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OBJECTIVES After studying this unit, you should be able to:

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OBJECTIVES After studying this unit, you should be able to: z Define Environmental Studies z Explain the

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OBJECTIVES After studying this unit, you should be able to: z Define Environmental Studies z Explain the

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OBJECTIVES After studying this unit, you should be able to:

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OBJECTIVES After studying this unit, you should be able to:

Scope and Importance of the Environmental Studies z Understand the Importance of the Studies Irrespective of Course z Describe the Need for Creating Public Awareness about Environmental Issues INTRODUCTION Let us first explain the meaning of environment. Then, we will move to environmental studies. The environment is something with which you are quite familiar. It includes all that builds up our surroundings and influences our ability to survive on this earth. The air we breathe, the water that occupies most of the earth's surface, the plants and animals around us, and much more. In recent years, scientists have been cautiously inspecting the ways that people impact the environment. They have observed that we are causing air pollution, deforestation, acid rain, and other problems that are harmful both to the earth and to ourselves. Nowadays, when we hear people talking about “the environment”, they are usually conforming to the complete situation of our planet, or how healthy it is. Thus, man is firmly placed as an important part of the global ecosystem, which depends on him much as he depends on it. Hence, there is a close relationship between man and environment. In this unit, you will study the concept of environmental studies. You will also analyse the scope and importance of the environmental studies. At the end of the unit, you will learn about the need for creating public awareness about environmental issues. 1.1 DEFINITION AND CONCEPT OF ENVIRONMENTAL STUDIES Now let us begin with the definition and concept of environmental studies. With the above fact in view, you must be in a position to understand a definition of environment. The word ‘environment’ is originated from the French word, environ means 'around' or 'to surround' or 'to encompass'. This means that environment includes things or objects or events that surround us. But this definition is not enough. This needs to be enlarged to include that there is an interaction between objects and surrounding. You must note that it is the interaction between living beings (plants and animals) and their environment. Living being and their environment include

Unit 1 - Nature of Environmental Studies Notes 7 physical non-living components like air, rivers, oceans, land and mountains. They also include interaction among living beings. It is, thus, a multidirectional system of interactions. This system is made up of living organisms and non- living physical components (like air, water and land) of our planet earth and its associated features like weather, waves and tides. When we consider environment as a system concept, we must be clear that a system is made up of components which can be separately identified and studied. However, they are connected and these connections are repeated in time and space. Each component is a system by itself and can be referred to as ecosystem. Lakes, ponds, mountain ranges, forests and coastlines are some of the examples of ecosystems. If the realisation about our dependence on healthy environment becomes part of our thinking, the action for the protection of nature then, also becomes its part. We know that life is dependent upon natural environment that includes air, water and land. We get a number of services from environmental resources that are necessary for production of goods and services. Source: http://www.uta.edu/ees/ Figure 1.1: Areas of Environmental Studies Environmental studies constitute knowledge of many disciplines of natural sciences, social sciences and humanities, biology, chemistry, geology, physics,

Environmental Studies Notes 8 atmospheric studies, hydrology, anthropology, sociology, law, economics and ethics. Besides, there are many other disciplines from which the edifice of environmental studies is built. Apart from the knowledge of various disciplines, environmental studies involve developing a sense of spirit of environment or our surroundings in a larger context. It is important for you to note that when one goes out and looks at the landscape, the forests, lakes, rivers or mountains, one starts learning about the relationship between the living and the non-living and the entire concept of life support system. Environmental studies then can be seen as a study of objects and the processes. The lakes, rivers, mountains or living organisms (plants, animals and human) are the objects. These objects undergo a dynamic change. This involves processes like flow of energy and cycling of nutrients. Such a learning experience ignites the curiosity and brings a feeling that the world we live in, is not of human making and it does not follow the laws and rules of man. Environment provides habitat (place) in which plants and animals survive. The resources are of two kinds; non-renewable and renewable. The former, if used at the present rate may become depleted. Renewable resources like forests and fisheries cannot be overused or exploited. They need constant renewal that does not happen automatically because of over consumption/use by rapidly growing population. More people mean more requirements of goods and services. And with rising income, people become more affluent, spend more and consume more. This practice of consumption results in more production and exploitation of resources. When resources decline, for example, shrinking forests or depleting fisheries, this may result in environmental damage. Also, expanding deserts, overgrazing, eroding soils, falling water levels, rising temperatures, melting glaciers or dwindling variety of plants and animals further add to environmental damage. Also, you must understand that the pollution that results from our production and consumption systems interferes with the ability of environment to provide a healthy habitat for living beings. Pollution damages air, water and land. Air becomes harmful, water becomes unfit to drink and land with its pollutants and toxic wastes that originate from industrial processes and landfills, becomes a threat to life. 1.2 SCOPE AND IMPORTANCE OF THE ENVIRONMENTAL STUDIES In this section, you will learn about the scope and importance of the environmental studies. The scope of environmental studies is very large. We have today, fairly good knowledge of this subject, especially the environmental

Unit 1 - Nature of Environmental Studies Notes 9 problems that concern us and our future on this planet. Some of the problems are global because they affect everyone in the world. Examples of these are global warming or climate change and ozone depletion. Then there are problems that are regional and local. Examples of these are destruction of forests, degradation of land, pollution of air, water, soil, and management of wastes both hazardous and non-hazardous. As we see around at

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the area in which we live, we observe that our surroundings were formerly a natural landscape such as a forest, a river, a mountain, a desert, or a combination of these elements. Most of us live in landscapes that have been heavily modified by human beings, in villages, towns or cities.

But even those of us who live in cities get our food supply from surrounding villages. These villages, in turn,

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are dependent on natural landscapes such as forests, grasslands, rivers, seashores, for resources such as water for agriculture, fuel wood, fodder, and fish. Thus, our daily needs

are connected with our surroundings and greatly influence them. We consume water to drink and for other day-to-day functions. We breathe air, we use resources from which food is made and we depend

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on the community of living plants and animals which form a web of life,

of which we are also a part. Everything around us forms our environment and our lives rely on keeping its vital systems as intact as possible. Our dependence on nature is so vast that we cannot continue to live without protecting the earth's environmental resources. Thus, you must be aware that

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most traditions focus to our environment as 'Mother Nature.' Most traditional societies have understood that respecting nature is

a prime concern for their livelihoods. All the environmental problems pose a great challenge to us and our way of life irrespective of whether we are living in developed countries or developing countries. We, today, find that our economic growth is proceeding at a faster rate. Standards of living are rising, especially in the developed nations and among the middle and upper strata of society in the developing nations. International trade is rapidly growing and production of goods and food grains is increasing. Similarly, life expectancy is going up and many diseases have been brought under control. Many more positive developments like those in communication and information system are indications of human capacity using science and technology for making life more comfortable. However, we must take care of the results arising out of such situations which show a rapid pace of growth and development. If this development is destroying our support system, i.e. our natural resources, then we have to reconsider our concept of living standard and economic development. If by producing bumper crops and large quantities of food grain we deplete our ground water resource, erode our topsoil and lose soil fertility, then we are damaging our life support system.

Environmental Studies Notes 10 Source: http://www.hulcher.com/featured-projects/case-studies/environmental-services/environmental-remediation- chemical-plant.asp Figure 1.2: Before and After Results of Environmental Studies Our livestock (sheep, goat and cow), which are the major sources of animal proteins live on grazing land which is under great pressure. Overgrazing has led to increase in desertification and in turn, to dust storms. As mentioned earlier, our forests are under great stress. Trees are cut faster than they can be planted. Deforestation thus leads to floods, it also causes imbalance in ecosystem. The capacity of ecosystem to absorb excessive carbon dioxide produced as a result of burning of fossil fuels (coal, petrol) is reduced. The result is, rise in the level of carbon dioxide leading to rise in the earth's temperature. This further leads to melting of ice in the arctic causing havoc in the form of cyclones and floods. We are witnessing loss of biodiversity, (plants and animals) which means we are losing biological wealth. Our plants and animals are being destroyed due to destruction of habitat, climate change and pollution. We must realise that each species of plants and animals not only has a role in ecosystem but many of them constitute a source of food and life-saving drugs also. Natural disasters due to hurricanes and

 cyclones are occurring often causing not only environmental damage but are also leading to huge economic losses. You must observe the three reasons for studying the state of the environment. 1. Need for information that clarifies modern environmental concepts such as the need to conserve biodiversity, the need to lead more sustainable lifestyles and the need to use resources more equitably. 2. There is a need to change the way in which we view our own environment by a practical approach based on observation and self-learning. 3. There is the need to create a concern for our environment that will trigger pro-environmental action; including activities we can do in our daily life to protect it. A multidisciplinary approach is required to understand and tackle problems relating to environmental damage. It is the knowledge of science, arts and humanities that would enlarge our understanding of the environment. Also, we require to adopt an approach that transforms the knowledge and understanding into action. For example, action is required as to how to adopt the best practices for land use vis-à-vis environmental protection or how to reduce emission of harmful gases by adopting best engineering or chemistry skills. Such examples can be multiplied, embracing knowledge from various disciplines. No single discipline or its approach would help us in understanding environment and its problems. It is a multifaceted problem with multipronged corrective measures that should be the central policy and approach. Whatever the approach is, but this is a fact that our existing policies of growth, progress or development are not sustainable for sure. Our present model of economics and development is short-sighted because it is depleting our natural resources which constitute natural capital. We have to adopt an approach in which economic progress and development become compatible with natural resources. Our political leaders, economists, industrialists, capitalists and other stakeholders have to integrate the principles of sustainability into decision-making process. It is a difficult and complex situation because it requires a change in our mind-set towards the very notion of progress and prosperity. Take any article that you use in daily life – a bucket full of water, or an item of food, a table, or a book. Trace its components journey backwards from your home to their origins as natural resources in our environment. How many of these components are renewable resources and how many non-renewable?

 Self Assessment Fill in the blanks: 1. Environmental studies can be seen as a study of ..... and the ..... 2. A ..... approach is required to understand and tackle problems relating to environmental damage. 3. Lakes, ponds, mountain ranges, forests and coastlines are some of the examples of ..... 4. The capacity of ecosystem to absorb excessive carbon dioxide produced as a result of burning of fossil fuels (coal, petrol) is ..... 5. Deforestation leads to ..... 1.3 IMPORTANCE OF THE STUDIES IRRESPECTIVE OF COURSE Now let us discuss the importance of the studies irrespective of course. There is another aspect of environmental studies, namely the economic growth that needs our attention. The economies of both the developed and developing world are growing. India and China constitute largest population of developing world; both are in the process of expanding their economies. A large number of people in both these countries are getting into middle class economically. Prosperity and consumptions, particularly in China, are increasing as rapidly as in Japan. Imagine what will happen if people of China and India come to have one car per family as in the USA; it would mean consumption of as much fuel per day as is being daily produced worldwide. And where will be the place to park these vehicles? To do this, land will have to be made available, which is now being used for agriculture. This would in turn lead to decline in agriculture output. Take an example of paper consumption. If per capita consumption of paper in China or India rises to the same level as that of the USA, the forests would disappear gradually. Many more examples of these kinds lead us to conclude that we need a different model of economic development. This should certainly not be based on western fossil fuel or carbon but a new kind of economic model that would stop the decline of natural wealth in our ecosystem. A new economy is needed that would take into consideration the basic ecological concepts. The experts are of the opinion that carbon-based economy should be replaced by hydrogen- based economy where we would be using renewable sources of energy.

