Maharashtra Agricultural Universities Examination Board, Pune.
Semester End Examination
B.Sc. Hons.(Agri.)
Answer Sheet

Semester: III | Academic year : 2018-19
Course No: ESDM-231 | Title : Environmental Science & disaster management
Credit :3 (2+1) | Date:
Time : 3 hrs | Total marks :80

Note: 1. Solve any **Eight** questions from **Section 'A'**
2. All questions from **Section 'B'** are compulsory.
3. All questions carry equal marks.
4. Draw neat diagrams wherever necessary.

a) Scope of Environmental Science

Environmental studies has been seen to be multidisciplinary in nature so it is considered to be a subject with great scope.

Environmental science can be applied in the following areas :

a) Ecosystem Structure and Function
b) Natural Resource Conservation
c) Environmental Pollution Control
d) Environmental management
e) The scope of environmental studies in industry
f) Research and development
g) Social Development

Importance of Environmental Science

a) Environmental studies helps to maintain ecological balance by providing a basic knowledge of environmental systems and their processes
b) It also helps to gain a skill in using techniques to analyze various environmental systems and the effect of human activities on that system.
c) Environmental studies applies economical methods and concepts to issues of the environment, management, environmental policy analysis
d) Environmental study includes diverse area such as property rights, economic instruments for pollution control with environmental policy.
e) Concepts from environmentally studied can be applied to the study of agriculture and the design of sustainable production systems.

b) Population Explosion

The rapid growth of population is perhaps the most obvious factor affecting the present and future national and regional development, but it is by no means the only population problem in the world today. The main problem is that of 'Population Explosion'.

Population explosion doesn't mean overpopulation or population density. Infact, overpopulation or population density is not the major problem. The problem arises when the economic developments fails to maintain pace with population growth. So the most important factors regarding

population are how fast population is growing; and most important is where it is growing. For example, Japan has a high population density but it ranked first on the human development index formulated by U.N.D.P. On the other hand low population density areas of Africa or S. America are unable to support the existing population. Thus, the size, distribution and structure of the population within a country must be viewed in relation to its natural resources and the techniques of production used by its population. The extent to which they are used and the way in which they are utilized determine whether an area/country is under-or over-populated and hence witnessing population explosion or not. A country is said to have an "optimum population" so long as the number of people is in balance with the available resources of the country. If in a country the process of industrialization accompanied by urbanization is not fast and education is not widespread, then this is really a grave situation called as Population Explosion.

Effects of population explosion

The effect of population explosion is numerous with far reaching consequences. Some of them are enumerated as under:

Unemployment,
Low living standard of people,
Hindrance in the process of development of economy
Pressure on agriculture land,
Low per capital income,
Lack of basic amenities like water supply and sanitation, education, health, etc.,
High crime rate
Environmental damage,
Migration to urban area in search of job,
Energy crisis,
Overcrowding of cities leading to development of slums.

A-2 **A food chain shows how each living thing gets its food.**

1. Plants are called producers because they are able to use light energy from the Sun to produce food (sugar) from carbon dioxide and water.
2. Animals cannot make their own food so they must eat plants and/or other animals. They are called consumers. There are three groups of consumers.

a. Animals that eat ONLY PLANTS are called herbivores (or primary consumers).
b. Animals that eat OTHER ANIMALS are called carnivores.
i. carnivores that eat herbivores are called secondary consumers
ii. carnivores that eat other carnivores are called tertiary consumers
e.g., killer whales in an ocean food web ... phytoplankton → small fishes → seals → killer whales

3. Animals and people who eat BOTH animals and plants are called omnivores.
4. Then there are decomposers (bacteria and fungi) which feed on decaying matter. These decomposers speed up the decaying process that releases mineral salts back into the food chain for absorption by plants as nutrients.

A-3 **a) Define Natural Resources. Explain the various types of classification of natural resources**

Natural Resources: A resource is anything needed by an organism or group of organisms.

