

CLEANER, GREENER, HEALTHIER

A PRESCRIPTION FOR
STRONGER CANADIAN
ENVIRONMENTAL LAWS
AND POLICIES

David R. Boyd



UBC Press · Vancouver · Toronto

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Praise for *Cleaner, Greener, Healthier*

“David Boyd asks exactly the right questions and comes to the sad conclusion that Canada’s environmental laws are far weaker than those of other countries. But he’s ultimately optimistic: if government exerted some political will, most environmental threats to our health could be eliminated.”

– Gideon Forman, Executive Director, Canadian Association of Physicians for the Environment

“In this comprehensive and readable survey, David Boyd catalogues the many hazardous substances that we encounter in our environment and highlights how Canada lags far behind other developed countries with respect to regulation of many exposures. Boyd not only diagnoses the problem, he provides a scientifically robust prescription for treating it. This is a must-read for policymakers at all levels of government and for all Canadians who care about the air we breathe, the water we drink, and the food we eat.”

– Peter D. Paré, MD, Professor Emeritus of Respiratory Medicine and Pathology at the University of British Columbia and editor-in-chief of the *Canadian Respiratory Journal*

“David Boyd’s latest book provides a sobering assessment of Canada’s current legal framework for environmental protection and a thoughtful prescription on what can be done to improve it. An excellent read for anyone with an interest in environmental health, policy, and regulation.”

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“This important book addresses the political failures of governments to adequately protect Canadians from environmental harm and to create more health-enhancing environments. More importantly, it shows how we can – and must – change this, using all available political, legal, and economic tools to create a cleaner, greener, and healthier future for us all.”

– Prof. Trevor Hancock, School of Public Health and Social Policy, University of Victoria

“This book must be put in every politician’s hands. For years, David Boyd has built a very robust diagnosis of Canada’s environmental problems. Now, through this appealing and very positive book, Boyd provides the next step: a powerful prescription for achieving a healthy environment.”

– Dr. François Reeves, Université de Montréal, author of *Planet Heart: How an Unhealthy Environment Leads to Heart Disease*

“Want to save thousands of lives, billions of dollars in health costs, and have a cleaner environment? Then read this book. With meticulous research and superb writing, David Boyd paints a powerful policy road map for making Canada healthy, wealthy, and wise – if we take his advice.”

– Prof. Stewart Elgie, Faculty of Law, University of Ottawa

“David Boyd has once again made a monumental contribution to the scholarship of Canadian environmental law. Only rarely can it be said that a book could actually save lives; this one can. If we adopt the very reasonable approaches he suggests, we will indeed create healthier Canadians both now and in the future. A must-read for all Canadians.”

– Prof. Lynda M. Collins, Faculty of Law, University of Ottawa



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Library and Archives Canada Cataloguing in Publication

Boyd, David R. (David Richard), 1964-, author

Cleaner, greener, healthier : a prescription for stronger Canadian environmental laws and policies / David R. Boyd.

(Law and society)

Includes bibliographical references and index.

Issued in print and electronic formats.

ISBN 978-0-7748-3046-1 (bound). – ISBN 978-0-7748-3048-5 (pdf). –

ISBN 978-0-7748-3049-2 (epub)

1. Environmental law – Canada. 2. Environmental policy – Canada. 3. Environmental health – Canada. 4. Canada – Environmental conditions. I. Title. II. Series: Law and society series (Vancouver, B.C.)

KE3619.B65 2015

344.7104'6

C2015-903877-4

KF3775.B65 2015

C2015-903878-2

Canada

UBC Press gratefully acknowledges the financial support for our publishing program of the Government of Canada (through the Canada Book Fund), the Canada Council for the Arts, and the British Columbia Arts Council.

This book has been published with the help of a grant from the Canadian Federation for the Humanities and Social Sciences, through the Awards to Scholarly Publications Program, using funds provided by the Social Sciences and Humanities Research Council of Canada.

Printed and bound in Canada by Friesens

Set in Segoe and Warnock by Artegraphica Design Co. Ltd.

