazards are emerging. In order to stay abreast of these new threats and to monitor and manage traditional threats, research is required. Such research should be priority driven, peer-reviewed, intersectoral and have results diffused and integrated into policies and programs to improve environmental health service delivery and policy development. In order to achieve these goals, it is proposed that the following strategies should be considered at the national level:

- There is a need to develop a highly trained and skilled environmental health workforce. For this to be achieved, collaboration with universities is needed to ensure current programs are regularly evaluated, that proposed programs contain contemporary topics and research methodologies, and that relevant and needs-based professional development programs and short courses are widely available in many formats including distance and online.
- There is a need to recognise that research can be a career pathway. For example, a system of professional recognition is required to ensure that those professionals who choose to pursue a Masters in Science have

the same if not better career options than those who choose to study a Masters in Business Administration.

- There is a need for specific and competitive environmental health scholarships to be offered through various avenues.
- There is a need to develop a system that can advocate for research and its integration into practice and policy. This management system would need to consider issues such as the dissemination of research findings, and the promotion of avenues that aim to increase research literacy within the existing environmental health workforce.
- There is a need to engage seriously with other agencies. This would involve sharing information and data and working collaboratively to produce better environmental health outcomes. Protection of careers and personal agendas would need to be compromised for this to be successful.

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Conclusion

The Chartered Institute of Environmental Health in the United Kingdom stated that health is everything inside an individual and the environment is everything outside an individual (1997). Taking this view, environmental health would cover almost everything, making it a highly complex and widely varied area of research. This paper has attempted to highlight some of the gaps that exist in the area of environmental health research in Australia. The proposed environmental health research framework could provide direction for the development of environmental health research priorities and might assist in explaining the complexity and variety of research methods that are used within the environmental health discipline. The framework may also open opportunities for the generation of new ideas and energy, the development of research capacity building programs as well as the development of genuine and new partnerships that have a greater understanding of the differing roles of environmental health professionals.

PRACTICE, POLICY AND LAW

Tobacco Compliance Monitoring in New South Wales

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The implementation of public health law is often regarded as an important weapon in achieving public health goals. The appropriateness of tobacco compliance monitoring as an effective and efficient initiative in public health is an issue that has, perhaps, been overshadowed by other strategies. The intent of this report is to raise the level of awareness among public health practitioners and to encourage further debate within the profession on the reasons behind compliance monitoring, its implementation and ultimate benefits to the health and wellbeing of the public, particularly those young people who are thinking about taking up smoking.

Key words: *Tobacco; Compliance; Monitoring; Public Health*

Tobacco smoking accounts for 18,124 deaths per year in Australia and is the largest single preventable cause of death (National Approach 2000). According to the Australian Bureau of Statistics survey data, 90% of Australian smokers take up the habit by age 20. It has also been generally accepted, through a wealth of international research, that smoking from an early age leads to an increased risk of smoking related disease and that it is less likely that an individual will be able to stop smoking.

Many experts also seem to agree that restricting young people's access to tobacco products can help in reducing adolescent smoking. Studies have demonstrated that it is possible to decrease the proportion of shops that sell tobacco to minors with two studies in the US, which also incorporated legislative strategies focusing on adolescents, finding significant reductions of regular smoking among adolescents (DiFranza, Carlson & Caisse 1992; Jason et al. 1991). These two studies provide support for the association between restricting access to tobacco products among minors and reducing tobacco use, at least under the US compliance monitoring strategy.

Legislation and the NSW Compliance Monitoring Strategy

In NSW, Section 59 of the *Public Health Act 1991*(NSW) as amended, prohibits the sale of tobacco to persons under the age of 18 years and also details the provisions that allow enforcement of the Act. The 1996 Australian Secondary School Student's Alcohol and Drugs Survey (ASSAD survey) (Hill 1999) found that 38% of persons under the age of 18 years claimed to be obtaining cigarettes through illegal sales. The 1999 ASSAD survey indicated 34% of males and 22% of female adolescents had illegally purchased their most recent cigarette.

There is currently an active and ongoing "strategy" in NSW with sales to minors monitored by routine, standardised and annual compliance tests conducted by Public Health Units (PHUs) of the local Area Health Service. Known as "compliance monitoring" each Area Health Service PHU is meant to undertake compliance tests on a minimum of 10% of retailers annually. Compliance monitoring includes a policy whereby the continued failure of retailers found not to comply with Section 59 of the *Public Health Act* may lead to possible prosecution. The Tobacco and Health Branch of NSW Health report that there have been 130 prosecutions in NSW since

1994 for cigarette sales to minors. In 2002 testing showed that 22.5% of premises involved in compliance monitoring sold cigarettes to minors (Brotherton 2002).

Routine, standardised and annual compliance tests conducted by PHUs are primarily coordinated by Environmental Health Officers (EHOs). The current strategy requires EHOs to recruit adolescents under 18 years of age, who are suitably briefed and trained on what to say and do, and then sent into the retailers to simply ask for a packet of cigarettes. If they are sold a packet the EHO then returns to the shop and either issues a warning letter, or, if the retailer has been previously caught in this manner, proceeds with further legal action.

Enforcement and outcomes

In reality, Section 59 of the Act is very difficult to enforce because it is a "victimless" offence. The Act provides that the offence is to sell a minor tobacco, but it should be noted that, unlike legislation related to illicit drugs, no offence exists for the child to unlawfully possess tobacco, to use tobacco, to purchase or "attempt" to purchase tobacco. A retailer may, however, rely on a defence against a prosecution whereby they are able to demonstrate that they "had reasonable cause" or "had taken all precautions that were reasonably required" to ensure that tobacco was not sold to an under age person (Reynolds 1995, p.193).

Studies also suggest that outlets such as supermarkets, service stations and corner stores are more likely to engage in selling to minors while licensed premises such as hotels and clubs and specialist tobacconists are likely to enforce the legislation far more stringently (Reynolds 1995)

There can be no denying the logic that assumes restricting access to tobacco for children should have an effect on the numbers of people who start smoking from an early age. The evidence suggests, however, that interventions to deter

retailers from making illegal sales are neither having any significant effect nor are any great sustained or consistent compliance levels being achieved (Stead & Lancaster 2002). Current studies also indicate that active enforcement and multi-component educational strategies may be achieving some results, but that no single strategy has achieved complete and sustained compliance and, perhaps more importantly, there has been little or no effect on youth perceptions of access or the prevalence of smoking among minors (Stead & Lancaster 2002). Brotherton (2002) also reports on the cost-effective analysis of compliance monitoring and found, even using the most optimistic assumptions, compliance monitoring would reduce youth smoking uptake by only 1-5%.

Nevertheless, the National Tobacco Strategy (National Expert Advisory Committee on Tobacco 2000) identifies reducing the availability and supply of tobacco as one of its six key strategy areas. The strategy claims that a reduction in illegal sales and supply of tobacco to minors will be achieved by: "developing, implementing and evaluating a national 'best practice' model in sales to minors programs including community and retailer education, legislative options, penalties, monitoring, effective compliance checks and enforcement."

The ethics of protecting children

In looking to develop a "best practice" model in compliance monitoring the question must be asked as to why or how such a strategy can be considered an appropriate instrument in achieving a public health goal? In this regard, it may be worth considering why the protection of children from the harms of tobacco is such an emotive and passionate public health issue.

John Stuart Mill (1869) elaborates upon our notions of liberty and freedom within a modern society and provides *inter alia* "...that the only purpose for which power can be rightfully exercised over any member

of a civilised community, against his will, is to prevent harm to others". While Mill also decrees that, "over himself, over his own body and mind, the individual is sovereign", he qualifies this by allowing an exception for children or young persons "below the age which the law may fix...", and that; "those who are still in a state to require being taken care of by others, must be protected against their own actions".

In the case of tobacco, our concept of an individual's autonomy or "right to choose" is somehow transformed the minute a person turns 18 years of age from a paternalistic, beneficence and non-maleficence view into a more ethical pluralistic approach (that is, individuals are free to do whatever they choose provided their behaviour does not harm anyone else and they extend the same freedom to others). As a society, therefore, we appear to be more than comfortable with the legal and ethical situation where an 18-year-old can choose to smoke but a 17-year-old cannot and that, when it comes to tobacco, anything lawful is ethical and vice versa.

Entrapment

As previously mentioned, the crime of selling tobacco to minors is a "victimless" offence whereby the purchaser is normally the only witness to the commission of the offence and, as such, is highly unlikely to complain to the Health Department. The issue therefore becomes one of gathering sufficient evidence to prove that an offence has been committed and ensuring that such evidence has been gathered in a way that guarantees a successful prosecution. The community has generally accepted that undercover police officers use the practice of "entrapment" in the prosecution of dealers and consumers of illicit drugs such as heroin or marijuana; but does this strategy transfer comfortably to the Health Department using children in the same way? Tutt (1997) claims that all sorts of reasonable arguments have been put forward by ethics committees and health workers as to reasons why entrapment should not be used, including that:

- it's illegal,
- it's immoral and unethical,
- it's unfair,
- it's un-Australian,
- it's unpopular,
- it's ineffective, and
- the whole issue is just "distasteful".

Chapman (1997) also points out that until 1997 at least eight separate research applications that involved compliance monitoring had been rejected by Australian ethics committees on the basis of the same arguments.

Despite any feelings of unease or trepidation relating to the community's perceptions of entrapment, the *Public Health Act* (NSW) does not prohibit the gaining of evidence by these means and the defence of entrapment cannot be used. However, courts do have a discretion to exclude evidence where they believe that it was illegally or improperly obtained and the court must determine if the trap was laid to catch an unwary offender as opposed to an unwary innocent. Trapping at random might also not be viewed well by the court and it is likely that a reduced penalty could be considered where evidence has been gained by entrapment (Reynolds 1995). The court must also be convinced that the "bait" was not made to look, or claimed to be, older than they actually were, and that the retailer was not harassed or enticed in any way actually to sell cigarettes. Nevertheless, despite these considerations and with the law as it stands, entrapment remains the only practical method of enforcement and means of monitoring compliance.

The Role of the Health Department

It could be stated that perhaps a fundamental paradox in tobacco compliance monitoring appears to be the expectations of

a health service primarily designed to “cure” rather than “prevent” disease and in this regard it may be widely accepted that the prosecution of criminals is not a function ordinarily associated with the Health Department. The Department’s role in tobacco compliance monitoring could also appear to be unique in comparison with its non-participation in the enforcement of other significant public health legislative interventions specifically related to children, such as under-age drinking, wearing bicycle helmets, having swimming pool fences, and preventing scalding from hot water systems.

In such matters there might even be some recognition that other agencies, such as the Police, Local Government or the Environment Protection Authority, are better resourced, better trained and more capable of effectively and efficiently enforcing legislation than the NSW Health Department. Nevertheless, the reorientation of health services beyond their responsibilities for providing clinical and curative care is recognised within the Ottawa Charter for Health Promotion (World Health Organization [WHO] 1986), and the Health Department’s involvement in tobacco compliance monitoring should, at the very least, be recognised in this regard.

Influencing change behaviour in the community

Notwithstanding any concerns regarding the Department’s role in “enforcing” legislation it should be generally acknowledged that NSW Health has made a significant contribution to “introducing” and/or “amending” tobacco legislation. However, what might not be so readily apparent is determining if such legislation has been the result of genuine community concern and consultation or if it has been the result of well-meaning politicians and/or health professionals and their ability to dominate the issue, to force their opinion on others, and to claim that they know what is

“best” for the general community.

It is not that this approach should be considered a “bad thing”, but that this top-down or “diffusion of innovation” as a theoretical perspective of influencing change behaviour could perhaps be more readily recognised for what it is, and even utilised for increased benefit. For example, Ferrence (1996, p. 24) claims that diffusion of innovation theory can provide a useful way of “explaining patterns of tobacco use and refers to the spread of new ideas, techniques, behaviours or products throughout a population”. Ferrence (1996, p. 24) also claims that the diffusion of tobacco can be related to structural factors in both the tobacco industry and in regulatory bodies and whether or not “the responsibility for the regulation of tobacco products is located within a health ministry or one concerned with commercial relations”. This has a direct effect on the behaviour of the retailer from an economic perspective whereby the benefits of selling to minors is weighed against the likelihood of getting caught.

The diffusion model can be applied to the study of tobacco use both as a model for explaining patterns and trends in populations and can also be used to identify the most effective approaches to changing patterns of use. Ferrence (1996, p. 25) for example, points out that while young people are influenced in their tobacco use by their family and friends:

the availability of tobacco to underage youth in neighbourhood outlets, the advertising and promotion of new and existing products, and the availability of ‘kiddy’ packages and illegal single cigarettes have probably been critical factors in the rate and extent of adoption, independent of interpersonal factors.

In other words, according to Ferrence, the effectiveness of tobacco compliance monitoring in the diffusion of innovation context of a behavioural change factor, can be seen as being dependent on an understanding of how well it is assessed within the overall patterns and trends

within the population. More important, on one hand it could be strongly argued that compliance monitoring and its effectiveness as a behavioural change factor applicable to adolescents purchasing the cigarettes and also retailers selling the cigarettes, is clearly dependent on how well it is enforced.

On the other hand, in a more “bottom up” or “popular education” theoretical approach, the community could be encouraged to define issues for themselves in looking to effect behavioural change. Perhaps the community could even be engaged to provide comments on such reforms as:

- Making the possession and/or consumption of tobacco by persons under the age of 18 an offence similar to many illicit drugs and alcohol.
- Notwithstanding the trade practices implications, considering restricting the sale of tobacco to licensed premises and specialist tobacco outlets in the same way as the sale of alcohol is restricted.
- Shifting the responsibility for enforcement away from the Health Department to the Police and/or Local Government, or insisting that the Health Department “lift its game” by committing more resources to improving compliance strategies and being more accountable for reporting back to the community the results of such monitoring.

Conclusion

Clearly, according to John Stuart Mill, the community’s expectations are such that we have a responsibility to protect children from harm and to punish those who would inflict harm upon them, even if this harm is not immediately apparent. In a practical sense, however, the questions that must be asked in relation to the current tobacco compliance monitoring strategy are:

- Is it the right and appropriate thing to do?
- Simply because it is within the framework of the law, is it still morally and ethically acceptable to use children as “bait” to trap unsuspecting retailers?
- Is the ultimate objective of the law in stopping (or even reducing) the prevalence of smoking amongst adolescents being consistently and equitably achieved?
- Are the resources allocated to this strategy appropriate in terms of an outcome specifically related to the prevalence of smoking among adolescents?

In regard to compliance monitoring and tobacco sales to minors the latest statistics and actions can be interpreted to show that:

- 76% of male and 78% of female adolescents who admit to smoking did not obtain their last cigarette through an illegal sale.
- 90% of retailers are not tested annually.
- Of the 10% of retailers who were tested in 2002, 78.5% of them did not sell cigarettes to minors.
- Retailers caught selling in the first instance, have to be “trapped” at least once more before they even face the possibility of prosecution.
- Of the many tobacco retailers in NSW, after eight years of compliance monitoring, only 130 retailers have been prosecuted (Brotherton 2002).