Classification of natural resources :

a) **Based on quantity, mutability and reusability** viz., Inexhaustible , Exhaustible, renewable and non-renewable.
b) **Based on continual utility** viz., renewable, non-renewable and cyclic resources

c) **Based on origin** viz., biotic and abiotic
(Brief description with proper example should be given for each class)

b. Classification based on exhaustibility: Renewable vs. Non-renewable

- PERPETUAL RESOURCES – these are resources which exist irrespective of the amount of their usage. With adequate technology, they provide a vast potential for use. Example. Sun, wind and water

- RENEWABLE RESOURCES - the resources which can be renewed and reproduced by physical, chemical or mechanical processes are known as renewable or replenishable resources. These resources are able to increase their abundance through reproduction and utilization of simple substances. Examples of such resources are water, forests and wildlife, plants etc. we can further divide into continuous or flow and biological.

o Renewable Resources can be further classified as Living Renewable Resources and NonLiving Renewable Resources. Some examples of renewable resources though they do not have life cycle but can be recycled are wood and wood-products, pulp products, natural rubber, fibers (e.g. cotton, jute, animalwool, silk and synthetic fibers) and leather.

o Living Renewable (biological) resources are those renewable resources which come from living (biotic) sources – like forests, plants

o Non-Living Renewable resources are those that renewable resources which come from non-living (abiotic) sources like land, water, air. Example, metals, minerals, wind, sun etc.

o Continuous/ Flow Renewable resources are resources which do not need regeneration. Similar to that of perpetual resources, example wind, tides etc.

- NON-RENEWABLE RESOURCES - this process takes place over a long geological time. Examples of such resources are minerals and fossil fuels. This may take millions of years in their formation. Some of the resources like metals are recyclable and some like fossils fuels cannot be recycled and as such they get exhausted with their use.

o Non-Renewable Resources can be further classified as Recyclable and Non-Recyclable resources.

o Recyclable resources are those which can be processed to be used again and again

These are non-renewable resources, which can be collected after they are used and can be recycled. These are mainly the non-energy mineral resources, which occur in the earth's crust (e.g. ores of aluminium, copper, mercury etc.) and deposits of fertilizer nutrients (e.g. phosphate sock and potassium and minerals used in their natural state like asbestos, clay, mica etc)

o Non- Recyclable resources are those which once used perish, example coal. These are non-renewable resources, which cannot be recycled in any way. Examples of these are fossil fuels and uranium, which provide 90 per cent of our energy requirements.

o There are a few substances too which can be recycled a few times, before they completely perish or turn non-renewable resources.

A-4 **a) Effects of Modern Agriculture**

1 Soil erosion

2 Agriculture and the loss of genetic diversity

3 Fertilizer-pesticide problems

4 Water Logging

5 Salinity

b) Fertilizer-pesticide problems

For photosynthesis apart from water, sunshine and CO2, plants need micro and macro nutrients for growth. These nutrients are supplied in the shape of fertilizers. There is lot of potential to increase food productivity by increasing fertilizer use. On one hand application of artificial chemical fertilizers increases the productivity at faster rate as compare to organic fertilizers, on the other hand application of fertilizers can be a serious problem of pollution and can create number of problems. Excessive level of nitrates in ground water has created problems in developed countries. These are:

a. Accumulated phosphorous as a consequence of use of phosphoric fertilizer are posing serious threat as residues in domestic water supply and for ecology of river and other water bodies. Increased level of phosphates in different water results in eutropication.

b. Effect of chemical fertilizer is long term, therefore leads to net loss of soil organic matter.

To control insects, pests, diseases and weeds which are responsible for reduction in productivity different chemicals are used as insecticides, pesticides and herbicides. Successful control of insects, pests and weeds increases productivity and reduces losses and provide security for harvest and storage. Applications of these synthetic chemicals have great economic values and at the same time cause number of serious problems such as:

a. Affects human health which includes acute poisoning and illness caused by higher doses and accidental exposes

b. As long term effect, cause cancer, birth defects, Parkinson's disease and other regenerative diseases.

c. Long term application of pesticides can affect soil fertility.

d. Danger of killing beneficial predators.

e. Pesticides resistance and pest resurgence

A-5 **a) What are the specific objectives of Conservation of Biodiversity**

Conservation of our natural resources has the following three specific objectives:

To maintain essential ecological processes and life-supporting systems;

To preserve the diversity of species or the range of genetic material found in the organisms on the planet; and

To ensure sustainable utilization of species and ecosystems which support millions of rural communities as well as the major industries all over the world?