Copy editor and proofreader: Francis Chow

UBC Press

The University of British Columbia

2029 West Mall

Vancouver, BC V6T 1Z2

www.ubcpress.ca

Sample Material © 2015 UBC Press

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PART 1

EXAMINATION

The Surprising Magnitude of Environmental
Health Problems in Canada

— The area of environmental impacts on health has been seriously neglected in Canada and requires urgent investment.

– NATIONAL ADVISORY COMMITTEE ON SARS AND
PUBLIC HEALTH (2003)

1

A Neglected but Vital Issue

Despite the major efforts that have been made over recent years to clean up the environment, pollution remains a major problem and poses continuing risks to health.

– DR. DAVID BRIGGS, DEPARTMENT OF EPIDEMIOLOGY AND PUBLIC HEALTH, IMPERIAL COLLEGE, LONDON (2003)

On the surface, Canada is one of the most beautiful nations in the world, with seemingly abundant fresh water, clean air, and few obvious signs of environmental contamination or degradation. However, looks can be deceiving. Canada has a relatively poor environmental record, and, as a result, Canadians are exposed to environmental hazards that cause cancer, impair the normal development of children, interfere with the respiratory, cardiovascular, reproductive, endocrine, immune, and nervous systems, and inflict damage on skin and organs.¹ Over two hundred human diseases and conditions are linked to chemical exposures, ranging from birth defects and asthma to cancer and heart disease.² Specific examples of adverse health outcomes that scientists link to environmental hazards are acute lymphoblastic leukemia, lung cancer, bladder cancer, skin cancer, premature birth, permanent decreases in IQ, behavioural problems, asthma, chronic obstructive pulmonary disease (COPD), Parkinson's disease, heart attacks, strokes,

reduced fertility, and acute gastrointestinal illness. The Conference Board of Canada, a respected think tank not known for alarmist prognostications, warned that life expectancy for today's Canadian children could be shorter than for their parents, in part due to illnesses linked to environmental factors.³

It is widely recognized that air pollution contributes to thousands of premature deaths and millions of episodes of illness in Canada annually.⁴ Rates of physician-diagnosed asthma among children in Canada quadrupled in recent decades.⁵ There have been hundreds of outbreaks of waterborne illness in Canada in the past three decades, most notably the Walkerton, North Battleford, and Kashechewan disasters.⁶ Canadian industries release billions of kilograms of toxic substances into the air, water, and soil annually.⁷ One in six Canadians lives within one kilometre of a major pollution-producing facility.⁸ The reality is that pollution is pervasive, penetrating every ecosystem in Canada and accumulating inside every Canadian. The bodies of adults and children across Canada are contaminated by dozens of industrial chemicals, including pesticides, PCBs (polychlorinated biphenyls), fire retardants (polybrominated diphenyl ethers, or PBDEs), PFCs (perfluorochemicals, found in many consumer products), volatile organic compounds (VOCs), and phthalates (used as fragrances and plastic softeners).⁹ Despite Canada's reputation as a relatively clean country, the chemical body burden of Canadians is similar to that of Americans.¹⁰ Recent studies even found hundreds of toxic industrial chemicals in the cord blood of newborn infants in Canada and the United States.¹¹

Twenty-first century environmental hazards in wealthy countries like Canada are difficult for individuals to detect – often we can't see the pollution or the microbes in the air we breathe, can't taste the pathogens and chemicals in the water we drink, and can't smell or taste the pesticides and bacteria in the food we eat. Our senses can't tell us whether foods are genetically modified or whether consumer products contain nanoparticles. We can't distinguish a mosquito harbouring West Nile virus from one that does not. Some people have difficulty believing that the presence of a chemical in their body in seemingly infinitesimal quantities could harm their health. Yet many common prescription drugs are biologically active at similarly minuscule concentrations. Two examples are Viagra, which is active in the body at levels as low as 30 parts per billion (ppb), and the birth control medication Nuvaring, whose estrogen component is clinically effective at 0.035 ppb. Despite such tiny doses, these drugs can initiate procreation or prevent it, and also cause major side effects.¹²

Despite humanity's remarkable scientific and technological prowess, there are still enormous gaps in our knowledge and understanding of the relationships between environmental hazards and human health. Almost every week there are peer-reviewed studies published in medical and scientific journals that either strengthen our understanding of the connections between environmental factors and human health or raise troubling new questions.¹³ In 2014:

- Scientists identified a gene that raises the risk of developing Parkinson's disease in people exposed to certain pesticides.¹⁴
- A long-term study of Inuit children enabled researchers to identify the distinct negative impacts on neurological development caused by exposure to lead, mercury, and PCBs.
- Canadian researchers revealed that exposure in the womb to chemicals found in cosmetics and other consumer products can trigger autism.¹⁵
- Researchers identified mechanisms by which human sperm function can be damaged by exposure to endocrine-disrupting chemicals in common consumer products.¹⁶

In 2013, the International Agency for Research on Cancer (IARC) designated air pollution as a human carcinogen. Three new studies link in utero exposure to organophosphate pesticides with decreased cognitive development in early childhood (deficits in IQ, working memory, and perceptual reasoning).¹⁷ In 2010, a panel of experts appointed by US President Barack Obama concluded that environmental causes of cancer had been "grossly underestimated."¹⁸ The lower limit at which some toxic substances have been shown to harm human health has repeatedly decreased because of new discoveries. Three classic examples are lead, a potent neurotoxin; benzene, a cancer-causing substance; and particulate air pollution. As well, researchers have discovered that exposure to some chemicals can have transgenerational health effects, meaning that your grandmother's exposure to a toxic substance could increase your vulnerability to certain diseases, and your exposure could harm your grandchildren.¹⁹ As the authors of one article observe: "If the exposure of your grandmother at mid-gestation to environmental toxic substances can cause a disease state in you with no exposure, and you will pass it on to your grandchildren, the potential hazards of environmental toxic substances need to be rigorously assessed. Transgenerational studies need to be performed in evaluating the toxicology of environmental compounds."²⁰ Unfortunately, as Professor Tracy Bach recently

observed, “environmental and public health laws struggle to keep pace with this growing body of environmental public health research.”²¹ The continuing evolution of our knowledge explains the urgency of using the precautionary principle as a fundamental guidepost in our decision-making processes. This principle acknowledges the fact that we will always be confronted by uncertainty, but taking a more cautious approach in the future will enable us to learn from, and avoid repeating, our past mistakes.

We also need to remember and build upon past successes. Many of the great public health achievements of the nineteenth and twentieth centuries were in the field of environmental health – treated drinking water, food safety, wastewater treatment, and cleaner fuels for transportation, cooking, and heating. Improvements in public infrastructure reduced preventable deaths, illnesses, and injuries. Early land-use zoning laws protected residential neighbourhoods from abattoirs, tanneries, and other sources of noxious pollution. The burning rivers, dead lakes, and choking clouds of smog that helped galvanize the modern environmental movement in the 1960s seem like distant memories in Canada today. While great strides have been made, much more remains to be done, and new challenges continue to emerge. For example, researchers continue to investigate the health implications of new scientific discoveries, from biotechnology to nanotechnology.

One of the fundamental premises of this book is that human health and environmental protection are inextricably linked. By failing to acknowledge and act upon the reality that Canadians are dependent upon the natural world for both our health and well-being, governments devote inadequate attention to resolving both health and environmental problems.

Canada’s Environmental Record

Contrary to the myth of a pristine green country providing environmental leadership to the world, a large body of evidence proves beyond a reasonable doubt that Canada lags behind other nations in terms of environmental performance. According to researchers at Simon Fraser University, Canada’s environmental performance ranks twenty-fourth out of the twenty-five wealthiest nations in the Organisation for Economic Co-operation and Development (OECD).²² The OECD has published blistering critiques of Canada’s weak laws and policies, perverse subsidies for unsustainable industries, and poor environmental performance.²³ In 2014, Canada ranked fifty-eighth out of sixty-one nations for its climate policies, ahead of only Kazakhstan, Iran, and Saudi Arabia. The authors concluded that “Canada

still shows no intentions to move forward on climate policy and thereby [maintains] its place as the worst performer of all western countries.”²⁴ A 2013 study published by the Center for Global Development, a think tank in Washington, DC, ranked Canada dead last among twenty-seven wealthy countries on environmental indicators.²⁵ For years, the widely respected Conference Board of Canada has ranked Canada fifteenth out of seventeen large, wealthy industrialized nations on environmental performance.²⁶ Sweden and Norway are consistently at or near the top of the rankings. According to the Conference Board, these Scandinavian nations also outperform Canada in terms of economic competitiveness and innovation, debunking the myth that there is a trade-off between strong environmental protection and economic prosperity.

