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For two decades, scientists have been warning that chlorofluorocarbons (CFCs) and halons (bromine-containing fluorocarbons) may deplete the stratospheric ozone shield that screens out some of the Sun's harmful ultraviolet rays and thus regulates the amounts which reach the Earth's surface. CFCs have been used as refrigerants, solvents, foam blowing agents, and outside the United States, as aerosol propellants; Halons are used primarily as fire-fighting agents. Increased radiation could result in an increase in skin cancers, suppression of the human immune system, and decreased productivity of terrestrial and aquatic organisms, including some commercially important crops. This book deals with implementation, policy issues and phase out of methyl bromide. In September 1987, 47 countries (including the United States) agreed to the Montreal Protocol on Substances that Deplete the Ozone Layer, which first required controls on the world's consumption of ozone depleting substances. Over 160 countries have signed on to the Protocol, whose phasedown schedule for developed countries was accelerated twice and completely phased out Halon production at the end of 1994 and CFC production at the end of 1995. The Protocol's coverage has also been extended to include hydrochlorofluorocarbons and other chlorine- and bromine-containing substances such as some solvents and methyl bromide, a widely used soil fumigant. The Ozone Layer contains the proceedings of the Meeting of Experts on the Ozone Layer, organized by the United Nations Environment Programme and held in Washington, DC, on March 1-9, 1977. The papers review all aspects of the ozone layer, including the potential impact of stratospheric pollution and a reduction in the ozone layer on mankind, and encompass fields ranging from stratopheric physics and chemistry to biology, ecology, trade, and economics. This book is comprised of 23 papers and begins with a discussion on the environmental aspects of stratospheric ozone depletion and the effects of changing levels of ultraviolet radiation on phytoplankton, plants, timber production, and human health. Subsequent chapters explore some economic and social implications of a possible ban on the use of fluorocarbons; the link between atmospheric exchange processes and the ozone problem; and industry-sponsored studies on the effects of chlorofluorocarbons on the concentration of atmospheric ozone. The remaining chapters focus on stratospheric and ozone research activities in countries such as Canada, Germany, Italy, the Netherlands, United Kingdom, and the United States. This monograph will be a valuable resource for environmental scientists and policymakers. This book is the first comprehensive history of international efforts to protect the ozone layer, the greatest success yet achieved in managing human impacts on the global environment. Its arguments about how this success was achieved are both theoretically novel and of great significance for the management of other global problems, particularly global climate change. The book provides an account of the ozone-depletion issues from the first attempts to develop international action in the 1970s to the mature functioning of the present international regime. It examines the parallel developments of politics and negotiations, scientific understanding and controversy, technological progress, and industry strategy that shaped the issue's development and its effective management. In addition, the book offers important new insights into how the interactions among these domains influenced the formation and adaptation of the ozone regime. Addressing the initial formation of the regime, the book argues that authoritative scientific assessments were crucial in constraining policy debates and shaping negotiated agreements. Assessments gave scientific claims an ability to change policy actors' behavior that the claims themselves, however well known and verified, lacked. Concerning subsequent adaptation of the regime, the book identifies a series of feedbacks between the periodic revision of chemical controls and the strategic responses of affected industries, which drove rapid application of new approaches to reduce ozone-depleting chemicals. These feedbacks, promoted by the regime's novel technology assessment process, allowed worldwide use of the chemicals to decline further and faster than even the boldest predictions, by nearly 95 percent within ten years. This report examines key issues surrounding ozone depletion, beginning with the status of the stratospheric ozone layer and the causes of depletion of this layer. Impacts of ozone depletion and the consequent increase in ultraviolet-B radiation are reviewed along with global and Canadian initiatives to protect the ozone layer. This is followed by review of ozone layer protection initiatives in British Columbia. Finally initiatives that should be carried out in the near future by the provincial and federal governments are identified. Appendices include information on the ozone depleting potential of various chemicals, ozone-depleting substance phase-out dates, and key requirements of the provincial Ozone-Depleting Substances Regulation. In recent years, several new concepts have emerged in the field of stratospheric ozone depletion, creating a need for a concise in-depth publication covering the