b Write in brief about In-situ conservation

In-situ or on-situ conservation means conservation of species in its natural ecosystem or even in man-made ecosystems (i.e. artificial ecosystems). This type of conservation applies only to wild fauna and flora, and not to the domesticated animals and plants because conservation is possible by protection of population in nature. In-situ conservation is a comprehensive system of "protected area", which involves setting aside large portions of earth's surface for wildlife with emphasis either to save the entire area or an endangered species. According to World Conservation Union, 'protected area' is defined as -" an area of land and/ or sea specially dedicated to the protection and maintenance of biological diversity and of natural and associated cultural resources and managed through legal or other effective means". There are different categories of protected areas which are managed with different objective. These include – national parks, sanctuaries, biosphere reserves, etc.

The advantages of In-situ conservation are:

In-situ conservation is the best strategy for the long term protection of biodiversity.

Large pockets/ areas of protected zones are essential for not only conserving vast number of species of living organisms but also provide opportunities to evolve. Otherwise, man-made habitats (e.g. zoo, aquarium, etc.) may end-up with static gene-pool.

Further in-situ conservation are always preferred because, in most cases, it is cheaper to protect populations in their natural habitat than to reintroduce captive-bred ones.

Some of the limitations or factors that reduce the laudable advantages of in-situ conservation to some extent are:

Many protected habitats are not large enough, not maintained properly, and are not properly protected from environmental pollution; and

Many protected habitats are used for logging, tourism or other profitable activities; thus, diluting the objective of conservation biodiversity.

Describe the role of an individual in prevention of pollution in details

Environment protection has been burning issue in last half century. In order to tackle the menace of pollution, urgent steps have to be taken at not only global or country level, but also at local level. In fact, the role of individuals in prevention of pollution is of critical importance, because it is the individuals that make a community or country. Effort by each individual at his or her level can have a significant effect on global level. It has been aptly said "charity begins at home".

Aware and inspired individuals are strongest tool to tackle pollution. This is because an aware individual not only lessens the burden on state but also he/she can tackle problem of pollution more effectively as he/she is more familiar with problems persisting at local level and he himself/herself deals with them in his/her day to day life. It is better and more viable to prevent pollution by educating individuals than controlling pollution. Individuals should encourage to modify their lifestyle and living habits if that are not healthy for environment.

Ways in Which a Individual can Help in Prevention of Pollution

- Individuals should minimize wastage of resources such as electricity. Every unit of electricity saved is equivalent unit of electricity produced as it not only saves the fuel that would be used to produce that electricity, but also help to prevent pollution that is accompanied by burning of that fuel. Therefore, person should always switch off appliances when not in use.
- Individuals should prefer walking or use cycles instead of using motor vehicles, especially when distances to be travelled are small.
- Individuals can make considerable contribution by using mass transport (buses, trains, etc) instead of using personal vehicles.
- When going to workplace, colleagues from nearby localities should pool vehicles instead of going in individual personal vehicles.
- Taking personal vehicles for periodic pollution checks at centres approved by authorities.
- Individuals should reuse items whenever possible.
- Products that are made of recycled material should be given preference.
- Use gunny bags made of jute instead of plastic bags.
- Take part in environment conservation drives such as tree planting drives.
- Use water resources efficiently.
- Use renewable resources by installing equipment such as solar heaters and using solar cookers.
- Dispose potentially harmful products such as cells, batteries, pesticide containers, etc properly.
- Use of refrigerators should be minimised wherever possible as they are main source of CFC, which is responsible for Ozone layer depletion.
- Follow and promote family planning, as more population means more resources utilized and more resources utilized imply more pollution.
- Avoid making noise producing activities such as listening to loud music.
- Use handkerchiefs instead of paper tissues.
- Organize drives to clean streets and clean drains with help of other people of locality.
- Spread awareness and inspire other people to prevent pollution. Individuals should be encouraged to acquire information and innovations from world over and implement them locally.