A comprehensive comparison of nations with federal governance systems concluded that “Canadian environmental quality and environmental policy are worse than one might expect in a relatively wealthy country.”²⁷ A survey of over five thousand experts found that:

- 60 percent rated Canada’s performance in protecting Canadians from the health impacts of pollution as poor or very poor.
- 65 percent rated Canada’s performance in protecting fresh water as poor or very poor.
- 85 percent rated Canada’s efforts to address climate change as poor or very poor.²⁸

On a per capita basis, Canadians pump out more air pollution – volatile organic compounds, nitrogen oxides, sulphur dioxide, and carbon monoxide – than any other nation in the OECD.²⁹ Contradicting the perception that air quality is improving, Environment Canada reports that since 1990, average levels of smog are up 13 percent and ground-level ozone is up 10 percent.³⁰ Air pollution in Alberta’s “Industrial Heartland,” where oil and gas are processed, is comparable to that in the world’s dirtiest megacities.³¹ Canadian industries in the heavily populated Great Lakes region discharge twice as much cancer-causing pollution per facility as their American competitors.³² Thousands of Aboriginal people living on reserves in Alberta, Manitoba, Ontario, and Quebec lack access to running water, resulting in elevated levels of waterborne illnesses.³³ Canadians have the seventh-largest per capita ecological footprint in the world.³⁴ If all 7 billion people on Earth consumed resources and produced waste at the prodigious rate of Canadians, we would require three additional planets.

There is some good news. Emissions of sulphur dioxide, nitrogen oxides, volatile organic compounds, mercury, and lead have come down substantially over the past thirty years. Major investments have been made to improve drinking water treatment and wastewater treatment infrastructure. Canada has eliminated the use of dozens of toxic chemicals and pesticides as a result of health and environmental concerns, resulting in lower exposures and declining body burdens of these substances (e.g., dioxins, mercury, and organochlorine pesticides). Discharges of certain toxic water pollutants, including dioxins and furans, have been reduced dramatically.

The Conservative government, elected in 2006 and re-elected in 2008 and 2011, has significantly weakened Canada's capacity for environmental protection through various actions, including:

- watering down environmental laws, including the *Fisheries Act*, *Navigable Waters Protection Act* (now the *Navigation Protection Act*), *Species at Risk Act*, and *Canadian Environmental Assessment Act*
- eliminating the National Round Table on the Environment and the Economy
- preventing government scientists from speaking to the media
- attacking environmental groups and seeking to revoke their charitable status
- cancelling thousands of environmental assessments
- reducing environmental protection budgets by hundreds of millions of dollars.³⁵

Once internationally renowned as an environmental leader, Canada “is now a laggard in both policy innovation and environmental performance, known for inaction and obstruction.”³⁶ Canada built a strong reputation over decades by demonstrating leadership on issues such as acid rain, ozone depletion, protection of the Arctic, and rules governing the world's oceans. As recently as the early 1990s, it was the first industrialized nation to ratify the United Nations Convention on Biological Diversity and the United Nations Framework Convention on Climate Change. Today Canada is an international environmental law outcast. For years, we have garnered countless “fossil of the day,” “Colossal Fossil,” and Dodo awards for blocking progress at international negotiations on climate change and biodiversity. In 2012, Canada became the only country in the world to turn its back on legal obligations under the Kyoto Protocol. In 2013, Canada became the only country in the world to withdraw from the United Nations Convention to

Combat Desertification. Despite the call of the World Health Organization (WHO) for an end to all uses of asbestos, Canada has repeatedly blocked proposals to add asbestos to the Rotterdam Convention, an international agreement that regulates trade in hazardous substances.³⁷ Global leaders, including Ban Ki-moon (UN secretary-general), José Manuel Barroso (former president of the European Commission), and Rajendra Pachauri (former chair of the Intergovernmental Panel on Climate Change), have criticized Canada's failure to live up to expectations in protecting the environment.³⁸

