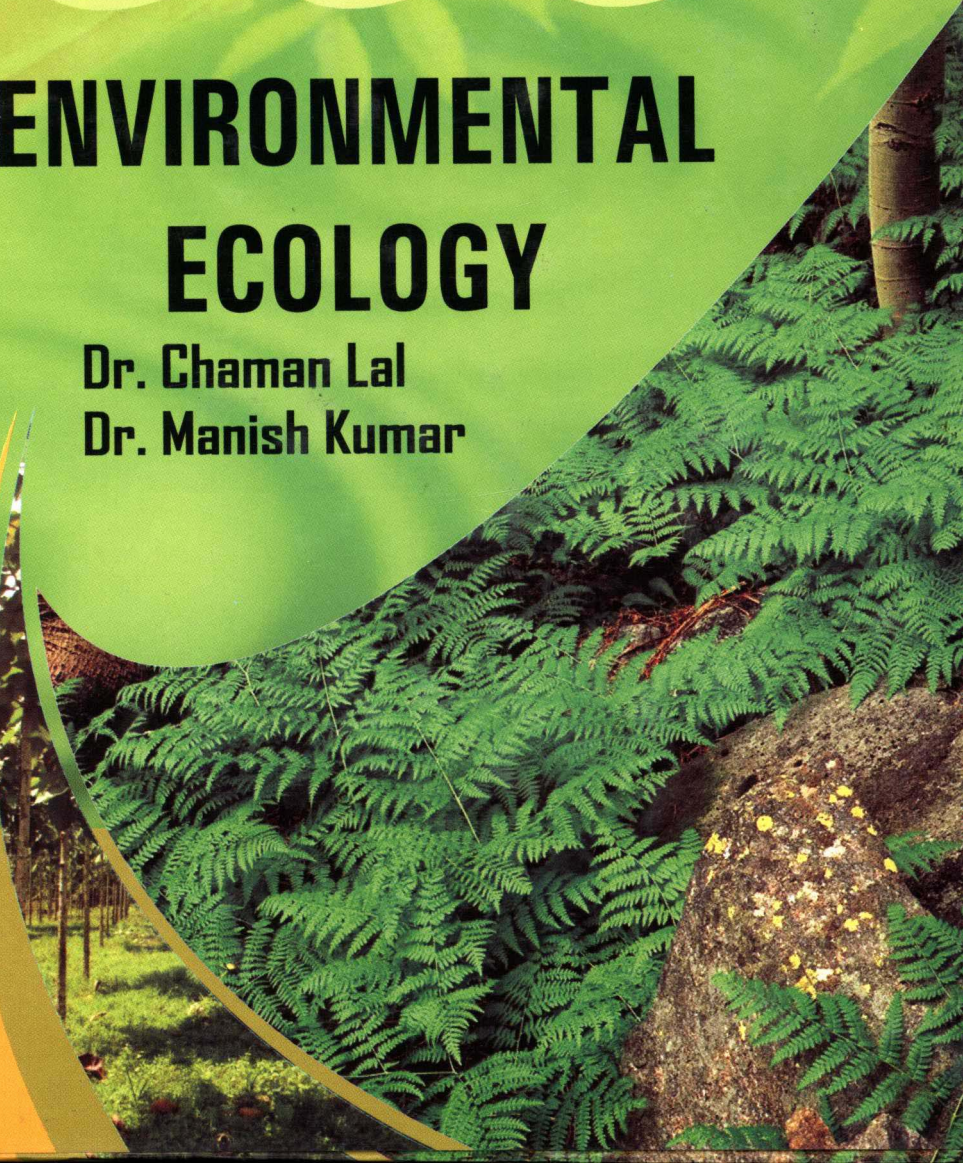


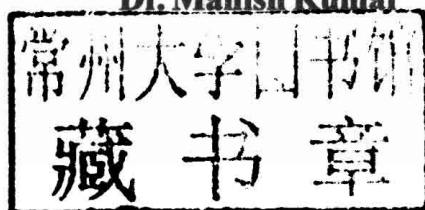
ENVIRONMENTAL ECOLOGY

**Dr. Chaman Lal
Dr. Manish Kumar**



ENVIRONMENTAL ECOLOGY

**Dr. Manoj Rawat
Dr. Chaman Lal
Dr. Manish Kumar**



DPS
PUBLISHING HOUSE
New Delhi (India)

© Reserved

First Published 2013

ISBN:978-81-924651-2-8

Published by

D.P.S. PUBLISHING HOUSE

4598/12B, Gola Cottage, Ansari Road, Darya Ganj, Delhi-110002

Ph. 011-23251264, Mob. 9811734184

E-mail: prashant_pbd@yahoo.co.in

dpspublishinghouse@gmail.com

WEB: www.dpspublishinghouse.com

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical or photocopying or otherwise, without prior permission in writing from the publishers/author.

