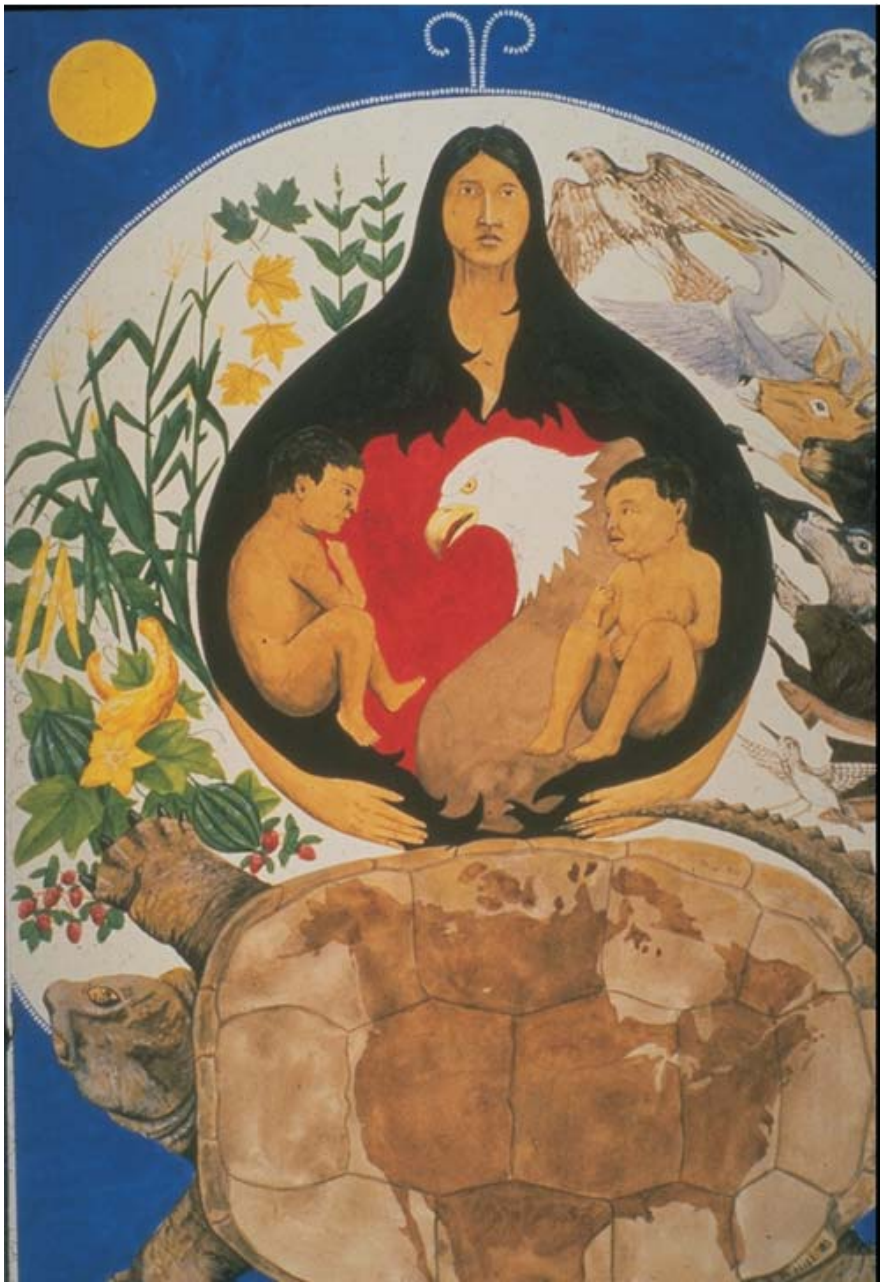
Health Canada Santé Canada

Canadian Handbook on Health Impact Assessment:

Volume 1: The Basics



Canada

About the cover illustration:

THE HAUDENOSAUNEE CREATION

Watercolour by Richard W. Hill, Sr.
Tuscarora, Six Nations

The Haudenosaunee Creation Story established the relationship of humans to the universe. We see the universe as a complex web of life, with each being connected in a spiritual way with each other being. The Universe is like a giant sphere, with the top half called the Sky World. Above us is the sky dome, seen in the painting as a beaded curve. Up in that sky world is a great magical tree of life. That tree, seen as the double curve above the woman's head, gives off bright light and has medicinal powers. The Sun, who we call our Elder Brother, and the Moon, who we call Our Grandmother, are connected to that Sky World light. The eagle connects us to that world above.

Once, a woman who lived in the Sky World, heavy with child, fell from above and was saved by the water bird who put their wings together to break her fall. The birds placed her on the back of the turtle. She had small plants and seeds from the Sky World that she planted in the mud that was placed on the back of the turtle. As she walked in an ever-increasing circle, she planted those seeds. New life was created on the Turtle Island. We live on the back of that giant turtle. We call North America the Great Turtle Island. We call that turtle island, Etinohah – Our Mother, the earth. Below the Turtle Island is a deep ocean with dark and mysterious creatures.

She gave birth to a girl, who herself was impregnated by a Turtle Spirit Man. He placed two arrows over her bed. One had a flint arrow head. She was to have twins, but one seemed to cause her trouble even before he was born. She could feel the boys wrestling inside her. That twisted-minded boy decided to be born in an unusual way and in doing so killed his own mother. His brother, who was First Born, had a kinder personality and went about creating nice things on the Turtle Island. When the body of the mother was buried, the four sacred plants grew from her body – corn, beans, squash and native tobacco.

Soon those boys held many contests to see who would have authority over the newly created earth. They wrestled with each other. They played lacrosse. They held many contests, but each to a draw. Finally, with help from the deer spirit, the Good-Minded Son defeated his brother and, in doing so, made the earth ready for humans. He took fresh mud from the Mother Earth and shaped two human figures from the clay – a man and a woman. He breathed into them and they came alive. They were the Original People and he taught them the Original Instructions about how to live in harmony with the earth, plants, animals and spirit forces.

The animals represent the family clans of the Haudenosaunee – hawk, heron, deer, bear, wolf, beaver, eel, snipe and turtle. We inherit the clan of our mother. Each clan is headed by the Clan Mother in honour of the Sky Woman and the Mother Earth. The plants represent those that we celebrate and give thanks to through our ceremonies – tobacco, maple tree, corn, beans, squash and strawberries. People are meant to live happy and healthy lives, but we must give thanks for all that the creation provides us and use it sensibly. It is a great gift of life.

CANADIAN HANDBOOK ON HEALTH IMPACT ASSESSMENT

VOLUME 1: THE BASICS

NOVEMBER 2004

A Report of the Federal/Provincial/Territorial Committee on Environmental and Occupational Health

Our mission is to help the people of Canada maintain and improve their health.

Health Canada

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The *Canadian Handbook on Health Impact Assessment* has a long history, evolving over time with input from a significant number of individuals. Only some are specifically mentioned here, though the contributions of all were crucial to the finalization of the *Handbook*. The *Handbook* was prepared under the general guidance of the Health Impact Assessment Task Force reporting to the Federal/Provincial/Territorial Committee on Environmental and Occupational Health (CEOH). The CEOH had membership from all provinces, territories, and the federal government. Membership on the CEOH and Task Force represented environment, health, and labour sectors. The Task Force members included representatives of Health Canada and Labour Canada, as well as the following representatives of provincial government bodies:

- Mark Allan, Department of Health and Community Services, New Brunswick
- George Flynn, Alberta Health, Alberta
- Pierre Gosselin, World Health Organization–Pan American Health Organization Collaborating Centre on Environmental and Occupational Health Impact Assessment and Surveillance, Quebec City University Hospital, Public Health Institute and Public Health Agency, Quebec
- Jerry Spiegel, Department of Environment, Manitoba

The *Handbook* started as a discussion paper prepared under contract by Kate Davies and entitled *The National Health Guide for Environmental Assessment: A Discussion Paper*. Consultations on the discussion paper took place in 1995 at six multisectoral workshops held in Dartmouth, Nova Scotia; Montreal, Quebec; Toronto, Ontario; Winnipeg, Manitoba; Vancouver, British Columbia; and Ottawa, Ontario.

Based on input from the 1995 workshops, a draft *Handbook* was written with contributions from several authors. Special thanks go to staff of Health Canada's Environmental Health Assessment Services for coordinating the preparation of the 1998 draft *Handbook*. In 2000, multistakeholder consultations on the draft *Handbook* were held in Dartmouth, Nova Scotia; Montreal, Quebec; Toronto, Ontario; Regina, Saskatchewan; Vancouver, British Columbia; and Ottawa, Ontario.

For both the 1995 and 2000 workshops, numerous provincial government and Health Canada regional staff assisted in the planning and delivery of and reporting on the workshops.

The final version of the *Canadian Handbook on Health Impact Assessment* was prepared on the basis of discussions at the workshops held in 2000 and contributions from several authors. Special thanks go to staff of Health Canada's Environmental Health Assessment Services, Healthy Environments and Consumer Safety Branch (HECSB), for their efforts in coordinating input to the *Handbook*.

Individual authors were involved in the writing of the various chapters of the *Handbook*. Their input is greatly appreciated. Significant contributions were made by Reiner Banken, Ugis Bickis, Marci Burgess, Pierre Chevalier, Wesley Cragg, Kate Davies, Pierre Dubé, Alan Emery, Pierre Gosselin, Philippe Guerrier, Henry Lickers, Pascale Méra, Robert Rattle, and Alain Webster; Industrial Economics Inc. in Cambridge, Massachusetts; and Health Canada staff in the Department's Environmental Health Assessment Services, the Biostatistics and Epidemiology Division, and the HECSB Office of Policy Coordination and Economics.

Finally, special recognition is given to Pierre Gosselin for his efforts in coordinating input into and finalizing Volumes 2 and 4 of this *Handbook*.

PREFACE

> Human beings are at the centre of concern for sustainable development. They are entitled to a healthy and productive life in harmony with nature.
>
> U.N. Conference on Environment and Development
> Rio de Janeiro, 1992

The environmental impact assessment (EIA) process is a comprehensive planning process to predict and assess the effects of a proposed project, program or policy. The recently released International Study on the Effectiveness of Environmental Assessment[1] identified social and health impact assessment as areas that are not considered or are inadequately treated in project environmental impact assessment. There has been a tendency in health impact studies to set up curative services to deal with the health problems created by a project instead of setting in place appropriate preventive strategies as an integral part of the original development.[2]

Human activities are intimately embedded in, and dependent on the natural environment, which is in turn impacted by human activities. Human activities and all our social constructs are a subsystem of the natural environment and are intrinsically dependent on the health of ecosystems. Human health is therefore embedded in and intimately dependent on the natural environment as well. However, environmental quality is only one variable affecting human health. A comprehensive definition of health, such as that provided by the World Health Organization, *"a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity"*, acknowledges the influence of the multitude of human social constructs and their complex inter-relationships. The influence of political, social, cultural and economic elements are all crucial determinants of human health. The interplay amongst these and the feedbacks

1. Sadler B (1996). *Environmental Assessment in a Changing World. Evaluating Practice to Improve Performance. Final Report of the International Study of the Effectiveness of Environmental Assessment.* Canadian Environmental Assessment Agency, Ottawa.
2. Slooff R (1995). Consultant's Report. *Commonwealth Secretariat Expert Group Meeting on Health Assessment as Part of Environmental Assessment*. Aberdeen, Scotland, 1-3 February 1995. Commonwealth Secretariat Publications, Marlborough House, London, SW1Y 5HX, ISBN 0-85092-499-9.

developed between them and the natural environment weaves a complex web of factors determining our quality of life, health and well-being. We need to manage human activities to recognize this complexity and evolve societies which can monitor, learn, respond and adapt rather than try to manage and control nature.

The World Health Organization's definition suggests a holistic interpretation of health linking the complex interrelationships between social, economic, political and cultural health determinants with the natural environment. Based on such a comprehensive definition, it is evident a proposed development project has the potential to create significant human health impacts. They may arise from direct and indirect influences of development, and result in cumulative and synergistic impacts, often characterized by complex cause-effect relationships. Given the environmental risks and uncertainties associated with increasing material and energy consumption from human activities, and the intimate relationship between human health and ecosystem health, the ability to predict, assess, understand and monitor the impacts of development projects on quality of life, human health and well-being is becoming ever more imperative.

Development projects are expected to have beneficial effects on health and well-being because they create jobs and provide other economic benefits that contribute to a better standard of living. Although there are exceptions, economic well-being has been repeatedly linked with longevity and other indicators of health because people with adequate incomes can afford to eat balanced diets and live healthier lifestyles. However, development projects also have the capacity to cause adverse effects on health and well-being at the individual and community level. Sometimes these effects are experienced by people who do not share in the project's benefits. One of the negative effects that can be associated with projects is related to physical health, such as mortality and morbidity from disease and injury. Social and community health may also be affected negatively where individuals face a loss of cultural identity and quality of life, social disruption and violence, and a breakdown of community and family support networks. Furthermore, socio-cultural well-being can be affected by increasing stress, anxiety, and feelings of alienation.

Creating changes in a community without learning from, or knowing what the impacts of those changes were, can generate uncertainties within the community leading to a loss of control over and deterioration of the quality of life and health of the community. Whether beneficial or negative, it is important to understand, assess and respond to changes and if possible, prevent or enhance them as determined. Communities might notice a marked decrease in their quality of life and health, yet be incapable of determining when or from what processes these changes emerged. On the other hand, their quality of life may have improved, yet without the knowledge of just where and when these

improvements began, enhancing such changes or duplicating them in the future or in other communities may prove difficult, and attempts to do so may be counterproductive.

Health need not be thought of as the end product of all the endeavours of society. Rather, it works the other way as well. The healthier the population, the more productive the economy will be, and the more sustainable our natural environment and resource base will be.

Roy E. Kwiatkowski
Chief, Environmental Health Assessment Services
Health Canada

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OVERVIEW OF THE HANDBOOK

Purpose

This *Handbook* examines the need and the procedure necessary to incorporate the assessment of human health effects in the EA process. The *Handbook* will make reference to the federal and provincial governments' legislated environmental assessment processes; however, the *Handbook* is not designed to address specific issues associated with the various legislative regimes. Instead, the *Handbook* is of a general nature, designed to provide guidance, irrespective of which EA process is used.

Scope

The *Handbook* seeks to assist individuals with health knowledge in the medical fields, social sciences and government/industry health experts to participate in the environmental assessment process.

Contents

The *Handbook* provides the answers to some commonly asked questions concerning health in EA. The following presents those questions and directs you to the appropriate section in the *Handbook*.

Q: What is meant by the term "health" and what are the principle determinants of health?

A: If you are aware that health encompasses not only the absence of disease or infirmity but also our physical, mental and social well-being, then you are on the right track. But if the nine determinants of health elude you, we encourage you to read Chapter 1.

Q: Why do we need environmental assessment (EA)?

A. EA is a decision-making tool designed to identify, predict, evaluate and mitigate the ecological and related health, social, economic and cultural implications of proposed human activities. EA legislation exists in each province as well as at the federal level. Please see Chapter 2 for more information about EA and Chapter 4 for information on EA legislation in Canada.

Q: Why should health be incorporated in the EA process?

A: Health needs to be integrated into EA to:

a) address public concern;
b) minimize the need for separate health and EA;
c) ensure cost effectiveness;
d) minimize the adverse and maximize the beneficial effects on health;
e) support the concept of sustainable development.

Please see Chapter 2 (page 2-16) for more information.

Q: How do you carry out an EA?

A: Steps to carry out an EA:

1. Describe project and determine whether or not an EA is required.
2. Scope or identify the key issues to be considered in an EA.
3. Assess the potential effects and determine their significance.
4. Identify mitigative measures to prevent, minimize or compensate for the impacts and monitor the project once it is in operation.
5. Make recommendations on the fate of the project and conditions attached to its approval.
6. Provide process for public participation throughout the EA.

For more information concerning the EA process, please see Chapter 2 (page 2-2) and consult the Glossary in the Appendix for definitions.

Q: What types of indicators should be used to assess potential health effects?

A: Baseline and/or predictive (modelling) information needs to be compared to the potential effects likely to be caused by the project. To obtain this information, the types of indicators required are direct measures of health (e.g., cancer incidence, injuries, changes in stress levels, etc.) and indirect measures of health (e.g., levels of toxic chemicals in human tissues, discharges of hazardous substances to the environment, etc.). To get a better understanding of the health indicators for use in EA, please see Chapter 3.

Q: Who takes part in the EA process?

A: The main players in an EA are the proponent, government departments/ministries or agencies, the public, the EA practitioner, including the health professional and decision-makers (please see Glossary). Aboriginal peoples are an important segment of the public that can aid in the EA process since they can contribute traditional knowledge.

Q: Are EAs being carried out only in Canada?

A: Although Canada is a world leader in the field of EA, EAs have evolved into an integral element of environmental policy not only in all of Canada, including Aboriginal lands, but also at an international level. Chapter 4 addresses EA in Canada, Chapter 5 discusses EA on Aboriginal lands and Chapter 6 deals with EA on an international level.

Q: What is the future outlook for health in EA?

A: The ability to sufficiently incorporate health considerations in EA is very encouraging although to date, this has not been achieved. Some of the issues that would assist in achieving this goal include: (a) increasing awareness and education; (b) strengthening cooperation between EA practitioners and health professionals; (c) assessing cumulative health effects; (d) dealing with risk perception; (e) greater public consideration and community action; and (f) improving the follow-up monitoring process. More information surrounding these issues can be found in Chapter 7.

Q: Where can I get more information?

A: At the end of each chapter, further information can be obtained for the topics of the corresponding chapter. Please see “Suggested Readings” at the end of each chapter.

INTRODUCTION: ROADMAP

Canada needs economic development to ensure a secure future. In the last 150 years, the production and consumption of Canada's natural resources and the resulting industrialization and urbanization have led to obvious improvements in the standard of living. Yet at the same time, these activities have been linked to new health problems; some related to environmental degradation. Chemicals and wastes contaminate water supplies. Airborne pollutants from industry, cars and other sources are changing the composition of the planet's atmosphere. Overcrowding, inadequate housing and poverty lead to poor sanitation and other health problems. Unsafe working conditions result in accidents, injuries, occupational diseases and lost productivity. It is clear that these activities cannot continue without further impacting human life or human and environmental health.

Canada's Goal

"Ensure that citizens today and tomorrow have the clean air, water and land essential to sustaining human health and the environment."

Life's Three Essentials
Environment Canada

As efforts to enhance Health Impact Assessment (HIA) with the EA process evolves, concerns grow about the data/information which must be gathered to meet scientific, political, public or legislative requirements. The resources required to obtain this data/information is also of concern. Development of a consistent scientific approach to environmental/human health impact assessment will focus efforts and diminish resource requirements, providing better information for decision-makers and the public.

History and Evolution of HIA

The key concepts and basics of Health Impact Assessment have evolved over the years in parallel with those of public health. HIA is rooted in the history of public health, and its evolution is reflected in a number of major conferences that have taken place during the past two decades.

At the Ottawa Conference in 1986, the World Health Organization, along with Health Canada (formerly Health and Welfare Canada) and the Canadian Public

Health Association, agreed on the *Ottawa Charter for Health Promotion*. The *Charter* sees health in the context of the interaction between the person and the environment. It recognizes the elements of our social environment, including peace, shelter, education, food, income, social justice and equity as prerequisites for health. For the first time at an international level, the *Charter* recognized the fact that our physical environment is important to health, and expressed the need for a "stable ecosystem and sustainable resources". As well, it called for the creation of a supportive environment.

After the adoption of the *Ottawa Charter*, the ***WHO Healthy Cities*** movement began to take form in 1986 and soon became the pilot project for the WHO. In line with "Think Globally, Act Locally", the slogan for the United Nations Environment Program, the *Healthy Cities* program has initiated long-term urban health and development initiatives which aim to improve the health and well-being of people living and working in cities (Tsouros, 1992). The philosophy of the movement is based on four key principles:

1) that health should be an integral part of settlements management and development;
2) that health can be improved by modifying the physical, social, and economic environment;
3) that conditions in settings such as the home, school, village, workplace, and city, profoundly influence health status; and
4) that intersectoral coordination for health is necessary at the local level.

The *Healthy Cities* approach seeks to ensure that health does not remain the exclusive affair of health departments and professionals, but that all development sectors and agencies, including those dealing with housing, local government, agriculture, industry, transport and planning, address health issues in their work. The **Municipal Health Plan** process, involving the collaboration of many different agencies and the use of urban indicators to help us better understand our cities, is a useful tool for removing barriers to integrative approaches, and makes use of communication, education, and information transfer.

Over the last decade, the *Healthy Cities* project has generated a large amount of practical knowledge concerning strategies and structures for more integrated approaches to health and development at the local level. Examples from all continents were reviewed during the *Habitat II Dialogue* in June, 1996. Networks of cities in all regions of the world have been formed to make health an integral component of settlements planning and management.

In Canada, the **Healthy Communities Project** and **Villes et Villages en Santé** were developed in the late 1980s under a joint venture of the Canadian Institute of Planners, the Canadian Public Health Association, and the Federation of Canadian Municipalities. It helps communities build a commitment to healthy environments through projects, communication, and cooperation. More than 100 municipalities across Canada participated in this effort.

In the early 1990s, a second initiative called **Strengthening Community Health** supported strategies for community collaboration and greater citizen participation. Sponsored by the Canadian Public Health Association, with funding from Health Canada, the initiative resulted in a wide variety of undertakings. These range from creating provincial networks for coordination and communication to sponsoring local workshops for skills development and training.

The **United Nations Conference on Environment and Development**, also called the **Earth Summit**, was held in Rio de Janeiro in 1992, and with recommendations from the WHO Commission more than 150 member states adopted *Agenda 21* – an action plan to guide future strategies for health and environment activities on a national and an international level. The Rio process had its roots in the 1972 Stockholm Conference on the environment. In the 20 years between Stockholm and Rio, global environmental threats and the link between environment and development and human well-being became recognized, and the concept of "sustainable development" became a mainstream issue with the Brundtland Commission (WCED, 1987). The international consultation process established in Rio will continue for the next five years.

The WHO Commission also acknowledges that good health and well-being can neither be attained nor maintained in hazardous or deteriorating environments. The WHO has developed a nine-step procedure for integrating health into EA (WHO, 1987). In fact, the WHO's new "paradigm for health: a framework for new public health action", states the following:

> Human health should be seen in a physical, social, behavioural, and ecological context. In this holistic model, promotion of health plays a prominent part. Health promotion activities should involve other sectors making a contribution to health, such as education, food, nutrition, and environment.
>
> WHO, 1987

In evaluating progress made since Rio concerning environmental threats to human health, the WHO acknowledges the changing pattern of environmental health hazards and associated health risks, moving from "traditional hazards" (poverty and insufficient development) to "modern hazards" (rapid development and consumption of natural resources). With time and economic development, it has come to be known as the "risk transition". A health-and-environment cause-effect framework was developed, inspired by work on "sustainable development indicators" by the OECD (1993) and CSD (1996). It simplified the complex cause-effect relationships operating between driving forces, environmental pressures, environmental states, human exposures, health effects, and actions aimed at minimizing these effects (WHO, 1997).

A decade after the Earth Summit: Since the Rio Conference (1992) and the adoption of *Agenda 21*, the follow-up and up-to-date assessment of the impact of environmental hazards on health at the local, national, and global levels are still a major preoccupation. Many international conferences on health and environment have stressed that sustainability concerns relate not only to the environment, but also to a whole range of social, economic, and political factors. Among these components of sustainability, however, health in particular stands out. Health has become a concern not only for the "health sector", but also for almost every sector in society.

(For more information on environmental assessment and HIA on an international level, see Volume 1, Chapter 6).

Health Impact Assessment Task Force

To promote the concepts of health impact assessment within Canada, the Federal/Provincial/Territorial Committee on Environmental and Occupational Health (which has membership from health, labour and environment) established a Health Impact Assessment Task Force (four federal and four provincial representatives) in September of 1992. The Task Force was asked to produce guidance material to help proponents of projects, intervenors, government agencies, and EA practitioners identify valued components within environmental/human health assessment.

Mandate of Task Force:

- To provide advice, share information and foster communication among federal, provincial and territorial agencies, industry, universities and consultants on health impact assessment (HIA).
- To encourage coordination and harmonization of approaches to HIA.

- To improve awareness of the linkages among environmental, socio-economic, cultural and human health effects.
- To carry out workshops to address specific information exchange needs on HIA.
- To assess the need for a registry of databases on HIA.