Unit 1 - Nature of Environmental Studies Notes 13 1.3.1 Population and Its Implications You must know that population growth and economic development are affecting the environment. The interplay between population growth, resource depletion and environmental damage has been debated much. There are people who think that high population growth causes stress on environment. There are also some others who put more blame on economic development, industrial and agricultural practices for causing environmental damage. The fact is that both population growth and unsustainable economic development are the causes for concern, especially in developing countries. There is relationship between population growth and environmental damage but it is very difficult to prove or disprove the effects of population on the environment. We may recall famous Eirlich Equation: I = P × A × T I = Impact on environment P = Population A = Affluence (consumption) T = Technology co-efficient India's population is now beyond one billion mark. Have we devised developmental programmes that commensurate with this increase? If not, population factor alone would have significant contributions toward degradation of environment and resource depletion. More people mean more pressure on resources, more consumption of energy, more production of wastes, including greenhouse gases – all having adverse effects on environment. Though population growth has slowed down, it has to be stabilised at still lower level.
Table 1.1: Population World Population Reached It is Expected to Reach One Billion in 1804 Two Billion in 1927 Three Billion in 1960 Four Billion in 1974 Five Billion in 1987 Six Billion in 2000 Seven Billion in 2013 Eight Billion in 2028 India's population may reach 1.2 Billion in 2016 increasing by 16–17 million each year Note: There is also high projection of 11 billion by 2050 and low projection of 7.5 billion, in 2040.
Environmental Studies Notes 14 1.3.2 Gross National Product You need to be aware that the rate of Gross National Product (GNP) is considered to be an indicator of economic performance of any nation. Increase in GNP indicates that economic health of the country is good. But such increase in the ultimate analysis is based on high rate of consumption of natural resources of which environmental degradation is the result. In such a situation, economic growth comes in conflict with issues of environmental concerns. India, since the early 1990s, opted for a major economic transition towards free market economy. Major economic advantages are expected to follow this transition. However, economists would have to take into account the idea of ecological disadvantages inherent in such an economic shift. In order to ensure the success of such an economic transition, it is imperative that the economists take into account short and long-term ecological costs so that in our effort to increase GNP, we may not liquidate ecological assets. High economic growth means high rate of extraction, transformation and utilisation of non-renewable resources. We must realise that though higher rate of GNP is important, equally important is the rate of regeneration of natural resources. Concept of sustainable development which was brought into focus ('Our Common future,' 1987) states that economic growth has to be environmentally sustainable. There is no economic growth without ecological costs. The GNP in the annual budget must be accompanied by ecological budget. Taken together the two will give a real picture of our economy. The National Accounting System should reflect the state of both our economy and environment. There is one more issue. As mentioned above, the developing countries have yet to undertake more developmental programmes and yet to attain reasonable standards of living. Therefore, GNP must increase for these countries. But one must realise that increased development and higher GNP are related to environmental damage and resource depletion. Therefore, an element of resource regeneration and positive approach to environment has to be incorporated in developmental programmes.
1.3.3 Poverty It is important for you to note that poverty is a multidimensional problem. It is a major challenge all over the globe. In relation to development and environmental issues, solutions to poverty are country-specific. While managing environment and resources, due consideration has to be given to the fact that poor people directly depend upon natural resources for their livelihood.
Unit 1 - Nature of Environmental Studies Notes 15 Source: http://business.inquirer.net/50043/indian-poverty-levels-fall-to-29-8%E2%80%94gov%E2%80%99t Figure 1.3: Poverty in India Therefore, an effective strategy for tackling the problems of environment, development and poverty has to begin with the economic conditions of people, their resources and productivity. Development must address the issue of eradication of poverty which is linked with employment for both women and youth and other income generation programmes. 1.3.4 Human Settlement Issues You should keep in mind that human settlement conditions, especially in developing countries are deteriorating mainly as a result of low investment in sectors like housing and social welfare. The environmental implications of urban development and other human habitations (slums) must be recognised, giving priority to the needs of urban as well as rural poor. The thrust of human settlement programmes should be for: 1. Providing shelter to all 2. Investing infrastructure for providing water and managing sewage and solid waste 3. Promoting sustainable energy and transport system in human settlement 4. Promoting sustainable land-use management 1.3.5 Land Resources You must understand that planning and management of land resources constitute another area of concern for environment. Land not only includes a physical entity in terms of topography but it also includes natural resources, soil, minerals and biota. These components of land provide a variety of services essential for life-support system. Land is a finite resource. The integrated approach for management of land requires sectorial planning concerned with various aspects of land use and its resources.

Environmental Studies Notes 16 Source: http://www.sciencedaily.com/releases/2008/05/080528101708.htm Figure 1.4: Land Resources 1.3.6 Forests Here you must observe that it is relevant to mention that rational approach for the management of forest and forestlands is a major issue as far as environmental problems are concerned. Sustainable forest development, production of forest products and forest services, require an institutional approach at governmental level. Management of forests requires specialised managerial skills. Source: http://worldwildlife.org/habitats/forests Figure 1.5: Forests 1.3.7 Mountains You will find it interesting to know that about 10% of world's population depends directly on mountain resources. But mountain ecosystem is undergoing degradation; consequently, the inhabitants of hills are facing resource crunch and poverty. In the process of degradation, there is rapid loss

Unit 1 - Nature of Environmental Studies Notes 17 of plants and animals too. Therefore, proper management of mountain resources and socioeconomic conditions of inhabitants must be given priority. Source: http://www.getupanddosomething.org/click-to-calm-mountains/ Figure 1.6: Mountains 1.3.8 Agriculture It is essential for you to know that agriculture is the mainstay of Indian economy and villages are support basis of growth of India. Agriculture has to meet the challenge of growing population mainly by increasing production on the land which is already under use and by preventing further encroachment on land. Major adjustments are required in agricultural policy vis-à-vis environment both in developed and developing countries for increasing food production and farm products. Agricultural output is dependent upon fertilizers (natural or artificial) and pesticides; both of these have environmental implications. An increased understanding of interaction between agriculture and ecosystem is required, especially when modern technologies are used. Source: http://www.oxfamblogs.org/fp2p/?cat=600 Figure 1.7: Agriculture in India Environmental Studies Notes 18 1.3.9 Biodiversity You must also know that biodiversity or biological diversity means a variety of plant and animal species. Presence, absence and richness of these species determine the state of biological wealth. Decline in biodiversity due to human activities is a threat to our environment. Source: http://www.greenrooftechnology.com/biodiversity Figure 1.8: Biodiversity 1.3.10 Protection of Oceans You should keep in mind that management of marine resources of seas and islands is crucial. The coastal areas contain diverse and productive habitats for human settlements. Many of the world's poor are crowded in coastal areas. These areas are under constant threat and erosion, (recent instance is Tsunami). The marine environment is being constantly polluted by sewage; plastic, metals and other organic compounds, especially oil both by accident or illegal spills. Management of these wastes has to be carried out in such a manner that it would not affect the productive capacity of the oceans. Source: http://newswatch.nationalgeographic.com/2009/06/29/new_havens_for_manta_rays_whal/ Figure 1.9: Indian Ocean

Unit 1 - Nature of Environmental Studies Notes 19 1.3.11 Trade and Commerce Trade and commerce activities show that 21st century markets have been driven by the requirements of sustainable environments. Markets of the new millennium will be able to create wealth if they respond to sustainable development. Sustainability will become the ultimate end of business. Unsustainable products will become obsolete. The 'Earth Summit' (1992) did suggest programmes that would promote environmental protection and resource conservation for industry. Source: www.legalindia.in Figure 1.10: Trade and Commerce 1.3.12 Business and Industry It must be already known to you that business and Industry are closely linked with environment and resources utilisation. Production process and strategy for eco-friendly technologies throughout the product life cycle and minimisation of waste play major role in protecting the environment and conservation of resources. Business, Industry and multinational corporations have to recognise the environmental management as the priority areas and a key determinant to sustainable development. Some enlightened leaders of industry and transnational corporations are implementing certain policies that show environmental concern – viz. Environment Impact Assessment (EIA) and Environmental Audits. Besides, legal compliance, some of them are voluntarily taking innovative initiatives in this regard. Business and Industry both have a major role in environmental degradation and resource depletion. In developing countries most of the industries are not fully sensitive to the damage to the environment. This attitude has to change. A few businesses have realised that environment can provide competitive advantage like Total Quality Management (TQM) did in 1980's and 1990's. Twenty-first century markets shall be driven by the requirements of sustainable environments. Markets of new millennium will be able to create wealth if they respond to sustainable development. Sustainability will become the ultimate end of business.

Environmental Studies Notes 20 Unsustainable products will become obsolete. The 'Earth Summit' did suggest programmes that would promote environmental protection and resource conservation. These are discussed elsewhere. Source: http://businesstoday.intoday.in/story/cci-survey-says-india-business-confidence-worsened-in-q3/1/191316.html Figure 1.11: Industry in India 1.3.13 Ecological Deficit Whenever there is budgetary deficit and economic crisis, you must take note of it that the economists try to offset it by taking loans from various agencies including International Institutions like World Bank and International Monetary Fund. They even mortgage the gold reserves. All these are to be returned when the economy improves. As far as environment is concerned, we are creating a deficit of our non-renewable resources on account of production and other direct and indirect developmental programmes. This is 'ecological deficit'. What are the efforts to be undertaken for reducing this deficit? To reduce the ecological deficit, some projects were taken up during the early part of the eighties like Ganga Action Plan, Watershed Rehabilitation and Wasteland Development Programme. We have yet to develop strategies to ensure that there is no addition to the ecological deficit on account of economic growth. Unlike economic discipline imposed through the Annual Budget, no ecological discipline has been imposed to prevent future decline of our environment. One strategy should be to make the environmental management a statutory obligation of all developmental projects. History of ecology gives us a clear lesson. Over 6000 years ago, flourishing civilisations of Mediterranean, Babylonian, Nile Valley, Indus Valley, Hang Ho Valley and Mayan crumbled because these civilizations were not concerned with the importance of environment, though they have given advanced knowledge in science, technology, agriculture, literature, culture, music, art, etc. The Indian civilisation had respect for environment but this has now been forgotten by us.