ozone-climate issue. This monograph fills that void in the literature and gives detailed treatment of recent advances in the field of stratospheric ozone depletion. It puts particular emphasis on the coupling between changes in the ozone layer and atmospheric change caused by a changing climate. The book, written by leading experts in the field, brings the reader the most recent research in this area and fills the gap between advanced textbooks and assessments. This book underscores the re-emergence of the ozone hole problem and deals with it in its current context of exacerbating global warming. It traces the history of the ozone hole from the stage of formation of the stratospheric ozone ‘layer’, millions of years ago, into the late 20th century when the anthropogenic destruction of that ozone was discovered. The chapters are written to bring the the reader up to the present day. Factors that influence stratospheric ozone are discussed and the ways to halt ozone depletion are cataloged. And more complex interrelationships are being discovered between ozone depletion and two other global concerns: climate change and ocean acidification. This book sheds light on the intricacy of the situation and its portants. The book will be useful to students and researchers looking for a current overview of the ozone hole problem. div Global Environment Monitoring System. Peter Fabian and Martin Dameris provide a concise yet comprehensive overview of established scientific knowledge about ozone in the atmosphere. They present both ozone changes and trends in the stratosphere, as well as the effects of overabundance in the troposphere including the phenomenon of photosmog. Aspects such as photochemistry, atmospheric dynamics and global ozone distribution as well as various techniques for ozone measurement are treated. The authors outline the various causes for ozone depletion, the effects of ozone pollution and the relation to climate change. The book provides a handy reference guide for researchers active in atmospheric ozone research and a useful introduction for advanced students specializing in this field. Non-specialists interested in this field will also profit from reading the book. Peter Fabian can look back on a life-long active career in ozone research, having first gained international

recognition for his measurements of the global distribution of halogenated hydrocarbons. He also pioneered photosmog investigations in the metropolitan areas of Munich, Berlin, Athens and Santiago de Chile, and his KROFEX facility provided controlled ozone fumigation of adult tree canopies for biologists to investigate the effects of ozone increases on forests. Besides having published a broad range of scientific articles, he has also been the author or editor of numerous books. From 2002 to 2005 he served the European Geosciences Union (EGU) as their first and Founding President. Martin Dameris is a prominent atmospheric modeler whose interests include the impacts of all kinds of natural and man-made disturbances on the atmospheric system. His scientific work focuses on the connections between ozone and climate changes. For many years he has been an active contributor to the WMO scientific ozone depletion assessments, which have been used to monitor the depletion and recovery of the ozone layer in accordance with the Montreal Protocol. The destruction of the ozone layer, together with global warming, is one of the hot environmental topics of today. This book examines the effect of human activities on atmospheric ozone, namely the increase of tropospheric ozone and the general diminution of stratospheric ozone and the production of the Antarctic ozone hole. Also discussed is the role of remote sensing techniques in the understanding of the effects of human activities on atmospheric ozone as well as in the development of social and political awareness of the damage to the ozone layer by man-made chemicals, principally CFCs. This led to the formulation and ratification in 1989 of the Montreal Protocol on controlling/banning the manufacture and use of chemicals that damage the ozone layer. Since then, remote sensing has played a key role in monitoring atmospheric ozone concentration and determining the success of the Montreal Protocol in protecting the ozone layer from further damage. In this book, the renowned authors discuss the sophisticated instruments that have been launched into space to study not only ozone but also other trace gases in the atmosphere, some of which play a key role in the generation and destruction of ozone in the atmosphere. Professors Cracknell and Varotsos also examine the satellite-flown instruments which are involved in monitoring the absorption of solar ultraviolet light in the atmosphere in relation both to the generation and destruction of ozone and consequently to human health. This scholarly book, written by the foremost experts in the field, looks at remote sensing and its employment in the various aspects of ozone science. It is widely acknowledged that global warming, due to anthropogenic greenhouse gases emissions, represents a threat to the sustainability of human life on Earth. However, many other threats are potentially just as serious, including atmospheric pollution, ozone depletion, water pollution, the degradation of agricultural land, deforestation, the depletion of the world's mineral resources and population