Principles to be followed by the Task Force:

- The World Health Organization's definition of health is accepted by the Task Force.
- Environmental and human health are inextricably interlinked and therefore, HIA is an integral part of Environmental Impact Assessment (EIA).
- A cornerstone of HIA is the recognition of the need for public participation in the definition and scoping of human health concerns, and in decision-making.
- HIA is required throughout the life cycle of the project (planning, construction, operation, decommissioning and follow-up monitoring) and takes into consideration occupational health and safety.
- Development of a scientific approach to HIA will focus efforts and diminish resource requirements, providing a fair, effective and efficient process of information gathering for decision-makers and the public.
- Educational tools are required to promote or increase awareness of environmental/human health assessment, risk assessment and communication, and the linkages among environmental, social, economic, cultural and human health effects.

Six regional, multi-sectoral workshops, sponsored by the Task Force, were held in 1995 and 1996 (Health Impact Assessment Task Force, 1996). There was a consensus at all of the workshops that guidance material on health impact assessment within EA is needed in Canada and that it should include advice on assessing effects on socio-cultural health and occupational health, as well as physical health. This would be consistent with the World Health Organization's definition of health and the known determinants of health (Federal, Provincial and Territorial Advisory Committee on Population Health, 1994).

It was suggested that because different people have different levels of familiarity with the issues associated with including health in EA, there may be a need to prepare more than one guidance document. Participants stressed that the guidance material should be flexible and adaptable to circumstances in different provinces and that it should not be prescriptive.

The resulting document – the *Canadian Handbook on Health Impact Assessment* – consists of four Volumes reflecting the requirements which stakeholders identified. The *Handbook* consolidates the ideas expressed at the six workshops held in 1995-96 on the role of health professionals in EA, and aims to encourage and promote an integrated approach to developing a human health perspective within the framework of EA.

Volume 1 of the *Handbook* introduces the concepts of health impact assessment and presents the rationale for the necessary presence of the health sector in the area of environmental assessment, as well as a summary of current practices in Canada and other countries. Volumes 2, 3, and 4 are practical extensions of the first Volume. Volume 2 presents criteria for conducting an HIA within the context of EA and provides examples of impacts as a reference for health professionals, based on principles of sustainable development. Volume 3 of the *Handbook* provides a summary of stakeholder values, social impact assessment, economic evaluation, indigenous HIA, environmental epidemiology, occupational health and safety, and contaminants in foods. Volume 4 outlines the environmental and health impacts of implementing development projects in each of Canada's major economic sectors.

Volume 1

This volume, *The Basics*, focuses on the need for and components of HIA within EA. It does not address the need for and components of EA directly, other than where necessary to understand the role of HIA. (Reference documents on EA can be obtained from the Canadian Environmental Assessment Agency for the federal EA process and provincial/territorial EA administrators for provincial/territorial EA processes).

The need to incorporate full health considerations into the EA of projects is the underlying theme of all the chapters of Volume 1:

- Basic concepts inherent to health: the WHO definition of health; determinants of health (e.g., income and social status, education, employment, physical environments, biology and physical endowment, social support networks, and health services); and the benefits and adverse effects of development projects (Chapter 1).
- Basic concepts in environmental assessment: definition and schematic of EA; identifying key players in an EA; a description of the steps in the EA schematic and examining health within the specified stages of EA (Chapter 2). These concepts and those covered in Chapter 1 lay the groundwork for the remainder of the *Handbook*.

- Health indicators for use in EA: indicators as valuable tools to assess and predict the impacts of projects; the effective use of health information; and contacts for information on public and occupational health (Chapter 3).
- Environmental assessment within the Canadian context: progress and achievements in EA; an overview of Canadian federal, provincial and territorial legislation and regulation; and the consideration of health within this legislation (Chapter 4).
- Aboriginal health and traditional knowledge: Aboriginal definition of health; health impacts on Aboriginal communities; EA on Aboriginal lands; fiduciary duty; and health within the context of traditional knowledge, and future prospects for including this knowledge in health considerations (Chapter 5).
- Environmental assessment on an international level: the current international situation; environmental factors most pressing on human health; actions of the WHO and other agencies; and progress around the world (Chapter 6).
- Forging ahead: future challenges and the necessity to effectively incorporate health considerations into EA; strengthening cooperation between EA practitioners and health professionals; the need for greater public consideration and community action; improving the follow-up monitoring process and future volumes of the *Canadian Handbook* (Chapter 7).

Volume 2

The second volume, *Approaches and Decision-making*, focuses on the procedures to follow when evaluating the environmental and health impacts associated with the implementation of a project or program in a given region. The discussion includes criteria for conducting a health impact assessment and several examples of impacts of development projects as a guideline for public health professionals.

The environmental assessments conducted in Canada vary considerably in scope, depending on the requirements of the provinces and the federal government. It would be impossible to cover the entire range of methodologies and disciplines which are available or useful. Volume 2 focuses on those that are likely to require the expertise of local or regional public health authorities.

The roles normally expected of public health authorities in an environmental impact assessment are: 1) to participate in the process, be it public or strictly administrative, in order to clarify specific EA requirements relating to health; 2) to comment on the studies submitted by project and program proponents; and, 3) to offer their views regarding the acceptability of projects under review, from a public health perspective.

The discussion of the procedures and criteria for an HIA in relation to the implementation of a development project comprises six chapters addressing the following topics:

- Useful concepts in environmental assessment: determinants of health; types of EAs; and the role of health professionals and criteria for their involvement in HIA within the context of EA (Chapter 2).
- Sustainable development (SD) and health: SD as a framework for integrating the risks and benefits to public health, the principles involved, and developing and implementing projects based on these principles (Chapter 3).
- Analyzing health risk data: types of data and common problems in conducting an analysis (e.g., in relation to spatial and temporal scale, risk groups, workers, new technologies, and methodologies) (Chapter 4).
- Risk management tools: framework and methods for risk management, including the current approach in Canada, and the underlying risk management principles and their connection with EA (Chapter 5).
- Public health notices and interventions in EA: advice on preparing a public health notice, and a summary of advantages and disadvantages (Chapter 6).
- Communication and credibility: development of a process for communicating credibly and effectively with the public; preparing a communications strategy; and useful ethical principles for EA (Chapter 7).

Volume 3

Volume 3, *The Multi-disciplinary Team*, addresses key concepts and issues which traditionally had not been adequately considered within the context of environmental assessment and health impact assessment – for example, due consideration of stakeholder values, social impact assessment, economic evaluation of development projects, indigenous HIA, environmental epidemiology concepts and methods, and occupational health and safety, and contaminants in food.

The third Volume expands on important elements of Volume 1 with respect to determinants of health, health indicators, Aboriginal health and traditional knowledge, risk perception, and greater public consideration and community action. It is also consistent with Volume 2 regarding the role of health professionals, the development and implementation of projects based on sustainable development principles, and the importance of credible communication with stakeholders, including the general public. As well, the concepts and principles outlined in Volume 3 are applied to the Volume 4 discussion of the impacts of development projects in Canada's major economic sectors.

Specifically, the major topics presented in Volume 3 comprise the following key concepts and issues which are increasingly recognized as essential to the conduct of effective and accepted HIA within the context of EA:

- Values, health, and environmental assessment: incorporation of stakeholder values into EA, including identifying and understanding the full range of relevant values; and guidance on how to build these values into the EA process (Chapter 2).
- Social impact assessment in EA protocols: linkages between SIA and HIA; the key steps and benefits of SIA; public involvement and misconceptions; the types of social impacts; methods and tools in SIA; and challenges facing SIA practitioners (Chapter 3).
- Economic appraisal/evaluation of projects: basic elements and principles of economic analysis; methods to valuate health effects; benefit transfer techniques (e.g., in valuing morbidity and mortality risks); and integrating the valuation of health impacts into the overall economic evaluation or projects (Chapter 4).
- Indigenous HIA: naturalized knowledge systems; a comparison of indigenous and non-indigenous health-related EA methods; and indigenous community health indicators and the process and methodology for developing them (Chapter 5).
- Environmental epidemiology and health impact assessment: epidemiological study designs (e.g., experimental studies and observational studies); data sources for epidemiological HIA (e.g., population data, disease/health outcome data); and a suggested approach for HIA, incorporating health, occupation, environment, and the use of prospective data (Chapter 6).
- Considerations relating to worker health protection: occupational health risks and HIA; facets of, and professional disciplines in, occupational health; occupational / environmental hygiene; occupational disease and its prevention, including the use of occupational exposure limits as a tool; occupational hygiene applied to HIA, including aspects of biological monitoring; pitfalls of occupational hygiene in HIA; and an appendix on guidelines on the selection of an occupational hygiene specialist (Chapter 7).
- Food issues in environmental impact assessment: potential contaminants, available foods, and exposure pathways; hazard assessment – toxicology; food consumption information; monitoring and background data; human health risk assessment; risk assessment and risk management (Chapter 8).

Volume 4

The fourth volume of this *Handbook*, *Health Impacts by Industry Sector*, presents a discussion of the environmental and human health impacts associated with development projects and activities in major sectors of the Canadian economy, with a focus on public health.

Volume 4 applies the health impact assessment concepts, techniques, and tools outlined in Volumes 1 and 2 to examples of environmental assessments of development projects in each of eight major economic sectors. It also incorporates the concepts and approaches presented in Volume 3 with regard to the economic context, social impacts, Aboriginal values and considerations, and occupational health and safety.

As mentioned earlier, the EAs carried out in relation to these economic sectors can vary considerably in scope. The types of projects described in Volume 4 are those that are likely to involve local or regional public health authorities. This Volume offers guidance for public health professionals in conducting HIAs and presents examples of the application of HIA to development projects in the various economic sectors.

The impacts addressed in Volume 4 include those on the biophysical environment and on human health (including psychosocial impacts and quality of life), as well as socioeconomic impacts. The range of environmental and health hazards generally include atmospheric emissions, food and water pollution, and soil pollution; emergencies and disasters; psychosocial concerns; and technological hazards, among others.

The basic structure of each of the chapters in Volume 4 is similar and includes information on the Canadian context of each sector, a socioeconomic overview, and background information on the technical aspects of the sector and development projects of interest. Each chapter is rich in descriptive and technical detail on the nature of each sector, and on the environmental hazards and health impacts of development projects. In the discussion of the types of environmental and occupational hazards and related public health impacts/risks, representative projects have been selected to illustrate the diversity of each sector within the context of EA and the wide range of health impacts that can arise.

One of the very useful features of the information in Volume 4 is the inclusion of a matrix of environmental and health impacts for major development projects in each of the eight economic sectors (for example, in the energy sector: hydroelectric dams, cogeneration power plants, nuclear power generation). These matrices consist of a biophysical environment and a human health component, and are a handy tool for organizing and analyzing the wealth of technical

information on environmental hazards and health impacts for any given project. Two detailed appendices are also provided: the first (A) addresses air quality and related health effects; and the second (B) outlines occupational health and safety considerations for each economic sector.

The chapters comprising Volume 4 address the environmental, human health, and social impacts of development projects in the following Canadian economic sectors:

- Energy: hydroelectric dams; co-generation power plants; transportation and liquefaction of natural gas; and nuclear power generation, including fuel and reactor wastes (Chapter 2).
- Transportation and communications: road construction; high-voltage power transmission lines, including the effects of electromagnetic forces; maintenance of power line rights-of-way; and airport construction, expansion and operation, including emergencies and disasters (Chapter 3).
- Forestry: the use of herbicides (e.g., glyphosate) and mechanical clearing in forest regeneration; and the use and effects of the bacterial insecticide *Bacillus thuringiensis* (Chapter 4).
- Mining: fundamentals of mining operations; gold mining (extraction methods, acid mine drainage, mine tailings); and uranium mining and human health concerns, particularly occupational risks (Chapter 5).
- Agriculture: hog production and associated wastes and pollution; and pesticide use in apple production (Chapter 6).
- Waste management: landfilling, including the hazards and effects of biogas and leachate; and atmospheric emissions and solid wastes associated with waste incineration (Chapter 7).
- Wastewater and sludge management: wastewater treatment plant construction and operation; management of municipal wastewater treatment sludge, including incineration; agricultural and silvicultural use of sludge; and septic tank sludge (Chapter 8).
- Manufacturing industries: atmospheric, liquid, and solid waste pollutants and related health effects of aluminum production and pulp and paper production (Chapter 9).

All four Volumes of the *Handbook*, as well as revisions and updates, are available by Internet at:

http://www.hc-sc.gc.ca/hecs-sesc/ehas/index.htm (english);

http://www.hc-sc.gc.ca/hecs-sesc/sehm/index.htm (french)

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1 LEARNING THE BASICS ABOUT HEALTH

To effectively incorporate health considerations into an environmental assessment, it is necessary to understand some basic concepts. As such, this Chapter will:

- Define health
- Outline and examine the determinants of health
- Discuss beneficial and adverse effects of projects on health
- List suggested readings

Defining Health

Our health is primarily our own responsibility. Government's job is to provide citizens with accurate and appropriate information so that they can protect themselves. People have their own idea about what is meant by the term "health". Acknowledging a specified definition of health, however, is the first step to promoting consistent procedures. Federal, provincial and territorial governments and health officials have accepted the World Health Organization's (WHO) definition of health:

Health

"a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity"

World Health Organization, 1967

and,

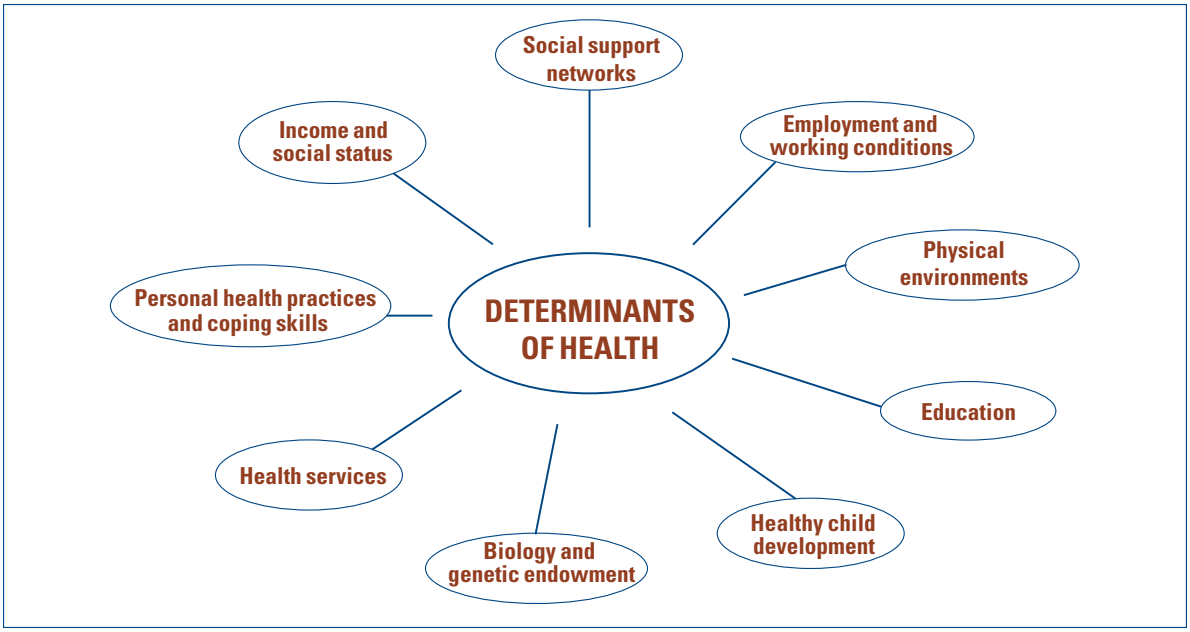
"the extent to which an individual or a group is able, on the one hand, to realize aspirations and to satisfy needs, and on the other, to change or cope with the environment"

World Health Organization, 1984

Outlining and Examining the Determinants of Health

This definition of health clearly indicates that health is more than the absence of sickness and disease. Health encompasses social, economic, cultural and psychological well-being, and the ability to adapt to the stresses of daily life. A recent Canadian report by the Federal, Provincial and Territorial Advisory Committee on Population Health (1994), examined the issue of what makes people healthy and identified the "determinants of health" shown in Figure 1.1:

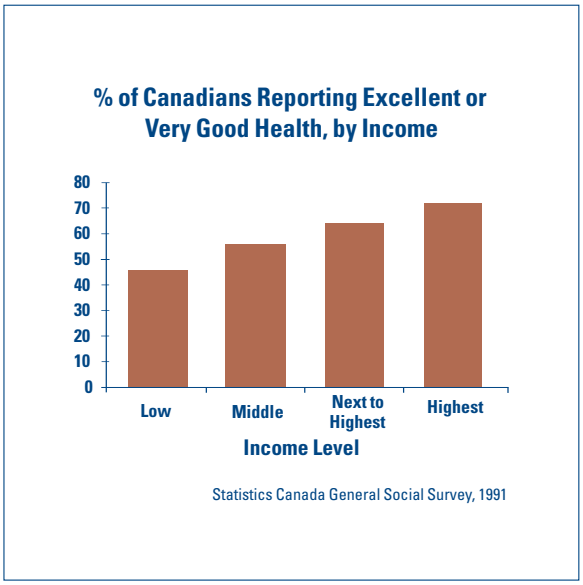
Figure 1.1
Outlining the Determinants of Health

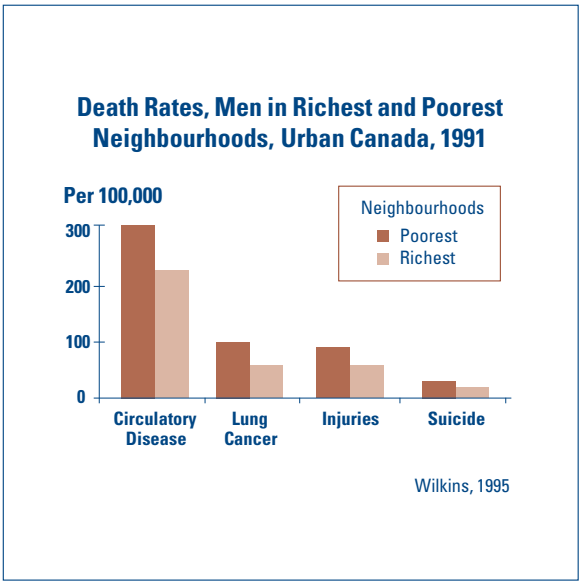


A closer examination of the determinants of health as identified by the Federal, Provincial and Territorial Advisory Committee on Population Health might clarify why they are so important to our health and happiness. Four of these categories – income and social status, education, biology and genetic endowment, and personal health practices and coping skills – relate to the individual whereas the other five categories relate to the collective conditions that provide the basis for the individual categories. Although these factors are important in their own right, they are interrelated.

Income and Social Status

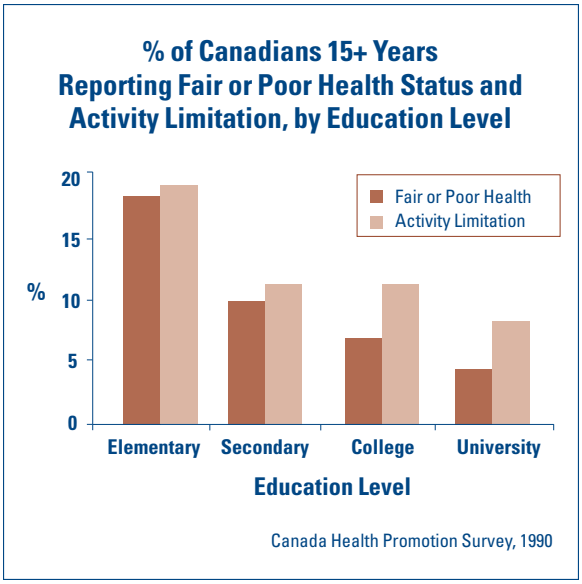
Growing evidence from the Federal, Provincial and Territorial Committee on Population Health indicates that income and social status is the most important determinant of health. People perceive themselves as being healthier the higher their socio-economic status and the higher their income level. This may be surprising considering we have a health system that provides virtually equal access for all Canadians, regardless of their income. Yet studies in provinces, territories and cities throughout Canada consistently indicate that there is not only a difference between people in the highest and lowest income scale, but that people at *each* step on the income scale are healthier than those on the step below. Furthermore, many studies demonstrate that the more equitable the distribution of wealth, the healthier the population, regardless of the amount spent on health care.





Education

For a variety of reasons, health status improves with an increasing level of education. Education improves opportunities for employment, income, job security and job satisfaction and equips people with knowledge and skills necessary for problem solving. People also have more control over their work environment and are better able to access and understand information to help them stay healthy.



Employment and Working Conditions

Unemployment is linked to poorer health: the unemployed experience significantly more psychological distress, anxiety, health problems, hospitalization, etc., than the employed. Within the employed population, however, other factors that negatively affect health include stress-related demands of the job and the frequency of deadlines. Workplace support is measured by the number and quality of interactions with co-workers. The more connections people have, the better their health. Finally, workplaces that are not conducive to preventing workplace injuries and occupational illnesses also decrease health status.

Physical Environments

Health is critically dependent on the elements in the natural environment such as the air we breathe, the water we drink, and the food we eat. Factors in our human-built environment such as housing, workplace and community safety have equally important influences on health.

Biology and Genetic Endowment

The organic make-up of the body, the functioning of various body systems and the processes of development and aging serve as fundamental determinants of health. Biological differences between the sexes and the traits and roles that society ascribes to females and males form a complex relationship between individual experience and the development and functioning of key body systems. At the same time, genetic endowment predisposes certain individuals to particular diseases or health problems.

Social Support Networks

The support which families, friends, and communities provide contributes to improved health. Social support networks can help people cope with daily stresses and solve their problems. "The caring and respect that occurs in social relationships, and the resulting sense of satisfaction and well-being, seems to act as a buffer against health problems" (Strategies for Population Health, 1994).

> "Studies show that the more social contacts people have, the lower their premature death rates."
>
> Berkman, 1979

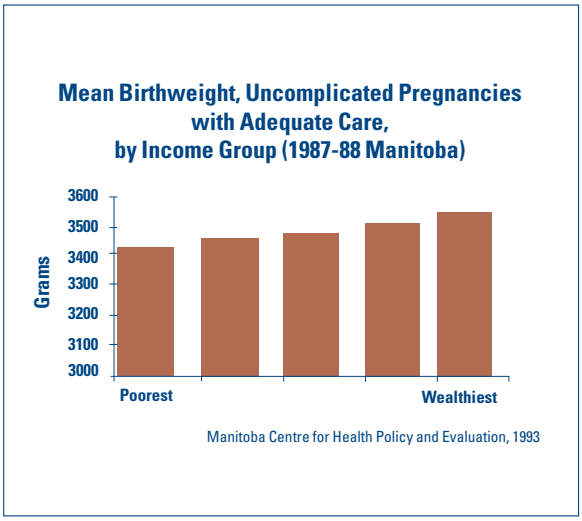
Overall, most Canadians report access to a substantial level of support. Females reported a higher level of support (86%) than males (80%). High support was found to be most prevalent in adolescents with a gradual decline of support with age.

Personal Health Practices and Coping Skills

Social environments that promote healthy choices and lifestyles are linked to improved health. A balanced diet and regular exercise have been shown to provide substantial health benefits while tobacco and excessive consumption of alcohol are linked to many of the most common health problems. The way people react to stresses and events which they encounter in their day-to-day lives demonstrates their coping skills and how self-reliant or able they are in solving problems to make informed choices that enhance health.

Healthy Child Development

The significant decreases in maternal and infant death rate over the last 60 years have had a profound impact on Canadians' life expectancy. Mounting evidence indicates that prenatal and early childhood experiences have a powerful influence on subsequent health, well-being, coping skills and competence. Not only are infants with low weights at birth more susceptible to infancy deaths, neurological defects, congenital abnormalities and retarded development, they also experience negative effects later in life which can include premature deaths. Of further interest, a strong correlation exists between a mother's level of income and the baby's birth weight; mothers at each step up the income scale have babies with higher birth weights, on



average, than those on the step below. Finally, the degree of prenatal care at an early age also influences a child's coping skills and health for the rest of their lives.

Health Services

Health care services contribute to health status, particularly when they are designed to maintain and promote health and prevent disease. Services such as prenatal care, immunization and those that serve to educate children and adults about health risks and choices all serve to improve health. On the flip side, environmentally sustainable practices can improve population health and help reduce costs to the health care system.

In 1994, Canada spent an estimated $72.5 billion on health, or $2,478 per person.

Health Canada, 1996

The determinants of health, specifically the living and working environments, community cohesiveness and health services are important factors in shaping the health and well-being of an individual or a community. At the same time, economic development provides jobs, income and social status which can promote health by allowing the community to afford and promote well-being. As such, individuals accept a huge responsibility in shaping their health.

Health Promotion

"Health promotion" through community support is an important method enabling people to gain greater control over the determinants of their own health. This concept is also tied to the social learning theory which supports the notion that people self-regulate their environments and actions; and despite being acted upon by the environment and their surroundings, people also create their surroundings (Green & Kreuter, 1991).

