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Editor

# Paradigms in Pollution Prevention

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# Foreword

The age old tradition of the use of our air, land and water resources as disposal media for our waste products is now being questioned by the public, government, industry and elected officials. The environmental protection paradigm centred on controlling pollution after it has been created is being challenged by an emerging view rooted in preventing pollution at its source. The regulatory paradigm based on emission limits and extensive government inspection programmes is now widely recognized as incomplete, inadequate, too costly and a significant barrier to enhanced trade relations among nations.

Increasingly, a pollution prevention paradigm is being substituted which focuses on reducing the overall cost of pollution control by changing production and distribution processes. This results in more responsibility for pollution control in the private sector and shifts the focus of regulation from substantive improvements in environmental quality to procedural efficiency concerns.

By integrating pollution control in the private sector, the pollution prevention paradigm not only cuts the overall cost of regulation, it also harmonizes standards and increases compliance both nationally and internationally.

It is important to understand that implementation of the preventive paradigm depends much more on people as consumers, workers, managers and professionals than does traditional, reactive environmental management. But, by and large, most people have poor environmental literacy. Without detailed environmental knowledge, resistance to change may be severe.

Pollution prevention as social, cultural and economical change means that large numbers of people must cooperate. Ordinary environmental concerns that are fed by the popular press coverage of environmental issues may not be capable of sustaining long-term personal and occupational commitment to preventive actions. Practicing prevention, in other words, requires more mature environmental responsibility than most people have thus far experienced. The preventive strategy requires a high level of personal commitment, responsibility and habitual behaviour.

Solving the current environmental problems and preventing future environmental pollution requires new ways of thinking. We have much to learn from our successes and failures, but we must shift from some of the old paradigms, enhance others and produce new ones where appropriate.

This book serves as an excellent medium for the readers from which they can explore new approaches and change their thinking so as not to be condemned to repeat the environmental mistakes, mishaps and misdeeds.

The chapters in this book hold many lessons for pollution prevention programmes. The goal is to place some of the many environmental events in a context in which they can be scrutinized objectively, systematically and passionately.

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# Preface

As the stride of industrial activity strengthened and the understanding of collective effects grew, a pollution control paradigm became the dominant approach to environmental management. This new paradigm of pollution prevention will serve as the epoch of state and local environmental dogmas. The challenge is to switch from past environmental regulations based on pollution control and government authorized regulations to future environmental procedures which would be based on pollution prevention, source reduction, recycling and waste minimization. It will require a new social setup amongst environmental, industrial and regulatory interests.

The current approach has failed to prevent global contamination and environmental damage because it underestimates the scale, complexity and diversity of the hazards of chemical pollution. There exists an urgent need for fundamental shifts in the mode of chemical assessment and policies.

A new framework should focus on chemical classes rather than individual substances, and the conversion of industrial processes to prevent the production and use of persistent and bioaccumulative substances. The default state of pollution policy must be shifted in the face of uncertainty from permission to restriction.

To preserve public health, environmental strategies must be developed to understand pollution prevention ethics and eliminate or minimize waste production. Preventing pollution, rather than devising more costly control methods, is key to industrial competition and environmental health and sustainability.

The advantages of pollution prevention include improving the effectiveness of managing reduced waste streams, minimizing the uncertainty associated with the environmental impact of released pollutants, avoiding transfers of released pollutants and protecting natural resources. Prevention of pollution also educates the public on matters of waste management, and promotes regulatory inspections of industrial waste management practices.

For any comprehensive system to work, governments must encourage and participate in recycling, consumption of recycled products and investment in recycling technologies. With this perspective, the paradigm associated with environmental protection has been changing. Educational programs and training activities must be available to prepare people for this coming paradigm shift.

This book will provide insight to readers on various types of pollution affecting our environment, its health hazards on our living system and preventive ways to keep a check on the proliferating menace of pollution. It discusses diverse topics on pollution prevention and waste minimization leading towards zero discharge.

We thank Amity University and Hon'ble Founder President for providing the platform and infrastructure to organize this workshop and continuous support to bring out the publication in a presentable form. We would like to express our deepest appreciation to the scientists, faculties and research scholars who have contributed their chapters for the development of the book. In particular, Dr. J. S. Pandey, Dr. Abhishek Chauhan, Dr. Charu Gupta, Dr. Renu Khedkar, Dr. Monika Thakur, Dr. Pallavi Saxena and Dr. Khushbu Gulati played an important role in the formation of the book. Several anonymous reviewers provided helpful comments that improved the presentation of the material in the book.

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# Abstract

The book is a compilation of some related presentations at a national conference entitled 'Pollution Prevention Paradigm' held on May 11, 2012, at Amity University, Noida, Uttar Pradesh, India.

Environmental pollution prevention programs and policies cover all aspects of pollution and involve coordination among areas such as industrial development, city planning, water resources development and transportation policies; their implications and priorities may vary.

As environmental pollution control technologies have become more sophisticated and more expensive, there has been a growing interest in ways to incorporate prevention in the design of industrial processes with the objective of eliminating harmful environmental effects while promoting the competitiveness of industries. Among the benefits of pollution prevention approaches, clean technologies and toxic use reduction also have the potential for eliminating worker exposure to health risks.

Pollution prevention is a pragmatic program capable of constantly and speedily addressing pollution issues as they arise. It is arguable that traditional control measures have reached their limit and only the implementation of comprehensive pollution prevention programs will be capable of addressing the next phase of environmental protection in a practical and effective way.

Pollution prevention programs now have an extraordinary opportunity to evolve and make a unique contribution to homeland security and provide a new driver for pollution prevention implementation. The time to design and implement a more preventive, risk reduction approach based on pollution prevention protecting human health, the environment and community is now in this new arena of environmental security.

Continued support is necessary to expand our pollution prevention program's efforts to reduce generation of wastes, use toxic chemicals, improve resource conservation and management and expand environmental security through pollution prevention.

A more proactive approach is demanded which suggests that pollution must be prevented, not just controlled. The more pollution is prevented from ever being produced, the less money has to be spent controlling it. The pollution prevention approach focuses directly on the use of processes, practices, materials and energies that avoid or minimize the creation of pollutants and wastes, and not on 'add-on' abatement measures.

In the future, it will become gradually more important for pollution prevention programs and organizations to recognize that it is more effective to prevent environmental damage and prove there is no safer way of proceeding with production when adopting a guiding principle of cleaner production. This will require a unified approach for resource use and consumption and an understanding that environmental risks cannot be shifted among workers, consumers or media, i.e. land, air and water. This multimedia approach to pollution prevention will ensure the source reduction of wastes. For example, no longer will pollution control techniques remove air pollutants only to place them in water or solid waste streams.

Topics include the benefits as well as the health hazards related to food industry waste, the measurement of volatile organic compounds (VOCs) indicating their importance and role in photochemical smog formation, the need for sustainable treatment systems to clean up of lakes and rivers of India, the combined effect forces of global dimming and global warming, the beneficial role of microbes in our environment, green building, energy efficiency, carbon, ecological foot printing, life-style solutions and the environmental pollution and public health studies in relation to increasing cases of asthma in rural and urban India. Featuring a collection of informative and descriptive chapters, this book is essential reading for environmental scientists, environmental toxicologists and people from allied fields.