-7 **Enlist various environmental conservation acts. Explain forest conservation act**

The six laws related to environmental protection and wildlife are:

1) The Environment (Protection) Act, 1986;
2) The Forest (Conservation) Act, 1980;
3) The Wildlife Protection Act, 1972;
4) Water (Prevention and Control of Pollution) Act, 1974;
5) Air (Prevention and Control of Pollution) Act, 1981
6) The Indian Forest Act, 1927.Apr 7, 2015

The essential purpose of National Environment Protection Act (NEPA) is to ensure that environmental factors are weighted equally when compared to other factors in the decision making process undertaken by the Government. The act establishes the national environmental policy,

including a multidisciplinary approach to considering environmental effects in democratic government agency decision making.

The Forest Conservation Act, 1980 :

The Forest Conservation Act, 1980 was enacted to help conserve the country's forests. It strictly restricts and regulates the de-reservation of forests or use of forest land for non-forest purposes without the prior approval of Central Government. To this end the Act lays down the pre-requisites for the diversion of forest land for non-forest purposes.

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, recognises the rights of forest-dwelling Scheduled Tribes and other traditional forest dwellers over the forest areas inhabited by them and provides a framework for according the same.

The Indian Forest Act, 1927 consolidates the law relating to forests, the transit of forest-produce and the duty leviable on timber and other forest-produce.

8 **What is natural disaster. Give it's types and effects of landslides in details**

A natural disaster is a major event caused by the natural processes of the Earth including extreme weather such as floods, hurricanes, tornadoes, volcanic eruptions, earthquakes, tsunamis, and other geologic processes.

Natural Types of Disasters

- Agricultural diseases & pests.
- Damaging Winds.
- Drought and water shortage.
- Earthquakes.
- Emergency diseases (pandemic influenza)
- Extreme heat.
- Floods and flash floods.
- Hail.

Effects of Landslides

Lead to economic decline

Landslides have been verified to result in destruction of property. If the landslide is significant, it could drain the economy of the region or country. After a landslide, the area affected normally undergoes rehabilitation. This rehabilitation involves massive capital outlay. For example, the 1983 landslide at Utah in the United States resulted in rehabilitation cost of about $500 million. The annual

loss as a result of landslides in U.S. stands at an estimated $1.5 billion.

Decimation of infrastructure

The force flow of mud, debris, and rocks as a result of a landslide can cause serious damage to property. Infrastructure such as roads, railways, leisure destinations, buildings and communication systems can be decimated by a single landslide.

Loss of life

Communities living at the foot of hills and mountains are at a greater risk of death by landslides. A substantial landslide carries along huge rocks, heavy debris and heavy soil with it. This kind of landslide has the capacity to kills lots of people on impact. For instance, Landslides in the UK tl happened a few years ago caused rotation of debris that destroyed a school and killed over 144 people including 116 school children aged between 7 and 10 years. In a separate event, NBC News reported a death toll of 21 people in the March 22, 2014, landslide in Oso, Washington.

Affects beauty of landscapes

The erosion left behind by landslides leaves behind rugged landscapes that are unsightly. The pile of soil, rock and debris downhill can cover land utilized by the community for agricultural or social purposes.

Impacts river ecosystems

The soil, debris, and rock sliding downhill can find way into rivers and block their natural flow. Many river habitats like fish can die due to interference of natural flow of water. Communities depending on the river water for household activities and irrigation will suffer if flow of water is blocked.

A-9 **Define air pollution. Explain air /water pollution causes, effects and control measures**

Air pollution can be defined as the presence of toxic chemicals or compounds (including those of biological origin) in the air, at levels that pose a health risk.

Most of this **air pollution** we **cause** results from the burning of fossil fuels, such as coal, oil, natural gas, and gasoline to produce electricity and power our vehicles. Carbon dioxide (CO2) is a good indicator of how much fossil fuel is burned and how much of other **pollutants** are emitted as a result.

Emissions From Industrial Plants and Manufacturing Activities. ...
Combustion From Fossil Fuels. ...
Farming Chemicals and Household Products. ...
Natural Causes of Air Pollution. ...
Other Causes.

air pollutants are as follows:

Carbon monoxide.
Lead.
Nitrogen dioxide.
Ozone.
Particles.
Sulfur dioxide.

Control measures:

Avoid smoking indoors (quitting smoking is the best answer for overall health)
Use craft supplies in well-ventilated areas.
Make sure your gas stove is well-ventilated.
Minimize clutter.
Remove carpeting if possible.
Use a dehumidifier and/or air conditioner to reduce moisture.

