

ISBN-978-93-94174-59-7

Emerging Topics in Environmental Science and Natural Resource Management

Editors

Dr. R. S. Khoiyangbam

Dr. Ch. Raghumani Singh



First Edition

Excellent Publishers

Emerging Topics in Environmental Science and Natural Resource Management

Editors

Dr. R. S. Khoiyangbam, Ph.D.

Department of Environmental Science,
Manipur University, Canchipur,
Imphal (Manipur) – 795 003, India

Dr. Ch. Raghmani Singh, Ph.D.

Department of Environmental Science,
Manipur University, Canchipur,
Imphal (Manipur) – 795 003, India

ISBN: 978-93-94174-59-7

<https://doi.org/10.20546/978-93-94174-59-7>



Excellent Publishers



Excellent Publishers

Kancheepuram, India

www.excellentpublishers.com

email id: excellentpublishers2013@gmail.com

Copyright © 2025 Excellent Publishers. All rights reserved.

Publisher: Excellent Publishers

Editors: Dr. R. S. Khoiyangbam and Dr. Ch. Raghumani Singh

ISBN: 978-93-94174-59-7

DOI: <https://doi.org/10.20546/978-93-94174-59-7>

Note: No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or any information storage and retrieval system, without permission in writing from the publisher.

Contributors

ABHIK GUPTA, PH.D., Professor, Department of Ecology and Environmental Science, Assam University, Silchar-788011, Assam, India.
CH. RAGHUMANI SINGH, PH.D., Guest Faculty, Department of Environmental Science, Manipur University, Canchipur, Imphal – 795003.
CHONGTHAM MEMTOMBI CHANU, PH.D., Assistant Professor, Department of Environmental Science, Pole Star College, Hiyanglam-Wabagai-795103, Manipur, India.
CHONGTHAM VEDAMANI DEVI, Assistant Professor, Department of Zoology, Western College, Konthoujam, Manipur-795113.
DEVASHISH KAR, PH.D., Professor, Division of Wetlands, Fishery Science and Aquaculture, Department of Life Science & Bioinformatics, Assam University, Silchar - 788011, Assam, India.
KHOMDRAM NERMESHORI DEVI, PH.D., Assistant Professor, Department of Environmental Science, Pravabati College, Mayang Imphal-795132, Manipur.
KHUMANTHEM BABINA DEVI, Research Scholar, Department of Environmental Science, Mizoram University, Tanhril, Aizawl- 796004.
KHUMANTHEM RONALDO SINGH, Department of Environmental Science, IGNOU, Maiden Garhi, New Delhi- 110068.
KHWAIRAKPAM ROMESH SINGH, PH.D., Guest Faculty, Department of Forestry, Manipur University, Canchipur-795003.
L. BIDYALAXMI DEVI, PH.D., Assistant Professor, Department of Environmental Science, Ng. Mani College, Khurai Chairenthong, Imphal East-795010, Manipur, India.
LEISHANGTHEM RANIBALA DEVI, PH.D., Assistant Professor, Department of Botany, Ng. Mani College, Khurai Chairenthong- 795010, Manipur, India.
LEISHANGTHEM SARNABATI DEVI, PH.D., Assistant Professor, Department of Environmental Science, Thambal Marik College, Oinam-795134 Manipur, India.
M. SHOMORENDRA, PH.D., Assistant Professor, Department of Zoology, Thambal Marik College, Oinam-795134, Manipur, India.
MAISNAM SAPANA DEVI, PH.D., Assistant Professor, Department of Environmental Science, Thambal Marik College, Oinam-795134, Manipur, India.
NADA TADI, Scientist-C, Rain Forest Research Institute, Sotai, Deovan, Jorhat, Assam-785010.
NGANGOM NGANBI DEVI, PH.D., Assistant Professor, Department of Zoology, Western College, Konthoujam-795113, Manipur, India.
NGASEPAM ROMEN SINGH., PH.D., Assistant Professor, Department of Zoology, Kumbi College, Kumbi-795133, Manipur, India.
NONGTHOMBAM SURAJ SINGH, Research Scholar, Department of