"Health promotion is the process of enabling people to increase control over and improve their health."

CPHA, 1995

Improving community health also requires collaboration among a variety of sectors – not only for the general population, but particularly for vulnerable groups which experience lower health status than others. Gender is gaining recognition as another determinant of health because of the lower health status experienced by women. Lower income and social status, longer lifespans implying more disability and illness than men, and increasing stresses between work and tending to the family negatively affect women and lower their health status. Of greater severity is the situation among Aboriginal peoples, who have the poorest health status among Canadians. Aboriginal people experience significantly higher infant death rates

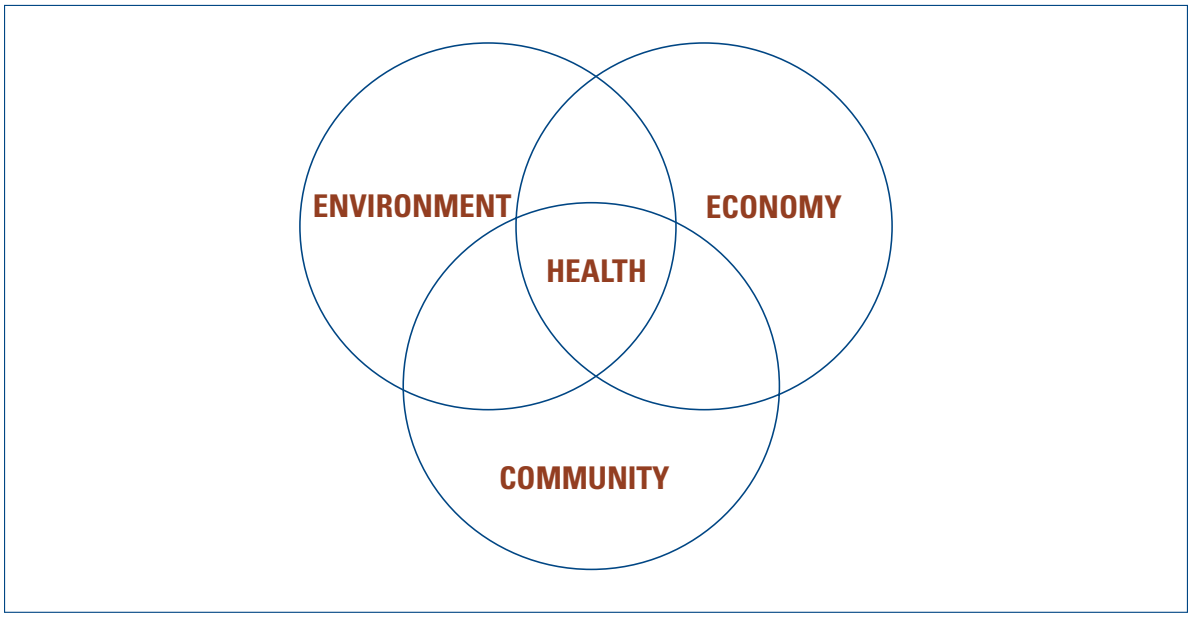
and much higher disease rates than the rest of Canada. As such, government and non-government organizations need to work together to implement strategies targeting vulnerable groups. Community initiatives, particularly at the local level have proven to be an effective means of improving health.

Investing in a population health approach offers benefits in three main areas:

- increased prosperity because a healthy population is a major contributor to a vibrant economy;
- reduced expenditures on health and social problems; and
- overall social stability and well-being for Canadians.

With this in mind, one is able to understand how the environment, economy and community are interrelated with health. Figure 1.2 provides a holistic or EA approach which recognizes that economic health, environmental health, and the health of the community are inextricably linked.

Figure 1.2
Holistic Approach of EA (modified from Hancock, 1990)



Human health depends in a fundamental way on the environment as both a source of resources and a sink for wastes. It is also true that environmental quality is more likely to be properly respected if the economy is healthy. In the past, most decision-making for health, the environment and economic development has been conducted separately. The challenge now is to better understand the links between health, the environment and economic development, and to develop ecosystem-based decision-making processes that integrate these considerations. Environmental assessment (EA) is recognized within Canada, as well as internationally, as a primary decision-making tool for maintaining and enhancing environmental quality while carrying out economic development.

Beneficial and Adverse Effects of Projects

Most projects requiring EA are expected to have beneficial effects on health and well-being because they create jobs and provide other economic benefits that contribute to a better standard of living. Although there are exceptions, economic well-being has been repeatedly linked with longevity and other indicators of health because people with adequate incomes can afford to eat balanced diets and live healthier lifestyles. As well, a health economy is necessary to pay for health care services.

Projects also have the capacity to cause adverse effects on health and well-being at the individual and community level. Sometimes these effects are experienced by people who do not share in the project's benefits. One of the negative effects that can be associated with projects is related to physical health, such as mortality and morbidity from disease and injury. Social and community health may also be affected negatively where individuals face a loss of cultural identity and quality of life, social disruption and violence, and a breakdown of community and family support networks. Furthermore, socio-cultural well-being can be affected by increasing stress, anxiety, and feelings of alienation.

Now that health and the determinants of health have been identified, we will look at environmental assessment (EA) and discuss the health component within the stages of EA.

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2 LEARNING THE BASICS ABOUT ENVIRONMENTAL ASSESSMENT

To better understand environmental assessment, this Chapter will describe the basics of EA by:

- Defining environmental assessment (EA)
- Identifying the players in EA
- Providing an EA schematic
- Describing the steps in the EA schematic and examining health within the specified stages of EA
- Tying Things Together: health as an integral component of EA
- Listing suggested readings

Getting Started: Defining Environmental Assessment (EA)

Since its inception in the early 1970s, EA has become an effective decision-making tool to assist decision-makers in ensuring the integration of economic development and important environmental issues. EA is designed to anticipate and prevent adverse effects of projects. Simply put, EA involves determining any changes or impacts that a project or action will have on our surroundings – be it positive or negative effects – before that project is carried out in order to prevent irrevocable damage from occurring. Thus, environmental assessment[1] can be defined as:

1. For the sake of convenience, this *Handbook* will use the term "environmental assessment" (EA) synonymously with the term "environmental impact assessment" (EIA), environmental assessment review, and impact assessment.

Environmental Assessment (EA)
a comprehensive and systematic process, designed to identify, analyze and evaluate the environmental effects of a project in a public and participatory manner; environmental assessment involves the use of technical experts, research and analysis, issue identification, specification of information requirements, data gathering and interpretation, impact prediction, development of mitigative proposals, design of any required follow-up monitoring, external consultations, and report preparation and review

Identifying the Players in an EA

The question now turns to those involved in an EA. A number of areas of expertise are required in an EA. There are essentially five main players in an EA, namely: (1) the proponent (the individual, company or organization that proposes a development project); (2) government departments/ministries or agencies, including local and regional authorities; (3) the public; (4) the EA practitioner, including the health professional; and (5) decision-makers. Further details of these main characters involved in an EA can be found in the Glossary.

Providing an EA Schematic

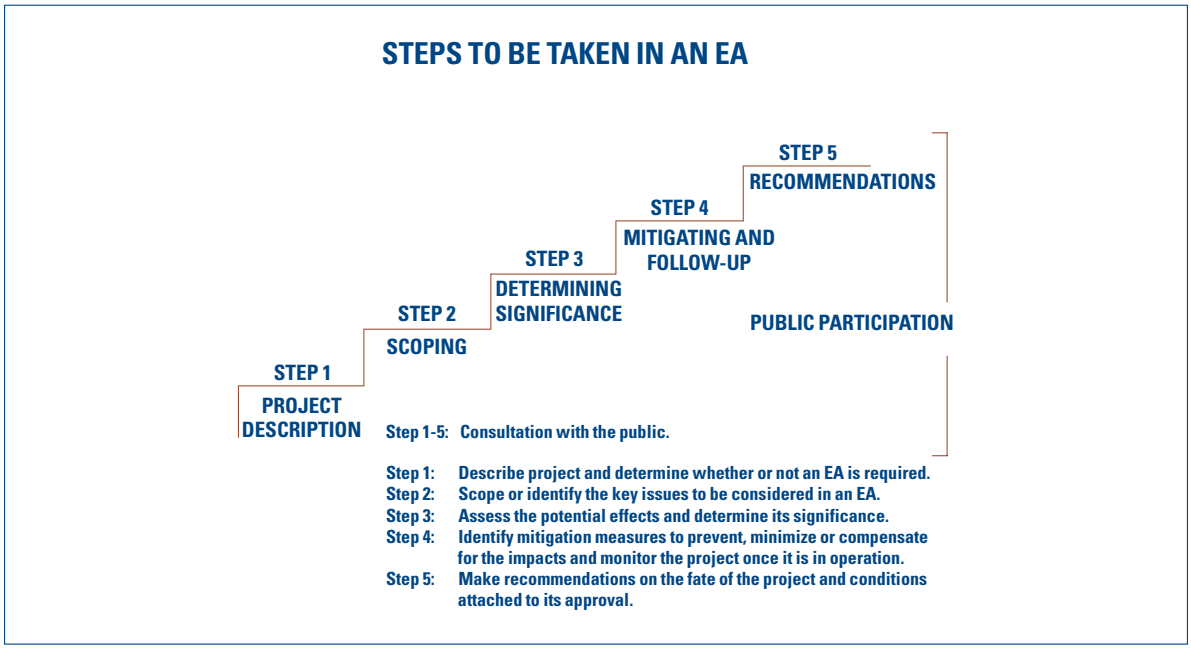
EA requirements and processes vary, not only internationally, but provincially as well. However, many common procedural elements exist within Canadian EA processes. These are schematically outlined in Figure 2.1. Depending on the jurisdiction, these steps can be combined or be complementary.

Describing the Steps in the EA Schematic and Examining Health within the Specified Stages of EA

Step 1: Project Description

The project description will provide the basic information – the who, what, when and where – regarding the project. This information presented by the proponent should offer sufficient information to anyone not familiar with the project. Data which can be included at this stage are:

Figure 2.1



- the rationale, objectives and goals of the project;
- a description of the project including the processes, chemicals, and types of equipment to be used and the building layout;
- sufficient detail of the planning, designing, construction, operating, maintenance and decommissioning phases;
- types and quantities of inputs (energy, water and chemicals used in the industrial process) and outputs (products and waste materials) and a brief discussion of their treatment and disposal;
- expected infrastructure, local facilities and services (e.g., electricity, water, sewage, roads);
- advantages and drawbacks associated with the project.

At this stage, a determination as to whether or not the project is subjected to an EA is made. Who makes that decision varies with jurisdiction. EA administrators (part of the Ministry of Environment within the provincial/territorial regime) make that decision within the provincial EA processes, while within the federal EA process, the manager responsible for the project (irrespective of which department) makes the decision. It is important that the project description also focus on the features that will likely generate public concern. Projects that are prone to trigger health concerns are those associated with mining, agriculture, energy production, natural resource management, waste management, chemical

production and manufacturing processes. Public sector projects such as infrastructure and urban development (airports, highways, railways and utilities) are further examples of areas that usually raise concerns about the health effect implications.

The scope of possible effects on occupational and public health is shown in Table 2.1.

Table 2.1
Health Factors to Be Considered in the Project Description

	Factors to Consider
Project	Location, environmental setting.
	Different stages of the project's life cycle (e.g., construction, operation, maintenance and decommissioning).
	Different project activities (e.g., transportation of raw materials and products, processing of materials and waste management).
	The manufacture, use or disposal of chemicals or microbiological organisms, including products of biotechnology.
	Physical hazards associated with the projects, such as noise, dust or radiation.
Human Exposure	The potentially affected populations, including workers and the public.
	Any especially vulnerable groups that could be exposed such as Aboriginal peoples, children, pregnant women and hypersensitive individuals.
	Expected changes in human exposures and the effects of the project on total human exposures.
	Any changes in human contact with communicable diseases or their vectors (e.g., mosquitoes, rodents).
Possible Effects	Possible effects on the physical health of potentially exposed populations.
	Possible effects on socio-cultural well-being.
	Possible effects on health care facilities and occupational health services.

Ideally, the project description should be prepared by the proponent and an EA practitioner who has a thorough understanding of environmental and health issues.

Step 2: Scope

The scope of an EA is analogous to an EA workplan. It lays the foundation for an effective EA by identifying significant issues and the potential environmental effects that the project might have on the biophysical and social environment, including any health issues that need to be assessed. A properly defined, scoped project improves the efficiency and effectiveness of the EA and focuses efforts on issues deemed important by the public and the experts.

Unfortunately, the process used to scope a project is not an exact science and is not always carried out in a disciplined or consistent fashion. As a result, important health issues are sometimes not identified, or identified too late for a thorough health assessment to take place. Furthermore, if health issues are overlooked, individuals can be hostile to the proponent for neglecting an issue during public consultation, thus jeopardizing the proponent's credibility.

There are essentially four major objectives of scoping. These are:

- determining the factors to be considered, alternatives to the project, and the potential effects of the project to be considered;
- prioritizing the issues to be addressed in the EA;
- setting appropriate boundaries for the EA study; and
- determining the appropriate level of effort for the EA.

The first objective of scoping is to determine the significant environmental and health effects, and factors and alternatives to be considered. This objective is paramount as it helps the proponent focus time and resources on the essential environmental and health concerns raised by the project.

Boundaries:
Spatial boundaries are set on the basis of the geographical limits of the impacts.

Temporal boundaries deal with the timing and the life span of the impacts arising from the project.

Jurisdictional boundaries refer to the legal requirements that the project must adhere to.

Canter, 1986

A second objective of scoping is the prioritization of issues identified in the first objective. It would be impractical for an EA to address every single potential effect or to discuss all of the alternative means of carrying out the project to the same level of detail. Prioritizing the issues from a list of potential problems should be achieved in consultation with the public and experts. Clearly, it is unfair to claim that a proponent has not adequately addressed an issue if the issue was not clearly raised, and the importance of addressing it was not established during scoping sessions. Another difficulty associated with the prioritization of

issues is that opinions of the project proponent and the public may differ with respect to the impacts (i.e., where the project proponent might view a health issue as being inconsequential, the public may place a higher priority to that risk).

A third objective of scoping involves setting realistic and appropriate spatial, temporal and jurisdictional boundaries on what is to be included or excluded in the EA. A problem commonly faced with large boundaries is that if the project is scoped too broadly, it will be very difficult to assess. The proponent can also feel that it is unattainable with the limited time and resources. If the project is scoped too narrowly, it can miss some potential effects. This can upset the public who may feel that important environmental and social issues are being neglected. For this reason, boundaries should be reasonable. Criteria used to determine appropriate spatial and temporal boundaries can include:

- the size and nature of the project;
- the environmental effects of relevant past, existing and future projects in the area which, in combination with the proposed project, would suggest that cumulative effects occur;
- the availability and feasibility of existing data; and
- the characteristics of the environment in which the project will occur (e.g., aquatic boundaries such as watershed, habitat, land use).

The fourth objective of scoping involves determining the appropriate level of effort for the EA. This can be largely determined by the same criteria as those used to determine appropriate spatial and temporal boundaries and should be consistent with the magnitude and severity of the potential effects caused by the project.

Many factors will determine the types of health effects identified during the scoping stage. Table 2.2 outlines several factors of health that have been considered during the scoping stage of an EA.

Table 2.2
Factors of Health Considered in EA

Factor	Characteristics
Hazardous agents	Microbiological virus, bacteria
	Chemical – heavy metals and toxic organic chemicals
	Physical – noise, dust, radiation, vibration
Environmental	Changes in the quality or availability of water, food, air, land and soil
	Waste management practices
	Physical safety and security
	Disease vectors
Exposure conditions	Human exposure pathways – food, air, water, etc.
	Public exposure
	Occupational exposure
	Identification of high-risk groups
Effects on physical health	Mortality
	Morbidity – communicable and non-communicable diseases, acute and chronic effects
	Injuries and accidents
	Effects on future generations
	Effects on high-risk groups (i.e., due to exposure or sensitivity)
	Exacerbation of existing health conditions (e.g., asthma)
	Cumulative effects
Effects on health care services	Incremental health care needs
	Displacement of traditional health care services
Effects on social well-being	Effects on income, socio-economic status and employment
	Effects on municipal revenues and local industries
	Migration and re-settlement
	Effects on social and community health including effects on culture and way of life
	Effects on services (e.g., education, social support networks, etc.)
	Effects on psychological well-being (e.g., stress, anxiety, nuisance, discomfort)
	Beneficial effects on health

Step 3: Determining Significance

Predicting the potential impacts and determining their significance is a key step to project approval and condition setting, and in choosing among alternatives. This step involves assessment of the potential health, environmental and social effects of the project, interpreting information and providing advice on the significance of effects to the decision-makers.

Baseline Health Status:

"Baseline status" refers to the conditions prior to the construction and/or operation of the project.

Once issues of concern have been identified through scoping, baseline health status of the population that will be affected must be obtained. The baseline health status of the potentially affected population, particularly sensitive sub-groups such as workers, Indigenous people, children, pregnant women and the elderly, is needed to assess the potential impacts of the project on health and well-being. The baseline health status is also essential to monitor the changes to environmental health once the project is in place.

The types of quantitative and qualitative information that should be used to describe baseline environmental, health and social conditions are shown in Table 2.3.

Table 2.3
Types of Information Used to Describe Baseline Environmental, Health and Social Conditions Related to the Determination of Human Health Impacts

	Types of Information
Environmental conditions	Levels of environmental contaminants in air, water, soil and biota
	Resources or species that are important for commercial or other reasons
	Community infrastructure, such as drinking water, sewage treatment, solid waste management, transportation and housing
	Local amenities, recreational facilities and sites of historical, cultural or religious significance

Table 2.3 (Cont'd)

	Types of Information
Health and social conditions	The demographic characteristics of the potentially affected population(s) including their size, cultural origins, education, age structure, socio-economic status, patterns of employment and work experience
	Current health status of the potentially affected population(s) including information on their physical health and psycho-social well-being
	The local health care and occupational health services
	The characteristics of any incoming groups of people, such as construction workers
	The history of the potentially affected population(s) in relation to development
	Any distinguishing, unique or traditional behaviours, lifestyles or ways of life in the local community or the potentially affected populations

Baseline data usually rely on existing available health information. Relying on this type of information can raise certain problems:

- Health information is collected for specific purposes and is not usually adaptable for use in EA. For example, medical data rarely distinguish between new health problems and repeat visits for the same condition – useful for consideration in EA.
- There is often a lack of information on health statistics at the community level.
- Precisely how the environment affects health is still in its infancy, therefore, existing health information is rarely related to environmental quality.
- Confidentiality of data especially where one is dealing with a small population where individuals might be identified from the data set.

Although there are difficulties in locating appropriate health information, there are health indicators presently of use in EA. The following chapter will discuss this issue in greater detail.

Assessing the Impacts:

Once the baseline health status has been determined, assessing the impact and determining significance is the next step. Criteria for assessing and determining the significance of adverse health effects can be found in Table 2.4.

Table 2.4
Criteria for Assessing Impact Significance (Canter, 1986)

Nature of the Impact	Definition
Magnitude	The probable severity of each potential adverse impact, in the sense of degree, extensiveness or scale. How serious is the impact? Does it cause a large change over baseline conditions (e.g., will crime rates double?) Does it cause a rapid rate of change – large changes over a short time period? Will these changes exceed local capacity to address or incorporate change? Does it create a change which is unacceptable? Does it exceed a recognized threshold value?
Geographical limits	This is the extent to which the potential impact may eventually extend (e.g., local, regional, national, global), as well as, to geographical location (e.g., far North, reserve, etc.)
Duration and frequency	The length of time (day, year, decade) for which an impact may be discernible, and the nature of that impact over time (is it intermittent and/or repetitive?) If repetitive, then how often?
Cumulative impact	The potential impact that is achieved when the particular project's impact(s) are added to impacts of other projects or activities that have been or will be carried out. The purpose being to predict whether or not a threshold level is surpassed.
Risk	The probability/predictability of an impact occurring. For many socio-economic impacts, qualitative assessments would be appropriate (high, medium, low).
Socio-economic importance	The degree to which the potential effects may (or be perceived to) impact on local economies or social structure.
People affected	How pervasive will the impact be across the population? This criterion should be used to assess both the percentage of the population affected and the extent to which it will affect different demographic groups, particularly the vulnerable groups (e.g., Aboriginal groups, children, elderly, pregnant women, etc.).
Local sensitivity	To what extent is the local population aware of the impact? Is it perceived to be significant? Has it been a source of previous concern in the community? Are there any organized interest groups likely to be mobilized by the impact?
Reversibility	How long will it take to mitigate the impact by natural or man-induced means? Is it reversible, and, if so, can it be reversed in the short or long-term?
Economic costs	How much will it cost to mitigate this impact? Who will pay? How soon will finances be needed to address this impact?
Institutional capacity	What is the current institutional capacity for addressing the impact? Is there an existing legal, regulatory, or service structure? Is there excess capacity, or is the capacity already overloaded? Can the primary level of government (e.g., local government) deal with the impact or does it require other levels or the private sector?

Health-based guidelines and objectives can be used to provide advice on the significance of potential adverse health effects. Guidelines and objectives have been developed for environmental and occupational hazards, including noise level, contaminants, radiation and microbiological agents. Useful guidelines include Health Canada's *Guidelines for Canadian Drinking Water Quality* and the *Guidelines for the Management of Wastes Containing PCBs* under the Canadian Council of Ministers of the Environment (CCME). Predicted levels are insignificant or have little effect if they fall below the level as specified by the guidelines or objectives.

Health-based guidelines and objectives provide a straightforward means of predicting impacts, but they do not exist for every possible environmental health hazard. Reasons why guidelines and objectives should be used with caution include:

- they are set to protect against specific types of health effects (e.g., common acute effects and cancer) but do not guarantee protection from all types of adverse health effects;
- they are usually set for individual hazardous agents; however, people are often exposed to mixtures;
- they have not been developed for all environmental hazards and they do not address the social, community or psychological dimensions of health and well-being effectively; and
- finally, health-based guidelines and objectives do not necessarily account for the age and sex of a person. For instance, children, the elderly and pregnant women can be more vulnerable to environmental hazards.

If no regulatory standards or objective criteria are available, other modes of evaluation should be used. Other approaches that can be used to assess a project's potential effects on health can be a balance between expert judgment and experience, risk-based analyses, public input, literature reviews, and case studies of effects associated with other similar projects.

Often, the evaluation of impact significance is seen as an ambiguous area of practice. Scientists and health professionals can evaluate significance of impacts differently or judgments can be subjective and contingent upon social values.

Social Impact Assessments:

Assessing the effects on socio-cultural well-being has often been referred to as social impact assessments (SIA). SIAs are conducted to examine the effects of projects on social and related economic conditions, such as employment, demographics, behaviour and lifestyle. Although SIAs are normally part of most EAs

for medium-sized and large projects, the approaches and methods used have evolved separately from those used for health. If the World Health Organization's definition of health is to be reflected in EAs, SIAs should be seen as part of the health component of EAs.

Occupational Health:

EAs should also address the potential effects on occupational health. In most Canadian jurisdictions, occupational health is usually assessed in EA. However, occupational health concerns are sometimes dealt with only later in project approval processes, such as facility licensing or permitting. It is important to include occupational health in EA because mitigative measures (design changes) to protect worker health are often more easily incorporated at the EA stage than at the facility licensing or permitting stage.

As well, in some cases, measures to protect occupational health may have a spill-over effect and result in improved protection for public health. Although occupational and public health concerns should be assessed in the same EA, the actual assessments need to be done separately. This is because occupational exposures are likely to be different from public exposures, and because occupational populations are different from the general public, since they are largely comprised of healthy adults. However, this information must come together within environmental assessment for decision-makers.

Health promotion (focusing on behavioral change strategies) versus health protection (efforts for making worksites safer) is an issue that has proven challenging when dealing with the occupational health and safety of workers. Increasing health promotion in the workplace is ineffective if efforts to make worksites safer (i.e., addressing the hazards of work) are minimal. Similarly, a health protection program that does not consider personal risk factors or wellness programs is equally ineffective. Consequently, an integrated approach to health promotion and health protection which includes joint worker and management participation in program planning and implementation, consultation with workers about worksite changes, and coordinated educational programs targeting health behaviour change is essential to promote worker health and safety.

Step 4: Determining Mitigation and Follow-Up

This stage focuses on two aspects. Mitigation, which is necessary to eliminate or to reduce to acceptable levels the predicted impacts, and follow-up monitoring, to verify the accuracy of the predicted impacts and modify the mitigation measures if need be.

Mitigation:

Mitigation measures are usually required to address significant adverse effects. If adverse impacts cannot be avoided or prevented, then minimizing these effects through mitigation is sought. If this is not attainable, compensation which usually takes the form of monetary payments, for damages caused by the project can be utilized. Monetary payment, or compensation does not reduce the environmental impacts but serves to financially compensate the individual(s) for tolerating the negative impact.

