ENVIRONMENTAL CONSERVATION AND SECURITY

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PREFACE

Life on earth depends on many ecosystem services that include microbial recycling of nutrients, replenishment of atmospheric oxygen, maintenance of atmospheric ozone, water balance and gene pool for world's stocks of plants, animals and wildlife. However, factors like exponential growth of world population; excessive consumption and lack of equitable distribution of natural resources, urbanization; deforestation; unsustainable technological development; disposal of human and industrial wastes in air, water and land beyond the absorbing and recycling capacity of the environment; economic imbalance; race for getting control of scarce natural resources; development of weapons of mass destruction, etc., have been jeopardizing, particularly in last few decades, the ability of ecosystems to continue to provide such essential services for global life support systems. Alarmed by the possible adverse effects of these factors on global environment and human health, and the complexity of the interactions between various environmental forces, exploring ways and means for effective management of our planet's environment and ecosystems are now getting greater attention.

The concept of national security is now being linked to the environmental security at regional and international levels. Efforts are being made to develop cleaner technologies; and to evolve effective strategies and technologies for remediation of sites contaminated by industrial and/or military activities. National and international standards are being generated as guiding factors for environmental management and a number of multilateral environmental agreements are being negotiated to achieve a common goal of protecting the

global environment and safeguard the overall interests of present and future generations from impacts of adversity.

The above activities have led to a vast amount of literature on various aspects of environment particularly related to air, water and soil pollution, degradation and conservation. However, information on issues such as environmental security, environmental standards, processes and technologies for remediation of sites contaminated by industrial and military activities, multilateral environmental agreements is scattered. The aim of this monograph has been to collect, collate, analyse and present information from diverse sources and present a one-volume comprehensive scientific description of basic and some of the current aspects of environmental issues. To the extent possible, an attempt has been made to make the work concise and self-explanatory. Some references have been provided for more detailed information.

The monograph has been divided into seven chapters, each of which covers a particular aspect viz., brief history, environmental degradation, environmental pollution, environment related miscellaneous issues, environmental security, remediation of contaminated sites, and multilateral environmental agreements. The five appendices briefly describe environmental legislation in India, national ambient air quality standards, general standards for discharge of effluents, ISO 14000 family of environmental management standards, and major environmental conventions/protocols. The monograph contains several illustrations for an easy comprehension and establishing linkages between related issues, causes and effects. An effort has also been made to summarise the current status, both at national and global levels, and possible future trends. We hope this monograph proves useful and provides information of interest and value to all across the board.

December 2005 — Dr AK Datta
Delhi 100 054 — Dr Ram Kumar

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Earth is unique among the planets of the solar system in that it supports life. The complex process of evolution occurred because of the presence of water, an oxygen rich environment, 0.03–0.04 per cent carbon dioxide, and a convenient surface temperature of about 15 °C. Mercury and Venus, the two other planets that lie between the Earth and the Sun, do not support life. This is because Mercury has no atmosphere and therefore becomes very hot during the day while night temperatures may reach –140 °C. Venus has the same mass as Earth but a thicker atmosphere containing approximately 96 per cent carbon dioxide makes it too hot (between 150–450 °C) to sustain life. Among all planets, Mars is the most similar to Earth, as both have 24 hours day, seasonal changes, polar ice caps, dust storms, craters, and same land area. Mars atmosphere consists mainly of carbon dioxide (95.3 per cent), but the atmosphere is very thin, most of its carbon dioxide is frozen in the ground and its average surface temperature is about –50 °C and has so far shown no signs of life or conditions conducive to life. The climates of Mars and Venus are very different but very stable and predictable. As compared to the above two planets, the climate of Earth is regarded as unstable and unpredictable.

Environmental conditions of the earth are being continuously transformed through natural processes and human interventions. There are several views on the ability of the earth's environment to withstand the changes being brought about by human beings. First view is the *nature forgiving* with its ability to return to its original state. It thrives on the live and let live principle. Another view is *nature unforgiving*, which stipulates that there is a limit of the environment as a link or provider of services; the world is finite, and the environmental impacts of society are cumulative and difficult to reverse. Still another view is of *nature resilient*. In this case, ecological systems including human beings are strengthened by

environmental stresses so that they can withstand greater shocks should the need arise, although there is a limit beyond which a system can no longer survive. Whenever the rates of environmental change become too rapid, successful management in any case may be impossible.

Sufficient scientific evidence is now available that the health of the planet Earth is under siege. These worrisome trends on the degradation of the health of this planet, which include population problem, greenhouse effect and climate change, depletion of ozone layer, increase in air pollution and a host of other environmental concerns pose a serious threat to human life. The dumping of hazardous wastes in rivers and seas, and land-based sources of marine pollution pose a threat to the oceans. A large number of species of wild plants and animals is being lost every year. All this requires interdisciplinary studies on interactions among atmosphere, oceans, land and biological systems. Human activities such as energy and food production involve the subjects of atmospheric composition, air and water quality, and bio-geochemical cycles. Estimates by experts bring out clearly that the world just cannot sustain its present level of natural resource consumption and still survive.

These trends indicate the environmental challenges ahead and can be modified with technological interventions and human resolve. A coherent and flexible policy is needed to provide a foundation for coordinated national and international inter-agency programmes related to observations, research, analysis, and negotiation toward a policy consensus and action plan concerning global environmental conservation. The question is, how fast will this transition to more sustainable forms of production and environmental management proceed, and effectively mitigate the effects of large-scale environmental damage. The linkages between human beings, their environment locally and globally and the links between environmental, social, economic and developmental issues have been the focus of international community at the Earth Summits in 1992 and 2002.

Over the past 10–15 years, considerable interest has been generated on the links between environment, impoverishment, conflict and security. Environmental security has emerged as a new facet to combat a non-traditional security threat. Military or terrorist

About the Book

The book presents collection, collation and analysis of a broad range of environment related issues concerning the global community with special emphasis on topics like environmental security, international environmental standards, remediation of contaminated sites and important international environmental agreements. The book has been divided into seven chapters dealing with specific areas of environmental concern, i.e., history of the environmental movement, causes and processes of environmental degradation, environmental pollution, other related environmental issues, environmental security, remediation of contaminated sites and multilateral environmental agreements. The book also has five appendices describing the legislative support, ambient air quality and effluent standards in India; ISO standards for environment and major conventions/protocols concerning environment.

About the Authors

Dr AK Datta is an eminent scientist and worked in Defence Research & Development Organisation (DRDO) as Director, Centre for Fire and Explosives Safety (CFEES) and later as Chief Controller, R&D. He worked in the area of safety, environment and related matters for more than 15 years and under his directorship he raised state-of-the-art laboratory for environmental studies. The experience gained during the period and knowledge acquired is elucidated in this monograph.

Dr Ram Kumar is well known mathematician and management expert. He carried out post-doctoral research at Imperial College of Science & Technology, London, and was Professor in the Department of Applied Sciences in University of Technology, Baghdad. During his service with DRDO for three decades he was deeply involved in variety of activities including basic/applied research, R&D management, personnel management, etc. He has published a book and a number of research papers and technical reports. He has been associated with and interested in the subject of environmental pollution and security for more than a decade.

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