Printed in India

Published by DPS Publishing House, New Delhi & Typeset by Sathya Sai Graphics, New Delhi, and Printed at Asian Offset, Delhi.

ENVIRONMENTAL ECOLOGY

Preface

Ecology is the scientific study of the relations that living organisms have with respect to each other and their natural environment. Variables of interest to ecologists include the composition, distribution, amount (biomass), number, and changing states of organisms within and among ecosystems. Ecosystems are hierarchical systems that are organized into a graded series of regularly interacting and semi-independent parts that aggregate into higher orders of complex integrated wholes. Ecosystems are sustained by the biodiversity within them. Biodiversity is the full-scale of life and its processes, including genes, species and ecosystems forming lineages that integrate into a complex and regenerative spatial arrangement of types, forms, and interactions. Ecosystems create biophysical feedback mechanisms between living and nonliving components of the planet. These feedback loops regulate and sustain local communities, continental climate systems, and global biogeochemical cycles.

Environmental conservation is an integral part of the socio economic development. The growing population, high degree of urbanization and steep rise in energy use, have affected the sustainability of the environment. Deforestation results in the reduction of the sink for carbon dioxide and increases soil degradation. Industrialization leads to water and air pollution. The water resources get polluted due to the discharge of untreated or partially treated wastes from industry, domestic sewage and fertilizer and pesticide run off from agricultural fields. Conservation is not opposed to development, since it includes both protection and rational use of natural resources. One of the greatest challenges is how to accelerate

economic growth without exhausting natural resources. Environment is influenced by a variety of factors, hence environmental management is a complex issue. A benchmark survey of the present status of various factors that govern the environment is a pre requisite to formulate an appropriate environmental policy. The Tamil Nadu Government has prepared a 'State of Environment Report', which has broadly outlined the environmental issues in various sectors and possible approaches to tackle them. The key sectors in Tamil Nadu that are concerned with the environment are agriculture and horticulture, forests and wildlife, water resources, coastal and marine environment, energy, industrialization, urbanization and archaeology and tourism. The State, while planning for social and economic progress that satisfies the present needs of the citizen, has the moral obligation to pass on the nature's gifts to the future generation. One of the critical activities in this regard is preservation of our environment.

-- Dr. Manoj Rawat

-- Dr. Chaman Lal

Dr. Manish Kumar

Contents

<i>Preface</i>	v
1. Ecology and Environment: An Introduction	1
2. Ecology and Environment of Mangrove Ecosystems	24
3. Mainstreaming the Environment: Global Ecology	33
4. Sustainability in Ecological Economics, Ecology and Livelihoods	63
5. Integrating Landscape Ecology in Environmental Impact Assessment Using GIS and Ecology	93
6. Statistical Ecology and Environmental Statistics for Cost-Effective Ecological Environmental Analysis	103
7. World Ecology and Global Environmental Governance	132
8. Conservation Agriculture, Environmental and Economic Benefits	157
9. The Justice of Ecological Restoration	167
10. An Ecological Perspective to Cognitive Limits: Modeling Environment-Mind Interactions	195
11. Towards An Egalitarian Global Environmental Ethics	215
12. Global Warming and Ecological Disasters	235
13. Ecological Restoration and Global Climate Change	251
<i>Bibliography</i>	261
Index	263

Ecology and Environment: An Introduction

The natural environment with its numerous living and non-living resources is man's most precious heritage. The basic goal of environmental conservation is the management of human use of these natural resources, so that they may yield the greatest sustainable benefits to present generation while maintaining their potential to meet the needs and aspirations of future generations.