Providing, as a community, we continue to accept Mill’s doctrine of excluding children from the “right to choose” and the

autonomy normally reserved for adults only, then of course preventing children from smoking should be considered a worthwhile pursuit. However, if it is considered to be a worthwhile thing to do, then it is worthwhile doing it properly. The problems surrounding this issue perhaps need to be more explicitly stated rather than implicitly assumed by both the community and health services. The community's thoughts or even perceptions on the matter need to be researched and the results of such research made more readily available. Further longitudinal research conducted in Australia is needed to state unequivocally the association between restricting access to tobacco and reducing tobacco use among Australian minors.

While no-one appears to question the Health Department's mandate to protect the health of the public the Department should be transparent, accountable and able to justify its intervention programs and their success or otherwise. The community should have the right to consider how appropriate compliance monitoring is and how effectively and efficiently it helps to stop children from smoking. Health professionals have an obligation to consider the effectiveness of tobacco compliance monitoring by understanding exactly what the issues are, engaging in meaningful dialogue and two-way communication, and then through a process of consultation and collaboration deciding on what further actions may be required.

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Legislation

Public Health Act 1991 (NSW)

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An Outbreak of Foodborne Illness Due to Endemic Non-01, Non-0139 *Vibrio cholerae* Probably Transmitted by Freshwater Crayfish in Wide Bay, Queensland

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*Of the 100 serogroups or more of *Vibrio cholerae*, only two serogroups (serogroups 01 and 0139) produce the clinical syndrome of cholera, the remainder being sometimes associated with sporadic cases and small outbreaks of gastroenteritis (Chin 2000). Non-01, Non-0139 *Vibrio cholerae* are believed to have caused an outbreak of foodborne illness in nine people who ate at a restaurant on one evening. Epidemiological investigations did not demonstrate a strong association with any particular food. Environmental samples indicated the presence of non-01, non-0139 *Vibrio cholerae* in dam water where freshwater crayfish (redclaw) were being grown and supplied to the restaurant. It is theorised that cross contamination occurred from the raw live product to the cooked product. This might have been further transmitted to other foods, as indicated by epidemiological results, by poor food hygiene measures in the restaurant. It is possible that the outbreak had been occurring over a period of time.*

Key words: *Gastroenteritis; *Vibrio cholerae*; Foodborne Disease*

There are 139 serogroups of *Vibrio cholerae* of which only two, 01, the classical and El Tor bio-types, and 0139, (a relatively new sero group), are associated with the large outbreaks of the clinical syndrome of cholera. (The isolation of 01 and 0139 *Vibrio cholerae* in a pathological specimen satisfies notifiable disease criteria under the *Health Act 1937*(Qld).

The great majority of the mainly non-toxicogenic strains of *Vibrio cholerae* are found throughout the world in aquatic environments, and while they can cause sporadic or small outbreaks of gastroenteritis, are not associated with the severe epidemic disease known as cholera (Crowcroft 1994). Various strains of *Vibrio cholerae* have been isolated in environmental water samples from South East Queensland waterways in the past (Bourke et al. 1986). Evidence suggests that

Vibrio cholerae is an endemic organism in these waterways that tends to disappear in the cooler months and reappear in the warmer summer months. The reservoir of the organism has not been identified.

Outbreak Notification

In November 1999, the Central Public Health Unit received a presumptive notification from a local hospital laboratory of the detection of *Vibrio cholerae* in the stool of a woman who had presented with vomiting and acute severe watery diarrhoea. Her admission to hospital was complicated by a myocardial infarction. The stool specimen was forwarded to the Laboratory of Microbiology and Pathology, Scientific Support Services, Brisbane, where the organism was later confirmed to be non-01, non-0139 *Vibrio cholerae*.

Public Health Unit staff commenced epidemiological and environmental investigation upon receipt of the presumptive notification to determine whether there were any associated cases and possible sources of the infection. Both the case and her husband (who had suffered a similar but milder gastrointestinal illness) had consumed a meal at a seafood restaurant the evening prior to onset. A stool specimen from the husband did not indicate the presence of *Vibrio cholerae*.

Methods

(1) Presumptive isolation of *Vibrio cholerae*

Faeces are routinely inoculated on XLD agar (xylose lysine deoxycholate, *Campylobacter* agar (charcoal based) and a selenite broth. If clinical notes indicate that the patient has consumed seafood or that the specimen is watery, a TCBS plate is inoculated as well. Yellow colonies grew after 24 hours. The isolate was identified as presumptive *Vibrio cholerae* using an API 20E. The isolate was forwarded to Queensland Health Scientific Support Services for further testing.

(2) Identification of *Vibrio cholerae* isolates

The isolate of *Vibrio cholerae* received from the hospital microbiology laboratory were plated out for purity onto appropriate media (TCBS and Blood agar), and inoculated into tryptone broth. The following day isolates were screened by conventional biochemical tests produced in-house, including salt tolerance tests at various concentrations of salt.

Both isolates were confirmed biochemically as being *Vibrio cholerae*. Subcultures were also made to nutrient agar slopes, and after 24 hours incubation, suspensions were made in saline for agglutination with *V. cholerae* 01 and 0139 antisera. No agglutinations were observed against either antisera, and positive controls produced the expected results in each case.

The isolates were reported as *Vibrio*

cholerae non-01, non-0139. No further characterisation tests were performed on these isolates (such as toxigenicity studies), because the isolates were not strains of epidemic cholera.

(3) Food and water

The water samples were processed and suspect isolates examined and their identification confirmed according to the Australian New Zealand Standard 4276.15.1999, Water Microbiology Method 15: Examination for *Vibrio Cholerae* (Standards Australia New Zealand).

Epidemiological

Initial enquiries were made of the proprietor of the restaurant who advised that approximately 250 people had eaten at the restaurant at two smorgasbords, one at 6pm and one at 8pm on the evening in question. Incomplete guest contact lists were obtained and a telephone survey was conducted by staff of the Central Public Health Unit of people who had attended the smorgasbord at 6pm on that evening. The survey involved questions regarding whether the respondent had eaten at any restaurants in the preceding two weeks, and if so which one/s, did the person eat with other people, and had there been diarrhoea or vomiting in the respondent or their fellow diners. Of a total of 254 people (target population) represented on the restaurant's appointment register, contact details were available for a total of 184 people (sample population). From this register contact was made with 55 people. Of these, seven reported symptoms of diarrhoea and/or vomiting and/or stomach cramps with varying onset periods after consuming a meal at the restaurant's smorgasbord.

Case control study

A case definition of diarrhoea or vomiting, or nausea or stomach cramps, developing 2 to 72 hours after commencing eating at the restaurant was adopted. A food history questionnaire was developed based on the

restaurant menu. Three controls were interviewed for each case. The controls were matched by sex and age from the population of unaffected persons who were contacted. The Questionnaire used was a composite of Part 1 and Part 2a, from existing Departmental protocol (Queensland Health 1999). The responses were entered and analysed using the CDC Atlanta's Epi Info 2000 software package.

Environmental

Environmental health investigations were carried out at the implicated restaurant, at a number of seafood suppliers' premises, and on the supplier of the freshwater crayfish (redclaw) seafood. Contact was made with the local water board to confirm satisfactory local town water quality and chlorine residuals. Enquiries were also made of the Local Government Authority to ascertain if any other reports of foodborne illness had been received.

Investigations by Environmental Health Officers focused on obtaining a range of food products, including ice used to chill seafood, and water from the dams of the local supplier of the freshwater crayfish (redclaw) for bacteriological examination.

Because of the time lag between illness and case notification no left-over foods from the evening meal in question were available, and no red claw ready for human consumption was available during the investigation. As the organism is a *Vibrio*, emphasis was at first placed on seafood and the source of water used to cool the cooked product. A food hygiene audit of the restaurant by Queensland Health and local government Environmental Health Officers was carried out.

Results

Epidemiological

The mean incubation period for the cases, that is, from time of meal to onset of first symptoms, was 12 hours. The median incubation period was 14 hours incubation period, with a range of 7 to 18 hours.

The most common symptoms were diarrhoea and stomach cramps (78% each), followed by nausea (44%), and finally vomiting (22%). The mean duration of symptoms was 37 hours, with a median of 24 hrs and a range of 2hrs to 96hrs.

The analysis of food items consumed for cases and controls was done by 2 by 2 tables. An indication of association between exposure and illness in a case control study is the odds ratio, with its upper and lower confidence. An odds ratio of over 3, (that is, 3 times more likely to have consumed a certain item and being ill, than as not of being ill), is empirically taken as a strong association. Confidence intervals with a lower limit greater than unity lend support for that association being real, though confidence intervals with small numbers of cases and controls are inherently liable to be wide.

The highest odds ratios were for eating cauliflower (5.6), and salami (6.0). While the lower limits of their respective confidence intervals were both less than unity. They were close to one (0.96 and 0.81), which were much higher than for any other items.

The next highest odds ratio was for eating prawns (2.73), which would fit more readily into the scenario of seafood being the likely source of the organism. However, confidence intervals were wide and the lower limit of the 95% confidence interval was only 0.27. The redclaw itself had an odds ratio of close to unity, not indicating any statistical association between its consumption and illness.

Environmental Samples

All food and ice samples proved negative for the presence of *Vibrio cholerae*. However, one sample of oysters was of doubtful microbiological quality because of a high standard plate count. During the food hygiene audit of the premises it became apparent that an unsatisfactory practice had been occurring. Live redclaw had been provided to the restaurant on a weekly basis

for some months. The product was cooked by boiling and then placed back into the same polystyrene boxes (in which they had been delivered) to cool before being placed onto the chilled seafood smorgasbord. Advice from the restaurant was that the boxes should have been cleaned with a solution of hypochlorite, but it was not clear whether that this had occurred on every occasion.

Samples of water taken from the dams at red claw farm did prove positive for non-01, non-0139 *Vibrio cholerae*. It is possible that the raw redclaw coming into the restaurant provided a means of direct transmission of the pathogen to other foods in the restaurant.

Discussion

Vibrio cholerae are aquatic, halophilic, and are commonly found in estuarine waters worldwide. They are known to occur in the tidal reaches of the Mary River, not far from the redclaw farm. They can multiply in fresh water bodies (Chin 2000). Their numbers tend to peak in the warmer months, and this incident occurred in early summer. Sporadic cases and small outbreaks of gastroenteritis can be caused by non-01, non-0139 *Vibrio cholerae*, and are commonly associated with eating raw or undercooked seafood.

The investigation of this outbreak provided strong evidence that it was caused by non-01, non-0139 *Vibrio cholerae*. The "chain of evidence", however, is not complete. One of the cases had the organism isolated from stools and one other case sample was negative. No other cases had provided stool specimens or had sought medical assistance.

The organism was isolated from the pond in which the red claw were reared, but not from the red claw in the restaurant as no samples were obtained, or any other of the food items. However, evidence from the investigation of poor food-handling practices, which was likely to result in the recontamination of the cooked red claw with any organisms from the crayfish when delivered, was found.

The lack of strong epidemiological association between the reported consumption of redclaw and illness was somewhat anomalous. The two food items with the highest Relative Risk, that is, salami and cauliflower could have been subject to cross contamination, and the salami in particular, because of its constitution could have supported viable organisms, and perhaps even their multiplication. It is inherently improbable that either food item could have been the primary source of the *Vibrio* contamination.

A staff member at the restaurant who undertook some food handling reported having suffered a gastrointestinal illness approximately one month earlier when travelling in Indonesia. A stool specimen was obtained from this employee which did not indicate the presence of *Vibrio cholerae*.

It appears that a sequence of events had occurred enabling the transmission of the organism. However, it is not uncommon for pathogens to exist in raw food such as poultry and other meats. This outbreak highlights the need for food handlers to be constantly aware of the problems that can result from cross contamination of raw food to cooked food.

The source of the *Vibrio* in the redclaw dams is not certain. The redclaw supplier has ceased to supply redclaw on his own volition and is currently undertaking unrelated works on the dams. The dams had been fed with water from a bore some 80 metres deep. A major local river in which non-01, non-0139 *Vibrio cholerae* has been isolated in past years is only 100 metres approximately from the farm. It appears that the outbreak could have been avoided, by preventing cross contamination of cooked product with raw product, if proper food handling techniques had been in place. If live product is delivered to restaurants then the risk of cross contamination should be highlighted with adequate advice as to appropriate cooking and the need to prevent cross contamination.

Conclusion

Environmental samples from the water of the red claw aquaculture farm found non-01, non-0139 *Vibrio cholerae*, as did the isolation from one of the two faecal samples obtained from cases in this outbreak of gastroenteritis. This with the unsatisfactory handling practices in the implicated restaurant strongly support the conclusion that this locally endemic serogroup was the causative organism.

Recommendations

Medical practitioners should be aware of the existence of non-01 and non-0139 serogroups *Vibrio Cholerae* in the aquatic environment in Queensland, and need to

distinguish these from “true cholera”, and be aware of the public health measures specific to this latter more serious infection.

Operators of aquaculture facilities, and their customers should be aware of the potential contamination of their freshwater ponds, and of the crustacea they rear in them, by this organism.

Caterers need to maintain good food hygiene when dealing with raw products from aquaculture farms, and avoid cross contamination of other prepared food. The ease of cross contamination from “seafood” to other food items by local serogroups of non-01 and non-0139 serogroups *Vibrio cholerae* could be the subject of laboratory and environmental health investigation.

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Lessons from Local Sustainability Monitoring: Outcomes and Aftermath of the Western Sydney Regional State of the Environment Report 2000

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Many theories within sustainability and sustainable development discourses have emerged in response to environmental problems facing humanity. However, there is insufficient evidence regarding the effectiveness of the transfer from this theory into practice. For example, while the development of environmental and sustainability indicators is advancing significantly, their application in decision making is not keeping pace. In 1998, legislation was promulgated in New South Wales for annual State of the Environment (SoE) reports to become a means for local governments to implement sustainable development. Recently, some local authorities have collaborated to produce SoE reports on a broader scale. A study was conducted in 2002 into the processes and outcomes of one such regional SoE report, issued in 2000. That regional report was a collaboration of nine municipalities in the urban fringe of western Sydney. The research used semi-structured interviews with informants who comprised almost all of the membership of the report's steering committee. The preparation and aftermath of the report was found to involve considerable complexity, confusion, conflict and concern among all players involved in the report's development. Matters inhibiting and advancing the implementation of the report were examined in this study and reported here as "primary", "practical" and "people" issues. The findings of this paper will be useful in evaluating the design, preparation, and implementation of future regional SoE reports.

