# Career in Environmental Science & Engineering: Need to nurture the stream

**Dr. Pawan Kumar 'Bharti'**

## Introduction

Environmental science is a multidisciplinary field that integrates physical, chemical, biological and information sciences (including ecology, botany, biotechnology, hydrology, physics, chemistry, zoology, mineralogy, oceanology, oceanography, limnology, soil science, geology, atmospheric science, geography, meteorology, statistics, environmental law, earth sciences and geodesy but not limited to these sub-streams) to the study of the environment, and the solution of environmental pollution and associated problems. Environmental science provides a quantitative, integrated, and interdisciplinary approach to the study of environmental components and ecosystems. Environmental science's related areas include environmental studies, environmental engineering & technology. Environmental studies incorporate more of the social sciences for understanding human relationships, perceptions and policies towards the environment. Environmental engineering focuses on design and technology for improving environmental quality in every aspect. Environmental scientists work on subjects like the understanding of earth processes, evaluating alternative energy systems, pollution control and mitigation, natural resource management, and the effects of global climate change. Environmental issues almost always include an interaction of physical, chemical, and biological processes.

> **The definition of environment is 'The totality of circumstances surrounding an organism or group of organisms, especially the combination of external physical conditions that affect and influence the growth, development, and survival of organisms'.**

## Pollution

One of the greatest problems that the world is facing today is that of environmental pollution, increasing with every passing year and causing grave and irreparable damage to the earth. The environmental consequences of rapid industrialization have resulted in countless incidents of land, air and water resources sites being contaminated with toxic materials and other pollutants, threatening humans and ecosystems with serious health risks. More extensive and intensive use of materials and energy has created cumulative pressures on the quality of local, regional and global ecosystems. Environmental pollution consists of five basic types of pollution, namely, air, water, soil, noise and light.

## Monitoring and Assessment

Environmental monitoring describes the processes and activities that need to take place to characterize and monitor the quality of the environment. Environmental monitoring is used in the preparation of environmental impact assessments, as well as in many circumstances in which human activities carry a risk of harmful effects on the natural environment. All monitoring strategies and programmes have justifications and reasons, which are often designed to establish the current status of an environment or to establish trends in environmental parameters.
Basically, environmental monitoring and assessment may be of these types:

- Ambient air quality monitoring
- Indoor air quality monitoring

- Water quality monitoring
- Soil and sediment monitoring
- Noise level monitoring
- Assessment of solid waste generation
- Assessment of plankton in aquatic ecosystem
- Assessment of benthic organisms in aquatic ecosystem
- Biodiversity assessment
- Assessment of Oil spill
- Assessment of microbial load
- Assessment of radiation contamination

**Prediction and modeling**

Prediction of impacts is an important component in environmental impact assessment process. Such predictions are superimposed over the baseline status of environmental quality to derive the ultimate scenario of environmental conditions. The quantitative prediction of impacts lead to delineate suitable environmental plan needed for implementation during operational phase in order to mitigate the adverse impact on environmental quality.

**Control and Remedial measures**

Under the pollution control approach, attempts to protect the environment have especially relied on isolating contaminants from the environment and using end-of-pipe filters and scrubbers. These solutions have tended to focus on media-specific environmental quality objectives or emission limits, and have been primarily directed at point source discharges into specific environmental media like air, water and soil.

Application of pollution control methods has demonstrated considerable effectiveness in controlling pollution problems. Application of appropriate technologies is based on a systematic analysis of the source and nature of the emission or discharge in question, of its interaction with the ecosystem and the ambient pollution problem to be addressed, and the development of appropriate technologies to mitigate and monitor pollution impacts.

