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INDIAN INITIATIVES FOR ENVIRONMENT CONSERVATION

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Abstract

Society, at large, has to realise the gravity of environmental degradation and participate fully in the mitigation of environmental problems. This article discusses the Indian initiatives and the important milestones in the path of environmental protection and pollution abatement. The commitment of the Indian Government to the cause of public awareness of environment conservation is reflected in its outreach and educational programmes involving its ministries, environmental monitoring agencies, NGOs, academic and research institutions. The Ministry of Environment and Forests (MoEF) has played a leading role in the national priority programmes of environmental monitoring, assessment and pollution control. All the stake holders have succeeded to some extent in creating public interest in environmental issues but much more needs to be done.

National level institutions like NEERI, NIO and TERI are actively involved in research to find feasible solutions to our environmental problems and in dissemination of relevant information through their publications. In our country, voluntary organisations and NGOs have been contributing immensely to environmental causes. Following the directive of the Supreme Court in 1991, environmental education is a compulsory component of school and college curricula. India has contributed significantly to the deliberations at COP (Conference of the Parties) fora especially the recently held COP-21 at Paris. Our suggestions for creating a pollution free world have always been welcomed by the participating countries specially the developing countries.

This article also presents the results of an environmental study carried out in Wilson College, Mumbai in which the effect of salinity on the rate of degradation of effluents released in marine waters, was quantitatively studied using reaction kinetics.

Keywords: environmental monitoring and assessment, pollution control, MoEF, COP- 21 (Paris), Green technology, analytical methods, reaction kinetics

INTRODUCTION

Today, more than ever before, there is a great need to create public awareness about conservation of the environment and to ensure the full participation of society in the mitigation of environmental problems. Environment and sustainable development are interlinked and should be regarded as national priorities.

The Government, environmental monitoring agencies, NGOs, academic and research institutions and the media must work synergistically to combat pollution and thus create a healthy environment. All these stake holders have succeeded to some extent, in creating an awareness about the adverse effects of ecological degradation.

GOVERNMENT INITIATIVES

Degradation of the environment and its disastrous consequences have been a matter of great concern for governments all over the world. Several legislations have been passed to provide a legal framework for the management and preservation of the environment. Environment was first discussed on June 5, 1972 at the United Nations Conference on "Human Environment" held at Stockholm leading to the declaration of June 5 as World Environment Day. It is creditable that within four years of the historic Stockholm Conference, India enacted legislation aimed at protection of the environment which later formed a part of the Indian Constitution. The 42nd Amendment Article 48Aof our Constitution provides "The State shall endeavour to protect and improve the environment and to safeguard forests and wildlife in the country" and Article 51A (g) provides "It shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compassion for all living creatures". Thus environment was given a pride of place in the Directive Principles of State Policy and Fundamental Rights.

The need for integrating environmental factors into the process of planned sustainable development was first highlighted in the Fourth Five Year Plan (1969-1974). Thus, in our country the debate between environments versus development was triggered as early as in the 1960s.

The other important milestones in the path of environment conservation are:

1. In 1972 the National Committee on Environmental Planning and Coordination (NCEPC) was set up to serve as a high level advisory body to the government.
2. In 1980 the N.D. Tiwari Committee was appointed which recommended the setting up of an independent Department of Environment under the Government of India, which subsequently became a full-fledged Ministry of Environment and Forests in 1985.

3. The Wildlife Protection Act was passed in 1972(and subsequently amended in 2002) for setting up National parks and sanctuaries.
4. The Wildlife Protection Rules were passed in 1973 for the protection of all bird and animal species irrespective of their habitat. As a result, conservation projects were launched for endangered species which have contributed in a large measure to the increase in wildlife in India especially Project Tiger.
5. Forest Conservation Act of 1980 for protection of all types of forests and prevention of non-forest activities was amended in 1998.
6. Environment Rules for Siting of Industrial projects were passed in 1999.
7. The Biological Diversity Act of 2002 laid down clear guidelines for conservation of the biological diversity of the country.
8. The Prevention of cruelty to animals Act of 1960 was later amended to Animal welfare Act in 2006.
9. The State /Union Territory Minor Forest Produce (Ownership of Forest Dependent Community) Act of 2005 was a landmark legislature which recognised the legitimate rights of the forest dwellers to the use of forest produce.
10. The National Green Tribunal Act of 2010 which enables creation of special tribunals for expeditious disposal of cases involving environment.

WATER AND AIR POLLUTION –PREVENTION AND CONTROL

Over the years, the Government of India has passed several path breaking acts to curb and prevent water and air pollution:

1. Water (Prevention and Control of Pollution) Act of 1974 provides institutional safeguards for the prevention and abatement of water pollution. This act resulted in the setting up of the Central Pollution Control Board.
2. Water (Prevention and Control of Pollution) Cess Act of 1977 provides for levy and collection of cess from water consuming industries and establishments.
3. Air (Prevention and Control of Pollution) Act of 1981 defined air pollution in the atmosphere and measures to curb air pollution including noise pollution.
4. In 1970 the Merchant Shipping Act dealing with oil spills from ships near the coastal areas was passed. This act was primarily aimed at preventing marine pollution and to protect the vulnerable marine life.
5. The Environment (Protection) Act of 1986 was a comprehensive legislation covering all aspects of protection of the environment. This act was passed by Parliament after the Bhopal Isocyanate gas tragedy of December3, 1984.
6. The Coastal Regulation Zone Notification of 1991regulates all activities in the coastal areas including construction and seeks to safeguard backwaters and river estuaries.