Key words: *State of the Environment Report; Regional Reporting; Sustainability; Sustainable Development*

Humanity's impact upon the human and non-human aspects of the planet is becoming increasingly apparent (National Research Council [NRC] 1999). So too is the urgent need for contemporary society to rectify its past effects and to improve the possibilities for a humane, sustainable future (McMichael 2001a; NRC 1999; Organization for Economic and Cooperative Development [OECD] 2002). Sustainability discourse is a worldwide interactive framework within which ideas about this change in direction are debated, and various forms of the ensuing practice of sustainable development are fostered (Brown 1998; Ecologically Sustainable Development Steering Committee 1992). While

acknowledging those who criticise the concept of sustainable development (Beder 1997; Eckersley 1992), this paper nevertheless recognises that the concept pre-eminently represents the dominant idea in this field. The idea of sustainable development is here understood to be an hierarchically organised, economic-growth centred and industrially based framework, and this is how it is used in state and local government action in New South Wales (NSW). Within that context, sustainable development is understood to be governance that requires "... the effective integration of economic and environmental considerations in decision-making processes" (*Local Government Act 1993*, p. 439).

In order to achieve this integrated decision making process, a significant responsibility has been placed upon local government authorities by the NSW legislature for regular state-of-the-environment reporting (Farrier, Lyster & Pearson 1999). This area is the focus of this paper, as SoE reporting is an important practical outcome of the broad discourse that relates to sustainability. The evolution from theory to practice lies within the subcategory of sustainable development, which is often known as ecologically sustainable development (ESD) in Australia (Ecologically Sustainable Development Steering Committee 1992).

At their most basic level, SoE reports are collections of data (indicators) that are used to measure trends in selected aspects of the natural, built or social environment at the local, regional, state or national levels (Powell, Love & Sampson 1999). More specifically, in NSW, these reports cover the themes of land, air, water, biodiversity, waste, noise, aboriginal heritage and non-aboriginal heritage (Powell, Williams & Murphy 2001).

The complex range of ideas in this field can be seen in the evolution of SoE reporting. Initially, the reports measured biogeochemical aspects of the natural environment and were used by scientific experts to measure the past effects of human activities, for example, Australia's first State of the Environment Report, published in 1985 (Australian Department of Arts, Heritage and the Environment [ADAHE] 1985). Later, human concerns were added to the 'natural' environment with the Brundtland Report of 1987 (World Commission on Environment and Development [WCED] 1987), particularly in the era of the post-1992 Rio Earth Summit (SD Gateway 2002). SoE reports, in their latest, more developed and complex form have evolved into being instigators of, and monitors for, sustainability outcomes and as future-oriented tools for assessment and change by institutions and the

community (AtKisson 1999; Brown 2001a; Plant & Plant 1995; Western Sydney Regional Organisation of Councils [WSROC] 2000).

Recently, attempts have been made by some local councils to conjointly produce "regional" reports. One such was the *Western Sydney Regional State of the Environment Report 2000* (RSoE), which was coordinated by the Western Sydney Regional Organisation of Councils (WSROC 2000). At the time that the regional report was issued, the nine organisations that formed WSROC were Baulkham Hills, Blacktown, Blue Mountains, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta and Penrith councils. This region is made up of metropolitan, urban, peri-urban, rural and bushland areas covering 5,761 km² and takes up a large proportion of the Sydney Basin on which the City of Sydney has been built and also includes a large section of the surrounding Blue Mountains. Many forms of industrial, commercial, fast-developing residential, agricultural and recreational land uses comprise the basis for much of the human impacts on the region (Rosen 1995; WSROC 2000).

It became clear to the membership of WSROC that themes such as air and water, which cross council boundaries, could be more effectively dealt with on a regional basis (Brown 2001b). WSROC commissioned the Regional Integrated Monitoring Centre (RIMC) of the University of Western Sydney (UWS) in 1999 to produce the first regional SoE in Australia that was based on sustainability principles, and that also included the results of a high degree of community involvement. Up to this point the regional reporting project could still be viewed as being well within the biogeochemical data-collecting framework. The RSoE sought to advance this by addressing legislative changes to SoE reporting that were gazetted in January 1998 (*Local Government Amendment (Ecologically Sustainable Development) Act 1997* [LGA(ESD)A 1997]). These changes placed

an onus on councils to link the reports to their management plans (WSROC 2000), this aimed to change the reports from being passive documents to a decision making tool. Although this had become a mandatory process for councils, and was generally accepted as one that was useful and necessary, in practice it became apparent that this new situation was not well understood by all the stakeholders.

A collaborative effort to reposition SoE reporting from a local orientation into a regional framework was agreed to by the WSROC councils, and the RSoE project was also asked to research ways to express these new legislative expectations. A multidisciplinary team from UWS was formed and, with this approach, RIMC won the tendered project using a best practice framework and on a nonprofit basis (Brown 2001b).

The RSoE was published in hard-copy form as a 206-page book, as an eight page community summary and an interactive CD-ROM (WSROC 2000). The report is available at the WSROC website (<http://www.wsroc.com.au/>) and both the RSoE and a supplementary report about the process of its preparation are available at the RIMC website (<http://www.uws.edu.au/about/acadorg/cste/sea/research/rimc>). The report was essentially organised along the traditional OECD Pressure-State-Response framework for State of the Environment reports, but employed a new element, that of "potential for change" to reflect the (new) linkage between the reports and a council's management plans. Thus each chapter covered one of the eight legislated themes (land, water, air...) and used traditional environmental indicators to assess the situation of each theme, but also included an additional section to assess the potential for changing the region's situation towards ecologically sustainable development. In order to assess this factor, sustainability indicators were developed in consultation with the community through extensive community vision forums (WSROC 2000).

A version of the RSoE's new model (Pressure-State-Response-Potential) has now been adopted at the national level with the 2002 *Australian State of the Environment Report* (EA 2002, Department of Environment and Heritage 2002).

Study Rationale

The significance of this research is found, at least in part, in the untapped potential that SoE reporting has as a powerful auditing tool for sustainable local and regional environmental management. This is particularly so when it comes to monitoring the \$2.5 billion (or approximately 13%) of their total expenditure per annum, that is allocated by local councils in Australia on environmental matters (Australian Bureau of Statistics [ABS] 2002). The reports can also become a mechanism for focusing this expenditure on being more economically efficient, and so also towards social sustainability.

The RSoE review which follows seeks to help in the process of opening up the possibilities of a situation in which there is a comparatively well developed theoretical base of sustainable development, coupled to well intentioned SoE reports that, nevertheless, remain largely unconsulted shelf-documents. In NSW, this situation exists at the same time as environmental professions such as Environmental Health are already efficiently organised in monitoring particular areas, for instance, food health regulations (Brown 2001c; Farrier, Lyster & Pearson 1999). In many councils, the same application of professional proficiency has not manifested itself with regard to the newer expectations for local SoE reports in NSW (Brown et al. 1998). The question was, did this situation apply to the more complex scenario of regional reporting in western Sydney?

This paper is nested within three previous studies. One involved in-depth interviews with Chief Executive Officers and SoE writers of 20 councils in the Western Sydney area and was published by the then

Hawkesbury-Nepean Catchment Management Trust before the RSoE was developed (Brown et al. 1998). The results which covered 20 of the 21 councils of the catchment, including those of the current study, found that while both Council Chief Executive Officers and SoE writers appreciated the potential for SoEs to contribute to Council decision making, neither group considered that it currently did.

The second study was the report on the process of preparing the RSoE by the UWS team who developed the design and content for the report in collaboration with representatives of the nine WSROC Councils (Brown 2001b). This process report emphasised the importance of achieving agreement regarding community sustainability goals and the matching indicators; extended the 1992 Organisation for Economic Cooperation and Development's Pressure-State-Response monitoring framework to include the potential for sustainability; and documented the considerable number of "teething pains" experienced by the consultancy team in putting together the inaugural regional report.

The third inquiry, conducted 18 months after the issuing of the RSoE, is the major source for the current paper (Parissi 2002). The latter investigation accessed a large proportion of the councils that had participated in the two former studies, although some of the personnel involved had changed.

This paper presents a small portion of findings from the, third, larger and more complex research project which was concerned with reviewing the implementation of the RSoE (Parissi 2002). Overall, the original study highlighted the complexity, confusion, conflict and concern that existed within the implementation mechanisms of the reports. This is one of the critical points of the junction at which the ideologies of sustainable development and the practice of SoE reporting meet. The

subject matter of this paper centres on the aftermath of the RSoE and revolves around the core issue of what the practitioners, who were involved in the production of the report, made of it: in which ways was it of value to them, or not, and why?

Methods

Semi-structured one-to-one interviews were conducted with 16 key informants who were involved in the production of the report, or, as in the case of two interviewees, held the positions of those who originally did so. These 16 interviewees came from eight of the then nine councils in WSROC and thus constituted almost the whole membership of its Regional Environmental Management Strategies (REMS) steering committee as constituted at the end of the RSoE project. One council did not participate in the study.

The cohort consisted of ten council officers who were principals for their respective organisations in the project and six people from the expert consultancy team and from WSROC. The consultancy team was made up of a core from RIMC and also included experts from the former Hawkesbury-Nepean Catchment Management Trust. In addition, expertise was also drawn from the nine councils, WSROC, NSW state departments and agencies and the Upper Parramatta River Catchment Trust (WSROC 2000).

A semi-structured format was selected as the approach for the interviews in this study, as this allowed flexibility in facilitating the interview when an answer seemed to warrant further inquiry. The interview questions contained both closed and open items, with probing questions following initial answers from the respondents (Beed & Stimpson 1986). The researcher recorded responses during the interview by hand during the one to two hours that the interviews lasted. All interviewees were guaranteed anonymity.

In all, 13 questions were put to each of the respondents. The first four questions were of

the closed type and inquired about such matters as “What is your position in this organisation?” and “What duties are associated with that position?” Questions three to six asked about local SoE reporting while question seven asked “Do you think that the concept of Ecologically Sustainable Development is valuable in your professional practice?” Questions eight to 13 dealt with the WSROC regional report and the outcomes of its subsequent application. Although 13 questions were asked during the interviews, the data presented here focused on question ten, the responses to which provided a particularly rich vein of information (Parissi 2002).

Findings and Discussion

Table 1 is presented in order to give a broad profile of the types of answers that informants gave to question ten: “What do you think of the report?”. The report referred to here is the *Western Sydney Regional State of the Environment Report 2000* (WSROC 2000).

Table 1: Profile of informants based on responses to the question: “What do you think of the report?” (N=16)

The Nature of the Responses				
Type of Organisation	Only Positive	Mixed	Neutral	Only Negative
Council (N=10)	1 (10%)	3 (30%)	1 (10%)	5 (50%)
Other (N=6) Organisations	0	6 (100%)	0	0
Total (N=16)	1 (6%)	9 (56%)	1 (6%)	5 (31%)

Note: The “report” referred to in this table is the *Western Sydney Regional State of the Environment Report 2000* (WSROC 2000).

One person in the whole cohort gave only positive answers to the question. As can be seen in Table 1, that respondent was from a council. The same result was found for neutral replies, that is, one (1) out of the sixteen (16) respondents was neutral. The 56% of the total who gave mixed answers were made up of 30% of the council cohort

and 100% of the interviewees from other organisations. Those who gave only negative responses made up 50% of the interviewees from councils representing 31% of the total, with no one from the other organisations in this category.

Judging solely by the results in Table 1, one could conclude that the responses to the question were straightforward, and generally negative in character. A pessimistic view for example might focus on the 50% of council informants having given “Only Negative” assessments and 100% of those from other organisations indicating a mixed response. The interview data, though, tell a much richer, dynamic and hopeful story. All respondents were at pains to review the situation and keen to provide feedback on their experiences. This inquiry generated much commentary about the production stages of the report, as well as valuable suggestions for the future. A review of these responses is presented under the derived themes of complexity, confusion, conflict and concern, although there are significant points of crossover with some of the issues discussed.

Complexity

First, it is of crucial importance for regional reporting that the RSoE was initiated and produced, as its trajectory was intended to course uncharted territory: that of sustainability SoE reporting (Brown 2001b; WSROC 2000). But the question remains, “Produced for what purpose?” One of the basic problems was that the report had few, if any, antecedents on which to model itself. It was groundbreaking work, especially if one considers that it was the first regional report in NSW that focused on sustainability goals and one that was constructed on the basis both of the knowledge of experts and that of the local community (Brown 2001b).

The context from which the RSoE emerged was one of regular, annual local SoE reportage. Matters to consider here included the complex interaction of various frameworks that practitioners carried with

them. For example, the local government professionals who first produced SoEs in the late 1980s and most of the 1990s were originally expected to present only collections of scientific data in those reports (Brown 2001a). However, since 1998 in NSW, these professionals have been expected to produce SoEs that are also management and policy oriented documents for change and that include significant community involvement (Brown et al. 1998; Powell, Williams & Murphy 2001). For some people, the habit of looking at the SoE reports as passive scientific assessment only of past effects, is reflected in many of the comments of respondents, such as, "The main problem was data management",... "80% of the time was spent on the community visioning exercise, and 20% on data, it should have been the other way around".

In contrast to the above comments, one council interviewee stated "The community visioning exercise involved people that we had never been able to reach". So, not only was there a disparity between the demands of the newer legislation and the nature of expectations of some of the report writers, but there was also among the cohort of council respondents. Some respondents clearly appreciated the value of bolstering the scientific data that the professionals delivered by the inclusion of lay-community values and information.

The fundamentally complex nature of the RSoE arose from the simple matter of the geography that made up WSROC. It is a complex entity that is neither a bioregion, nor a single catchment, nor a complete collection of geographically associated councils, yet it is, in part, a mixture of all of these. For example, it comprises only a quarter of the land area of its main catchment (the Hawkesbury-Nepean) but also has part of two other catchments (the Upper and Lower Parramatta River and the Georges River).

To add to this geographic complexity, two councils, Blue Mountains and Hawkesbury,

are wholly within the Hawkesbury-Nepean system; two are entirely outside that catchment (Parramatta and Holroyd) and all but the former two councils have more than one river system within their boundaries (WSROC 2000). In terms of data management alone, this matter was a complex one to deal with for all parties concerned, but is further explored below under Conflict.

The question remains as to what makes WSROC a regional organisation? In terms of jurisdictional boundaries, at the time the RSoE was commissioned, it comprised nine councils of western Sydney that voluntarily associated for stated aims. Since the RSoE was finalised, the local government authority of Auburn has joined (WSROC 2000). One might then ask, what is 'Western' Sydney? Should areas that are outside the Sydney Basin, such as the City of Blue Mountains, be considered to be a part of Western Sydney? Is it a regional entity if the nearby localities of Camden, Campbelltown and Bankstown, which are within the Sydney Basin, are not included?

A major emphasis was placed on the report being a local document if only by the fact that an 18-month deadline existed so that it could be used, by those councils that wanted to do so, as their SoE report for the period 1999/2000 (WSROC 2000). If indeed the RSoE was intended to be a local document, then five councils (50% of that group) reported in this study that the RSoE was used as such. It also needs to be noted that five authorities did not use the RSoE as their local report. One respondent stated, "there were too many differences between the nine councils for it to be a useful local report". The significance of this comment is to emphasise that the question of defining the commonality of this region (or any other) needs to be more clearly articulated. This would assist councils that wanted to use the report for both local and regional functions, if that should be the aim of the project. The lesson to be gained here is the need for more preparation time for this type of regional report.