Environmental Science, Manipur University, Imphal - 795003.
R.S. KHOIYANGBAM PH.D., Associate Professor, Department of Environmental Science, Manipur University, Imphal - 795003.
RAJUKUMAR KHUMUKCHAM, PH.D., Assistant Professor, Department of Environmental Science. T.S. Paul Manipur Women's College, Imphal -795003.
RITA NONGMAITHEM, PH.D., Assistant Professor, Department of Botany, Ng. Mani College, Khurai Chairenthong- 795010, Manipur, India.
ROBERT PANMEI, PH.D., Guest Faculty, Department of Forestry, Manipur University, Canchipur-795003.
RS LOUSHAMBAM, PH.D., Guest Faculty, Department of Forestry, Manipur University, Canchipur-795003.
SALAM DILIP, PH.D., Guest Faculty, Department of Forestry, Manipur University, Canchipur-795003.
THANGJAM GOPESHWOR SINGH, PH.D., Assistant Professor, College of Food Technology, Central Agricultural University, Lamphelpat, Imphal-795004, Manipur.

Table of Contents

Contents		Page No.
Chapter-1	Heavy metal concentrations in aquatic plants of a riverine ecosystem: A case study in Nambul River, Imphal West, Manipur, India <i>Dr. Thangjam Gopeshwor Singh, Dr. Abhik Gupta, Dr. Khomdram Nermeshori Devi & Dr. Ch. Raghumani Singh</i> doi: https://doi.org/10.20546/978-93-94174-59-7_1	1-13
Chapter-2	A review on certain biomarkers of type I and type II synthetic pyrethroids in fish <i>Dr. Maisnam Sapana Devi, Dr. Ngangom Nganbi Devi & Dr. Abhik Gupta</i> doi: https://doi.org/10.20546/978-93-94174-59-7_2	14-25
Chapter-3	Toxicity of Pesticides on Aquatic organisms: An analysis of the effect of Endosulfan, Chlorpyrifos and Cypermethrin on four Fish species <i>Dr. Ngangom Nganbi Devi, Dr. Maisnam Sapana Devi, Dr. L. Bidyalaxmi Devi, Chongtham Vedamani Devi & Dr. Abhik Gupta</i> doi: https://doi.org/10.20546/978-93-94174-59-7_3	26-36
Chapter-4	Impact of Pesticides on the Environment <i>Dr. Leishangthem Sarnabati Devi</i> doi: https://doi.org/10.20546/978-93-94174-59-7_4	37-49
Chapter-5	Effect of pesticides on soil algae <i>Dr. L. Bidyalaxmi Devi, Dr. Ngangom Nganbi Devi & Dr. Chongtham Mamtombi Chanu</i> doi: https://doi.org/10.20546/978-93-94174-59-7_5	50-57
Chapter-6	Importance of Acanthocephalan parasite of genus <i>Pallisentis</i> (Van Cleave, 1928) in freshwater fish <i>Channa punctata</i> (Bloch) from Sone Beel, Assam <i>Dr. Ngasepam Romen Singh, Dr. M. Shomrendra & Dr. Devashish Kar</i> doi: https://doi.org/10.20546/978-93-94174-59-7_6	58-69
Chapter-7	Prospect of Ethnobotanical study of Northeast India in the 21st century <i>Dr. Rita Nongmaithem & Dr. Leishangthem Ranibala Devi</i>	70-83

