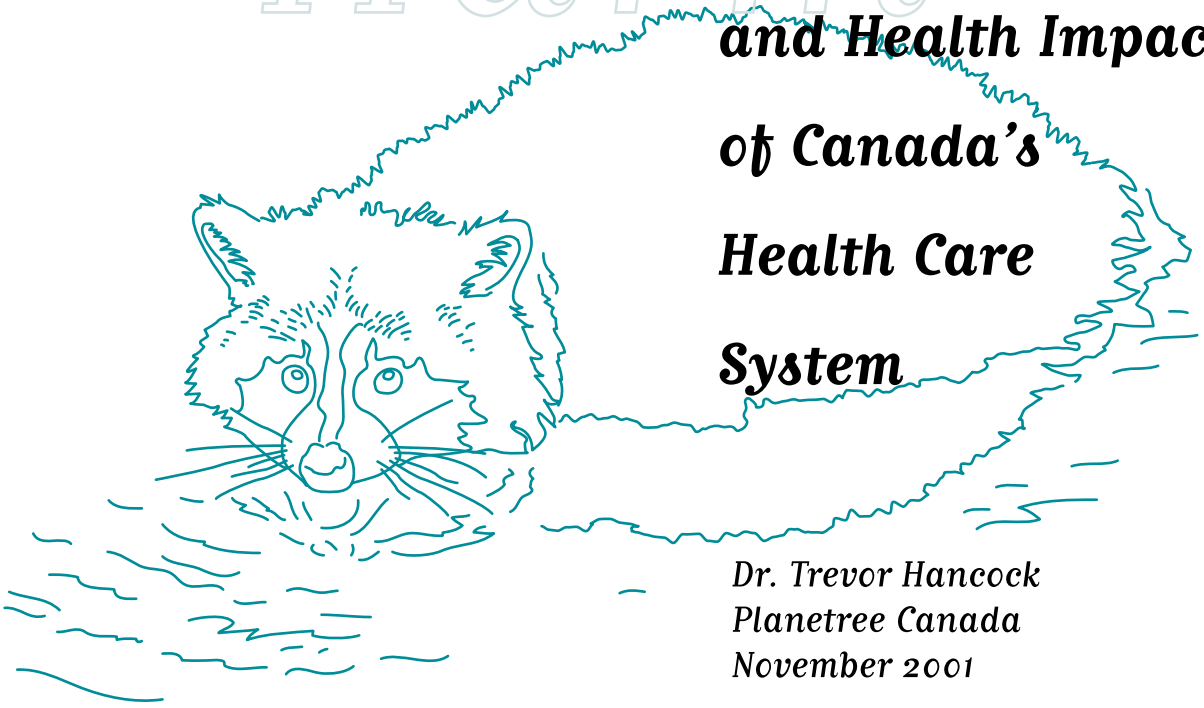
Doing Less Harm:

Assessing and Reducing the Environmental and Health Impact of Canada's Health Care System



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Planetree Canada
November 2001

The Canadian Coalition for Green Health Care
Coalition canadienne pour un système de santé vert

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The Canadian Coalition for Green Health Care was established in late 2000 and includes major national health care organizations, major national environmental organizations and hospitals and other health care organizations (see membership list inside back cover).

The *mission* of the Coalition is "to minimize the adverse environmental and human health impacts of Canada's health care system" and its core areas of focus include:

- energy conservation
- pollution prevention
- resource conservation and solid waste reduction
- good indoor air quality
- environmentally-responsible design and management, including both health facility accreditation and ISO 14001 certification.

The Coalition is committed to encouraging the adoption of these resource conservation and pollution prevention principles and effective environmental management systems, without compromising safety and care, so as to protect human health and reduce the Canadian health care system's ecological impact.

The Coalition works with health care organizations and facilities, health care professionals, governments, non-governmental organisations, the private sector and others to raise awareness of this issue and to increase the capacity of health care organisations and their staff or members to address this issue.

This report was prepared by Dr. Trevor Hancock, a Principal of Planetree Canada, under a contract with the Office on Sustainable Development, Health Canada. The views and opinions in this report are those of the author and do not necessarily represent the views of Health Canada.

Additional copies of this report can be purchased from the Coalition for $10.00 each (incl p & p), or downloaded in PDF format from the Coalition's website.

The Coalition can be reached via its website: *www.greenhealthcare.ca*.

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Fourteen (or more) Good Reasons to be a Green Hospital

1. Health care has an ethical duty to do no harm to the environment or to human health.

2. Being a good environmental neighbour enhances your hospital's image and reputation in the community.

3. Investing in energy conservation now frees up dollars for health care in the future.

4. Effective waste separation can reduce the amount of material going to expensive bio-medical waste treatment and thus reduce costs.

5. Recycling programs not only reduce disposal costs but can actually generate revenue.

6. Low emission materials, paints, wall and floor coverings, etc., can improve indoor air quality and help to avoid "sick building syndrome" among your staff and patients.

7. Reducing greenhouse gas emissions can help to reduce global warming and its associated health effects.

8. Good waste separation can reduce the amount of material going to incineration and thus can reduce dioxin emissions.

9. Energy-efficient operations help to reduce the release of health-damaging air pollutants such as ozone precursors, acid emissions and particulate matter.

10. Phasing out mercury reduces releases of this neuro-toxic contaminant to the environment.

11. Phasing out PVC not only removes an important contributor to dioxin emissions from incineration but reduces patients' exposure to carcinogenic phthalates.

12. Being environmentally responsible now puts you ahead of the regulatory regime.

13. Practising integrated pest management (IPM) can markedly reduce the use of toxic pesticides.

14. Using 'green' cleaning products can help reduce health effects among cleaning staff and others.

... and more — add your own reasons here.

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1 Introduction

1 Introduction

"If wealthy industrialized societies as a whole are unsustainable, then so are the health care systems housed by these societies. And if the material scale of these economies is to be reduced, so must the scale of health care." — Jameton and Pierce, 2001

1. Introduction

Health care is almost 10 percent of Canada's GDP; hospitals alone constitute approximately 1/30th of the entire Canadian economy. Just like any other major economic sector, the health care system is thus a major consumer of a wide variety of both renewable and non-renewable resources, including energy; a major producer of a vast array of solid waste ranging from the non-hazardous to the highly toxic; a source of pollution that contaminates the air, water, soil and food chains both locally and, to some extent, globally; and through its emissions of CO_2 and other greenhouse gases, a contributor to global warming. It has been estimated, for example, that the health sector contributes approximately 2.1 percent of Canada's total greenhouse gas emissions directly; is a source of 1 percent of solid waste and — as a result of medical waste incineration — is the second largest sectoral source of dioxin contamination in Canada, accounting for 16% of total emissions as well as an important source of mercury pollution, contributing about 2% of total atmospheric emissions and 20% of all the mercury emissions from incineration.

Jameton and Pierce (2001) note that in addition to the direct "downstream" impact of health care on the environment caused by the various wastes that leave the system, there are indirect "upstream" effects. These upstream effects result from the environmental impacts of the use of natural resources needed to manufacture the huge quantities of a wide variety of products, from bricks and mortar to pharmaceuticals, used in the delivery of health care, as well as the environmental impacts of those manufacturing processes themselves.

It seems ironic that a system that is a potent symbol of health in the community, one that frequently includes in its mission statement the promotion of the health of the community, should at the same time be a source of both local and global environmental harm, especially when one considers that there are adverse effects on human health arising from these impacts. Yet until recently, the contribution of the health care system to environmental damage seems to have received relatively little attention, and even today it does not appear to loom large on the agenda of the health care system.

One thing that sets the health sector apart from many other sectors of the economy, however, is that it has an explicit ethical duty to do no harm. This concept — *primum non nocere* — is embodied in the Hippocratic Oath; doing no harm to human health is a fundamental value for health care providers and thus for the health care system. Yet, inevitably, the scale and scope of the health care system's environmental impact means that it has a significant — although inadvertent — adverse impact on human health both locally and, through its contribution to global environmental change, at a global level.

It is thus no exaggeration to state that the health care system has an overriding ethical duty to take steps to reduce its environmental and human health impact.

In the past few years, however, there has been a growing recognition in Europe, the United States, and now in Canada, that health care's environmental impact must be reduced. As described below, this awareness has led to the creation of the Canadian Coalition for Green Health Care. This issue is also recognized in Health Canada's recent Sustainable Development Strategy (2000), tabled in the House of Commons in December 2000, which notes that Health Canada is "committed to fostering the environmental ... sustainability of the Canadian health care system".

Hospitals should be environmentally-responsible corporate citizens not only because they are "perceived as cornerstones of health in a community", as Cambridge Memorial Hospital (a leader in this area and the first hospital in Canada to be ISO 14001 Certified) puts it, but — as they also point out — because "failure to effectively manage its environmental impacts could result in the potential of exposure to liability and regulatory penalties, and a decline of community, creditor and insurer confidence".

Another reason for reducing environmental impacts is that it will reduce costs, freeing up money for patient care. For example, the University of Alberta Hospital worked to reduce its energy its energy consumption through a range of programs from staff education through simple technical changes to major overhauls and upgrading of its systems. In the five year period

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1991/2-1996/7 the hospital reduced its electricity consumption by 16 percent, its use of steam by 12 percent and its water use and sewer output by 42 percent. This translated into savings of more than $1 million annually (Office of Energy Efficiency, 1998). Similarly, the Hospital for Sick Children in Toronto addressed waste management in a comprehensive manner with the result that between 1992/3 and 2000/1 it has reduced its biomedical waste by 80 percent, its waste going to landfill by 6.7 percent (despite filling 650,000 square feet of new space) and has reduced the cost of waste management from $560,000 to $107,097. (O'Grady, 2001, personal communication).

Thus there is ample justification in broad ethical and symbolic terms, in Federal policy and in simple, pragmatic economic and legal terms, to take action to reduce the environmental — and thus health — impact of the health care system.

This report describes the environmental and health impact of health care and ways in which that impact can be reduced; identifies many of the most important existing activities directed at "greening" health care at the local, provincial, national and international levels; and identifies opportunities for action to reduce the environmental impact of Canada's health care system. But it begins with a brief review of previous and recent national-level efforts to reduce health care's environmental and health impact.

1.1 A Brief History

Interest in the environmentally-responsible management of health care systems is not new. As a result of the energy crisis in the early 1970s, a National Taskforce on Energy Management in Health Care Facilities was established in 1979 and remained active until at least the mid-1990's (Task Force ... 1984, 1987, 1990).

A second wave of interest in environmentally-responsible health care was occasioned by the Brundtland Report, *Our Common Future* (WCED, 1987) and the subsequent UN Conference on Environment and Development in 1992. Thus for example the Canadian Medical Association commissioned a report on the role of the medical profession with respect to the environment and sustainable development (CMA 1991), while in 1995 the CNA and the CMA produced a joint policy statement on environmentally-responsible activity in the health sector (see Appendix 1).

A third wave of interest arose out of concern with the safe disposal of infectious and hazardous medical waste, particularly in the context of the AIDS epidemic. Federal/provincial work groups worked over the course of several years to develop national standards for the safe handling and disposal of medical wastes. A by-product of this issue was a growing concern that the incineration of medical waste, particularly in inadequate hospital waste incinerators, represented a threat to the local community as a result of the production of dioxin and other air pollutants. This concern was heightened by the recognition that in Ontario alone there were some 50 hospital incinerators and that a number of these, those built prior to 1986, had been specifically exempted from air quality control measures (Environmental Commissioner of Ontario, 1998).

A fourth wave of concern, also associated with the Brundtland Report and the growing concern with sustainable development, was the emergence in the early 1990s of the Health Care Environment Network in the Toronto region. It brought together members of the management teams of hospitals across Southern Ontario to address issues of waste reduction, environmentally-friendly purchasing, environmentally-responsible plant operations and so on. Much of the concern here was with reduction of the volume of solid waste, enhanced recycling and environmentally-friendly purchasing programs. The Network operated quite actively for a number of years but in the mid to late 1990s its activities tailed off.

In the mid-1990s, the Canadian Centre for Pollution Prevention worked with Karin Broadhurst to develop a manual and a series of workshops on pollution prevention for hospitals, while individual hospitals such as the Hospital for Sick Children and the Cambridge Memorial Hospital have developed important environmental management initiatives.

1.2 Current activities and some key resources

The current wave of interest in environmentally-responsible health care comes from the concurrent interest in several of these historical — but still current — issues. Some examples are given below; for a number of them, more detailed information can be found in text boxes later in this report and in section 3.12, while a more detailed description of three particularly useful resources are found in Boxes 1 – 3.

- the Canadian Centre for Pollution Prevention has identified the health care system as an important sector in terms of its contribution to pollution and has developed and is conducting a second series of pollution prevention workshops for the health care sector. (See Box #1 for more detail.) The Centre also hosts the Healthcare Environet website (*www.c2p2online.com*).

- the growing concern with global warming and the need to reduce greenhouse gas emissions has led Natural Resources Canada to establish an Energy Innovators program that includes a program directed at the health care sector through the Canadian College for Health Service Executives (*www.cchse.org*). See Box #10 for more detail.

- the US-based coalition Healthcare Without Harm has coalesced around concerns with both mercury contamination and also the role the health sector plays as a major source of dioxin and other toxic contaminants. In Canada, the Toronto Environment Alliance has become the Canadian 'arm' of Healthcare Without Harm and is working on these issues (*www.noharm.org*). See Box #2 for more detail.

- a growing recognition that the health care system is an important source of mercury contamination, principally through the incineration of medical wastes, has led Pollution Probe to work with the health care sector and the medical supply industry to reduce and eventually phase out the use of mercury (*www.pollutionprobe.org*).

- the ISO 14001 standard includes a requirement for environmental management systems and a few hospitals, as part of their commitment to continuous quality improvement and other well accepted aspects of good management, are beginning to commit themselves to acquiring and maintaining ISO 14001 certification.

- influenced by the same factors, the Canadian Council for Health Services Accreditation has recently strengthened the environmental management component of its accreditation process. (See Box #22 For more detail.)

- In the early 1990s, at a time of growing public interest in sustainable development, some private sector corporations began to address the issue of environmentally-responsible health care. Notable among these was Baxters, which at the time committed itself to being the most environmentally-responsible corporation in the health care sector and specifically committed itself to reducing both greenhouse gas emissions and CFC emissions.

- recognizing that physicians and the health care system as a whole must practice what they preach, the Canadian Association of Physicians for the Environment (*www.cape.ca*) has identified the greening of health care as one of its priority topics and is committed to mobilizing the medical profession, other health care professions and the health care system as a whole around the issue of environmentally-responsible health care.

There are also a number of other primarily US-based initiatives such as the Sustainable Hospitals Project at the University of Massachusetts at Lowell (See

www.sustainablehospitals.org and Box #3) and the Nightingale Institute for Health and the Environment, while in Queensland, Australia, the Ministry of Health established a Green Hospitals Award in 1992 (Gorey, 1994) which continued until 1997.

In addition to these national and international initiatives, there are some provincial-level initiatives, a sampling of which is given below, based on information provided by members of the Canadian Coalition for Green Health Care.

- In **Nova Scotia**, the Department of the Environment funded an environmental resource manual for the health care sector in 2000.
- In **Manitoba**, the Winnipeg Health Sciences Centre was a partner in establishing the Manitoba Green Procurement Network, with support from the provincial government's Sustainable Development Coordinating Unit. The chair of the Network is Jane Maslowski, Environmental Health and Safety Manager for the Winnipeg Regional Health Authority (204) 787-1466 or *jmaslowski@hsc.mb.ca*).
- In **Ontario**, the Ministry of Environment has been involved in three different initiatives:
  - the Pollution Prevention Pledge Program (P4) supports the voluntary adoption of pollution prevention throughout the province. About eight health care facilities — one of them being Cambridge Memorial Hospital — have been involved in the program
  - early work with Environment Canada and the Etobicoke General Hospital (now part of the William Osler Heath System) to develop a training program for staff in pollution prevention and EMS. The project began in 1996 but did not survive dramatic staff turnovers at the hospital in 1997/8.
  - MOE worked with Pollution Probe on their mercury reduction program and the MOU, which was signed with several hospitals. Unfortunately, it was not possible to engage the Ontario Hospital Association in a province-wide effort at that time.

Box 1 The Canadian Centre for Pollution Prevention (C2P2)

The Canadian Centre for Pollution Prevention **(C2P2)**, a recognized leader in pollution prevention, encourages actions that avoid or minimize the creation of pollutants to foster a healthier environment and sustainable society. Serving as a catalyst for change, C2P2 disseminates information so that others include pollution prevention in their decision-making and help businesses, governments and the public find solutions that result in pollution prevention action. Over the past five years, the C2P2 through the support of Environment Canada — Ontario Region has been actively promoting environmentally responsible health care.

In 1996, the Centre developed a Workshop and Resource Guide as an aid to hospital and health care employees to help minimize the negative impact of their normal activities upon the environment. The Guide was used at pollution prevention workshops designed and presented to over 100 health care professionals from 80 health centres at workshops in six locations across Ontario.

Continued

Box 1, continued

With renewed interest in greening health care and new environmental challenges faced by health care institutions, the training workshops have been updated and were offered in Toronto and London in mid-February and Sudbury and Thunder Bay in early March 2001. The Guide was also updated to reflect the evolution of environmental management and pollution prevention in health care facilities.

The Centre has recently updated the Healthcare EnviroNet website (*www.c2p2online.com*) the purpose of which is "to provide the health care community with access to environmental information, products, and services that support a commitment to quality health care, protection of the environment, and sustainability". Healthcare EnviroNet delivers a unique collection of Canadian-based information including:

- Green alternatives for health care facilities
- Regulatory updates and government initiatives
- Canadian case studies

Box 2 Health Care Without Harm/Toronto Environmental Alliance

Health Care Without Harm is a broad-based international campaign to reform the environmental practices of the health care industry. In Canada, the **Toronto Environmental Alliance (TEA)** has taken on the responsibility of organising this initiative. Its principal goals are:

- to eliminate the non-essential incineration of medical waste and to promote safe materials use and treatment practices
- to phase out the use of PVC plastics and persistent toxic chemicals in health care and to build momentum for a broader PVC phase-out campaign
- to phase out the use of mercury in all aspects of the health care industry
- to develop health-based standards for medical waste management and to recognize and implement the public's right to know about the chemical use in the health care industry
- to develop just siting and transportation guidelines that conform to the principles of environmental justice: no communities should be poisoned by medical waste treatment and disposal.

