ENVIRONMENTAL APPLICATIONS (89)

Candidates offering Environmental Science (Group II) are not eligible to offer Environmental Applications (Group III).

Aims:

1. To acquire knowledge of the origin and functioning of the natural system and its correlation with the living world.
2. To develop an understanding that human beings, plants and animals are part of a natural phenomenon and are interdependent.
3. To appreciate influence of human activity on the natural processes.
4. To develop awareness of the need and responsibility to keep the natural system in a condition that it sustains life.
5. To develop sensitivity in personal attitudes to environmental issues.
6. To develop a keen civic sense.
7. To develop a sense of responsibility and concern for welfare of the environment and all life forms which share this planet.
8. To develop a sound basis for further study, personal development and participation in local and global environmental concerns.
9. Understand 'development' to intervene in the relationships between society and the natural environment.
10. To participate in local issues through carefully monitored projects.
11. To create awareness about the role of local communities in sustainable growth.
12. To develop an understanding of how local environments, contribute to the global environment.

CLASS IX

*There will be **one** written paper of **two hours** duration carrying 100 marks and Internal Assessment of 100 marks.*

THEORY – 100 Marks

1. Introduction

Broad introduction to the current environmental problems. Magnitude of these problems and appreciation of the complexity of issues involved. This is to be done through-

- *presenting facts and statistics.*
- *inter-linking facts to generate a broad perspective.*
- *understanding frameworks and systems that contribute to the problem under study*.

Our main environmental problems:

(i) Understanding ecosystems- threats and conservation measures.

Major causes of ecosystem destruction. The extent of forest cover left in India and the world today. For instance, India is left with about 4.6% protected forest cover. The rate of destruction. Efforts being undertaken to save the forests. Names of some organisations which are involved and understanding of conservation measures. Examples of successful cases.

(ii) Resource depletion.

The consequences of major resources being depleted. Use of local and international examples. For example, petroleum products are likely to last only a few more decades.

(iii) Waste generation.

Issues of waste generation and disposal. A few prominent examples like dumping of nuclear waste and other hazardous wastes in developing countries by developed countries. Basel Convention.

(iv) Economic disparities.

The extent of poverty in India and in the world. The nature of poverty in developed countries and developing countries - in rural and urban areas. Consequences and implications with reference to the lifestyles and aspirations of

communities and society. Developmental paradigms and the politics of poverty.

(v) Land use.

Changing patterns of land use. Modern agriculture. Issues related to water.

2. Basic Ecology

To give a clear understanding of ecological concepts. The learning will be enhanced if live examples are used with as many outdoor classes as possible.

(i) Biotic and abiotic components of an ecosystem.

Classification. Understanding role.

(ii) Food chains, food web and trophic levels.

To understand the use of these tools as a means of understanding ecosystems.

(iii) Ecological niche, habitat and microhabitat.

The criticality of the role of each species in an ecosystem. The difference between habitat and microhabitat.

(iv) Succession.

How forests regenerate. Kinds of succession - primary and secondary.

(v) Ecotypes.

The influence of external factors like climate and soil (micro habitat) on organisms.

(vi) Flow of energy through an ecosystem.

Sun as the primary source of energy. Linear flow of energy versus cyclical flow of nutrients.

(vii) Concept of species.

To understand the sovereignty of species. The importance of critical minimum size of species population.

(viii) Extinction of species.

Effects of extinction.

(ix) Introduced species.

The impact of introduced species on indigenous species and ecosystems - competition, habitat destruction, diseases etc., e.g. Acacia, Subabul, Lantana.

(x) Endemic species.

Inter-relationship with other organisms, their evolution, the extreme adaptability to local environments.

(xi) Keystone species.

Understanding that while all species have a niche, some species play a more critical role as they are keystone species, e.g. crocodile, sharks, fungi.

(xii) Kinds of ecosystems.

Study a range of ecosystems, the life that they support, their uniqueness, etc.

Suggested Activities/Visits:

- *Visit a surviving ecosystem and do a rapid assessment.*
- *Study natural communities of your neighbourhood like bird, insect population, etc.*

3. Conservation of Ecosystems

(i) Conservation strategies*:*

- *Species approach including CITES.*
- Ecosystem approach including formation of National parks, sanctuaries and Biosphere reserves.
- Wildlife management.