Finally, what was to be done with the RSoE? As one respondent said, "How can you have a regional SoE without a regional environmental framework to integrate it into?" There are a number of contenders that could form a basis for such a framework; these are, WSROC, Team West, The Office of Western Sydney, any or all of the relevant Catchment organisations, and one or more the relevant NSW state government departments. It could also be useful to consider a combination of some or all of these organisations to fulfil this role. Except that the report was formally lodged with the Department of Local Government, WSROC and each of the councils, the matter remains unresolved.

Confusion

A great deal of confusion occurred among the stakeholders during the production of the RSoE. An analysis of the interviews indicated that the confusion stemmed from the historical bed from which the report emerged: that of local SoE reportage and the (lack of) detail about how the theory of ESD was supposed to develop into practice. The deficiencies of resources and training for local government SoE writers, which applied to local reporting (Anderson et al. 1997; Lloyd 1996), was amplified in this situation. All the problems that the practitioners faced in preparing SoEs for their own councils compounded when it came to nine councils collaborating on a regional report. In addition, there was confusion among the stakeholders about what a regional document would look like; how the legislative requirement for community involvement was to be achieved; what indicators would be used, and what sorts of links to council management plans would be established.

The development and management of data sets and indicators was a prominent and multi-faceted source of confusion. This again demonstrates the enmeshed nature of local and regional reporting in this case. Reports are not always produced with a

"whole of council" approach. As one respondent said: "more than one council has different Geographic Information System (GIS) software so that one department cannot easily 'converse' with another". Similarly, councils and various state level departments can also have this difficulty. Further, several barriers to the effective collation of data between councils were discovered. For example, one informant stated:

We can have two councils along or across from the same stream, but we don't necessarily use the same sampling techniques, the same instruments, the same methods, or units of measurements and, even if we can get all of that right, we can still do it at different times of year or in different years.

Access to data presented another challenge for the project with some councils refusing to release certain information. One informant stated, "In the beginning, five councils refused to hand over GIS information", and another said, "A couple of councils withdrew from the project late in the process and, to the end, refused to supply data, claiming proprietary knowledge". That situation seemed to be a confounding one for the report writers, and may well have encouraged the consultants to progress with other aspects of the report, such as community consultation as achieved in the visioning exercise. Another, more hopeful, comment about this issue came from a council interviewee who said, "It was good that we learned where many of the gaps in our data gathering were and in the processes we used". Eight of the respondents (50%) used words, such as, "It was a good experiment" or "It was a benchmark report" in order to suggest that this itself was a positive beginning. Certainly, breaking new ground is always difficult, and although it was much more than just a foundation or learning exercise, even as such, the RSoE project was of immense value.

Some of the most telling remarks came from an informant who was one of those dedicated to a regional project but was

disappointed about the difficulties encountered. There was an interesting paradox within this informant's comments. For example, as previously quoted, this person had stated that "The consultants spent 80% of the time on the community visioning exercise and 20% on data management, it should have been the reverse". This informant could not reconcile the community sustainability-goal setting process with the establishment of accurate data sets and indicators. The council officer was highly experienced and, evidently, personally dedicated to environmental improvements. However, there seemed to be a clash between the professional who was scientifically trained in the reductionist mode of operation (the value of expert scientific data) and the change agent (engagement with the community). As a potential solution, the same informant stated: "They [consultants] should have had their community goals but had them put through the experts to see how practical they [the community indicators] were".

The final point of confusion was the lack of clarity that came about from the REMS steering committee. The changing personnel caused a shifting set of agendas, as discussed, but the committee began without a clear framework to operate within. As one respondent said, "REMS did not have a Terms of Reference at the time of the report. The committee evolved, existing before the report and evolved into overseeing the report but was not set up for a specific purpose". Nine interviewees (56%) stated that REMS needed to define more clearly its aims and its desired outcomes.

Conflict

Besides being a complex issue that added major confusion to the reporting process, data management was also a source of direct conflict. With whom did the responsibility for data management rest? According to a table of "Project Components" cited by Brown (2001b, p. 5), the councils were support organisations and the consultants

were the lead agency to "Collect data from Councils and other agencies, identifying anomalies and resolving inconsistencies". However, each of the involved agencies, consultants, WSROC, and the councils, had equal responsibility to "Reconcile differing GIS systems, for ease of data transfer and presentation" (Brown 2001b, p. 5). This anomaly within the project brief needed to be rectified as it was a cause of dispute.

One informant's opinion was that, "The consultants came in with preconceived notions and did not listen to local government people, for example, the nine councils recorded data in different ways and were told to sort out the mess. Meanwhile councils expected the consultants to sort it out". How this was supposed to be resolved within a cooperative venture, when some councils refused to supply data as described earlier, remains unclear.

What is also unclear is how an originally cooperative project could have "come unstuck" on this point. Many of the examples of conflict came from the previous issue of confusion over the purpose of the report. Among other causes, this resulted from the changing composition of REMS, when council representatives came into and departed from the committee. Nicholson (2002) has also noted difficulties arising from working with a changing cohort of council officers.

This came up when two council informants, who joined the project late, stated that they expected the consultants to produce effective tools for the practitioners to use in the field, as they were seeking help in their harried and stressed work situations. For example, one respondent stated, "Council looked for specific action points, like 'put this water quality monitoring system into the management plan' or 'put counters on this road or these types of roads', but they don't do that". All these matters needed to be sorted out in setting the brief for the consultants, and maintained over time, instead of having a changing list of expectations. In the end, that the published

report is as comprehensive as it is, stands as a testament to the dedication of all those involved in the RSoE project.

Perhaps more a matter of a foundation for potential conflict than an example of direct conflict was the fact of a perceived distance between the consultants and the “professionals in the field”. Three council informants stated, “The PSR-P model was an academic exercise only”, “We spoke different languages” and “The language and concepts in the report were too difficult to understand and use”. Further, in what may have been an unintentionally ironic remark, one of these people also stated, “The academics wanted community knowledge, the councils wanted scientific knowledge”. This is perhaps best considered as another example of the diverse paradigms that were held by various council officers and between some of these people and the consultants.

An example of this point that developed into tension was to do with the model used for the RSoE. By legislation the OECD Pressure-State-Response (PSR) model was to be employed in NSW (*Local Government Act 1993*; Powell, Williams & Murphy 2001) but the consultants wished to update the formulation to include the demands of the 1998 changes to the Act (*LGA (ESD)A 1997*), as mentioned previously. The consultants put to the REMS committee that a further ‘P’ (for ‘Potential’) was needed to adjust the PSR model and this was accepted. From this PSR-P model, actions for management plans could be derived.

Discussion over that issue created several organisational challenges. One interviewee reported that “RIMC threatened to resign over it” and another respondent said, “The consultants wanted a ground-breaking report. The councils wanted more practical outcomes, ones that could be put into our management plans”. Yet, from a different organisation came this comment, “They (councils) wanted links to management plans and could not see that each community-found sustainability goal was linked directly to a planning outcome.

Chapter 3 was full of examples”.

It seems that there may well have been rather poor communication, even if not “different languages”. The significant point here is that all of the participants in the RSoE process were professionals; it was not really a matter of university academics using jargon with non-English speaking workers. The more likely source of that disquiet was a divergence in paradigms that some in each of the groups were working within. As discussed above, sometimes this appeared to be manifested within individuals, not just between them.

Two issues, which provoked a great deal of conflict, arose out of the previously mentioned matter of the confusion regarding geography. First, some stakeholders thought that the RSoE favoured the Hawkesbury-Nepean catchment. As one person said, “They didn’t acknowledge, until it was too late, that we were not all in the Hawkesbury-Nepean system”. There might have been some basis for this, as the consultants, RIMC, the former Hawkesbury-Nepean Catchment Management Trust and catchment councils had collaborated previously to research the links between the catchment, SoE reporting, councils, the community and environmental management (Brown et al. 1998). To some, the emphasis on one catchment appeared to carry over into the initial stages of the regional reporting process and cause some resentment.

The second aspect of that issue is that of “brown” versus “green” council areas. As one informant stated:

There were big problems regarding environmental issues. Some councils were bullied into accepting an environmental emphasis and were alienated from the report process because it could make them look bad.

These were predominantly urban and metropolitan councils that were concerned about public perceptions of their localities both suffering from and causing pollution. In other words, some councils were worried about the possible public relations effects of

the RSoE.

Out of the confusion as to the role of REMS, a great deal of tension arose. One informant when referring to the consultants stated, "They did not get direction from the councils, but, still, they were not open to direction from the councils". Another four informants (25%) made comments such as, "The steering committee needed to take charge, not the consultants". Again the point needs to be made that as the project evolved differing expectations existed among the participants. In particular, some of the council officers seemed to be unaware, or have different interpretations, of the project's original cooperative framework.

Concern

Despite all the problems encountered in producing the RSoE, the essential point to be emphasised is that the participants maintained a healthy concern for improving environmental management practices in general and regional SoE reporting in particular. This is the single most useful observation that can be presented, for, even with the differences in paradigms and perceptions, without the good will of the participants for the process, no progress could be expected. This aspect can be seen in the 50% of respondents who considered the report as being a "good experiment" or "good first effort".

Another significant statement, which came from a critic of the outcomes of the RSoE, was that it was "a flawed process rather than a flawed concept". It is clear that a regional context for SoE reporting can be extremely important, what remains to be done is to establish an effective set of processes to achieve this. This contention can be seen to have been supported by the 40% of council interviewees who gave either positive or mixed answers about the RSoE and the 62% of the total cohort who gave such responses, as detailed above in Table 1.

Recommendations and Conclusion

Even when considering this small part of the larger study, the responses of the interviewees have uncovered a number of important matters that need to be addressed for the future of regional reporting. These matters can be categorised as "primary" issues, "practical" issues and "people" issues. Primary issues are those that need to be addressed as "threshold questions", that is, questions that need to be answered in the very first stage of a regional reporting process. These deal with:

- Thoroughly scoping the exercise to reveal the extent to which there is a need to establish
 - compatible data sets and indicators;
 - congruent GIS systems;
 - guaranteed access to data from all participants;
 - a common understanding of the legislative needs of a report.
- Firmly setting parameters for the project and detailing a brief for the consultants. For example
 - securing commitment from the participating organisations that agreements arrived at would be maintained for the whole of the exercise;
 - agreement needed to be assented to by high level staff from each council;
 - clarifying the function of a steering committee;
 - clearly delineating responsibilities between report writers and any steering committee, this includes firmly establishing the context for such a relationship;
 - whether as a cooperative exercise, a commercial arrangement, or a combination of both.

Practical matters that deal with the

development of the report are also important. These issues include:

- Determining project boundaries so that
 - a clear definition of the nature of the “region” is available;
 - the possible end-functions that the report needs to serve (local, regional, or local and regional) are established.
- Identifying an organisation or a set of organisations to lodge the report with and that can act on its findings.
- Establishing a process and a site for routinely lodging data gathered by individual councils and data that has been collectively gathered.

Finally, people issues are of critical importance. Under this heading three factors are of importance:

- Allocating adequate resources for the task at hand, both in terms of local SoE reports and for a regional project. This item includes:
 - Training of SoE writers in new legislative needs;
 - Allocating sufficient staffing and their training to ensure compatible GIS systems are established and adequate data

gathering procedures are put into effect.

- Stabilising the membership of any steering committee that is established for the duration of the project.
- Acknowledging that various paradigms are operating within and between the participants. In this regard, it will be useful to establish a series of seminars and workshops that aim to achieve a working understanding of the diverse paradigms that operate within the profession.

The above has led to the conclusion that a strengthened foundation is needed for future regional reporting, and indeed for local SoE reporting. If this is achieved then SoE reporting, as a forward looking environmental management tool, will be more likely to become an effective mechanism to help achieve the aims of sustainability at the local level. The urgency of this task is reflected in the high expectations that have been placed on previous SoE efforts, that are themselves supported by global agreements, a worldwide discourse, national and state legislation and the depth of concern among all of those involved in this field.

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Acting for Sustainability and Health

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The Sustainability and Health Project aims to improve the understanding of what 'sustainability of the environment' and the 'health of the community' means for public health practitioners who want to be active participants in working towards a sustainable society. We explore the changing role of environmental health practitioners in this context. To be active participants we need to understand the principles of sustainability and the processes and protocols to design for sustainability and health. To design for sustainability and health, first, we need an understanding of the complexity of and interrelationship between, environmental and social systems. Second, we need to acknowledge and respect the diversity of viewpoints and differing interpretations of these systems. Third, we need to understand the principles of the change process and develop our skills as change agents in order to build community capacity in working towards sustainability and health. This paper provides a succinct overview of a number of key principles of change, of change action, and issues in working with the community as innovators and change agents.

Key words: *Environmental Health Practitioners; Structural Change; Systems Thinking*

There is increasing evidence linking local and global ecological integrity to health. Global ecological integrity is now identified as a paramount determinant of health. The World Health Organization estimates that poor environmental quality contributes to 25% of all preventable diseases in the world today (Towards Earth Summit 2002). There is an urgent need for us all to respond to huge global transformations created by human activity. Some of this activity is posing risks to the health of humans now, and even greater risks are predicted for the future if we do not heed the principles of sustainable development. In Grootjans et al. (2002), the authors reported on the Sustainability and Health project. We will not repeat here either the rationale for, or the processes of, the project. Rather, we will focus on key themes in two of the chapters (Verrinder, Nicholson & Pickett in press) of the resource book *Sustainability and Health: Working Towards Global Integrity* (Brown et

al. in press) that has been developed as part of that project.

Sustainability is described in the resource book as a form of "short-hand for the long-term changes required to re-establish global environmental integrity ... and so also the health of the human population" (Brown et al. in press, p. 15). The public health practice advocated by the authors of the book is broad and collaborative in nature. Practitioners at all levels from the local to the global are urged to listen to multiple perspectives, acknowledge multiple forms of evidence and adopt innovative action to manage the sustainability of the environment for human health. In this article we argue the need for action in defining a parallel path to be incorporated within the future development of environmental health practice.

Globally, there has, over recent years, been a call for change in the way we think about the health of the environment and of human health (AtKisson 1999; Brown 2002;

McMichael 2001; Suzuki 2002; Wilson 2002). In keeping with this groundswell of opinion, Australia's National Environmental Health Strategy calls for a new, much broader, cooperative and collaborative approach to environmental health practice (enHealth Council 1999).

The question of the century is: "How best can we shift into a culture of permanence, both for ourselves and for the biosphere that sustains us?" (Wilson 2002). It is not surprising though that many of us feel overwhelmed by the fact that despite the knowledge we have about the importance of our relationship with the world around us, we continue to hurtle headlong towards the destruction of civilisation as we know it. We know that what we are doing is not sustainable but feel powerless to do anything about it.