As is clear from its goals, Health Care Without Harm is focused on the prevention of pollution and the management and disposal of toxic materials that result from the operation of the health care system. For further information visit the website at *www.noharm.org*.

Box 3 The Sustainable Hospitals Project

The Sustainable Hospitals Project (SHP) provides technical support to the healthcare industry for selecting products and work practices that eliminate or reduce occupational and environmental hazards, maintain quality patient care, and contain costs.

SHP is a project of The Lowell Center for Sustainable Production. The Center draws on the resources and expertise of the University of Massachusetts Lowell, including the Toxics Use Reduction Institute (TURI)and the Department of Work Environment.

Key components of the project include:

- **Sustainable Hospitals Clearinghouse** (*www.sustainablehospitals.org*)

  The Sustainable Hospitals Project has established this web site with online information about safe needle devices and alternatives to products containing mercury, latex, polyvinyl chloride (PVC) and other potentially harmful materials. Here you will find alternative product lists and vendor information, as well as key user considerations for the products. The web site also includes information on effective strategies for implementing product changes. Because the web site is a work in progress, users are urged to provide constructive criticism, to share their experiences with products and practices, and to identify information that would make the web site more useful.

  To complement the web site, the Clearinghouse staff researches alternative products and practices, and provides technical support to health care professionals.

  For assistance, you may contact the Clearinghouse staff at 978-934-3386.

- **Technical Research and Resource Development**

  The Sustainable Hospitals Project staff works within the University with faculty, professional staff, and students to design and undertake research projects related to occupational health and pollution prevention in the health care setting. Resources in Plastics Engineering, Work Environment, and Nursing and Medical Technologies support and complement the SHP's mission. Recent efforts include:

  - a recently-released report on DEHP toxicity identifying product alternatives to PVC, latex, and mercury
  - cost-benefit analysis on the use of alternatives in a hospital setting
  - implementing P2OSH teams in hospitals
  - developing criteria for selection of medical gloves
  - initiating an Environmentally Preferable Purchasing (EPP) network among New England Hospitals, in collaboration with Massachusetts Office of Technical Assistance (OTA) and Health Care Without Harm (HCWH).

The project also publishes a series of fact sheets addressing such issues as "10 Actions to Promote Environmentally Preferable Purchasing (EPP)"; "Alternatives to Products That Contain Mercury"; "Alternatives to Products That Contain PVC" and "Selecting Medical Gloves".

One important result of these and other recent developments has been the establishment in the fall of 2000 of the Canadian Coalition for Green Health Care.

1.2.1 Health Canada's role

At the federal level, amendments to the Auditor General Act in 1995 established the position of Commissioner of Sustainable Development and required all federal departments to prepare sustainable development strategies and table these strategies in the House of Commons. Health Canada's second sustainable development strategy "Sustaining Our Health", covering the period April 2001 to March 2004, was tabled in December 2000. The strategy contains numerous references to reducing the environmental impact of health care and "greening" the health care system.

The strategy states that Health Canada is "committed to fostering the environmental ... sustainability of the Canadian health care system" and is interested in "opportunities to examine the greening of the current system", as well as "finding, examining and adopting technologies that bring increased health benefits to all Canadians and that contribute to sustainable development" (pages 10 – 11). Indeed, a short-term target under objective 1.5 (Health Canada's commitment to strengthen partnerships on health, environment and sustainable development) is to

"encourage and augment initiatives for 'greening' at least three aspects of the health care system, in collaboration with the provincial and territorial governments, by the end of March 2004".

The strategy also commits Health Canada to addressing its own environmental impact , specifically through adopting a pollution prevention approach, meeting or exceeding applicable federal environmental statutes and regulations, emulating best practices from the public and the private sectors, and developing and implementing environmental management systems (p 16). While these approaches are clearly intended for the Department's own facilities, including hospitals and other health care facilities, they can and should also apply to Canada's health care system as a whole.

Importantly, as a result of its commitment to the greening of health care, Health Canada's Office on Sustainable Development has provided support to the Canadian Coalition for Green Health Care, through several of the Coalition's member organizations, for projects that include both this report, and an accompanying compilation of case studies of environmentally-responsible health care.

2 Health Care's Environmental and Health Impact

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2. Health Care's Environ-omental and Health Impact

Because the health care system has an ethical duty to do no harm to health, it is important to understand the actual and potential adverse health impacts of the health care system on the health of the population. (That the health care system has positive impacts on the health of the population is taken as a given, in that this is the stated and intended purpose of providing health care.)

The focus here is solely upon the environmentally-mediated health impacts of health care and on ways to reduce this impact. This requires both an environmental impact assessment of health care and, as part of and subsequent to that, a (human) health impact assessment of that environmental impact.[1] Health impact assessment "is a combination of procedures, methods and tools by which a policy, program or project may be judged as to its potential effects on the health of a population, and the distribution of those effects within the population" (WHO Europe, 1999).

The health care system contributes to environmental harm through its use of resources and its production of wastes. One way to categorize these impacts was proposed by Hancock and Davies (1997) in a paper prepared under the auspices of the Royal Society of Canada for Environment Canada, as part of its contribution to the "Rio + 5 Conference". They suggested four broad categories of environmental impact that have human health affects:

- pollution and ecotoxicity
- resource depletion
- climate and atmospheric change
- reduced ecosystem health.

This framework will be used to describe the principal ways in which the health care system contributes to environmental damage and thus may harm human health. Wherever possible, examples and data will be provided. However, it is important to point out at this stage that there has never been an assessment of the environmental and health impact of Canada's health care system as a whole, nor of its components. Addressing this gap in knowledge is one of the first priorities that must be addressed.

In addition to this analytic approach, there are at least two more integrative analytic frameworks that can be applied to the issue of health care's environmental impact, and these are briefly summarized below.

- The EIOLCA (Economic Input-Output Life Cycle Assessment) model, developed for the US economy at Carnegie Mellon University, provides a means of assessing the resource utilization and waste production of various sectors of the US economy, including the health sector. The impact is assessed in terms of a given level of economic activity of the sector (e.g., per $1 million). (Go to www.eiloca.net for the detailed working model.)
- The ecological footprint, a concept developed by Wackernagel and Rees (1996) provides an integrative method for assessing the overall impact of an activity, facility, community or nation in terms of the amount of land required to produce the resources that are consumed or absorb the wastes that are produced (See Box # 4). While the methodology has been applied to a wide variety of activities and a wide selection of facilities, it has not yet been applied to a hospital or other health care facility (Rees, personal communication, 2001), although the Canadian Association of Physicians for the Environment (CAPE), through one of its members, has recently undertaken a project with the Lions Gate Hospital in North Vancouver to do this (see Box # 5).

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[1] It should be recognized that this health impact assessment does not represent the total sum of the adverse health effects of health care, which would require an examination of clinical, social and cultural iatrogenesis (Illich, 1977). A recent partial assessment of this impact can be found in the report of the US Institute of Medicine (2000), To Err Is Human, which reviewed the health impacts of medical error in the United States.

Adapting the EIOLCA or other suitable assessment method to the Canadian health care system and economy, and/or calculating the ecological footprint of health care facilities or activities in Canada are important ways of both contributing to an assessment of the environmental and health impacts of the Canadian health care system and raising awareness among health care providers and administrators of that impact.

Box 4 The Ecological Footprint

The Ecological Footprint concept has been designed to assess the human impact on nature. This is done by measuring how much nature we use to sustain our lifestyle. Ecological footprint calculations are based on two simple facts: first, we can keep track of most of the resources we consume and many of the wastes we generate; secondly, most of these resource and waste flows can be converted to a corresponding biologically productive area. Thus, the Ecological Footprint of any defined population (from a single individual to a whole city or country) is the area of biologically productive land and water area occupied exclusively to produce the resources consumed and to assimilate the wastes generated by that population, using prevailing technology. As people use resources from all over the world and affect far away places with their wastes, footprints sum up these ecological areas wherever that land and water may be located on the planet.

Our impact…

Based on 1996 data (World Wide Fund for Nature, 2000), the average Canadian requires 7.66 hectares (or 17 acres — roughly 17 football fields) of biologically productive land to provide their current level of consumption. However, in comparison, the average American lives on a footprint of 12.22 hectares, about 60 percent larger, while the average Western European requires 6.28 hectares. Since optimistic yield figures are used in the calculations and not all uses of nature are included, these figures underestimate the biologically productive areas truly necessary to sustain these people. The average global footprint is 2.85 hectares, while it is 1.33 hectares in Africa ad 1.78 hectares in Asia and the Pacific.

… compared to the available eco-capacity

Dividing all the biologically productive land and sea on this planet by the number of people inhabiting it results in a statistical average of 2.18 hectares per person. This is only between a quarter to a third of what is necessary to accommodate the footprint of an average Canadian, and not even enough for the global average footprint.

However, the human species shares this planet with perhaps 30 million other species. Most of them are excluded from the spaces occupied so intensively by human activities. How much of the bio-productive area should we leave relatively untouched for these other species? Few people believe that we should leave them less than one-third of the eco-capacity. But even if we follow the ecologically insufficient suggestion by the authors of the Brundtland Report (World Commission on Environment and Development, 1987) to protect 12 percent of the biologically productive space for them, humanity's footprint exceeds the eco-capacity of the biosphere by more than 30 percent. In other words, humanity consumes more than what nature can regenerate and is eating up the globe's natural capital stock.

(Adapted in part from the Redefining Progress website — www.rprogress.org/programs/sustainability/ef/

Box 5 A Premiliminary Assessment of a Hospital's Footprint

The very first determination of the ecological footprint of a hospital has recently been conducted by Dr. Susan Germain, a member of CAPE, for a hospital in Vancouver. She found that the ecological footprint of this facility, with an average daily in-patient count of 591 patients, of whom approximately 280 were extended care residents, was 2,841 hectares, or 4.81 hectares per patient per year. This compares to the average Canadian ecological footprint of 7.66 hectares per person. Given the area of the hospital site (3.95 hectares) the hospital's ecological footprint is more than 700 times its actual size. This compares to the ecological footprint of the City of Vancouver, which is approximately 180 times that of its "political area".

Some astounding numbers emerge from this study. Among them:

- the energy component of the hospital's footprint was about 88 percent, which is considerably greater than the approximately 50 percent share that energy has for the overall footprint for the developed nations. Given that the generating source for electricity in BC is 90 percent hydro-electric and 10 percent natural gas, this is a conservative estimate. If all the electricity had been generated from coal, the energy footprint would have been roughly double what it was, while if it had all been generated from natural gas the energy footprint would have been approximately two-thirds greater. Thus in provinces where coal and gas are more important fuels for electricity generation, the ecological footprint of the hospital would be much greater, perhaps half as much again, depending on the energy mix.
- in this one hospital alone, in excess of 1.75 million pairs of gloves were used in the course of one year, or 8.2 pairs per patient per day (98 percent of them were non-sterile gloves for patient care).
- more than 135,000 adult disposable diapers and more than 31,000 disposable incontinence pads were used.
- it was estimated that almost 220 tonnes of paper was brought into the hospital, of which 97 tonnes of paper and 67 tonnes of cardboard were recycled.
- the ecological footprint method is unable to estimate the adverse environmental impact of toxic chemicals, including not only dioxins and other contaminants from incineration but such items as the 13,000 litres of Phenokil that are used annually in the hospital.
- this study also found that there are some major problems in even obtaining the data needed to undertake an ecological footprint — or any other form of environmental accounting. In part this is due to the refusal of companies to provide information on the composition of their products (in terms of plastic, paper, metal, etc.) and in part due to the fact that, like most companies, hospital records and accounting systems are set up to record economic costs but not "natural capital", or the actual resources used.
- the calculated ecological footprint is very conservative, since it does not include a number of items. Among items not included were
  - food
  - building maintenance (a not insignificant component for which readily available data was not easy to obtain)

Continued

2 Health Care's Environmental and Health Impact

Box 5, continued

- the environmental impact of toxic and other chemicals.

This fascinating and important study provides an initial look at the environmental impact of health care in Canada. While there are problems with both the method and the availability of data, a start has been made in the vitally important process of understanding health care's environmental impact. It is to be hoped that others will be inspired by this project to enquire further into this vitally important and quite fascinating issue.

(*Source: Unpublished thesis, Capilano College, BC. It is hoped that an edited version of the study will be published soon in a leading health management journal and that the full report will be made available on the Coalition's website — www.greenhealthcare.ca*)

2.1 Pollution and ecotoxicity

The health care system produces a large volume of a wide variety of wastes, ranging from the relatively benign (glass, cardboard, food wastes, etc.) to the highly dangerous (persistent organic pollutants, heavy metals, radio-active materials, cytotoxic drugs). The main categories of health care wastes include:

1. clean general waste
2. recyclables
3. biomedical waste
4. chemical and liquid waste
5. radioactive waste
6. pharmaceutical waste
7. miscellaneous wastes

(Canadian Centre for Pollution Prevention... 1996).

In this section solid, liquid and gaseous wastes are first considered in general terms, following which specific wastes of concern are described.

2.1.1 Solid waste

Health Care Without Harm, an alliance of North American health, environmental and other groups, reported that the volume of waste produced by hospitals in the US per bed had more than doubled since 1955. It was estimated that hospitals produced 7 kg of waste per bed per day in the US, due primarily to increased use of plastics and disposables, unnecessary red-bag disposal, inefficient waste management and lack of waste storage space in hospitals, and excessive use of disposables. (*Health Care Without Harm*, 1998)

Most of this solid waste can go to landfill. However, Health Care Without Harm (1998) points out that in the USA anywhere from 75-100 percent of this medical waste is incinerated, but that in practice only 10-15 percent of hospital waste is infectious, while only 1-2 percent of medical waste actually needs incineration to protect the health of the public. [2]

According to a fact sheet produced by the Toronto Environmental Alliance (2000)

- Ontario MOE estimates that Ontario hospitals produce 150,000 tonnes of solid waste annually, of which 10 percent (15,000 tonnes) was handled as biomedical waste
- a 1993 MOE evaluation of this biomedical waste found that 39 percent of it required no special handling as it consists of ordinary solid waste
- this same study found that only 2 percent of biomedical waste is pathogenic (red bag) and needs to be incinerated

- infectious (yellow bag) waste requires only sterilization in an autoclave before being disposed of in a sanitary landfill
- a 1998 study for the Canadian Institute for Environmental Law and Policy found that approximately 60 percent of Ontario's biomedical waste was exported for disposal in the US (Ohio, Michigan, Vermont).

A waste audit conducted by the Hospital for Sick Children in Toronto identified 8,890 separate products in their waste stream, 20 of which comprised 80 percent of hospital waste. Moreover, the audit found that 80 percent of the biomedical waste stream — which was being incinerated in the hospital's on-site incinerator, together with corrugated cardboard and solid waste — consisted of items such as paper, cans, bottles and packaging, none of which belonged there. (Source: www.cciw.ca/green-lane/success-stories/on/ valerie.html)

A 1992 study examined the composition of surgical waste in a tertiary teaching hospital in Michigan (Tieszen and Gruenberg, 1992). The study examined the waste from five different sorts of surgical procedures, namely operations on the vessels, valves or septa of the heart; on the spinal canal, including spinal fusion; hernia repair; abdominal operations; and operations on the joints, including joint replacement and ligament repair. A total of 274.7 kilograms of surgical waste arising from 27 cases was examined and the composition was as follows:

39 percent	disposable linens
26 percent	plastic
7 percent	paper
27 percent	miscellaneous waste

Thus disposable linen, paper and recyclable plastic accounted for 73 percent by weight and 93 percent by volume of the total surgical waste. When extrapolated to a national level for the USA, it was estimated that these five types of procedure alone would generate annually 23 million kilograms of waste occupying approximately 400,000 cubic metres of space. The authors estimated that by using reusable linen products and engaging in currently available and feasible recycling methods, the weight of surgical waste nationally could be substantially reduced.

There is clearly considerable potential for solid waste reduction through recycling, composting and other means, as discussed later.

Box 6 Solid Waste Composition

Based on an audit of the Ottawa General Hospital conducted by Ortech International in 1990, of the 5.5 kg/bed/day of waste that is produced, the composition is:

45 percent	paper	5 percent	miscellaneous
17 percent	food	3 percent	glass
14 percent	plastic	3 percent	wood
6 percent	liquids	2 percent	metal
5 percent	biomedical		

[2] *As pointed out later, medical waste incinerators are important sources of both dioxins and furans (potent human carcinogens) and mercury, an important neurotoxin, as well as the more common air pollutants such as acid emissions and particulates. Both the environmental and the health impacts of these emissions are of concern.*

2.1.2 Liquid effluents

Like all large facilities, hospitals discharge large volumes of liquid wastes to the sanitary sewers. And like many industrial facilities, hospitals use a wide variety of toxic materials, some of which have to be collected and disposed of as hazardous waste and some of which are discharged in waste water effluents. One of the largest potential sources for such contaminants in effluents are hospital laboratories, although other sources include disinfectants and sterilants used by the housekeeping department and others. Among the principal pollutants of concern that may be in waste water are the following:

- cyanide
- phenolic compounds
- mercury
- chromic acid
- solvents

(Canadian Centre for Pollution Prevention… 1996).

The safe use and disposal of these products and wastes is an issue of great importance, and moreover one that in many cases is subject to municipal, provincial or federal regulation.

2.1.3 Air emissions

The health care system is a source of a wide variety of air pollutants. Many of these are either directly or indirectly attributable to fossil fuel combustion used for space heating, steam generation and hot water supply, electrical supply, transportation and other purposes. As significant parts of local economies and users of energy on a local or regional scale, hospitals and other components of the health care system contribute their share to urban air pollutants including:

- sulphur oxides, nitrogen oxides, particulate matter and — as a result of the action of nitrogen oxides and VOCs in the presence of sunlight and heat — ground level ozone. All of these pollutants have both environmental and significant public health impacts (Ontario Medical Association, 2000). An overview of the health effects of these forms of air pollution is provided in section 2.3.3.
- Fossil fuel combustion is also the principal source of the main greenhouse gas, carbon dioxide. It is estimated that Canada's health care system contributes 2.1 percent of total Canadian greenhouse gas emissions (Canadian Public Health Association, 2001), and thus contributes to the environmental and human health impacts of global warming, as discussed later.