growth. Although acid rain and ozone layer depletion are highly-publicized issues, they have not received the legal attention they warrant. This detailed analysis fills this gap. With a thorough scientific background and a review of technically feasible countermeasures, it addresses the applicable rules of international law, exposing the tension between the traditional concept of sovereignty and the need for international cooperation. Published under the Transnational Publishers imprint. While government enforcement of laws and regulations to control the production of chloroflurocarbons in 1987 has been hailed as exemplifying the precautionary principle, for almost two decades US companies failed to take precautionary measures to prevent chemical emissions, despite the probable risk of stratospheric ozone loss. As a result, human harms in the form of skin cancer have reached epidemic proportions globally and in the United States where, today, one person dies every hour from skin cancer. This book reviews U.S. laws, regulations, and policies, as well as case law regarding similar toxic tort cases to consider whether companies can and should be held legally liable under tort common law theories and related tort justice theories for having contributed to increased risks of skin cancer. In the 1970s the world became aware of a huge danger: the destruction of the stratospheric ozone layer by CFCs escaping into the atmosphere, and the damage this could do to human health and the food chain. So great was the threat that by 1987 the UN had succeeded in coordinating an international treaty to phase out emissions; which, over the following 15 years has been implemented. It has been hailed as an outstanding success. It needed the participation of all the parties: governments, industry, scientists, campaigners, NGOs and the media, and is a model for future treaties. This volume provides the authoritative and comprehensive history of the whole process from the earliest warning signs to the present. It is an invaluable record for all those involved and a necessary reference for future negotiations to a wide range of scholars, students and professionals. Depletion of the stratospheric ozone layer by human-produced ozone-depleting substances has been recognized as a global environmental issue for more than three decades. Projections are for a return of ozone-depleting chemicals (compounds containing chlorine and bromine) to their “pre-ozone-depletion” (pre-1980) levels by the middle of this century for the midlatitudes; the polar regions are expected to follow suit within 20 years after that. Since the 1980s, global ozone sustained a depletion of about 5 percent in the midlatitudes of both the Northern Hemisphere and Southern Hemisphere, where most of the Earth's population resides; it is now showing signs of turning the corner towards increasing ozone. The large seasonal depletions in the polar regions are likely to continue over the next decade but are expected to subside over the next few decades. Ozone-depleting substances should have a negligible effect on ozone in all regions beyond 2070, assuming continued compliance with the Montreal Protocol. Large increases in surface ultraviolet (UVB; 280-315 nm) radiation and the associated impacts on human health and ecosystems would likely have occurred if atmospheric abundances of ozone-depleting substances had continued to grow. As a result of the worldwide adherence to the 1987 Montreal Protocol and its Amendments and Adjustments, the large impacts were avoided, and future trends in UVB and UVA (315-400 nm) at the surface are expected to be more influenced by factors other than stratospheric ozone depletion (such as changes in clouds, atmospheric fine particles, and air quality in the lower atmosphere). Emissions of ozone-depleting substances by the United States have been significant throughout the history of the ozone depletion issue. At the same time, the United States has played a leading role in advancing the scientific understanding, leading the international decision making, and leading industry's actions to reduce usage of ozone-depleting substances. Continued future declines in emissions of ozone-depleting substances from the United States, along with those from other nations, will play a key role in ensuring the ozone layer's recovery. Projections of a changing climate have added a new dimension to the issue of the stratospheric ozone layer and its recovery, and scientific knowledge is emerging on the interconnections between these two global issues. Climate change is expected to alter the timing of the recovery of the ozone layer. Ozone-depleting chemicals and ozone depletion are known to influence climate change. The curtailment of the ozone-depleting substances not only helped the ozone layer but also very likely lessened the forcing of climate (i.e., how it alters climate). Climate change and ozone layer depletion are coupled; this has led to new scientific and decision-making challenges. The recovery of the ozone layer will occur in an atmosphere that is different from where we started roughly three decades back. Our scientific understanding of the connections between climate change and ozone layer depletion is at an early but rapidly advancing stage. That topic will remain a focus for the scientific community's efforts over the next few decades. This report, CCSP SAP 2.4, addresses