A-10 **Short Notes**

a) **Acid rain:**

The acid rain adversely affects plants, fishes and birds and corrodes metals and building materials. The effects of aid rain have been recorded in parts of the United States, the erstwhile Federal Republic of Germany, Czechoslovakia, the Netherlands, Switzerland, Australia, Yugoslavia and elsewhere. It is also becoming a significant problem in Japan and China and in Southeast Asia. Rain with a pH of 4.5 and below has been reported in many Chinese cities. Sulphur dioxide emissions were reported in 1979 to have nearly tripled in India since the early 1960s, making them only slightly less than the then-current emissions from the Federal Republic of Germany (http://www.geocities.com/narilily/acidrain.html).

Acid rain is a rain or any other form of precipitation that is unusually acidic, meaning that it possesses elevated levels of hydrogen ions (low pH). It can have harmful effects on plants, aquatic animals, and infrastructure. Acid rain is caused by emissions of carbon dioxide, sulfur dioxide and nitrogen oxides which react with the water molecules in the atmosphere to produce acids. Governments have made efforts since the 1970s to reduce the release of sulfur dioxide into the atmosphere with positive results. Nitrogen oxides can also be produced naturally by lightning strikes and sulfur dioxide is produced by volcanic eruptions. The chemicals in acid rain can cause paint to peel, corrosion of steel structures such as bridges, and erosion of stone statues.

b) **Role of NGO in disaster management:**

Recent trends with respect to management of naturaldisasters have highlighted the role of Non-Governmental Organisations (NGOs) as a vital stakeholder in the relief and response efforts especially with respect to facilitating communication and coordination between the administration and the

affected community.

NGOs are organizations registered under various Indian laws such as the Societies Registration Act, 1860, Section 25(1) of Companies Act, 1956 meant for non-profit companies, or State-specific Public Charitable Trust Acts. NGOs work on a variety of areas like humanitarian assistance, sectorial development interventions and sustainable development. NGOs play important roles in different stages of the Disaster Management Cycle.

Volunteerism and social service has deep roots in India, since time immemorial, even though it received special significance during the freedom struggle through the Gandhian concept of Shramdaan, implying the offering of free labour for some noble cause like rural development, construction of social assets and public infrastructure and amenities, etc. In post-Independent India, the Non-Governmental Organisations (NGOs) have been providing support in critical sectors like health, education, water supply and sanitation, shelter and infrastructure, restoration of livelihood food security and nutrition, environment, etc. Given India's multi-hazard risk and vulnerability to natural and man-made disasters, NGOs have been playing a significant role in providing humanitarian assistance to disaster-affected people in most of the severe disasters like the Latur earthquake in 1993, Orissa super cyclone in 1999, Bhuj earthquake in 2001, Indian Ocean tsunami in 2004, Kashmir earthquake in 2005, Barmer floods in 2006, Kosi floods in 2008,cyclones Aila and Laila and the more recent cloud burst in Leh in August 2010, apart from participating in providing relief to disaster affected communities in various other localised disasters.

In the recent past, the role of NGOs in disaster management (DM) has started changing from providing post-disaster relief to strengthening pre-disaster preparedness and mitigation through capacity building, public awareness campaigns, mock exercises, workshops and conferences, etc. NGOs have also started to collaborate with corporate entities in Public-Private Partnership (PPP) projects and Corporate Social Responsibility (CSR) initiatives in the field of DM at State, District and Sub-district levels. Till recently, the work of NGOs in the field of DM has been mostly sporadic, reactive, responsive and driven by local level compulsions in the geographic areas where they were implementing development projects and very often they faced enormous challenges in coordinating with the government machinery and even among NGOs themselves.

In line with it's mandate as envisaged in the Disaster Management Act 2005 (DM Act 2005), the National Disaster Management Authority (NDMA) has circulated National Disaster Management Guidelines on Role of NGOs in Disaster Management defining the role of NGOs in disaster management.

Noise pollution:

Noise pollution affects both health and behavior. Unwanted sound (noise) can damage physiological health. Noise pollution can cause hypertension, high stress levels, tinnitus, hearing loss, sleep disturbances, and other harmful effects.