In addition to fossil fuel-related air emissions, hospitals also contribute to key toxic air emissions such as dioxins, furans, mercury and other contaminants as a result of incineration of medical wastes, whether on site or at a more remote, centralized facility. (See section 2.1.5 for a discussion of dioxin and mercury pollution.)

Finally, hospitals are a source of a wide variety of other, fugitive air emissions as a result of their daily operations. These include VOCs (which are ozone precursors), pesticides and a wide variety of other substances. Some of these are generated within the hospitals' walls, contributing to indoor air pollution, as discussed below.

2.1.4 Indoor air pollution

There are several reasons why hospitals in particular should have high indoor air quality, including the fact that "a hospital cannot be a 'sick building' and still be a hospital" (Small, 2001). Thus hospitals should have high indoor quality both for their patients and for staff, particularly since patient health and safety is dependent at least in part upon the level of functioning of staff, which can be impaired by poor indoor quality. Unfortunately, one important strategy that hospitals in Canada undertook in the 1980's to increase their energy efficiency, in common with many other businesses and institutions, was to seal their buildings more tightly. However, this contributed to a worsening of indoor air quality. In one

particularly notorious case (Camp Hill Hospital in Halifax, Nova Scotia) a new wing of a hospital had to be closed and renovated because the poor air quality was making staff sick. (Indeed, this experience led to the establishment of the first Centre for Environmental Medicine in Canada, to investigate and treat people with environmental hypersensitivity.)

With respect to the health effects of indoor air pollution, Lowan (in Pollution Probe, 1998) suggested that there are two categories of problem:

- "building-related illness — occurs when a known cause and effect relationship occurs such as Legionnaires disease, carbon monoxide, tuberculosis or lead poisoning
- sick building syndrome — occurs when building-related symptoms are present but the cause is not known. The vast majority of environmentally-related effects fall under this category."

2.1.5 *POPs, heavy metals and pesticides*

It is a sad irony that hospitals have been identified as significant sources of both dioxins (see Box #7) and mercury (see Box #8), as well as other pollutants. Dioxin is the most potent human carcinogen we know. One important source is the incineration of hospital wastes that includes PVC and other plastics. The high chlorine content of PVC (up to 50 percent by weight) makes it an important factor in the generation of dioxins and other polychlorinated organic compounds, in situations where incineration occurs at lower temperatures, as is the case in older incinerators. (PVC is also a concern because of the use of DEHP, a plasticiser, in IV bags and tubing — see section 3.2.)

Hospitals are also a source of a number of potentially toxic heavy metals, including lead, cadmium and in particular mercury, which is a neuro-toxicant that is widely used in hospitals, from where it escapes into the wider environment. Clearly, hospitals should not be sources of environmental pollution that threatens human and ecosystem health. Fortunately, there is growing awareness of this issue and organizations such as Healthcare Without Harm have sprung up to address it. Alternative products that do not contribute to such pollution are available, as are alternative means of waste management and disposal.

In addition to these unintended toxic products, hospitals often also use a number of different pesticides. In a section on pest control, the Citizens Environmental Coalition (2000) noted that a study of pest management in New York State Hospitals by the State Attorney General's Environmental Protection Bureau found that 98 percent of hospitals use pesticides.

According to data from the Health Care Health and Safety Association of Ontario, 1.5 percent of all claims for the hospital sector in Ontario was attributed to chemicals (personal communication, March 2001). For the period between January 1996 and August 31st, 2000, a total of 336 claims in the health care sector as a whole were attributed to chemicals. However, there is no category for "sick building syndrome" or poor indoor air quality so it is hard to know to what extent this may be a problem.

Box 7 Dioxin

Dioxins are among the most toxic compounds in the environment and have been recognized by the US EPA as a human carcinogen. Dioxins are a class of 75 polychlorinated dibenzodioxins, seven of which are

Continued

Box 7, continued

highly toxic (including 2,3,7,8 TCDD, possibly the most carcinogenic chemical known, which is the reference compound). In addition to their carcinogenic potential, they have been associated at average (background levels) with effects on learning ability, thyroid and liver functions and increased susceptibility to infection in children, as well as adverse affects on metabolism and developmental and/or reproductive biology. At above average levels of exposure, they have been linked to cardiovascular disease, hypertension, miscarriage and infant death, birth defects, low birth weight, growth retardation and cancer. Dioxin is one of the 'dirty dozen' persistent organic pollutants identified by the UN Environment Program and is included in the recently completed International POPs Elimination Treaty. Human exposure is almost entirely through the food chain, since dioxins are fat soluble. The tolerable daily intake (TDI) for dioxin (measured as TEQs, equivalent dose to 2,3,7,8 TCDD) proposed by the World Health Organization and the EPA is 1-4 pg/kg bw/day, while Health Canada has a TDI of 10 pg/kg bw/day. Average daily intake for Canadian adults is approximately 1 pg/kg bw, while for Great Lakes sport fish eaters it is 4.65 pg/kg bw. However, Health Canada estimates that the average daily intake for breast-fed children is 57.05 pg/kg bw, well in excess of both Canadian and international TDIs and almost 60 times greater than adult exposure. (Source: *Dioxin Fact Sheet*, Toronto Environmental Alliance, June 2000).

Environment Canada estimated that in 1999 atmospheric dioxin emissions were 156 gTEQ, with waste incineration contributing 63 percent of the total. While almost half the dioxin emissions result from conical wood burners in Newfoundland and municipal waste incineration, medical waste incineration is the second largest sectoral source, contributing 16 percent of total atmospheric dioxin emissions in Canada in 1999, in excess of the contribution from steel manufacturing, residential fuel combustion, diesel fuel, or pulp and paper industry air emissions. (Environment Canada, 2000)

Concern about these dioxin emissions has prompted the Canadian Council of Ministers of the Environment to propose, under the Canada-Wide Standards process, new emissions standards for medical waste incinerators that will apply from 2006. *(www.ccme.ca/pdfs/com_meetings_04_01_e/d_and_f_standard_e.pdf)*

Box 8 Mercury

Mercury is a persistent neuro-toxin that accumulates in aquatic food chains after coÏon by natural processes to methylmercury. Biomagnification through the food chain can result in top predator fish having levels of methylmercury one million times the levels found in the water. Human consumption of these fish presents a threat to human health, and as a consequence mercury contamination is the principal cause of fish consumption advisories in North America, and accounts for 99 percent of all advisories for inland lakes in Ontario. (Pollution Probe Information Sheet on "Mercury in the Health Care Sector", undated).

Mercury is found in a wide variety of medical products including dental amalgam, oesophageal dilators, thermometers, sphygmomanometers, chemicals used in

Continued

Box 8, continued

the laboratory, particularly as histology fixatives and stains, in antiseptics and preservatives as well as in batteries (Environment Canada, Ontario Region, "Mercury Reduction in the Health Care Sector" Fact Sheet).

In the USA, it is estimated that medical waste incineration is the source of approximately 10 percent of all mercury air emissions. In Canada, the Canadian Council of Ministers of the Environment (2000) estimated that national atmospheric mercury emissions for the year 2000 amounted to 12 T/yr, with 2.8 T/yr from base metal smelting, 1.2 T/yr from waste incineration and 1.5 T/yr from coal-fired electricity generation. Of the 1.2 T/yr coming from waste incineration, an estimated 250 kg/yr comes from medical waste incinerators. Thus medical waste incineration is the source of 2% of total atmospheric emissions of mercury and contributes more than one-fifth of emissions from incineration. In addition, mercury thermometers used by the public and organizations in all sorts of ways may contribute as much as 1,850 kg of mercury annually (Pollution Probe Information Sheet on "Mercury in the Health Care Sector", undated).

2.1.6 *Pharmaceuticals*

Pharmaceutical wastes may end up in the solid or liquid waste stream, either because they are placed there on purpose or through secretion in urine or faeces. Among the most toxic are cytotoxic drugs, which have to be treated as biomedical waste. Heavy metals such as selenium (from shampoos), zinc (from ointments) and barium (from radiological imaging) may present a problem to water treatment plants. (Canadian Centre for Pollution Prevention... 1996)

While these concerns have long been recognized, recent concern has begun to focus on the more subtle impacts of pharmaceuticals and personal care products in the environment. A review by Daughton and Ternes (1999) notes that these products, which include both human and veterinary prescription drugs, diagnostic agents, fragrances, sun screen agents and others "can continually be introduced to the aquatic environment as complex mixtures via a number of routes, but primarily by both untreated and treated sewage". Because they are introduced on a continual basis, their lack of persistence in the environment does not negate their impact. The principal concern is with subtle, population-wide effects that accumulate slowly over time. However, they note that very little is known about the effects of these products on aquatic or terrestrial life, although we do know that "these substances have the potential to be profoundly bioactive through a constellation of different modes of action." Among the pharmaceuticals of concern are antibiotics, antidepressants, hormones and many other drugs which may have subtle effects on behaviour, reproductive and developmental outcomes in a range of aquatic organisms including "organisms from lower trophic levels whose presence is critical to community homeostasis". They note a German study that looked only at aspirin, paracetamol, clofribric acid (a blood lipid regulator) and methotrexate: "unmetabolized, the loading of these drugs into bodies of water in Germany could be hundreds of tonnes per year."

2.1.7 *Radioactive materials*

Hospitals use a variety of radioactive materials in both diagnostic and therapeutic activities. The safe use and disposal of these materials is subject to Federal regulation; a "green" health care strategy would seek to minimize the need for such materials in the first place.

2 Health Care's Environmental and Health Impact

2.2 Resource use

Hospitals consume significant amounts of energy (especially fossil fuels) as well as fibre (paper, fabrics, wood), metals and minerals, plastics, food, water and other resources, as the discussion of the hospital waste stream makes clear. Particular attention is paid to energy use and to the potential environmental and health benefits of energy conservation.

2.2.1 Energy use

"Health care facilities are important energy users in the Canadian economy. *Hospitals alone use more energy per unit building area than any other type of building in the commercial or institutional building sectors. Only energy use in industrial buildings is greater than the intensity of energy use in hospitals." (Taskforce on Energy Management... 1984)*

Energy use is particularly highlighted because it comprises roughly half of the total ecological footprint of buildings (Wackernagel and Rees, 1996). The environmental and health impacts of energy use include not only direct effects such as local air pollution or the emission of carbon dioxide that contributes to global warming, but include the full environmental, occupational and community health impacts of prospecting for, extracting, transporting, refining, processing, producing and distributing all forms of energy, as well as the impacts of waste disposal and the decommissioning of energy plants (Romm and Ervin, 1996).

Of particular concern is the use of fossil fuels, since they contribute to such important environmental and health effects as global warming and air pollution. The health care system uses fossil fuels both directly and indirectly:

- direct fossil fuel combustion — space heating, steam generation, vehicle use, etc.
- indirect fossil fuel combustion — use of electrical energy from fossil fuel fired plants, fossil fuel used for off-site incineration, fossil fuel energy used in the production of the construction materials, products and services used by the health care system.

Energy use and conservation in hospitals in Canada received a good deal of attention in the 1980s, primarily in reaction to the increase in energy costs following the 1973 "oil shock". A Taskforce on Energy Management in Health Care Facilities in Canada was established in 1979 and continued to operate until around 1990. A 1984 Taskforce report found that 62 percent of the energy use in a typical general hospital was for heating, ventilation and air conditioning (HVAC), 13 percent for lighting, 13 percent for hot water, 6 percent for food service, 3 percent for sterilizers, 2 percent for medical equipment and 1 percent was miscellaneous. At the time the Taskforce was established, a typical hospital used 80-100 EKWH/sq ft/year, but the Taskforce reported in 1987 that it believed that hospitals should be able to operate at 35-50 EKWH/sq ft/year. However, Canadian hospitals remain energy inefficient in comparison with hospitals in other countries (see Box # 9).

Energy consumption in the commercial sector as a whole (office buildings, retail establishments, large apartment buildings, hotels, motels, restaurants, warehouses, recreational buildings, schools and hospitals) in 2020 will be 33 percent greater than in 1995, with energy efficiency initiatives reducing the growth by 21 percent (Natural Resources Canada, 1997). But while floor area in all types of commercial buildings in Canada is expected to increase by 60 percent between 1995 and 2030, floor area in "hospitals and other health-care facilities grows by 137 percent of 1995 levels, reflecting an anticipated increase in demand for health-care services" (David Suzuki Foundation, 2000). Clearly, the environmental and health impact of energy use in the health care sector will be disproportionately greater in the 21st century unless action is taken to reduce it.

2.2.1.1 The health benefits of energy conservation

While there is good evidence that a certain level of energy use is related to physical, mental and social well-being, there is also evidence that energy production and utilization has adverse health consequences (Romm and Ervin, 1996). The question is, at what point does further increase in energy use fail to have any significant beneficial effects on population health and may in fact begin to have adverse health effects that outweigh the benefits? Other countries (such as Sweden or Finland) have been able to attain high levels of health with substantially lower per capita energy use, even when their climates are similar to that of Canada. Moreover, there is evidence that, as in Canada, these countries have been able to improve their health (at least as measured by infant mortality and life expectancy) while actually reducing their per capita energy consumption. It therefore appears reasonable that there will be health benefits to energy conservation, and probable that those benefits will outweigh any of the health risks of energy conservation, particularly in high energy societies such as ours (Hancock, 1998).

Given that more than half of the ecological footprint of the built environment is attributable to energy use, the health implications of energy use and conservation are probably greater than the health implications of all the other aspects of sustainable building development put together. Energy is so integral to all aspects of the construction and operation of buildings, including hospitals and other health facilities, and the health impacts of energy use are so large and wide-spread that the benefits of conservation are similarly likely to be large and wide-spread. The health effects are both direct and indirect. The direct benefits (or costs) accrue to those who live in these more sustainable built environments, while the indirect benefits or costs accrue to those who work in or live near the energy production systems and to society — indeed, the global population — as a whole.

The health benefits of energy conservation in the wider society include reduced environmental, occupational and community health impacts from energy extraction, transportation, production and utilization, and the ultimate disposal of wastes. Moreover, there may be social benefits to energy conservation including employment generation and distribution. A third consideration has to do with intergenerational equity; energy conservation now preserves energy options — and therefore health options — for future generations.

- **Extraction and transportation** of fossil fuels (coal, oil and gas), uranium, biomass and other renewables, and of the materials needed for energy production and the construction of energy conversion plants has both direct health effects (principally on workers but also on the general public) and indirect health effects because of the impact of the activities on the environment. To the extent that energy conservation avoids the necessity for extraction, transportation and plant construction altogether, the impact will be reduced.

- The same is generally true of **energy production and utilization**. To the extent that emissions arising from production of electrical and other forms of energy are reduced or avoided altogether, the environment and human health are likely to benefit. The major emissions of concern are carbon dioxide and other greenhouse gases, acid emissions, heavy metals, toxic organics, particulate matter and other pollutants entering air, water, soil, food chains and, ultimately, humans. (See Sections 2.3.1 and 2.3.3 for a brief discussion of the health effects of some of these emissions.)

- There are also environmental and health impacts related to the **disposal** of energy-related wastes (especially fly-ash from coal-fired stations) and the ultimate **demolition** of power plants. The disposal of radioactive waste from nuclear plants and their eventual **decommissioning** remain major challenges yet to be resolved.

In addition to the potential environmental health benefits of energy conservation, there are a number of potentially beneficial social health impacts. Conservation strategies create more employment of a long-term nature, distribute that employment more equitably across the community and require lower levels of technical skills (Haites and Mauldin,1990). Given that unemployment is a major health hazard and that we will

need to create employment opportunities at the lower end of the skill level and throughout the community to complement the growth in highly skilled occupations of the information age, such energy options are potentially beneficial to health.

Finally, we have to be concerned about the health and well-being of future generations (inter-generational equity). To the extent that energy conservation does not deprive them of resources they will need for their own well-being, does not lower standard of living and quality of life to the extent that health is impaired, and in fact provides them with additional resources, options and opportunities, energy conservation is likely to be beneficial to the health and well-being — physical, mental and social — of future generations.

Box 9 An International Perspective on Energy Use in Hospitals

In international terms, the energy efficiency of Canadian hospitals is low, according to a report by the Centre for the Analysis and Dissemination of Demonstrated Energy Technologies (CADDET, 1997). Based in the Netherlands and working in collaboration with the OECD and the International Energy Agency, CADDET has looked at international experience with respect to energy use and energy efficiency in hospitals. In a comparison of electrical and thermal energy consumption for typical hospital stock in 9 countries, Canada stands out as having the highest average annual electrical consumption/m2 of gross floor area and the second highest average annual thermal energy consumption (see Figure 1). The report notes that

"The only exceptional value is for Canada, which has an electricity consumption almost 6 times higher than Switzerland and 2.5 times higher than the average".

Not only is electricity consumption high in Canada's hospitals, Canadian hospitals are also the second highest in terms of thermal energy consumption, approximately 4 times that of Sweden and almost twice the average of the 9 countries. The report suggests that these high values for Canadian hospitals may be due to the fact that they are "on average, smaller than those in the other countries", while "their high thermal energy consumption could be due to the climate". However, the report also points out that thermal energy consumption levels for Sweden and Switzerland are low, despite having cold climates.

2.2.2 Other resource use

As the data on waste stream components indicates (section 2.1.1) hospitals use large amounts of paper and plastics in particular, as well as glass, wood and metal. This results in part from a concern with infection control, so that a lot of single-use, disposable products are used. But the "disposable mentality", common elsewhere in society and perhaps heightened by the unique concerns about infection control in hospitals, may often extend well beyond the real need to a pattern of behaviour based on convenience or even perhaps on sheer habit. The extensive use of paper and plastics has implications for the sustainability of both a key renewable source (forests) and a key non-renewable resource (oil), not to mention the disposal costs.

The health effects of consumption of these and other resources is, like energy use, associated with the life cycle costs of their use, from initial extraction to final disposal. Whether the resource is renewable (forest products such as wood and paper, fresh water, natural fibres such as cotton, or all sorts of food) or non-renewable (plastics from oil, metals and minerals), there are both environmental impacts and related

health impacts arising from their utilization (Hancock and Davies, 1997). A broader concern is that the depletion of these resources may threaten the livelihood, health and wellbeing of populations remote from us geographically (forest dwellers, local fishermen in Asia, etc.) or remote from us in time (our descendants).