Canada's Health Care Record

Just as Canadians are deeply proud of our beautiful natural environment, we also revere our health care system. However, despite universal access to health care and dedicated, highly skilled medical professionals, the health of Canadians also falls below expectations. According to the Conference Board of Canada, Canada ranks tenth out of seventeen wealthy industrialized countries on health performance, trailing environmental leaders such as Sweden, Norway, and France. Among the indicators where Canada's performance lags behind are mortality due to cancer and mortality due to diabetes, both of which are related to environmental risk factors. One in two Canadians suffers from a chronic disease, ranging from asthma to heart disease to cancer.³⁹

To make matters worse, current and projected levels of spending on health care are unsustainable. The total spent by Canadians on health care is well over \$200 billion annually, and these costs are rising much faster than rates of inflation or economic growth. The C.D. Howe Institute has warned that unless dramatic changes are made, health care spending could rise to 18.7 percent of GDP by 2031, crowding out spending on other government services, forcing tax increases, necessitating user fees, or decreasing the quality of services provided by the medical system.⁴⁰ Experts warn that cutting environmental budgets to fund health care will have the perverse effect of further increasing future health care costs.⁴¹

Canada has historically treated environmental protection and health care as separate issues, yet, as this book will demonstrate, such an approach is neither scientifically nor economically defensible. In Europe, this understanding has already taken hold: "The current, predominantly hazard-focused and compartmentalised approach to environment and health is insufficient to address interconnected and interdependent challenges, such as climate change, depletion of resources, ecosystem degradation, the obesity epidemic, and persistent social inequality."⁴²

Public Concerns about Health Care and the Environment

Opinion polls conducted in Canada often identify health care as the public's top priority and a cornerstone of this country's identity.⁴³ Although proud of the Medicare system created in the 1960s, the majority of Canadians lack confidence in the system and believe it needs either complete rebuilding or major repairs.⁴⁴ Canadians are also profoundly worried about the state of the environment, particularly air pollution, contaminated drinking water, and toxic chemicals.⁴⁵ Most Canadians connect the dots, expressing concern that environmental degradation is harming their health, their children's health, and their grandchildren's health. The majority of both the public and health care professionals expect that the impacts of pollution, climate change, urban sprawl, and resource depletion will become more severe in the future.⁴⁶ A study of Canadians' risk perceptions found that the percentage of Canadians ranking air pollution as a "high health risk" has risen dramatically, with almost 90 percent describing air pollution as either a high or moderate health risk.⁴⁷ A poll conducted by the Canadian Medical Association (CMA) to explore public perceptions of environmental health issues found that 88 percent of Canadians were very or somewhat concerned about the potential health effects associated with inadequate inspection and monitoring of food. The CMA survey also found that:

- 82 percent of Canadians are concerned that climate change will hasten the spread of diseases.
- 75 percent are concerned about the health effects of pesticides and herbicides.
- More than one in four Canadians reported that they or a family member had sought medical treatment for an environmentally related health condition, including cancer, asthma, and other respiratory illnesses.⁴⁸

In summary, opinion polls indicate that the environment has become one of the over-riding concerns of Canadians. Not surprisingly, most Canadians support stronger environmental laws and policies.⁴⁹

Health care professionals share the public's concerns about environmental hazards in air, water, and food.⁵⁰ Among the expert bodies calling for greater attention and resources to be allocated to environmental health in Canada are the National Advisory Committee on SARS and Public Health, the Royal Society of Canada, the Public Health Agency of Canada, the National Round Table on the Environment and the Economy, the Commissioner of the Environment and Sustainable Development, the Canadian

Institute of Public Health Inspectors, the World Health Organization, and the Commission on the Future of Health Care in Canada.⁵¹ A report on children's health in Canada commissioned by the federal minister of health highlighted the need to take action to protect children from environmental hazards, stating that "the physical environment – air, water, soil – all have a significant impact on the health of Canadian children and youth."⁵² The Canadian Cancer Society, Canadian Lung Association, Canadian Heart and Stroke Foundation, and Canadian Public Health Association have urged governments to enact stronger laws and policies in order to reduce environmental risks.⁵³ A few academics, industry representatives, and conservative think tanks argue that public concerns about environmental health are overblown;⁵⁴ however, the majority of experts agree that Canadians have good reason to be concerned.