> Mitigation is "the elimination, reduction, or control of a project's adverse environmental effects, including restitution for any damage to the environment caused by such effects through replacement, restoration, compensation, or any other means".
>
> CEAA, 1992

The severity of the effects as well as environmental, social, cultural, political and economic conditions will all play a role in choosing appropriate mitigation measures as well as local circumstances and acceptability by the potentially affected populations. When responsibility for designing and implementing mitigation measures lies outside the health sector, health professionals should provide advice on the likely effectiveness of the measures for managing health risks to those responsible for the mitigation measures.

Follow-up:

The purpose of follow-up is to verify the accuracy of the environmental assessment that has been conducted, so as to determine if the proposed mitigative measures were implemented, and to determine the effectiveness of those mitigative measures. It should be noted that the requirements for identifying follow-up differ between jurisdictions.

Follow-up requirements, however, may include:

- inspection and surveillance to ensure terms and conditions are implemented;
- compliance or effects monitoring to respectively ensure standards are met and impacts are within the predicted levels;
- impact management to address unanticipated changes and adjust mitigation measures and environmental management plans accordingly; and
- audit and process evaluation measures to examine the accuracy of predictions, the success of mitigation measures, and overall levels of environmental and EA performance.

Presently within EA, health monitoring and follow-up are poorly developed and represents a major area of weakness, particularly in comparison to the attention

and effort that is given to the previous steps. Monitoring and follow-up are perhaps the most crucial steps to advance our understanding of the effects of development projects on our physical and social well-being. If we are to understand the health implications for future development projects, we must rely on an accurate depiction of health effects from similar previous development projects. This can only be obtained through follow-up monitoring.

Step 5: Recommendations Regarding the Project

The final step in an EA is to decide whether or not the project should be allowed to proceed, and if so, what conditions should be attached to the approval. Conditions can include mitigative measures, requirements for follow-up activities, modifications to operating procedures, etc. Requirements for health mitigation or follow-up activities are sector specific (e.g., mining, nuclear, etc.) or project specific (urban/rural setting, or impacting on Aboriginal lands, etc.).

Decisions about whether or not a major project can proceed are made by the Minister of the Environment (provincial/territorial), the minister responsible for the project (federal) or Cabinet, and are based on recommendations received from government officials, a board or a panel. At this final stage, the decision-maker(s) look at both the potential adverse environmental and health effects of the project and its anticipated beneficial effects.

Public Participation

An integral part of the EA process is the public consultation process. This crucial stage is not seen as one of the steps of an EA schematic, since it is a parallel or ongoing activity to all of the aforementioned steps.

Environmental issues are best handled with the participation of all concerned citizens. Nations shall facilitate and encourage public awareness and participation by making environmental information widely available.

Rio Declaration on Environment and Development, 1992

Public consultation is an important process *throughout* an EA since it allows the public to voice its concerns about issues which it feels are relevant to the proposed project or themselves. In fact, concerns about a project's adverse effects on health, well-being and the quality of life are most often raised within the public consultation process. Allowing different perspectives and views to come forward will hopefully ensure that important aspects are not overlooked. Furthermore, including the public from the onset is important since the public may have valuable knowledge and insights (traditional knowledge) into the ecosystems that will be potentially affected by a project.

Public participation and consultation is a vital component of any EA throughout the entire process. Invariably, the public will be concerned about how the project will impact on its physical and social well-being. As such, it is paramount that consultation between the proponent and the public begin at the scoping stage in order that the public does not feel excluded from the decision-making process. Follow-up activities on health and well-being should also consider the role that the public can play in matters such as follow-up monitoring, advisory committees and notification mechanisms.

Public participation is important in EA for four main reasons:

- it provides an open dialogue among the stakeholders;
- it allows the public to bring forward relevant information about the environmental, health and social conditions in the area;
- it provides a means of gauging public concerns about a project; and
- it can prevent and/or resolve disagreements about the project and its potential effects.

While the proponent or the government might not agree with all public opinions or concerns, it is essential to carefully consider the public's concerns about a project. Without dismissing or criticizing public concerns, proponents and government officials should be prepared to explain carefully and comprehensively the perspectives based on scientific evidence or accepted health practice. For this reason, the role of the health professional can be particularly useful in contributing to the long-term education of the public about the project and about public health matters in general. Health professionals can generally be quite effective at explaining and convincing the public because of their long-standing favourable relationship with the public.

> "The fundamental point is that participation without redistribution of power is an empty and frustrating process for the powerless."
>
> Arnstein, 1969

Successful participation will require trust between the proponent and stakeholders and a "level playing field" where all the stakeholders have access to adequate resources and all relevant information and reasonable notice for the public to prepare comments, statements and written responses. Methods and approaches that are used to provide and obtain information from the public can include advertisements on TV or radio, distributing brochures, direct mail, newspapers, and exhibitions or displays in public areas, etc.

Another reason to include the public from the onset is to ensure that they feel that their voices are being heard and considered. This contributes to the "health promotion" concept (discussed in Chapter 1) which contributes to better health for individuals and communities who feel better and can be more receptive or adapt more easily to a project if they are a part of the decision-making process.

Costs of assessing the environmental impacts of projects are on average less than 2% of capital costs and in most instances represent a fraction of the costs of retrofitting or modifying poorly designed projects.

Health Canada, 1995

Tying Things Together: Health as an Integral Component of EA

Health assessment needs to be integrated into EA for reasons such as: (1) addressing public concerns; (2) minimizing the need for separate health and environmental impact assessments; (3) demonstrating cost effectiveness; (4) minimizing the adverse and maximizing the beneficial effects on health; and (5) supporting the concept of sustainable development. The bottom line is that it makes sense to include health considerations within EA for economic and social reasons and ultimately, to ensure that the health and well-being of individuals and society is not compromised.

Addressing Public Concerns

The public's main concern about projects is frequently related to health, well-being and the quality of life. These issues can go unnoticed by developers and be easily ignored unless individuals or communities raise them. EA has the capacity to address public concerns (and therefore health-related concerns), particularly during the public consultation process. Furthermore, EA has a follow-up and monitoring stage that is designed to ensure that the negative environment and health effects are minimized.

Minimizing the Need for Separate Health Impact Assessments

Health assessment needs to be integrated in EA and not done as a separate entity because decision-makers require information on economic issues, health and environmental effects concurrently. As such, the obvious decision should be to perform all tasks simultaneously. It would be time-consuming and often a duplication of information if one were to assess health separately from EA since information is often common for both. Equally important, the public expects health assessments to be part of the EA process.

Demonstrating Cost Effectiveness

The level of effort for assessing health in EA should be consistent with the magnitude and severity of the potential effects. Assessing health in the EA process is much more cost-effective for the proponent than assessing it separately since there is no duplication of data sets which requires time and additional monetary resources. One might argue that neglecting to assess health in EA would be even more cost-efficient; however, these costs are likely to be very small for the proponent in comparison with the eventual costs on society for curative and treatment services that could be required in the event that health effects were not foreseen or not assessed properly. Adverse effects on health can be minimized or prevented from occurring so as not to be an additional burden on health care services associated with the project. One of the difficulties with this argument is that quantifying the health effects prevented by EA or any positive health outcomes in economic terms is a new and somewhat unknown endeavour.

Minimizing the Adverse and Maximizing the Beneficial Effects on Health

Including health as a component of EA permits the reduction of adverse health effects through mitigative measures. If certain detrimental effects on health have been identified (and cannot be prevented), at the onset of the project, at least these impacts can be mitigated as much as possible and the effects can be monitored closely.

EAs need not only be used to mitigate adverse effects. They also have the potential to maximize beneficial effects of development on health. For example, EAs could identify strategies and measures that will actively promote health such as workplace programs on health. It has already been suggested that EAs should consider how projects can promote health by conducting "health opportunity assessments" (Slooff, 1995).

Contributing to Sustainable Development

In 1987, the World Commission on Environment and Development popularized the term "sustainable development". Since then, many countries have endorsed this concept. The report of the WHO Commission and UNCED's (United Nations Committee on Environment and Development) Agenda 21 recognized that even though health concerns are essentially related to those of environment and development, "health considerations are often taken for granted

Sustainable development: "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

WCED, 1987

when the latter are considered and either ignored or dealt with inadequately". Adamant that this notion must change, the first principle enunciated in the Preamble to the Rio Declaration on Environment and Development thus focuses on human health:

> "Human beings are at the centre of concerns for sustainable development. They are entitled to a healthy and productive life in harmony with nature."
>
> WHO, 1993

Suggested Readings

Arnstein S (1969). A ladder of citizen participation. *American Institute of Planners Journal*, July: 216-224.

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Sadler B (1996). *International Study of the Effectiveness of Environmental Assessment: Final Report*. Canadian Environmental Assessment Agency. Ottawa: Minister of Supply and Services Canada.

World Commission on Environment and Development (1987). *Our Common Future*. Oxford University Press. Oxford, U.K.

World Health Organization (1984). *Health Promotion: A Discussion Paper on the Concept and Principles*. World Health Organization Regional Office for Europe. Copenhagen, Denmark.

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Notes:

3 HEALTH INDICATORS FOR USE IN ENVIRONMENTAL ASSESSMENT

It has already been stated that the assessment phase and the phase determining the significance of potential effects lie at the heart of EA. This Chapter will delve into the requirements for baseline information on health and well-being that will be useful to decision-makers by:

- Discussing the type of health information and indicators for use in EA
- Providing possible sources to contact for information on public and occupational health
- Providing a list of suggested readings

Health Information and Indicators for Use in EA

As mentioned in the previous Chapter, baseline information on health and well-being is necessary to assess and determine the significance of potential effects on health. Several types of health information are useful:

- scientific information, such as data on the incidence of disease;
- public information and concerns;
- traditional knowledge held by people who live or work on the land, including farmers, hunters, trappers, guides and Indigenous people.

Information on health and well-being is usually represented by indicators. There are many different indicators of health and well-being. In most EAs, existing information and indicators are used for assessment purposes. Occasionally, for large projects, and when there is a shortage of information and indicators, it may be necessary to collect new information and to select new indicators. New information can be collected in health surveys and epidemiological studies, but these are often expensive, time-consuming and resource-intensive. It is rarely possible to collect new health information within the timeframe of most EAs.

Information and indicators used for health and well-being should be:

- relevant to the possible effects of the project on health and well-being;
- understandable by all stakeholders;
- interpretable and permit the distinguishing of acceptable from unacceptable conditions; and
- quantitative whenever possible.

The types of information and indicators used in an EA will depend on the type of project and its possible effects. Some types of information and indicators on health and well-being can be found in Table 3.1.

Table 3.1
Types of Health Information and Indicators for Use in EA

	Physical Health	Socio-cultural Well-Being
Public	■ Respiratory effects ■ Noise ■ Effects of accidents and malfunctions ■ Rates of communicable and sexually transmitted diseases ■ Cancer incidence ■ Effects on fertility and development, including congenital anomalies	■ Changes in the quality or way of life ■ Changes in cultural and social patterns ■ Rates of crime ■ Rates of drug and substance abuse ■ Changes in stress levels
Worker	■ Injuries, effects of accidents and malfunctions ■ Days off work or disability days ■ Long term activity limitations ■ Respiratory effects ■ Effects on skin (e.g., irritation, chloracne) ■ Effects on fertility ■ Cancer incidence	■ Changes in the quality or way of life ■ Necessity for relocation ■ Stress-related conditions

The types of information and indicators shown in Table 3.1 are mostly direct measures of health. Monitoring using direct indicators of health will usually only provide information after people have been affected. In contrast, indirect measures can provide an important means of preventive monitoring because they can provide information before health is affected. Indirect indicators of occupational or public health include:

- levels of toxic chemicals in human tissues, including blood, hair and urine;
- biological markers of exposure to toxic chemicals, such as enzyme induction, cellular abnormalities and the formation of DNA adducts;
- the proportion of workers and/or the public following safety procedures (e.g., workers wearing personal protective equipment);
- levels of hazardous substances in the environment;
- effects on the health and well-being of wildlife; and
- discharges of hazardous substances to the environment.

Often, the greatest difficulty lies in measuring and consequently, assessing effects associated with some aspects of physical well-being and socio-cultural well-being. Cumulative effects which contribute to physical well-being are often difficult to assess since effects can, and most likely will, occur over a long period of time. Furthermore, it is difficult to determine whether the impacts are attributed solely to the project on hand or whether other factors in the environment are contributing to the effect. Socio-cultural well-being, however, is much more difficult to assess since changes in the way of life or quality of life are often subtle, occur sporadically over different time spans and affect individuals differently. Consequently, indicators reflecting social well-being as it relates to health in EA are still in the developmental stage.

Contacts for Information on Public and Occupational Health

Fortunately, there is some information and indicators of health and well-being available for workers and the public throughout Canada. Some possible sources of information on public and occupational health are shown in Table 3.2.

Table 3.2
Sources of Information on Public and Occupational Health in Canada

Level	Description of Source
National/ Federal	Canadian census (Statistics Canada)
	Canadian Centre for Health Information (Statistics Canada)
	State of the Environment Report (Environment Canada)
	Federal EAs (Canadian Environmental Assessment Agency)
	Canadian Congenital Anomalies Surveillance System (Health Canada)
	Environmental health assessment staff of Health Canada
	Human Resources and Skills Development Canada
	Environment Canada staff
Provincial/ Territorial	Provincial/territorial health surveys (provincial health departments)
	Cancer registries
	Workers' Compensation Boards
	Provincial/territorial state of the environment reports (provincial environmental departments)
	Provincial/territorial EAs (provincial/territorial environmental departments)
	Staff of provincial health, environment and labour departments)
Local	Local health surveys (local health departments)
	Local state of the environment reports (municipalities)
	Health care professionals including physicians, nurses, community workers and industrial hygienists
	Local environmental, public health and occupational health consultants
	The public including local residents, local business people, labour organizations, environmental groups, hunters, fishers, and Aboriginal people
	Local academic and research consultants
	Municipal staff and local health department staff
Others	Epidemiological studies
	Toxicological studies
	Environmental studies

Suggested Readings

McColl S (ed) (1992). *Development of Environmental Health Status Indicators*. Institute for Risk Research. University of Waterloo, Waterloo, Ont., Canada.

Notes:

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4 ENVIRONMENTAL ASSESSMENT WITHIN A CANADIAN CONTEXT

To gain a better understanding of EA within Canada, the focus of this Chapter will include:

- Progress and achievements in EA
- EA legislation in Canada
- Focusing on health in EA legislation in Canada
- Suggested readings

Progress and Achievements in EA

Pursuing economic development and growth without compromising a sustainable environment has led to the introduction of EA – a decision-making tool designed to help maintain that balance. Today, EA has evolved into an integral element of environmental policy in Canada and elsewhere. As one of the first countries to practice EA and be recognized internationally as a world leader in this field, Canadians have a reason to be proud. Far from suggesting that we should be complacent, the following is an indication of the areas where further progress in EA within Canada is being made.

- The *Canadian Environmental Assessment Act* came into force in January 1995. This *Act* became significant as it enshrined EA in federal legislation for the first time. More importantly, it became representative of the growing concern for the environment and demonstrated government's recognition of the stature of the EA process as an effective means to integrate economic growth and sustainable development into decision-making. At this time, the Canadian Environmental Assessment Agency was established to administer the *Act*. All provinces and territories in Canada currently have legislated requirements for EA of projects as well.

The concern that Canadians have about environmental issues continues to be expressed in terms of personal health, the health of one's family, and the health of future generations.

We know that the quality of life depends on a clean and healthy environment.

We also know that our health is primarily our own responsibility and that we can protect ourselves from most hazards. To do so, however, we need accurate, timely and appropriate information.

"Notable achievements have been made in integrating environmental considerations into economic and sectoral policies. Examples include the legislated environmental assessment process, (and) the environmental analysis of policy proposals and legislation."

OECD Environmental Performance Reviews: Canada, 1995

- The integration of environmental considerations into proposed policies, programs and plans is emerging more frequently at all levels of government. In fact, the position of a Commissioner of Environment and Sustainable Development was established under the *Auditor General's Act*. Amendments to this *Act* required federal departments to prepare sustainable development strategies for submission to Parliament in December 1997, with annual reporting of department's progress thereafter.
- In January 1994, the North American Free Trade Agreement (NAFTA) between Canada, the U.S. and Mexico came into force. This Agreement represents a milestone for environmental protection as it is among the first to address environmental issues within a trade agreement. The North American Commission on Environmental Cooperation was established to protect, conserve and enhance the environment by monitoring and reporting on the environmental impacts of the NAFTA. All three countries require foreign companies to adhere to their countries' EA procedures.

Environmental Assessment Legislation in Canada

Each jurisdiction in Canada has different EA legislation and requirements. For example, unlike most other EA processes in Canada, federal EAs are based on the principle of self-assessment. In other words, the federal department responsible for a project is also responsible for the preparation of the EA. In contrast, provincial/territorial legislation usually states that the Minister of the Environment is responsible for making decisions about the EA, rather than the minister responsible for the project. The provincial and federal legislative requirements for including health in EA in Canada are highlighted in Table 4.2.

In most Canadian jurisdictions (municipal, provincial, territorial, federal), EA provides information for making decisions about whether or not projects should be supported or permitted to proceed. In other words, EA is usually an aid to decision-making, rather than an approval process for projects. One exception to this is Ontario, where EA can be a decision-making process.

In Canada, all three levels of government share responsibility for health, although constitutionally health is primarily a provincial responsibility. Municipal or local health departments are often responsible for routine services, such as ensuring food, hygiene and water sampling, and responding to complaints. Provincial environment and health ministries are involved in a wide range of issues, including environmental monitoring, risk assessment, setting standards, guidelines and objectives, and planning and approvals. The federal government is active in establishing guidelines for environmental health. It is important for EA professionals to be aware of the responsibilities of different levels of government and to consult with health and labour ministry staff at different levels of government, since responsibility for environmental, occupational and public health is shared.

Subject to the scope of the relevant statutes, proponents of projects must carry out an environmental assessment under federal and/or provincial legislation, depending on whose jurisdiction the project and effects occur. The *Canadian Environmental Assessment Act* (2003) is the main governing piece of legislation to be followed under the federal process. In addition, there are EA requirements found in other federal statutes attached to the issuance of certain permits or licenses or in self-government and land claims settlement agreements with First Nations. All Canadian provinces and territories, however, also have their own distinct legal procedures and requirements. That is why some projects require authorization from both the federal and provincial or territorial government. For this reason, EA practitioners should bear in mind which EA process must be followed.

Although the procedures among the provinces (and the federal process) are comparable, each system has a unique perspective on how EA should be carried out within its jurisdiction. Table 4.1 offers some of the similarities and differences among the federal and provincial EA systems.

Table 4.1
Overview of Environmental Assessment in Canada

	BC	AB	SK	MB	ON	QC	NB	NS	PEI	Nfld/ LB	NT	NU	YT	Canada (CEAA)
EA Act														
EA Planning Process and Impact Assessment					o	o	o		o			o	o	o
Broad Definition of Environmental Effects			o				o		o	o				o
Public and Private Sector					o									
Scope of Act		o	o	o		o			o	o	o	×		o
Size of Projects	o×	o×		o		o	o	o		o			×	
Policy Level EA	×	×	×	×	×	×	×		×		×	×	×	×
Cumulative Effects			o	o	×		o	o	o	o		o		
Alternatives	o	o	o	o		o	o					o		
Approvals Granted										o	o		o	o
Provisions for Exemptions	o	o	×	×	×	o		×	o	×	×	o	o	o
Public Involvement			o						o					
Review of EAs									o					
Authority of Review Panel or Board	×		×	×		×	×	×	×	×	×	×	×	×
Formality of Panel or Board	o×						o	×	o	o	o			o
Intervenor Funding for Panel or Board Process	o	o		o	o	×	×	×	×	×	×	×	×	
Participant Funding Early in Planning Process	o	×	×		×	×	×	×	×	×	×	×	×	o
Conflict Resolution Provisions	o		o	o	o	o	×		×	×	×	×	×	

Explanations and symbols for this table can be found on the following page.

Explanation for Table 4.1

EA Act	|	Legislated
	o	Policy or Guideline
	×	No formal legal instrument
EA as Planning Process and Impact Assessment	|	EA is Impact Assessment
	o	EA is a Planning Process and Impact Assessment
Broad Definition of Environmental Effects	|	Biophysical, socio-economic and technical; direct and indirect
	o	Biophysical and related socio-economic effects
	×	Biophysical only
Public and Private Sector	|	Public and Private Sector
	o	Public Sector and Selected Private Sector
	×	Public Sector
Scope of Act/Policy	|	Projects, Activities, Programs, Plans
	o	Projects, Activities
	×	Projects only
Size of Projects	|	Major and minor impacts and large and small projects
	o	Specific lists of projects
	×	Major projects or as determined by Minister
Policy Level EA	|	Included in legislation
	×	Not included
Cumulative Effects	|	Explicit requirement in *Act* or Regulation
	o	Implied or guideline basis
	×	Not required
Alternatives	|	Explicit requirement to examine functionally different alternatives to the project, e.g., rail *vs* road *vs* air
	o	Explicit requirement to examine different alternative methods of implementing project, e.g., sites or designs
	×	Examine project only
Approvals Granted	|	Formal approval, licence or permit issued for EA with explicit conditions
	o	Specialist advice to other agencies to issue their approvals
	×	No formal or informal approval granted
Provision for Exemptions	|	No provisions for exemptions
	o	Exemptions based on defined thresholds or criteria
	×	Discretionary exemptions granted by government
Public Involvement	|	Statutory requirement in *Act* or Regulation
	o	Voluntary and suggested in guidelines
	×	No explicit requirement

Explanation for Table 4.1 (cont'd)

Review of EAs	|	Provisions for independent review by panel or board
	o	In-house review
	×	No provision
Authority of Review Panel or Board	|	Decision-making
	×	Recommendation only
Formality of Panel or Board	|	Judicial or quasi-judicial adversarial
	o	Formal but not judicial
	×	Informal
Intervenor Funding for Panel or Board Process	|	Government pays
	o	Proponent pays
	×	No formal funding
Participant Funding Early in Planning Process	|	Explicit statutory requirement
	o	Voluntary, encouraged by guidelines
	×	No requirement
Conflict Resolution Provisions	|	Mediation or Alternative Dispute Resolution (ADR) offered as an alternative to review by board, agency or panel
	o	Mediation or ADR offered throughout the EA Process
	×	Conflict resolution not offered

Compiled by: EA Branch, MOEE, Ontario from survey of jurisdictions. In: *Environmental Assessment in Canada: Frameworks, Procedures, and Attributes of Effectiveness*. Minister of Supply and Services Canada, 1996.

On rare occasions, projects can trigger both federal and/or provincial/territorial EAs. Governments recognize the complexity and potential for duplication of having to comply with territorial, provincial, and municipal requirements concurrently. For this reason, federal, territorial and provincial governments are working to harmonize their EA processes. To date, harmonization agreements have been reached between the federal government and almost all provinces. These agreements acknowledge that cooperative approaches between the two levels of government are the most appropriate measures to take to ensure effective and efficient processes.

Health Within EA Legislation in Canada

Including health in EA in Canada has been recognized by the provinces and territories under different legislative acts and requirements. Table 4.2 summarizes the current requirements for including health and well-being in EA in major Canadian jurisdictions.

Table 4.2
Requirements for Including Health in EA in Canada 2004

Jurisdiction	EA Legislation	Status
British Columbia	*Environmental Assessment Act*	Health is mentioned in several places. "Effects" are defined as including health and the purpose of the *Act* includes the assessment of "health effects".
Alberta	*Alberta Environmental Protection and Enhancement Act*	Health is included in the definition of an "adverse effect" and the definition of "environment" includes "all living organisms" which covers human life.
	Alberta Public Health Act	Requires municipal health departments to assess the health and environmental effects of proposed waste facilities.
Saskatchewan	*Environmental Assessment Act*	Health is included in the definitions of "contaminant" and "pollution".
Manitoba	*Environment Act*	Health is included in several definitions, including "development", "pollutant" and "environmental health".
Ontario	*Environmental Assessment Act*	The definition of "environment" includes human life.
Quebec	*Environmental Quality Act*	Section 20 states that nothing may be discharged into the environment that "is likely to affect the life, health, safety, welfare or comfort of human beings".
New Brunswick	*Clean Environment Act*	Human life is included in the definition of "environment".
Nova Scotia	*Nova Scotia Environmental Assessment Act*	The definition of "environment" includes a reference to human life.