	doi: https://doi.org/10.20546/978-93-94174-59-7_7	
Chapter-8	A review of the problems and strategies encountered by the ethnomedicinal plants used for women's healthcare practices in India <i>Dr. Leishangthem Ranibala Devi & Dr. Rita Nongmaithem</i> doi: https://doi.org/10.20546/978-93-94174-59-7_8	84-92
Chapter-9	Conservation of soil and water in agricultural systems <i>Ms. Khumanthem Babina Devi & Mr. Khumanthem Ronaldo Singh</i> doi: https://doi.org/10.20546/978-93-94174-59-7_9	93-105
Chapter-10	Urban Forest: Toward a healthy Urban environment <i>Dr. Khwairakpam Romesh Singh</i> doi: https://doi.org/10.20546/978-93-94174-59-7_10	106-113
Chapter-11	Social Forestry <i>Mr. Nada Tadi, Dr. Robert Panmei, Dr. Salam Dilip & Dr. R.S. Loushambam</i> doi: https://doi.org/10.20546/978-93-94174-59-7_11	114-123
Chapter-12	Impacts of Urban Air Pollution on School going Children and Management Strategies <i>Dr. Rajukumar Khumukcham & Dr. R.S. Khoiyangbam</i> doi: https://doi.org/10.20546/978-93-94174-59-7_12	124-133
Chapter-13	Methane emission Mitigation and Removal Technologies: A Short Overview <i>Nongthombam Suraj Singh & Dr. R S. Khoiyangbam</i> doi: https://doi.org/10.20546/978-93-94174-59-7_13	134-144
Chapter-14	Nitrate Contamination in Soils used for Storing and Drying Biogas Spent slurry <i>Dr. R.S. Khoiyangbam</i> doi: https://doi.org/10.20546/978-93-94174-59-7_14	145-152
Chapter-15	Conventional Biogas plants: Farmer's Mini-manure Factory <i>Dr. R.S. Khoiyangbam</i> doi: https://doi.org/10.20546/978-93-94174-59-7_15	153-160

Preface

It is an indisputable fact that despite the tremendous human efforts and scientific advances in pollution control, the environment is degrading day by day. The most visible and frightening aspect is the disastrous impact on human lives. We can no longer ignore the relationship between environmental degradation and deteriorating human health and livelihoods. Today, we are standing at a crossroads with two eminent choices: act in time or face the impending consequences. One of the inevitable tasks in resolving the environmental crisis is understanding the underlying causes and the multiple implications we witness today.

While there are many environmental problems, bringing all within the ambit of the current book is not possible; we have delved into a few pertinent topics. Eminent authors have portrayed their views and observations suggesting way-outs for the environmental challenges of heavy metals, pesticides, insecticides, fertilisers and different human activities. Extensive use of pesticides has affected non-target aquatic organisms and natural biota. Therefore, a detailed understanding of the environmental impacts of pesticide use, advocacy for the development and adoption of sustainable agricultural practices, and emphasis on eco-friendly management strategies are needed.

Ethnobotanical studies are also an important area where indigenous knowledge needs to be trapped for use in the pharmaceutical industry. The rich bioresources of North Eastern India embody a rich traditional knowledge system. Therefore, ethno-medicinally important plants used for women's health care practised by different tribes of North East India have been highlighted. Rampant soil degradation and water depletion still occur despite employing agricultural techniques for conserving water and soil. A sustainable intensification plan via conservation agriculture using a systems approach to soil and water conservation is the need of the hour. Environmental degradation due to urbanisation can be effectively countered and mitigated by establishing urban forests, augmenting numerous ecosystem services. At the same time, social forestry services are at least versatile, dynamic, and receptive to unique situations and social climates. Worldwide, urbanites suffer from the onslaught of air pollution impacting school-going children. Methane is one of the most important greenhouse gases contributing to present-day global warming. The importance of reviewing the negative emission technologies as complementary to conventional decarbonisation methods and not a substitute has been highlighted. Improper handling of spent slurry discharged from community biogas plants contributes to nitrate contamination of soil and, subsequently, groundwater, leading to environmental and agricultural consequences. But biogas spent slurry is an excellent organic manure with a rich nutrient content that can be judiciously administered with mineral fertilisers under a well-planned integrated nutrient management practice.

The editors gratefully acknowledge the support and cooperation they received from various authors for their in-depth study and valuable efforts in bringing out this publication. The authors are indebted to the publisher for accepting the publication of the book. Without the synergistic efforts and hard work of all, the book would not have seen the light of the day. The editors will significantly appreciate being informed about errors and receiving constructive criticism.

