ENVIRONMENTAL ENGINEERING EDUCATION AND COMMUNITY DEVELOPMENT - AN OVERVIEW

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Synopsis : *With the advancement of technology and need for Industrial production vis-a-vis demand for material resources of the earth, it becomes vitally important to provide an adequate Environmental awareness among our future Engineers and tTechnicians. The present status of engineering and technological education does not provide an adequate base for this requirement. Certain ideas based on the basic concepts of Environmental Engineering aspects are proposed.*

These Environmental Education concepts were developed through the use of Delphy Survey Techniques and were identified, refined and approved by a selected group of 87 participants throughout the United Nations and reviewed by a group of 5 experts.

Introduction : The recent UN State of the Environmental report indicates that the trends of Environmental degradation, as mentioed below is alarming but still not beyond control. Human Civilization and our informatructural assets apparently do not face imminant extinction because of present level of Eco-degradation. It is said world's worst ecological disaster made human life possible on this planet. It has been estimated that about 2000 million years ago, the tiny-micro organisms that dominated Earth's oceans dumped large amounts of toxic waste to their environment. Eventually it killed them and along with it, much of the other life on the planet perished. This 'deadly' substance was oxygen. This strikingly illustrates the ability of simple bacteria to remove the entire atmosphere as was found from extensive investigations during the past several years using investigative satellites to monitor atmospheric changes, observing various indicating factors like tree-rings, air bubbles trapped in ancient ice and simulating future atmospheric

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patterns, it has become possible to visualize planet earth as a complex inter-dependent system in which oceans atmospheric gases and life affect each other and help shape the future climatic and atmospheric patterns of the planet. This collaborates with the physical indication of various degradation of the earth's resources like vegetable and forest cover, oxygen and ozone content and producing effects having long-turm impacts on human well-being. Added to this situation is strong economic impact of various environmental control works - particularly the development process of the third world countries. The difference in perception of development process viz-a-vis environmental impact between developed and developing countries in the world defy simple explanations and are rooted in a bewildering array of social factor, economic forces and technological trends. However, despite these inherent contradiction, it must be conceded that several developing countries achieved considerable progress in their respective environmental protection and control works. Almost all have established the required Administrative set-up, supported by legislations and legal acts. Opinion polls indicate strong public support for spending funds for environment protection despite very poor economic status of many developing countries. There is also strong support towards Environmental Engineering Education and orientation for Engineering and Technical personnel along with mass awareness programme at urban and rural grass root level. Since environment of man is a composite of natural and human resources, the study of interaction between organism and the surrounding environment concept of eco-system, development of Technology for Environmental monitoring, pollution control and developing the infrastructural resources, improving the efficiency for resource utilization along with environmental economy all have acquired a new dimension. In order to develop a strong human resource base at various levels of implementation, it is of utmost importance to make a sustained effort in providing adequate Environmetal Engineering Education,. which must be an integral part of our Technical Education System. A broad based Environmental orientation must include an overview of mankinds' Environmental impact and Educational requirement alongwith various curriculum components and identified Environmental Education concepts.

Mankind's Environmental Impact :

1. Overtaxing the carrying capacity of the environment through excessive concentrations of population.

2. The build-up of very large quantities of waste and the accumulation of material that is difficult to degrade by natural forces.

3. The build-up of highly toxic pollutants particularly substances that are highly residual in the air water and soil, such as radio active wastes, pesticides and mercury.

4. Abuse and misuse of environmental resources.

5. Excessive or wasteful uses of the fixed supply or limited natural resources.

Environmental Education Requirement

The basic requirement of Environment al Education -

1. Study of conservation, preservation, ecology and resource management.

2. Basic things which support or enhance the lives of individuals : air, water, noise, energy, shalter soil, natural resources and natural balance.

3. Emphasis on Individual value systems.

Environmental Education Curriculum Design Components :

The curriculum should emphasis the basic issues which may reduce the environmental degradation tha is avoidable through the following programmes :

1. Awareness
2. Appreciation
3. Understanding
4. Motivation for action
5. Community Participation for implementation

Environmental Education Curriculum must create an interest among the teachers and pupils at various levels. They should be activity involved in the process right from the development of concepts and encounter programmes. Besides this, active community participation in any programme is essential for the proper impact to be created.