Despite high levels of public and professional concern, Canadian policymakers and pundits have neglected environmental health issues. Back in 1974, the federal government published a paper on the future of health care in Canada that was widely regarded as revolutionary for its focus on health promotion, particularly its emphasis on the importance of environmental determinants of health, including air and water pollution.⁵⁵ The Lalonde report received national and international acclaim for its forward-thinking approach to health promotion, yet for forty years Canada has effectively ignored one of its central premises: the importance of protecting the environment in achieving progress towards healthy Canadians. In 2004, thirty years after that landmark report, Canada's minister of state for public health released a discussion paper on strengthening the Canadian health care system that did not even mention environmental health.⁵⁶ Jeffrey Simpson's award-winning book *Chronic Condition*, published in 2012, explored the challenges facing the Canadian health care system but completely ignored environmental factors.⁵⁷ Similarly, a 2013 report by the Canadian Institute for Health Information (CIHI) on the drivers of rising health care costs made no reference to the environment.⁵⁸

Defining Key Terms

Before going any further, it is essential to clarify what this book means when it uses the word "environment" and the phrase "environmental health." The failure to clearly define these terms has contributed to public misunderstanding and, in some cases, exaggerated fears about the connection between the environment and human health. The word "environment" can be defined in extremely broad terms, as illustrated by the International Epidemiological

Association: “all that which is external to the human host. Can be divided into physical, biological, social, cultural, etc., any or all of which can influence health status of populations.”⁵⁹ As an example of the misunderstanding caused by this broad definition, it has been stated that at least 90 percent of cancer cases are a result of environmental factors.⁶⁰ In one sense this statement is accurate, while from another perspective it is misleading. Medical studies indicate that less than 10 percent of cancers are caused exclusively by genetic factors unique to specific individuals. In this specific context, the remaining 90 percent of cancers are described as caused by “environmental” factors, referring to all factors outside of individual genetic characteristics, such as fitness, diet, lifestyle, occupation, and socio-economic status.⁶¹ This broad, all-encompassing definition is at odds with the narrower, conventional understanding of environmental factors, such as the definition used by the World Health Organization, in its pioneering work on environmental causes of disease: “The environment is all the physical, biological, and chemical factors external to the human host and all related behaviors, excluding those natural environments that cannot reasonably be modified.”⁶²

Using this narrower definition, which the public is more likely to understand, the proportion of cancer caused by environmental factors is much lower. This definition excludes factors such as genetics and culture while focusing attention on those areas where interventions can reasonably be expected to prevent or reduce mortality and illness. For these reasons, this book relies on the WHO’s definition of environment. Included are contaminants in air, water, food, and consumer products, as well as radiation, noise, the impacts of built environments (housing, roads, land-use patterns), anthropogenic climate and ecosystem change, and agricultural methods. Excluded are the health effects of alcohol and tobacco consumption (except for second-hand smoke, which involves involuntary exposure), and natural disasters unmediated by human intervention.

When the phrase “environmental health” is mentioned, people may be inclined to think about the state of the environment itself, but the phrase is intended to describe the relationship between the environment and human health. The definition used by Health Canada is relied upon in this book:

Environmental health comprises those aspects of human health, disease, injury, and wellbeing that are determined by chemical, physical, and biological factors in the environment. It includes the effects on health of the broad physical environment and related socio-economic factors. It also includes the professional practice of assessing, correcting, controlling, and

preventing environmental risks and promoting the benefits for individuals and communities.⁶³

The WHO adds that environmental health is intended to address both present and future generations.⁶⁴ Thus it includes not only pollution but also the adverse health effects arising from poor urban design, human destruction and manipulation of natural ecological systems, and naturally occurring hazards such as pathogens in drinking water or radon in buildings. For example, there is evidence that urban sprawl is associated with increased Body Mass Index (an indication of obesity and its attendant health problems).⁶⁵ The recent emergence of infectious zoonotic diseases such as Ebola, West Nile virus, hantavirus pulmonary syndrome, Lyme disease, SARS (severe acute respiratory syndrome), HIV/AIDS, variant Creutzfeldt-Jakob disease (the human version of mad cow disease), and avian influenza is also incorporated in this approach to environmental health, since these diseases are influenced by anthropogenic changes to the natural environment.⁶⁶ The rise of antibiotic resistance, caused in part by excessive application of antibiotics to livestock to accelerate growth rather than treat infections, is also included.