Unit 1 - Nature of Environmental Studies Notes 21 1.3.14 Village and Community Involvement As far as India is concerned, no development is possible without village and its community's involvement. Before modernisation, the village grazing lands, forests, streams and ponds were common property and villagers played an important role in their management. The British nationalised these resources and brought them under the management of government agencies. They formulated rules for planting of trees (social forestry). This alienated the villagers. Without villages' support, survival rate for the tree would be poor. The same is true of village ponds and streams which can be taken care of by the villagers themselves. Limits to Growth It is an important fact for you to know that we will not be able to 'manage' the environmental crisis unless people change their attitude, consumption patterns and production process. They have to develop a technological world that is less intensive in its use of materials and energy. It is also a fact that improvements in efficiency alone will not be enough. The economies till recent days are following a policy that assumes growth as an infinite variable. They are not mindful of what is called carrying capacity concept. The world now is desperately trying to keep pace with the environmental problems it has been creating as a result of the above policy. Take the case of climate change (global warming). It can only be combated if the world can make a rapid transition to a non-carbon energy economy so that the limitations of environmental concerns posed by carbon energy economy would be lessened. The nations of the world would then have almost unlimited environmental space in the foreseeable future to use alternate source of energy for their economic growth. For ensuring the sustainable use of global common systems, a separate set of policies would have to be adopted. It has to be a system that provides for the establishment of equitable entitlements or property rights to provide economic incentives to those who use this environment in a sustainable manner and disincentives to those who use it in an unsustainable manner. Within a globalised economy, those who consume more than their fair share of the world's environmental resource would thus have to pay for the extra resource they want to use from those who do not consume their full share. In this way, the world will begin to 'value the unvalued commons'. In case of global warming problem, the answer would be in establishing equitable entitlements to carbon emissions trading mechanism which helps to penalise those who want to consume more than their entitlements and reward those who do not use the full share of their entitlements. The world's knowledge system does not protect the biological knowledge of the local communities which reduces their interest in their local biodiversity resources. If this knowledge was protected and, thus, valued, then the interest

Environmental Studies Notes 22 of these communities and biodiversity-rich nations in their biological resources would also increase. The world is going to face an enormous challenge in the coming years. But our civil societies and changing social system will have the capacity to turn around to convince all the stakeholders that nature has its own rules and it will take its revenge if its capacity is stretched too much. Self Assessment Fill in the blanks: 6. The economies of both the developed and developing world are ..... 7. India and ..... constitute largest population of developing world. 8. Population growth and ..... development are affecting the environment. 9. Rate of Gross National Product (GNP) is considered to be an indicator of ..... of any nation. 10. Poverty is a ..... problem and is a major challenge all over the globe. 1.4 NEED FOR CREATING PUBLIC AWARENESS ABOUT ENVIRONMENTAL ISSUES Now in this section, let us study the need for creating public awareness about environmental issues. Concern about environment has existed for long time but developments of the last fifty years or so have seen a surge in environmental issues among the public. It arises from a desire to improve quality of life. The educational institutions, media, judiciary, and voluntary organisations (NGOs) have contributed a lot in creating environmental awareness. The government has also started a campaign for educating people about protection and conservation of nature, natural resources and ecology. An environmental movement has brought an increased awareness. This has led the governments to review existing legislation and regulations and enact new laws and formulate rules for the protection of environment. Enormous literatures with a focus on important environmental issues have been published. Schools and colleges started eco-clubs or societies on environment protection not only to educate the student population but also the community. These awareness clubs emphasise that human is trying to alter nature. Nature no longer takes care of itself due to human needs and greed. Therefore, environmental protection is a matter of great concern.

69% **MATCHING BLOCK 14/213** W

As the earth's natural resources are deteriorating and our environment is being largely ruined by human activities, it is clear that something required to be

69% **MATCHING BLOCK 15/213** W

As the earth's natural resources are deteriorating and our environment is being largely ruined by human activities, it is clear that something required to be

56% **MATCHING BLOCK 11/213** W

natural resources are deteriorating and our environment is being largely ruined by human activities, it is clear that something required to be

Unit 1 - Nature of Environmental Studies Notes 23 done. We usually realise that managing all this is something that the Government should perform. But if we go on degrading our environment, there is no method by which the Government may do all these clean-up functions. It is the prevention of environment degradation in which we all must take part that must become a part of all our lives. Just as for any disease, prevention is better than cure. To prevent ill-effects on

86% **MATCHING BLOCK 13/213** W

our environment by our actions is economically more viable than cleaning up the environment once it is damaged. Individually we can play

91% **MATCHING BLOCK 18/213** W

once it is damaged. Individually we can play a major role in environment management. We can reduce wasting natural resources and we can act as watchdogs that inform the Government about sources that lead to pollution and degradation of our environment.

91% **MATCHING BLOCK 24/213** W

once it is damaged. Individually we can play a major role in environment management. We can reduce wasting natural resources and we can act as watchdogs that inform the Government about sources that lead to pollution and degradation of our environment.

93% **MATCHING BLOCK 16/213** W

natural resources and we can act as watchdogs that inform the Government about sources that lead to pollution and degradation of our environment.

It is important for you to note that

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this can only be made possible through mass public awareness. Mass media such as newspapers, radio, television, strongly influence public opinion.

90% **MATCHING BLOCK 19/213** W

this can only be made possible through mass public awareness. Mass media such as newspapers, radio, television, strongly influence public opinion.

92% **MATCHING BLOCK 20/213** W

this can only be made possible through mass public awareness. Mass media such as newspapers, radio, television, strongly influence public opinion.

96% **MATCHING BLOCK 23/213** W

However, someone has to bring this about. If each of us feels strongly about the environment, the press and media will add to our efforts. Politicians in a democracy always respond positively to a strong publicly supported movement. Thus if

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If each of us feels strongly about the environment, the press and media will add to our efforts. Politicians in a democracy always respond positively to a strong publicly supported movement.

100% **MATCHING BLOCK 22/213** W

If each of us feels strongly about the environment, the press and media will add to our efforts. Politicians in a democracy always respond positively to a strong publicly supported movement.

you join an NGO that supports

87% **MATCHING BLOCK 27/213** W

conservation, politicians will make green policies. We are living on spaceship earth with a limited supply of resources. Everyone is responsible for exposing this message to as many people as possible.

You must observe that in order to sustain nature, and ourselves we need better education for ourselves and our children to understand ecology and natural resources and their use. There is a ray of hope to be optimistic because people, especially in the developed countries have begun to respond to increased awareness of environmental issues by changing their attitudes, values and actions. Many people, various national and international agencies and other organisations are trying to understand environment in a more responsible way. Prepare a survey report on efforts that are required to disseminate knowledge about environmental issues and responsibility. Self Assessment Fill in the blanks: 11. Environmental studies constitute knowledge of ..... disciplines. 12. Besides the knowledge of various disciplines, environmental studies involve developing a sense of ..... or our surroundings in a larger context. 13. A ..... approach is required to understand and tackle problems relating to environmental damage.

Environmental Studies Notes 24 14. Lakes, ponds, mountain ranges, forests and coastlines are some of the examples of ..... 15. All the environmental problems pose a great ..... to us and our way of life irrespective whether we are living in developed countries or developing countries. Turmeric (Haldi) and Neem Turmeric Emotions flared in India in March 1995, when the US Patent and Trademark Office (USPTO), Washington DC, awarded a patent on the use of turmeric (Cucurma longa) to heal ulcers and surgical wounds to the University of Mississippi Medical Centre. Generations of Indians who had grown up using 'grandmother's remedy' of turmeric paste or powder on scrapes and cuts protested, and were furious that foreign scientists had claimed rights over a remedy that Indians have known about for centuries. Neem The neem tree (Azadirachta indica), native to India, holds the distinction of being the subject of more than 53 patents in the world, but the majority of the patents belong to Northern corporations. The Indian government, scientific community and corporations have watched helplessly as the opportunity to commercialise the uses of neem, which had clearly emerged from Indian tradition and science, slipped through their fingers. Research on neem in India began in the 1920s at the Indian Institute of Science in Bangalore. In 1942, a scientist of CSIR isolated nimbim, a biologically active compound, from neem. But Indian scientists failed to take work forward to the stage of industrial and commercial production. As a result, India, with a total of just three patents in 1996, emerged as a late entrant in neem research. The first Indian patent was obtained by the National Institute of Immunology in 1993, the second by a private company Godrej Soaps Ltd. in 1994, and the third by CSIR in early 1995. Since 1995, however, Indian scientific institutions appeared to have adopted a more proactive stance, and 6 US patents have been awarded. Question: What do you infer from the given case study? Source: Global Environmental Negotiations.

Unit 1 - Nature of Environmental Studies Notes 25 SUMMARY z Environmental studies constitute knowledge of many disciplines of natural sciences, social sciences and humanities, biology, chemistry, geology, physics, atmospheric studies, hydrology, anthropology, sociology, law, economics and ethics. z There are many other disciplines from which the edifice of environmental studies is built. z Besides the knowledge of various disciplines, environmental studies involve developing a sense of spirit of environment or our surroundings in a larger context. z When one goes out and looks at the landscape, the forests, lakes, rivers or mountains, one starts learning about the relationship between the living and the non-living and the entire concept of life support system. Environmental studies can be then seen as a study of objects and the processes. z A multidisciplinary approach is required to understand and tackle problems relating to environmental damage. z The scope of environmental studies is very large. z We have today, fairly good knowledge of this subject, especially the environmental problems that concern us and our future on this planet. z Some of the problems are global because they affect everyone in the world. Examples of these are global warming or climate change and ozone depletion. z All the environmental problems pose a great challenge to us and our way of life irrespective of whether we are living in developed countries or developing countries. z We today find that our economic growth is proceeding at a faster rate. z Many more positive developments like those in communication and information system are indications of human capacity using science and technology for making life more comfortable. KEYWORDS Environmental Studies: Environmental studies is the interdisciplinary academic field which systematically deals with

human interaction with the environment in the interests of solving complex problems.

Multidisciplinary Approach: A multidisciplinary approach involves drawing appropriately from multiple disciplines to redefine problems outside of normal boundaries and reach solutions based on a new understanding of complex situations.

Environmental Studies Notes 26 Poverty: Poverty is scarcity, dearth, or the state of one who lacks a certain amount of material possessions or money. MULTIPLE CHOICE QUESTIONS Choose the correct answer from the following options: 1. Environmental studies constitute knowledge of: (a) Natural sciences (b) Social sciences (c) Humanities (d) All of the above 2. Life is dependent upon natural environment that includes: (a) Air (b) Water (c) Land (d) All of the above 3. Pollution damages: (a) Air (b) Water (c) Land (d) All of the above 4. The scope of environmental studies is: (a) Small (b) Large (c) Very large (d) Very small 5. The economies of: (a) Developed world is growing (b) Developing world is growing (c) Both the developed and developing world are growing (d) Both the developed and developing world are reducing 6. There is relationship between population growth and environmental damage but: (a) It is very easy to prove the effects of population on the environment (b) It is very difficult to prove or disprove the effects of population on the environment. (c) Both of the above (d) None of the above 7. Famous Eirlich Equation is: (a) I = P + A × T (b) I = P × A + T (c) I = P × A × T (d) I = P + A - T 8. In Eirlich Equation, I = Impact on environment, P = Population then A is: (a) Annuity (b) Amount (c) Affluence (consumption) (d) None of the above