Table 4.2 (cont'd)

Jurisdiction	EA Legislation	Status
Newfoundland and Labrador	*Environmental Assessment Act*	The definition of "environment" includes "human life" and "the social, economic, recreational, cultural and aesthetic conditions and factors that influence the life of humans in a community".
Prince Edward Island	*PEI Environmental Protection Act*	"Environment" is defined as including human life.
Northwest Territories	*MacKenzie Valley Resource Management Act*	The definition of "environment" includes all living organisms.
	Inuvialuit Final Agreement	The *Act* includes environmental impacts to Native persons.
Nunavut	*Nunavut Land Claims Agreement*	Environmental assessment includes socio-economic impacts and the promotion of the well-being of residents and communities (Article 12).
Yukon Territory	*Yukon Environmental and Socio-economic Assessment Act*	The definition of "socio-economic effects" includes effects on health, culture, tradition and life-style.
Federal Government	*Canadian Environmental Assessment Act*	The definition of an "environmental effect" includes any change in health or socio-economic conditions that are caused by the project's environmental effects.

One health area of federal jurisdiction is Aboriginal health. Chapter 5 will discuss the unique situation of Aboriginal people within the Canadian Constitution and the role of Aboriginal people in EA.

Suggested Readings

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Notes:

5 ABORIGINAL HEALTH AND TRADITIONAL KNOWLEDGE

Aboriginal people occupy a unique place in Canadian society – culturally, historically, geographically and legally. In order to understand the responsibilities of those conducting EAs to Aboriginal people and the possible roles of Aboriginal people in EAs, this Chapter will discuss:

- Who are Indigenous people?
- Aboriginal definition of health
- Health impacts on Aboriginal communities
- Aboriginal interests in land – reserves and traditional territories
- EA legislation
- Fiduciary duty
- Federal or provincial/territorial responsibility?
- Traditional knowledge and its origins
- What is traditional knowledge?
- Health and traditional knowledge
- Using traditional and western knowledge together
- Future prospects for including traditional knowledge in health
- Suggested readings

Who are Indigenous People?

Before discussing Aboriginal health and the role of Aboriginals in the EA process, it is necessary to define who are Indigenous people. According to the International Labour Organization, there are about 5,000 different Indigenous or tribal peoples living in seventy countries. The total world population of Indigenous and tribal people is estimated at about 300 million, mostly in Asia. In Canada, Indigenous peoples include Indians, Inuit and Métis. These peoples are collectively referred to as Aboriginal.

The term "First Nations" is often used by Aboriginals to refer to "Indians". The term Aboriginal and Indigenous are synonymous.

Aboriginal Definition of Health

Aboriginal people have traditionally gone further in their holistic view of health than even the World Health Organization's comprehensive definition which was discussed in Chapter 1. However, all Aboriginal communities probably do not share the same definition of health. Equally important, there can be significant social and cultural differences among the different communities. The definition of health by the First Nations of British Columbia is but one among a multitude of definitions offered by Aboriginal groups and states:

> Health
> "obtaining and maintaining a balance of all aspects of the self – mental, emotional, spiritual and physical – with and through the help and involvement of the family and the community"
>
> First Nations of British Columbia

This broad definition not only illustrates the interconnection between all aspects of a person's life, and the effect that a problem in one area can have on the others; it also shows the great value that Aboriginal people place on the community. For many, this sense of attachment to the community is as close as family, and the sense of attachment to the land goes far beyond any individualized concept of ownership. The people, the elements, the plants and the animals are all interconnected, on the physical and spiritual planes.

Health Impacts on Aboriginal Communities

Many development projects may have a major impact on the environment of Aboriginal communities, especially those located downstream or downwind of the project. Air- and water-borne contaminants may be carried into the community and can pose serious health risks to the inhabitants. Also, the greater the reliance of community members on wild food such as game and fish, the higher the health risk, as the animals also ingest the contaminants and pass them on in higher doses when the animals are used for human consumption. In this way, Aboriginal communities experience a potentially far greater health impact than do other communities in the same geographic area that do not rely on wild food. The impact of the projects on the environment and the consequent loss of fish and wildlife also negatively impact on the possibility for Aboriginal people to pursue their traditional lifestyles, and to pass these on to future generations.

Aboriginal communities that may be directly affected by a project should be involved from the outset in the EA conducted for that project (whether or not the EA is triggered or conducted under a federal or provincial EA process). Their close connection to and additional reliance on the natural environment make Aboriginal people especially concerned with the healthy preservation of that environment, which in turn, increases the possibility of negative health effects of a project on Aboriginal individuals and communities.

It is therefore necessary for all levels of government to develop specific processes, within or in addition to their regular public consultation procedures, to fully inform and involve local Aboriginal communities that could experience negative environmental impacts of projects.

Aboriginal Interests in Land

There are two broad types of Aboriginal interests in land - reserve lands and traditional territories – each of which needs to be addressed in the EA process.

In the provinces, reserves are areas that have been set aside for the exclusive "use and benefit of Indians" under the *Indian Act*. They are run by Band Councils elected by members of the community, and are officially considered to be federal lands as these lands are owned by the federal government. Individual Aboriginal people belonging to a band which has a reserve often have exclusive possession of allotments on the reserve. Band Councils administer the rest of the reserve. All land transactions on the reserve are effected exclusively by the federal government, usually at the request of the Band Council or an individual band member. Band Councils and band members who have allotments may ask the federal government to sell, lease or otherwise dispose of their interests. Band Councils usually do so with the consent of the community and by first surrendering or designating the land to the federal government. The government sometimes negotiates the transaction on behalf of the Band.

Traditional territories are much larger land areas, often encompassing thousands of hectares, where Aboriginal communities have historically carried out a range of traditional activities. These lands are used for subsistence activities such as hunting, trapping, fishing and other resource harvesting, but they also serve vital social, medical and spiritual needs and may contain sacred sites and burial grounds.

EA on Reserves

The *Canadian Environmental Assessment Act* (CEAA), which came into effect in 1995, requires that projects having environmental impact, and that are to be carried out wholly or partially on an Indian reserve, be subject to an EA as outlined under regulation. However, in the current era of increasing self-government by Aboriginal people, it is not appropriate for government to impose its process on First Nations governments without their participation. CEAA allows for the development of regulations regarding EA on reserves, and the federal and Aboriginal governments are currently discussing whether such regulations should be developed, and, if so, by whom, or whether First Nations should develop and implement their own EA processes. The CEAA triggers (proponent, Law List, land management, funding) are presently administered by the federal government.

EA for Projects on Traditional Territories

Throughout Canada, some territories are currently the subject of land claims by various groups of Aboriginal people, based on their historical and on-going use of those lands for traditional purposes. Some of these claims over traditional territories have been accepted by the federal government for negotiation. Aboriginal people also present these claims as a basis to respond to the needs of Aboriginal communities, since if they are going to achieve any meaningful degree of self-government, they require control of a land base that will support – physically and economically – their growing populations. Negotiations are under way involving First Nations, federal and provincial governments to resolve these claims and come up with an equitable distribution of not only the land, but also the rights to the resources on and under that land, and the appropriate management of both lands and resources.

Often projects undergoing an EA are also situated within traditional Aboriginal territories which are the subject of land claim negotiations. Aboriginal people may be concerned that their rights are being prejudiced by developments on these lands before the claims are settled.

EA Legislation

There are three levels of EA for projects that fall under the jurisdicton of the *Canadian Environmental Assessment Act* (CEAA): screening, comprehensive study and mediation or assessment by a review panel. In any case, the following factors must be included: environmental effects of a project and their significance must be assessed, relevant comments from the public, and mitigation measures. "Environment" is defined extremely broadly in the CEAA to include "land, water and air... all living organisms, and... interacting natural systems." "Environmental effect" is defined in part as:

> "any change that the project may cause in the environment, including any effect of any such change on health and socio-economic conditions, on physical and cultural heritage, on the current use of lands and resources for traditional purposes by Aboriginal persons, or any structure, site or thing that is of historical, archaeological, paleontological or architectural significance."

"Environment" means the components of the earth and includes:
(a) land, water and air, including all layers of the atmosphere,
(b) all organic and inorganic matter and living organisms,
(c) the social, economic, recreational, cultural, spiritual, and aesthetic conditions and factors that influence the life of humans and communities, and
(d) a part or combination of those things referred to in (a) and (c) and the interrelationships between two or more of them.

Innu Nation, 1996
Voisey's Bay, MOU

The federal role is Aboriginal-specific; the provincial role is based on equity to all residents. Both are, however, sub ject to the demands of the honour of the Crown, and this must mean, at a minimum, that the Aboriginal people to whom the Crown in all its' emanations owes an obligation of protection and development, must not lose the benefit of the obligation because of federal-provincial jurisdictional uncertainty.

Pratt, 1989

Clearly, the federal government has bound itself to ensure that the broad range of Aboriginal people's interests are adequately taken into account. While no such Aboriginal-specific provisions exist in provincial EA legislation, the requirements for public consultation and assessment of health effects are similar, and include Aboriginal people implicitly as part of the provincial population.

Fiduciary Duty

Fiduciary duty is variously defined, and the interpretation of the scope of the duty varies even more widely. In general, where one has control over the interest of another arising from a trust, the first person has a general duty to act primarily in the interest of the other party. Canadian courts have recognized that certain specific fiduciary duties may apply to the Crown in certain circumstances.

The *Guerin* Case – Reserve Lands

This 1984 case involved the lease of reserve land to a non-Indian party. The federal government obtained the land surrender on the understanding that certain terms would be included in the lease, but proceeded to negotiate a lease that was far less favourable to the Band than the one they had agreed to on surrender. The Band sued the government and the case went to the Supreme Court of Canada.

The Court recognized that the Aboriginal interest in land predates contact with Europeans, and characterized the duty of the federal government to Aboriginal people as fiduciary in regard to land holdings.

> The Indians' interest in land is an independent legal interest. It is not a creation of either the legislative or executive branches of government... Where by statute, agreement or perhaps by unilateral undertaking, one party has an obligation to act for the benefit of another, and that obligation carries with it a discretionary power, the party thus empowered becomes a fiduciary. Equity will then supervise that relationship by holding him to the fiduciary's strict standard of conduct.

Because federal government intervention is necessary under the *Indian Act* for the Band to comply in a transaction involving reserve or surrendered land, the government is therefore required to act in the best interest of the Band.

The *Sparrow* Case – Aboriginal Rights

The 1990 Supreme Court decision in *Sparrow v. the Queen* extended the scope of the fiduciary relationship far beyond reserve land and elaborated it to include protection of Aboriginal rights as recognized and affirmed by section 35 of the

Constitution. Any legislative infringement on existing Aboriginal rights must be justified by the Crown; the government must show that a valid legislative objective exists which is consistent with the fiduciary relationship between it and Aboriginal people, and that Aboriginal rights are only infringed to the extent necessary to meet that objective.

This does not protect Aboriginal rights absolutely, but does give them a very high degree of protection. For example, where fishing is at issue, the only justification for infringement of the Aboriginal right to fish (for food, social and ceremonial purposes) was identified as species conservation. The interests of all other users of the resource are subordinate to the Aboriginal right, and it is the duty of the federal government to protect that right.

Federal or Provincial/Territorial Responsibility?

Whether the provincial governments are themselves legally obliged to act in the interests of Aboriginal people, beyond their responsibilities to every resident of the province, is a question still subject to great debate.

Where by agreement a provincial government is conducting a federally triggered EA using the province's own process, the federal government should ensure that Aboriginal people are appropriately involved, and that assessment is made of all factors that are required to be considered by CEAA. These include the possible effects of a project on Aboriginal people's immediate and future health and well-being, and on their ability to pursue aspects of a traditional lifestyle. Adequate public consultation must take place since each Aboriginal group is culturally and socially distinct and it cannot be assumed that the interests of and impacts on one Aboriginal group are representative of all Aboriginal groups.

Where Aboriginals could be potentially affected by a project, the use of EA processes may assist in assessing the impact on Aboriginal interest, where such exist and where there may be a fiduciary duty. Furthermore, including Aboriginal people in the EA process, from the outset of the process, could reduce costs to proponents which are incurred by having to redo large sections of study reports, and conduct whole new studies, when the effects of the project on Aboriginal communities have not been initially or adequately considered. There is, however, a more fundamental reason for seeking the input of Aboriginal people. Aboriginal people are able to bring their unique perspective on environmental protection and sustainable use of resources to the EA. This is what is commonly referred to as 'traditional knowledge'.

Traditional Knowledge and Its Origins

All cultures have knowledge vested in their traditions. It can be as simple as a recipe handed down through generations, or a way of thinking about the world. It can be as formal as a traditional song or story, or it can be as informal as a manner in which people carry out a routine task. Typically, the farmer's understanding of the plants and soil, the fisherman's insight of the water and marine ecosystem, or the hunter's perception of animal practices are but a handful of sources of traditional knowledge.

One of the best documented groups which have significantly contributed to the concept of traditional knowledge are Indigenous peoples. Indigenous peoples often do not have formal written databases of knowledge. Some capture the knowledge in imagery, such as the ancient wall paintings in France, or in Australia, or of the North American Indians. Most have traditional songs, stories, legends, dreams, methods, and practices. Sometimes it is preserved in the form of memory games, initiation rites, ceremonies, or dance. Occasionally it is preserved in artifacts handed from father to son, or mother to daughter.

Where the Indigenous peoples themselves have disappeared – such as in the case of the Lescault rock paintings – the knowledge is gone as well. Currently within Indigenous communities, competition from European-derived cultures can capture the imagination of the young, teach them in western ways, and limit the capacity of the elders to pass on traditional knowledge to the young.

What Is Traditional Knowledge?

Traditional knowledge is shaped by the mythology of the people with the knowledge. For example, in European-derived culture, the Judeo-Christian mythology begins with an assumption that the world was created by God in six days and that God had the form of a man giving man dominion over nature. The legend of the Garden of Eden separated humankind and the natural world, allowing people to make observations of nature from afar – from an objective viewpoint.

The following descriptions of the characteristics of Indigenous traditional knowledge are the result of a workshop on environmental assessment held in Inuvik in November 1995 (Circumpolar Aboriginal People and Co-management Practice, November 20-24, 1995, coordinated by the Inuvialuit Joint Secretariat). These are the words of Inuit people answering the question, "What do we mean by traditional knowledge?"

- "It is practical common sense based on teachings and experience passed on from generation to generation."
- "It is knowing the country; it covers knowledge of the environment (snow, ice, weather, resources), and the relationship between things."
- "It is holistic – it cannot be compartmentalized and cannot be separated from the people who hold it. It is rooted in the spiritual health, culture and language of the people. It is a way of life."
- "Traditional knowledge is an authority system. It sets out the rules governing the use of resources – respect; an obligation to share. It is dynamic, cumulative and stable. It is truth."
- "Traditional knowledge is a way of life – wisdom is using knowledge in good ways. It is using the heart and the head together. It comes from the spirit in order to survive."
- "It gives credibility to the people."

The Words of the Director General of UNESCO (Mayor, 1994)

The Indigenous peoples of the world possess an immense knowledge of their environments, based on centuries of living closer to nature. Living in and from the richness and variety of complex ecosystems, they have an understanding of the properties of plants and animals, the functioning of ecosystems and the techniques for using and managing them that is particular and often detailed. In rural communities in developing countries, locally occurring species are relied on for many – sometimes all – foods, medicines, fuel, building materials and other products. Equally, peoples' knowledge and perceptions of the environment, and their relationships with it, are often important elements of cultural identity.

Recognition of Traditional Knowledge

Although the recognition of traditional knowledge as having any validity or value has been slow in western societies, it is now beginning to gain credibility. Western traditional knowledge provided the basis for much of western medicine, centuries of herbalist knowledge accumulated in the early writings of travellers, clerics, and natural historians.

Acceptance of the idea that ecological knowledge (a recent concept in science – starting about 1930) has existed in traditional knowledge for thousands of years is only a few years old. The Brundtland Commission in 1987 was the first to offer some credence to the concept. Very recently, the Biodiversity Convention, Agenda 21, the Rio Declaration and Forest principles provided a contemporary context for traditional knowledge.

The Content of Traditional Knowledge

Traditional knowledge is a system of knowledge. While it is not possible to disassemble the knowledge in the same manner that science can be parsed, nonetheless, there are categories that parallel science within the traditional knowledge base.

Classification: the understanding of specific elements of factors in the environment, such as the plants, animals, soil, water, air, weather and environmental phenomena.

Technology and Resource Management: the development and use of traditional technology for farming, hunting, forestry, fishing, trapping, and managing the resources for the use of both current and, more importantly, future generations.

Ecology, Evolution, and Systematics: the understanding and awareness of the "web of life". This includes the concept of origins of interrelatedness of types of animals, plants, and rocks. It understands the dynamic interrelationships of current ecological members of the same areas.

This last element of traditional knowledge is the most powerful, but also the least addressable from a scientific point of view. The basis for the traditional understanding assumes a holistic view including language, culture, practice, spirituality, mythology, customs, and even the social organization of the local communities. Scientific practice excludes the humanistic perspective, although it includes humans as animals.

Around the world, there is a sense of urgency to "collect" traditional knowledge because as the elders die, so the knowledge dies with them. The parts of the traditional knowledge base that are currently being collected most actively are both the classification and the technological aspects. Databases of many types are springing up, and some are available outside the traditional communities. There are inherent problems in making use of this knowledge – it is missing the contextual elements derived from the holistic and very personal approach that characterizes traditional use of the knowledge.

One of the problems with collecting the information in this manner, and missing the contextual elements, is that the temptation is to compare scientific and traditional answers. For example, the Inuit people have a far richer and more subtle understanding of the characteristics of ice and snow than does science. In fact, some of the Inuit classification is accessible only by virtue of its relationship to human activities and feelings. In South America, some of the Indian tribes have

a classification system for trees that identifies many species that science does not, and appears to miss obvious species that science recognizes. Once again, the classification systems have a different set of assumptions, so are not directly comparable. The species that appear to have been missed turn up as recognizable in other contexts for the native people. The extras from a scientific perspective are identified by traditional people either because science simply missed them, or because ecological variants have equal importance to genetic species from a traditional standpoint. These comparisons also sometimes incorrectly lead western practitioners to trivialize the traditional understanding because they do not have the whole concept included in the cultural and other values of traditional knowledge.

Health and Traditional Knowledge

Within an Indigenous community, there is a sharing of the knowledge base between the sexes (as compared to hunting and fishing, which are basically the domain of the male). Males tend to have dominion over the larger and more abstract issues of health, and the traumatic treatments. Women, by contrast, are the keepers of the practical remedies for common maladies, and also of much of the knowledge of pharmaceuticals and herbal remedies.

In the *Declaration on the Rights of Indigenous Peoples* in 1994, Article 24 stated that Indigenous peoples have the right to their traditional medicines and health practices, including the right to the protection of vital medicinal plants, animals, and minerals. The Declaration further claims the requirement of States to respect Indigenous medicine, pharmacology, health practices and promotion, including preventive and rehabilitative practices (section 3, article XII on health and well-being).

On the Matter of Ownership of Traditional Knowledge

Each local community considers its knowledge to be owned by that community. There is also a sense of common ownership when the knowledge of one local community is also the knowledge of another community. It is regarded as intellectual property, much as the written word or an artistic expression in the form of a painting, poem, or film is regarded as intellectual property.

Indigenous people have shared this knowledge freely in the past and have rarely received proper compensation or recognition for it. Today, Indigenous people feel the keepers of the knowledge who share it should be compensated – just like any other professional – for doing so.

Table 5. 1
Comparisons Between Traditional and Western Scientific Knowledge Styles

Indigenous Knowledge	Western Scientific Knowledge
Assumed to be the truth	Assumed to be a best approximation
Sacred and secular together	Secular only
Teaching through story-telling	Didactic
Learning by doing and experiencing	Learning by formal education
Oral or visual	Written
Integrated – based on whole systems	Analytical – based on subsets of the whole
Intuitive	Model or hypothesis-based
Holistic	Reductionist
Subjective	Objective
Experiential	Positivist

Table 5.2
Comparisons Between Traditional and Western Scientific Knowledge In Use

Indigenous Knowledge	Western Scientific Knowledge
Lengthy acquisition	Rapid acquisition
Long-term wisdom	Short-term prediction
Powerful predictability in local areas	Powerful predictability in natural principles
Weak in predictive principles in distant areas	Weak in local areas of knowledge
Models based on cycles	Linear modelling as first approximation
Explanations based on examples, anecdotes, and parables	Explanations based on hypotheses, theories, laws
Classification ■ mix of ecological and useful application ■ non-hierarchical differentiation ■ includes everything natural and supernatural	Classification ■ based on phylogenetic relationships ■ hierarchical differentiation ■ excludes supernatural

Using Traditional and Western Knowledge Together

In recent years, there has been an increasing acceptance, if tentative, of Indigenous knowledge in many fields. But there is both danger and benefit in these first communications.

Romanticism of Indigenous sacred beliefs, natural resource management, and health care can be very destructive and even dangerous. Often these are exploited with no care for the consequences of misusing these knowledge bases. Practitioners investigating these areas should always be aware of the existence of charlatans. In fact, more than one elder has told of tiring of the constant and seemingly silly questions of anthropologists. Indigenous people also became jaded because they came to realize the information they passed on never benefited the community that owned it, and they never received copies of the results of the studies. To amuse themselves, the elders sometimes made up inane and false "Aboriginal" knowledge, knowing that the professors would never know the difference.

By contrast, when Indigenous knowledge is used in its original context, and in partnership with western knowledge, the combination is often much more powerful a tool than either used alone. The most important examples of this are to be found in resource management, where both scientists and Aboriginal hunters, trappers, or fishermen work together giving equal weight to both types of knowledge. The practice of co-management was pioneered and is currently being developed most effectively in Canada. It is not, however, an easy process – it requires a hands-off style of governing the actions of the on-the-ground members of the co-management team. Often the information base is not easily written down, and if bureaucracy interferes too much, or if too sceptical members are chosen from the western side, the intimate relationship and trust amongst the members is lost, and the process of co-management can fail.

Co-management does exist to a certain extent in the health field. One example is the official recognition of the contribution of Aboriginal medical interpreters who act as cultural brokers, mediators, translators, stress-relievers, health care service dispatchers, etc. Without their input and guidance, many patients would be at a loss in the western medical system. Nonetheless, much work remains to integrate western and indigenous knowledge. What is needed is a true and trusting partnership, rather than the usual attitude of testing to see if the efficacy of traditional knowledge can be disproved. Modern medicine is also rapidly broadening its viewpoint from being a practice of health care to a practice of ensuring well-being. This changing perspective matches the attitudes of many Indigenous practices.

Future Prospects for Including Traditional Knowledge in Health

To create such a partnership will require research to assemble and examine case studies with the cooperation of Indigenous peoples. Once the required comfort level is reached, role-playing in the format of training workshops in documented case studies would enlighten the practitioners on both sides. Just as in the development of co-management of natural resources, the development of acceptable medical protocols would take time. This is not to say that progress has not been achieved in the integration of western and Aboriginal health systems. Indeed, many users are integrating practices from both approaches despite a lack of official recognition by the medical community. For example, some people seek alternative medical help to see who will provide better support, whereas others try to maximize the benefit by combining both approaches. However, if increased effectiveness were achieved in medical care similar to what has been achieved in natural resource management, it could represent a remarkable improvement and lowering of costs.

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ON THE WEB:

www.treaty7.org	Dene Cultural Institute
www.native.org	The Selkirk Healing Centre
www.merlin.com.au	Aboriginal Health Videos
www.anac.on.ca	Aboriginal Nurses
www.afn-ntb.ca	Assembly of First Nations

Notes:

Notes:

6 ENVIRONMENTAL ASSESSMENT ON AN INTERNATIONAL LEVEL

This Chapter will examine the situation of health and Environmental Assessment (EA) at an international level. The discussion will focus on the following:

- HIA progress around the world today
- Environmental factors most pressing on human health
- International organizations and HIA
- HIA in regions of the world (other than Canada)
- Evolving methods and approaches
- Selected major events and conferences
- Independent expertise
- Summary and concluding remarks
- References
- Suggested readings

The objective of this chapter is to map out where Health Impact Assessment has evolved to internationally while identifying key players, events, and resources.

Health Impact Assessment Progress around the World Today

Health Impact Assessment (HIA) has been associated with Environmental Impact Assessment (EIA) more so then with the health promotion sector of public health. The last decade has seen a shift in the way HIA is being utilized or, more precisely, has seen an expansion from HIA being used primarily as a mechanism to ensure that health is considered in the assessment of project impacts to an approach that seeks to make government policy and plans socially responsible. Consider, for example, the series of International Conferences on Health Promotion that have been seminal in the advancement of the

> "EA has now become institutionalized in over 100 countries and is a standard practice in business."
>
> Dorais, 1996

public health agenda dating back to the first conference known widely as the *Ottawa Charter* in 1986 (see Chapter 1 of this Volume). The fifth such Conference in Mexico City, 2000, saw a first in its tabling of HIA as "the key activity required to promote healthy policy-making at the local level" (Mittelmark, 2000; p.2). HIA is no longer just an environmental assessment add-on; it is now an approach to decision-making in a sustainable context. One could say that HIA is becoming a smart means by which governments can "invest" in the social capital of their constituents. This, however, is by far not yet a global phenomenon and is still on its way to being formally institutionalized even in the most advanced of regions, although recent progress is impressive. Leading European countries, namely Sweden, the Netherlands, England, Scotland, Northern Ireland, and Wales are working towards a critical mass of political will to become the first economic region to be fully integrating HIA in decision-making at several levels (Banken, 2001).