How do we need to think, what do we need to know and what skills do we need in order to act individually and collectively, locally and globally, now and for the future, to achieve an environmentally sustainable, socially equitable, spiritually rich world? First, we need to understand the complexity of the environmental systems and the social systems and the interdependence between them. Therefore, systems thinking is required. Second, there are multiple perspectives on what these systems and their connections look like, why they exist and how they are experienced (Wheeler & Perraca Biju 2000). These perspectives include the different ways in which individuals construct their knowledge.

The five sectors whose collaboration is routinely listed as essential to sustainability decision making are individuals, community, specialists, organisational strategists, and holistic thinkers (Brown et al. in press). Since these sectors together make up the sustainability decision making system, it is essential that each perspective is taken into account in planning for any one issue. It is important when viewed from the perspective of engaging with community stakeholders that we understand how

different people from different cultures see sustainability at different times and in different places. Each will have different opinions about the problems, the causes and the solutions. We need to recognise and respect these multiple perspectives. Only then will we begin to identify the opportunities to optimise the health status of members of the global community and the more localised communities within which we live. Third, we need to understand the dynamics of change. We need to understand how environmental health practitioners might create and embrace innovation, become change facilitators and work with individuals, groups, organisations and communities to build community capacity to work towards ecological sustainability and health.

The Precautionary Principle

The precautionary principle is one of the key principles of planning for sustainability and health. The principle holds that once there is reasonable evidence that a practice might be harmful, then preventive or ameliorative action should be taken. There is no need to wait for absolute proof (Australian Local Government Association [ALGA] 1992). There is ample evidence that environmental pollution and the unsustainable use of natural resources for example, are threatening the integrity of the natural systems. The World Health Organization (WHO 1997, p. 4) cautioned that "if this continues unabated the trend will lead to major impacts on health in developed and developing countries alike". On global warming for example, McMichael et al. (1996) predicted the exacerbation of existing problems with population displacement and impoverishment if the current trends with the enhanced greenhouse effect were to continue. Precaution is a principle of justice. It arises from values that support the notion that we should not have to live with the fear of harm to our health or environment. Further, as practitioners working for sustainability, we

have a responsibility to introduce the concept of precaution to other citizens and to develop techniques for its inclusion in research and practice. This inclusion promotes change and supports other principles of sustainability and health. The precautionary principle can inform every strategy launched by public or environmental health practitioners. It sits well with the familiar strategies of environmental management and health promotion - acting before the damage is done.

Systems thinking

Implementing the precautionary principle often means tackling problems one at a time, but addressing problems in isolation or on a situation - response basis has its limitations. For example, potential hazards such as those associated with the handling and application of pesticides in agriculture are frequently addressed individually by separate government agencies. There is a strong argument for a broader approach. Intersectoral collaboration that includes the environment, agricultural and health sectors for example, would work together to promote ecological integrity, sustainable agriculture and health. Implementing the precautionary principle in this context may mean thinking outside the traditional square.

The world is a complex system, which contains complex subsystems. Change in one system will affect changes in another. Decisions made in one will affect decisions in another. "General systems theory provides a unifying framework where explanatory and analytical tools will help toward good decisions" (Wheeler & Perraca Bijur 2000, p. 114). Incorporating the principles of systems thinking into the decision making practice for sustainability involves elements of acquired knowledge, action and experience, and review and reflection as a pathway towards learning and managing the complexities of the system as a whole. In short, a system is much more

than the sum of its parts. This notion is fundamental to our recognising that every system is characterised by the intimate connections between these different parts, their interactions with one another and the interactions between the system as a whole and its surrounding physical, social and economic environments. As systemic thinkers we therefore have little interest in "snapshots" of each component part. We seek instead further to develop our understanding of the interrelatedness of the world in which we live in order to enable us to solve complex problems.

In order to counter our human potential to destroy civilisation and wreak havoc on our less powerful partners on the planet, we need to broaden our perspective and carefully consider the human-planetary system and the inter-relationship between the subsystems. Linking systems thinking to decision making means to link knowledge and action in a learning cycle that takes account of dynamic change and which builds on its own learning.

Linking the Precautionary Principle and Systems Thinking

The ecological, or new public health view of health as "the pattern that connects" (Kickbusch 1989), is a current example of systems thinking, and one that is core to acting on the precautionary principle. Kickbusch (1989, p. 50) described the systemic nature of contemporary public health in terms of:

- disease patterns that are linked to social inequities and ways of life in industrialised societies;
- health problems that are social and environmental rather than medical in nature; and
- health problems and environmental disruptions that tend to be cumulative, long term, chronic and not amenable to curative and treatment measures.

The National Public Health Partnership's Planning Framework for Public Health Partnership (NPHP 2000) is based on just such an approach. The framework is designed to ensure the continued effectiveness of public health practice, in the context of complexity and change, through a process of ongoing review and redefinition. The framework is modelled on a combination of systems thinking, integrated action and the development of a common intersectoral and trans-disciplinary language.

Multiple perspectives

The importance of social justice in promoting health is well established. The importance of social justice in planning for ecologically sustainable environments is still emerging. There are a number of value positions arising from the relationship between the ecological and the social justice perspectives. As professionals working for sustainability and health we need to be aware of these value positions in that they will influence action. Ife (2002) provides a succinct discussion on perspectives of ecological and social justice and the relationship between the two. Ife advocates an integration of these two principles in order to bring about a sustainable society. He stresses that the ecological perspective does not, of itself, imply social justice principles. A major focus for environmental health practitioners working for social justice is to challenge structural disadvantage. Without social justice principles an ecological perspective may reinforce structural disadvantage. On the other hand, Ife argues that, because of the conventional economic prescription for many social problems brought about through economic growth, a social justice perspective is inadequate without an accompanying ecological perspective. Environmental health practitioners working for sustainability may need to challenge both the feasibility and desirability of continued growth. The more contemporary approach to current

principles of governance for sustainability and health recognises that better health is not an automatic outcome of economic growth (WHO 1997) and that there is a need to apply equal and simultaneous attention to improvement across all environmental, social and economic sectors. The United Nations Development Programme (UNDP 1996) reported that although many countries in the developing world were experiencing economic growth, for many of these countries the inequity in the distribution of the wealth has resulted in little impact on poverty alleviation. This example highlights the importance of the principle of equitable distribution in planning and governance for sustainability and health. Growth is seen as contributing to the current ecological crisis. Population growth and economic growth that does not account for natural resources and the carrying capacity of the natural systems are fundamentally antithetical to the sustainability and health principles.

Cleveland et al. (2001) contrast the "mechanistic individualism" of conventional, or "neoclassical" western-style economics with a more enlightened "ecological" economics, an approach that embraces the interdependence of materials, energy and living organisms. Whereas conventional environmental and resource economics are predicated on sustained economic growth based on the principles of compensation and substitution, the ecological paradigm emphasises the inherent difficulties of substituting for loss of, for example, biodiversity, or of compensating future generations for today's causes of environmental degradation. Environmental economists actively challenge the underlying cause of our current environmental and social problems, the dominant economic belief in the virtues of material progress and society's corresponding failure to acknowledge the finite limits of our natural resources. Unlike the neoclassical variety, environmental economics values equity over efficiency and,

as such, focuses on biophysical measures of human use of natural resources. Further, it recognises explicitly the inherent value of traditional, indigenous and local knowledge.

Professional praxis

All professionals come with a set of personal values which influences how they work. In order to incorporate the principles of ecological sustainability and health into our practice, we must first examine our own value positions arising from these perspectives. For practitioners, examining our values comes through the process of critical reflection. The Marxist tradition uses the word "praxis" as a way of describing a cycle of doing, learning and critically reflecting. Through this process we achieve a deeper understanding from which we can inform practice and build theory. This in turn creates further understanding of practice, society, and social change, and of our own personal values. Ife (2002, p. 229) refers to Marx to show how: "it is through trying to change society that we come to understand it".

To gain further insight into the multiple perspectives influencing action towards sustainability and health, environmental health practitioners need to consider:

- the relationship between personal, community, and global visions for a sustainable future;
- the co-operative international, national and local efforts being made to solve global issues, and examples of successful strategies for achieving a more sustainable future;
- the implications of the political, economic, and socio-cultural changes that are needed to assure a more sustainable future;
- the impacts of current government policies on environmental health issues;
- the processes of planning, policy-making and action for sustainability

by governments, businesses, non-governments organisations, and the public, as reflected in an integrated decision making framework, such as the D4P4 protocol presented by Grootjans et al. (2002).

Agents for Change

Despite numerous attempts to reshape action for sustainability, evidence of action to halt human-induced environmental harm and so human health, is relatively scarce. Environmental health practitioners need to work with communities (however defined) to build capacity to optimise the health of that community. Challenging the norms when needed, embracing innovation and becoming change facilitators form part of that role (Brown et al. 2001; enHealth Council 1999; Nicholson 2001). In the words of AtKisson (1999, p. 182): "Change agents are people who actively and effectively promote new ideas". In working towards ecological sustainability and health we need to increase our collective capacity to bring about structural change and to overcome societal and institutional barriers to change.

Structural change

Progress towards acting for sustainability has been slow. This has been attributed to fundamental flaws in human nature: selfishness, greed, intolerance, complacency and ignorance (Burrows, Mayne & Newbury 1991). There may be structural causes such as the dominance of the global economy by high-income countries and ineffective or inadequate governance and governing systems (Rapport 2001). Other causes include: sustenance needs, little connection to the land, ignorance, resistance to change and low critical mass (Costanza & Jorgensen 2002, p. 207). Traditional education styles tend to reinforce the current inequitable and unsustainable worldview. Our education system serves to emphasise the separation of humans from nature through

compartmentalised learning and individual specialisation.

Structural change requires that we act both individually and collectively. We know that the concept of empowerment is particularly important in order for individuals to act positively for their health. To feel empowered is to feel in control of one's life and participating in decision making about the things that affect us is critical to this state. To act collectively, there must be "networks between people that lead to cooperation and beneficial outcomes". Trust is therefore seen as central (Baum 2002, p. 343), and "social capital" is a prerequisite that facilitates change within the community. Barriers at the community level can be assessed with these prerequisites in mind.

In order to identify where problems are occurring, who is affected, and what factors are contributing to them we can use models such as PRECEDE (Predisposing, Reinforcing, Enabling Causes in Educational Diagnosis and Evaluation) from the field of health promotion for a situation analysis before we act. This provides us with a causal pathway of factors that contribute to a particular problem. Understanding this helps us to plan for and to take action in a comprehensive, systemic, way. There are three levels in the causal pathway: risk markers, risk factors and contributing factors. The contributing factors can be divided into predisposing, enabling and reinforcing factors (Green & Kreuter 1999).

If, for example, our problem is that the total burden of humans and their activities is overpowering the earth and its life-supporting capacity, risk markers signal where the problem is occurring and to whom, or to what environmental system. The risk markers identify the existence and at times quantify the extent of the risk but do not necessarily contribute to it. Risk factors account for why and how the problem is occurring. So, a risk factor prevailing within a commercial, community or governance sector might be that we are

too anthropocentric to adopt an ecocentric, or environmental perspective. For example, acknowledging the impact of land salinisation that is now a major environmental and social problem for Australia. The third category is the contributing risk factors. These are the things that contribute to our blinkered anthropocentrism. Predisposing factors can include such things as our lack of knowledge about the extent of salinisation in Australia and the impact that this is having on local communities or a belief that an easy solution can be developed by humans before it is too late. Enabling factors might be that we lack the resources locally to address the problem of salinisation. The re-enforcement might be the dominance of economic rationalism and our social admiration for conspicuous consumption, and therefore we maximise available land for agriculture in order to turn more profits regardless of the salinisation risk.

The key message throughout this paper is that environmental health practitioners need, first and foremost, to be innovators and change agents. We need to develop our understanding both of how change occurs and of the nature of resistance to change. The diffusion of innovation theory provides us with an analytical tool for diagnosing a population with whom we may be working. It enables practitioners to ensure that planned activities are well informed by the ways in which new ideas are taken up (or not), that is, how change takes place in a community. Diffusion is defined as "the process by which an innovation is communicated through certain channels over time among members of a social system". An innovation is defined as "an idea, practice or object perceived as new by an individual" (Rogers 1995, pp. 10-11). Diffusion of innovation occurs within a population group initially as clarity to a few, followed by a gradual uptake by the remainder of the group. Five general factors that influence the speed and success with

which new ideas are taken up have been identified. The factors are the characteristics of the adopters, the rate of adoption, the nature of the social system, the characteristics of the innovation and the characteristics of the change agents (Rogers 1995). Alan AtKisson has used the theory extensively and devotes a chapter to it in *Believing Cassandra: An Optimists Look at a Pessimists World* (1999). There are nine classifications of adopters, namely: Innovators, Change Agents, Transformers, Mainstreamers, Laggards, Reactionaries, Curmudgeons, Iconoclasts and Spiritual Recluses (AtKisson 1999). The innovators are the progenitor of new ideas. They may be considered “fringe” or eccentric or unpredictable by the rest of the community and so may not be trusted. The change agents are the “ideas brokers” for the innovator. The transformers or early adopters in the mainstream are open to new ideas and want to promote change. The mainstreamers can be persuaded that the innovation is a good idea and will change when they see the majority changing. The unwilling laggards, who constitute about the same number as the mainstreamers, are the sceptics who need to be convinced of the benefits before they adopt the change. The reactionaries have a vested interest in keeping things as they are. The iconoclasts highlight problems but do not generate ideas, and are often the silent partners of the innovator. The spiritual recluses might proffer the philosophical underpinning and influence the atmosphere for change. The curmudgeons, however, see change efforts as useless. AtKisson (1999) suggests that we each play all of those roles in different contexts.

In theory, the success or otherwise of innovation depends on how it is seen by the various groups, or stakeholders, within the affected population, on whether the innovation is seen as compatible with the established culture, for example, or the perceived relative advantage of the innovation to them. The simplicity and

flexibility of a particular innovation together with its reversibility and the perceived risk of the adoption will impact on the extent to which it is taken up by the community. Finally, the observability of the results will influence whether or not others take up the change (Rogers 1995). These are some of the essential issues we need to consider in working with communities as agents for change. The important thing for the environmental health practitioner is to develop a clear understanding of community and what is likely to influence its response before planning for action and also while the action is underway.

Practitioner roles in change

In “walking the talk” there are a number of roles that practitioners, whether employed at the international, national, state or local level, might take on in working towards change for sustainability and health. The role of practitioners who work within ecological and social justice perspectives will be necessarily broad. It might include everything from decision making, planning and the use of appropriate technologies to consciousness raising, social animation, imagining, networking, learning, advocating, teaching and researching. Practitioners might need to develop new skills in areas such as communication, negotiation and conflict management.