On a brighter note, the definition of environmental health used in this book also incorporates the health benefits available from nature, such as the valuable goods and services provided by biodiversity and the health-enhancing aspects of time spent in parks, gardens, and other green spaces.⁶⁷ Not only our physical health but also our psychological health is intimately connected to the state of the environment.⁶⁸

An Overview of the Book

The goal of this book is to comprehensively explore the landscape of environmental health in Canada, overcoming the current balkanization of information and expertise. The book strives to answer four overarching questions: What are the most serious environmental health problems in Canada? What are the economic costs of these problems? Compared with other wealthy countries, are Canada's current laws, policies, and programs adequate for reducing or minimizing the environmental burden of disease and death? What kinds of interventions – laws, policies, programs, and investments – might be introduced to reduce environmental risks, costs, and inequities in Canada? To answer these questions, this book has three parts – an examination, a diagnosis, and a prescription – similar to the three stages a doctor goes through when a patient comes in for a check-up.

Examination

Chapter 2 provides an overview of the environmental hazards – chemical, biological, and physical – that contribute to death and illness in Canada. This overview covers the full range of environmental hazards, including air pollution (outdoor and indoor), water contamination, industrial chemicals, heavy metals, pesticides, noise, radiation, consumer products, and zoonoses (diseases transmitted from other animals to humans), as well as related processes such as climate change, ozone depletion, urban sprawl, and declining native biodiversity. Chapter 2 also describes humans' fundamental dependence upon the natural world and the health benefits associated with access to ecosystem goods and services. In Chapter 3, the best available evidence is reviewed in an effort to estimate the magnitude of adverse health effects in Canada attributable to environmental hazards. How many Canadians are dying, falling ill, or becoming injured or disabled each year as a result of exposure to environmental hazards? While there are compelling reasons to be concerned about environmental impacts on health, it is important not to create unwarranted levels of concern. Other risk factors, including smoking, diet, fitness, lifestyle, and occupation, are also important determinants of health on a population-wide basis. Other significant influences include culture, income and social status, access to health and social services, education, social support networks, genetics, and personal health practices.

Chapter 4 explores the concept of environmental justice, addressing the distribution of environmental harms and benefits. Are specific Canadian communities bearing a disproportionate share of the burden of environmental risks or being denied fair access to environmental benefits? Although environmental justice has been extensively researched and debated in the United States, it is only beginning to attract attention from affected communities, activists, academics, and policymakers in Canada. Chapter 5 estimates the economic costs of the environmental burden of disease in Canada. These economic costs include the direct costs of medical care, the indirect costs caused by productivity losses, and the costs associated with premature mortality.

The results of this examination are deeply worrisome. The environmental burden of disease in Canada is much higher than generally recognized, causing thousands of premature deaths and millions of illnesses annually. To make matters worse, these harms are unfairly distributed, falling disproportionately on communities that are already economically or socially marginalized, including Aboriginal people. The economic costs

resulting from the environmental burden of disease, calculated using the government's own methods, exceed \$100 billion annually.

Diagnosis

Part 2 analyzes the Canadian laws and policies that are intended to prevent adverse health effects caused by environmental hazards. It seeks to answer the following questions:

- Are Canadian health and environmental laws and policies stronger or weaker than corresponding laws and policies in other wealthy nations?
- Are there successful laws, policies, and programs in other nations that have no comparable equivalents in Canada?
- Is there evidence that specific types of laws, policies, and programs are more effective in protecting human health from environmental hazards?
- Is Canada ahead of, on par with, or behind other industrialized nations in protecting its citizens from environmental threats to their health?