Unit 1 - Nature of Environmental Studies Notes 27 9. India's population is now: (a) One billion mark (b) Beyond one billion mark (c) Below one billion mark (d) None of the above 10. Decline in biodiversity due to human activities is a ..... to our environment. (a) Boon (b) Support (c) Threat (d) None of the above REVIEW QUESTIONS 1. Define environmental studies by giving examples. 2. "The scope of environmental studies is very large." Discuss. 3. Enumerate

the importance of environmental studies. 4. Write an essay on "Multidisciplinary Nature of Environmental Studies". 5. Discuss the

the importance of environmental studies. 4. Write an essay on "Multidisciplinary Nature of Environmental Studies". 5. Discuss the

the importance of environmental studies. 4. Write an essay on "Multidisciplinary Nature of Environmental Studies". 5. Discuss the

impact of population on environment studies. 6. What do you know about Gross National Product (GNP)? Explain. 7. Write short notes on the following: (i) Poverty (ii) Land Resources (iii) Biodiversity (iv) Ecological Deficit (v) Protection of oceans Answers: Self Assessment 1. Objects, Processes 2. Multidisciplinary 3. Ecosystems 4. Reduced 5. Floods 6. Growing 7. China 8. Economic 9. Economic performance 10. Multidimensional 11. Many 12. Spirit of environment 13. Multidisciplinary 14. Ecosystems 15. Challenge

Environmental Studies Notes 28 Answers: Multiple Choice Questions 1. (d) All of the above 2. (d) All of the above 3. (d) All of the above 4. (c) Very large 5. (c) Both the developed and developing world are growing 6. (b) It is very difficult to prove or disprove the effects of population on the environment. 7. (c) I = P × A × T 8. (c) Affluence (consumption) 9. (b) Beyond one billion mark 10. (c) Threat FURTHER READINGS Anindita Basak, Environmental Studies, Pearson Education. C.J. Barrow, Environmental Management: Principles and Practice, Routledge. Dr. R.J. Ranjit Daniels and Dr. Jagdish Krishnaswamy, Environmental Studies, Wiley India. Lewis Owen and Tim Unwin, Environmental Management: Readings and Case Studies, Wiley. N.K. Uberoi, Environmental Studies, Excel Books. R. Rajgopalan, Environmental Studies from Crises to Cure, Oxford University Press. en.wikipedia.org/wiki/Environmental_science en.wikipedia.org/wiki/Environmental_studies evsbyak.blogspot.com/2012/10/the-multidisciplinary-nature- of.html www.nap.edu/openbook.php?record_id=9975&page=8

Unit 2 - Natural Resources and Associated Problems Notes 29 UNIT 2 - NATURAL RESOURCES AND ASSOCIATED PROBLEMS CONTENTS Learning Objectives Introduction 2.1 Renewable and Non-renewable Resources 2.1.1 Definitions 2.1.2 Associated Problems 2.2 Forest Resources 2.2.1 General Description of Forest Resources 2.2.2 Functions and Benefits of Forest Resources 2.2.3 Effects on Environment due to Deforestation, Timber Extraction, Building of Dams, Waterways, etc. 2.3 Water Resources 2.3.1 Hydrosphere: Different Sources of Water 2.3.2 Use and Overexploitation of Surface and Ground Water 2.3.3 Effect of Floods, Draught, Dams, etc. on Water Resources and Community 2.4 Mineral Resources 2.4.1 Categories of Mineral Resources 2.4.2 Basics of Mining Activities 2.4.3 Mine Safety 2.4.4 Effect of Mining on Environment 2.5 Food Resources 2.5.1 Food for All 2.5.2 Effects of Modern Agriculture 2.5.3 World Food Problem Summary Keywords Multiple Choice Questions Review Questions Further Readings
Environmental Studies Notes 30 LEARNING

100%	MATCHING BLOCK 30/213	W

OBJECTIVES After studying this unit, you should be able to:

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OBJECTIVES After studying this unit, you should be able to:

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OBJECTIVES After studying this unit, you should be able to:

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OBJECTIVES After studying this unit, you should be able to:

z Differentiate between Renewable and Non-renewable Resources z Enumerate Forest Resources z Discuss Water Resources z Describe Mineral Resources z Analyse Food Resources INTRODUCTION We use a variety of materials which are derived from environment. Example: We have materials like metals (steel, aluminium, copper, zinc, lead, etc.); again we have non-metallic materials (sand, stones, clay, limestone, etc.). Similarly, we have minerals (phosphates, potash, lime, etc.); and raw materials like wood, coal, petroleum. Conservation of resources is an absolute necessity for economic growth as well as development and adequate living standards of growing populations. To understand these issues, it is essential to understand the functioning of the natural resources and the environment of which they are the parts. In this unit, you will study about the

90%	MATCHING BLOCK 35/213	W

renewable and non-renewable resources, forest resources, water resources, mineral resources

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renewable and non-renewable resources, forest resources, water resources, mineral resources

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renewable and non-renewable resources, forest resources, water resources, mineral resources

and food resources. 2.1 RENEWABLE AND NON-RENEWABLE RESOURCES Now let us begin the unit with understanding the concept of renewable and non-renewable sources. 2.1.1 Definitions Non-renewable resources means that any amount extracted or used is gone forever like coal, crude oil petroleum. Renewable resources are the resources like crops, fisheries, grass (on grazing lands) which are regenerated quickly after they are harvested. Renewables like groundwater may take longer time for renewal. 2.1.2 Associated Problems You must understand the problems associated with non-renewable sources: z They are finite and so will run out z Burning of fossil fuels to create energy produces lots of polluting gases

 z Contribute to global warming z Sculpture and nitrogen can cause acid rain Problems associated with renewable resources are: z One disadvantage with renewable energy is that it is difficult to generate the quantities of electricity that are as large as those produced by traditional fossil fuel generators. So it is needed to reduce the amount of energy used. z Another disadvantage of renewable energy sources is the reliability of supply. Renewable energy often relies on the weather for its source of power. Hydro generators need rain to fill dams to supply flowing water. Wind turbines need wind to turn the blades, and solar collectors need clear skies and sunshine to collect heat and make electricity. When these resources are unavailable so is the capacity to make energy from them. This can be unpredictable and inconsistent. The current cost of renewable energy technology is also far in excess of traditional fossil fuel generation. This is because it is a new technology and as such has extremely large capital cost. Natural resources notably, the non-renewables have to be used with a sense of responsibility because they are shrinking. 2.2 FOREST RESOURCES In this section, you will be able to understand the meaning of forest resources. 2.2.1 General Description of Forest Resources You must understand that the study and management of forest resources and forest ecosystem is a challenging task. They play a vital role in maintaining ecological balance, quality of environment, preventing soil erosion, conserving water, regulating water cycle, maintaining balance between oxygen and carbon dioxide and preventing floods. Recognising that the responsibility for forest management, conservation and sustainable development is in many countries allocated among central/state governments, each country, in accordance with its constitution and/or national legislation, should pursue these principles at the appropriate level of government. Tropical Rain Forests It is important to note that tropical rain forests need special mention because they are an excellent example of rich biodiversity and other characteristics, and need different consideration and management. They are located between tropic

 of Cancer and tropic of Capricorn. They receive lots of rains and remain wet and humid. They are subjected to deforestation like other forests. It is estimated that more than 50% of plant and animal species exist in tropical rainforests and yet these forests cover a small area on earth. It is believed by that one single species of trees, support 400 species of insects in these forests. Mangroves You must understand that these are forest ecosystems found mainly in the tropical and subtropical intertidal regions of the world. They inhabit a large number of plants and have remarkable capacity for salt tolerance. They stabilise the shoreline, inhabit rich biodiversity and provide source of livelihood for people of area. India has some of the best mangroves in the world located in the deltas of river Ganga, Godavari, Krishna and Cauvery and on Andaman and Nicobar Islands. 2.2.2 Functions and Benefits of Forest Resources It is important to note that forest resources constitute a complex system that deals with various aspects as: 1. Legal 2. Administrative 3. Economic 4. Social 5. Scientific It aims at efforts directed towards conservation of forests which include maintaining its ecosystem for production of goods and services that are economically, socially, legally viable and sustainable. It embraces many sectors of governmental organisations and requires a complete coordination of these sectors. The uses or functioning of forests falls under three categories: Use/Role of Forests for Maintaining Ecosystem This includes: 1. Protection of fauna and flora (biodiversity) 2. Carbon cycle 3. Protection of endangered/threatened species 4. Wildlife conservation 5. Control of soil erosion 6. Reclamation of eroded land 7. Irrigation and control of water runoff

Unit 2 - Natural Resources and Associated Problems Notes 33 Forests as Resources for Consumption by Indigenous People/Forest Dwellers/Rural and Deprived Population This includes use/consumption of: 1. Fuel wood 2. Grazing of livestock 3. Fruits and herbs 4. Household uses like sheds, furniture, poles, etc. 5. Weaving material like ropes and baskets 6. Food products like honey Industrial Uses 1. Pulp wood for various purposes like newsprints, paper, and packaging 2. Poles 3. Saw logs 4. Gums, resins, oils, etc. 5. Particle boards, fibber boards 6. Veneer logs for plywood, furniture You should note the methods for managing forests and forest resources. These resources are well developed in the countries of North. Most of the industrialised countries are aware of the need for developing efficient system with well-defined management objectives for avoiding over-exploitation. While reviewing above activities in respect of developing countries, one is led to the conclusion that these activities have resulted in serious deforestation and forest depletion. The management techniques would thus, involve understanding the causes of deforestation and forest depletion in these countries. Though the causes of deforestation and degradation have been categorically highlighted, it must be reiterated that the most essential is the clearing of forests lands for permanent agriculture. The other causes are rapid population growth and poverty, forcing the landless people to clear and cultivate forest land and to cut trees for fuel wood, and of course, the exploitation and uncovering of forests for industrial use. The issue of deforestation cannot be discussed in isolation; it is very much linked with other developmental issues. 2.2.3 Effects on Environment due to Deforestation, Timber Extraction, Building of Dams, Waterways, etc. You must understand the effects on environment due to the following:
Environmental Studies Notes 34 Deforestation The impact of deforestation on environment is as under: z Soil erosion: Soil erosion leads to loss of productivity of the land due to loss of mineral nutrients and soil microorganisms. Deforestation makes soil prone to erosion by agents such as wind and water. The roots of trees hold the particles of soil together thus, preventing the fertile top soil from being carried away. z Destruction of animal habitats: Marine and fresh water animals need forests as their habitats. These forests do not only provide a place for the animals to roam freely and fearlessly but also provide their food and act as a source of protection from predators through camouflage. Destruction of the animals' habitats literally kills the animals. z Medicinal plants: Some trees are used as herbs. Trees such as the Cinchona have been used as treatment against Malaria since time immemorial. Destruction of these forests leads to destruction of medicinal plants that could be used as treatment for various ailments. z Trees act as windbreakers: Absence of these trees enables strong winds and or storms, e.g. Hurricanes and Tornados. z Greenhouse effect and global warming: Nature balances the flow of energy and nutrients. Forests plan a very vital role in these cycles, e.g. the carbon cycle where deforestation causes carbon dioxide to remain in the atmosphere. Accumulation of carbon dioxide in the atmosphere acts as a blanket that traps long wave radiation of heat and prevents it from escaping the surface of the earth back into the atmosphere. This phenomenon is known as the greenhouse effect. The trapped radiation is converted into heat. This heat causes global warming. Timber Extraction It is important to note that the timber extraction has the following impact: z Timber extraction results in loss of forest cover that is essential for integrity and health of land. z Deforestation in mining area. z Net hydrologic losses for nitrogen, potassium, and calcium are shown for five years after whole-tree harvesting (WTH) and saw-log-only harvesting (SAW). Building of Dams Building of dams has the following impact: z Direct impacts to the biological, chemical and physical properties of rivers and riparian (or "stream-side") environments.