Goal 2 of the CCSP Strategic Plan: Improve quantification of the forces bringing about changes in the Earth's climate and related systems. The Atmospheric Composition chapter of the CCSP Strategic Plan describes a vision to produce a Synthesis and Assessment Product (SAP) on “Trends in emissions of ozone-depleting substances, ozone layer recovery, and implications for ultraviolet radiation (UV) exposure–SAP 2.4.” The report provides a synthesis and integration of the current knowledge of the stratospheric ozone layer, ozone-depleting substances, and ultraviolet radiation reaching the Earth's surface. Ozone depletion and climate change have usually been thought of as environmental issues with little in common other than their global scope and the major role played in each by CFCs and other halocarbons. With increased understanding of these issues, however, has come a growing recognition that a number of very important linkages exist between them. This document explores these linkages. It examines the influence of radiative processes on the atmosphere; the dynamics of the atmosphere; the chemistry of the atmosphere; and biogeochemical linkages. It also describes Canadian research and monitoring activities and policy implications. The mountain of information coming out of the respective regimes on climate change, ozone depletion and air pollution is monumental In industries today, there is a desire to stop pollution before it starts, through the process of pollution prevention. Unfortunately, many university level students are not exposed to the thinking process involved in environmental problem solving early enough in their academic career, if they are exposed to it at all. The goal of this thesis is to develop and to evaluate an interdisciplinary case-study about the depletion of the stratospheric ozone layer by chlorofluorocarbons (CFCs). This case-study will be used to teach first year chemistry students about environmental problem solving. The case study was assembled from existing literature according to principles derived from environmental texts. The written case study was evaluated first by a panel of four industry experts. The case study was then transformed into a computerized teaching tool using a Hypertext Markup Language (HTML) editor. The computer tool was then evaluated by a separate panel of experts comprised of three industry

experts, and three university professors. The professors were from the fields of chemistry, economics, and history. Both the economics and history professors were familiar with the field of environmental policy. This mix of disciplines allowed for a balanced evaluation of the interdisciplinary teaching tool. Finally, the experts' comments were incorporated into the final version of the teaching tool. Comprises the edited proceedings of an international conference on the health and environmental consequences of stratospheric ozone depletion, held at the Royal Institute of British Architects in London, November, 1988. Contributions from members of the medical, scientific and political communities present the state of knowledge on the ozone layer and the greenhouse effect; deleterious effects of ultraviolet radiation on humans, animals and plants; alternatives to chlorofluorocarbons; and political responses to the scientific discoveries. The ozone layer was discovered in 1913 by the French physicists Charles Fabry and Henri Buisson. The ozone layer has the capability to absorb almost 97-99% of the harmful ultraviolet radiations that sun emit and which can produce long term devastating effects on humans beings as well as plants and animals. The earth's stratospheric ozone layer plays a critical role in absorbing ultraviolet radiation emitted by the sun. In the last thirty years, it has been discovered that stratospheric ozone is depleting as a result of anthropogenic pollutants. Ozone layer depletion is one of the most serious problems faced by our planet earth. It is also one of the prime reasons which are leading to global warming. Ozone Layer depletion describes two related phenomena observed since the late 1970s: a steady decline of about four percent in the total amount of ozone in Earth's stratosphere, and a much larger springtime decrease in stratospheric ozone around Earth's polar regions. The latter phenomenon is referred to as the ozone hole. Chlorofluorocarbons (CFCs) and other halogenated ozone depleting substances (ODS) are mainly responsible for man-made chemical ozone depletion. This book describes of international efforts to protect the ozone layer, the greatest success yet achieved in managing human impacts on the global environment. The book provides an account of the ozone-depletion issues from the first attempts to develop international action in the 1970s to the mature functioning of the montreal regime. This Book represent state of knowledge regarding examines the parallel developments of politics and negotiations, scientific understanding and controversy, technological progress, and industry strategy to draws some conclusions concerning the setting of goals for that shaped the issue's development and its effective management. Simply explained, Ozone layer depletion is an important book bringing together diverse viewpoints from Environmentalist, state agencies and regulators, for all who wish to save Earth with quality life.

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