What is the extent of forest cover left in the world? What are the threats faced by forests? What are the different kinds of strategies that are being used to conserve forests? The above three are broad examples. Students should be made aware of the scope and limitation of the above approaches. Study an example of each kind.

(ii) Value of bio-diversity.

Study the value of bio-diversity from different viewpoints - ecological, economic, health, food and aesthetic.

Suggested Activities/Visits:

- *Visit to a national park /any protected area.*
- *Interaction with a group involved in conservation.*

4. Dynamics of Development and Resource Use

Understanding development

(i) People as resources.

To gain an understanding that most development issues arise due to not recognising people as valuable resources. Importance of generating employment.

(ii) Impact of scale and kind of technology on resources.

Understanding the model of modern development and the impact of industrialising and automating on the economy, people and resources. Short-term and long-term accounting. Depletion of resources. Resource scarcity and economic consequences.

(iii) Urbanisation and its impact.

Causes and consequences of rapid, unplanned urbanisation - impact on infrastructure, services and provision of basic amenities.

(iv) Ecological footprint of a city.

Study two sample cities to see the extent of ecological impact on surroundings and also the actual extent of resource supply to the city. Extent of waste generated in a city in a day. Ratio of biodegradable and non-biodegradable matter. The need to sort garbage. E.g. Chennai generates 3500 tons of garbage a day of which only 800 tons is non bio-degradable. Dumping of hazardous wastes particularly in developing countries. The Basel convention.

(v) Population (questioning Malthus, carrying capacity).

Self-explanatory.

(vi) Poverty

Dynamics of urban and rural poverty, relationship to social structure - the dynamics of the decline of traditional opportunities and occupations.

Suggested Activities/Visits:

- *Visit a rehabilitation site.*
- *Visit NGOs working in the field of development.*

5. Understanding Land use

(i) Agriculture.

(a) Traditional farming methods.

Study a few traditional methods of farming - region specific and crop specific. Management of commons. Farming as an activity of the whole community.

(b) Traditional varieties and their adaptability to local environments.

Study characteristics of a few sample crops drawn from different climatic and soil conditions.

(c) The impact of green revolution practices.

Study the impact of green revolution practices on soil, water, local crop varieties, food production, economy, small farmers and distribution using Punjab as an example; contribution to food security.

(d) Food scarcity in the midst of plenty.

To understand and analyse the distribution system.

Suggested Activities/Visits:

- *Visit to a modern chemical farm and an organic farm.*
- *Visit the wholesale market.*
- *Understand the flow of grain from farmer to the shop.*

(ii) Towards a world without hunger

(a) Introduction to new and old organic farming practices.

- Do nothing farming – Fukuoka.
- Bio-dynamic farming - Rudolph Steiner.
- Permaculture – Mollison.
- Integrated farming practices.
- Low Input Sustainable Agriculture (LISA).

Study the different farming practices - possibly through visits - if possible by growing crops on small patches of land.

(b) Assessment of Biotechnology.

Is biotechnology the answer to the various environmental issues around food production or is it yet another technological disaster waiting to happen.

(c) Global food security, food aid.

How to achieve food security?

Is food aid the right answer?

Is sustainable agriculture and subsistence farming the answer to the problem of food security - or is it necessary to achieve a judicious balance of the above with monocropping for building a national buffer of food grains.

Suggested Activities/Visits:

- *Try farming in small plots using different practices.*

INTERNAL ASSESSMENT- 100 Marks

*Students are recommended to complete **two** case studies and **one** project from the list given below.*

Suggested list of Projects/Case studies for topics from the syllabus-

Basic Ecology

Projects

(i) Where have all the sparrows gone?

Sparrows used to be one of the most common birds in India and are disappearing at a phenomenal rate across the country as has been recorded by various groups. Why has this happened? What could be the reason? They seemed pretty adaptive creatures and have inhabited human dwellings for a long time.

A study will help understand the fragility of a species' existence on earth and the various conditions that could make it disappear.

(ii) Why conserve turtles?

Turtles have managed to survive for 200 million years and are now on the brink of extinction. Development of the last few decades has brought about this situation.