Unit 2 - Natural Resources and Associated Problems Notes 35 z The dam wall itself blocks fish migrations, which in some cases and with some species completely separate spawning habitats from rearing habitats. The dam also traps sediments, which are critical for maintaining physical processes and habitats downstream of the dam (include the maintenance of productive deltas, barrier islands, fertile floodplains and coastal wetlands). z Another significant and obvious impact is the transformation upstream of the dam from a free-flowing river ecosystem to an artificial slack-water reservoir habitat. Changes in temperature, chemical composition, dissolved oxygen levels and the physical properties of a reservoir are often not suitable to the aquatic plants and animals that evolved with a given river system. On the issue of how necessary are big dams there are different views. The first school of thought is—given the projected increase of population growth, demand for food and water and requirement of energy, one cannot do without mega projects of dams. The adverse environmental and social consequences of these projects can be mitigated or compensated. The opposite point of view is that the impacts and consequences of such projects can never be fully foreseen, and hence, cannot be mitigated or compensated fully. Opponents of big dams also argue that benefits which accrue from such projects are not fully realised. Therefore, the benefits cannot possibly outweigh social and environmental costs. Unfortunately, one rarely comes across a comprehensive and judicious examination of these opposing points of view. Waterways You may already be aware of the fact that a waterway is any navigable body of water. A shipping route consists of one or several waterways. Waterways can include rivers, lakes, seas, oceans, and canals. In order for a waterway to be navigable, it must meet several criteria: z The waterway must be deep enough to allow the draft depth of the vessels using it; z The waterway must be wide enough to allow passage for the beam width of the vessels using it; z The waterway must be free of barriers to navigation such as waterfalls and rapids, or have a way around them (such as canal locks and boat lifts); z The current of the waterway must be mild enough to allow vessels to make headway. Vessels using waterways vary from small animal-drawn barges to immense ocean tankers and ocean liners, such as cruise ships.

Environmental Studies Notes 36 Self Assessment Fill in the blanks: 1. We use a variety of materials derived from ..... 2. ..... of resources is an absolute necessity for economic growth, development and adequate living standards of growing populations. 3. It is true that forests are ..... resource. 4. ..... means that any amount extracted or used is gone for ever like coal, crude oil (petroleum). 5. The renewables are the resources like crops, fisheries, grass (on grazing lands) which are ..... quickly after they are harvested. 2.3 WATER RESOURCES This section emphasises on the meaning and concept of water resources. 2.3.1 Hydrosphere: Different Sources of Water The hydrosphere in physical geography describes the combined mass of water found on, under, and over the surface of a planet. Different Sources of Water Now let us discuss the different sources of water. z Manmade sources: Rainwater, oceans, rivers, lakes, streams, ponds and springs are natural sources of water. Dams, wells, tube wells, hand-pumps, canals, etc. z Rain water: Rain water collects on the earth in the form of surface water and underground water. z Surface water: Water present on the surface of the earth in the form of oceans, rivers, lakes, ponds and streams is called surface water. The water in rivers and lakes comes from rain and melting of snow on mountains. Rivers flow into the sea. z Underground water: Some of the rainwater seeps through the soil on to the non-porous rocks below. This is underground water. Sometimes due to high pressure, this water sprouts out in the form of springs. It can be obtained by digging wells, sinking tube wells, etc. Analyse the contents of Agenda 21 and present comments, if any, over those points.

Unit 2 - Natural Resources and Associated Problems Notes 37 2.3.2 Use and Overexploitation of Surface and Ground Water The surface water can be used in the following ways: z Public supply z Domestic z Irrigation z Livestock z Aquaculture z Industrial z Mining z Thermoelectric Improper use of water and water resources results in the wastage of both ground and surface water. Overexploitation of surface and ground water can prove dangerous to mankind as well as for the environment. There should be proper management for the use of water. 2.3.3 Effect of Floods, Draught, Dams, etc. on Water Resources and Community You must understand the effect of floods on water resources and community: Floods Flood improves upon the water resources. Both underground and surface water level increases in the situation of flood. Flood has great impact on communities. Some of the impacts are discussed here: 1. Loss of human life 2. Damage of property 3. Can cause injury 4. Destruction of crops 5. Loss of livestock 6. Deteriorating health conditions Drought It is important to note the following environmental impacts of drought: z Harm to fish and wildlife habitat z Less food and drinking water for wild animals

Environmental Studies Notes 38 z Disease increase in wild animals because of reduced food and water supplies z Migration of wildlife z Stress on endangered species or even extinction z Lower water levels in reservoirs, lakes and ponds z Poor soil quality z Loss of wetlands z Wind and water erosion of soils z More wildfires The social impacts of drought on water resources and community are as follows: z Threat to public safety from an increased number of forest and range fires z Anxiety or depression about economic losses caused by drought z Health problems related to dust z Health problems related to low water flows and poor water quality z Loss of human life z People may have to move from farms into cities, or from one city to another z Reduced incomes z Fewer recreational activities Dams Benefits of Dams As mentioned above, you must note the benefits of dam which are as follows: z Flood control z Drought control z Irrigation z Hydroelectric power which is cleaner and safer Problems Related to Dams There are many problems associated with big dams. They are: z Displacement of people and their rehabilitation z Loss of nutrients z Loss of biodiversity

Unit 2 - Natural Resources and Associated Problems Notes 39 z Reduction in fishing z Silting of dam leading to loss of storage capacity Self Assessment Fill in the blanks: 6. ..... supply of safe water is essential for maintaining health and sanitary conditions. 7. ..... Management of water resources has implications for ecosystem, dams, silting of reservoirs, and submergence of forests, extinction of rare plants and animals and outbreak of disease. 8. Many rivers in India have ..... names. 2.4 MINERAL RESOURCES This section emphasises on the categories mineral resources and the effects of mining activities. Minerals are naturally occurring inorganic substances with physical properties like colour, hardness, and density and have a definite chemical composition. 2.4.1 Categories of Mineral Resources The various mineral resources are: z Metals (iron, copper, aluminium) z Industrial minerals (lime, potash) z Construction materials (sand, stone, gravel) z Energy minerals (uranium) 2.4.2 Basics of Mining Activities You must understand that mining of minerals is carried out wherever these materials occur in nature. Though the production of pure metals from the raw minerals by smelting is an elaborate process, it is a cause for environmental damages because the process results in pollution. Now, better technology is being developed for processing of minerals. These technologies are less polluting and consume less energy. Historically, demands and exploitation of minerals, like other essential natural resources have centred round a few of these. Precious metals like gold and silver extracted from the ores remain in great demand though copper, tin and iron are also prized materials. Above all, the discovery of copper is important because the whole era of early civilisation was named after its alloy bronze as Bronze Age. After Bronze Age, the civilisation entered the Iron Age. During 19th century, tin was in great demand for use in canning food products. There have been search and exploitation of mineral resources throughout historical

Environmental Studies Notes 40 period. Iron gained a great importance as much as those historians named a certain era as Iron Age, which was the period beginning around 2500 BC. Iron, from ancient times to 14th century AD, was made by a process in which coal would be burning in furnaces. The resulting spongy iron would be beaten into bars of soft wrought iron or soft steel from which more forms could be made by forging and welding. The technique, though simple, has lots of environmental problems in burning charcoal or wood or iron ore. A very high temperature is required to smelt iron and such smelting was achieved in 14th century AD in the Western Countries, though in China, the technique was discovered much earlier. 2.4.3 Mine Safety You must understand that minerals are made up of chemical elements. Some minerals are made from a single element like gold and silver but most of them are made up of more than one element. Many minerals contain oxygen and silicon. Some other minerals are made up of aluminium, potassium, calcium, iron, sodium or magnesium. Besides land, rivers and oceans are potential sources of minerals. Ocean waters will be exploited in future for mineral extraction while other sources may run out. Also when minerals from ocean bed prove to be very useful in agriculture or industry, they would be mined on large scale. Example: One example is phosphorite, which mainly consists of calcium phosphate. It has a great potential as our agricultural fertilisers have. Another mineral to be exploited from the ocean bed is manganese. USA and Japan have been investing a lot of money in developing technology to mine mineral wealth of oceans. You should keep this in mind that as mineral wealth of oceans is very important, the mining process may seriously affect coastal environment and ecosystem. Minerals affect the soil development. Certain minerals help to hold water and nutrients in the soil. This is essential for the growth of plants. For proper growth, plants require different minerals. Some minerals like nutrients are required in large amounts while other trace elements like copper, zinc and cobalt are required in small amounts for plants, animals and human. 2.4.4 Effect of Mining on Environment It is important to note that mining has the following impacts on environment: z Mining and processing of mineral is energy intensive. z Mining causes land disturbance and soil erosion. z Mining of mineral causes air and water pollution.

Unit 2 - Natural Resources and Associated Problems Notes 41 z Mining waste can be diffused by the action of wind and water can be deposited elsewhere. z When rain water seeps through the mine or when mine wastes carrying sulphuric acid (that is produced by the action of bacteria on iron sulphide in the wastes) seeps into nearby streams or ground water, it contaminates water supply and also causes toxicity which gradually poisons all life forms that consume it. z Mining of minerals results in emission of toxic chemicals into the atmosphere, affecting plant and animal life, especially wildlife. Self Assessment Fill in the blanks: 9. ..... are naturally occurring inorganic substances with physical properties like colour, hardness, and density. 10. Minerals have a ..... chemical composition. 11. Mining of minerals is carried out wherever various materials occur in ..... 2.5 FOOD RESOURCES In this section, you will learn about the food resources, the effects of modern culture and world food problem. 2.5.1 Food for All You must understand that the land area is limited. New land area for the purpose of increasing cropland is possible if we cut the forests or reclaim the wasteland. Forest cover has already been reduced and it has reached the minimum essential for life support system. Reducing the forest cover is therefore not the solution. Wasteland is limited and its reclamation is not an easy task. In earlier times, a piece of land was used for cultivation as long as the land retained its fertility. Once the land became less fertile, the farmers moved to more fertile lands because they were easily available and the abandoned land became the wasteland. In view of the above limitations, raising the production of existing cropland is the solution for feeding the hungry people. Production can be raised by: 1. Using high yielding variety of crops 2. Using fertilisers 3. Increasing the number of crops per year through multiple cropping. High yielding varieties are available—thanks to genetic engineering—for wheat, corn and rice. Apart from the high yielding variety of seeds, another Environmental Studies Notes 42 factor that helps in improving the yield is the use of fertilisers. The land being used for growing crops, both in a developing and developed country, has become poor in nutrients. The natural nutrient cycle of nature has been disrupted due to environmental factors like urbanisation. The world today, therefore, is becoming more dependent upon fertilisers to make up the nutrient deficiency, despite the fact that fertiliser use has its own adverse results. Besides using fertilisers, better practices of irrigation have improved the yield by making necessary moisture available to high yielding variety of seeds. India, like few other countries (China and Mexico), has been able to increase grain production by 3 to 4 times since independence. During the past 3–4 decades, the agriculture science has evolved many technologies that have helped in raising food production. But as mentioned above, the production has now reached a level beyond which it is difficult to increase it. Food production can also be increased by increasing the number of crops per year through multiple cropping. Two or three crops have become possible on the same land per year due to short-duration-growth plants which are available as a result of advances in biotechnology. It is being practiced in many parts of India and China. In India, double cropping of winter wheat and summer rice is now practiced. Similarly in China, double cropping of wheat and corn is harvested. Let us understand that raising productivity of land is the option that must be exploited fully. If this is not done, alternative option, as mentioned above, is to make more land available by clearing the forests. This alternative has serious environmental consequences and can lead to the collapse of life support systems. The optimism is that we have not yet reached the saturation point as far as the scope of biotechnology is concerned. The scientists would be working for devising varieties of crop plants that can resist drought or can become salt-tolerant so as to reduce the demand of fresh water for irrigation. 2.5.2 Effects of Modern Agriculture It is important for you to note that pesticides and fertilisers are chief chemicals which are used by the agriculturists for spraying on crops and the soil. Pesticides were introduced to kill the pests of crops and other pests like mosquitoes, house flies, etc. It was found that these pesticides were not only killing pests but were directly or indirectly injuring other animals including humans. It was also thought that when sprayed on the plants, the pesticides would not leach into the soil or if they did they would be degraded before reaching deep into the soil. This is not true. Pesticides reaching the water tables and through the food chain reach the non-target organisms include humans. DDT is one of the famous pesticides that are still found on soil after it was banned many years ago. DBCP (Dibromocholropropane) which was used as fumigant on fruits is still found in water supply even after its ban. (CPCB of India has done extensive studies on the residues of pesticides, fertilisers and industrial chemicals found in soils and reaching the water supply). One important point about many of these chemicals is their long life. The chemical