Dr. R. S. Khoiyangbam, Ph.D.
*Department of Environmental Science,
Manipur University, Canchipur,
Imphal (Manipur) – 795 003, India*

Dr. Ch. Raghumani Singh, Ph.D.
*Department of Environmental Science,
Manipur University, Canchipur,
Imphal (Manipur) – 795 003, India*

About the Editors



Dr. R. S. Khoiyangbam earned his Master's in Environmental Science from Guru Jambheshwar University, Hissar, Haryana, and his Ph.D. from the Indian Agricultural Research Institute, New Delhi. Dr. Khoiyangbam has experience working in both governmental and non-governmental organizations. He worked as a Junior Scientist on a project entitled "Environment Education for School Children of Himachal Pradesh" funded by the Norwegian Embassy. He was a faculty member at Bundelkhand University, Jhansi U.P., and D. M. College of Science, Imphal. He is presently working as an Associate Professor and Head of the Department of Environmental Science at Manipur University. He has the experience of teaching B. Tech., M. Sc., M. Tech., and M. Phil. Environmental Sciences. Research areas of his prime interest include energy and environment, greenhouse gas emission, and environmental pollution. He had availed ICAR-SRF to pursue PhD at IARI, New Delhi. He had worked as a Research Associate at IARI, New Delhi, and G. B. Pant National Institute of Himalayan Environment, Himachal Unit, Mohal-Kullu. He has supervised the dissertation work of many MSc., a few M.Phil, M.Tech. and PhD scholars. He was the principal investigator of projects funded by ICSSR, UGC, GBPNIE, DST-SERB, ATREE, CPCB, Manipur Biodiversity Board, etc. He has published two books and more than five book chapters, edited a book for IGNOU, prepared a policy document on Ecotourism and Agroforestry for Manipur, and published more than 35 scientific papers in various international and national journals. He was an Expert Member of CPCB - Research Advisory Committee for the Central Pollution Control Board (CPCB), Regional Directorate North East, Shillong. He is currently a member of the State Level Expert Appraisal Committee (SEAC), Manipur, under MoEF&CC, GoI, New Delhi, and the Nodal Officer, Himalayan Knowledge Network - Project funded by the GB Pant National Institute of Himalayan Environment, Almora.



Dr. Ch. Raghumani Singh earned his M.Sc. degree in Environmental Science from Bundelkhand University, Jhansi, Uttar Pradesh. He got his Ph.D. degree from the Dept. of Ecology & Environmental Sciences, Assam University (A Central University), Silchar, Assam in 2017. After getting his Ph.D. degree, he taught undergraduate students at Radhamadhab College, Silchar, Assam. Further, he had also cleared UGC-NET (Environmental Science) and SLET (Environmental Science). Currently he is working as a Guest Faculty in the Department of Environmental Science, Manipur University (A Central University). So far he had guided more than 12 students in their dissertation work. His area of research interest includes Solid Waste Management, Biodiversity Conservation, and Pollution Monitoring etc. He had published scientific papers in international journals and also book chapters. He also associated in preparation of Ecotourism policy of Manipur. He had over six years' experience of research, teaching and extension activities. Before he joined the Manipur University in 2019, he also worked as Senior Research Fellow at the DBT-sponsored Advanced Level Institutional Biotech Hub, Dept. of Botany, G.P. Women's College, Imphal, Manipur. There he also taught PG & undergraduate students. He had also coordinated in organizing many seminars, workshops and many other extension activities.

ISBN-978-93-94174-59-7

Emerging Topics in Environmental Science and Natural Resource Management

First Edition



Dr. R. S. Khoiyangbam, Ph.D.
Department of Environmental Science,
Manipur University, Canchipur,
Imphal (Manipur) – 795 003, India



Dr. Ch. Raghumani Singh, Ph.D.
Department of Environmental Science,
Manipur University, Canchipur,
Imphal (Manipur) – 795 003, India



Excellent Publishers
Kancheepuram, India
www.excellentpublishers.com

ISBN 978-93-94174-59-7



9 789394 174597