Interestingly, the integration of health into EIA may be better done in North America and the Australian Commonwealth, where HIA methodology has evolved along side or in response to EIA legislation. However, in the Australian Commonwealth the application of the approach to wider government actions has not been taken up as readily. In several regions of the world – Europe, the Middle East, and Asia, for example – the integration of health into environmental assessment and project decision-making is still by and large limited to the realm of the risk assessment of exposure to deleterious factors instigated by the carrying out of the project.

Meanwhile, the World Health Organization (WHO) continues to attempt to spread the adoption of HIA among developing regions, but progress appears to be slow. Similarly, on the American continents the North has a lead on the South in the integration of HIA in either EIA or in the development of healthy public policy. But even in the North, progress is confined primarily to the health sector.

In an international context, HIA is also progressing as a tool with which to address emerging global health issues such as climate change, as well as the more traditional problems of inequalities in health among countries. HIA can be applied at an earlier stage through Strategic Environmental Assessment (SEA) in determining the impacts of policies and plans. As well, HIA is finding its way into development project-level processes through Social Impact Assessment (SIA). Environmental justice, Strategic Environmental Assessment, and social impact assessment are concepts that run synonymously with activities and progress in HIA today. The global ecosystem is the focus of attention on health impact, and this appears to be a growing trend. Banken (2001), in one of a series of discussion papers on HIA established by the WHO's European Centre for Health Policy, asks whether HIA is an idea whose time has come. A briefing paper on what

impact assessment could bring to the realization of its agenda was presented at the Johannesburg World Summit on Sustainable Development in 2002 (Morgan, 2003).

At present, there are no legal frameworks specifically dealing with HIA. Rather, its legal impetus has historically been carried by environmental impact assessment legislation, although its first incarnation as a legal instrument may have little to do with EIA specifically. There is movement towards the development of a legal framework for HIA among European countries, emanating from the European Union Directive and taking the form of a multi-national protocol on Strategic Environmental Assessment, which is broader in scope than project assessment.

While many countries and states have adopted EIA legislation, the extent to which health will be integrated into any of these depends on the definition in each case given to health and to environment, respectively, in other words, to the relationship between people and the environment recognized by the government in question. Whether humans are part of, or seen as separate from the environment, in a legal interpretation is the significant factor in the extent to which health would be addressed within the EIA legislation.

Environmental Factors Most Pressing on Human Health

The problems that developing countries face are different and much more intense than those of more developed countries. In developing countries, an enormous range of physical and social factors (known as “traditional” hazards) can adversely affect human health. The most prevalent factors are:

- population growth, which increases the pressure on resources and on the ecosystems necessary to support human activity;
- poverty which is closely related to ill-health, premature death and degradation of the environment;
- unsafe and insufficient supplies of drinking water and the provision of basic sanitation and waste management to impede the propagation of infectious diseases;
- inadequate shelter, indoor air pollution; and
- lack of nutritious food, the poor handling of food, and pesticide toxicity.

Rapid and uncontrolled urbanization in developing countries has created severe air and water pollution which compounds the health problems related to poor

housing and overcrowding. In turn, overcrowding encourages the spread of infectious and waterborne diseases such as schistosomiasis and malaria.

Developed countries experience health problems related to air pollution, municipal waste, poor management of toxic chemicals and hazardous wastes, as well as those related to unhealthy diets, alcohol, smoking, drug abuse, crime and other psycho-social problems. These are typically referred to as "modern" hazards. Whereas developed countries suffer almost exclusively from modern hazards, developing countries are usually affected by both modern and traditional hazards. As such, it is essential that developing countries incorporate health considerations into EA since they are much more susceptible than are developed countries to changes in their physical and social well-being, with the introduction of development projects.

> "Health is a state of complete physical, mental and social well-being and not merely the absence of disease and infirmity. The enjoyment of the highest attainable level of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic and social condition."
>
> WHO Constitution, 1994

Despite a decade of improvements in studying and searching for ways on how human health is influenced by environmental factors, the Commission on Sustainable Development (CSD, 1997) identified several unresolved issues that warrant special attention:

- the need to better integrate health into environmental impact assessment procedures;
- the need for effective and efficient environmental health information systems; and
- the need to improve knowledge of environment-health linkages.

International Organizations and HIA

The World Health Organization (WHO) (Headquartered in Geneva)

The WHO is a leader in promoting the development and application of HIA principles and practices among its 192 member states. A website dedicated to

HIA – www.who.int/hia/ – is the prime link to quickly access a range of networks, tools, and guides. The WHO has seven regional offices, with varying levels of HIA activities among them: two in Africa, one in the Americas, one for Southeast Asia in India, one for Europe in Copenhagen, one for the Eastern Mediterranean in Cairo, and one for the Western Pacific in the Philippines. Other partnerships and specialized institutions related to health and environment and/or HIA within regions have been established and will be discussed below, by geographical region. (See **HIA in Regions of the World (other than Canada)** for further details on the WHO's Regional Offices and Collaborating Centres around the world; and **Selected Major Events and Conferences** for global conferences on health promotion, as well as European Ministerial Conferences on Environment and Health sponsored by the WHO).

The United Nations

The United Nations, with its charter speaking to human rights, peace, and vulnerable populations, supports the advancement of health and environment considerations among its member states, primarily through the UN Economic Commission for Europe (UNECE) and the UN Environment Program (UNEP). HIA *per se*, however, is not a focus of the UN. Rather, it has provided secretariat services for World Summits on sustainable development and the SEA Protocol (see below), which in turn have provided opportunity for the advancement of the development of concepts and operationalization of HIA.

World Bank and Other Multilateral Development Banks (MDBs)

As one of the world's largest sources of development assistance, the World Bank plays an enormous role in the implementation of projects in developing countries. There is no formal mechanism to ensure the integration of HIA in the operations of the World Bank and other MDBs. Each of these banking organizations has policy or technical/discussion papers on the environmental assessment of funded projects which in turn integrate health considerations to varying levels. Of note is a publication of the Asian Development Bank, "Environmental Assessment for Developing Countries in Asia" (see Lohani B. *et al.*, 1997), which incorporates extensive consideration of health assessment methodologies and considers to some extent strategic and cumulative impacts, and so approach the strategic integration of health into Bank decision-making regarding the funding of projects. Still, the extent to which these are adhered to and the results these give are not easily assessed. In 2003, the Inter-American Development Bank produced a document synthesizing its Environmental Strategy, which "sets forth a new paradigm for Bank action in environmental matters…" (IADB, 2003; p. i) in which health considerations are quite extensive, providing evidence that progress is taking place.

There are four other Multilateral Development Banks in the world:

- The African Development Bank
- The Asian Development Bank
- The European Bank for Reconstruction and Development
- The Inter-American Development Bank Group

HIA in Regions of the World (other than Canada)

Europe and the Australian Commonwealth

The Treaty on European Union, signed in 1997, contains an article stating that "a high level of human health protection shall be ensured in the definition and implementation of all Community policies and actions" (European Commission, 2001; p.2). This positions the European Union to bring HIA to new heights. The European Commission prepared in 2001 "a practical Guide" to this effect, in an attempt to "operationalize" or institutionalize HIA for use in application at the country and local level. Political commitment in the European Union is moving towards the systematic integration of health considerations in projects and policies as evidenced by the number of guides published in recent years (see Table 6.1). Results of a pan-European survey among health ministries on HIA and government policy-making were released in the spring of 2003. Key findings show that "several governments are active in the field of health impact assessment and some have allocated resources to support its development and use. However, there is still much to be done to increase awareness and understanding of HIA among governments" (Welsh Assembly Government, 2003). The survey also found that there was very strong agreement with the following definition of HIA proposed in the *Gothenburg Consensus Paper* in 1999:

Health Impact Assessment is a combination of procedures, methods and tools by which a policy, programme 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.

In addition to its headquarters in Geneva, the WHO has established a Regional Office in Denmark as well as two European Centres for Environment and Health – one in Rome, Italy, established following the first Ministerial Conference on Health and Environment in 1989; and one in Bonn, Germany. These Ministerial Conferences have provided opportunity for political commitment regarding health and the environment. In May of 2003, 36 European countries adopted a protocol for Strategic Environmental Assessment (SEA), which once in effect will require its Parties to evaluate, among other topics, the health impacts of policies, including their official draft plans and programmes. This is the culmination of a process dating back to the early 1990s and the *Espoo Convention on Environmental Impact Assessment in a Transboundary Context*, which is the most widely applying formal SEA mechanism in existence in terms of geographical area covered, and represents a step forward for the "mainstreaming" of HIA. Being strategic in environmental decision-making naturally invokes that health considerations play a central role. The United Nations Economic Commission for Europe UNECE has been integral to the process of the SEA Protocol.

Strategic Environmental Assessment (SEA) Protocol

SEA allows the identification and prevention of possible environmental impact right from the start in decision-making – developing a more sustainable transport policy rather than just minimizing the environmental impact of building a road, for example – and it enables environmental objectives to be considered on a par with socio-economic ones, bringing sustainable development closer.

Source: www.unece.org/env/eia/#

Provisions in the SEA Protocol for Human Health

The Protocol repeatedly and consistently refers to **health** whenever referring to the environment in terms of effects, concerns, considerations, information, authorities, etc.

Source: www.unece.org/env/eia/health.html#

Table 6.1
Sampling of Guides on Health Impact Assessment

Country	Author	Title	Year of Publication
Australia	Commonwealth Department of Health	Health Impact Assessment Guidelines	2001
England	Ruth Barnes and Alex Scott	A Ten-minute Guide to Health Impact Assessment	2000
England	Merseyside Health Impact Assessment Steering Group	The Merseyside Guidelines for Health Impact Assessment	1998
England	Health Development Agency	Introducing Health Impact Assessment: Informing the Decision-making Process	2002
England	NHS Executive London	A Short Guide to Health Impact Assessment: Informing Healthy Decisions	2000
Ireland	Institute of Public Health in Ireland	Health Impact Assessment: An Introductory Paper	2001
New Zealand	Ministry of Health	A Guide to Health Impact Assessment	1998

Source: Adapted from: www.who.int/hia/about/guides/en/

Another influencing process among European countries has been the *Aarhus Convention*. An initiative of the UN Economic Commission for Europe, this *Convention on Access to Information, Public Participation in Decison-Making and Access to Justice in Environmental Matters* was adopted on June 25, 1998, in the Danish city of Aarhus (Århus) at the Fourth Ministerial Conference in the "Environment for Europe" process. The *Convention* came into force on 30 October 2001, and gives the public the right of access to environmental information and to participate in decision-making processes; and ensures access to justice for the public.

Americas

It would appear that the uptake of HIA into political processes has not progressed in North, Central, or South America. References to it are more sparse than those of the equivalent search effort among European government initiatives. Although Canada and the U.S. have extensive experience in the area of EIA, the integration of health considerations into EIA as well as SEA is still limited in comparison to Europe. However, even the WHO's Regional Office for the Americas, namely the Pan American Health Organization, has not adopted the push for HIA into its member countries as wholeheartedly as have its European counterparts. The first meeting of the Health and Environment Ministers of the Americas (HEMA, 2002) took place in March 2002 and may very well be a signal of coming

change. While explaining these differences is a subject needing and worthy of further exploration beyond the scope of this chapter, there are some obvious possible explanations.

The difference may be an ideological one wherein the role of health protection and promotion is seen as being the purview of the health sector rather than something that begins early on at the heart of government planning, programs and policies which, in contrast, the Treaty on European Union promotes. Perhaps the reconciliation of this tension within a government is an important step towards achieving sustainable government practices, but which for the most part has not emerged in government structuring, in either region of the developed world. The *Ottawa Charter*, back in 1986, recognized that "health promotion policy requires the identification of obstacles to the adoption of healthy public policies in non-health sectors…" (*Ottawa Charter for Health Promotion*; in Banken, 2001; p. 3), but yet the institutionalization of this understanding has not seen as much movement on the American continents as it has in Europe. Rather, the political processes by which HIA is making headway appear to be different in the Americas.

Of interest is the place of HIA at the recent Pan American Health Organization Session of the Executive Committee. In an analysis of strategic lines of work to be implemented in the context of "the impact of globalization and the opportunities and risks that it represents for improving population health in the Americas…" (PAHO, 2003), the first of five lines of work was the "health impact assessment of globalization". Alternatively, it may be a simple question of lag-time between the two regions; the European Union may have a slight advance on the Americas in terms of adopting HIA as a tool for use in decision-making.

In terms of environmental assessment processes, PAHO undertook an evaluation of the current situation in the Region of the Americas (Latin and Caribbean) with respect to the capacity and barriers to integrating health into environment assessment processes. In 1999 PAHO produced a Regional Plan on Environmental and Health Assessment, whose objective is "to ensure that all countries of the Region of the Americas have an operational framework in place regarding the use of environmental and health impact assessment" (PAHO, 1999; p.5) over the next decade, i.e., by 2010. The analysis identified a number of significant challenges to overcome in that period and, moreover, pointed out that "numerous environmental conflicts have occurred between countries, and in border areas, resulting from incompatible interests or different perceptions of the risks associated with particular projects" (PAHO, 1999; p. 3). For the use of HIA in environmental assessment processes in this part of the world, much work remains to be done at the country level and in terms of transboundary effects. There is at least progress with this PAHO initiative, with the establishment of a plan. In the

Caribbean, for example, the Caribbean Environmental Health Institute has identified Environmental Health Impact Assessment as one of its program areas. It reports that, while "EIA has been increasingly used as an aid to planning and decision-making throughout the Caribbean region", the integration of health therein leaves much to be desired (CEHI, 2003). Progress in terms of capacity-building in these southern Americas (Latin and Caribbean) is progressive, with training, knowledge transfer, and the production of published and educational materials (e.g., see Weitzenfeld, 1996; UNAMAZ, 1998).

Arctic

The Arctic represents a special case in international cooperation around health and environment issues. Guidelines for Arctic Environmental Impact Assessment were adopted by the ministers of the Arctic Countries in their *Alta Declaration* of 1997 and are hosted by Finland. The latter recognize the value of Human Impact Assessment and its particular application to a northern context:

> *Human Impact Assessment* (HuIA) is a further elaboration of the traditional Social, Health, and Environmental Impact Assessment approaches. In a wide and multidimensional manner, it focuses on the consequences of a current or proposed action for individuals, organizations, and social macro-systems. The aim is to minimize the adverse effects – and to maximize the good effects – that are likely to follow from specific public or private agency actions. HuIA gives an opportunity to put health and social welfare on the agenda of other sectors and to ensure socially sustainable outcomes.
>
> (Source: www.stakes.fi/sva/huia/index.html)

Western Pacific

A WHO Collaborating Centre for Environmental Health Impact Assessment has been established in affiliation with the Curtin University of Technology in Australia. The Centre provides expertise and services to the Western Pacific/Asia Pacific region and beyond, including training and education, and support for the development of methods and approaches.

Eastern Mediterranean

The WHO's Regional Office for the Eastern Mediterranean has established a specialized centre in Amman, Jordan, namely the Centre for Environmental Health Activities, or CEHA. Its "priorities include programs and plans to incorporate environmental health impact assessment throughout the activities of its member states" (www.emro.who.int/ceha/). HIA progress takes place in the context of environmental health impact assessment processes, and the region is in a capacity-development phase in terms of the application of HIA. Clean water and proper sanitation remain priority issues for this region.

Africa

Almost half of the African population does not have access to clean water and proper sanitation. The WHO's Regional Office provides technical guidance to countries on environmental health impact assessment and are working with other partners to build HIA capacity in the region within the established framework for EIA. Informal partnerships established by a number of development and academic institutions have been established under the title of *Acting Upstream*, whose focus is capacity-building in HIA (WHO, 2001).

Evolving Methods and Approaches

While HIA methodology is stable, there are nevertheless advances with respect to the areas of its applicability. Social impact assessment (SIA) is of particular interest to HIA in the international context, given its applicability to programs, policies, and plans. Its approach is better suited to operationalizing or working with the widely accepted holistic definitions of health, such as that of the WHO. Development efforts, whether in the developing or least developed countries, require a well-defined methodological approach to ensure that efforts move toward ameliorating rather than promoting health inequities within developing countries and between global regions.

The International Association for Impact Assessment or IAIA (see www.iaia.org/), an independent professional association which publishes *Impact Assessment and Project Appraisal*, has facilitated a five-year multi-stakeholder and international process culminating in the proposal of International Principles for Social Impact Assessment. The impetus for development of these International Principles includes:

- to assist in the development of legislation and policy at the national level; and
- to provide standards for SIA practice in an international context (trans-boundary projects, development corporation, foreign investments, international banking) (Vanclay, 2003).

These principles compliment the widely published 1994 guidelines and principles for social impact assessment (see Interorganizational Committee, 1994).

Those involved in climate change, a concern of global proportion, are taking a lead in drawing on health impact assessment methods and tools. The Third Ministerial Conference on Environment and Health, which took place in London in 1999, recommended "the development of capacities, as necessary, to undertake national HIAs with the aim of identifying the vulnerability of populations and subgroups in order to ensure the necessary transfer of know-how among countries…" (WHO/HC/UNEP draft document, 2003; p. 5). The Guidance document proposes that each country's Minister of Health facilitate their nation's health impact assessment of climate change, speaking to the broad recognition and applicability that HIA has come to have to issues other then environmental impact assessment (WHO/HC/UNEP, 2003; p.17).

Selected Major Events and Conferences

World or Earth Summits hosted by the United Nations

1992: Rio Summit on Environment and Development: The international community adopted *Agenda 21*, an unprecedented global plan of action for sustainable development.

1995: World Summit for Social Development, Copenhagen: Governments reached a new consensus on the need to place people at the center of development. At the end of their deliberations, the delegates at the Summit agreed on the adoption of the *Copenhagen Declaration on Social Development*, and the Programme of Action of the World Summit for Social Development.

2002: Johannesburg Summit on Sustainable Development (August 26 to September 4): Heads of state and government, national delegates and leaders from non-governmental organizations (NGOs), businesses, and other major groups came together to focus on meeting difficult challenges, including improving people's lives and conserving our natural resources in a world that is growing in population, with ever-increasing demands for basic resources, health services, and economic security.

Summit of the Americas process

The first *Summit of the Americas* was held in Florida in 1994 and saw the *Declaration of Principles* signed by the democratically elected heads of state and government. The Summit speaks to partnership for development and prosperity: democracy, free trade, and sustainable development in the Americas. The

Organization of American States (OAS) (www.oas.org/) serves as "institutional memory of the process" and whose Charter stipulates that within the United Nations, the OAS is a regional agency.

The Health and Environment Ministers of the Americas (HEMA) held their first meeting in Ottawa in March, 2002, following the third Summit of the Americas which took place in Quebec City in 2001.

Global Conferences on Health Promotion

The WHO has hosted a series of international conferences for its member states which represent a stepwise progression among these on the place health holds today in development issues around the world.

- First International Conference: The Ottawa Charter for Health Promotion, 1986
- Second International Conference: The Adelaide Recommendations, 1988
- Third International Conference: Sundvall Statement on Supportive Environments for Health, 1991
- Fourth International Conference: The Jakarta Declaration on Leading Health Promotion into the 21st Century, 1997
- Fifth Global Conference: Health Promotion Bridging the Equity Gap, Mexico City, 2000

European Ministerial Conferences on Environment and Health

The first such conference was held in 1989 – after which the WHO's European Centre for Environment and Health was established in Rome.

Every five years the WHO hosts Ministerial Conferences on Environment and Health through the European Environment and Health Committee.

Independent Expertise

There are a few of independent "international" groups who provide various HIA-related services and also promote the use of HIA. Each of the following organizations has a website and consists of experts for hire and/or associations of people who share core HIA values.

- International Association for Impact Assessment (IAIA) and its francophone secretariat (www.iaia.org/)
- International Health Impact Assessment Consortium (www.ihia.org.uk/)

- ISEqH – International Society for Equity in Health (www.iseqh.org/)
- International Society for Ecosystem Health (ISEH) (www.ecosystemhealth.com/index.htm)
- Institut de l'Énergie et de l'Environnement de la Francophonie (www.iepf.org/)

Summary and Concluding Remarks

The World Health Organization has championed the promotion of HIA in its member countries through proactive secretariat-type functions and assistance of various kinds. Progress is tangible primarily in Europe, where integration of health considerations is taking place not just from within health ministries, but more horizontally across sectors. Other areas such as the Latin American and Caribbean countries, Africa, the Eastern Mediterranean and Western Pacific regions are in the process of organizing themselves to better integrate health into EIA processes by building capacity and acquiring the basic building blocks to be able to launch HIA initiatives themselves. Partners from northern regions – ranging from the development banks to WHO Collaborating Centres such as that for Environmental and Occupational Health Impact Assessment and Surveillance at the Centre hospitalier universitaire of Québec City – are providing aid, training, and assistance to these regions. Here the phenomenon of globalization may be a trigger to the application of HIA beyond environmental assessment.

Ironically, but not surprisingly, those regions of the globe where health status and sustainable development practices are most lagging are the same regions with the least HIA capacity and where HIA is far from becoming mainstreamed and well done in either an EIA or a strategic (i.e., policy) context. Progress is, however, evident even in the regions most in need, namely some parts of Africa and Latin America, and continued support from northern partners may pave the way to efficient capacity-building.

The WHO's work is certainly not the only factor accounting for the surge in HIA seen in recent years. Banken (2001; p. 3) speculates that it may be based on the "increasing awareness of the complexities of intersectoral action for health." Whatever these complexities may be, there does seem to be a window of opportunity available now to those working in health promotion and protection to have health assessment take its proper and effective place in decision-making.

It would seem that the popularity and recognition of HIA internationally have been greatly aided by international events or tools, including conferences, conventions and, more recently, summits; and have been fuelled by economic integration, as is the case in Europe. In this respect HIA is becoming, by

association and for good practical reason, a tool for use in international health and environmental matters. HIA is also becoming the means through which socially responsible governance is to be achieved within and between borders.

Nevertheless, the President-elect of the International Association on Impact Assessment warns against the dangers of HIA losing its edge and effectively becoming a passing trend rather than a fundamental credo leading development far into the future: "The current surge in HIA development is very welcome, but that growth needs to be managed effectively in order to maintain the integrity and value of the method" (Morgan, 2003).

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Notes:

Notes:

7 FORGING AHEAD

So, what is the future outlook for health in EA and what are the next steps? This Chapter will be dedicated to discussing important issues for future consideration including:

- Strengthening health considerations in EA
- Increasing awareness and education
- Strengthening cooperation between EA practitioners and health professionals
- Assessing cumulative health effects
- Dealing with risk perception
- Encouraging greater public consideration and community action
- Improving the follow-up monitoring processs
- Concluding remarks
- Suggested readings

Strengthening Health Considerations in EA

Principle 17 from the 1992 *Declaration of Principles* of the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro, Brazil, states that:

> "Environmental impact assessment, as a national instrument, shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent national authority."

After analyzing the progress achieved since UNCED, the UN Commission on Sustainable Development stated, at its fifth session in April 1997, that an unfulfilled expectation was the fact that health impact issues were not included within the environmental impact assessments of development projects. According to the UN Commission, this is due, in part, to the lack of analytical capacity within the ministries of health.

The concept of sustainable development acknowledges the importance of the environment in maintaining and improving health, as well as the significance of social and economic conditions. We need a healthy environment to provide the resources that enable us to be healthy. Sustainable development requires that environmental, economic and community considerations be taken into account in both public and private sector decision-making. An open and transparent reconciliation of economic development, community needs and environmental quality through an evidence-based decision-making process is paramount.

It is hoped this *Handbook* has been able to provide you with a better understanding about EA and the current situation of health within it. So where does this leave us? Perhaps our greatest priority is to strengthen health considerations within EA that is consistent with currently-accepted definitions of health (such as that used by Indigenous peoples) as well as the known determinants of health. This requires taking into account a community's social well-being and not just a person's physical well-being.

Procedures, methods and indicators for assessing comprehensive health effects are not as well developed as those for measuring biophysical health effects. However, methods, practices and procedures applied in social impact assessment (SIA) can be an effective tool in EA. SIAs are ideal since they are a reasonably well-developed component of EA with established approaches and measures that could be linked to health. Granted, that while SIA has not yet been effectively related to health and well-being, it does, however, represent an opportunity for viewing health and well-being in a broader context.