Unit 2 - Natural Resources and Associated Problems Notes 43 companies are now developing chemicals that are short-lived and at the same time more effective. The pesticides, whether short-lived or long-lived, are harmful to human and wildlife. After Bhopal tragedy, governments in many countries became seriously concerned about the pesticides and other toxic chemicals reaching the soil, water tables and finally, the human system. Their effects on humans, especially children cause impairment of health. The laws, especially in developed countries became stricter requiring a proper toxic release inventory that gives complete information of the toxic chemicals that includes extent of toxicity and health risks. Fertiliser Use All over the world, there is no new land added for agriculture. Therefore, to meet the demand for more food, the productivity of the present land has to be increased. Besides using high yielding seeds and having more than one crop per year (multiple cropping) for raising the productivity, use of fertilisers has become a routine agricultural practice. Fertilisers are added to the soil to remove the deficiency of soil nutrients. Excessive use of fertilisers leads to their run off into rivers and oceans. This leads to increase in growth of algae in rivers and oceans. Algae use up all available oxygen in the water, which affects the sea life. As a result of fertiliser use, nitrates in underground water increase and they find way in water supply. Pesticides You must keep in mind that the use of pesticides is adopted as a measure to increase the agricultural output both in the field and the storage because they destroy and repel the pests like insects, fungus, rodents, etc. Overgrazing Although the grazing land is dry and infertile to support any crop, it supports cattle like cows, buffaloes, sheep and goats. These animals constitute livestock and supply milk, meat, wool, leather, etc. In some countries, overgrazing has left rangeland degraded. Overgrazing, leads to desertification (formation of deserts and sand dunes). Land degradation due to overgrazing is affecting the economy. In the first instance, the productivity decreases due to overgrazing. Later, when the vegetation gets destroyed, it results in soil erosion and creation of wasteland. 2.5.3 World Food Problem It will be important for you to know that the food problem of expanding population is going to be a difficult proposition in the 21st century. One fifth of the world's population is hungry and undernourished. People remain hungry because either they do not produce enough food or they do not have enough

Environmental Studies Notes 44 money to buy food. Poverty and hunger are interlinked. Most of the hungry people are confined to Asian and African Continents, and that too mostly in rural parts. The food production comes from (i) cropland (ii) rangeland (grazing ground) and (iii) fisheries. All the three sources are under great stress, particularly the last two. The cropland used for agriculture is a serious management problem. The agricultural land when it is passed on from one generation to another gets divided among children with the result that division leads to fragmentation of farms that no longer can support the people living on them. Most of the farms in India are less than five acres. Situation is worst in Africa. If the population keeps on growing at the present rate, the size of the land holdings will decrease. Also, in the developing countries, food production will be further reduced because of water shortage. Already, in these countries water tables are falling down; pumping more water for agriculture will affect drinking water supply and industry's requirements. No doubt, green revolution did increase food production during the last quarter of century, but the production now is slow in relative terms. Per capita production of food (fisheries, beef and grains), especially in Africa, has been slowed down. United States of America, China and India are the three major food-producing countries. Though most of grain harvest is consumed by man, some portion is used as food for livestock and poultry. Among the above three countries, India uses least amount for livestock and poultry and USA uses a large portion. Mutton and beef produced worldwide come from animals that graze on rangelands. The rangelands are now being overgrazed and resulting in reduction in meat production. Self Assessment Fill in the blanks: 12. Forests are related to the entire range of environmental and development issues and opportunities, including the right to socio-economic development on a ..... basis. 13. The guiding objective of these principles is to contribute to the management, conservation and sustainable development of forests and to provide for their ..... and ..... functions and uses. 14. Productivity mainly refers to production of ....., ..., ... 15. ..... is one of those natural disasters, which no one can predict and so when it occurs it is always difficult to manage it.

Unit 2 - Natural Resources and Associated Problems Notes 45 Disappearing Butterfly Forests very fall, in one of the most remarkable spectacles in nature, somewhere around a quarter of a billion monarch butterflies (Danaus plexippus) flutter southward from Canada and the United States into the mountains of central Mexico, where they spend the winter in cool, high- altitude, oyamel fir forests. Incredibly, some of these delicate insects travel up to 4000 km to reach their winter refuge. Discovered by entomologists only 25 years ago, about a dozen small patches of cloud-forest about 3000 m (9750 ft.) in altitude in the mountains west of Mexico City offer exactly the right conditions for monarch hibernation. With night temperatures just above freezing, and cool, foggy days, these forests allow insects to conserve energy and avoid desiccation as they wait spring. The average colony contains about 20 million monarchs; some larger ones are thought to have three times this many. From November to March, tall trees in the mariposa (butterfly) forests are completely covered with bright orange and black blankets as millions of butterflies cling to tree bark and to each other, often breaking off branches with their collective weight. On sunny days when the butterflies awaken and flutter down to streams to drink, the air is filled with floating specks of colour. As temperatures warm in the spring, more and more butterflies become active until sometime toward the end of March golden streams of insects pour down out of the Sierra Transvolcanica to begin their journey northwards once again. You can follow the migration and learn more about monarchs on the web page of Journey North, an interactive environmental science project for school children. As they move northward through Mexico and then spread out from the Rocky Mountains to the Atlantic Coast, the monarchs follow spring flower emergence, sipping nectar and laying their eggs on milkweed plants providing toxins that protect caterpillars and adults from predators. Summer offspring of spring migrants live only about a month, but those hatched in the fall somehow sense the need to fly south, over a route they have never seen, to the cloud forests where they will survive until the next spring. Unfortunately, the oyamel forests on which this whole cycle depends are rapidly disappearing. Representing less than two per cent of all Mexican forests, this unique ecosystem is one of the rarest and the most endangered in the whole country. Wood harvesting and fires-both accidental and deliberately set to clear land for agriculture are the greatest threats. In 1986 a presidential decree created the "Reserve de la Biosfera Mariposa Monarca" protecting 161,100 ha (about 60 sq. mi) including 5 of the 12 known monarch overwintering areas. The decree provided two levels of E Contd...

Environmental Studies Notes 46 protection: a "nuclear" zone, in which no timber harvest is allowed, and a buffer zone, in which limited cutting is permitted. Most of the land from which the reserve was created was "ejido" or communal property, and local ejido members were never compensated properly for lost income where the logging ban was enforced. Consequently, logging–both legal and illegal–has continued in the sanctuary. Increasing numbers of Eco tourists, who come to see the amazing monarch concentrations, provide some income for local communities, but tourism lasts only for about five winter months. Few peasant families can make enough money in this short season to last a whole year. Some conservationists are undertaking economic development projects to compensate residents for the costs of protecting this officially designated "threatened phenomenon" and the forests on which it depends. The Monarch Butterfly Sanctuary Foundation, for instance, is paying an ejido with land rights in the Sierra Chincua sanctuary not to log in the reserve buffer zone. This case study exemplifies issues affecting forests around the world. Growing human populations with increasing standards of living put pressures on forests that are home to threatened species. In some cases, forest destruction is the work of large, transnational corporations; in others, poor peasants cut trees to clear farmland or to make a little money from forest products. In either case, events happening in places we've never heard of affect species and essential ecological processes we consider important. Finding alternative sources of forest commodities and ways to bring about economic development that provides sustainable livelihoods not dependent on forest depletion are worldwide challenges. Questions: 1. Explain the issues that affect the forest around the world. 2. How could the economic developments provide the sustainable development? Source: http://www.mhhe.com/EnviroSci/CaseStudyLibrary/TopicBased/CaseStudy_DisappearingButterfly.pdf SUMMARY z Forests are related to the entire range of environmental and development issues and opportunities, including the right to socio-economic development on a sustainable basis. z The guiding objective of these principles is to contribute to the management, conservation and sustainable development of forests and to provide for their multiple and complementary functions and uses. z The materials like coal and some of the metals leave a strong impact on environment while mining.

Unit 2 - Natural Resources and Associated Problems Notes 47 z A dam is a barrier constructed to hold back water and to raise its level, forming a reservoir. Dams are built for power generation and irrigation. z Dams have been built on many river systems. z Sustainable management of water resources has implications for ecosystem, dams, silting of reservoirs, and submergence of forests, extinction of rare plants and animals and outbreak of disease. z A systematic study of impact of water resource projects on environment has to be undertaken at national level. z The people who are likely to be affected by projects–like river valley projects, water shed projects or dams–should be taken into confidence and even involved in project formulation and implementation. z Management of shortage of water and management of water pollution are complex tasks. z Drought affects food and water supplies so people have to rely on relief or they migrate to another area. z The main cause for drought is continuous decrease in rainfall. z Climate changes cause decrease in rainfall. z It is believed that El Nino can also cause droughts around the world. z Technically, flooding occurs when the water level in any stream, river, bay or lake rises above bank full. z Bays may flood as the result of a tsunami or tidal wave induced by an earthquake or volcanic eruption; or as a result of a tidal storm surge caused by a hurricane or tropical storm moving inland. z Streams, rivers and lakes may be flooded by high amounts of surface runoff resulting from widespread precipitation or rapid snowmelt. z On a smaller scale, flash floods due to extremely heavy precipitation occurring over a short period of time can flood streams, creeks and low lying areas in a matter of a few hours. z The food problem of expanding population is going to be a difficult proposition in the 21st century. z One fifth of the world's population is hungry and undernourished. z People remain hungry because either they do not produce enough food or they do not have enough money to buy food. z Poverty and hunger are interlinked. z Most of the hungry people are confined to Asian and African Continents and that too mostly in rural parts.