**Degree/Diploma Courses:**

Nature lovers or conservators can make career in their interests. Various degree/diploma courses are conducted by various universities/institutions. One can pursue different courses, degree or diploma in the field of environmental pollution control. Few major courses are given below:

- B.Sc.- in environmental science
- B.Tech. – in environmental engineering
- M.Sc.- in environmental science
- PG Dip. - in Environment, Health and Safety or industrial safety, etc.
- M.Tech. – in environmental science & technology or environmental engineering
- Short-Term Courses/Diploma - in Pollution and Control, EIA, Rainwater Harvesting, Lead auditor, etc.
- M.Phil. – in environmental science or environmental technology or environmental engineering

- Ph.D. - in environmental science or environmental technology or environmental engineering

**University/Institution:**
There are many universities and institutions, where one can pursue the above said courses. Few of them are given below:

- Gurukula Kangri University, Haridwar (Uttarakhand)
- MJP Rohilkhand University, Bareilly (UP)
- Guru Jambheshwar University, Hissae (HR)
- Indian School of Mines, Dhanbad (JH)
- Jawaharlal Nehru University, Delhi
- University of Delhi, Delhi
- Central University of Bihar, Patna
- Jammu University, Jammu Tawi
- Dr. RML University, Faizabad (UP)
- GBP University, Pantnagar
- BBA University, Lucknow
- HP University, Shimla
- Bharatidasan University, Tiruchapalli
- University of Burdwan, WB
- Doon University, Dehradun
- Punjab University, Chandigarh
- Punjabi University, Patiala
- EIILM University, Sikkim
- Gauhati University, Guwahati
- HNB Garhwal University, Shrinagar (UK)
- North-East Hills University, Shillong
- Kumaun University, Nainital
- Kalyani University, Nadia (WB)
- Anna University, Chennai
- Cochin University of science and Technology, Cochin
- Gulbarga University, Karnataka
- Pondicherry University, Pondicherry
- Tezpur University, Assam
- Bharatiar University, Coimbatore
- Bangalore University, Bangaluru
- University of Pune, Pune
- Andhra University, Vishakhapattanam

**Opportunities:**
After pursuing a suitable degree or diploma in environmental science or engineering from the above said university or similar institutions, the candidate can choose any of the given options as per his qualification, interest and potential. The most popular occupations for professional career are given below:

- Assistant Professor (Lecturer) - in university campus or colleges.
- Research scientist – in research institutions

- Lab in-charge – in testing laboratories
- Scientific officer – in scientific governmental organizations or NGOs
- Assistant manager - in corporate various groups like DLF, Voyants, SGS, Unitech, Asian Paints, Eureka Forbes, IL&FS, Jaypee, KSK, etc.
- Environmental officer – in consultancies or industries or similar firm
- ETP/STP in-charge – in industries as well as municipality or municipal corporations
- Environment and safety officer – on various project sites
- Ecologist – for sensitive areas or special regions
- Pollution controller – in production industries
- EIA coordinator - in EIA consultancy or similar firms
- Consultant – in EIA consultancy or similar firms
- Writer/author – for various publishing houses or freelance
- Environmental Journalist – for various magazines, newsletters
- Analyst - in testing laboratories or with instrument manufacturer
- Conservator – in biodiversity parks, reserve areas, forest ranges
- Dy. Director/ Scientist - in Govt. institutions/organization or ministries like MoEF, CPCB, NEERI, IITM, NCAOR, MoES, CWC, IOCL, WII, etc.
- Environmental professional - in Infrastructure, hydropower, highways, or similar fields based work.
- JRF/SRF/RA/SRA - in various prestigious institutions like NIITs, IITs, IISc, TIFER, etc.
- Technical officer or specialist – in Remote sensing, GIS, Space applications,
- PDF - in USA, Canada, Taiwan, Korea, Spain, France, etc.

Candidate can start his career in the field of environment and pollution control or biodiversity conservation easily and can get a starting salary from 15-20,000 to 70, 000 after promotion in various organizations. During the post doctoral fellowship (PDF), one can earn money in USDs. Apart from earning money, an environmentalist always works for the betterment of nature and conservation of natural resources including biodiversity. Environmental science or technology or engineering is quite interesting and vast subject, but there is an urgent need to promote and nurture this stream. It will not only create employments to youth, but also be a milestone in the field of environmental conservation and protection in a better way.

**(Author is a well known environmentalist & freelance writer and has written many books and research articles on environmental issues. He was the member of 30th Indian Scientific Expedition to Antarctica during 2010-11. E-mail:gurupawanbharti@rediffmail.com)**