2.3 Climate and atmospheric change

Climate and atmospheric changes include both local changes in the atmosphere as a result of the combustion of fossil fuels and other activities that contribute to local air pollution and acid rain, and more global phenomena such as global warming and stratospheric ozone depletion. The key link between climate change and air pollution is the combustion of fossil fuels. Both climate change and air pollution have significant health effects and combatting one contributes to combatting the other — there are co-benefits (Last, Trouton and Pengelly, 1998).

2.3.1 Greenhouse gas emissions

One result of the energy intensity of the health care system, as already noted, is that the health sector contributes about 1/50th of Canada's total greenhouse gas emissions. In a report prepared for the David Suzuki Foundation (2000), Canadian energy efficiency expert Ralph Torrie looked at current and projected greenhouse gas emissions in 1995 and 2030. He noted that under a "business as usual" scenario, greenhouse gas emissions will increase from some 600 million tonnes per year in 1995 to 780 megatonnes in 2030, an increase of 30 percent. Moreover, as noted earlier, the share of emissions from the health care sector will be greater than this. Clearly, unless hospitals become a lot more energy efficient, their share of greenhouse gas emissions will increase at a greater rate than the country as a whole or the commercial and institutional building sector as a whole.

The environmental and health impacts of greenhouse gas emissions and global warming have been the topic of extensive research and discussion in recent years (Intergovernmental Panel on Climate Change, 1996; McMichael et al, 1996; Intergovernmental Panel on Climate Change, 2001; Canadian Public Health Association, 2001). The environmental impacts include the melting of glaciers and continental ice caps, increased sea level, major changes in wind and ocean currents, melting of permafrost, major shifts in natural and agricultural ecosystems and other massive changes.

The health impacts are both direct and indirect and will occur both in Canada and globally. Direct health impacts will include more deaths and disease from heat waves and from the worsening air pollution that is likely to accompany higher urban temperatures, as well as deaths and disease resulting from more severe weather events. These health effects will occur both in Canada and globally, although the major impacts will be global. Of particular concern is the potential for flooding and storm surges in low lying delta areas such as the Bay of Bengal, where millions may be affected.

The larger health impacts, nonetheless, are likely to be indirect. They include the wider dispersion (in terms of both latitude and altitude) of the insect vectors of a number of infectious diseases. Of particular concern is the anticipated increase in malaria world-wide as malaria mosquitos are able to migrate further north and south and higher in altitude. There is even a theoretical risk of the spread of malaria into southern Canada (southern Ontario was malarial in the 19th century) although there is greater concern for increased exposure to such conditions as the encephalitides, dengue fever and Lyme disease in Canada. Even more massive health impacts may result from the changes in natural and agricultural ecosystems (already underway in the Arctic), which may lead to the displacement of large populations around the world, with the attendant health effects of mass migration and refugee conditions.

2.3.2 Ozone-depleting substances

The principal concern here was the use of CFCs by hospitals in a variety of applications including as a carrier for ethylene oxide (banned since January 1st, 1996); in refrigerants (a large chiller can hold as much as 2 – 3 tons of CFCs); and in halon fire extinguishing equipment (essentially phased out except for their presence in existing extinguisher systems and their use in fighting fires).

However, CFCs are not the only ozone-depleting substances. Given the close links between ozone depletion, increased UV-B radiation and increased rates of skin cancer, cataracts and other health effects, (IPCC, 1996) the health care system has a particular responsibility to ensure that it avoids the release of *any* ozone-depleting substance.

2.3.3 Air pollution from fossil fuel combustion

As already noted (2.1.3) fossil fuel combustion results in air pollution, which has significant impacts on both mortality and morbidity. Through the use of fossil fuels, both directly and indirectly, the health care system contributes to air pollution and thus to death and disease in the community.

An important point to understand with respect to the health effects of air pollutants is reflected in the concept of the "health effects pyramid"; by and large, air pollution does not kill people so much as it makes them sick. Thus a recent report on the illness costs of air pollution in Ontario notes that for every death there are 5.1 hospital admissions, 6.8 emergency room visits and 24,128 minor illness days (Ontario Medical Association, 2000).

The reality of air pollution is that individuals are not exposed to single pollutants but to a chemical soup — one that is clearly visible above major cities on smoggy days. The health effects that result are thus the product of the total effects of all the pollutants together. Thus an examination of the effect of the ambient gaseous urban air pollution mix (ozone, nitrogen dioxide, carbon monoxide and sulphur dioxide) on daily mortality rates in 11 Canadian cities for a 12 year period, spanning 1980-1991 inclusive found that the average percentage increased risk of death attributable to changes in mean air pollution concentrations for all pollutants combined was 8.2% (Burnett, Cakmak and Brook, 1998)

At the provincial level, the Ontario Medical Association (2000) reported that "in the year 2000, approximately 1,900 premature deaths are forecast to occur in Ontario as a result of air pollution" with the number of premature deaths rising to 2,600 by 2015 if nothing is done to reduce air pollution. The OMA report also concluded that "the impact of ground-level ozone, acid aerosols and particulates on the health-care system is also negative"; for 2000, it was forecast that air pollution in Ontario would result in 9,800 hospital admissions, 13,000 emergency room visits and 47 million minor illness days.

While the health care system is clearly not the principal source of such health damaging air pollution, the fact that it contributes at all to this significant adverse health impact is a cause for concern.

2.4 Reduced biodiversity

Ultimately, our human, social and economic development depends upon the sustainability of the natural resource stocks (ecosystem goods) and the health of the ecosystems that provide "ecosystem services" (such as oxygen generation, UV radiation protection, climate stabilization, hydrological cycling, etc.) that make life on earth possible.

Unfortunately, the planet's ecosystems are under strain, as recent authoritative reports from the World Resources Institute (2000) and the World Wide Fund for Nature (2000) have illustrated. In its most recent biennial assessment of the world's resources, subtitled "The Fraying Web of Life", the World Resources Institute assessed the functioning of five key global ecosystems (agro-ecosystems, forest, fresh water, grass land and coastal ecosystems) in terms of their abilities to perform eight key functions (food and fibre production, water

quality, water quantity, biodiversity, carbon storage, recreation, shoreline protection, and woodfuel production). The report concludes that

> *"The current rate of decline in the long-term productive capacity of ecosystems could have devastating implications for human development and the welfare of all species."*

Similarly, the World Wide Fund for Nature, in its most recent assessment of what it calls the "Living Planet Index", states that the index has declined by 33 percent since 1970. The index is based on changes in the populations of typical species in three different ecosystems: forests (319 species populations), fresh water ecosystems (194 species populations), and marine ecosystems (212 species populations). The index for these three ecosystems has declined over the past 30 years by 12 percent, 50 percent and 35 percent respectively, while at the same time

> *"The ecological pressure of humanity on the Earth has increased by about 50 percent over the same period, and exceeds the biospheres regeneration rate." (World Wide Fund for Nature, 2000).*

The decline in ecosystem health is not attributable to any one factor, but rather to the combination of many of the issues discussed above. When climate change, air pollution, UV irradiation, ecotoxicity and food chain contamination, soil salinization, deforestation, river damming, destruction of wetlands, over-fishing and a myriad other factors work together, massive stress is placed upon ecosystems and the species they contain. Small wonder then that the web of life is fraying. The question, which is more than academic, is just how many strands of the web of life can we cut before we seriously impair the web of life as a whole? In the purported words of Chief Seattle a century or so ago, "We are all part of the web of life, and whatever we do to the web of life, we do to ourselves".

The extent to which the health care system itself contributes to declining ecosystem health, loss of habitat and extinction of species is difficult, if not impossible to assess. However, as a significant part of the national economy, the health care system undoubtedly contributes its share to this decline. To the extent that the health care system contributes at all, either directly or indirectly, to habitat destruction and all the other factors that contribute to impaired ecosystem health, it is contributing to the fraying of the web of life. Clearly, to contribute to the fraying of the web of life is to be in breach of the fundamental ethical duty to do no harm.

2.5 *Health impact — a partial summary*

As already noted, a full health impact assessment of the environmental damage resulting from health care's activities must await the assessment of the health care's system environmental impact. However, given that the health care system is about 10 percent of the Canadian economy, it is quite clear that the impact is unlikely to be negligible. Some of the ways in which the health care system may well contribute to mortality and morbidity, as noted above, include:

- respiratory and cardiovascular disease and premature death associated with air pollution
- potentially massive long-term health impacts resulting from global warming
- health effects resulting from the dispersion of dioxin, mercury and other contaminants, into the environment and the food chain
- increased incidence of skin cancer, cataracts and other health affects resulting from increased UV radiation as a result of ozone depletion
- health effects for staff and patients resulting from the use of pesticides and other toxic materials in the health care system
- health effects for staff and patients as a result of indoor air pollution, particularly those who are environmentally sensitive
- health effects — perhaps principally mental and social but also physical — resulting from the operation of landfills.

In addition to these relatively direct health effects that can be traced to the operation of the health care system, there are in addition all of the perhaps unquantifiable health effects that result from environmental pollution, depletion of natural resources and impairment of ecosystem health.

In the absence of evidence to the contrary, it is probably reasonable to suggest that the health care system, both directly through its activities and indirectly through its use of products and services, contributes about 10 percent of the ill health and premature mortality that results from the adverse environmental impact arising from the activities of the Canadian economy. In addition to its purely domestic impacts (to the extent that impacts can be separated into domestic and global, which is not likely very feasible, given that ecosystems cross boundaries) the Canadian health care system undoubtedly contributes to global health effects arising from the environmental impact of the global economy. This is a heavy burden of responsibility that the Canadian health care system — and health care systems throughout the world — must address.

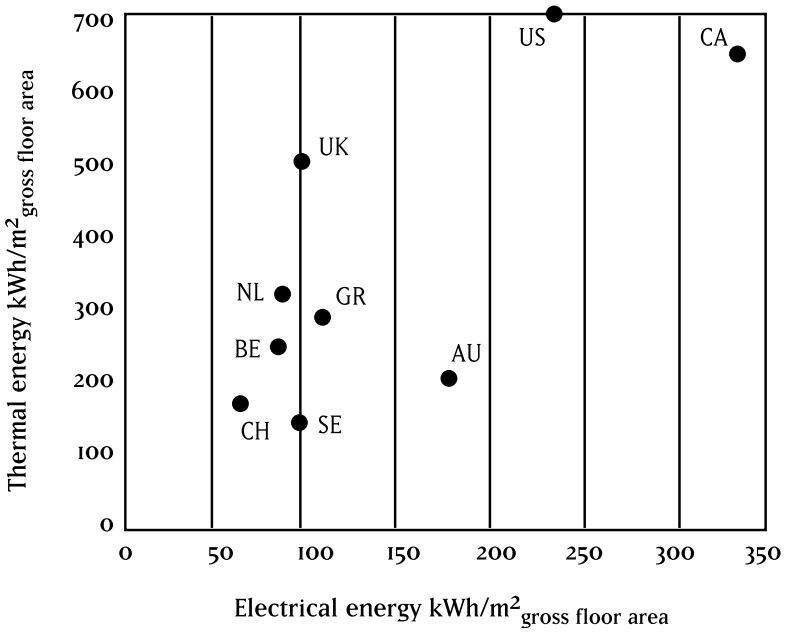

Figure 1. *Average annual electrical and thermal energy consumption per gross floor area, for typical hosptial stock in nine countries. Data is presented as kWh/m*$_{gross\ floor\ area}$ *for the annual average.* (CADDET, 1997)

3 Reducing Health Care's Environmental and Health Impact

3 *Reducing Health Care's Environmental and Health Impact*

3. *Reducing Health Care's Environ-omental and Health Impact*

Key aspects of environmentally responsible health care are reviewed in this section, concluding with a review of some of the economic benefits that might be anticipated as a result of operating the health care system in a more environmentally-responsible manner. Ten key steps are outlined:

- reduce energy use
- reduce use of toxic materials
- reduce emissions of key pollutants
- reduce solid waste production
- create healthy indoor environments
- design green and healthy buildings
- maintain green grounds and gardens
- implement environmentally-responsible purchasing
- secure the economic benefits
- meet the legal requirements.

Finally, it is proposed that a comprehensive, integrated environmental management approach is needed.

3.1 *Reduce energy use*

Hospitals are intensive energy users because of their need to maintain a stable and comfortable room temperature, to operate 24 hours a day and to use a wide variety of electrical equipment. The energy budgets for hospitals are substantial, and any means to reduce them can contribute to a "healthier" bottom line. A high level of energy efficiency will also contribute to reductions in greenhouse gas emissions (GHG) and air pollution, where the energy source is fossil fuel, with significant environmental and health benefits. Energy-efficient designs may include using natural heating and cooling, active or passive solar heating, co-generation, use of low GHG fuels or alternative energy sources and so on. At the same time, great care has to be taken to ensure that energy-efficient construction does not contribute to poor indoor air quality.

The concern with energy conservation in health care facilities seems to have waned during the 1990s, but has re-emerged in the late 1990s as Canada has considered how it is to reduce greenhouse gas emissions (particularly CO_2) in line with its commitments under the Kyoto Agreement. As a result, Natural Resources Canada, through its Energy Innovators Program, has established an Energy Innovators Program at the Canadian College of Health Service Executives (see Box # 10). This program works with hospitals across Canada to encourage energy efficiency and the reduction of greenhouse gas and other emissions. A recent survey carried out by the CCHSE Energy Innovators Program found that only 35 percent of the 222 facilities that responded to the survey had an energy efficiency program in place, while even fewer (14 percent) were specifically focused on greenhouse gas emission reductions. While 20 percent had a capital budget for energy efficiency projects over the next two years, 29 percent reported they had encountered obstacles in implementing energy efficiency programs, with 71 percent of these reporting lack of funding as an obstacle (CCHSE, 1999).

According to CADDET (1997), hospitals have a high potential for energy savings, with estimates ranging from 20 percent in Germany to as much as 44 percent in the Netherlands. Some fairly simple measures, for which no special budget is needed, can result in around 10 percent of primary energy savings within a single year. More comprehensive energy savings require a dedicated energy efficiency budget and attention to at least eight separate areas of energy use (see Table 1).

There is thus considerable potential for reducing health impacts through such strategies as energy conservation; switching to more appropriate and efficient fuels for space and water heating (eg., from electricity to gas or solar); electrical energy efficiency improvements, including improved efficiency in lighting, appliances, motors and other electrical end-uses; and use of renewable energy technologies.

These topics are briefly reviewed below, and individual case studies of energy conservation in Canadian hospitals are summarized at the end of this section (Box # X13).

Table 1. An overview of energy saving areas in hospitals (Source: CADDET, 1997)

Heating system	Room thermostats	Thermo-static radiator valves	Insulation of hot water tanks and boilers	Installation of local water heaters	Boiler replacement	etc.
Combined heat & power	Start with careful check of heating and electricity needs	Usually most cost-effective when all heat and electricity can be	used within the hospital area	etc.		
Building fabric & air-conditioning	Insulate roof	Draught proofing	Window shading	etc.		
Lighting	Replace incandescent tungsten lamps with compact fluorescent lamps	Replace old fluorescent tubes with new low-energy one	Replace old electromagnetic ballasts with electroni	Check applicability for time controls, presence detectors and daylight compensators	etc.	
Mechanical ventilationa	Install variable speed control on fans and large pumps	Increase the temperature as much as possible when cooling is required	Check the present system, especially its control settings	Use outside air for "free cooling"	Explore opportunities for heat recovery from the exhaust air	etc.
Building energy management systems	Explore all possibilities to make better use of systems installed	If no BEMS is installed, consider installation	Make use of system within the energy management program	etc.		
Maintenance	Regular inventories of systems, equipment and components	Time schedule for inspection and maintenance	Inventory of stock kept for critical repairs	Data and supply of equipment parts	etc.	
Services	Laundry: typlically potential for heat and water savings	Kitchen: typically large potential for reduction of heat usage	etc.			

Box 10 The Energy Innovators Program, CCHSE

The Canadian College of Health Service Executives, with funding from Natural Resources Canada, has established an energy innovators program for the health care sector. The program helps health care organizations save money through improved energy efficiency in their facilities by providing information, access to training workshops, organizational support for program implementation, and local and national recognition. NRCan's Office of Energy Efficiency also has grants available for buildings that meet new energy standards under its commercial buildings incentive program; there is some discussion about extending this program to the institutional sector. There are over 3,500 health care facilities in Canada, but as of September 2000 only 93 (less than 3 percent) had joined the CCHSE Energy Innovators program.

In a 1999 survey, the project distributed questionnaires to 1,677 health care facilities across Canada seeking information on their activity with respect to energy efficiency and other environmental initiatives. Only 222 surveys were returned, a response rate of only 13 percent, and these presumably represent the facilities that are most keenly interested in environmental issues. The results reported below therefore probably represent an over-estimation of the actual participation in energy management and efficiency programs:

- 35 percent — have energy efficiency programs in place
- 29 percent — encountered obstacles in implementing energy efficiency (71 percent of these were related to funding)
- 20 percent — capital budget available for energy efficiency over the next 2 years
- 18 percent — resources (budget, staff) dedicated to energy management
- 14 percent — greenhouse gas reduction programs
- 8 percent — generate electricity
- 7 percent — plan a co-generation project in the next 5-7 years.

(Source: *The Partnership* CCHSE/Energy Innovators Newsletter 1(2) fall 1999)

3.1.1 Energy conservation

Even very simple conservation measures, such as switching off lights and equipment, can have significant benefits. For example, in a presentation prepared for a workshop on "Health Care Without Harm in" Toronto (September 2000) O'Grady and Scott noted the following with respect to energy use at the Hospital for Sick Children, where they work:

- more than 50 percent of the equipment and lights in all rooms are left on 24 hours a day
- most office occupants are out of the office at least half of their work day
- most computer monitors use screen savers that use three times the power of the "energy star" screen saver.

They estimated that among the 500 offices in the HSC, there were 2000 hours of vacant time daily during working hours and an additional 8000 hours of vacant time during off hours. Based on these figures, they estimate:

- potential annual energy savings — 8,141 kWh
- potential annual utility savings — $402,814
- potential pollution prevention — 585 Kg of greenhouse gases, CO_2, sulphur dioxide.