There are other challenges facing us in achieving our goal to incorporate health considerations in EA. These challenges include:

(1) increasing awareness and education;

(2) strengthening cooperation between EA practitioners and health professionals;

(3) assessing cumulative health effects;

(4) dealing with risk perception;

(5) greater public consideration and community action; and

(6) improving the follow-up and monitoring process.

Increasing Awareness and Education

The major reason why health is not sufficiently included in EA is lack of awareness. This deficiency can be two-fold: (1) EA practitioners, health professionals, decision-makers, and the public may lack awareness of the benefits of including health in EA; and/or (2) this same group might not be aware of the full scope of EA – or at least the generally accepted definition of health put forward by the World Health Organization (WHO), and the known determinants of health.

There are also individuals who are of the opinion that health is automatically protected within EA if environmental protection measures are adequate. This is naive and inaccurate since it does not take account of the physical health of humans (e.g., bioaccumulation) or the social, community and psychological aspects of health and well-being.

The World Health Organization has recognized the need to increase the importance and benefits of including health in EA. The following are four of its objectives in this regard (WHO, 1987):

(i) inform health professionals (including public health doctors, toxicologists and epidemiologists) of the preventive opportunities offered by EA;

(ii) persuade decision-makers (i.e., politicians, policy-makers, etc.) and EA practitioners (i.e., EA commissions) of the dangers of not considering health effects;

(iii) inform EA practitioners of the importance of health in EA; and

(iv) inform the public of the value of EA in maintaining and protecting health.

The World Health Organization continues to be the major international supporter of Health Impact Assessment through the development of resource material and WHO regional workshops and training activities. In support of the World Health Organization's transfer of HIA information between practitioners, the WHO has recently set up a database of case studies at its international website and published a special issue on health impact assessment as part of its Bulletin series. The WHO is not alone in its support of HIA. Australia, England, the Netherlands, Sweden, and Wales have all established websites with HIA literature, reports, theses, or manuals (see HIA web addresses provided at the end of this chapter).

The International Association for Impact Assessment (IAIA) is an interdisciplinary society which brings together researchers, practitioners, and users of impact assessment. The Association is dedicated to developing international capacity to anticipate, plan, and manage the consequences of development at scales ranging from local to global. The Association has over 2,500 members in over 100 countries and its meetings are deigned to provide impact assessment practitioners with the capacity to anticipate, plan, and manage consequences of development, so as to enhance the quality of life. The first HIA paper session at IAIA was held in New Zealand in 1999, and since then the HIA sessions have expanded dramatically to become a mainstay within the parallel paper sessions at the annual IAIA meetings.

Strengthening Cooperation Between EA Practitioners and Health Professionals

As it stands, health professionals need to become more actively involved in the EA process and work in collaboration with EA practitioners to ensure that the full scope of EA is not overlooked. One might point to educating health professionals to convince them of the necessity of their role and responsibility in EA. This approach, however, does not facilitate their involvement and ensure their collaboration with EA practitioners. This suggests that appropriate mechanisms should be implemented to facilitate their cooperation with EA practitioners through joint committees for scoping and determining significance, to ensure collaboration between health and environmental agencies, and to provide training programs to discuss the responsibilities of the other in EAs.

Health professionals and EA practitioners should also be made aware of the positive repercussions that a thorough EA could have on health and well-being. Ensuring that the physical and social aspects have been properly assessed and dealt with in an EA, can serve as a preventative check to protect against possible physical harm or mental anguish suffered by individuals during or after the implementation and operation of a development project.

Assessing Cumulative Health Effects

In 1992 almost two out of every three people surveyed within Canada said that their health has likely or has definitely been affected by environmental pollution. The risk to health from pollution is undeniable. However, there is a growing consensus that our health is also influenced by other factors. The term ‘determinants of health’ (see Chapter 1) is now increasingly used to refer to the many factors thought to contribute to the health of populations. They include

our social and economic environment, our physical environment, our personal health practices, our individual capacity and coping skills, the availability of health services and other factors such as gender and culture.

Thus the impact of a development project on the biophysical environment is only one of a number of impacts which cumulatively affects the overall health of an individual or a community. Impacts from the development project can be positive (such as the creation of jobs – unemployment and underemployment are associated with poorer health) or negative (release of toxic substances either singly or in complex combinations into the air, water, food or soil).

Historically, environmental impact assessment has focused attention on the movement of contaminants or other hazards through the air, water, food and soil and the resulting human health implications. There is a pressing need to monitor and assess the impacts that development projects have on the other determinants of health so that a truly holistic (cumulative) impact assessment is done.

Dealing with Risk Perception

Risk assessment is a cornerstone of environmental impact assessment and/or health impact assessment. It involves the systematic collection, analysis and interpretation of selected environmental or health-related data and the subsequent development of possible options for managing the risks involved with the development project, including consideration of environmental or health benefits. Risk management also involves the selection and implementation of a strategy for mitigating or remediating the risk. Risk management must take many factors into account, including social, economic and environmental considerations.

Attitudes and perceptions about health risks associated with development projects can have an important effect on an individual and/or a community. One of the central challenges for risk communicators is that the risks that have significant health outcomes and the risks that upset the community are not always one in the same. There is often no correlation between the ranking of health risks by experts and public outcry over the same risks. At the individual level, perceptions of health risks can lead to a number of negative health outcomes (i.e., stress, increased blood pressure, sleeplessness, reduced functioning of the individual's immune system, etc.), while at the community level, it can lead to social discord or even to social violence. Development of effective risk communication techniques is a key challenge, so that appropriate environmental, social and economic considerations can be taken into account in both public and private sector decision-making.

Encouraging Greater Public Consideration and Community Action

The report of the World Commission on Environment and Development (Brundtland Commission), *Our Common Future*, expressed optimism that the world could solve its environmental and economic development problems "in a more open, fair, and just manner". Reconciling the need for economic development, environmental quality and community acceptance necessitates the recognition of the needs for integrated decision making at all levels of society – the individual level, the community level and within and among all levels of government (municipal, provincial, territorial and federal). Conflicts arising from risks (real or perceived) associated with development projects need to be examined openly, in an informed manner using the best tools available. The essence of public involvement is two-way communication.

Project managers often delay going to the public until they feel that they have completed their background research and planning. This approach, often referred to as the 'DAD' (Decide, Announce and Defend) approach has often resulted in public outcry and delays in project implementation. Public participation in project planning, before any irrevocable decisions are made, ensures that the views of the community are known and considered when important decisions regarding the project are taken. An important aspect to effective public participation is the extent to which participants are able to exercise power in decision-making, especially when it is perceived that the decision(s) will impact on an individual's health, the health of their children or the health of their community.

Which decision to make is not always clear. Many factors must be taken into account during the decision-making process, including the nature of the health/environment concerns and the likelihood that the concerns will occur, uncertainties in the science, health benefits, public perception, economic impacts, social, political and cultural implications, as well as the technical and economic feasibility of the remedial options being considered. However, the final decision and the reasons for the decision, must be clearly articulated to the public that have participated in the identification of the health concerns. Issues that seem obvious to the project manager or health professional, might not be obvious to the impacted community. If the environmental/health impact assessment is perceived to be incomplete or biased toward the interests of the project proponent, it will not be trusted or accepted by the community. The environmental/health impact assessment report should be a comprehensive and balanced summary of the scientific, public, economic and social concerns, and be available to all interested parties.

Improving the Follow-Up Monitoring Process

Chapter 2 examined the follow-up monitoring process and suggested that this phase represented a major area of weakness in EA. Without some sort of systematic follow-up monitoring mechanism, we stand to continuously thwart any chance we might have of accurately assessing the full impact of projects. We cannot continue carrying out a fragmented EA. If carried out effectively, follow-up monitoring could undoubtedly strengthen our knowledge base since cumulative effects influencing physical and social well-being could be better understood once a project has been implemented. This information would consequently serve to provide a more accurate depiction for future assessments of a similar nature. Furthermore, systematic follow-up monitoring could also aid in the development of health indicators, particularly with respect to social and community health. These indicators could then be useful as baseline information and in determining significance of the potential effects.

Concluding Remarks

As our knowledge base on how to carry out sound environmental assessments improves, all stakeholders in a development project will realize the importance of environmental assessment in decision-making. As our experience in environmental assessment improves, so should the interactions among resource experts, economists, policy experts and environmental, social and human health scientists. The ultimate goal of these interactions is to truly integrate economic, environment and health considerations in decisions regarding development projects, so as to ensure that the basic concepts of Sustainable Development are adhered to.

The goal of this *Handbook* is to encourage and promote an integrated approach to developing a human health perspective within the framework of environmental assessments. It is not intended to be a standard. The *Handbook* consolidates the ideas expressed at regional, multi-sectoral workshops held in 1995-96 and then again in 2000. There was a consensus at all of the workshops that national guidance material on health within environmental assessment was needed in Canada and that it should include advice on assessing effects on socio-cultural health and occupational health as well as physical health. This would be consistent with the World Health Organization's definition of health and the known determinants of health.

Even though this *Handbook* has undergone extensive multi-stakeholder consultations, it is important to bear in mind that the *Handbook* was designed in order to allow for expansion and modification in the future. The *Handbook* is published as a binder, which allows pages to be inserted, deleted or modified with relative ease. Changes to this *Handbook* will be recorded on the Internet at the website address:

> www.hc-sc.gc.ca/hecs-sesc/ehas/index.htm (for English); and
> www.hc-sc.gc.ca/hecs-sesc/sehm/index.htm (for French).

and will be available for downloading free of charge. Efforts are underway to have the *Handbook* (all four volumes) translated into other languages as well, so that it can serve a wider audience. Links to the web pages containing the translated versions will be posted at both the English and French websites listed above.

The overall objective of the *Handbook* is to develop and promote partnerships and new alliances of support for health impact assessment. The development of leadership in this new evolving area so that health impact assessment can be sustained as a continuing process within environmental impact assessment at all levels is an important strategy to mobilize greater social and political commitment for the World Health Organization's total *Health-for-All* movement.

It is hoped that these four Volumes will promote self-reliance and enable others outside of the health professions, particularly at the community level, to take greater responsibility for their own health and the health of their community, through informing and educating them and developing their own leadership potential.

Suggested Readings

United Nations (1992). *Report of the United Nation Conference on Environment and Development*. Rio de Janeiro, Brazil, June 3-14.

WHO (1987). *Health and Safety Component of Environmental Impact Assessment*. Report on a WHO Meeting. World Health Organization. Copenhagen, Denmark.

WHO (2003). *World Health Organization Bulletin 2003: Special Issue on Health Impact Assessment*, Vol. 81, number 6, pp. 387-472. www.who.int/bulletin/

HIA Web Addresses

Australia:

www.health.gov.au/pubhlth/publicat/document/metadata/env_impact.htm

England:

www.publichealth.nice.org.uk/page.aspx?o=503066
www.ihia.org.uk/
www.londonshealth.gov.uk/hia.htm
www.pho.org.uk/

The International Association for Impact Assessment:

www.iaia.org/

The Netherlands:

www.hiadatabase.net/

Wales:

www.hpw.wales.gov.uk/English/national/

World Health Organization (International):

www.who.int/hia/en/

World Health Organization (EURO):

www.euro.who.int/eprise/main/WHO/Progs/HMS/Home

Notes:

APPENDIX

Glossary – Volumes 1-4

Abiotic: 1) Having no life; lifeless; 2) independent of the vital processes of a living organism.

Actinomycetes: Any one of a group of bacteria found in soil that are structurally similar to certain fungi. Antibiotics such as streptomycin and chloramphenicol are derived from some actinomycetes.

Acute (toxicity): Toxicity manifested within a relatively short time interval after toxicant exposure (i.e., as short as a few minutes to as long as several days). Such toxicity is usually caused by a single exposure to the toxicant.

Adenocarcinoma: A cancer that originates in the epithelium (a thin layer or layers of cells forming a tissue that covers surfaces of the body and lines hollow organs) of a gland or duct.

Adenosine triphosphate (ATP): A compound found in the cells of organisms and consisting of adenosine and three phosphate groups. The removal of phosphate releases large amounts of energy for use in biological reactions or processes such as muscle contraction and the metabolism of sugars.

Alternaria: Any one of a genus of fungi that cause fruit and vegetable blight, mould, or rot.

Alveolitis: Inflammation of the alveoli (the small air sacs of the lungs) where gas exchange (oxygen, carbon dioxide) occurs.

Anadromous species: Species that travel up rivers from the sea to spawn (e.g., of salmon and shad).

Anaerobic bacteria: 1) Bacteria that can live without free oxygen or bacteria that cannot live in the presence of oxygen; 2) bacteria living, growing, or residing where there is no free oxygen. Some anaerobic bacteria get their oxygen from the matter released during fermentation, which takes place in the absence of free oxygen.

Anuria: The absence of urine; the inability to urinate.

Aplastic anemia: A severe anemia caused by failure of the bone marrow to produce various blood elements, such as red blood cells, as a result of exposure to, for example, certain antibiotic drugs, poisons, or ionizing radiation (e.g., large doses of X-rays), or for unknown reasons.

Audiometry: The testing of the sense of hearing.

Auxin hormone: Any hormone of a group synthesized in the protoplasm of the young, active parts of plants, which regulates plant growth and development.

Baseline status: Refers to the conditions prior to the construction and/or preparation of the development/remediation project.

Benefit transfer technique: An economic tool that uses estimates from existing research to valuate the potential health benefits and detriments of development project scenarios under consideration. The main advantage of benefit transfer is that the process is less expensive and time consuming than primary valuation techniques. The benefit transfer technique consists of five steps: 1) describe the project case; 2) identify relevant studies; 3) review relevant studies for quality and applicability; 4) transfer the benefit estimates; and 5) address uncertainty.

Bioaccumulation: Occurs when a substance is assimilated into an organism through eating another organism (plant or animal). Depending on the substance, it may be passed through the body fairly quickly or it may accumulate (concentrate) in certain tissues or organs. Small animals bioaccumulate toxic substances, for example, by feeding on smaller organisms, and as they in turn are eaten by larger animals, they pass the absorbed contaminants along to the next higher level in the food web.

Bioaerosol: A suspension of airborne particles, large molecules, or volatile compounds that are living or were released from a living organism; also defined as a suspension of non-viable microbial cells with which endotoxins can be associated. Individual aerosol particles range from submicroscopic (<0.1 µm) to greater than 100 µm in diameter.

Biological monitoring: A tool used to assess environmental or occupational exposures and involving the analysis of appropriate bodily fluids (e.g., blood, urine, exhaled breath) or tissues and comparing the results with guideline values such as maximum acceptable concentrations (MACs) or with biological exposure indices (BEIs).

Biomagnification: The increase in the concentration of toxic chemicals with each new link in the food chain. For example, a pesticide sprayed on vegetation can concentrate in the fat of animals and fish that eat vegetation and then is further concentrated in the fat of meat and fish eaters, resulting in an overall biomagnification of the chemical.

Boundaries: Spatial boundaries are set on the basis of the geographical limits of project impacts. Temporal boundaries deal with the timing and the life span of the impacts arising from the project. Jurisdictional boundaries refer to the legal requirements to which the project must adhere.

Calcination: The act or operation of calcining – i.e., burning or incinerating (something) to ashes or powder.

Canadian Environmental Assessment Agency: Federal government organization that administers the *Canadian Environmental Assessment Act* and reports directly to the Minister of the Environment.

Carboxyhemoglobin: The compound formed in the blood when inhaled carbon monoxide combines with hemoglobin, thereby restricting the amount of oxygen that the blood can carry; the resulting condition is known as carboxy-hemoglobinemia.

Case-control study: (Syn: case-referent study, case comparison study) A type of observational analytical study. Enrolment in the study is based on the presence ("case") or absence ("control") of a disease of interest. Histories of previous exposures to some suspected risk factor(s) are then compared between cases and controls, controlling for potential "confounders." Causal factors should occur more frequently among cases than among controls.

Central agency: Component of government playing a key role in the successful formulation and implementation of government policies and programs by over-seeing interdepartmental mechanisms of information-sharing, consultation, and coordination. In the case of the Canadian federal government, the Privy Council Office, Treasury Board, and the Department of Finance are its central agencies.

Chronic (toxicity): The adverse effects manifested after a long period of uptake of small quantities of a toxicant. The most serious manifestation of chronic toxicity is carcinogenesis, but other types of chronic toxicity are also known (e.g., reproductive and neural effects).

Clastogenic: Causing chromosome breaks and aberrations.

Cohort: A well-defined group of people who have had a common experience or exposure and who are then followed up after entry in the cohort (e.g., date of hire, date of birth, date of moving into a neighbourhood) for the incidence of new diseases or events, as in a cohort or prospective study. A group of people born during a particular period or year is called a birth cohort.

Cohort study: (Syn: follow-up, longitudinal, or incidence study) A type of observational analytical study. Enrolment in the study is based on membership in a "cohort" and on exposure characteristics. Disease, death, or other outcome rates are ascertained over the follow-up period and are compared between different exposure subsets of the cohort.

Confounding: The undesired mixing of effects of extraneous risk factors with the main effect of the targeted risk factor(s). The influence of cofactors (e.g., smoking) biases (distorts) the observed main effect of interest (e.g., dusts and lung cancer). Confounding is usually controlled for by multivariate analysis and other statistical adjustment techniques.

Conjunctival congestion: Congestion of the conjunctiva, the mucous membrane that covers the front of the eyeball and the inner surface of the eyelids.

Cost-benefit analysis (benefit-cost analysis): The principal analytical framework used to evaluate public expenditure decisions. It attempts to evaluate a project before it is undertaken to help stakeholders (in the case of environmental assessment) and decision-makers determine in what form and at what scale it should be undertaken, and indeed whether it should be undertaken at all. Cost-benefit analysis involves the following steps: 1) identification of the project or projects to be analysed; 2) enumeration of all project impacts, both favourable and unfavourable, present and future, on all members of the public (e.g., a community) if a particular project is adopted; 3) valuation of these impacts in monetary terms (favourable impacts are registered as benefits, and unfavourable impacts as costs); and 4) calculation of the project's net benefits (total benefits minus total costs).

Country foods: Foods that are harvested by hunting, trapping, or fishing; and produce such as that grown in vegetable gardens and orchards or collected from naturally occurring sources (e.g., wild berries).

Creatinine: A constituent of urine produced by the breakdown of creatine (a compound found chiefly in the muscles of vertebrate animals, which is involved with supplying energy for voluntary muscle contraction); also found in blood, muscle, plants, soil, etc.

Cross-sectional study: (Syn: prevalence study) An observational study in which the presence of exposure and the presence of disease (or other health-related variables) are ascertained simultaneously at the time of the study. Participants are sampled irrespective of their disease or exposure status. While being less expensive than others, such studies have little statistical power, i.e., few cases and few people exposed. They are best used to describe prevalence of diseases or exposures in a population.

Cryptosporidiosis: A gastrointestinal infection caused by the enteric protozoan *Cryptosporidium*, usually through waterborne transmission, and resulting in symptoms of gastroenteritis. The most common sources of this protozoan include domestic animals (e.g., cattle, sheep), contaminated recreational waters, drinking water treatment systems, and well and spring water.

Decibel (dB): A unit for measuring the relative intensity of sounds, equal to 1/10 of a bel. The decibel scale used for this measurement is logarithmic, with every 3-dB increase indicating a doubling of noise intensity. The term dBA is the dB sound pressure level filtered through an A filtering network to approximate human hearing response at low frequencies. The decibel is also used to describe levels of sound power and is the logarithm of sound power level. A two-fold increase in the power output of a source will result in a 3-dB increase in power level and correspondingly a 3-dB increase in sound power level at any distance from the source. Sound power level will be reduced 6 dB for every doubling of distance from a source.

Decision-makers: Persons (e.g., cabinet ministers, senior officials, regulatory authorities, etc.) who help determine if a project should be permitted to proceed.

Determinants of health: Interacting factors that influence the health status of ndividuals and populations and that determine health differentials and inequalities. These factors are many and varied and include biology and genetic endowment, income and social status, social support networks, education, employment and working conditions, physical environment, personal health practices and coping skills, healthy child development, and health services. These determinants of health are interlinked, and differentials in their distribution lead to health disparities in a given population.

Distributional analysis: An economic analytical technique that evaluates the distribution of project impacts across segments of the economy. For example, an economic impact analysis might examine the impacts of a project on the revenues and profits of particular industries or on employment in those industries. Economic impact analysis can help to identify the segments of the economy

within the local region that stand to gain or lose from a project's development and can also help to predict the likely distribution of impacts between geographic regions.

Dose: In the context of this volume, dose refers to the contaminant intake from the consumption of a food and is measured in units of µg/kg body weight per day. It is the product of the mean of the levels of the contaminant of potential concern found in the food (C_f in µg/g) and the rate of consumption of the food (IR_f, in g/day), divided by body weight (BW, in kg); i.e., Dose = $C_f \times IR_f / BW$.

Dyspnea: Difficult or laboured breathing.

Ecological bias and fallacy: The relationship observed between variables at an aggregate level in an ecological study does not necessarily represent the relationship that exists at an individual level. This phenomenon is said to result from an ecological bias. Inferring that the relationships at the individual level are the same as those observed at an aggregate level is called the "ecological fallacy" (an error of inference due to failure to distinguish between different levels of organization). One must be extremely careful in making inferences or generalizations about individuals based on ecological studies.

Ecological risk: The toxicological risk to an ecosystem.

Ecological study: (Syn: aggregate study, correlational study) A type of observational study in which the units of observation are populations or groups of people rather than individuals. The question asked is: Do geographical populations with a higher occurrence of a specific exposure tend also to be those with a higher occurrence of health outcomes or mortality? In ecological studies, data on aggregate measures (averages or rates) of exposure and of health outcomes are obtained for each "ecological unit of analysis" (i.e., geographically and chronologically defined populations), and the relationship between the summary exposure and outcome measures is analysed across ecological units. Ecological studies are often a preliminary step in investigating a suspected exposure-outcome relationship, particularly in the investigation of environmental health impacts, and the results from these studies should be confirmed by cohort, case-control, or cross-sectional studies.

Ecosystem: A biological community of interacting organisms and their physical environment.

Endocarditis: Inflammation of the endocardium (i.e., the smooth membrane that lines the cavities of the heart).

Endospore: 1) The inner coat or wall of a spore of certain plants; endosporium; 2) a spore formed within a cell of certain bacteria.

Endotoxin: A toxic substance that remains inside the organism (e.g., bacteria) that produces it. Endotoxins are cell wall components of Gram-negative bacteria and are inherently toxic and can lead to various problems, but this occurs mainly when they are present in very high concentrations or when the micro-organisms that produce them are viable.

Enterobacteria: Intestinal bacteria, especially those belonging to a large family of rod-shaped coliform bacteria that includes the genera *Escherichia* (e.g., *E. coli*) and *Klebsiella*.

Enterotoxin: An intestinal toxin produced by certain bacteria that causes symptoms of food poisoning.

Environment: Refers to the components of the Earth and includes: 1) land, water, and air, including all layers of the atmosphere; 2) all organic and inorganic matter and living organisms; 3) the social, economic, recreational, cultural, spiritual, and aesthetic conditions and factors that influence the life of humans and communities; and 4) a part or combination of those things referred to in (1) and (3) and the interrelationships between two or more of them.

Environmental assessment: A comprehensive and systematic process designed to identify, analyse, and evaluate the environmental effects of a project in a public and participatory manner. Environmental assessment involves the use of technical experts, research and analysis, issue identification, specification of information requirements, data gathering and interpretation, impact prediction, development of mitigation proposals, external consultations, and report preparation and review. In this Handbook, the term “environmental assessment” is used synonymously with “environmental impact assessment,” “impact assessment,” etc.

The International Association for Impact Assessment defines environmental impact assessment as the process of identifying, predicting, evaluating, and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made.

Environmental assessment practitioner: Someone who is involved in the environmental assessment process (i.e., government employee, knowledgeable person in the environmental assessment field, etc.).

Environmental audit: An internal evaluation by a company or government agency, to verify its compliance with legal requirements as well as its own internal policies and standards. It is carried out by either outside consultants or employees of the company or facility from outside the work unit being audited. Audits can identify compliance problems, weaknesses in management systems, or areas of risk. The findings are documented in a written report.

Environmental effect: Any change that the project may cause in the environment, including any change it may cause to a listed wildlife species, its critical habitat or the residences of individuals of that species, as those terms are defined in subsection 2(1) of the *Species at Risk Act*; and including any effect of any such changes on health and socioeconomic conditions, on physical and cultural heritage, on the current use of lands and resources for traditional purposes by Aboriginal persons, or on any structure, site, or thing that is of historical, archaeological, paleontological, or architectural significance.