MINISTRY OF ENVIRONMENT AND FORESTS (MOEF)

MoEF set up in 1985, implements the various environment protection laws all over the country through the Central and State Pollution Control Boards. MoEF has the mandate to

1. Monitor and control pollution especially in industries,
2. Increase the forest cover in the country,
3. Conserve and increase wildlife and the rich biodiversity of the country,
4. Support research in Environmental Science and Technology.

MoEF works closely with the Ministry of Non-Conventional Energy Sources and the Department of Ocean Development (DOD). It is also the nodal agency for monitoring climate change in the country. The Forest Survey of India monitors changes in the land and forest resources and implements social forestry programmes.

In 1982, MoEF instituted the Environment Information System to provide information to policy planners, decision makers, scientists, industry and the general public through workshops and seminars in regional languages and extensive use of the print and electronic media.

The Government has made Environment Impact Assessment (EIA) compulsory for all proposed developmental projects. EIA is an environment management tool to evaluate the possible impact of projects on the environment and involves sampling of air, water and soil followed by analysis. Technical aspects like effluent emission, air pollution and noise pollution are also studied.

The Central and State Pollution Control Boards are required to ensure the strict implementation of the policies laid down by the government to conserve the environment[1]. Sadly these well intentioned rules are, more often than not, flouted and unscrupulous elements continue to ravage the fragile ecosystem of the country.

INSTITUTIONAL INITIATIVES

Several national level scientific institutions are engaged in research for finding feasible solutions to environmental problems facing the country.

1. **National Environmental Engineering Research Institute (NEERI),** one of the 39 laboratories under CSIR with headquarters at Nagpur and five zonal laboratories, is engaged in providing innovative and cost effective solutions in the following thrust areas:

a. Recovery and recycling of waste from industry,
b. Waste water recycling for zero discharge,
c. Air and water pollution,
d. Environmental biotechnology,
e. Toxic waste management,
f. Impact of salinity on soil.

NEERI also disseminates information regarding environmental issues through its journal, website, annual reports, publications and newsletter[2,3].

2. **The Energy Research Institute (TERI)** (earlier Tata Energy Research Institute), located at Delhi is a premier institute devoted to energy related studies and has handled numerous projects dealing with climate change, biodegradable materials, biodiesel and insecticides from plants and recovery of oil from oil wells using bacteria. TERI University offers PhD programmes in climate change, forest ecology, biodiversity assessment and conservation and wetland management[4,5]. TERI is deeply involved in the development of clean technologies which will be energy efficient and will have minimum adverse environmental impact.
3. **National Institute of Oceanography (NIO),** based at Goa is involved in the chemical, physical and biological studies of the oceans. One of the major areas of research is marine pollution and impact of land reclamation on marine life.

ROLE OF VOLUNTARY ORGANISATIONS IN ENVIRONMENT CONSERVATION

In our country voluntary organisations and NGOs have contributed immensely to environment conservation. To name a few:

1. Bombay Natural History Society (BNHS),Mumbai
2. World Wide Life Fund,India(WWF-India)
3. Society for Clean Environment(SOCLEEN)
4. Friends of Trees
5. Nature and Eco Clubs in academic institutions.

Mass movements spearheaded by highly motivated individuals have aroused a passion in the common people for environment conservation and many 'barefoot' social workers have been working silently at the grassroots level. Mention must be made of Sunderlal Bahuguna's *Chipko movement*, Rajendra Singh's *water conservation movement*, '*Tehri Bachao Andolan*', and Anna Hazare's *Ralegaon Siddhi water harvesting experiment*. Prime Minister Indira Gandhi's strong support to the *Silent Valley protection movement in Kerala* saved the precious biodiversity hotspot from the evils of urbanisation.

INITIATIVES TAKEN BY EDUCATIONAL INSTITUTIONS

In 1991 the Supreme Court of India issued directives to make Environmental Science a part of the curriculum as a result of which all academic institutions introduced a compulsory course in Environment Science. In addition to formal studies, several activities related to environment protection are undertaken, some of these are:

1. Organisation of workshops on water analysis, waste water recycling, rain water harvesting, pesticide detection and analysis and pollution control,
2. Interaction with industry and government agencies to evolve strategies to combat environmental degradation,
3. Use of print and electronic media to popularise eco-friendly practices,
4. Setting up Nature and Eco Clubs which involve the young in nature conservation through the media of street plays, nature trails, exhibitions and planting of trees,

The IITs and most universities have full-fledged departments of Environmental Science and Engineering engaged in the following areas of research of development of:

1. Clean technology which consumes fewer raw materials and emit minimum pollutants than conventional technology,
2. Biodegradable materials,
3. Alternative renewable sources of energy,
4. Green Chemistry and Technology.