Like other nations, India too bears the scars of damage done to its natural environment resulting in a wide array of environmental problems affecting the well-being of its citizens. While for developed countries, environmental problems are largely the by-products of affluence marked by resource wasteful life-styles, the stress on India's environmental resources come mainly from the pressures for satisfying the basic human needs of a large and growing population which has crossed 1 billion mark according to the Census of 2001. Environmental problems in a developing country like India can be classified into two broad categories:

- (a) Those arising from conditions of poverty and under development.
- (b) Those arising as negative effects of the very process of development.

The first category has to do with the impact on the health and integrity of our natural resources (land, soil, water, forests, wildlife

etc.) as a result of poverty and inadequate availability of the means to fulfil the basic human needs (food, fuel, shelter, employment, etc.) for a large section of our population. The second category has to do with the unintended side-effects of efforts to achieve rapid growth and development. In this latter category would fall the distortions imposed on natural resources from not only poorly planned development projects and programmes, as well as from lack of attention to long-term interests by commercial and vested interests, but also the inherent and somewhat irreconcilable contradiction between development and ecological preservation. Over the centuries, Indians have worshipped nature. Even in modern times, India can count itself as among the few countries of the world that have made specific reference in their Constitution to the need for promoting ecological security. The Indian Constitution lays down in the Directive Principles of State Policy the following duties for the State and the Citizen: The Tamil Nadu Pollution Control Board and the Department of Environment of the Government of Tamil Nadu are entrusted with the task of monitoring pollution and taking efforts for abatement of pollution in the State. The Tamil Nadu Pollution Control Board enforces the provisions of Water (Prevention and Control of Pollution) Act, 1974 as amended in 1978 and 1988 and the Air (Prevention and Control of Pollution) Act, 1981 as amended in 1987 and the relevant provisions/ rules of the Environment (Protection) Act, 1986 for tackling pollution of water, air and land on account of causes such as industrial effluents, industrial gases, use of chemical pesticides, human negligence etc., Among its activities are (1) monitoring of treatment and disposal of effluents from the industries and local bodies and (2) survey of water resources in the State to assess their quality. The Department of Environment created in 1996 has the triple functions of implementation, co-ordination and monitoring of the State and Centrally Sponsored Schemes in such areas for pollution abatement.

Performance in Ninth Five Year Plan (1997-2002)

An outlay of Rs. 50 crores was provided for "Ecology and Environment" during the Ninth Five Year Plan period. The allocation to the Tamil Nadu Pollution Control Board was Rs. 15.87 crores for

the implementation of thirteen schemes programmes and to the Department of Environment Rs. 34.13 crores for the implementation of six schemes programmes out of the total sectoral allocation of Rs. 50 crores .

Ecological Security

One of the points in the Chief Minister's 15 point programme for realising the vision of making Tamil Nadu the best State in the country by providing opportunities for a healthy and productive life for all is ecological security. In the address of the State Finance Minister Budget session, of the State legislative in March' 2002, it was emphasised that environment protection is the key to ensuring a healthy life for the people. Environmental problems are on the increase and are more pronounced in densely populated cities. Exploding urban migration, as experienced in the last decade, is bound to widen the gap between demand and supply of infrastructural services such as energy, housing, transport, communication, water supply, sewerage, solid wastes disposal and recreation for communities. The mixing of the air with a high level of sulphur dioxide, carbon monoxide, oxides of nitrogen and suspended particulate matter by industries and vehicles is adding to air pollution. The area around Manali near Chennai, the belt of Vaniyambadi to Ranipet in Vellore District, textile and dyeing industries in and around Tiruppur & Erode towns and areas around tanneries in Vellore district are most prone to industrial pollution in Tamil Nadu.

As against the Ninth Five Year Plan outlay Rs. 50 crores , the expenditure for the sector "Ecology and Environment "during the Ninth Five Year Plan period would be of the order of Rs. 11.69 crores representing approximately 24% of the Ninth Five Year Plan sectoral outlay of Rs. 50 crores . The expenditure under Centrally Sponsored Schemes and schemes shared between State & Centre (Full Govt. Schemes) is estimated to be Rs. 11.81 crores and Rs. 17.49 crores respectively for the programmes of Ecology and Environment during the Ninth Five Year Plan period.