Environmental Studies Notes 48 KEYWORDS Non-renewable: Non-renewable means that any amount extracted or used is gone forever like coal, crude oil petroleum. Renewables: Renewables are typically resources like crops, fisheries, grass (on grazing lands) which are regenerated quickly after they are harvested. Renewables like groundwater may take longer time for renewal. Minerals: Minerals are naturally occurring inorganic substances with physical properties like colour, hardness, and density and have a definite chemical composition. MULTIPLE CHOICE QUESTIONS Choose the correct answer from the following options: 1. A non-renewable source of energy is: (a) Wildlife (b) Fossil fuels (c) Water (d) Forest 2. A renewable exhaustible natural resource is: (a) Forest (b) Coal (c) Petroleum (d) Minerals 3. Biogas is which type of natural resource: (a) Renewable (b) Inexhaustible (c) Non-conventional (d) Both (a) and (c) 4. Deforestation brings about: (a) Soil erosion (b) Weed control (c) Decreases draught (d) Increased sunlight 5. Deforestation is the major causal agent of: (a) Depletion of natural resources (b) Environmental pollution (c) Desertification of habitat (d) Genetic erosion 6. In India, common type of forest is: (a) Tropical forests (b) Sal and Teak forests (c) Tropical most deciduous forest (d) Tropical dry deciduous forest 7. It is not a protected forest: (a) Reserve forest (b) Sanctuary (c) Core of biosphere (d) Orchard

Unit 2 - Natural Resources and Associated Problems Notes 49 8. Main source of water to soil is: (a) Rainfall (b) River (c) Canals (d) Lakes 9. Maximum use of fresh water is in: (a) Agriculture (b) Domestic use (c) Industry (d) Pisciculture 10. Most effective controlling floods is: (a) Deforestation (b) Constructing dams (c) Reforestation (d) Digging canal REVIEW QUESTIONS 1. What are natural resources? Define. 2. Is forest necessary for human beings? Explain. 3. What do you know about National Forest Policy? 4. What should be done for better forest management, conservation and sustainable development? 5. Enumerate the disadvantages of over exploitation of forest. 6. Can deforestation kill human beings in future? Explain. 7. What do you know about timber extraction? 8. “Water is life”. Explain it by giving a few examples. 9. Suggest ways to conserve rain water. 10. Enumerate causes of floods in India. Answers: Self Assessment 1. environment 2. Conservation 3. renewable 4. Non-renewable 5. Regenerated 6. Adequate 7. Sustainable 8. sacred 9. Minerals 10. definite 11. nature 12. sustainable 13. multiple, complementary 14. timber, firewood, fodder and industrial wood 15. Drought

Environmental Studies Notes 50 Answers: Multiple Choice Questions 1. (b) fossil fuels 2. (a) forest 3. (d) Both (a) and (c) 4. (a) soil erosion 5. (c) desertification of habitat 6. (d) Tropical dry deciduous forest 7. (d) Orchard 8. (a) Rainfall 9. (a) Agriculture 10. (c) Reforestation FURTHER READINGS N K Uberoi, Environmental Studies, Excel Books. Lewis Owen. Tim Unwin. Environmental Management: Readings and Case Studies. Wiley. C J Barrow. Environmental Management: Principles and Practice. Routledge. Anindita Basak. Environmental Studies. Pearson Education. R Rajgopalan. Environmental Studies from Crises to Cure. Oxford University Press. R J Ranjit Daniels. Jagdish Krishnaswamy. Environmental Studies. Wiley India. en.wikipedia.org/wiki/Environmental studies www.preservearticles.com/.../essay-on-natural-resources-and- associated-problems.html www.setju.ac.in/Environmental.../Natural_Resources...2/.../Write%20up.pdf en.wikipedia.org/wiki/Natural_resource en.wikipedia.org/wiki/Environmental_science

Unit 3 - Ecosystems Notes 51 UNIT 3 - ECOSYSTEMS CONTENTS Learning Objectives Introduction 3.1 Concept of Ecosystem 3.2 Structure and Functions of Ecosystem 3.2.1 Structure of an Ecosystem 3.2.2 Functions of an Ecosystem 3.3 Energy Flow in Ecosystem 3.4 Major Ecosystems in the World 3.4.1 Terrestrial Ecosystem 3.4.2 Aquatic Ecosystem Summary Keywords Multiple Choice Questions Review Questions Further Readings LEARNING

Ecosystem z Describe the Energy Flow in an Ecosystem z Explain Major Ecosystems in the World INTRODUCTION In this unit, we will study the concept of ecosystem, structure and functions of ecosystem. We will focus on major ecosystems and energy flow in ecosystem.

Environmental Studies Notes 52 3.1 CONCEPT OF ECOSYSTEM You must be aware that both the living (plants and animals) and the non-living (atmosphere, water, mountains and other physical components) components of environment interact and function together as a unit called ecosystem. A pond, a lake, a river, an ocean, a forest or a desert is considered as an ecosystem. In any ecosystem, both the living organisms and its environment influence each other and both are necessary for survival of life (the living environment is called biotic environment and the non-living abiotic environment). Abiotic components such as air and water enter the body of living beings and then return to the environment in a changed form. Self Assessment Fill in the blanks: 1. Components of environment interact and function together as a unit called ..... 2. A pond, a lake, a river, an ocean, a forest or a desert is considered as an ..... 3. Both the living organisms and its ..... influence each other and both are necessary for survival of life. 4. The ..... environment is called biotic environment and the non-living, abiotic environment. 5. ..... components such as air and water enter the body of living beings and then return to the environment in a changed form. 3.2 STRUCTURE AND FUNCTIONS OF ECOSYSTEM You need to know the structure and functioning of an ecosystem. Following explanation focuses on structure and functions of an ecosystem. 3.2.1 Structure of an Ecosystem The structure of an ecosystem includes the living community (biotic components such as plants, animals, etc.), their diversity, life history and distribution, etc. The living beings include the following: 1. Producers: Producers are those living beings, which convert solar energy into chemical energy inside the body with the help of inorganic substances such as water and carbon dioxide and organic substances such as enzymes. These producers are called autotrophs, which include green plants such as trees, grass, herbs, shrubs, tiny green organisms living in water (phytoplankton's), etc. With the help of chlorophyll (a green pigment present in producers), solar energy or light, carbon dioxide from the atmosphere and the water and minerals from outside, the producers are able to produce food and maintain themselves.

Unit 3 - Ecosystems Notes 53 2. Consumers: Consumers are chiefly animals including humans. Consumers who eat plants or their parts or products are called herbivores and when they eat animals, they are called carnivores. The carnivores eat herbivores and other carnivores. Consumers are also referred to as heterotrophs. 3. Decomposers: Decomposers are those living beings, which depend upon dead organic matter for their food such as bacteria or fungi. They break down complex organic matters found in dead animals and plants into simpler substances and release them for the producers. 3.2.2 Functions of an Ecosystem Remember, an ecosystem is the basic functional unit that includes organisms and the physical environment, which are interacting and influencing each other and having relationship of interdependence. The parts of ecosystem are not separable from the whole functionally and thus analysis and functions of each part needs to be studied in detail. A pond or a particular forest or any other component of ecosystem can be considered as a functional unit and its functioning becomes the function of the ecosystem. It is important to point out that an ecosystem is a dynamic concept. It is capable of self-maintenance and self-regulation and thus remains in a state of equilibrium. Human intervention can disrupt this equilibrium and the changes, then occurring in such an ecosystem are unnatural and threatening to life. Overuse of resources of ecosystem or exploitation of services provided by the ecosystem or any of its components for the purpose of higher production is commonly observed. Such overuse of ecosystem for production would not be sustainable. The ecosystem as a dynamic concept is exemplified by the following functions or ecological services. z We observe a cyclical functioning of an ecosystem as we see various elements are circulated in the environment. Elements like oxygen, hydrogen and carbon dioxide are moving in and out of organisms and constitute nutrient cycle. z Food chain is another aspect of functioning ecosystem. z Every ecosystem has a carrying capacity. It can support population and communities to a limited extent. Ecosystem provides the needs of such a population but if the population becomes too large, ecosystem becomes overloaded and affects the health of the population. z Ecosystem provides services on which the organisms depend, and this dependence is based on complex conditions. Some of these conditions become a limiting factor.
Environmental Studies Notes 54 Example: If the ecosystem were not able to provide enough water or suitable temperature, it would affect the development of the organisms. z Various ecosystems serve as habitat for organisms in which they live and move about. The habitats are air, water and land, also called aerial, aquatic and terrestrial respectively. Each habitat has an important role in controlling the environment and maintaining the balance on the earth. Understanding, therefore, of these habitats is important in comprehending various functions of ecosystem. 3.3 ENERGY FLOW IN ECOSYSTEM You must be aware that work or any activity requires energy. Energy is required to maintain the functions of living organisms and this energy ultimately comes from the Sun (Solar energy). Solar energy enables the process of food formation in the plants, which are the producers. This process of formation of food is called photosynthesis. In fact, the solar energy in this process is transformed into chemical energy inside the plants (producers). When the producers are eaten by the consumers, the stored energy of the producers is converted into heat energy when the consumers do work or carry out any other activity inside or outside their body. The stored energy is called potential energy and when energy is used for carrying out any work or any other activity, it is called kinetic energy. Energy transformation in ecosystems is explained in relation to the laws of thermodynamics. The first law of thermodynamics is the Law of Conservation of Energy, according to which, energy may be transformed from one form to another. Energy is neither created, nor destroyed, it is transformed from one form to another and the decrease or increase occurs in the internal energy of the system itself. In order to understand the energy flow in an ecosystem, the first step is to understand the dynamics of solar energy in relation to producers. All the solar energy reaching the earth's atmosphere is not available to producers. It depends upon the geographical distribution of producers, i.e., latitude of the hemisphere. Solar energy received at higher latitude is much more than that received at lower latitude. Solar energy is used in the process of food production (photosynthesis). The carbon dioxide released by animals and human is consumed by plants and oxygen released during photosynthesis is consumed by animals. Energy flow in an ecosystem can thus be summed up as under. Solar energy enters the plants and is transformed into usable energy (by photosynthesis) for plant's growth and is stored in chemical form in plants. The plants are producers. When the plants are eaten by primary consumers which are called herbivores, the energy stored in the plants enters their body. When the herbivores are eaten by carnivores (animals), energy gets transformed into their body. These carnivores