By working with a selected concept, a sequence of study can be effected, incorporating many skills that allow for a variety of activities in which everyone can participate.

Activities traverse the range of instruction level (knowledge, comprehension, application and invention) as well as congnitive, affective and psychomotor domaining .

Concepts have been selected, based on Delphy Survey Techniques, and analysed for the purpose of experiencing activities present in living-learning process.

Based on the experience an effective teaching-learning-appreciation programme is planned for the relevant concept.

Environmental Training Requirements:

1. In-Career or on-the-job education of practicing engineers based on short term and case-study and task analysis.

2. Inclusion of ecological and Environmental principles in undergraduate education.

3. Specialization on specific Environmental impact studies post-graduate level.

4. Awareness and encounter sessions amongsts grass root level and women folk.

5. Periodic behavioural orientation programme with a feed back mechanism.

Environmental Education Concepts :

The following set of Environmental Education Concepts were developed through the use of the Delphi Survey Technique. These concepts were identified, refined and approved by a selected group of 87 participants throughout the United Nations and were reviewed by a group of 5 panelists.

The 113 concepts are listed below so that you can select the categories to be studied . This selection should be made on a basis of relevance to the

learner and the teaching-learning situation. Concepts are in the order of importance as indicated by the participants in the Delphi Survey.

1.0.0 General Concepts :

1.1.0 Earth can be viewed as a large spaceship with limited resources and some recycling systems.

1.2.0 The human attitude about the earth must change from one of 'use and abandon' to one of 'wise use and preservation' of support systems.

1.3.0 Survival of an organism depends upon its ability to adjust to the environment. Human being make most adaptations through use of their intelligence.

1.4.0 Human beings are a natural part of the Environment and are capable of presevaing or destroying the earth.

1.5.0 Earth's resources and natural re-cyclying systems can support only a limited number of people.

1.6.0 Population growth and mankind's tremendous use and mis-use of energy are primarily responsible for today's more serious environmental problems.

1.7.0 Living things are interdependent.

1.8.0 Green plants are the original source of food, clothing, shelter and energy.

1.9.0 Some resources such as soil, water, forest, grass lands and wild life are renewable and with careful management, can be used without eventual distruction.

1.10.0 Some resources such as iron, coal and minerals are not renewable and must be carefully conserved or recycled or new alternatives must be found.

1.11.0 The Exhaustion of one resource produces demands upon others.

1.12.0 The population explosion and unrestricted human use of resource, pose a threat to all natural resources.

1.13.0 Population grows geometrically; food production grows arithmetically.

1.14.0 New laws that are strictly enforced, a concerned citizenery, and a new technology may enable mankind to reduce pollution.

1.15.0 Money will not solve environmental problems without modifying values and attitudes of people.

1.16.0 The amount of pollution is related to the number of people, their standards of living and the types of technology being used.

1.17.0 Safe and proper disposal of waste products is essential to the preservation of the environment.

2.0.0 Air Pollution :

2.1.0 Air is an essential natural resource.

2.2.0 Air is a reusable resource, cleaned by nature and by human beings to a limited degree. Preventing air pollution must become a human responsibility.

2.3.0 The atmosphere acts like glass in a greenhouse allowing light to pass through it but filtering out radiated heat.

2.4.0 Air pollution is atmospheric contamination which can be detected and measured. It is generally caused by vaporization, attation, and combustion.

2.5.0 Some types of air pollution are caused by natural occurrences such as volcanic eruption, forest fires, and decaying vegitation.

2.6.0 An atmosphere filled with pollutants can prevent warming sunlight from reaching earth and can eventually change the climate.

2.7.0 Air pollution contributes to deterioration of metals, brick and cement, and has a negative effect upon animals and plants.

2.8.0 Air is considered free, but human beings must make personal and financial commitments to have pollutants removed so that we can breathe clean air.

2.9.0 Mankind is attempting to control air pollution, by enforcing laws and enacting legislation.

3.0.0 Balance in Nature :

3.1.0 A food chain, or web, is provided when green plants, use minerals and eater from the soil, carbon dioxide from the air and energy from the sun to manufacture food. The plants provide food for some animals which later die and decay into the soil providing minerals to be used by other green plants.