Ife (2002, pp. 226-8) provides a critique of the “cookbook approach” to working in communities. We commend this critique to environmental health practitioners working in any setting. The cookbook approach suggests the process of working in a community is well ordered and linear. The reality, as is well known to all environmental health practitioners who have ever worked at the community level, is very different. To some extent each approach needs to be different. The culture, resource availability, and the reason for the community’s very existence need to be considered. Communities change over time. No two communities are the same, no two

settings are the same, and of course no two practitioners are the same. We all bring to our work our own accumulated lived and professional experiences and our own personal values and worldviews. At the same time we have to learn to work within the context of the values and worldviews of others, and to respect and draw on their knowledge and experience in order to strengthen our collaborative action towards ecological sustainability for health.

Conclusion

The practitioners of environmental health are recognised by enHealth (1999) as representing a multidisciplinary group of professionals. The individual environmental health practitioner or professional groups within environmental health practice cannot afford to work in isolation from other professions, from the different government agencies, or indeed from the communities whose health and wellbeing is at stake. In working towards sustainability we must work collaboratively with other stakeholders. This means opening up channels of communication. It means breaking down traditional professional and cultural barriers to communication and collaboration. But most important it means respecting and valuing the different knowledge constructs that together provide a holistic and systemic view of an increasingly complex array of new and emerging 21st century issues of public health and ecological sustainability. The task is also to increase awareness that the total burden of humans and their activities is overpowering the earth and its life-supporting capacity and thus has an

immediate and long-term impact on the health of humans.

Globally we have some major tasks ahead of us if we are to control population size, develop a new economic paradigm, reduce consumption, lessen the economic gap between rich and poor, develop sustainable agricultural practices, control pollution, apply new technology for renewable energy resources and conserve natural resources. We cannot hope to achieve any of these goals without changing the way we currently live, and practice our professions.

This leaves every environmental health practitioner in the role of change agent, wherever and in whatever role they may be working. The strategies presented here are but a few of those available once that role is adopted. Change needs to occur at every level from the international to the local. The Australian Charter of Environmental Health Rights and Responsibilities calls upon all of us to contribute to that change as representatives of government, business and industry or as community members. The *National Environmental Health Strategy* emphasises the need to develop a new environmental health practice based on the principles of the new public health and ecological sustainability (enHealth Council 1999). We may feel overpowered by the enormity of the problems that face us. We may feel there is little we can do, but as environmental health practitioners we have a responsibility to develop a key role in influencing change. As Paul Kelly (1992) reminds us, "from little things big things grow" (Kelly & Carmody 1992).

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NATIONAL STANDARD FOR SEAFOOD SAFETY TAKES SHAPE

New food safety regulations being developed for the seafood industry by Food Standards Australia New Zealand will help to maintain Australia's reputation as a producer of high-quality, safe seafood.

Food-borne illnesses are generally on the rise around the world. The revised seafood safety laws, designed to address critical points in the production and processing of the food, will provide consumers with added measures of safety against these illnesses.

FSANZ's General Manager Food Safety, Greg Roche, said a new national seafood standard would draw on the best of existing State by State approaches and industry initiatives aimed at producing national uniformity for the sector.

"We are working with the seafood industry and the jurisdictions to design regulations which will achieve our safety goals while not imposing an undue compliance burden on the industry" Mr Roche said.

"The new seafood standard will be based on international risk management principles which will enable Australia to provide levels of seafood safety equal to the best in the world."

"The standard will be mandatory in all states and territories and will apply to the harvesting, processing, handling and storage of seafood, including aquaculture production. It will also apply to imported seafood."

Mr Roche said FSANZ had established a Standards Development Committee to assist it in its work, with representatives from consumer groups, peak seafood industry associations and from Commonwealth and state agencies that have an interest in the new regulations.

He believed that the involvement of industry and the jurisdictions in the planning stages of the seafood standard would result in a smooth transition to the new standard, which is likely to pass into law in mid-2004 and become effective a year later.

"The next milestone in the process will be the release of a Draft Assessment in December, including a draft standard, and a second opportunity for interested parties to comment on the proposed regulations." Mr Roche said.

"The new national seafood standard will be an important step in enhancing Australia's growing reputation as a source of seafood that is safe and healthy."

Media contact: Arrangements for interviewing Mr Roche can be made through Dr Michael Dack on 02 6271 2239 or 0401 144 440 (mob).

Making Decisions Regarding Local Community Wellbeing Programs: the Beaudesert Shire Council

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There is considerable evidence to support local government involvement in Community Wellbeing Programs (CWPs), however, this involvement is reliant on internal capacity, on existing local services and on community needs. Community and political pressures have forced the Beaudesert Shire Council (BSC) to review its current position in relation to CWPs. The outcomes of this review have the potential for considerable implications for infrastructure and resources. Consequently, the sustainability of any programs being considered had a significant impact on the decision making process as the BSC has limited capacity in this area. However, the establishment of community grants programs, participating in community based planning activities, and continued advocacy to support community development are roles that could be managed within the current Shire's capacity. This article provides an introduction to the BSC and reports on the study that assisted the Council with the decision making process.

Key words: *Community Wellbeing Programs; Local Decision Making*

Australia maintains a wide variety of Community Wellbeing Programs (CWP) including the provision of services to manage childcare, domestic violence, homelessness and housing, refugee and migrant services, mental health services, and teen-parent issues. Traditionally, CWPs have been the responsibility of state and federal governments, however, there is increasing pressure on local government to become involved in this service provision sector. As a result, CWPs are one of the fastest growing areas for local governments (Evatt Research Centre 1990). Beaudesert Shire Council (BSC) is one council that has experienced this pressure.

The BSC is located in Southeast Queensland and has a population of more than 53,000 (Office of Economic & Statistical Research [OESR] 2002b). The Shire is located one hour by car from both Brisbane and the Gold Coast and has a mix of rural and urban living. Community and

political pressures have forced the BSC to reassess its current position in relation to CWPs. The consequence of these pressures has considerable implications for infrastructure and resources with the Council having limited capacity to develop and sustain such initiatives. Importantly, however, the Council was aware of its responsibilities to meet the community's needs and commissioned a study to assist with the process.

This paper reports on the findings of the BSC study, which was undertaken in two parts. First, a number of service providers providing CWPs within the Shire was recruited as a sample to report on service provision in the Shire, current issues for the Shire, and on strategies to manage the identified issues better, as well as how they believed the BSC could better assist the sector. Second, a review was undertaken to ascertain the level of commitment and the types of services offered by other local

government authorities (LGA) in the region.

Why Should Local Government Authorities Provide CWPs?

LGAs in Australia are democratically elected governments working at the local level. Local government is the only way of providing for the social and environmental needs of identifiable communities in a manner that is comprehensive, democratically based and with accountability (Alexander 1991). There are 692 LGAs within Australia, with 125 located in Queensland. These jurisdictions are accountable to diverse metropolitan, regional, rural, and indigenous communities.

Overall, local government endeavours to provide good governance for local communities. This is achieved by being fully informed on local issues; by considering all aspects of environmental, social and economic wellbeing through effective strategic and corporate planning based in extensive community consultation; and by balancing competing claims and interests openly, fairly and sympathetically (Australian Local Government Association [ALGA] 2002). Further, ALGA (2002) recommends that local governments should provide or support programs and services, which are required to meet local community needs. These services must be affordable and delivered equitably, efficiently and effectively.

During the previous 20 years, the roles and responsibilities of local government have been expanded to be inclusive of social, environmental, cultural and physical factors. Contemporary roles supported by the majority of local governments in Australia, include land-use planning, the control of building and development standards, public health, environmental protection, cleansing and waste management, local economic development, maintenance and building of road infrastructures, consumer protection, cultural services, and tourism. Labonte

(1993) summarised these duties and outlined the five major roles of local government as being policy, legislation, education, partnerships, and advocacy.

Linking CWPs with the National Environmental Health Strategy (NEHS)

The *National Environmental Health Strategy (NEHS)* (Department of Health and Ageing 1999) was developed to drive policy and the provision of environmental health services in Australia into the future. It recognises that environmental health services need to be provided in a collaborative and consistent manner at the local, state, federal and global levels. The NEHS establishes links to community wellbeing services in many ways. For example, the development of environmental health policies that focus on preventing disease and actively encourage supportive environments, which will contribute to better health outcomes for individuals and populations, are advocated throughout the document.

The Strategy contains Charters that outline the entitlements and responsibilities for business and industry, governments, individuals, and communities, which if adhered to would enable the promotion of good health. Specifically relating to the provision of welfare services, governments are responsible for:

- Ensuring effective mechanisms for linkages between agencies to achieve improved health outcomes;
- Aiding community involvement;
- Ensuring appropriate infrastructure and services are available and effective; and
- Ensuring transparent and consultative decision-making processes.

The NEHS (Department of Health and Ageing 1999) also states that the traditional roles of local government are changing and

with the community becoming increasingly scientifically literate, the types of services provided are showing more initiative and imagination in using a range of approaches to mobilise people to promote and protect their health (p. 13). One of the primary principles of the NEHS (Department of Health and Ageing 1999) is environmental health justice and a range of target groups is listed including socially and economically disadvantaged populations, children and Indigenous Australians. Health inequalities are discussed and risk factors such as a lack of education, unemployment, low income, poor housing, inappropriate diets, and individual risk taking behaviour are discussed. The NEHS (Department of Health and Ageing 1999) advocates for good social support networks, particularly for family and friends, as these are associated with better health outcomes (p. 22). It further states that community empowerment strategies will assist in reducing health inequalities.

Basic Community Profile for the BSC

Unlike many rural LGAs, the population of BSC is increasing and has doubled since 1986 (BSC 2002). The Shire is split into two census areas with Part A being predominantly urban and Part B predominantly rural. Briefly, for Part A, the median age for this part of the Shire is 33 years, unemployment is 6.5% and the average family income is \$800-999.00. These figures are slightly different for Part B in that the median age for this part of the Shire is 37 years, unemployment is 7.6% and the average income is \$700-799.00 (ABS 2002a & b; OESR 2002a).

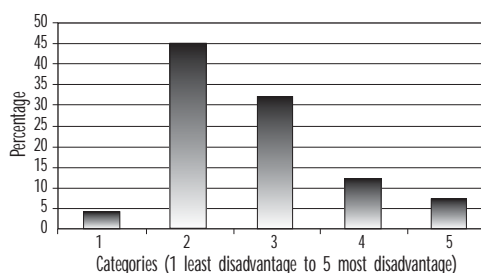
The age distribution, indigenous population and education levels for the Shire are similar to those for the State (ABS 2002a & b). Approximately two thirds of the workforce in the Shire are in full time employment and most of the remainder has part time employment. The two main types of businesses operating in the Shire are in the agriculture (including forestry and fishing) and construction industries. These

two industries alone make up approximately half of the businesses operating within the Shire. Trades and related activities are the occupations with the largest number of persons employed within the Shire. Almost 70% of the people employed within the Shire travel to work by car (ABS 2002a & b).

The Shire area is considered Highly Accessible, Rating 1, according to the Accessibility/Remoteness Index of Australia (ARIA). This means that residents of the Shire are considered to have relatively unrestricted accessibility to a wide range of goods and services and options for social interaction. The Shire has an Index of Relative Socio-Economic Disadvantage (IRSED) in line with the State average. The distribution for the Shire according to the IRSED is detailed in Figure 1 below. Approximately 50% of the population falls within the two highest categories indicating least disadvantage, while only 7% fall within the most disadvantage category (OESR 2002b).

The BSC's current commitment to CWP's includes the employment of a Community Wellbeing Officer and the provision of limited funds and in-kind support, such as the use of facilities for meetings.

Figure 1: Beaudesert population distribution by Index of Relative Socio-Economic Disadvantage



Community Wellbeing Issues and the BSC

Local governments like the BSC that include large rural areas present certain challenges to the development and

provision of services. Generally, the BSC has a number of significant contributors to issues regarding community wellbeing. First, there is considerable growth within the rural population and around the urban fringe areas in the Shire. Both of these increases can be attributed to affordable housing offered within the Shire. There are numerous community wellbeing issues for these areas as they usually extend beyond reasonable access to essential services and infrastructure. Both rural and urban fringe areas often have limited local employment opportunities, generally attract lower income people due to the affordable housing available, and require considerable travel to services and recreation with this travel usually undertaken by motor vehicle. The majority of the services to support this sector are positioned within the largest township and limited decentralised services are provided.

Methodology

Data collection for the Key Stakeholder Study

A cross-sectional design was utilised for this study (Portney & Watkins 1993) involving a survey methodology for the collection of data from the study participants. The study was conceptualised as an exploratory study and as such no formal hypothesis testing was conducted. The results have been presented in a descriptive form including tables showing counts and percentages.

Sample

The collection of data involved the identification of the key stakeholders in community wellbeing service provision for the BSC. The key stakeholders were contacted by telephone and a survey instrument was administered. A total of 35 organisations listed in the Beaudesert Shire Community and Service Directory (Beaudesert & Jimboomba Times 2002) were identified as key stakeholders which were involved in the provision of CWP within

the Shire. For this study, attempts were made to contact all the key stakeholders and a logistic maximum of three attempts was made to contact each of the study participants. From key stakeholders identified, 29 (83%) organisations participated in the study and completed the questionnaire.

The questionnaire used in the study was developed to collect data on organisational structures, services offered, community wellbeing issues, strategies in use and the role of the BSC. Prior to the study the questionnaire was piloted with a Brisbane community wellbeing service provider and modified before its use in the study.

Organisations within the study

The organisations which participated in the study ranged from Church groups (Christian Outreach, Uniting Church, St Vincent de Paul), Community Health Services (Community House and Mt Tamborine Community Care) to other community based organisations such as the Beaudesert Cancer Support Group, Al Anon and Al Teen Services. The services offered for the Shire range from counselling, home medical services, and guidance for spiritual wellbeing to providing food, funds and shelter for people in emergency situations. Representatives from the organisations fulfil a variety of positions including volunteers, Family Support Workers, Church Ministers, the Police Liaison Officer, Community Development Officers and Community Health Nurses.

Study Results

Identified issues: The urban setting

Most of the study participants ($n=26$) identified community wellbeing issues for the urban setting within the Shire. Three participants ($n=3$) did not respond to this question indicating being unsure of the issues or unable to comment. In summary, the most common issue identified was the need for more CWPs for the Shire. Examples

of the programs needed for the Shire included more low level care services (e.g. meals, cleaning and home maintenance), more emergency accommodation and increased services better to manage child behaviour issues, family breakdown, crisis care, and respite care. Other major issues were the lack of public transport and the current level of unemployment within these areas. Table 1 details the issues identified by the organisations.

Table 1: Issues relating to community wellbeing in the urban setting

Issues Identified	No of Responses
More community wellbeing services are needed	17 (28.2%)
Lack of public transport	13 (21.5%)
Impacts of unemployment	13 (21.5%)
Alcohol and drug abuse	5 (8.5%)
Isolation	5 (8.5%)
Lack of activities for the kids and young parents to do within the Shire	2 (3.5%)
Low income people moving into the Shire	2 (3.5%)
Too much political influence	1 (1.6%)
The current drought	1 (1.6%)
Crime	1 (1.6%)
Total	61 (100.0%)

Note: Study participants could offer more than 1 issue

Identified issues: The rural setting

Response rates were high for this question (n=26). Table 2 identifies responses with the most common issue being isolation. This issue was linked to the lack of public transport, lack of services, high unemployment, and drug and alcohol abuse.