Tamil Nadu Pollution Control Board

The Tamil Nadu Pollution Control Board implemented the thirteen schemes programmes envisaged during the Ninth Five Year Plan period with their own sources of funds. They are: (1) Hazardous Waste Management, (2) Strengthening of TNPCB Laboratories, (3) Noise Level Monitoring, (4) Vehicle Emission Monitoring, (5) Water Quality Monitoring of Non-Point Sources, (6) Establishment of Environmental Information System, (7) Coastal Monitoring Programme, (8) Monitoring of Industrial Estates, (9) Education and Training, (10) Air Quality Monitoring, (11) Emergency Response Centre, (12) Ozone Monitoring Cell and (13) Establishment of Environmental Management Cell for preparation of environmental maps, zoning atlas etc.

In addition to the above thirteen schemes programmes, the Tamil Nadu Pollution Control Board took up the following Pollution control activities during the Ninth Five Year Plan period:

- Major programme for development of green belt in municipal corporation areas to mitigate air and noise pollution in urban areas.
- Detailed project reports for solid waste management at Udthagamandalam, Kodaikkanal, Palani, Thiruchendur, Kanyakumari, Rameswaram, Mamalapuram and Kutralam.
- Creation of awareness regarding the ecological hazards posed by plastics, through mobile exhibitions on eco-friendly alternatives to plastic materials and also through advertisement campaigns in public transport buses.
- Establishment of a research fund and sanction of nine projects.
- Constitution of Public Hearing Panels as per the Environmental Impact Assessment Notification, 1994.
- Monitoring of 17 categories of highly polluting industries, specified by Government of India under which 202 units were identified.

- Initiation of necessary steps to implement the Recycled Plastics Manufacture and Usage Rules, 1999.
- Enforcement of the Bio Medical Waste Management and Handling Rules, 1998 as amended in 2000.

Towards setting up and operation of common effluent treatment plants in the State, the Government of Tamil Nadu sanctioned and released a subsidy amount of Rs. 1179 Lakhs and the Government of India released a subsidy amount of Rs. 1190 Lakhs during the Ninth Five Year Plan period.

1. Five Old Towns

Pollution abatement works in river Cauvery at Bhavani, Pallipalayam, Erode, Komarapalayam and Tiruchy towns are being undertaken under the National River Conservation Programme during the plan period. The programme became 100% Government of India supported programme since April 1997. The total estimated cost is Rs. 38.20 crores . The project period is 10 years and all the works will be completed by 2005. The expenditure during Ninth Five Year Plan period was Rs. 12.13 crores .

2. Seven New Towns

Government of India accorded administrative approval for the abatement of pollution in five towns on the banks of the river Cauvery viz Kumbokanam, Thanjavur, Karur, Mayiladuthurai and Tiruchy besides Madurai along Vaigai river and Tirunelveli along Tamirabarani river.

3. National Lake Conservation Programme

Government of India gave administrative approval for the implementation of the project for conservation and management of Kodaikanal and Ooty lakes at a total cost of Rs. 10.33 crores and Rs. 1.95 crores respectively.

Chennai City River Conservation Project

Under National River Action Plan, Government of India sanctioned a scheme at an estimated cost of Rs. 1700 crores with the

participation of various Government agencies departments to clean Chennai City Waterways viz. Adyar, Cooum, Buckingham Canal, Otteri Nullah, Captain Cotton Canal and Mambalam Channel. Government of India grant for this project is Rs. 491.52 crores . The works, funded by Government of India, are executed by the Chennai Metropolitan Water Supply and Sewerage Board. The Public Works Department is involved in desilting of the waterways and sectioning, while the Tamil Nadu Slum Clearance Board is involved in rehabilitation and resettlement of 8000 slums on the fringes of the waterways. The Corporation of Chennai is involved in micro-drainage and solid waste management works. The Metro Water Board is also executing works to the tune of Rs. 228 crores from their own funds.

Coastal Zone Environment Management

The Government of India has constituted an authority called the 'State Coastal Zone Management Authority' with the Secretary to Government, Environment and Forests Department as Chairperson and the Director of Environment as Member-Secretary with five other official and non-official members.

Environmental Master Plans

The district profiles containing the details of data from primary and secondary sources have been prepared for all the districts and sent to the District Collectors and other user agencies. The preparation of status report on environment is nearing completion.

Environmental Education and Awareness

To enhance environmental awareness among students, over 1200 eco clubs have been started in the schools. Eco clubs have been started in all the 30 districts by involving NGOs educational institutions. Financial assistance is also given for conducting workshops, training programmes to NGOs and educational institutions for conducting rallies on important days.

