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# ENVIRONMENTAL IMPACT ASSESSMENT THEORY AND PRACTICE

ANJI REDDY MAREDDY

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# ENVIRONMENTAL IMPACT ASSESSMENT THEORY AND PRACTICE

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**An interdisciplinary approach to performing an effective environmental impact assessment**

- Presents detailed methodologies for air pollution control, waste treatment schemes, phytoremediation, bioremediation, hazardous waste, green belt development, and rain water harvesting
- Highlights the concepts and some important definitions of EIA as well as the planning and management of EIA studies along with the composition of EIA teams
- Discusses the impacts on valued environmental components like air, water, soils, land, noise, biological environment, and socio economic environment in a systematic manner

An interdisciplinary approach to performing an effective Environmental Impact assessment, *Environmental Impact Assessment: Theory and Practice* describes the various pieces of knowledge necessary to speak the language of EIA as well as carry out EIAs focusing on a variety of environmental issues including impacts on environmental components like air, water, soils, land, noise, and biological environment in a systematic manner.

Organized into 15 chapters covering most aspects of EIA, *Environmental Impact Assessment: Theory and Practice* provides engineers with the tools and methods to conduct an effective assessment that includes report preparations, design measures, or other relevant mitigation measures that can be taken to reduce or avoid those effects. Case studies are presented to provide guidance so that they can better understand, plan, and prepare environmental impact assessments.

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# ENVIRONMENTAL IMPACT ASSESSMENT

MARREDDY



# Environmental Impact Assessment

Theory and Practice

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Hyderabad, India

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# **Environmental Impact Assessment**



*Dedicated to my parents,  
Late Smt. Anasuyamma Mareddy  
Late Smt. Rami Reddy Mareddy*





# Preface

It is with utmost happiness and satisfaction, that I am presenting the book titled *Environmental Impact Assessment: Theory and Practice* to the students of undergraduate and postgraduate courses in the country, who would like to become EIA professionals.

The Environmental Protection (EP) act in India is considered to be the best legislation to protect and improve the quality of environment and hence quality of human life. This act requires environmental impact considerations to be included in project planning and decision making process in any developmental activities along with engineering and economic parameters. Consideration of environmental impacts due to developmental projects necessitates preparing the environmental impact assessment reports based on the actions, which significantly affect the quality of human environment. EIA is now firmly on the agenda as a result of the introduction of legislation at both national and international levels, and is very much in tune with widespread and growing concern about environmental issues and the impact of development on the environment.

EIA is an interdisciplinary scientific tool to study environmental impacts, and to be successful in this field, a professional requires a good understanding of the multitude of cross-disciplinary concepts. A holistic view on EIA is necessary to form an understanding of the challenges a professional would face, when solving environmental problems, be it at micro level or at macro level. This is of particular importance to environmental engineers, scientists, consultants, and stakeholders, who have to formulate and implement practical solutions to mitigate the adverse impacts with the ultimate goal of achieving sustainable development. The author has made an attempt to prepare this book as a comprehensive text to students and as a reference book for practitioners. This is an output of 25 years of author's teaching experience to post graduate students of environmental management, environment geomatics and his research in environmental related projects. Several examples are included in this book as the author is involved in appraising the developmental projects as Chairman of State Expert Appraisal Committee (SEAC), Andhra Pradesh under the umbrella of Ministry of Environmental and Forests (MoEF), Government of India. His experience in the practical aspects, natural resource conservation, assessment and evaluation of EIA reports on various projects, plans and legislative actions, and pollution control as member of several expert committees related to environmental issues also helped in shaping this book.

This book can be used as a textbook for graduate and postgraduate students of civil and environmental engineering, chemical engineering, environmental management, and environmental science. The book can also be used by individual environmental professionals trained in other related disciplines such as geology, geography,

planning, ecology, etc. Information is included in this book that is relevant for both classroom presentations and illustrations of the practice of EIA.

This book is organized into 14 chapters covering most aspects of EIA. The design of all these chapters is compatible and in accordance with the generic structure of EIA. Chapter 1 highlights the concepts and some important definitions of EIA where as the planning and management of EIA study along with the composition of EIA team is given in Chapter 2. Chapter 3 describes the affected environment and various methods of extraction of baseline data products. The impact identification methodologies and their comparative analysis are presented in Chapter 4. The impacts on valued environmental components like air, water, soils, land, noise, biological environment, and socio economic environment are discussed in a systematic manner in Chapters 5–10. More emphasis is given on the conceptual approach for identification of impacts on all environmental components, impact prediction, impact assessment, and mitigation measures in these chapters. The environmental management plan and mitigation strategies are highlighted in Chapter 11 with a case study for better understanding on how an EMP can be prepared for the proposed development projects.