3.2.0 All living things must live together according to natural laws. The ecological relationship among plants, soil and water is commonly referred to as the balance of nature.

3.3.0 The interdependence of animals and plants provides a balance between living things on Earth and does not allow overpopulation .

3.4.0 Human are a part of the eco-system and must live within it.

3.5.0 Natural laws provide for an intricate and inter-related balance in nature which can be upset by mankind.

3.6.0 The balance in nature may be upset when one species is destroyed thus creating the possibility of the overpopulation of another species.

3.7.0 Many organisms that are harmful to human beings are helpful in maintaining a balance among living things.

3.8.0 Pesticides that serve as substitutes for natural enemies of insects have provided a means to produce food for a rapidly increasing population at a reasonable cost; however, pesticides are unintentionally determimtal to many species when used improperly.

4.0.0 Conservation of Forests and Timber :

4.1.0 A forest is an eco-system of innumerable plants and animals dominated by trees.

4.2.0 Forests and timber are renewable re-

sources.

4.3.0 Plants, including trees, purify the air, provide ground cover to hold soil in place, protect the water supply, shelter wild-life add a beauty to the landscope and supply many materials for mankind's needs.

4.4.0 Forests are important for use as recreational areas.

4.5.0 Vegetation is destroyed by overgrazing, insects, forest fires and improper forestry methods.

4.6.0 Recycling paper products can be a means of preserving our forests.

4.7.0 Forests are owned and managed by the federal Govt., the State Govt., industry and individuals.

4.8.0 Wise use and proper management of forests can protect them for the future.

5.0.0 Conservation of Human Resources :

5.1.0 Human resources include the physical and mental abilities that people possess and the knowledge that they have generated.

5.2.0 Long-range planning must be applied to the use of human resources.

5.3.0 Each person should strive to attain his/her level of competence.

5.4.0 Environmental and generic factors determine how an individual develops and contributes to society.

5.5.0 Every person can contribute to society by employing individual talents and skills.

5.6.0 Healthful living can improve the individual's talents and life.

5.7.0 Each individual should be aware of the immediate environment and understand its changes, varieties, similarities and interrelationships.

5.8.0 Individuals working together can effect change.

5.9.0 Esthatic resources and recreational facilities are important factors in human beings' leisure time activities.

5.10.0 If the population expands faster than the economy, the economy cannot absorb the additional manpower.

6.0.0 Noise Pollution :

6.1.0 There are many kinds of sounds-some are pleasant, some are unpleasant, depending upon the listener.

6.2.0 The sound that strikes the eardrum is measured in decibles.

6.3.0 The most annoying sounds, called noises, are irregular, intermittent, monotonous and generally of high frequency and high intensity.

6.4.0 Noise may occure hearing loss, nervous tension and generally alter mankind's biological system.

6.5.0 Noise interferes with learning ability and other mental processes.

6.6.0 Even though technological advances have incurred noise pollution, technology can also help remedy the problem.

6.7.0 The noise level increases each year.

6.8.0 Vegetation can absorb some noise.

6.9.0 Laws that limit unnecessary and excessive noise, should be passed and enforced.

7.0.0 Conservation of Land Resources :

7.1.0 Land is a natural resource with limited boundries.

7.2.0 Green plants and trees control soil erosion.

7.3.0 Indirectly soil provides food, clothing and shelter.

7.4.0 Irrigation, drainage and vegetation can bring some additional lands into useful production.

7.5.0 All factors should be considered before nature's plan is altered.

7.6.0 Dams amy aid in making arid lands productive and pose special environmenatl problems of their own.

7.7.0 Unsightly and unproductive land can sometimes be transformed into greenbelt areas, recreational sites, and other projects beneficial to human beings.

7.8.0 Technology and proper management can sometimes restore land; education sould control future occurances of destruction.