Comments on the current CWP's within the Beaudesert Shire

Nineteen (n=19) of the study participants identified limitations with the current service provision. These identified limitations included the following:

- Limited weekend services
- Lack of emergency housing

Table 2: Issues relating to community

wellbeing in the rural setting

Identified Issues	No of responses
Isolation	14 (40.0%)
Lack of Public Transport	7 (20.0%)
More CWPs needed	5 (14.0%)
Impacts of Unemployment	4 (11.0%)
Alcohol and Drug abuse	3 (9.0%)
Domestic Violence	1 (3.0%)
Lack of community spirit	1 (3.0%)
Total	35 (100.0%)

Note: Study participants could offer more than 1 issue

- Enough but overlapping services
- Duplication of programs
- Lack of coordination between services
- Lack of funds for service provision
- The spread and quality of services throughout the Shire
- Difficulties finding "the right person"
- Lack of infrastructure to house all the different agencies within the Shire.

Strategies to improve the Community Wellbeing Sector

A number of the study participants (n=7) provided potential strategies to improve the current service provision within the Shire and these strategies included:

- Improving delivery of programs through the establishment of a coordinating body or a "one-stop shop" for consultations and information
- Providing more funds for services, specifically for therapists and counsellors
- Raising awareness within the community of available services

- Increasing the capacity of smaller organisations to carry out service provision and access further funding
- Undertaking a comprehensive review of community needs and evaluating existing service provision within the Shire, and
- Establishing a peak community organisation to assist with fund raising and with sourcing funds for groups.

Connections with the BSC

The majority of the study participants ($n=24$) indicated not having worked directly with the BSC, with a small number ($n=5$) having had some contact. However, overall, a majority of the study participants considered BSC ($n=20$) had a role within the community wellbeing sector. From the remaining study participants, six ($n=6$) indicated that the BSC did not have a role, and three ($n=3$) were unsure. Those study participants who indicated that the BSC did not have a role based their responses on the following comments:

- “The Council has enough to do with town planning, roads and other essential services”
- “Keep politicians out of this area (i.e. community wellbeing service provision)”
- “People see the Council as an authority and there is a need to keep confidentiality”
- “They are there for the upkeep of the Shire”
- “There are no health professionals on Council”, and
- “The organisations need to work independently”.

The study participants who saw the BSC as having a role in the community wellbeing sector provided many suggestions as roles for the Council. These are outlined in Table 3.

Table 3: Suggested roles for the BSC in community wellbeing service provision

Suggested Roles	Number of Responses
Contribute to improved coordination.	8 (38.0%)
Contribute to funding in the community wellbeing area.	3 (14.5%)
Council could provide a community developmental worker to assist with service delivery.	3 (14.5%)
Advocate for services at state and federal level.	2 (9.5%)
Council could contribute to capacity building within the local communities.	1 (4.7%)
Assist with the provision of refuge facilities for partners and children affected by drinking problems in the family (specifically for Indigenous people)	1 (4.7%)
Contribute to planning in the community wellbeing sector.	1 (4.7%)
Contribute by promoting community wellbeing services for the Shire.	1 (4.7%)
Review the demographics for the Shire and provide research on the needs of the community.	1 (4.7%)
Totals	21 (100%)

Review of the services offered by neighbouring local governments

As part of the overall review process, neighbouring LGAs were contacted and surveyed about the methods and types of CWP's offered by each. This was achieved by contacting the BSC's Community Development Officer, or similar position, and also by accessing each LGA's website.

There are 19 LGAs within the Southeast corner of Queensland and they vary considerably in size and capacity. The outcome of this review revealed a considerable diversity of services offered, as well as variations in the levels of commitment to CWP's within this region. For example, one larger council was providing day care centres, after school care, and home maintenance services. Another of the larger councils was providing programs for older community members, sporting options for Indigenous people, many programs for youth, including flexible schooling, and a substantial community grants program. Smaller LGAs, however,

tended to limit their activities to community grants programs, managing service directories, and providing meeting rooms or other in-kind support for volunteer organisations. There was also a number of community planning projects completed or underway within the region. From this review, it appears that there are resources and the capacity within local government to influence significantly the level of commitment to community wellbeing projects in the region. This review provided a number of service options for the BSC to consider within the overall reassessment process, some of which are discussed below.

Discussion

The findings from the key stakeholder study undertaken revealed considerable issues in the community wellbeing sector for the Beaudesert Shire. However, as the Beaudesert Shire is not a unique community these issues are likely to be common throughout CWPAs in other LGAs. The study revealed a considerable number of CWPAs operating within the Shire. Notably, the Shire has capacity for significant residential development resulting in the additional pressure of an apparent migration of lower income people drawn to the affordable rural or semi-rural lifestyle. According to some of the study participants, this growth has had a considerable impact on existing programs. Consequently, the study participants considered the provision of more services in this sector as a priority for the Shire. Other priority issues that were identified included reducing the effects of drugs and alcohol, addressing the lack of public transport, and concentrating on reducing unemployment and isolation.

With regard to the BSC involvement within the community wellbeing sector there are a number of factors to consider. Most significantly, the BSC has very limited capacity within its existing infrastructure and resources to deal with community wellbeing, yet the issues identified within the study are likely to require substantial resources. However, some of the study participants identified strategies that the BSC could employ when addressing community wellbeing issues. Many of the

roles identified are realistic and within the BSC's capacity; particularly the suggestion of contributing to improved coordination with a level of financial support, and the provision of a Community Development worker to assist with current and future programs.

The other LGAs surveyed, provided a considerable variety of CWPAs that are of interest to the BSC. On one hand, many of these options require considerable financial and structural supports (e.g. day care centres) and consequently are beyond the capacity of the BSC at this time. On the other hand, most of the staff from the other LGAs interviewed, indicated that adopting coordination and facilitation roles were preferred to direct service provision. These roles have been supported by a number of study participants ($n=8$) to be appropriate for the BSC.

One suggestion offered from the study participants was that the BSC should employ a Community Development Officer who would contribute to both social services and infrastructure within the Shire. The BSC currently has a comparable position (Community Wellbeing Officer) whose mandate is to influence these areas. However, the lack of recognition for this position may be an indication that links between the position and the sector are not strong. Consequently, promoting this position and the linked activities to the community and agencies within the Shire would be beneficial. Further suggestions for the BSC included the contribution to coordination and the provision of infrastructure and funding to assist with service provision. It was further recommended that the Community Wellbeing Officer become involved in community activities and should initiate and manage a community grants scheme funded through surplus budgetary funds from the LGA. There is also scope for the Community Wellbeing Officer to be involved in advocacy activities and the promotion of current services in the Shire.

Findings from the key stakeholder study revealed that a Community Development Plan for the Shire and a review of the current service directory is on the agenda for

2003. Some of the direct outcomes of these planned activities might include a raised profile for the Shire in the community wellbeing sector, stronger partnerships, an overall strategic direction for operations within the Shire, and increased coordination and greater opportunity for collaboration, specifically for further funding opportunities. However, it recommended that for sustainability and to achieve the greatest impact for the community, the Community Development Plan should be integrated into the BSC's corporate and strategic planning processes.

Conclusion

There is evidence to support local government involvement in the community wellbeing sector and this is well demonstrated within the LGAs in the Southeast corner of Queensland. National

documents such as the NEHS also advocate that local governments should become involved in such community-based issues. However, this study revealed that the level of involvement is reliant on internal capacity and often reflects existing local services and community needs. The BSC has identified community wellbeing as a priority but currently has limited capacity to develop and sustain initiatives within this sector. Yet, there are still many opportunities for involvement. Increasing the profile of the Community Wellbeing Officer within the community, promoting the community grants programs, participating in community based planning activities and continuing to be an advocate, are all roles that could be undertaken by the BSC with manageable impacts to increase the quality of life of its residents.

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REPORTS AND REVIEWS

New National Food Labelling Requirements: An Overview

Eric Middledorp

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Food Standards Australia New Zealand (previously the Australia New Zealand Food Authority)), maintains the Food Standards Code. This Code requires all food businesses to conform to new food labelling requirements. These new requirements were implemented at the end of 2002. This article was initially presented at the AIEH 2002 Annual Conference and attempts to outline the new food labelling requirements.

Key words: Food Labelling Requirements; Food Standards Australia New Zealand Food Standards Code

Food Standards Australia New Zealand (FSANZ, previously the Australia New Zealand Food Authority), maintains the Food Standards Code. Any food sold or produced for sale anywhere in Australia now must conform to the Food Standards Code (FSC) requirements relating to that food.

The introduction of the FSC was a major breakthrough leading to interstate cooperation relating to food regulation. This breakthrough came about due to an agreement reached and signed between the Commonwealth of Australia and the states and territories in 1991 to adopt uniform Food Standards. In NSW the FSC was adopted with the introduction of the "Food Standards Code (Adoption) Regulations" initially in 1989 with any new amendments to the Food Standards Code being automatically adopted by NSW as they are Gazetted at the Commonwealth level. It should be mentioned that a new NSW Food Bill 2002 has recently been tabled in Parliament and should replace the 1989 Food Act sometime in the future. This new legislation also reinforces the Labelling requirements.

Revised Food Standards Code

The Food Standards Code (FSC) has been recently revised. The "old" FSC is now known as Volume 1. The recently revised FSC is known as Volume 2. The new Volume 2 became mandatory towards the end of 2002. Until then, food businesses could

choose whether to follow Volume 1 or Volume 2.

Volume 2 of the FSC

Volume 2 of the FSC consists of four parts or Chapters.

In summary, the new Chapters of Volume 2 are as follows:

Chapter 1: General Food Standards

Chapter 2: Food Commodity Standards

Chapter 3: Food Safety Standards

Chapter 4: Primary Production Standards

Chapter 3 Food Safety Standards, has already been adopted and implemented throughout Australia (except, in some cases Standard 3.2.1 relating to Food Safety Programs).

Labelling Requirements

Chapter 1 of the new FSC largely deals with food labelling requirements. Briefly, Chapter 1 consists of a number of sections including:

- introduction to the FSC
- preliminary/interpretations section
- the actual labelling requirements
- additives section
- residues and contaminants
- microbiological and processing standards and requirements.

Chapter 1 Part 1 (1.1) Preliminary Requirements is very useful as it provides information on definitions contained in the Standard and guidelines relating to the “general” application and interpretation of the FSC. For example, this section defines a “label” to include any tag, brand, statement in writing, or any representation attached or used in connection with any food or package.

Chapter 1 Part 2 (1.2) is the most important section relating to Labelling. Part 1.2 is called Labelling Requirements and other Information Requirements and it contains information and requirements relating to:

- Date Marking of Packaged Food;
- Directions for Use and Storage;
- Nutrition Information Requirements;
- Legibility Requirements;
- Allowed Additives;
- Characterising Ingredients and so on.

The Standards in Part 2 are discussed in more detail below.

1.2.1 (Chapter 1 Part 2 Standard 1) requires all retail and catering food (catering food is defined as foods used in restaurants, canteens, schools, caterers etc where food is offered for immediate consumption) to contain Labelling information but with the following exemptions under 1.2.1 Standard 2 (1):

- food which is not in a package
- food in inner packages for sale in an outer package
- food made and packaged on the premises
- fresh fruit and vegetables

- food sold at a fund raising event
- delivered packaged, and ready for consumption (e.g. Take-away-food deliveries)
- “delicatessen” food -but Labelling information should be available, in this case, upon demand (e.g. if the deli buys a whole “soccerball” ham for sale in slices, the outer wrapping which will contain ALL the labelling information should be retained).

1.2.2 Food Identification Requirements This requirement means that if there is a “prescribed name” within the Food Standards Code for a food, this name must appear on the label. Examples of prescribed names include milk, jam, manufactured meat (liverwurst, pate) and so on. Other names must indicate the true nature of the food (FSC 1.2.2 clause 1). Under this Standard, the batch or Lot number also needs to be included on the label. This information is essential in meeting the Product Recall procedures (FSC 1.2.2 cl. 2).

Also, the manufacturer’s or importer’s address must be included (1.2.2 cl. 3).

Country of origin information is also required to be displayed on the label. This requirement is actually part of 1.1.3 cl. 2, but does not need to apply to New Zealand products.

1.2.3 Warnings and advisory declarations must be made on the label if the food contains certain substances that can potentially cause an allergic reaction. For example, declaration must be made if a pate contains gluten (flour may be added as a binder) (1.2.3).

Some people can suffer a serious allergic reaction with products containing peanuts such as peanut butter or some sate sauces. This reaction can be very severe and in some cases can be fatal (as was the case recently with a young child on a school excursion).

So, the addition of this information on food labels is beneficial to the consumer.

1.2.4 Labelling of Ingredients A full list of all the ingredients in descending order of ingoing weight must be included on the label. However, lists of ingredients are not required in certain circumstances such as with what could be considered to be 'whole' foods. For example you wouldn't need a list of ingredients on a carton of milk or a carton of eggs as the ingredient is the food itself. Certain alcoholic beverages such as beer and wine, also do not need to contain an ingredient list. Small packages with a total surface area of less than 100 square centimetres also are not required to display a list of ingredients. Single serve packs of butter, jam, and so forth are just not big enough to hold all the required printed information.

1.2.4 Declaration of Food Additives As part of the List of Ingredients mentioned previously, more details will be required in relation to 'additives' used. Different types of additives are listed in Standard 1.2.4 Schedule 1 as 'Classes' of Additives, which are allocated 'Prescribed Names'. Examples of Prescribed Names of classes include Acids, Antioxidants, Colours, Emulsifiers, Flavour Enhancers, Preservatives, Sweeteners, Thickeners and so on.

It should be noted that each additive has been allocated its own prescribed name and an Internationally recognised 'code number'. For example:

- Citric acid is number 330;
- the colour Tartrazine is 102;
- the preservative Sulphur dioxide is 220 and so on.

Manufactures can either use the specific prescribed name or the allocated Code Number when including them in their List of Ingredients. For example, the pate mentioned previously which may contain (among other ingredients) acids, thickeners and preservatives can list these as:

- acid (citric acid) or acid (330);

- vegetable gum (agar) or vegetable gum (406);
- preservative (sodium nitrite) or preservative (250)

1.2.5 Date Marking requirements are one of the sections of the new labelling laws that the consumer will notice. The terms "Use By" or "Best Before" must be used in relation to Date Marking.

The distinction between applying the term "Use by" or "Best before" relates mainly to health and safety reasons. "Use by" should be used for the riskier perishable foods where the food becomes potentially hazardous if consumed after this time. "Best before" is used for foods where it is more of a "quality" issue if the food is consumed after this date. For example, a dry breakfast cereal like corn flakes consumed after the prescribed date may be unpleasant but not necessarily hazardous if consumed. Also, this Standard under 1.2.5 clause 3 prohibits the sale of food after the specified "Use by" date.