Chapter 12 is considered as very important and is named as Technology in EIA, is presented with detailed methodologies for air pollution control, waste treatment schemes, phytoremediation, bioremediation, hazardous waste, green belt development, rain water harvesting, and remote sensing and GIS methods for preventing the pollution in the process of developing a particular site and to avoid anticipated adverse impacts. The EIA procedure in India as notified by Ministry of Environment and Forest, Government of India, is discussed in Chapter 13, which can be very much useful for an environmental consultant and a true EIA practitioner. An important issue in EIA is public participation, the involvement of local people; various methods of involving them in the decision making process is focused in Chapter 14 under the title Public Involvement in EIA.

The author would like to express his gratitude to the Ministry of Environment and Forest, Government of India and Andhra Pradesh Government for its support in appointing the author as the Chairman of Environment Committee through which the preparation of this book has become more easy with a number of case studies. The author wishes to express his gratitude to a number of individuals who have participated directly or indirectly in the assemblage of information related to this book. The author has benefitted by teaching courses on EIA through various universities in India and abroad and acknowledges for their collaboration. The author is very much thankful to Dr. V. Bakthavatsalam, Chairman, SEIAA; Sri Krishna Gopal, Member, SEIAA; and Sri Sanjay Kumar, IAS, Member Secretary, Andhra Pradesh SEIAA and PCB for their positive cooperation and technical help in preparation of this book. I am thankful to the officers of APPCB who provided the relevant information for this book.

I am grateful to the faculty and reviewers who have suggested changes for this book. I am also indebted to those authors whose books are source of information. I am very thankful to the members of SEAC for their technical help. I cannot forget the technical help extended by Mr. Sastry and Miss. Preethi of AP PCB, time to time, for the preparation of this book for which I am very much thankful. Special thanks to

environmental consultants who have provided the necessary material in writing this book. I am also thankful to all of my research scholars and students for their help in preparing this book.

Of major importance to the author is the positive attitude and helpfulness of Mr. Nikhil Shah and Mr. Naresh of BS Publications in preparation of this textbook. Truly, special thanks for my wife Jaya, children Chandu and Rajeev for the cooperation and encouragement in writing this book.

**Anji Reddy Mareddy**



## About the author

**Anji Reddy Mareddy** is a professor of Environmental Science and Technology, at Centre for Environment, Jawaharlal Nehru Technological University Hyderabad (JNTUH) India. Dr. Reddy received his PhD in Remote Sensing (Civil Engineering) from JNTUH in 1995; M.Tech. in Civil Engineering from Indian Institute of Technology (IIT), Kanpur in 1989; and MSc in Geology and BSc from Andhra University, in 1986 and 1984, respectively. He has more than 24 years of teaching and research experience. Dr. Reddy's research interests include environmental impact assessment methods and strategies, execution of operational EIA projects, environmental management, pollution source evaluation and environmental protection methods, remote sensing, GIS, and GPS. He has guided 28 PhD students, more than 160 M.Tech. students and executed more than 25 sponsored research projects. Dr. Reddy has published and presented more than 180 research papers. He has also delivered a number of lectures in these areas of research in national and international institutions.



He has authored several textbooks, including Remote Sensing and Geographical Information System, Geoinformatics for Environmental Management, and Digital Image Processing and Environmental Science and Technology. Dr. Reddy has also edited the seven proceeding volumes of International Conference on Environmental Management. This book is his fifth textbook which is an outcome of 6 years of his experience as Chairman of Andhra Pradesh State Environmental Expert Appraisal Committee (SEAC) constituted by Ministry of Environment and Forests, Government of India with the recommendation of Government of Andhra Pradesh. He is also the author of a number of research reports, book chapters, course materials related to environmental studies. He has also written environmental statements and EIA reports on projects such as mineral extraction, power plants, cement industry, roads, wastewater treatment plants, industrial estates, parks, special economic zones, flood control banks, etc.

He is a technical member and auditor of World Bank funded projects, Coordinator of environmental geomatics, TIFAC-CORE (Centre of Relevance and Excellence), Department of Science and Technology, New Delhi. He is a National expert committee member for revival of village ponds project, a member of Earth and environmental science expert committee for the empowerment of women, expert member of the project Kolleru lake restoration management plan of DST, expert working group member

of hyper spectral signature database creation project, and village knowledge management system of NRDMS, DST.

Awards received by him include *Rotary Vocational Excellence Award 2009*, *AP SCIENTIST AWARD 2010* in recognition of outstanding services rendered in the areas of environmental sciences and technology, EIA, and environmental management systems. *Best Teacher Award-2012* from Govt. of Andhra Pradesh and *AP fellow* of A.P. Academy of Sciences.

For his outstanding contribution in environmental problem solving, pollution control, health and safety, GIS and Remote sensing applications for water quality, environmental planning and assessment, EIA, socio-economic development through scientific means, he stood not only as a distinguished professor in JNTU but also at the national and international level.

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