Studying this will help the student understand the reasons for the disappearance of turtles- the main reason being trawling and trawlers are not merely killing turtles. Trawling is ravaging ocean ecosystems and creating under sea deserts. It will also help understand the role of turtles in ocean ecosystems.

There is also much north- south politics around conservation like the Tuna dolphin issue and the shrimp - turtle issue.

(iii) Importance of green areas in a city.

(iv) Importance of mangroves.

Case Study

Study different kinds of existing ecosystems like the Sundarbans, the Sholas, rainforests, scrub forests, etc. for the bio-diversity they contain and the pressures they face. (Preferably an ecosystem that is nearby.)

Conservation of Ecosystems

Projects

(i) Zoos as places for conservation of species.

(ii) Insects as keystone species.

(iii) How can I conserve a piece of land in my neighbourhood?

(iv) Understand the conflict with the usage of CITES - Dolphins and Tuna, Turtles and Shrimp, Norway, Japan and whales, culling elephants in Africa, etc.

(v) Project Tiger, Project Elephant

(vi) The study of plight of Jarawas in the Andamans [Tribals and their relationship to the environment].

(vii) Protecting and conserving forests, rivers, oceans, etc; strategies, difficulties.

(viii) Is there effective legislation for addressing the environmental concerns?

Dynamics of Development and Resource use

Project

Conduct a study of a selected area.

Case Studies

(i) NGO /peoples groups working with impact of large projects and/or human rights issues.

(ii) Assessing the impact of women's mobilisation and empowerment.

(iii) Child labour reports.

(iv) Development in a tribal region.

(v) Sourcing of livelihood in a traditional community.

(vi) Comparative studies.

When a student finds it too difficult to understand a context very different from his own, it becomes valuable to generate parameters by which one's own context may be compared to that which one is studying. Alternately, it is possible to choose two related / opposite / parallel contexts and assess them through the same parameters. For example, if one is studying the usage of income in different economic classes, it is possible to compare expenditure on the basis of-

- primary requirements like food, shelter and clothing;
- entertainment;
- travel;
- buying of utility and luxury items;
- health;
- educational facilities;
- services, etc.

(vii) Consumer group reports.

Understanding Land Use

(a) Agriculture

Case Studies

(i) Public Distribution Systems (PDS).

(ii) Alternatives to PDS like the targeted PDS.

(iii) Starvation in Orissa & Andhra Pradesh.

(iv) Agricultural practices of a small and large farmer.

(b) Towards a world without hunger

Project

Is bio-technology the answer to the world's food problems?

Case Studies

(i) The case of Bt Cotton.

(ii) Terminator and traitor technology.

(iii) The case of golden rice.

(iv) Bio-piracy.

Mapping - What I can do

By the end of the year the students would have gained exposure to various environmental issues. It is important for them to find personal solutions to many of the problems as this will empower them to find creative solutions to larger issues and the learning can be solution centred rather than problem centred. There are many areas listed which fall within the students' scope of intervention. The students can be invited to choose the areas they would like to invest in.

(i) In my home.

a. Energy consumption -projects to minimise, eliminate, use alternate sources.
b. Fossil fuel usage - minimise, use public transport, cycle.
c. Water consumption.
d. Sourcing food items - organic, farmer, small retailer, large corporation and supermarket.
e. Sourcing clothes - handloom, mass produced machine loom goods, branded products, imported clothing, and designer wear.

This is just a sample list to show possible personal initiatives.

(ii) In my school.

a. Carrying out paper audits.
b. Minimising or avoiding plastic altogether.
c. Making school a litter free zone or plastic free zone.
d. Planting and taking care of trees, herb gardens, vegetable gardens.
e. Maintaining patches of land.

(iii) In my neighbourhood.

a. Help in teaching under-privileged children.
b. Work with preventive health care and basic first aid.
c. Sanitation- learning about and promoting low cost decentralised systems.
d. Rainwater harvesting- setting up pits.
e. Separation of garbage - vermicomposting of bio-degradable waste.
f. Spread awareness of the four R's -Reduce, Reuse, Recycle, Refuse.
g. Care for neighbourhood animals - Rabies shots, deworming, feeding, etc.