Strengthening the training facilities of the Department of Environment

Equipments such as OHP, LCD projector, colour TV, VCR etc. have been purchased to facilitate the conduct of communication and awareness programmes.

Tenth Five Year Plan

The latest United Nation Report on environmental trends states that the expansion of cities, destruction of forests, erosion of fields and rising demand for water are likely to threaten human and ecological health in many countries for at least a generation. The report also observes that “Without the protection of environment, there can never be the kind of development needed to secure a fair deal for this or future generations”.

Keeping this in view, the *objectives* of the Government of Tamil Nadu during the Tenth Five Year Plan period for the sector “Ecology and Environment” would be as follows:

- Protection of environment and reduction of wastes at source, besides continuing enforcement and monitoring activities.
- Conservation and enhancement of life support systems like land, water, forests, biodiversity, ocean and the atmosphere giving ecological security.
- Properly treating or converting the pollutants into useful products and thereby reducing their negative impact.
- Promotion of suitable measures and technologies for recycling reusing.
- Emphasising the environmentally safe waste disposal options viz, composting of all organic wastes, common facilities for bio-medical wastes, etc.
- Maintaining essential ecological processes to ensure genetic diversity and prevent environmental degradation.

- Promoting the active participation of people at all levels - from the village panchayat to the State as a whole - in the preservation of the environment and promotion of sustainable development through awareness campaigns.

Besides the main two agencies viz., the Tamil Nadu Pollution Control Board and the Department of Environment, the various agencies/departments would also be addressing themselves to environmental concerns in the discharge of activities falling within their domain for the purpose of mainstreaming environmental consciousness and for tackling environmental issues on a holistic manner on all fronts in the State. The environmental concerns relating to various agencies/departments are listed below:

Local Bodies

- Formulation and implementation of schemes for proper collection, conveyance, treatment and disposal of municipal sewage and solid wastes.
- Promotion and implementation of segregation of wastes at source, composting of wet wastes, recycling of dry recyclable and safe disposal of other wastes including toxics.
- Promotion of rainwater harvesting.
- Preparation of environmental management plans.
- Environmental awareness.
- Implementation of schemes for proper collection, conveyance, treatment and disposal of municipal sewage.
- Protection and monitoring of drinking water sources from impurities and contamination.
- Implementation of rain water harvesting systems.

Public Works Department

- Protection and monitoring of water resources including rivers, lakes and ground water.

- Sustainable development of major irrigation projects.
- Macro drainage network in river basins including proper de-sludging and desilting of river courses and water bodies.
- Implementation of statutory regulations on extraction of ground water.
- Action on rain water harvesting systems and enhancing the recharge capacity of ground water.
- Adoption of environmental features in industrial estates including green belt development, prohibition of disposal of toxic and nonbiodegradable wastes including plastics.
- Proper collection, conveyance, treatment and disposal of sewage arising in the industrial estate.
- Implementation of environmental management plan in industrial estates.
- Adherence of environmental planning in new industrial estates.
- Action for evolving waste minimisation techniques and cleaner technologies for reduction/reuse/recycle of wastes in industries.

Tamil Nadu Electricity Board

- Action for utilisation of fly ash arising from thermal power plants.
- Improvement, operation and maintenance of air pollution control measures in thermal power plants to satisfy the standards prescribed.
- Evolving environmental management plans for urban development.
- Review of master plan/development plan as per environmental considerations.

- Strict enforcement of land use classifications.

Forest Department

- Green belt development in the State.
- Implementation of urban afforestation programmes to control air and noise pollution.

Police and Transport Departments

- Action for control of vehicular pollution viz., emission and noise pollution.
- Proper traffic management especially at intersections and restriction of heavy vehicles in cities/towns during peak hours of the day based on the air quality monitoring data.
- Action for compliance of noise standards, especially during festival periods, celebrations, meetings, processions, etc.
- Curbing the use of air horns and cone speakers.

Food and Civil Supplies Department

- Check adulteration of fuel.

Inspector of Factories

- Action for compliance of on site and off site emergency preparedness in major industries.
- Action for establishment of emergency response centres in industrial areas.

Health Department

- Monitoring of environmental epidemiology due to pollution.
- Conduct of pesticide epidemiological surveys.
- Action for establishing health care centres in major industries.