Clause 6 of this Standard also requires the manufacture to specify the required storage conditions to ensure that the food will remain safe for the use by period. In the example of the pate, a statement requiring the consumer to store the pate below 5°C for the entirety of the "Use by" period would be required.

There are exemptions to the "Use by" requirements which include:

- Small packages (<100cm²)
- Individual portions (e.g. ice cream)
- Long Shelf Life (>2 years)

1.2.6 Directions for Use and Storage This new Standard requires directions for the use or storage to be included to help ensure the safety of the food. In the example of the pate, this may read "Once opened, the pate is fresh and must be consumed within 4 days".

This is an additional requirement to clause 6 of Standard 1.2.5 mentioned previously relating to the "Use by" storage conditions. For example, the pate might have a 4 week "Use by" date, BUT a 4 day

consumption period after the package is opened. Another example may be where dried powdered milk may have a 12 month "Best Before" date, but must be stored at below 5°C and be used within 4 days after reconstitution.

1.2.8 Nutritional information The comprehensive Nutritional Information requirements provide additional important details on the nutritional composition of the food. The aim of this new requirement is to allow the consumers to see for themselves what nutrients the food may contain. For example, pate might contain approximately:

- 27.6g/ 100g fat;
- 11.6/100g protein;
- 8.1g /100 g of CHO, and
- 1356 KJ energy per 100g of pate and so on.

In most cases, the nutritional information per serve and per 100 grams of the product must be declared (the amount per 100 grams may be considered more useful as it indicates more or less the percentage content of the nutrient within the food).

There are exemptions to Nutritional Labelling requirements such as:

- fruit, vegetables, meat and so on. These are sold "as is" and are "single ingredient" foods
- food sold at fund-raising events or in small packs
- alcoholic beverage or herbs/spices
- vinegar and related products
- salt and salt products
- Tea/coffee products

1.2.9 Legibility requirements mean labels must be in English and at least 3mm type (1.5mm for small packages -less than 100cm²) (FSC 1.2.9).

1.2.10 Characterising ingredients content need to be declared. For example if the pate

is sold as Duck Liver Pate, the label should declare the amount of duck liver in the pate, e.g. "Contains 10% Duck Livers" (FSC 1.2.10).

1.5.2 Genetically Modified Food The Food Standards Code 1.5.2 lists the permitted Genetically Modified Food and additives that may be utilised. If it is not listed, it can not be used. New GM foods/additives must go through an approval process before being included in this list. Genetically Modified food/ingredient must be declared so that the consumer is aware that the food may contain GM material, for example: "Soy Flour-Genetically Modified".

Offences and penalties

Each state currently requires every package of food intended for sale to bear a label setting out the Labelling information covered above. For example, the *Food Act 1989* (NSW) section 9 (1) states "A person who prepares for sale any food for which there is a standard prescribed is guilty of an offence unless the food complies with the prescribed standard". A 50 Penalty Unit penalty applies to breaches of this Section of the current *Food Act 1989* (NSW) (a PU is currently \$110).

As mentioned previously, in the case of displayed food such as would be found in delicatessens, this information must be made available on request (e.g. the original packaging which contains this information should be retained).

The new NSW Food Bill 2003 (Model Food Bill), currently before Parliament in NSW, will replace the *Food Act 1989* (NSW) and has penalties ranging from \$50-\$250,000 for breaches of FSC Labelling requirements. Please note that the status of equivalent legislation varies in other States and Territories.

Conclusion

All food businesses, regulators, food safety officers, auditors and so on should be aware of

the new labelling requirements of the Food Standards Code to ensure compliance and to help ensure that the consumer receives all appropriate labelling information.

There is extensive information available on the new Food Standards Labelling requirements. If you require the details on the new Labelling requirements and the FSC, refer to the FSANZ Internet Site.

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AFSA and Food Safety Standard of Practice

The much awaited Food Safety Standard of Practice and Australian Food Safety Assessment (AFSA) are now available from the Australian Institute of Environmental Health. The Standard of Practice and AFSA have been developed to promote consistency and provide guidance to Environmental Health Practitioners in assessing any food handling activity against the outcome based Food Safety Standards.

A copy of the Food Safety Standard of Practice can be freely downloaded from the AIEH website at www.aieh.org.au

AFSA is available for purchase for \$30.80 (incl GST). A bulk purchase discount of 10% is available for orders of 10 or more pads. Further information about AFSA and a sample is included in the Food Safety Standard of Practice.

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Microfibre Non-chemical Cleaning Makes Inroads into Australia

Paul Sampson



Ha-Ra Cleaning Products

For years, the commercial cleaning industry (and to some extent the domestic cleaning market) have failed to address the issue of reducing the use of toxic chemicals. This is not the case in Europe where for more than 20 years microfibre products have been used as a viable alternative to chemical cleaning methods. This technology can reduce chemical usage by 95-98% and water usage by as much as 50%.

Looking at the fibres through a microscope will reveal that most will have a triangular shape with minor variations. These fibres, which are then attached to a specially designed backing, have the ability to remove fat and dirt from surfaces without smearing. Even the smallest particle can be collected and held by the capillary action of the fibres when used with cold water.

The weight of these fibres is approximately 6 grams per 100,000 metres with a diameter that needs to be expressed in micrometers (micro-fibres). Some of the more recent developments see fibre sizes even smaller and their size is expressed in nano-metres.

To put this into perspective, the silkworm produces fibres that weigh-in at 13 grams per 100,000 metres. (And this is without the "special" shape.)

The woven backing and the variations here (depending on application) are also extremely important as the fibres operate optimally when under the correct angle. Getting this right ensures that minimum exertion is required to clean.

The fibres' shape, length, composition and backing vary depending upon the application - for example some fibres clean general surfaces, while others are better

suited to outdoor areas such as wood, terra cotta or brick (removing algae, dirt), and others clean surfaces such as granite and marble.

The fibres can be washed and used over and over again, and come in many forms including cloths, gloves, window cleaners and floorpads.

The fibres can pick up all types of contaminants including dirt, dust, fat and grease. The fibres also have another important attribute - they hold the contaminant until rinsed or washed, in other words there is no carryover from one surface to another. This has both health and efficiency (commercial) benefits.

Local Government Initiatives

There is an attitudinal change taking place in the Australian cleaning industry, and it is being led by local government.

The Municipal Association of Victoria is leading the way with ECO-Buy - an association that is gathering together all companies with environmentally credentialed products, and assisting with fostering business associations with local government.

As a result, municipal councils are now using Ha-Ra microfibre products. The areas of particular interest are: childcare, home care, aged care facilities, municipal buildings and contract cleaning.

Part of the feedback to Ha-Ra was the request for assurances on the bacteria control properties of the products, and as a result the products were tested under NATA-approved conditions.

The tests included removing various pathogens from stainless steel surfaces. The

tests included:

- Natural (raw meat)
- *Staphylococci aureus*
- *Escherichia coli*
- *Listeria monocytogenes*

Additional tests were performed to ascertain “carryover” to other clean surfaces. These tests produced no discernible increase in the bacteria count. A broad range of microfibre cloths was tested, with complete success—proving that the physical/mechanical removal of bacteria is possible, eliminating the need to spray chemicals, or to use traditional sanitising procedures in many situations.

The implications are that bacteria control can be simplified, and a reduction in chemical usage is feasible.

An Environmental Health Officer with many years’ experience at local and state government level has commented:

Cleaning and Sanitation programs are a major component of Food Safety Programs that have been recently introduced for Victorian food businesses. It is inevitable that food safety programs will eventually be a requirement in all states. Products that assist business more efficiently to achieve high

standards of cleanliness and sanitation are welcome. It will enable businesses to clean and sanitise surfaces and equipment with minimal effort compared to traditional methods using chemicals. This is particularly important for small businesses working long hours in a competitive environment (Personal Communication 2003).

The interest from government now includes a focus on Occupational Health & Safety issues and the reduction of chemicals in the workplace.

Private Industry

The acceptance of microfibre cleaning in private industry is slowly but surely taking place. It is much more difficult to gain acceptance in this sector as the “green” credentials do not influence decisions, it is predominantly the bottom line, and this is being achieved by reducing the labor costs with increased efficiency.

Major areas taking up this system are: public swimming pools/gymnasiums, high-profile leisure/convention centres, childcare facilities, hotels and caravan parks, restaurants and the home market. The hospital industry has been making serious efforts to reduce chemical use for some time, and 120 hospitals have now taken up Ha-Ra for general cleaning and the cleaning of surgical instrument sterilising cabinets.

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Environmental Change, Climate and Health: Issues and Research Methods

Pim Martens and Anthony J. McMichael (Eds)

Cambridge University Press, 2002, 334 pp. ISBN 0 521 78236 8, \$199.00 (hardback)

This book is a very impressive text. Its release represents an important and timely step in providing guidance, and a framework, for the exploration of issues surrounding global environmental change. One of the most striking aspects of the book is its extensive list of contributors. These, along with the editors, Pim Martens and Anthony McMichael (a formidable team who have extensive expertise in global assessment, human health, population health and global environmental change), mean that this book contains contributions from an extensive range of international professionals.

These professionals represent disciplines spanning epidemiology and population health, public health, medicine, hygiene and tropical medicine, ecology and hydrology, global climate change, occupational and environmental health, integrative studies, applied science, veterinary medicine, disease control and vector biology, ecosystem, international health and environmental sciences, with the contributors representing universities and research organisations from the United States, United Kingdom, Australia, Italy, the Netherlands, and New Zealand. This not only gives you the impression that this is a very significant text, but gives one a sense of unity in addressing the issues of climate change. This, in itself, encourages you to read further.

The early chapters of the book set the scene for understanding and appreciating the complexities of the issues surrounding climate change. The chapters introduce the concepts, challenges and importance of research, particularly the scientific uncertainties that exist with its current

application to health and global change policies. This is achieved through the consideration of topics such as the risks to health through global change, the historical connections between climate, medical and human health, and the contribution of global environmental factors to ill health.

These chapters provide an excellent overview of the combination of the historical epidemiological approaches to health, drawing upon the range of disciplines that contribute to the investigation and improvement of health outcomes, while addressing the impact of the emerging problems caused by the overloading of the earth's capacity by humankind. These chapters are informative, comprehensive and serve as good reference material for understanding the general relationship between health and global change. Diagrammatic representations of concepts are provided, which are good tools in supporting and illustrating the various concepts. At the same time, the topics provide a good basis for the subsequent chapters, which explore differing approaches to research and their application to the investigation of climate change.

These chapters begin with an introduction that assists the reader in obtaining a clear (and easily read) understanding of the concepts surrounding the research paradigm, whilst keeping in context with the overall text. This is important, and advantageous for the reader, since it immediately provides an understanding of the methodological approaches being explored and the particular relevance to the investigation of health and global change.

The methodological approaches explored include the application of complex interactions, modelling, epidemiological and impact assessment, analogues, remote sensing, geographical information systems, and spatial analysis, to assessing the impacts on health due to global change. As the individual chapters progress, the reader is taken through the various approaches in a more detailed manner, again with the support of illustrations, tables and diagrams, together with examples of the use of the various models on the detection of health impacts such as vector borne diseases, food and water borne diseases and infectious diseases (such as HIV/AIDs). The extensive use of these illustrative materials is advantageous.

These chapters are particularly beneficial for those considering undertaking research, or for understanding more broadly the implications associated with attempting to provide estimates of health impacts, particularly when the decisions involve the development, application or communication of policy in the area of global change.

The text concludes with a chapter titled 'Dealing with scientific uncertainty'. This valuable chapter explores the issues surrounding the development of scientific

policy and building public trust. It also highlights the need to take into account the changing world in which we live and the future role of exact science. It makes for insightful reading.

Overall, the book provides an important contribution to addressing the complex and uncertain area of environmental change, climate and health. It is particularly beneficial to individuals and organisations that are attempting to build a greater understanding of the broader implications associated with providing estimates of health impacts. In addition, the text provides an appreciation of the challenges that need to be addressed in order to do this, and the tools required to enable us to move forward in the protection and preservation of our world. It is a well written, well referenced text that represents a significant and valuable resource for academics, policy makers, environmental health researchers, and scientists.

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Please charge my Credit Card: ☐ Bankcard ☐ Mastercard ☐ Visa

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3097, AUSTRALIA

Note: For information about the Australian Institute of Environmental Health
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Australian Institute of Environmental Health
ABN 58 000 031 998

Application for Membership

I wish to apply for: ☐ Admission to **OR** ☐ Advancement within the AIEH.

Mr/Mrs/Ms/Prof/Dr Surname:

Other names:

Address (residential and postal):

..... Postcode:

Date of birth:/...../..... ☐ Male ☐ Female

Phone Home Work: Fax:

Mobile: Email:

Current membership status (if applicable)

Current Employment Position:

Commencement date:/...../..... Name of Employer:

Special Professional Interests: (National SIGs shown in bold)

- | | |
|---|--|
| <input type="checkbox"/> Disaster Management | <input type="checkbox"/> Communicable Disease/Immunisation |
| <input type="checkbox"/> Indigenous Health | <input type="checkbox"/> Catchment Management |
| <input type="checkbox"/> Environmental Management | <input type="checkbox"/> Food Safety |
| <input type="checkbox"/> Health Legislation | <input type="checkbox"/> Waste Management |
| <input type="checkbox"/> Toxicology | <input type="checkbox"/> Management Health Promotion |

Other (specify):

I agree to be bound by the Memorandum and Articles of Association and By-Laws of the Institute at all times. I certify the details provided are correct.

The following items are enclosed: ☐ Subscription payment ☐ Certified copy of qualifications ☐ Certificate fee

Applicant's Signature: Date:

Send Application Form together with Membership Fee, Certificate Fee and proof of qualifications to your State Office.

Michelle Deards
PO Box 186
Victoria Park WA, 6100

Danielle Rippin
PO Box 168
Unley SA, 5061

Bernadet Ferraro
PO Box 806
Macleod Vic, 3085

Blair Thompson
PO Box 397
Drummoyne NSW, 2047

Jo Rolls
PO Box 2222
Fortitude Valley BC Qld, 4006

Dayle Stagg
PO Box 172
Launceston TAS, 7250

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Tick one box	Membership level	Qualification requirements	Cost (including GST)
<input type="checkbox"/>	Member	Degree in Environmental Health or related field	\$264
<input type="checkbox"/>	Associate Member	Diploma, Advanced Dip., Associate Dip., Certificate in EH or related field	\$264
<input type="checkbox"/>	Affiliate Member	Person or Organisation in EH or related field	\$264
<input type="checkbox"/>	Student member	Undertaking first full time study in EH related course, No Certificate	\$38
<input type="checkbox"/>	Retired member	Conditions apply. Contact Membership Officer on 03 9455 3169	\$38
<input type="checkbox"/>	Indigenous Environmental Health Workers		\$55