Chapter 6 begins the diagnosis by looking at macro-level law and policy considerations, including recognition of the right to live in a healthy environment, national environmental health policies, children's environmental health strategies, and international environmental health policies. It also identifies several crucial knowledge gaps that constrain informed policy responses to environmental health problems in Canada, including missing information about:

- the prevalence and distribution of environmental hazards
- the exposure of Canadians to environmental hazards
- the connections between exposures and adverse health outcomes
- the effectiveness of environmental health laws, policies, and programs.

Chapter 7 compares Canadian laws, policies, and standards governing air quality (indoor and outdoor), drinking water, food, consumer products, climate change, and biodiversity with environmental rules in other industrialized nations, including the United States, Europe, and Australia. These comparisons also incorporate World Health Organization recommendations. Specific case studies investigate ambient air quality standards; drinking water quality standards; pesticide registrations; maximum residue limits for pesticides on food; the regulation of five toxic substances, including chemicals that are known carcinogens and endocrine disruptors; climate

change laws and regulations; and laws protecting endangered species. Chapter 8 explores the extent to which Canada is implementing the polluter-pays principle and enforcing environmental laws, again in comparison with other wealthy industrialized countries. Part 2 concludes (in Chapter 9) by probing the reasons for differences in Canada's performance vis-à-vis other industrialized nations in addressing the health risks associated with environmental hazards. Among the factors examined are political and legal institutions (including constitutional factors and national styles of regulation), culture, societal actors, and framing (the social construction of environmental health issues).

Again, the results of the comparative analysis are a source of major concern. From every perspective, the Canadian environmental laws and policies intended to protect human health lag behind those of other wealthy industrialized nations. This relative weakness applies to systemic issues such as Canada's refusal to recognize the fundamental human right to live in a healthy environment and the lack of a national environmental health strategy. It also reveals that Canada has weaker air quality guidelines and weaker drinking water guidelines, permits the use of pesticides not authorized in Europe, allows higher levels of pesticide residues, either fails to impose environmental taxes or does so at substantially lower levels, and is reluctant to enforce environmental laws rigorously. Many of these failures appear linked to an economic world-view that is outdated and unduly narrow, focused on natural resource extraction while overlooking health and environmental costs and the potential of a shift towards a green economy.

Prescription

Part 3 draws on international innovations, best practices, and success stories to chart a future course for environmental health law and policy in Canada. The concluding chapters offer a suite of recommendations intended to close existing knowledge gaps and remedy the Canadian legal and policy weaknesses identified in Part 2. Implementing these solutions will increase the health benefits provided by nature; prevent or reduce the adverse health effects of exposure to physical, chemical, and biological hazards; identify and ameliorate environmental injustices; and reduce the economic costs of environment-related illness and death. Key areas of recommendations include:

- making strategic investments in environmental health research, capacity building, knowledge exchange, and education

- developing a comprehensive national environmental health action plan that includes targets, timelines, measurable indicators, and improved surveillance of environmental hazards, exposures, and illnesses
- articulating principles, including the right to a healthy environment, to guide the implementation and enforcement of new and improved laws and regulations to reduce risks, particularly for vulnerable populations
- addressing the underlying causes of Canada's relatively poor environmental record
- ensuring that Canada plays a positive role in promoting and protecting environmental health internationally.

The recommendations in this book, based largely on proven solutions, are intended to provide Canadians with a level of protection for their health that is consistent with the highest standards found in other industrialized (i.e., OECD) nations. Based on both Canadian and international experiences with strengthening environmental laws, policies, and standards, doing so would almost certainly result in economic benefits that far outweigh the costs.

Conclusion

Two aspects of the relationship between human health and the environment should inspire optimism. First, the health benefits provided by ecosystems and access to nature can be systematically increased through strengthened laws, policies, and programs. Second, adverse environmental impacts on human health are almost entirely preventable, meaning Canada could not only reduce but virtually eliminate the majority of environmental threats to human health. Prevention is more effective because it addresses populations instead of individuals, more efficient because it is less costly than post-facto treatment or restoration, and more equitable because it reduces the heightened risks facing disadvantaged groups. Investing in a more preventive and precautionary approach is the only way that Canada will be able to afford its universal health care system in the future and eventually achieve its official health goal:

Canada is a country where:

The air we breathe, the water we drink, the food we eat, and the places we live, work and play are safe and healthy – now and for generations to come.⁶⁹