Environmental epidemiology: The application of epidemiology to suspected environmental health problems. It seeks to determine whether a link exists between diseases or health outcomes and environmental factors. Environmental epidemiological studies are used to assess the health status of populations exposed to suspected environmental sources of pollution and to identify potential health problems; to identify more vulnerable subgroups within environmentally exposed populations; to assess the health risks or effects of environmental exposures; and to assess the contribution of environmental factors to suspected environmental diseases, deaths, or other health conditions.

Epidemiology: The study of the distribution and determinants of health-related states or events in specified populations, and the application of this study to the control of health problems.

Equity assessment: An economic technique that examines the distribution of project impacts on different segments of society – i.e., across a range of demographic variables, such as income group, race or ethnicity, age, gender, and others. Equity assessments are often designed to provide information on how a project is likely to affect groups that are significantly disadvantaged (e.g., low-income households) or particularly vulnerable to adverse impacts (e.g., children or the elderly).

Erysipeloid: 1) An infectious disease, resembling erysipelas (an acute infectious disease that causes fever and chills and a rapid spreading, deep-red inflammation of the skin, caused by streptococcus), but not attended with fever, contracted by people who handle animals infected with erysipelas;

2) an acute or chronic bacterial disease of hogs, and less commonly of turkeys and sheep, characterized by enteritis, red patches on the skin, and arthritis.

Eutrophication: The accumulation of nutrients in lakes and other bodies of water, causing rapid growth of algae, which deplete the water of oxygen.

Experimental study: A study in which the investigator specifies (ideally by random allocation) the exposure category for each individual (clinical trial) or community (community trial), then follows the individuals or community to detect the effects of the exposure. Only therapeutic and preventive experimental studies can ethically be conducted on human individuals or communities. Hence, epidemiological studies conducted under health impact assessments rely on "observational" and not on experimental epidemiological studies.

Exposure ratio (ER): Also termed the Hazard Index, it is the ratio of the dose (i.e., contaminant intake from food consumption, in µg/kg body weight per day) and the toxicological reference value (TRV, also in µg/kg body weight per day) for a specific contaminant; i.e., ER = Dose/TRV.

Fetotoxic: Toxic to the fetus or embryo.

Fluorosis (dental): A disease condition characterized by a mottled tooth enamel and caused by the ingestion of excessive amounts of fluorine in drinking water. Fluorosis negatively affects tooth development, particularly in children less than six years of age, and, on a longer-term basis, leads to osteoporosis.

Genotoxic: Toxic to the genetic material (i.e., genes, made up of DNA) in an organism's cells.

Genotoxic carcinogens: Cancer-causing agents that are toxic to the genetic material (i.e., genes made up of DNA) in an organism's cells.

Giardiasis: An infection caused by the protozoan parasite *Giardia lamblia* and characterized by a form of gastroenteritis known as beaver fever. This enteric pathogen is the most commonly implicated agent in waterborne disease outbreaks in North America and other parts of the world. A waterborne outbreak often occurs as a result of human or animal fecal contamination of a water supply. Natural hosts include beaver, muskrat, and deer.

Government departments/ministries or agencies: The federal, provincial, and/or territorial government institutions partaking or providing guidance in the environmental assessment.

Health: Defined by the World Health Organisation as a complete state of physical, mental, and social well-being and not merely the absence of disease or infirmity. Consistent with this definition, health has been defined in this *Handbook* in terms of its physical and sociocultural dimensions. "Health and well-being" is synonymous with this definition of "health" and has been used to emphasize the inclusion of physical health and sociocultural well-being. The Aboriginal definition of health is "obtaining and maintaining a balance of all aspects of the self – mental, emotional, spiritual, and physical – with and through the help and involvement of the family and the community".

Health impact assessment: 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 (see: http://www.who.int/hia).

Health professional: A person who has formal education and/or experience in how the environment and other factors can affect human health and well-being. This includes professionals in the medical field (i.e., doctors, nurses, epidemiologists, toxicologists, etc.), professors and experts in the social science field, and occupational health and safety experts in government and industry.

Health promotion: The process of enabling people to increase control over and improve their health; and the combination of educational and environmental supports for actions and conditions of living conducive for health. "Environmental," in this context, usually refers to the social, political, economic, organizational, policy, and regulatory circumstances bearing on health and not the physical environment or the provision of medical services.

Helminthes: Parasitic worms.

Hepatitis: 1) Inflammation of the liver; 2) a contagious viral disease characterized by inflammation of the liver, fever, and usually jaundice. Infectious hepatitis is known as hepatitis A, and serum hepatitis as hepatitis B.

Hepatotoxic: Toxic to the liver.

Histological diagnosis: Medical diagnosis based on the analysis of the microscopic structure of the tissues and cells of animals and plants.

Immunosuppression: Suppression of the immune system. Immunosuppression may result from certain diseases such as AIDS or lymphoma or from certain

drugs such as some of those used to treat cancer. Immunosuppression may also be deliberately induced with drugs, as in preparation for bone marrow or other organ transplantation to prevent the rejection of the transplant.

Incidence rate ratio: A measure of effect, the incidence rate ratio is the incidence rate of the health outcome in the exposed group relative to the incidence rate in the unexposed group. The incidence rate ratio is usually the preferred measure of effect because it accounts for duration of exposure and follow-up time for each member of the cohort(s).

Indigenous health impact assessment: The health impact assessment methods and approaches identified by indigenous communities in Canada. Indigenous health impact assessment is based on three concepts: 1) indigenous communities rely heavily on naturalized knowledge systems; 2) health impact assessment is very closely linked to environmental impact assessment; and 3) health impact assessment as a process depends on measurement and evaluation of health indicators, and indigenous communities themselves must develop their own specific community health indicators.

Leachate: Any substance that has undergone leaching – i.e., the dissolving out of soluble parts from, for example, ashes, ores, or other matter – by running water or other liquid through slowly; a substance subjected to the action of percolated water. The contaminated water or leachate in landfill sites is a complex, highly variable mixture, consisting of various organic and inorganic compounds and microorganisms. It is generated by precipitation or by other moisture that enters the landfill from the breakdown of organic matter or from ground water. It is generally characterized by a strong odour and dark brown colour and contains high levels of pollutants.

Life Indicators Wheel: An important part of the indigenous environmental assessment process, the Life Indicators Wheel holds that community health depends on some balance of the corporal and spiritual "opposites" and of the intellectual/visceral. Community life indicators (i.e., values, morale, responsibility, spirituality, economics, environment, politics, and religion) are represented on the perimeter of the wheel. The health of the community is the balance point in the centre of the wheel, and community health indicators are developed from one-on-one links across the centre (i.e., environment-morale, economics-values, politics-responsibility, and religion-spirituality). The Life Indicators Wheel and community health indicators reflect and support the values of cultural sustainability of traditional First Nations societies.

Lipopolysaccharide: A compound formed by a lipid (a type of fatty substance; includes fatty acids, oils, waxes, and steroids) and a polysaccharide (a complex sugar); e.g., bacterial lipopolysaccharides.

Meta-analysis or Bayesian approaches: Statistical methods used in the benefit transfer process to derive values from the study case and apply them to the project case, and which combine estimates from several studies of similar effects; the resulting estimates may be more accurate and reliable than point estimates or valuation functions. Meta-analysis can be used to integrate the results when many relevant studies are available; the Bayesian approach includes data on the project case as well as data from existing studies.

Methemoglobin: A compound that can be formed from nitrates and nitrites and that restricts or prevents transportation of oxygen by the blood, resulting in a condition known as methemoglobinemia. Ingesting water containing more than 10 mg/L of nitrates can, in the long term, promote methemoglobin formation.

Mitigation: The elimination, reduction, or control of a project's adverse environmental effects, including restitution for any damage to the environment caused by such effects through replacement, restoration, compensation, or any other means.

Mucocutaneous irritation: Irritation of the mucous membranes of the skin (e.g., the lining of the nose, throat, and other cavities of the body that are open to the air; tissue containing glands that secrete mucus; mucosa).

Multifactorial: Having many contributing causes, as in, for example, the context of disease risks.

Multiple myeloma: A very painful cancer usually affecting a number of bones, originating in bone marrow, and causing lesions of the bone and of certain soft tissues such as the kidneys.

Myeloma: A malignant tumour of the bone marrow.

Myocarditis: Inflammation of the myocardium, the muscular part of the wall of the heart.

Naturalized knowledge systems: This term is used in various contexts and generally refers to traditional indigenous or Aboriginal knowledge. A key element of indigenous health impact assessment, naturalized knowledge systems are bodies of ideas, values, and concepts that social systems use to function within their environment. This process is dynamic and cumulative – i.e., it adapts itself

to new technological and socioeconomic conditions as they emerge. Naturalized knowledge systems are based on the principles of respect, equity, and empowerment. They focus on the understanding of the importance of the environmental knowledge of First Nations communities and the complexity of traditional approaches to environmental systems. Naturalized knowledge systems link the observation and appreciation of the physical world with the philosophy and attitudes created and supported by the close interaction among the environment, health, and lifestyle.

Neoplastic: Having to do with a neoplasm – i.e., a new, abnormal growth of tissue, such as a tumour.

Nephrotoxic: Toxic to the kidneys.

Net efficiency criterion: Decision-making within the context of benefit-cost analysis depends on the net efficiency criterion – i.e., in any choice situation, one selects the alternative that produces the greatest net benefit. In some cases, of course, the net benefits of all alternatives evaluated may be negative – i.e., their costs outweigh their benefits; in such cases, the best alternative is to do nothing, which produces a net benefit of $0.

Neuroendocrinological system: The physiological system having to do with the nervous system and the endocrine glands (i.e., the glands that secrete hormones directly into the blood).

Neurotoxic: Being or caused by a neurotoxin; toxic to the nervous system.

Observational study: A class of epidemiological studies that are "observational" in nature, and where nature is allowed to take its course. Changes or differences in one characteristic are studied in relation to changes or differences in others, without the intervention of the investigator. There are four types of observational studies: 1) cohort; 2) case-control; 3) cross-sectional; and 4) ecological. Each study design has its own economic and scientific advantages and disadvantages.

Occupational hygiene: Generally defined as the art and science dedicated to the recognition, evaluation, communication, and control of environmental hazards or stressors in, or arising from, the workplace that may result in injury, illness, or impaired well-being of workers and/or members of the community. These hazards or stressors can be biological, chemical, physical, ergonomic, or psychosocial. Occupational hygiene also deals with the assessment of the extent of risk posed by the hazards and the development of effective strategies to eliminate or control the risks (risk management).

Occupational hygienist: An occupational health professional with expertise in the anticipation, recognition, evaluation, communication, and control of environmental hazards in, or arising from, the workplace that may cause injury, illness, or impaired well-being of workers and/or members of the community. These hazards can be biological, chemical, physical, ergonomic, or psychosocial (see: http://www.crboh.ca). The International Commission on Occupational Health uses the term "occupational health professional" to encompass occupational health physicians and nurses, occupational hygienists, ergonomists, and safety specialists.

Odds ratio: The standard measure of effect used in case-control studies. The odds ratio is a measure of association that quantifies the relationship between an exposure and health outcome in a comparative study; also known as the cross-product ratio. In incidence case-control studies, the odds ratio approximates the incidence rate ratio.

Oocyst: A thick-walled structure in which sporozoan zygotes develop.

Opportunity cost: Represents the value of goods and services that society loses by forgoing allocation of a resource to its best alternative use. While market prices generally reflect opportunity costs, adjustments may be necessary in certain instances – e.g., when the size of a project is so substantial that it may actually influence the market price of a resource.

Organoleptic: Using various sense organs to determine flavour, texture, or other quality.

Osteoporosis: A disease in which the bone spaces or Haversian canals become enlarged and the bones become weak and brittle. It occurs especially in elderly people, causing bones to break easily and heal slowly.

Osteosclerosis: An abnormal hardening and increased density of bone, especially at the ends or outer surface, often caused by an infection or a tumour.

Paresthesia: An abnormal sensation of prickling, tingling, or itching of the skin.

PCB congeners: Each polychlorinated biphenyl (PCB) molecule consists of two six-carbon rings with one chemical bond joining a carbon from each ring. Chlorine can attach to any of the other 10 carbons. There are 209 possible arrangements called "congeners"; congeners with the same number of chlorines are called isomers. PCB molecules with the two rings in the same plane (i.e., the two rings are not twisted) are termed "coplanar." Coplanar molecules have dioxin-like properties. There are currently 13 PCB congeners listed by the World Health

Organization with interim toxic equivalent factors for human intake of dioxin-like PCBs. The potential toxicity of various PCB mixtures present in the environment varies, depending on the composition of the PCB mixture.

Pericarditis: Inflammation of the pericardium, the membranous sac enclosing the heart.

Perinatal: Of or having to do with the period of a child's life including the five months preceding birth and the first month after birth.

Prevalence ratio: The prevalence of a specific health outcome in an exposed group relative to its prevalence in an unexposed group; i.e., a comparison of two groups in terms of prevalence of the specific health outcome.

Product life cycle analysis: Analysis taking a "cradle to grave" approach to thinking about products, processes, and services. It recognizes that all product life cycle stages (extracting and processing raw materials, manufacturing, transportation and distribution, use/reuse, recycling, and waste management) have environmental and economic impacts.

Project: Any proposed physical undertaking or activity required to undergo an environmental assessment. Most environmental assessment legislation defines the types of development projects subject to environmental assessment requirements.

Proponent: An individual, organization, or company that proposes a development project.

Psychosocial (risk): Of or involving the influence of social factors or human interactive behaviour.

Public: Local residents, environmental groups, Aboriginal people, local businesses, and other citizens. It does not include proponents or government departments (see definition of stakeholder).

Putrescible: Likely to putrefy or rot.

Pyrolysis: Chemical decomposition produced by exposure to high temperatures.

Randomized controlled trial: The ideal experimental epidemiological study design, in which individuals are randomly assigned to different preventive or therapeutic interventions and are then followed prospectively to assess any differences in outcomes between the intervention ("test") groups and the control

group(s). Such randomization tends to make study groups comparable in every respect that can affect the outcome. Most often, randomized controlled trials are conducted "blind" – i.e., participants do not know which treatment/exposure they are receiving. Ideally, randomized controlled trials are "double blind": neither the participants nor the observers (including caregivers) know which treatment/exposure is given to whom until the end of the trial.

Receptor: Refers to the human population residing in the development/remediation project area that may be exposed to potential contaminants from the consumption of country foods. In those cases where no communities exist near the project site, receptors can be humans who frequent the area to gather country foods.

Recommended maximum weekly intake (RMWI): In the context of food consumption, it is the product of the toxicological reference value (TRV, in µg/kg body weight per day) for a specific contaminant and body weight (BW, in kg), divided by the mean of the levels of the contaminant of potential concern found in the food (C_f, in µg/g); multiplied by 7 (i.e., days in a week); that is: RMWI (in g/week) = (TRV × BW/C_f) × 7.

Regional public health authorities: Provincial/territorial or regional government bodies with responsibility to address public health concerns (e.g., Medical Officers of Health).

Relative risk: (Syn: risk ratio) A ratio of the risk of some health-related event such as disease or death among the exposed group to the risk among the unexposed group. This measure is usually used in cohort studies and sometimes in cross-sectional studies. It is sometimes used as a synonym for "odds ratio" or "incidence rate ratio" if the disease is "rare" (i.e., incidence rate <10%).

Revealed preference methods: Economic valuation methods that are based on observed behaviours that can "reveal" the values of non-market goods based on prices and preferences for related market goods or services. Revealed preference methods include wage-risk studies, cost-of-illness studies, and averting-behaviour studies.

Risk assessment: The qualitative or quantitative estimation of the likelihood of adverse effects that may result from exposure to specified health hazards or from the absence of beneficial influences. Risk assessment attempts to calculate or estimate the risk to a given target system following exposure to a particular substance, taking into account the inherent characteristics of the substance of concern as well as the characteristics of the specific target system. The process

includes four steps: 1) hazard identification, 2) dose-response assessment, 3) exposure assessment, and 4) risk characterization. (see: http://www.who.int/health_topics/risk_assessment).

Risk management: A decision-making process involving considerations of political, social, economic, and technical factors with relevant risk assessment information relating to a hazard so as to develop, analyse, and compare regulatory and non-regulatory options and to select and implement the optimal decisions and actions for safety from that hazard. Essentially, risk management is the combination of three steps: 1) risk evaluation; 2) emission and exposure control; 3) and risk monitoring. (See also, section 5.2.)

Septicemia: Blood poisoning, especially in which microorganisms and their toxins enter the bloodstream.

Silviculture: The cultivation of woods or forests; the growing and tending of trees as a branch of forestry.

Social impact assessment: The process of analysing, monitoring, and managing the intended and unintended social consequences, both positive and negative, of planned interventions (policies, programs, plans, projects) and any social change processes invoked by those interventions. Its primary purpose is to bring about a more sustainable and equitable biophysical and human environment. Social impact assessment is a project planning and decision-making tool that describes the social context within which development projects are undertaken; assesses, in advance, the social impacts of a policy, program, or project on affected communities; and proposes mitigation measures to avoid, reduce, or compensate for the impacts. Social impact assessment also identifies those groups at risk or at benefit and, when possible, the extent of the impacts. (see: http://www.iaia.org).

Social learning theory: Supports the ideas that people self-regulate their environments and actions and that, although people are acted upon by their environments, that they also help create their surroundings.

Sociosanitary: Of or having to do with social health and well-being; favourable to social or public health. Issues such as public water supplies, sewage systems, air pollution, and radiation controls – as in the construction of dams, pipelines, incinerators, and the like – are examples of sociosanitary issues.

Spatial (scale): Of or concerning space; a geographical analytical scale for the assessment of health impacts. The zone of influence in a spatial scale varies depending on the nature of the exposure to a risk factor. For example, the zone

affected by the effluent produced by a smokestack is different from the area affected by noise. When studies are based on official maps and related attributes, sometimes massive but poorly detailed scales (e.g., 1:500 000) are used, which provide a means of "overlooking" certain fragile areas or historical sites and also serve to reduce impact study costs. The Inter-American Development Bank now stipulates minimum scales (e.g., 1:50 000) for these studies in order to avoid such problems.

Sporulation: The formation of or conversion into spores or sporules (small spores), e.g., as in certain protozoa.

Stakeholder: Any individual, organization, or company that has an interest, financial or otherwise, in a project. Types of stakeholders commonly associated with environmental assessments include the proponent, government departments, local residents, environmental groups, Aboriginal people, local businesses, and others (see definition of public).

Stated preference methods: Economic methods used in valuating health effects and that typically employ survey techniques and ask respondents to state what they would pay for the anticipated reduction in adverse health effects (or what they would pay to avoid unfavourable health effects). These methods can be used to directly valuate the development project of concern and to assess the values for specific effects. Stated preference methods include contingent valuation, conjoint analysis, and risk-risk trade-offs.

Strategic environmental assessment: The systematic and comprehensive process of assessing the environmental effects or implications of a proposed strategic decision or action, policy, plan, program, and its alternatives. At the same time, strategic environmental assessment is the process of integrating the concept of sustainability into strategic decision-making. A good-quality strategic environmental assessment process informs planners, decision-makers, and affected public on the sustainability of strategic decisions, facilitates the search for the best alternative, and ensures a democratic decision-making process. This enhances the credibility of decisions and leads to more cost- and time-effective environmental assessment at the project level. For this purpose, a good-quality strategic environmental assessment process is integrated, sustainability-led, focused, accountable, participative, and iterative (see: http://www.iaia.org).

Stressor: Any stimulus that produces stress or strain.

Surveillance system: A systematic, ongoing process whose components are data collection, expert analysis and interpretation, and response (communication of information for action).

Sustainable development: Development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs.

Temporal (scale): Of or concerning time. In the context of health impact assessment, "temporal" refers to an analytical scale relating to the time scale for the assessment of health impacts. For example, on a temporal scale, toxicity can be variously described as acute, chronic, or even transgenerational. Therefore, it is important to specify desirable spatial and temporal scales for every significant risk. Scale determination is crucial and can exert a considerable influence on the perceived importance of a pollution problem.

Teratogen: A substance (e.g., a drug or other agent) that causes birth defects or malformations of the embryo or fetus.

Teratogenicity: The quality of being teratogenic, i.e., the tendency to cause malformations of the embryo or fetus or birth defects.

Tetany: A condition characterized by muscle spasm or prolonged contraction of a muscle.

Threshold limit values: The most universally accepted occupational exposure limits, established by the American Conference of Governmental Industrial Hygienists. Occupational exposure limits are not "ideal" or "target" workplace levels, but rather the current maximum acceptable (airborne) levels of contaminants. In the case of occupational exposure limits adopted by regulation, they are legal maxima. Even in situations where exposures are below the occupational exposure limits, the former should be reduced to the lowest practical levels on a matter of principle.

Time-weighted average: The "average" exposure over the working day. The time-weighted average numerical limits that are listed assume that there is an 8-hour exposure. If worker exposure occurs over a longer period and/or there is not a 16-hour period between exposures, then adjustments may have to be made to these values from a legal standpoint and/or to conform to fundamental toxicological principles.

Toxicity: The ability of a substance to produce deleterious or adverse effects in the exposed organism.

Toxicological reference values: Reference values indicating the toxicity of specific contaminants and used for risk assessment purposes. Toxicological reference values are established by appropriate agencies and are used to

determine the human health risks associated with exposure to contaminants in the development/remediation project area. For example, toxicological reference values specific to food-borne contaminants and approved by Health Canada are preferable for the assessment of human health risks posed by contaminants in country foods.

Toxicological risk analysis: The determination of the probabilities and magnitude of potential toxic effects due to exposure to xenobiotics or to ionizing radiation.

Transboundary environmental impacts: Typically refers to a local source of pollution, that causes environmental impacts across political perimeters.

Transgenerational (toxicity): Toxicological effects occurring in the offspring of the exposed organism.

Trihalomethanes: A class of chemical organic compounds that are chlorination by-products formed when organic matter naturally present in surface water reacts with the chlorine added during the disinfection process (chlorine treatment of drinking water).

Uremia: An abnormal condition resulting from the accumulation in the blood of waste products that should normally be eliminated in the urine. Nephritis (inflammation of the kidneys) is a frequent cause of uremia.

Valuation of health effects: An assessment of the monetary value of the health effects of a development project. If a project is expected to have a favourable effect on human health, the benefit should be valuated by gauging individuals' willingness to pay for the anticipated reduction in adverse effects. Similarly, if a project is expected to have unfavourable health effects, then individuals' willingness to pay to avoid these effects should be added to the project's cost. By valuating health effects in this manner, economic analysis can integrate such impacts into a benefit-cost framework.

Zoonosis: Any of various infectious diseases that can be transmitted under normal conditions from animals to humans (e.g., tuberculosis, rabies).

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Activities Carried Out by the Task Force

Chronology of Events:

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Sept. 1993 Review of National and Provincial/Territorial Literature

Mar. 1994 1st Draft (reviewed by Task Force)

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Oct. 1994 3rd Draft (translated and distributed for comment)

Sept. 1995 Workshop Halifax (multistakeholder)

Nov. 1995 Workshop Winnipeg (multistakeholder)

Nov. 1995 Workshop Montreal (multistakeholder)

Dec. 1995 Workshop Toronto (multistakeholder)

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Mar. 1996 Workshop Ottawa (federal government)

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Apr. 1997 Draft Canadian Health Impact Assessment Guide, Volume 1: The Beginner's Guide

June 1999 Canadian Handbook on Health Impact Assessment Volume 1: The Basics

Dec. 1999 Draft Canadian Handbook on Health Impact Assessment Volume 2: Decision Making in Environmental Health Impact Assessment

Dec. 1999 Draft Canadian Handbook on Health Impact Assessment Volume 3: Roles for the Health Practitioner

Apr. 2000 Workshop Ottawa (multistakeholder)

May 2000 Workshop Vancouver (multistakeholder)

May 2000 Workshop Regina (multistakeholder)

June 2000 Workshop Halifax (multistakeholder)

June 2000 Workshop Toronto (multistakeholder)

June 2000 Workshop Quebec (multistakeholder)

Mar. 2001 Final Version Canadian Handbook on Health Impact Assessment Volume 2

May 2003 Canadian Handbook on Health Impact Assessment Volume 3

May 2003 Canadian Handbook on Health Impact Assessment
Volume 4

Nov. 2004 Canadian Handbook on Health Impact Assessment
Volume 1: The Basics

Nov. 2004 Canadian Handbook on Health Impact Assessment
Volume 2: Approaches and Decision-making

Nov. 2004 Canadian Handbook on Health Impact Assessment
Volume 3: The Multidisciplinary Team

Nov. 2004 Canadian Handbook on Health Impact Assessment
Volume 4: Health Impacts by Industry Sector

Notes: