



Climate Change Impact on Ecosystem



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AL. Ramanathan is a Professor in School of Environmental sciences, Jawaharlal Nehru University, New Delhi, India. He is leading the group working on coastal biogeochemistry and hydro geochemistry and has worked extensively on mangroves estuaries and coastal ground waters of India for the past two decades. He is actively engaged in coastal research with different institutions in India and from various parts of the world such as Australia, Russia, USA, etc, on nutrient dynamics, Biomarkers, paleo environment, nutrient source identification etc., He has guided two dozen PhDs in these aspects and published more than seven dozen papers in referred reputed journals like Estuaries, Wetland Ecology and Management, Estuarine, Coastal and Shelf Science, Journal of coastal research, Bull of Marine sciences, Indian journal of marine sciences, Marine pollution bulletin, Hydrogeology Journal, Water Soil and Air Pollution, Hydrological Process , Geofluids Applied Geochemistry, Journal of Geochemical Exploration etc., He has also published five books and wrote several chapters in books of national and international repute. He was a Post doc fellow under STA Japan program,, UGC Russian academy of science program, CSIR, INSA, DST, etc., He was a member of editorial board in Indian journal of marine sciences and is a referee for many national and international journals.

Leonard Sonnenschein, 46 years experience in keeping fish, 35 years experience in scientific research, 23 years experience in science education innovation, over 100 publications, and extensive performance in conservation collaboration, climate change issues and public awareness. Leonard Sonnenschein opened St. Louis Children's Aquarium in 1993 and on June 8, 2004 (World Ocean Day) opened its expansion facility, the World Aquarium. Leonard regularly supervises students from over 45 universities which collaborate with the research component of the aquarium in facility development, exhibit design, fisheries, aquatic sciences, ecology, aquariology, legal frameworks, consumer awareness, cultural comprehension of environmental issues, and public understanding through field, conference and inter-governmental work. In 2006, Sonnenschein founded the Conservation for the Oceans Foundation to expand the World Aquarium's focus. The mission of the Conservation for the Oceans Foundation (CFTO) is to support grassroots-level conservation, education and research projects that bring about positive changes to ecosystems worldwide through local and multi-stakeholder actions. In 2009, Youth Voices in Conservation was developed for additional youth engagement opportunities (ages 3-50). In 2011, based upon the Low Carbon Lifestyles' campaign, the Youth Voices in Conservation's GreenLeaf Program was developed to allow for raising capital for residual support mechanism based upon the carbon offset credit from worldwide projects' actions. Leonard regularly collaborates with international agencies such as UNESCO, UNEP, WHO, International Ocean Institute, the Global Forum on Ocean, Coasts and Islands and is a co-founder of the World Ocean Network. Leonard recently started Innovative Drug Manufacturing, LLC to bring new patented technology to the pharmaceutical, nutraceutical, cosmetic and aquaculture industries.

Ram Boojh, Programme specialist at the UNESCO Office in New Delhi, responsible for Ecological and Earth Sciences, World Heritage Biodiversity and natural heritage programmes and is also focal point for the UN Decade for Education for Sustainable Development (DESD). He has over 30 years of experience of working with the academic institutions, voluntary sector, Government and international organizations. He has a distinguished academic career with Doctorate in Ecology and recipient of many awards and honours including the Indian National Science Academy Medal presented by Mrs Indira Gandhi, then Prime Minister of India in January 1984. He has travelled widely and has been visiting fellow at many European and US universities and academic institutions. He has Published over 100 research/technical papers / popular articles and 11 books.

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Preface

Climate change is a fact. It is evident from the physical, biological and geological system responses from all the continents and oceans. According to various working Group of IPCC (Intergovernmental Panel on Climate Change) anthropogenic outcome had significantly contributed to the global warming and climate change. Evidence of global and continental changes due to global warming are conspicuous in continents like Europe, Central Asia and North America where the databases and studies related to different environmental parameters are noteworthy. Databases and published information related to climate change responses are sparse in regions like Southeast Asia, Indian Ocean and Africa Present book consists studies on climate change from Indian continent. This book “climate change impact on ecosystems” consists observations from different eco systems.