More comprehensive approaches to energy conservation are related to:

- improved ceiling, floor, wall and basement insulation, air sealing and window and door upgrades
- more energy-efficient heating, ventilation and cooling (HVAC) systems
- more energy-efficient new buildings
- water heater insulation and heat traps
- heat pumps
- low flow shower heads
- reduced "embodied energy" in the hospitals' structure, ie., the energy involved in the extraction, production and transportation of the building materials to the construction site and the energy costs of construction itself. (See Box # 11)

However, one issue that was raised by a hospital manager in BC is that any savings resulting from energy efficiency in this year's budget are clawed back by the provincial Ministry of Health in the following and subsequent years. This clearly removes a major incentive for energy efficiency, since the energy dollars are not transformed into health care dollars at the local level but are simply repossessed by the provincial government. Apparently this is not the case in Ontario, and it clearly is an issue that needs to be addressed nationally. (Kent Waddington, CCHSE — personal communication)

3.1.2 *Fuel switching*

Fuel switching refers to the use of a different fuel mix than is presently the case. In a study looking at fuel switching for space heating in Ontario, Passmore Associates (1992) noted that since 60-90% of the electricity required for space heating is from fossil (primarily coal) -fuelled generation at 30-60% efficiency, and since high efficiency gas furnaces operate at up to 93% efficiency and their emissions are cleaner than coal emissions, the benefits of switching from coal-fired electric operation to domestic gas for space heating can be considerable, with roughly three-fold reductions in CO_2 emissions, six to ten-fold reductions in SO_2 and almost complete elimination of nitrogen oxide. This results not only in reducing greenhouse gas emissions, but in the co-benefit of reducing acid rain emissions and emissions of ozone precursors.

Hospitals can reduce harmful emissions from fossil fuels by

- reducing consumption of fossil fuels through energy conservation, including the installation of co-generation plants
- replacing the use of fossil fuels by substituting them with renewable energy (wind, solar — both passive and active)
- replacing high emission fossil fuels (oil, coal) with low emission fossil fuels (gas) (see section 3.1.2)
- considering the use of fuel cells as power sources
- converting vehicle fleets from gasoline to natural gas, electric hybrid or fuel-cell powered
- purchasing electricity from clean/renewable supply sources rather than coal or gas.

3.1.3 *Electrical efficiency improvement*

According to Fickett, Gellings and Lovins (1990), the use of advanced technologies could save anywhere from 24 to 75% of current electricity use. For example, some 55 to 90% of electricity used for lighting could be saved; moreover, better lighting might increase productivity (see Box # 12) and there would be reduced maintenance costs. Better motors can yield 10 to 40% savings, while efficient appliances can save anywhere from 50 to 90% of electricity currently used to power them.

With respect to energy efficient lights, appliances and motors, while in general it is reasonable to assume that the hazards of production and use of more energy efficient products is not any greater than the production and use of energy inefficient products, there are certain instances where the materials used in the more energy efficient product are or may be more hazardous to health. For example, fluorescent lamps contain mercury, while incandescent lights do not. There is thus a potential health hazard from the production of the more energy efficient fluorescent lamps, which needs to be taken into account.

Box 11 Reducing the Embodied Energy in Hospital Construction

A new hospital development/reconstruction for the Princess Margaret Hospital in Swindon, UK involved the application of the principles of The Natural Step by the Carillion Construction Company. This dramatically reduced the amount of energy embodied in the hospital in terms of construction materials, transport trips and waste production. The principles of The Natural Step, a Swedish-based environmental organization (www.naturalstep.org) are that as a society

- we must not extract resources from the earth at a faster pace than can be reabsorbed
- substances produced by society must not be produced at a faster rate than can be broken down in nature
- human activity must not diminish the quality or quantity of earth's productive services or harvest more from nature than can be recreated
- human activity must use resources fairly and efficiently to meet human need.

When applied to this hospital design and construction project, this meant

- reducing the amount of materials brought on site for construction and sent off site for disposal
- careful reuse and recycling of unavoidable waste
- increased roof insulation
- choosing ecologically- and health-sensitive materials, including using timber from certified sustainable forests and using water-based paints and varnishes or wood soap
- using local labour and local suppliers wherever possible.

The benefits included

- reduced waste to landfill — only 50 tonnes or two lorry loads, while 400 tonnes of paper and cardboard were composted and 400 tonnes of timber reused on site
- 20,000 fewer lorry journeys than a standard construction project
- reduced costs — landfill tax, transport costs, manufacturing costs, maintenance costs
- reduced ecological impact
- healthier working environment for construction workers and health workers
- strengthened local economy
- reduced ecological impact
- enhanced reputation.

Source: Vetter, Weston and Martin (no date)

Box 12 Productivity and Energy Efficiency

Business is interested in energy efficiency for very pragmatic reasons — healthier workers are more productive. This is well demonstrated by a report from the Rocky Mountain Institute, a leading "think tank"

Continued

Box 12, continued

established by 'soft energy path' advocate Amory Lovins. An article in the RMI Newsletter (Fall/Winter 1994) entitled "Greening the Bottom Line" summarizes the publication *Greening the Building and the Bottom Line: Increasing Productivity Through Energy-efficient Design* (Romm and Browning, 1994). The publication includes twenty case studies that demonstrate that "while energy-efficient design can pay for itself in reduced energy costs alone, it can often produce even greater benefits in higher worker productivity, lower absenteeism, and fewer errors." For example, the article reports:

- a retrofit to the US Post Office in Reno, Nevada, that also addressed lighting quality led to an increase in output at the mail sorting machines of 6% and a reduction in errors to one per thousand. "The post office calculates those productivity gains to be worth $400,000 to $500,000 a year — up to ten times the energy/maintenance payback".
- Pennsylvania Power and Light redesigned the lighting in a building housing its drafting engineers. In addition to the energy savings, there was a 13% increase in productivity, a 25% decline in sick days taken and a reduction in drafting errors. All in all, the return on investment was over 1,000%.

The authors point out that since businesses spend roughly 72 times more on workers than on energy, a 1% increase in worker productivity resulting from "an energy retrofit or new design can save as much in wages as a company spends on its entire energy bill. In effect, productivity savings can leverage energy savings by 10 fold or more..."

Box 13 Energy Conservation Case Studies

The Office of Energy Efficiency in Natural Resources Canada has a number of case studies of energy innovators in the health care sector. Among the examples:

- The Robert Giffard Hospital Centre in Québec City established its energy management program in 1987. Based on the forecast financial performance for converting its boilers from oil to natural gas, the hospital self-financed the project, leveraging its investments by using utility incentives, including a grant from the local gas company worth 45 percent of the total project cost. Payback time was anticipated to be between three and four years; the project also reduced operating costs since the new system required fewer personnel and less maintenance. (Energy Innovators Office case study, 1992).
- The Toronto Hospital signed a contract with GE Energy Management Canada and Honeywell Limited in 1994 for a long-term energy management plan. A typical energy service contract, the package included complete financing for the $10 million project along with a guarantee of $2 million in energy and operational savings each year. Initiated in 1994, and completed in December 1995, the project involved major energy efficiency upgrades in lighting, building automation, heating, ventilation and air conditioning, and water conservation, resulting in an anticipated reduction in energy consumption of 20-25 percent. (Energy

Continued

Box 13, continued

Innovators Office case study, June 1995)

- The BC Children's Hospital and BC Women's Hospital and Health Centre signed an energy service contract with Honeywell Limited in 1993 for an energy efficiency program to include a major lighting and HVAC mechanical retrofit of the facilities. The lighting retrofit resulted in a $144,000 annual energy saving and a $34,000 yearly lamp and ballast replacement cost saving, as well as a reduction in labour costs. The installation cost was $1,565,000, indicating a payback time of approximately eight years. The HVAC upgrade and mechanical retrofit resulted in a reduction in energy consumption in the last quarter of 1994 of 20 percent compared to a similar period in 1992. The program was financed by a $2.8 million loan from a commercial bank, based on an annual performance guarantee from Honeywell of $400,000, as well as an incentive grant of $420,000 from BC Hydro. The reduction in energy costs overall amounted to a 40 percent reduction in energy costs, and a payback time of five years. (Energy Innovators Office case study, June 1995)
- The Capital Health Authority in Edmonton, Alberta implemented an energy efficiency program at the University of Alberta Hospital. Initiatives ranged from simple steps such as replacing faucet aerators, shower heads and lighting to steam grid humidification and better matching of HVAC with a building's actual needs. In the period from 1991/2 to 1996/7 the hospital saved 16 percent on its electricity use, reduced the amount of steam it required by 12 percent and the amount of water and sewer output by 42 percent. This translates into more than $1 million in annual savings. (Office of Energy Efficiency, Success Stories, 1998)

3.2 *Reduce use of toxic materials*

The health care system uses a wide variety of toxic materials that may adversely affect human health. The use of these materials should be reduced and preferably eliminated wherever possible. Among the toxic materials used in hospitals are pesticides and cleaning agents. They are discussed below, together with the problematic issue of PVC. A broad approach to environmentally sensitive care is described in Box # 16.

Given the potential health problems associated with poor indoor air quality, as well as the availability of low emission products and materials and a wealth of expertise in the design of healthy indoor environments, hospitals should also be in the forefront of reducing the presence of potentially toxic materials in their facilities that might impair indoor air quality and the health of their patients, staff and visitors. (See also Sections 3.5 and 3.6.)

3.2.1 *Pesticides*

Given the widespread concern with the wide range of health effects associated with pesticide use, and given the availability of safer, equally effective and less expensive alternatives the use of pesticides should be reduced if not eliminated from health care facilities (see 2.1.5). The Citizens' Environmental Coalition (2000) suggests an integrated pest management (IPM) approach to pest management in hospitals and reports the following success stories:

- At least ten Boston hospitals have been using IPM for 15 years, they no longer use rodenticides, pesticide sprays and do not make "preventive" pesticide applications.
- The University of Rochester Medical Centre has eliminated roach and ant aerosols, organo-phosphate insecticides, and has also eliminated preventive applications in a hospital, ambulatory care centre, health science schools and 25 associated medical complexes. In the process they have cut costs for materials and labour, while reducing the risks to patients, staff and the general public.

3.2.2 Cleaning agents and disinfectants

A number of disinfectants and cleaning agents, particularly glutaraldehyde, are associated with skin allergies, contact dermatitis and asthma among staff. Disinfectants include quaternary ammonium compounds, phenols, chlorine, alcohols, aldehydes and oxides, while cleaning products include floor buffers, floor strippers, glass cleaners, carpet cleaners, metal cleaners and solvent cleaners and degreasers (Homer, 2001). Among the products of concern is the quaternary ammonium compound benzalkonium chloride, which has been associated with occupational asthma, dermatitis and sensitization and allergic reactions; and glutaraldehyde, a high-level cold sterilant for semi-critical devices that has been associated with contact dermatitis, skin sensitization and occupational asthma (Tessler, 2001).

In response to these concerns, there is a growing interest in finding alternative, less environmentally- and health-harmful or "green" cleaners. For example, five hospitals in the United Kingdom are now glutaraldehyde-free, using alternatives such as peroxyacetic acid and other products (Tessler, 2001). The Kaiser Permanente Health System in the United States has developed a chemical cleaning product selection process that includes specifications (primarily relating to safety issues) that are absolutely required for product selection to proceed and criteria that are not essential but are important in product selection. These specifications and criteria cover individual, environmental, community and public health concerns. In one recent invitation to bid for a contract on cleaning agents, only three of forty companies invited to bid met the basic criteria and only these three companies were given serious consideration (Thehavi, 2001). Similarly, the Vienna Hospital Association has established criteria for environmentally-friendly cleaning products. In their initial review of their use of cleaning products, they found that 15 of 45 products were heavily polluting the environment. Under their new purchasing criteria, of 175 products offered, only 20 were ecologically benign, 20 were ecologically acceptable, 105 were not acceptable and 30 were acceptable but too expensive (Klausbruckner, 2001).

Useful resources for purchasing less toxic, 'green' cleaners include the janitorial products Pollution Prevention Project (*www.westp2net.org/janitorial/jp4.htm*) and in Canada, cleaning products that have been approved by the Canadian Environmental Choice Program (*www.environmentalchoice.com/index_main.cfm*) a report on "cleaning for health" is available from Lara Sutherland of Inform (sutherland@informinc.org, or 617 864-3730).

3.2.3 PVC

While some toxic materials are present in the general health care environment, in a few cases they are present in products and supplies provided directly to patients. Of particular concern here is the presence in PVC (vinyl) IV bags and tubing of DEHP, a phthalate used as a plasticizer to make PVC products soft and flexible. IV bags typically contain 30-40 percent DEHP by weight, while medical tubing may contain as much as 80 percent by weight. The DEHP leaches from these devices and thus can directly enter the blood stream or other tissues. This leaching is sensitive, among other things, to temperature, storage time, flow rates and agitation of the device. Of particular concern is exposure among premature and ill newborns, because of their generally immature metabolic pathways and because of the high temperatures maintained in incubators and neonatal intensive care units. DEHP has been shown to be toxic to a number of organ systems, in some cases levels "close to those that might be experienced by individuals undergoing medical treatment". Moreover, some tissues such as the testis may be particularly sensitive in the developing fetus and neonates. However, there is an absence of good human toxicity or epidemiologic studies of DEHP. But given the results from animal studies, it probably makes sense to eliminate products that use DEHP or similar compounds, particularly in neonates, especially as safer alternatives exist (Tickner et al, 1999). (See Box #14 for examples of PVC elimination.)

Box 14 Eliminating PVC from Health Care Facilities

PVC is widely used in health care, not only in IV bags and tubing but in items such as urine bags, surgical sheets, oxygen tents, mattress covers, shoe covers, examination gloves, patient ID bracelets, office supplies such as binders and in other settings. While not all of this material goes to incineration, more does than is necessary. Moreover, there are problems associated with the use of the plasticizer DEHP in IV bags and tubing. For these reasons, there is a move to phase out PVC in health care and to replace it with less harmful products. Health Care Without Harm's position is that "PVC use should be minimized and ultimately eliminated, alternatives used when available without compromising patient safety or care, and all unnecessary waste incineration should be avoided." (Health Care Without Harm, 2001). Information is becoming more available on alternatives to PVC, useful information sources include Health Care Without Harm (*www.noharm.org*) and the Sustainable Hospitals project (*www.sustainablehospitals.org*)

The issue of PVC elimination is also being addressed in Europe. Among the leaders are the Swedish health care system and the Vienna Hospital Association. In a useful English language report published by the Federation of Swedish County Councils (Landstingsförbundet, 2000) the issues surrounding the use of PVC and the availability and implementation of alternatives is reviewed (*www.lf.se*). Stockholm County Council has committed to phasing out PVC "wherever quality and safety standards can be met using other materials". The use of PVC for surgical sheets, patient ID cards, shoe covers, and stationery has already been eliminated. Work is underway to find PVC alternatives for IV drips, blood bags and pharmaceutical packaging. One market analyst has predicted that "the proportion of medical consumables still containing PVC in Europe will fall by about 10 percent over the next 5 – 7 years".

- The Austrian Supreme Court, in a case between Greenpeace and the vinyl industry, has recognized PVC as "an environmental poison". As part of its environmentally-responsible purchasing policy, the Vienna Hospital Association is moving to complete elimination of PVC from their waste stream; currently they have less than 1 percent PVC in their wastes. (Klausbruckner, 2001)

3.3 *Reduce emissions of key pollutants*

Hospitals are a source of both liquid effluents and gaseous emissions to the environment. These emissions should be reduced as much as possible. This requires:

- reducing the purchase and use of toxic materials in the first place (see also 3.2)
- substituting less toxic products and materials whenever possible
- rigorously abiding by all federal, provincial and municipal legislation and regulations pertaining to liquid wastes, toxic and hazardous wastes and air pollution.

Beyond these generalities, there are two specific areas that require attention:

- Reduce emissions of dioxins by
  - replacing PVC and other high-chlorine plastics and materials with alternative products (see Box # 14)
  - reducing the amount of solid waste — in particular plastics and paper — going for incineration

- ensuring that biomedical waste only goes to incinerators that meet the highest possible standards for dioxin control.

- Reduce mercury emissions by
  - phasing out the use of mercury
  - ensuring that mercury-containing products do not go to incineration and that the mercury is recovered and appropriately recycled/disposed of (see Box # 15).

Efforts to reduce mercury use and its presence in the waste stream going to incineration will be hastened by the new Canada-wide standard for mercury approved by the Canadian Council of Environment Ministers in June 2000 . The new Canada-wide standard calls for small medical waste incinerators (less than 120 T/yr) to make determined efforts to reduce stack concentrations of mercury in the exhaust gas exiting the stack to a maximum40 ug/Rm3, while existing large incinerators (more than 120 T/yr) or new or expanded incinerators are to achieve maximum concentrations of 20 ug/Rm3 by 2006 (Canadian Council of Ministers of the Environment, 2000 or see *www.ccme.ca/3e_priorities*)

Box 15 Phasing Out Mercury in Health Care

As a result of the growing concern with the use of mercury in the health care sector, several initiatives have been developed to reduce and ultimately eliminate the use of mercury. In the US, a Memorandum of Understanding was signed between the American Hospital Association and the Environmental Protection Agency which commits the health care industry to eliminating mercury by 2005. A number of State-level MOUs have also been signed. In Canada, the Ontario Mercury Elimination and Reduction Challenge (MERC) initiated by Pollution Probe has resulted in a Memorandum of Understanding, signed in 1996 by Environment Canada, the Ontario Ministry of the Environment, the Health Care Environment Network and a number of hospitals (interestingly, the Ontario Ministry of Health is not a signatory). The MOU commits the partners to work to voluntarily reduce and eliminate the use of mercury in hospitals (Hodgson and Giannetas, 1999).

One incentive for the health care system to eliminate mercury is the cost savings that can result. While the costs of alternative, mercury-free products may be more expensive than products containing mercury, the indirect costs of mercury-containing products mean that the total costs of mercury-free products are much less. For example, the additional costs associated with a sphygmomanometer containing mercury include costs associated with hazardous waste and spill training, clean-up kit costs, potential costs associated with non-compliance with regulations such as fines, sampling and monitoring costs, remediation, etc., and indirect costs related to the removal of mercury from incinerator emissions. In the case of a mercury sphygmomanometer, the additional direct costs raise the price from $264.70 to between $309.95 and $777.45, compared to the purchase price for a mercury-free sphygmomanometer of $300. Additional indirect environmental costs may amount to between $700 and $1,000. Furthermore, as more health care facilities purchase mercury-free products, the price of those products will decline. (Lourie, Giannetas and Lukey (1996).