Major causes / sources of noise pollution are:

(i) Industrial Sources;

(ii) Transport Vehicles;

(iii) Household;

(iv) Public Address System:
(v) Agricultural Machines:
(vi) Defense Equipment:
(vii) Miscellaneous Sources:
(viii) Physical Effects:

Noise health effects are the physical and psychological health consequences of regular exposure, to consistent elevated sound levels. Elevated workplace or environmental noise can cause hearing impairment, hypertension, ischemic heart disease, annoyance, and sleep disturbance.

With extended exposure, noises that reach a decibel level of 85 can cause permanent damage to the hair cells in the inner ear, leading to hearing loss. Many common sounds may be louder than you think… A typical conversation occurs at 60 dB – not loud enough to cause damage.

As per the rules, the prescribed highest limit of noise levels for residential localities is 55 and 45 decibels (during the day and the night respectively), for silence zones the level is 50 and 40 decibels, respectively.

The Noise Pollution and Abatement Act of 1972 is a statute of the United States initiating a federal program of regulating noise pollution with the intent of protecting human health and minimizing annoyance of noise to the general public. Loudness (also called sound pressure level, or SPL) is measured in logarithmic units called decibels (dB). The normal human ear can detect sounds that range between 0 dB (hearing threshold) and about 140 dB, with sounds between 120dB and 140 dB causing pain (pain threshold).

d) **Ecological Pyramids: Graphic representation of the trophic structure and function at successive trophic level of an ecosystem.**

Types of pyramids:

a) Pyramid of numbers (individuals per unit area): Showing the number of individual organism at each level or show the relationship between producer, herbivores and carnivores at successive trophic levels in terms of their number.

b) Pyramid of Biomass (gram dry wt. per unit area): Showing the total dry weight and other suitable measures of total amount of living matter. In grassland and forest, there is generally gradual decrease in biomass of organisms at successive level from the producers to the top carnivores. Thus pyramids are upright. However in a pond as the producers are small organisms, their biomass is least, this value gradually shows an increase towards the apex of the pyramid, thus making pyramid inverted in shape.

c) Pyramid of energy: Showing the rate of energy flow and productivity of successive trophic levels. It is always upright in position.

Section B

A-11

1. **Disaster management:** Disaster management refers to effective management of counter measures that are taken in order to mitigate the effect natural calamities that lead to desperate situations after calamities such as earthquakes, floods, landslides, tsunamis, etc.
2. **Climate Change :** The term, climate, is generally used to connote a complex natural phenomenon comprising such variables as air temperature and humidity, wind, and precipitation
3. **Soil Erosion:** Soil erosion refers to loss or removal of superficial layer of soil due to the action of wind, water and human factors. In other words, it can be defined as the movement of soil components, especially surface-litter and top soil from one place to another.
4. **Ecosystem:** The term ecosystem is defined as the system resulting from the integration of all the living and non-living factors of the environment.
5. **Biodiversity Hotspot:** An area on earth with an unusual concentration of species, many of which are endemic to the area, and which is under serious threat by people.
6. **Ecology:** A branch of science concerned with the interrelationship of organisms and their environment with the study of ecosystems.
7. **Food web:** complex network of many interconnected food chains and feeding relationships.
8. **Omnivore:** an animal that eats both plants and animals

A-12

1. Abiotic component of ecosystem comprises of non-living things –**True** (True/False)
2. The major benefits of dams are hydroelectricity generation –**True** (True/False)
3. The major problem of malnutrition is a progressive emaciation caused by lack of protein and calories called as **Marasmus** (Fill in the blank)

4. The Apex Body for Disaster Management in India is headed by the Prime Minister of India, is **National disaster management authority** (NMDA) (Fill in the blank)

5 The main source of water for the Himalayan Rivers such as Ganga, Brahmaputra and Indus are **Glaciers** (Fill in the blank)

6 The long form of IAEM---- **International Association Of Emergency Managers**

7 IPCC stands for ----**Intergovernmental Panel on Climate Change (IPCC)**

8 NEPA is the **abbreviation** of National **Environment** Protection Act

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Dr.V.A.Apotikar
Associate Professor
College of Agril,
Akola
Mob.No.7774966640

Dr B.V.Saoji
Head
Deptt. Of Agronomy
Dr PDKV, Akola
Mob.No.:9960716342