Regulatory measures for judicious utilization of natural resources are essential. The first chapter of this book discusses the environmental impact assessment and trend and practices for sustainable development. Green house gas emissions are to be reduced so as to minimize the climate change and process. Possible ways to control the factors that affect climate change are discussed in the second chapter. It suggest many recommendations to improve the environmental scenario of Assam the foothills of eastern Himalaya.

Fresh water contamination due to saline water intrusion in coastal and Island aquifers is the immediate effect of sea level rise due to climate change. A case study was carried out in Kurusadai Island, Gulf of Mannar for adequate water availability is ascribed in this book . Rain water may drain through surface and subsurface into ocean, soon after the rain. The number of low pressure system formed over Indian landmass and adjoin seas are examined in this book. Low pressure system shows fluctuating trend in Arabian Sea and Bay of Bengal. Hundred years data on temperature and rainfall were analyzed in another study It is observed that during the period of high global temperature, rainfall occurrence is low.

Sources of climate change induced gases are presented in two chapters. Environmental issues related to open mining may augment the process of global warming. Chemistry of lignite and coal consuming power plants and fly ash are examined. Coal power plant through exit hot flue gas has substantial contribution towards climate change. Agriculture is one of the source of green house gases that ultimately increase regional

and global temperature. Jhuming, a traditional method of farming in Manipur a hilly mountain state is discussed in this book. Jhuming is directly related to deforestation and destruction of biodiversity. Socio-economic and ecological impact of Jhuming is also presented.

Climatic zones of different geographical locations are an important aspect of Climate change. Brown seaweeds from Karachi coast is examined in this book. Ecosystem and eco subsystem parameters of major and minor estuaries in India reveal the oxygen deficiency in surface and subsurface waters of many estuaries. A typical mass balance model was developed for dissolved oxygen for Krishna estuary. About 100 botanic gardens located in different parts of Indian subcontinent are placed in network as a part of the adaptive measures to climate change. This book also focused on the availability of Rare, Endangered and Threatened (RET) species in Indian Botanic Gardens. There are as many as 565 RET species are growing in 33 botanic gardens of India.

Models developed on the basis of Neuro-Fuzzy technique is discussed in this book for regional climatic variation. After model development, the effects of rise in temperature (Global Warming) have been studied over potential evapotranspiration. This will presents the climate change scenario in this region. Remote sensing technology can be an effective toll to examine the same. This book consists studies related to Ogn storm that crossed Indian coast on October 30, 2006. IRSP6LISS image was utilised for the study. Envisat satellite were used for submergence analysis due to Ogn storm.

Impact of climate change in Indian economy and environment are discussed in this book. India should modulate an effective international agreement to deal with issues related to Climate Change. Weather warning can be disseminated to the stakeholders by way of improved Information and communication technology. A new model on dissemination of communication of weather forecast in line with the global standards meeting the Millennium Declaration Target is discussed in this book.

Many of the activities viz. use of LPG, use of waste paper by millions of families and water conservation have significant contribution to global warming. Household behavior is the nerve centre for mitigating global warming. Efficiency of traditional chullas will reduce the quantity of CO₂ emission to the atmosphere. Enhancing the efficiency one third of the fuel used by the traditional chullas may be saved. This book consists many devises developed and applied to reduce the carbon emission during domestic firewood use.

Climate change impact database and information are quite sparse in tropical regions. Present book consists multidisciplinary studies from different geographical and ecosystems of Indian subcontinent. The information available in this book varies from impact of climate change on

mountain to Island aquifers. Studies on mines, industry, agriculture, coal and jhuming had made this book, a unique compilation of climate change information from a tropical country. It consists many tools related to mitigation especially to reduce the green house gas emissions from firewood during traditional cooking. The innovations and the creativity of the studies in this book will be highly beneficial for the future climate proof planning of tropical regions.

This book is a contribution of dedicated scientists and researchers who met at Cochin University of Science and Technology and Kadmat Island of Lakshadweep to discuss the impact of Climate Change on different ecosystems. Excellent support secured by School of Marine Sciences, Cochin University of Science Technology, Administrator U.T of Lakshadweep and Officers of Lakshadweep Science & Technology U.T of Lakshadweep, India are gratefully acknowledged.

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