Box 16 Environmentally Sensitive Care in Hospitals

The Canadian Society for Environmental Medicine has produced two guides for environmentally-sensitive care in hospitals. The first book is focused on the provision of a supportive environment for optimum patient care through preventing pollution in the hospital, while the second part of the guide is focused on enhancing staff environmental awareness and provides advice for specific departments and activities. (Both guides can be obtained from the Canadian Society for Environmental Medicine, PO Box 62058, Convent Glen Postal Outlet, Orleans, Ontario, K1C 7H8.)

- The pollution prevention guide provides suggestions for administrative services and policies, public relations and staff communication, engineering and maintenance, housekeeping and waste management, laundry, and purchasing and central supply.
- The guide to environmentally-sensitive care includes suggestions for pharmacy, nursing, emergency, medicine, medications, surgery and operating room, anesthesia and respiratory care, physio and occupational therapy, food services, laboratory, and radiology.

3.4 *Reduce solid waste production*

Many hospitals are already working to reduce their solid waste, as revealed in the CCHSE's Energy Innovators survey, (1999) which found the following involvement in waste reduction activities among the 222 respondents:

75 percent	paper recycling
64 percent	waste management
47 percent	plastic recycling
46 percent	glass recycling
14 percent	organic waste management.

The core of solid waste reduction is to practice the "3Rs" — reduce, re-use and recycle, to which can be added "repair". Not only are there environmental and health benefits, there are also economic benefits to this approach. The first step in reducing solid waste production is to reduce the acquisition of materials in the first place. This means, among other things:

- reducing the amount of material used — and wasted — in construction (see Box # 11)
- implementing purchasing policies and agreements with suppliers that reduce the amount of packaging and/or ensure that packaging is returned to the supplier.

The second step is to re-use materials rather than throwing them out after a single use. This includes:

- replacing single-use and disposable products with multi-use/reusable products (e.g., surgical drapes, crockery, bed linen, etc.
- re-using medical equipment whenever practical and safe.

The third "R" after reducing and reusing is recycling. Health care facilities can recycle paper (both newspapers and fine papers), bottles and other glass, cans and other metals, while food wastes can go for composting.

Since a significant portion of hospital wastes go for incineration, practicing the '3Rs' can not only reduce landfill waste, but can also contribute to reducing the materials going to incineration, with all its attendant problems.

Some examples of what hospitals can do are shown in Box #17.

Box 17 Reducing Solid Waste in Health Care — Some Examples

- In the early 1990s, the Hospital for Sick Children's average expenditure on waste management approached $1.2 million, and the Hospital had no recycling programs in place. As of 1998, the Hospital had achieved the following in its drive to better handle its wastes:

- an 80 percent reduction in biomedical waste volume between 1992/3 and 2000/1, with these wastes falling from 4 percent by volume to 1 percent

- a 78 percent increase in recycling over the same time period, rising from 6 percent of waste by volume to 47 percent

- a 6.7 percent reduction in the weight of materials going to landfill over the same period, falling from 90 percent of volume to 52 percent, despite filling 650,000 square feet of new space

- annual waste management costs were reduced from $560,000 in 1992/3 to $107,097 in 2000/01.

(Source: Valerie O'Grady, Environmental Coordinator, HSC)

- The Itasca Medical Center in Grand Rapids, MI, a 108-bed community hospital,

- switched from single use to re-useable salad plates and dessert bowls for a net savings of $3,500 per year

- changed from disposable to re-usable pads for patient beds, with net annual savings of $7,500 per year and increased patient comfort (Canadian Centre for Pollution Prevention... 1996)

- The Medical Center Hospital of Vermont prepares 3,000 meals a day. And every day, it trucks 6-900 pounds of kitchen waste (not food from anyone's plates) to a compost site managed by a non-profit group dedicated to organic food production. The 80 tonnes of food wastes that the hospital sent to compost in 1993 was transformed into 40 tonnes of compost and in return the hospital received 10 tonnes of fresh organic produce at a wholesale price of $6,000 (Raver, 1994)

3.5 *Create healthy indoor environments*

One of the first responsibilities of a hospital must be to ensure that the physical environment of the hospital does not make patients, visitors or staff ill. Yet the combination of sealed buildings, synthetic materials, emissions from hospital and office equipment and the use of multiple cleaning and disinfecting agents can all contribute to poor indoor air quality in hospitals. But good building design and management can overcome many of the problems that contribute to indoor air quality. This means paying attention from the outset to the materials used in the construction, internal fittings, equipment and furnishing of the building, as well as the ongoing operation, maintenance and cleaning of the facility. A green hospital must be designed from the outset to ensure a high level of indoor air quality and operational standards must be maintained in order to ensure high indoor air quality continues.

Thus hospitals need to review their use of potentially toxic chemicals; to be at the forefront of developments in building technology that maximize natural ventilation whilst still conserving energy; reduce indoor air pollution by using materials such as wood, natural fabrics and ceramics rather than plastics and resins; and consider the use of plants to clean

the air. CMHC has long had an interest in this topic and is an important resource for the health care sector in this regard.

A good example of how to create a healthy indoor environment is provided by South Riverdale Community Health Centre in Toronto, which went to great lengths to create such an environment in its new building (see Box # 18 for a summary of this approach).

Finally, there is interest in a more natural form of air cleaning that is being developed in Canada by Genetron Systems. The "breathing wall" creates a natural ecosystem of plants, animals, fish and water and then passes the building's air through this system to remove contaminants (see Box 19). While there are obvious concerns about soil microbes and fungi, hospitals such as Mid-Columbia Medical Centre in the Dalles, Oregon, which has a 30 foot high waterfall in its atrium to which all floors open, provide evidence that waterfalls are not incompatible with the hospital environment; perhaps the day will come when all hospitals will have "breathing walls" in their atria and elsewhere as part of their HVAC system.

Box 18 Indoor Air Quality at South Riverdale Community Health Centre

In ensuring that its new building had the highest possible indoor air quality, the health centre made every effort to ensure that materials and construction were environ-mentally healthy. In working with the architect (A J Diamond, Donald Schmitt and Company) and an indoor air quality consultant (Ed Lowans), they addressed the following topics:

- insulation
- ventilation
- paints
- glues
- flooring
- windows
- lighting
- cabinetry
- ceiling tiles
- furniture
- electrical supply
- medical equipment
- office equipment
- cleaning and maintenance procedures.

The health centre identified the following criteria to use in choosing materials:

- low emissions
- no perfumes
- no listed chemicals of concern
- high energy efficiency
- low toxicity
- no unnecessary colorants
- recycled materials where possible
- superior indoor air quality

Contact: South Riverdale Community Health Centre, 955 Queen Street East, Toronto, Ontario, M4M 3P3 telephone — 416 461 1925 or Ed Lowans, Lowans & Stephen, Sustainability Consultants, 425 Echo Dr. Ottawa, ON, K1S 1N6 Tel: 613-237-6302.

Box 19 The Breathing Wall

In recent years Canada Life, Panasonic and the Club Monaco clothing chain have each installed a "breathing wall" in their Toronto headquarters. The work of Toronto biologist Wolfgang Amelung and his company,

Continued

Box 19, continued

Genetron Systems Inc., a breathing wall is an indoor air biofilter that serves as an alternative to current ventilation systems to remove or control contaminants such as VOCs, irritants, particulates and odours. The wall has three main sections: a hydroponic area with many different types of green plant, an aquatic system and a scrubber of fibreglass panels with external faces of porus lava rock, covered with moss and wetted by circulating water. It is installed in a room as a pleasing green, living ecosystem, thus acting as a soothing and pleasing amenity as well.

The Canada Life Environmental Room's breathing wall was described and evaluated by researchers at the University of Guelph Their research looked at three VOCs — formaldehyde, toluene and trichloroethylene (TCE), important indoor air pollutants. The researchers found that:

"The filter removed significant amounts of all VOCs… toluene and formaldehyde were removed effectively, however TCE levels were not removed with the same efficiency."

They concluded that water soluble materials were removed, but because they did not accumulate in the water (in the case of toluene and formaldehyde) they suggested that the system "not only captures these materials but also degrades them".

(Source: *www.plant.uoguelph.ca/research/envweb*)

For more information, contact: Genetron Systems, 4801 Keele Street, Unit 34, Downsview, ON M3J 3A4; ph: 416-665-8155.

3.6 *Design green and healthy buildings*

Environmentally-friendly design has been a focus of great interest in the residential and commercial building sectors for many years. While there has been some spill-over into the health care sector, much of the focus until now has been on creating more patient-friendly, healing environments rather than focusing on designing hospitals and other health facilities to have the lowest possible impact on the wider environment. But lessons learned from the residential and commercial building sectors are now beginning to be applied to health centres (notably South Riverdale Community Health Centre and Queen West Community Health Centre in Toronto) and hospitals (for example, the new Thunder Bay Regional Hospital is being designed with environmentally-friendly/green guidelines in mind as is the Northumberland Health Care Corporation's new hospital). Environmentally-friendly design incorporates a number of components, including

- using construction materials with low embodied energy
- using recycled materials
- designing for disassembly
- using low toxicity/low emissions materials
- maximizing use of natural ventilation
- designing to maximize the use of passive solar energy (orientation, materials selection, natural shading, etc.).

These and other approaches can reduce the environmental impact of both the construction and the operation of a hospital. Among the organizations that are addressing this issue are Canada Mortgage and Housing Corporation (CMHC) and the Royal Architectural Institute of Canada (*www.raic.org/wastenot*). The Fall 2000/Winter 2001 edition of the Wastenot newsletter (available from the Environmental Management Institute at *www.emi-igm.org*) features the health care system.

Two other leading edge 'green' technologies are worth considering. The first, the 'Breathing Wall', was described earlier. The second is the 'Living Machine' sewage treatment

system, which is the ultimate approach to reducing liquid effluents, effectively eliminating them altogether (see Box #20). This is a self-contained, on-site sewage treatment plant that uses natural ecological processes (in a greenhouse-like setting) to treat sewage, resulting in the production of clean water that can be discharged to the environment without further treatment (Todd and Todd, 1993).

Whether such a system could be used in a hospital, with its unusually high loading of pathogenic bacteria and viruses, is an issue that would have to be explored. But certainly the technology works in this climate (The Body Shop's Toronto headquarters has one) and has the added benefit of providing a restful and therapeutic green space.

Box 20 The "Living Machine" Sewage Treatment System

"Living machines" are sewage treatment systems designed and built as functioning ecosystems. They can vary in size from systems to treat waste from a small office — the Body Shop's Toronto headquarters has had one in place for some years — to systems for neighbourhoods that would be comparable in size to a fair-sized hospital. They use helpful bacteria, plants, snails and fish to break down and digest organic pollutants. Since much of the process takes place in greenhouses, the system can actually be a positive asset, providing a relaxing green meeting place; in addition, the process can also be used to grow cedars or other plant material that can later be sold.

A case study on the Living Machine website (*www.livingmachines.com/htm/study1.htm*) describes a system installed in South Burlington, Vermont in 1996 to treat 80,000 gallons per day of municipal sewage, an amount typically generated by approximately 1600 residential users. The process is described as follows:

"Sewage flows to a greenhouse with two treatment trains, each with five aerobic reactors, a clarifier and three Ecological Fluidized Beds. The open aerobic reactors have aerators and are planted with a variety of aquatic plant species in floating plant racks."

The living machine has exceeded its target parameters for both chemical and biochemical oxygen demand, fecal coliform and other pollutants.

3.7 *Maintain green grounds and gardens*

Most hospitals have grounds and/or gardens for which they are responsible. In this they are similar to both hotels and schools, although the therapeutic role of gardens adds another dimension to this issue in the case of hospitals. Advice and guidance on the maintenance of grounds in an environmentally-responsible manner can be found in the Green Partnership Guide published by Canadian Pacific Hotels. The guide emphasizes the use of composting and other natural approaches, the elimination of toxic materials and the use of chemical-free, organic insecticides; the elimination of wasteful packaging and recycling of materials; the reduction of water consumption; the planting of trees and the creation of landscapes that attract birds and beneficial insects. (Troyer, 1991; also, see Box #24, which describes other 'Green Hotel' approaches that may be relevant to hospitals.)

The Evergreen Foundation, through its Learning Grounds program which was established in 1993, has worked with over 1000 schools across Canada to naturalize school grounds. In a recent report, *Nature Nurtures*, a review of the literature

identifies benefits that accrue to students, teachers and the community that range from lower exposure to toxins to creation of a sense of place, from a healthier natural environment to a stronger sense of community. The same issues, the same approaches and the same benefits apply to hospitals. (Copies of the report can be obtained through the Evergreen Foundation at 1 888 426 3138 or *www.evergreen.ca*)

The role of plants and nature in promoting healing is another area of growing interest. [3] The restorative powers of nature have been known and used by health care providers for centuries. Monastic gardens, medicinal herb and physic gardens, the rural setting of spas and sanatoria and the gardens and farms of mental asylums are all examples of this. It is only in recent years that we have forgotten — and are now rediscovering — this important healing tradition. Growing numbers of health care facilities are developing and using gardens (Cooper-Marcus and Barnes, 1995) while horticultural therapy, popular in the early part of this century, is enjoying a renaissance (Journal of Therapeutic Horticulture, 1996; Hewson, 1994). At the community level, the healing qualities of a community garden as a place where people can come together and create an attractive and functional space that is of benefit to the community as a whole has increasingly been recognized as an important strategy for healthy community projects, particularly in North America (Lewis, 1992).

In discussing the influence of plants on individual wellbeing and health, Ulrich and Parsons (1992) comment on Ulrich's well known 1984 study in which "matched pairs of gallbladder surgery patients who had window views of either a small stand of trees or a brick building wall (were compared)... patients with the view of trees had shorter post-operative hospital stays, required fewer potent pain drugs, and received fewer negative staff evaluations about their conditions than those with the wall view" and on a 1982 study by E. O. Moore which found that among prison inmates "those who had a view of nearby farmlands and forests... were less likely to report for sick call" than those whose cells looked out onto the prison yard (Ulrich and Parsons, 1992).

Clearly there is scope for being both green and healthy, to the benefit of patients, staff and visitors.

3.8 *Implement environmentally responsible purchasing*

One of the important strategies for reducing environmental impact is to alter purchasing policies so as to purchase less environmentally harmful products in the first place. In Manitoba, the Winnipeg Health Sciences Centre was a partner in establishing the Manitoba Green Procurement Network, with support from the provincial government's Sustainable Development Coordinating Unit. The Health Sciences Centre itself has a corporate policy on environmentally-responsible procurement. The policy, which is two pages long, reads in part as follows:

> *"Where clinical performance, safety and other factors are equal or better, HSC procurement decision-makers shall give preference for products demonstrating the highest level of environmental sustainability through:*
>
> *a) efficient use of energy, resources and packaging,*
>
> *b) use of environmentally certified products where feasible,*
>
> *c) contribution to pollution prevention,*
>
> *d) long service life,*
>
> *e) potential for waste minimization, and*
>
> *f) contribution to HSC environmental performance targets."*

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[3] I am indebted to one of my graduate students, Catherine Goetz, for her compilation of a great deal of the work in this area, upon which this section is based.

In the US, several large health systems have developed green purchasing policies. At the Health Care Without Harm's "CleanMed 2001" conference in Boston, May 4th-5th, senior executives from some of the largest health systems in the US such as Kaiser Permanente, Catholic Health East, and Catholic Health West stressed above all that their systems had made a clear and strong ethical commitment to environmentally-responsible management. This commitment is incorporated in their Values and Mission Statements, in the upper-most levels of the board and senior management team structures, and in at least one case, in the criteria by which their senior executives compensation and incentive and bonuses are assessed. Even more impressive was a panel featuring senior executives of four large group of purchasing organizations that between them represented more than three-quarters of all US hospitals. They made it clear that as member-driven organizations, they are committed to increasing the stringency of their requirements for environmental responsibility in product purchasing. The largest of them, Premier, has a catalogue of PVC-free, mercury-free and latex-free products on its website (*www.premierinc.com*) and gives special consideration to companies that themselves support environmentally-preferable purchasing.

3.9 *Meet the legal requirements*

The health care system not only has an ethical obligation to reduce its environmental and health impact, it also has legal requirements to do so. For example, in Ontario, the need for environmental responsibility on the part of the health care sector is enshrined in Ontario's Environmental Bill of Rights. As the Ontario Ministry of Health's business plan states

> *"As one of the Ministries covered under the Environmental Bill of Rights, the Ministry has an obligation to consider and incorporate environmental concerns into its policy decision-making",*

although, regrettably, the Ministry states that "this SEV applies only to the Ministry of Health itself" and does not apply to the hospitals that the province funds, although stating that "the Ministry will encourage these other institutions to practise environmentally responsible behaviour similar to that set out in this SEV".

Hospitals and other health care facilities also have quite specific legal obligations to protect the health of their residents and workers. For example, in a report prepared for Pollution Probe that examined the legal aspects of indoor air quality in Canada (but presumably applying to other environmental issues) Castrilli, (1999) noted that

> *"Provincial legislation establishing hospitals and other health care facilities... gives the Minister authority to regulate their construction, maintenance, and inspection, while legislation establishing special health care facilities obligates operators of these facilities to protect residents from health and safety hazards."*

For example, regulations in Ontario under both the Public Hospitals Act and the Private Hospitals Act require hospital boards to pass by-laws that among other things address issues such as

> *"(1) a safe and health hospital work environment, (2) the safe use of substances in the hospital, (3) safe and healthy work practices in the hospital, (4) the elimination of undue risks and the minimizing of hazards inherent in the hospital environment and (5) a health surveillance program".*

Similar powers regulating the operation of nursing homes are included in the Nursing Home Act, which among other things declares that every nursing home resident "has the right to live in a safe and clean environment". Regulations under the Act require among other things that every nursing home "be maintained at all times so as to be free from anything that might be hazardous to the health or safety of residents".