GREEN CHEMISTRY- THE CHEMISTRY OF THE FUTURE

A green chemical process is based on one of the 12 Principles of Green Chemistry as enunciated by Paul Anastas and John Warner.[6,7,8]. The underlying theme of Green Chemistry is "Precaution is better than cure". Some of the emerging green technologies developed in the last few years are:

1. Advanced Oxidation Processes (AOPs) like Photo-Fenton process and processes based on ozonolysis, sonolysis and photocatalysis. AOPs can degrade almost all organic contaminants. AOPs generate negligible amounts of residue and are applicable at very low concentrations of pollutants. They are a promising technology for water treatment and purification.
2. Micro wave assisted synthesis,

3. Super critical fluid chemistry,
4. Chemical reactions on surfaces,

Green Technology is based on the 3R principle: Reduce, Reuse and Recycle and will be the technology of the future.

A CASE STUDY

A case study of the effect of salinity on the degradation of effluents released in marine waters around Mumbai[9] was conducted at Wilson College, Mumbai. Living organisms like bacteria oxidise organic matter present in environmental effluents such as domestic waste and diary water which are released in the marine ecosystem. The carbon in the organic matter is converted to carbon dioxide and water,

$$\text{Organic matter C} + O_2 \rightarrow CO_2 + H_2O + \text{biomass}$$

As a result the dissolved oxygen in marine water gets depleted. The rate of degradation of organic matter is equal to the rate of depletion of dissolved oxygen in water ie amount of organic matter oxidised = amount of dissolved oxygen depleted. This process of wet oxidation follows first order kinetics and the rate constant (k) can be calculated using the first order rate equation,

$$k = 1/t \cdot \ln (DO)_o /(DO)_t$$

Where $(DO)_o$ is the initial dissolved oxygen concentration and $(DO)_t$ is the dissolved oxygen concentration at time t during the course of the oxidation reaction.DO is estimated at regular time intervals by the Aletebergazide modification of Winkler method using Sodium azide.

The rate of wet oxidation was determined at different salinities: $[Cl^-]$ in mg/L = 0, 5000, 10000, 15000 and 20000

First order kinetics was used to determine the rate of wet oxidation. The rate of oxidation of organic matter in the effluents was found to decrease with increasing salinity hence salinity has a negative impact on the rate of degradation of effluents. This finding has to be critically considered while planning the disposal of organic effluents in the marine ecosystem.

COP-21 PARIS

The 2015 UN Climate Change Conference (COP-21) was recently held at Paris during November 30 and December 12, 2015. It was the 21st yearly session of the Conference of the Parties (COP) to the 1992 Framework Convention on Climate Change and the 11th session of the Meeting of the Parties to the 1997 Kyoto Protocol.

COP 21 reached an agreement to limit global warming to less than 2^0 C compared to the preindustrial levels and to bring about zero net anthropogenic greenhouse gas emission during the second half of the 21st century. Member countries felt that the temperature rise should be limited to 1.5^{o}C which will require that the zero emission of greenhouse gases should be effected between 2030 and 2050.

India has always been a strong votary of clean environment at the COP meetings and has made major contributions to the deliberations of the august gathering of environmentalists. India has consistently voiced concern at the continuing environmental decay and suggested effective remedial measures. The Indian delegation to COP 21 was largely responsible for securing a fair deal for the developing countries in the face of opposition and indifference from the developed nations.

Some of the environmental problems which demand urgent action are;

1. Development of Green technology based on the 12 Principles of Green Chemistry and Technology,
2. Cleaning up of our rivers and water bodies,
3. Disposal of e-waste,
4. Development and greater use of bio-fertilisers and organic manures,
5. Reduction in emission of greenhouse gases(GHG),
6. Development of sensitive analytical methods to detect and estimate pollutants in water, air and soil at micro gram and nanogram levels.

CONCLUSIONS

Public awareness about environmental problems has been created to some extent by several agencies-government, pollution control boards, academic and research institutions, NGOs and media. A synergistic collaboration between all these stakeholders alone can prevent further damage to the fragile environment.

Public awareness is perhaps the strongest bulk work against exploitation and degradation of the environment.

After all environment is of the people, for the people and by the people.

REFERENCES

1. http://mpcb.mah.nic.in
2. NEERI Newsletter Vol.16(7-9), July-September 2014.
3. NEERI Annual Reports,2012,2013 and 2014.

4. https://portal.teriuniversity.ac.in/
5. www.teriuniversity.ac.in/program
6. Paul T Anastas and John Warner, Green Chemistry : Theory and Practice, Oxford University Press, New York,1998.
7. www.beyondbenigh.org
8. www.acs.org/greenchemistry
9. Shivani S Dhage, Amita A Dalvi and D V Prabhu, Environmental Monitoring and Assessment (Springer), DOI 10.1007/S 10661-011-2341-ySeptember 23, 2011