7.9.0 People must be educated to appreciate and protect the environment.

8.0.0 Problems of the City :

8.1.0 Long-range, flexible planning is essential for adequate and orderly community development.

8.2.0 Large cities grow away from the inner city, developing a ring of low-rent housing around the inner city.

8.3.0 Industrialization and centralization may destroy urban areas.

8.4.0 Congestion of people in urban areas may create problem sin litter, pollution, safety and health.

8.5.0 City crowding and the resulting polluted environment create problems such as crime and unsanitery living conditions.

8.6.0 Community spirit may be created through public awareness of problems and alternative solutions.

8.7.0 Urban renewal plans attempt to rebuild; restore, or revitalize existing land and buildings in the inner city.

8.8.0 Areas of urban renewal should include parks and greenbelt areas to serve citizens.

8.9.0 Improved public transportation can re-

lieve congested city areas,

9.0.0 Wise use of Mining and Minerals :

9.1.0 Minerals and chemical elements or compounds found in the ground.

9.2.0 Minerals are an exhaustable, non-renewable resource.

9.3.0 Most things that human eat, wear, or use have minerals in them.

9.4.0 Useful minerals are distributed unevenly throughout the world and vary greatly in quantity and quality.

9.5.0 Advances in technology can increase mineral use.

9.6.0 Wasting minerals increases the cost of obtaining them at a later time.

9.7.0 Many minerals are necessary for our way of life.

9.8.0 Depletion of some of our mineral resources is accelerated because of their huge demand and out waste.

9.9.0 Ecologically sound ways of mining and recycling can conserve our mineral resources.

9.10.0 Mankind is responsible for the use and misuse of minerals.

10.0.0 Conservation of Water Resources :

10.1.0 Water is essential for most living things.

10.2.0 Water is a renewable resource.

10.3.0 Chemicals, raw sewage, oil and agricultural wastes are polluting lakes, rivers and seashores.

10.4.0 The ocean is the final dumping place for many pollutants

10.5.0 Environmental constraints must be enacted and enforced to keep the oceans from becoming more contaminated.

10.6.0 The oceans contribute to our climate; the climate is critical to our existence.

10.7.0 Ocean plants supply 70-80 percent of our oxygen.

10.8.0 Corrective measures may be applied to most of the contaimination now in existence.

10.9.0 Clean water will cost more each day that we wait to clean up pollution.

10.10.0 Improved research developes watershed techniques that protect the land from soil eresion. This conserves most water for use by individuals.

10.11.0 Humans must be aware of the social, political and economical factors influencing management of the water systems.

10.12.0 Water management and conservation must begin on land where the raindrops.

11.0.0 Preservation of Wildlife :

11.1.0 Wildlife is a renewable resource so long as species do not become extinct.

11.2.0 Wildlife is a usable resource.

11.3.0 Wildlife species are interdependent with non-living and other livig things in the environment.

11.4.0 Wildlife can survive in an environment that provides the necessary elements for a suitable habitat.

11.5.0 Destruction of wildlife may lead to the eventual collapse of food chains.

11.6.0 Wildlife populations are naturally limited by disease, habitats predators, accidents and lack of food, water, and shelter.

11.7.0 Loss of habitat and pollution of air, water and land have resulted in over one hundred species of wildlife becoming extinct and angered in the United Nations.

11.8.0 Since 1600, three hundred fifty species of animals have become extinct. Mankind is a species.

11.9.0 Human beings' activities are often responsible for the extinction of whole species.

11.10.0 Legislation has protected some wildlife through establishment of game preserves, wildlife refuges, and hunting laws.

11.11.0 Careful management of wildlife populations is necessary if we are to continue enjoying the benefits that we now receive from animals.

Conclusion :

Considering the rapid expansion of Exploratory Sciences for Environmental monitoring and understanding Earth's resource balancing and locating past evidence of earth's capacity itself in protecting life, it is extremely necessary to constantly update and develop new concepts for effective Environmental Education at various levels. It is therefore, imperative that constant effort in curriculum updating supported by sustained faculty development programme and continued education programme for industry personnel with adequate media, plays a big role in this type of mass orientation. Adequate hardware procurement and Software development must be made at a priority level and basic infrastructure created at the Institution level. Intersectional co-ordination between Industries, Research Institutions, construction agencies and Engineering and Technical Institutions play a vital role in creating an effective awareness during Planning, Designing and implementation of Environmental Control System.

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