While these references are to the obligations of hospitals essentially within their four walls, it is not unreasonable to

suggest that the same obligations could be extended to protecting the health of the surrounding community and the environment. And of course, except where specifically exempt, (as they sometimes are, witness the exemption under Ontario's Environmental Protection Act (Section 27) of pre-1986 hospital incinerators in Ontario from even requiring Certificates of Approval), health care facilities have to meet all relevant federal, provincial and municipal environmental legislation (see Box # 21 for a summary of key environmental legislation affecting health care facilities). In particular, as noted earlier, health care facilities have particular obligations with respect to dioxins and mercury under the new Canada-Wide Standards adopted by the Canadian Council of Ministers of the Environment.

Box 21 Key Legal Requirements

The following are identified by C2P2 and Broadhurst Environmental Management (1996) as the principal environmental legislation effecting health care facilities; since the source for this information is a workbook intended for Ontario hospitals, the focus is on federal and Ontario legislation and regulations. However, other provinces will almost certainly have similar legislation and regulations to those found in Ontario.

- environmental legislation — federal
  - the Canadian Environmental Protection Act
  - the Fisheries Act
  - Transportation of Dangerous Goods Act
  - management plan for nitrogen oxides and volatile organic compounds
  - Ozone-depleting substances.
- environmental legislation — provincial
  - the Ontario Environmental Protection Act and regulations under the Act respecting hazardous and liquid industrial waste. Other regulations affect
    - waste audits and waste reduction work plans
    - source separation programs
    - air emissions
    - hospital incinerators
    - ozone-depleting substances
    - spills
    - asbestos
    - PCBs
- occupational health and safety legislation — Ontario
  - exposure to biological or chemical agents
  - health and safety committees
  - workplace hazardous materials information system

3.10 Secure the economic benefits

A full accounting of the potential economic benefits (and costs) of greening health care is beyond the scope of this paper. It must await the completion of a full environmental and health impact assessment of Canada's health care system and an assessment of the full environmental and health benefits and economic costs of implementing the various actions described above.

The economic benefits of greening health care fall into two broad categories:

- **direct savings** related to reduced costs for materials, labour and services in both the capital and operating budgets, as well as reduced costs related to absenteeism arising from illness and disability that result from environmental problems (such as indoor air quality, use of toxic materials, etc.) in the day-to-day operation of a health care facility.
- **indirect costs** arising from the avoided environmental damage and associated harm to human health that will result from reducing the impact of the health care system on the environment. As with other indirect costs (e.g., smoking) these indirect costs may well exceed by a substantial amount the direct costs savings.
- There may well be initial costs to improving environmental performance, so savings have to be calculated as net savings after additional costs have been allowed for.

Summarized below are some of the key areas in which both direct and indirect savings can be anticipated, based on examples referred to throughout this paper.

- E**nergy:** Energy costs may represent perhaps the largest direct and indirect savings. Direct savings are substantial, and will only increase if fuel prices increase, while indirect benefits, including reducing air pollution and global warming — and their associated health impacts — are potentially massive.
  - An energy conservation program at the University of Alberta Hospital resulted in savings of more than $1 million annually.
  - Staff at Toronto's Hospital for Sick Children estimated that by turning off lights and equipment in the hospitals 500 offices when they were not in use potential annual energy savings of 8,141 kWh and potential annual utility savings of $402,814 could be achieved.
  - the use of currently available advanced technologies in appliances, motors and lighting could save anywhere from 24 to 75% of current electricity use.
- **Waste management:** This area probably represents the second largest category of both direct and indirect savings. Reducing resource consumption in the first place, reducing the amount of waste treated as biomedical waste, reducing the amount of waste requiring sterilization and reducing the amount of waste going to landfill all represent significant savings. For example
  - in reducing its biomedical waste by 80 percent and its waste going to landfill by 6.7 percent since 1992, the Hospital for Sick Children in Toronto has reduced its waste management costs by almost 80 percent
  - an estimate of the indirect environmental costs of a mercury sphygmomanometer by Pollution Probe suggests that these costs may be 5 – 8 times the actual cost of the product
  - switching from single use to re-useable salad plates and dessert bowls and changing from disposable to re-usable pads for patient beds saved one hospital in the USA $11,000 annually
  - composting of food wastes can not only reduce land-fill charges but the compost can then be traded for organically grown food.
- **Indoor air quality**
  - Improved productivity resulting from improved indoor air quality and other aspects of the indoor environment are estimated by the Rocky Mountain Institute to result in potential savings of up to 10 times the cost of the renovation
- **Pesticides**:
  - experience with IPM approaches in a group of health care facilities in Rochester, New York has shown reductions in both product purchasing and labour costs.

3.11 Adopt a comprehensive, integrated strategy

As the previous sections make clear, the greening of health care, as with the greening of any other large enterprise, is a complicated process. That is why groups that are engaged extensively in this issue in a comprehensive manner, such as the Canadian Centre for Pollution Prevention, stress the importance of adopting an environmental management strategy (EMS). The adoption of an EMS requires commitment at the highest level to the implementation of a greening strategy, coupled with the creation of an interdepartmental "green team" or environmental management team to manage the process. This team needs to be accountable to the executive team and to include members from all relevant departments, including service providers, housekeeping, physical plant operation and so on.

The adoption of an EMS and the creation of a green team is a key part of the environmental component of the new accreditation standard put forward by the Canadian Council for Health Services Accreditation (see Box #22). It is also central to ISO 14001, a voluntary standard put forward by the International Standards Organization and its Canadian member body, the Standards Council of Canada. ISO 14001 is intended to guide organizations towards achieving the following goals:

1. awareness of their impact on the environment
2. acceptance of responsibility for those impacts
3. the expectation that harmful impacts will be reduced or eliminated
4. the placement of responsibility for environmental impacts upon all members of the community.

Over time, it is to be hoped that these two standards will coalesce within the health care sector, so that hospitals and other health care facilities seeking accreditation will, in the process, become ISO 14001 certified. The first hospital in North America to achieve ISO 14001 Certification is the Cambridge Memorial Hospital (see Box # 23).

Box 22 Environmental Management Standards in Health Services Accreditation

The Canadian Council on Health Services Accreditation has included guidelines for environmental management in its standards since 1995. In order to be accredited, organizations were required to establish an environmental management team and to manage the physical environment so as to ensure the safety of patients/clients and staff.

The most recent accreditation standards (2000) have an extensive section on environmental standards. There are five sections, as follows:

- providing a suitable environment
- minimizing adverse events
- respecting the environment
- being a learning organization
- achieving positive outcomes.

Under the theme of providing a suitable environment, standards address indoor air quality (but not specifically VOC emissions); the safe, efficient and effective use of equipment, supplies and medical devices, including issues of waste creation and disposal; and the meeting of laws, regulations and codes. Standards 3 through 5 under the Environmental section refer to minimizing potential hazards and risks, including safely operating and maintaining vehicles (but with no specific reference to vehicle emissions); the proper handling, storing and disposing of hazardous and infectious and material.

The main component of the environmental standards that are applicable to the theme of the greening of health care are found in standard 6, which states:

"While providing services, the organization protects and improves the health of the environment, in

Continued

Box 22, continued

partnership with the community and other organizations."

The processes and activities that are listed include (but are not limited to) reducing, reusing and recycling waste; conserving resources such as water and energy; using products and promoting practices that are environmentally friendly; testing and inspecting indoor air quality; controlling emissions; monitoring and disposing of hazardous gases; handling, storing, using, and disposing of hazardous materials and waste safely, efficiently and in accordance with the law; working together with local environmental management agencies; beautifying and maintaining the outdoor surroundings; and advocating for healthy public policy.

Finally, as part of being a learning organization and achieving positive outcomes, the standards refer to the selection and monitoring of indicators and the collecting and analyzing of data and information about these environmental issues, and improving environmental management process through linkages and partnerships, the sharing of knowledge and expertise and the demonstration of results.

Box 23 The Cambridge Memorial Hospital — Achieving ISO 14001 Certification

Cambridge Memorial Hospital is a 232 bed hospital with a staff of 1,100 people. The hospital has been a leader in its commitment to the application of sustainable development principals, recognizing not only that population health is linked to environmental protection but that "failure to effectively manage its environmental impacts could result in the potential to exposure to liability and regulatory penalties, and a decline of community, creditor and insurer confidence".

The hospital has developed an environmental management system (EMS) and has achieved ISO 14001 accreditation — the first hospital in Canada to do so. The hospital has undertaken a number of environmental initiatives, including:

- regional collaboration on recycling — CMH has joined with two other hospitals to collectively manage the recyclable waste stream
- refined recycling system — CMH has increased the recyclable content of its waste (glass, cans, newspaper and corrugated cardboard) by 40 percent in one year
- IV bag recycling program — by separating the high-density polyethylene (HDPE) outer shell from the PVC inner shell, bailing and delivering these materials to a local pelletizing plant for rework into raw material, CMH has diverted 8.6 tonnes of PVC and 2.7 tonnes of HDPE since 1996
- returnable office supplies — CMH works with its suppliers to return corrugated containers and print toner cartridges
- nickel-cadmium battery recycling — these batteries are collected from medical instruments and devices and recycled, diverting 5 kilograms of these batters from disposal
- fluorescent lamp recycling — to reduce mercury from land fills, CMH collects and recycles 20-40 lamps per month
- minimize use of disposables in operating room — disposable table covers and drapes have been replaced by reusable gore materials
- mercury-free medicine campaign — a comprehensive program has included a mercury audit, in-service education and continuing measures to phase out mercury-containing products
- pollution prevention pledge — CMH has pledged a 30 percent reduction in biomedical waste as part of the (Ontario) Ministry of the Environment's Pollution Prevention Pledge program. A 21 percent reduction in biomedical waste was achieved in 1999
- spill response training — 33 staff members from

Continued

Box 23, continued

Housekeeping, Maintenance, Central Supply, Security and Emergency were trained in spill response, with a particular emphasis on mercury and cytotoxic drug spills

- communication — EMS and environmental awareness training is provided to all new staff through the orientation program, to existing staff through monthly staff meetings and through the newsletter, the computer system, displays, presentations and training sessions
- the green team — the hospital has established a green team to oversee its EMS. The team includes members from various key departments and reports to the hospital's management team
- year 2000 projects — environmental projects planned for 2000 were:
  - pesticide usage: introduce integrated pest management in landscaping and aim for zero chemical applications on hospital grounds
  - packaging waste: decrease the quantity of supplier packaging from five currently purchased products
  - energy conservation: to increase the consideration of energy conservation as part of the new product evaluation process
  - chemical substitution: eliminate the use of five hazardous materials from CMH's day-to-day activities.

(Source: The Change Foundation/Ontario Hospital Association website)

3.12 *Some key resources*

Several pollution prevention manuals are available, of which the most comprehensive at this point appears to be the manuals developed by the Canadian Centre for Pollution Prevention and Broadhurst Environmental Management Inc. with input and financial assistance from Environment Canada and the Ontario Ministry of the Environment, for a series of pollution prevention workshops held across Ontario in 1996/7. (A revised and updated version of the manual has also been produced for a workshop series offered in 2000/2001.) Other useful resources include:

- The Canadian Society for Environmental Medicine has produced a guidebook for hospital staff which also covers a broad range of pollution prevention measures
- The Citizens Environmental Coalition in New York, together with the New York City Health Care Without Harm Coalition produced a resource guide for New York City Hospital materials and waste managers, entitled "Environmentally Safe Hospitals" focused on reducing waste and saving money
- The American Society for Healthcare Environmental Services (ASHES), a branch of the American Hospital Association, has produced two guidebooks, authored by Hollie Shaner and Glenn McRae of CTH Environmental Strategies Inc. in Burlington, Vermont (www.cthenvironmental.com). The two ASHES manuals are:
  - An Ounce of Prevention: Waste Reduction Strategies for Health Care Facilities
  - Guidebook for Hospital Waste Reduction Planning and Program Implementation: Waste Reduction Strategies for Health Care Facilities.
- The 'Green Partnership Guide' published by CP Hotels provides many ideas that are relevant to hospitals, since they too have a strong 'hotel' component in their work (see Box #24 for some examples).

A few useful videos have already been developed and are available for use; however, they are at this point all American. Clearly, a Canadian-content video would be both important and useful. Videos currently available include

- "Health Care Industry's Impact on the Environment: Strategies for Global Change". This is a two part video, produced by the University of Vermont and the American

Nurses Association and taken from an original teleconference. A four part version has also been created from the original two hour version that provides 4 hours of nursing contact and/or 1.5 hours of CME credit. The video focuses on the by-products of health care practices that can harm the environment, health hazards of environmental pollutants (especially dioxin and mercury) and ways in which health care facilities can reduce their emissions by changing their procurement, use and disposal policies and practices. The video is available from the University of Vermont, Division of Continuing Education at a cost of $99 US.

- The University of Vermont and the Environmental Protection Agency have produced a free 20 minute introductory video entitled "Our Waste, Our Responsibility: Moving Toward a Pollution Prevention Approach".
- Health Care Without Harm has produced a free 20 minute video on PVC use and the contribution of medical waste incineration to dioxin production. The video also explores ways to reduce or avoid PVC use.
- "No Time to Waste" is a 30 minute video with a study guide that demonstrates how hospitals can reduce waste and save money. The video is available from Fanlight Productions in Boston, MA (*www.fanlight.com*).
- "Mercury and the Health Care Professional "is a video that is part of the American Nurses Association "Pollution Prevention Kit for Nurses". The kit includes a facilitators guide, background information, action sheets for personal and political action and other resources. It is available from the American Nurses Association.

Box 24 Green Hotels

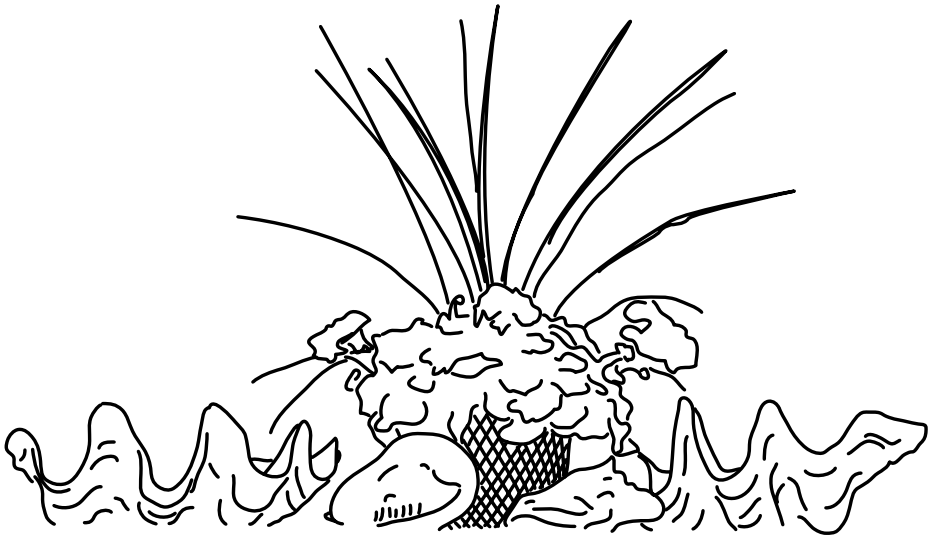
Since hospitals share many of the same functions as hotels, the 'greening' of hotels provides a useful model for hospitals to emulate. A number of hotel chains have initiated environmentally-responsible programs in the last decade or so, indeed there is even a magazine, Green Hotelier, put out by the International Hotels Environment Initiative. A good example is the Sheraton Rittenhouse Square Hotel, which is billed as the first environmentally-smart hotel in the US. In fact, the focus is more on health than the environment, with a lot of focus on improving indoor air quality by using low-emission materials, paints and adhesives, special fabrics, cotton and wool rather than synthetic fabrics and by banning smoking. (Cook, 1999)

In Canada, Canadian Pacific Hotels provides a good example of a greening program. Phase one included the development of 16 goals such as reducing the amount of waste sent to landfill by 50 percent, launching an extensive recycling program and redesigning purchasing policies to ensure that waste is reduced at the source and that supplies used in the hotels are nature-friendly. The hotel also commissioned a manual which provides a useful template that hospitals could follow. Focused on "12 steps to held create an environmentally-friendly setting for our guests, ourselves and our future", the 12 steps are:

- reduce, reuse, recycle
- eliminate excessive and unnecessary packaging
- eliminate all aerosols and phosphates
- buy recycled paper products wherever possible
- recycle everything else possible
- replace incandescent lights with fluorescents
- save our precious water
- buy organic foods wherever possible
- establish a guest recycling program
- redistribute used amenities to charity
- establish a toxic waste disposal program
- establish a green corporate purchasing policy.

The guide provides suggestions for key departments, all of which are also found within hospitals: waste disposal, laundry, kitchen, grounds, plant management, stores and purchasing, housekeeping, repairs and renovations, and food services.

4 A National Strategy for Greening Health Care



4 A National Strategy for Greening Health Care

4. A National Strategy for Greening Health Care

The Canadian Coalition for Green Health Care is committed to working with the federal and provincial governments, national and provincial health and environmental organizations, regional health authorities, health care facilities and the producers of environmentally-responsible health care products and services to "green" Canada's health care system. This calls for a national strategy that should include at least the following components:

- research
- education and communications
- partnerships
  - governmental
  - non-governmental
  - private sector
- policy development
- establishment of model green health hospitals and other health care facilities
- recognition for achievement.

4.1 Research

Any effort to reduce the environmental impact of Canada's health care system needs to begin with an understanding of how large that impact is. However, no environmental and health impact of Canada's health care system has yet been undertaken. Accordingly, the Canadian Conference of Ministers of Health — either directly or through Health Canada and the Canadian Institutes for Health Research or other funding agencies — should consider undertaking or supporting the following:

- a comprehensive assessment of the environmental and health impacts of the Canadian health care system
- an assessment of the ecological footprint of representative health care facilities across the country
- the development of a tool for health impact assessment and/or the ecological footprint calculation that can be used by regional health authorities and individual health facilities.

In addition to understanding the overall environmental and health impacts of the health care system, it is important to identify those current policies and practices that have the most impact on the environment and human health. Accordingly, the Conference of Ministers of Health and/or Health Canada should consider undertaking or supporting research into the major environmental and health impacts of the health care system, including but not limited to

- the use of energy, in particular fossil fuels
- the use and/or emission of POPs, mercury and other toxic contaminants
- indoor air quality
- solid waste reduction

Research support could be sought from the Canadian Institutes for Health Research, the National Science and Engineering Research Council, CMHC, Environment Canada, Natural Resources Canada and other organizations with interests in these areas.

In order for the environmental impact of health care to be reduced, it is essential that decision makers within the health care system both understand the environmental health impacts of their activities and be aware of the alternative technologies, products and practices that are available and that would enable them to reduce that impact. Accordingly, the Conference of Ministers of Health and/or Health Canada should consider undertaking or supporting research into:

- the state of the art with respect to environmentally-friendly health care technologies, products and practices
- the compilation of case studies of the application of these technologies, products and practices.

A national data base, website or clearing house should be developed as part of the education and communications strategy to ensure that this information is made available to decision makers in the health care system.

4.2 Education and communications

There is an undoubted need to raise awareness among health care system decision makers, health care professionals and staff working in the health care system at all levels about the environmental implications of their activities and the ways in which they can help to reduce health care's environmental and health impact. The Canadian Coalition for Green Health Care is seeking funding and support to develop some or all of the following:

- articles in professional and academic health care journals and newsletters
- displays at health conferences
- presentations at conferences
- a "Green Health Care" newsletter (print and/or electronic)
- a green health care website and data base (established in September 2001 at www.greenhealthcare.ca)
- workshops and training programs
- videos and DVDs

These activities need to be supported by federal and provincial health and environment ministries, provincial health associations and others.

4.3 Partnerships

The Canadian Coalition for Green Health Care is seeking partners in research, education, communication and the development of policy. There are a wide variety of governmental, non-governmental and private sector partners who need to be engaged in the important task of greening health care. Key partners include:

- federal government partners
  - Health Canada
  - Environment Canada (sustainable development, pollution prevention, etc.)
  - Natural Resources Canada (energy conservation, etc.)
  - Human Resources Development Canada (training and development programs)
- inter-governmental groups
  - Canadian Conference of Ministers of Health
  - Conference of Deputy Ministers
  - Advisory Committee on Population Health
  - Advisory Committee on Occupational and Environmental Health
- provincial and territorial governments
  - Ministries of Health
  - Ministries of Environment
- health care organizations
- ENGOs
- private sector
  - energy conservation companies
  - clean or green energy organizations
  - manufacturers of environmentally-friendly health care products and technologies
  - manufacturers of low emissions construction materials, fabrics, fittings, furniture, etc.
  - hospital architects and engineers

One aspect of partnerships with private sector organizations that is worth considering is the potential export market for clean/green health care products, technologies, services and know-how. The issue of the environmental and health impacts of the health care system is international in scope, providing a possible opportunity for export development.

4.4 Policy development

Given that the management and operation of the health care system is almost entirely within provincial jurisdiction, the scope for national policy depends upon the ability to negotiate federal/provincial/territorial agreements. However, there are certain areas within which federal powers may be exercised, in particular the regulation of toxic contaminants and pollutants under CEPA and other legislation (see section 3.9), while Health Canada does operate a number of health facilities itself.

In addition to federal legislation and regulation, there is scope for the development of standards within the framework of the Canada-wide Standards Agreement, in areas covered by those agreements (ozone, mercury, air pollution, etc.). Within the context of those standards, agreements similar to those established between the EPA and the American Hospital Association or the Maine Hospital Association with respect to mercury and dioxins may be possible.

Other policy development initiatives that might be pursued include:

- Provincial Ministries of Health should require that hospitals be constructed and operated as models of energy-efficient buildings, as should Health Canada for hospitals and other health facilities it operates
- purchasing organizations should put in place environmentally-responsible purchasing policies
- hospital pension and Foundation funds should be invested in "green" or ethical investment portfolios
- Provincial Ministries of Health should require that hospitals be ISO 14001 certified, as should Health Canada with respect to its facilities.

Another aspect of "regulation" concerns standards for accreditation. Health Canada could work with the Canadian Council for Health Services Accreditation to help strengthen the environmental management standards for the accreditation of health facilities.

4.5 Model green health care facilities

One of the most effective ways to demonstrate the feasibility of greening and at the same time to provide an opportunity for demonstrating and researching the various aspects of environmentally responsible health care will be the development of model green hospitals and other health care facilities. Provincial Ministries of Health and Health Canada may want to consider working with hospitals, health centres, regional health authorities, and other partners to implement various aspects of environmentally-responsible health care. Some of these models could be specific to a single unit or service, while others might include an entire hospital or health centre.

A number of different sorts of health care facilities should be identified as models, including some of those identified in this report as current exemplars. Another source of recruitment might be the facilities that are already partners in the CCHSE Energy Innovators Program. At the very least, model facilities should include an academic teaching hospital, a community hospital, a remote/rural/northern hospital/health centre/nursing station, a community health centre, a family practice unit and a medical specialty centre. One obvious opportunity is to work with hospitals that are undergoing major renovation and redevelopment, or even better perhaps to work from the outset with a new hospital that is to be constructed, making it an ideally "green" facility.

Research funding should be sought from a variety of sources to enable an evaluation of the greening project to be carried out.

4.6 Recognition for achievement

HOSPITALS AND OTHER HEALTH CARE FACILITIES SHOULD BE recognized for the efforts they take to reduce their environmental and health impact. This might take the form of a Green Health Care Award (with several appropriate sub-categories for different facilities) as well as provincial awards and recognition. A model is provided by the "Green Hospitals" Award, established by the Queensland government in Australia in 1992 to encourage the development of environmentally-friendly policies and practices. Awards were given for large and small hospitals based on the quality of their environmentally friendly initiatives, extent of community involvement, the creation of a supportive environment for staff, their health promotion initiatives, their environmental policies and their future planning. Awards were also given for environmental innovations and for waste management (Gorey, 1994).

Such an award system could be established within existing programs (for example the CCME Environment Awards or the Lieutenant Governor's Award for Conservation in Ontario). Alternatively, an entirely new recognition and awards program could be established in conjunction with the Canadian Coalition for Green Health Care and its member organizations. (At the OHA Convention in November 2001, the OHA and the Canadian Coalition for Green Health Care will be jointly awarding the first provincial Green Health Care Awards in four categories: overall leadership, energy conservation, pollution prevention and community involvement.)

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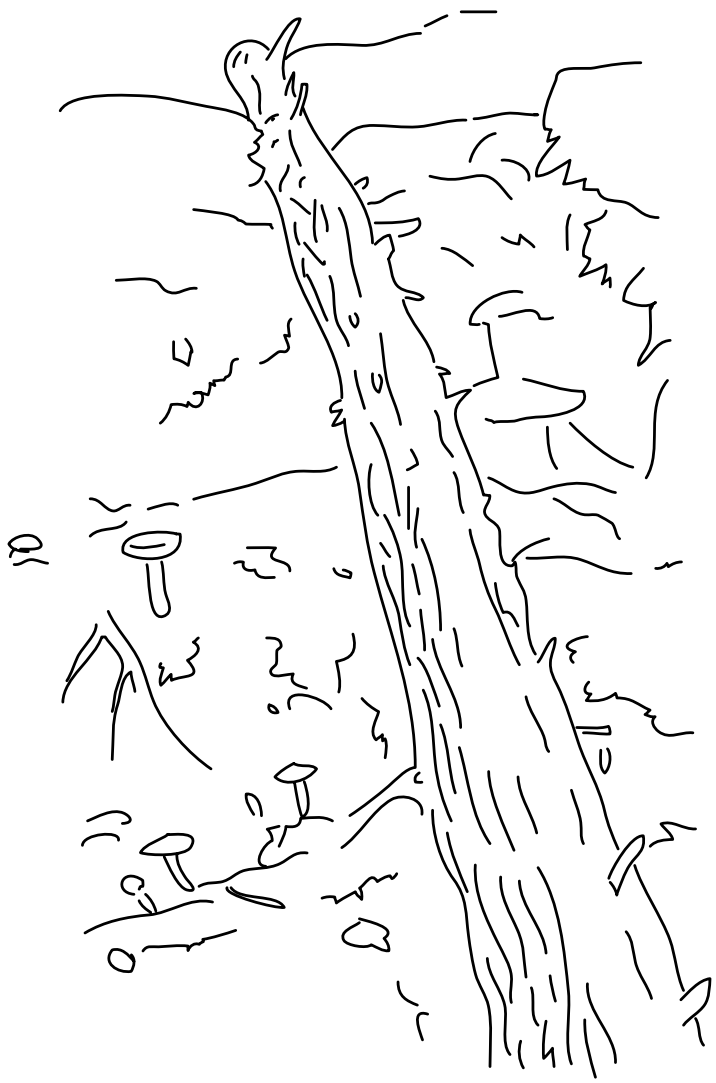

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Appendix 1:

Joint CNA/CMA Position Statement on Environmentally Responsible Activity in the Health Sector (May 1995)

Appendix 1

THE PURPOSE OF THIS STATEMENT IS TO EXPRESS THE commitment of both the Canadian Nurses Association (CNA) and the Canadian Medical Association (CMA) to increasing environmentally responsible activity within the health sector, thus helping to reduce the impact of environmental degradation on health, and preserving our ecological assets for current and future generations.

A healthy environment is fundamental to life, and attention to the effect of the environment on human health is imperative if we are to attain the goal of health for all. To achieve concrete results, environmental responsibility must be practiced at the individual level, in the workplace and in the home.

Economic activity in the health sector makes up close to 10 per cent of Canada's gross national product; as such the health sector's impact on the environment is great. The express purpose of health care is to increase the well-being of citizens. The health sector, however, contributes significantly to environmental degradation through the high use of energy and disposable items, and through technology such as sterilization equipment that contributes to the depletion of the ozone layer by releasing chlorofluorocarbons (CFCs) into the atmosphere. The challenge is to minimize this burden on the environment by integrating environmentally responsible practices into the delivery of health care.

This statement offers a vision of a "green" health sector and identifies strategies that both individual nurses and physicians, and their associations can use to help them achieve this vision.

Vision of "Green" Health Sector

IN A "GREEN" HEALTH SECTOR, MINIMIZING THE IMPACT ON THE environment would be a priority for individuals and organizations within the health care system in their day-to-day practice at all levels of decision-making.

While there are both health and financial reasons for reducing the negative impact of health sector activity on the environment, the most telling argument is ethical. The health sector, above all others, should be conscious of the health impacts of its operations and should seek to be as environmentally responsible as possible.

As decision-makers, caregivers and role models for healthy behaviour, nurses and physicians should encourage and implement measures to achieve environmental responsibility in the settings where they practice, and the health care system in general.

Challenges to the "Green Vision"

Many challenges impede the achievement of this vision, including:

- **failure to recognize the extent and urgency of the problem;**
- **low priority given to environmentally responsible practices among organizations;**
- **lack of awareness of available guidelines for environmentally responsible practice;**
- **lack of tools and structures to help guide the health sector in this area;**
- **high, short-term cost of new "green" technologies and programs; and,**
- **existing factors that encourage wasteful practice, for example:**

  1. increased diagnostic tests and paperwork related to fear of litigation, and,

  2. lifestyles and values that are difficult to change (for example, the convenience of disposable products).

CNA and CMA believe these challenges must be addressed, and will support and encourage activities that achieve environmentally responsible activity.

Appendix 1

Individual Practitioners

- Physicians, nurses and other health professionals are in an excellent position to provide leadership in implementing the principles of reduce, reuse, recycle, recover and re-educate. In individual practice this could involve:
  - minimizing paper and other office waste, for example, working to halt delivery of "junk mail" and to rationalize
  - packaging practices of suppliers;
  - avoiding indiscriminate use of disposable equipment;
  - using energy as efficiently as possible;
  - recycling plastic containers and other recyclable material;
  - observing safe disposal practices for:
    1. biomedical waste,
    2. plastic and nonrecyclable general waste,
    3. outdated medication, and,
  - encouraging health facilities to adopt environmentally-friendly organizational policies including:
    1. establishing strong and effective environmental improvement committees,
    2. in-house training in sound environmental practices,
    3. purchasing policies that emphasize safety and environmental soundness,
    4. creating a safe working environment, and,
    5. taking a lead role in implementing these policies where they exist.

In addition to environmental responsibility at the practice level, health professionals should serve as catalysts for change by becoming involved in activities in the community, such as advocating that decision-makers review the environmental impact of a proposed project before approving it.

Professional Associations

CNA and CMA believe that environmentally responsible activities within the health sector should be supported and encouraged.

Associations could provide leadership in the following ways:

- information sharing:
  1. supporting and encouraging educational initiatives for individual practitioners on environmentally responsible practices in a variety of health care settings,
  2. sharing information on successful practices nationally and among professional groups,
  3. encouraging research by health professionals and others on:
     a) the environmental determinants of health, e.g. health effects of contaminants, and
     b) ways the health sector can move towards environmentally responsible practices, e.g. minimizing waste production and practising safe waste disposal, and,
  4. supporting the efforts of all Canadians to find environmentally responsible ways to perform their daily activities;
- lobbying individual legislators and governments regarding the need to:
  1. initiate stricter legislation, e.g. reduce carbon dioxide emissions, and ban all use of CFCs before the end of this century,

2. initiate pricing policies that reflect the full environmental costs of goods and services, and,

3. provide incentives to promote the use of more energy efficient technologies and non-polluting energy sources; and,

- encouraging international professional bodies and their members to lobby their governments to promote sustainable environments, e.g. address the problem of toxic waste disposal in the Third World.

Conclusion

Protection of the environment is a health issue. The public perceives health professionals to be highly credible sources of information on health and the environment. The Canadian Nurses Association and the Canadian Medical Association view a "green" health sector as part of the bigger vision of a healthy environment in which people and societies choose to "tread lightly on the earth" in all their activities. We believe that health professionals should encourage greater environmental responsibility in all Canadians, and begin by setting the example of responsibility in their own personal and professional lives.

Appendix 2:

Green Health Care — Contacts and Resources

Appendix 2

Green Hospitals

Healthcare EnviroNet	*www.c2p2online.com*
Energy Innovators Project, CCHSE	*www.cchse.org*
Sustainable Hospital Project	*www.sustainablehospitals.org*
Health Care Without Harm	*www.noharm.org/*
Hospitals for a Healthy Environment (AHA/EPA)	*www.h2e-online.org/home.htm*

Healthy Hospitals

The Planetree Alliance	*www.Planetree.org*
WHO Health-promoting Hospitals Network	
Center for Health Design	*www.healthdesign.org*
Healthy Building Network	*www.healthybuilding.net*

Health Care and Environment Organizations

Canadian Association of Physicians for the Environment	*www.cape.ca*
Global Change and Health Program	*www.med.harvard.edu/chge/*

Environmental Organisations Working on Related Issues

Toronto Environmental Alliance/ HCWH	
Mercury Reduction Program, Pollution Probe	*www.pollutionprobe.org/*
The EPA's IAQ site	*www.epa.gov/iaq*
The Healthy Indoors Coalition	*www.healthyindoors.com*
The Evergreen Foundation	*www.evergreen.ca*

Coalition members to date are (in alphabetical order)

Canadian Association of Physicians for the Environment

Canadian Centre for Pollution Prevention

Canadian Council of Health Service Executives

Canadian Healthcare Engineering Society

Canadian Medical Association

Canadian Nurses Association

Canadian Public Health Association

Canadian Society for Environmental Medicine

College of Family Physicians of Canada

Environmental Health Clinic, Sunnybrook and Women's College Health Sciences Centre

Hospital for Sick Children, Toronto

Great Lakes United

Ontario College of Family Physicians (Environmental Health Committee)

Pollution Probe

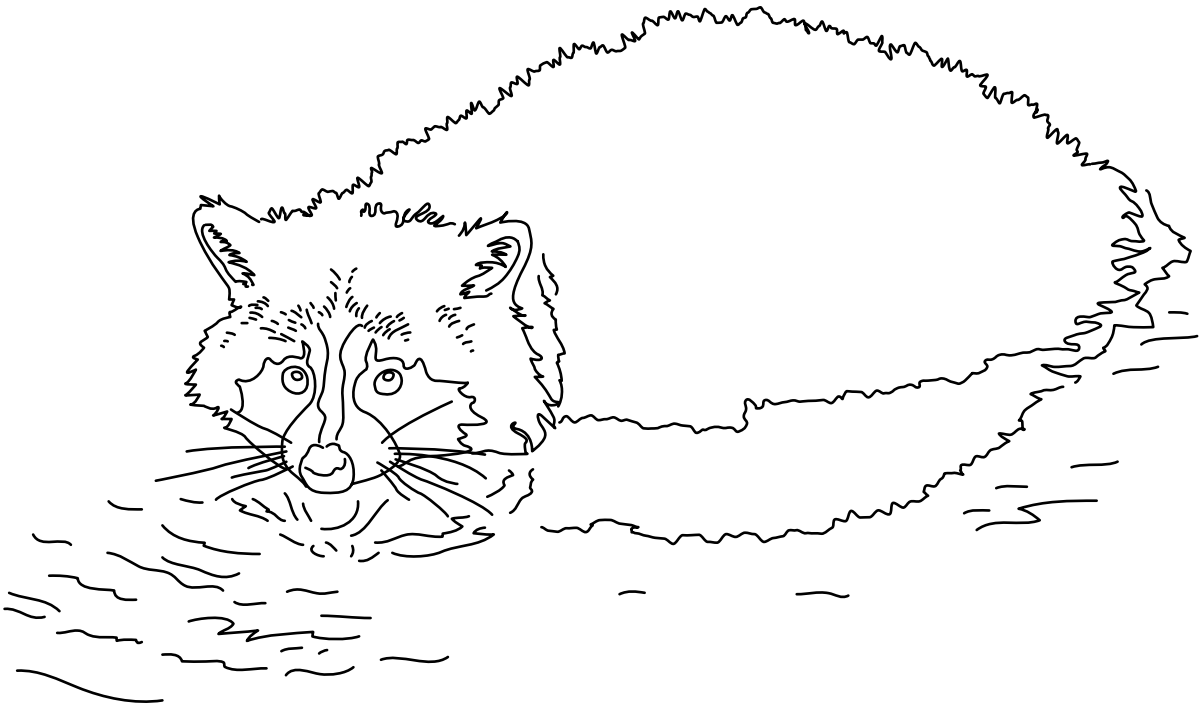
Toronto Environmental Alliance

University Health Network

University of Alberta Hospitals

Winnipeg Regional Health Authority, Laboratory Medicine Program

Doing Less Harm



The Canadian Coalition for Green Health Care
Coalition canadienne pour un système de santé vert

www.greenhealthcare.ca