Unit 3 - Ecosystems Notes 55 use energy for work and growth; some of the energy is lost through respiration. This transfer process continues along the entire food chain. Self Assessment Fill in the blanks: 6. Energy transformation in ecosystems is explained in relation to the laws of ..... 7. The first law of thermodynamics is the ..... 8. Energy is neither created, nor destroyed, it is transformed from one form to another and the decrease or increase occurs in the .....itself. 9. ..... keeps on changing either through natural event like cyclones or through human intervention like clearing of forests. 10. Some animals and plants are more efficient than others in establishing as colonists and quickly occupy the recovered area. These are called ..... Food Chain The concept of the food chain is an important ecological concept. The transfer of food energy initially starts from plants through a series of organisms where eating and being eaten occurs, and is referred to as the food chain. Each member of a food chain feeds on the one below. Human beings occupy a position at or near the end of most food chains. For example, man eats big fish that eats little fish that eats plants or microorganisms. The concept of a food chain is important for another reason besides understanding how energy gets transferred from one organism to another. Pollutants also are transferred in this process from one organism to another and become more concentrated as they progress through the food chain. Thus pesticides that wash off soil into water come to reside in fish, and as smaller fish are eaten by larger fish, these enter the latter. When humans eat larger fish, these pollutants reach human system producing harmful effects. DDT has been detected in the human system including mother's milk. 3.4 MAJOR ECOSYSTEMS IN THE WORLD You need to know that ecosystems are broadly divided into two: 1. Terrestrial 2. Aquatic Environmental Studies Notes 56 3.4.1 Terrestrial Ecosystem Terrestrial ecosystem mainly includes: z Forest z Grasslands z Deserts z Tundra Forest Ecosystem Forest ecosystem is a very important component of ecosystem. 1. It provides habitats for many species 2. It helps in soil formation by creating fertile humus 3. It protects soil from erosion 4. It plays an important role in carbon, oxygen and nitrogen cycles 5. It influences climate and energy flow Latitude plays an important role in the distribution of terrestrial ecosystems. Forest ecosystem includes Tropical (0-20°), Subtropical (20°-40°) and Temperate (40°-60°) forests. Tropical Rain Forests Temperature and humidity is high in tropical rain forests and therefore production of fauna (animal life) and flora (plant life) is very rich and high. One square kilometre may include 200–300 species (varieties) of trees. Such a variety is not found in any other ecosystem. In tropical rain forests, below the tall trees are plants which can grow in shade. Some plants take the support of tall trees and grow around them to absorb sunlight. Both the primary production and decomposition rate is very high in tropical rain forests. Subtropical Forests These forests have warm summers and cold winters with well-spaced rainfall which is less than that of tropical rain forest. The trees of these forests shed leaves and are not densely spaced. The fauna and flora are not as rich as in tropical rain forests but many timber trees grow in these forests. Temperate Rain Forests These forests have high rainfall and are situated in the same parts of India where tropical rain forests are. Large number of species of trees grows in these Unit 3 - Ecosystems Notes 57 forests. The production is high but the limiting factor for productivity is low temperature and lack of certain nutrients in the soil. The decomposition rate is slow because of cool climate. Grassland Ecosystem In grassland ecosystem, grasses grow taller in the regions where rains are heavy. In drier region, grasses are shorter. Most of the grasslands have been used by the human for cultivation of staple food crops like wheat or corn by converting these into cropland. In grasslands, besides grasses, herbs and other kinds of flowering plants are also common. Grasslands are rich in nutrients and can support rich growth of plants. The consumers in grassland regions are usually mammals (goats, cows, deers, etc.). It is estimated that grasslands occupy about 20% of earth's land. There are three kinds of grasslands: (i) Tropical (ii) Temperate and (iii) Alpine. Tropical Grasslands Tropical grasslands (20° from equator) receive moderate rainfall. The grasses growing in this region are tall, about 3 meters in height. The consumers of tropical grasslands are horses, deer, lions and giraffes. Temperate Grasslands Usually they have low rainfall. The consumers of these are various kinds of mammals. Alpine Grasslands They occur at high latitudes and include meadows. Besides grasses, many herbs and flowering plants grow in these grasslands. Potential of various types of grasslands for production has attracted the attention of ecologists. The potential for production and growth is great because the soil of grasslands is rich in nutrients (all major and micro nutrients are found; potassium, sodium, calcium, iron, etc. as major nutrients; zinc, copper, cobalt, boron, etc. as micronutrients). The primary producers of grasslands – grasses, herbs and few shrubs and trees – serve as food for the consumers which are herbivorous (plant-eating) mammals. Consumers also include insects and birds. The decomposers of grasslands include various types of bacteria and fungi. Desert Ecosystem Deserts occupy about 20% of earth's land surface and are located between 20° and 30° on either side of equator. They normally receive less than 250mm of rainfall in a year. Rate of evaporation of water in deserts exceed the rate of precipitation. Hence, there is water deficit. The temperature in deserts in hot season can go beyond 50°C. During day, the deserts surface heat up rapidly and during nights, they lose heat rapidly and become cool. High temperatures

Environmental Studies Notes 58 and water deficit give rise to characteristic desert ecosystem that has destructive soil, fauna and flora. The soil is rocky covered with sand. Rainfall is not distributed evenly in deserts. The areas which receive rainfall and support plant growth are called oasis. Human settlement is concentrated around the oasis areas. Date, palm and cotton grow in areas where water is available. Deserts often receive strong winds because of lack of reasonable vegetation. The winds not only blow the sands but also build up sand dunes. Sand dunes are mounds of sands sometimes up to the height of 200 meters as seen in Sahara (South Africa) and Thar deserts (India). Strong winds blow across a desert surface creating dust storms and sand storms which affect communication and visibility. There are two kinds of deserts, hot deserts and cold deserts e.g. hot deserts are Sahara and Thar. Example: The deserts of Iran and Mongolia are examples of cold deserts. The desert ecosystem either does not have any vegetation or any scanty vegetation (excepting Oasis) which consists of mainly thorny bushes. The desert plants have roots located at the top of soil to easily absorb the water available during rains. Leaves are reduced to thorns to reduce water loss. The stems of the plants are protected by wax or hair to reduce water loss. They contain milky juice in various parts as in cactus. Some desert plants have roots of great length penetrating into soil for absorbing water, e.g. desert melon has very long roots. The animals found in desert include locust, spiders, camel, mice, antelope, lizards, rattlesnakes and some birds. For successful living, both the plants and animals have undergone various adjustments and adaptations in their structure and behaviour to conserve moisture. Many animals live in burrows where humidity is greater and temperature extremes are lesser. Some have devices to store water in body. The primary producers i.e. plants of desert are not many in variety. Whatever the primary producers provide, consumers (animals) are adopted to live on these producers. Desertification

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It is the process in which fertile land is turned into desert or barren land.

The spread of desert condition in areas near the deserts occurs due to climatic changes or human intervention. But desertification can occur in other areas also. Desertification in Africa, India and South America affect the people because the capacity of land for production decreases and biodiversity is reduced. The loss of vegetation causes changes in soil which becomes less fertile and it also induces further loss of vegetation as more land becomes barren. Many factors cause desertification. Climate as mentioned above is one factor and it is a major factor. The other causes are overgrazing, over cultivation and deforestation. It is important to control desertification at early stages before it spreads to larger areas. This can be done by monitoring or detecting the process of desertification through remote sensing or GIS
Unit 3 - Ecosystems Notes 59 (Geographic Information System) and then by taking steps to stop over- cultivation, over-grazing and deforestation. Tundra Tundra is a biome where the tree growth is hindered by low temperatures and short growing seasons. In tundra, the vegetation is composed of dwarf shrubs, sedges and grasses, mosses, and lichens. Scattered trees grow in some tundras. The ecotone (or ecological boundary region) between the tundra and the forest is known as the tree line or timberline. Relationship with Global Warming A severe threat to the tundra, specifically to the permafrost, is global warming. The melting of the permafrost in a given area on human time scales (decades or centuries) could radically change which species can survive there. Another concern is that about one third of the world's soil-bound carbon is in taiga and tundra areas. When the permafrost melts, it releases carbon in the form of carbon dioxide and methane, both of which are greenhouse gases. The effect has been observed in Alaska. In the 1970s, the tundra was a carbon sink, but today, it is a carbon source. Methane is produced when vegetation decays in lakes and wetlands. The amount of greenhouse gases which will be released under projected scenarios for global warming have not been reliably quantified by scientific studies, although a few studies were reported to be underway in 2011. It is uncertain whether the impact of increased greenhouse gases from this source will be minimal or massive. In locations where dead vegetation and peat has accumulated, there is a risk of wildfire such as the 1,039 square kilometres (401 sq. mi) of tundra which burned in 2007 on the north slope of the Brooks Range in Alaska. Such events may both result from and contribute to global warming. Using internet collect more information on desertification. 3.4.2 Aquatic Ecosystem
The watery part of earth's surface constitute hydrosphere and includes three categories (i) inland water (rivers, lakes, ponds, ditches, springs, volcanic water) (ii) ocean water (seas and oceans) which have salty water and (iii) Estuarine water (mouth of a river through which it flows into sea is called estuary and the water of this region constitutes estuarine water. It is not as salty as seawater but more salty than fresh water).

Environmental Studies Notes 60 Inland Water Inland water is classified into (i) Standing water or lentic habitats and (ii) Running water or lotic habitats. Fresh water has highly diversified and wide range of physical and chemical conditions. For example, the temperature of fresh water differs from boiling lakes of volcanic regions to frozen water of polar regions. The clear lakes and other bodies of water in high mountain areas contain only a few salts or nutrients whereas water of lakes of interior areas near the seas is highly salty, and can support only a specialized form of plant or animal life. Varying physical and chemical conditions play an important role in control, survival and distribution of living organisms. Among physical and chemical characteristics are (i) light (ii) temperature (iii) water currents (iv) oxygen (v) carbon dioxide (vi) pH (Hydrogen ion concentration) and (vii) concentration of salts. Standing Water (Lentic Habitats) This includes ponds, lakes, swamps and marshes. All of these have different environmental conditions like minimum water movements and no circulation in deeper layers. The shallow water region of lentic habitat with light penetrating to the bottom is called littoral zone and the deep water region where the bottom is beyond effective light penetration is called profundal zone. 1. Ponds: Ponds are small bodies of standing shallow water where water movement is minimum. The temperature of water of pond varies during different seasons and times of the day. Variation in temperature is almost same as in atmospheric temperature. Ponds are one of three types: (i) Ponds derived from lakes; (ii) Ponds, which have been in existence for long and have no connection with lake; (iii) Artificial ponds due to activities of man. Ponds are rich in flora or vegetation. Plants growing in water are called hydrophytes and are adapted well to survive in aquatic environment. Some plants float on the surface of water while others remain submerged. The animals living in the ponds include numerous species of various groups like insects, shelled animals, fishes, frogs, turtles, snakes and birds. 2. Lakes: A lake is an inland depression in the surface of earth and it extends from a few meters to thousand or more meters in depth. Lakes vary in size. The largest lake is Lake Superior and has an area of 31,000 square miles. Three zones are distinguishable in lakes – littoral, limnetic and profundal depending on the depths. Littoral is upper stratum, profundal is deep zone and limnetic is in between the two.

Unit 3 - Ecosystems Notes 61 Light penetrates in littoral and limnetic zones and not in profundal zone. During summers, top water of lakes becomes warmer and so the warm top layer circulates. The upper warm layer forms a distinct zone in relation to lower layer which is cold. During winter, temperature falls down and both the layers become cold. Lakes are classified into many categories and the classification is based on the variety of plant and animal life supported by lakes. The animal and plant life of lakes resemble that of ponds but in addition, lakes support some of those animals and plants that occur in sea also. Rivers and Streams River, streams, creeks and brooks form flowing or running water systems in which water currents of varying velocity are present. Flowing water follows a distinct watercourse or channels. Small channels are called streams and large are called rivers. Nile, Amazon and Mississippi are the world's longest rivers. The speed of water becomes slow as the running water systems reach the plains. Small rivers or rivulets combine to form a river. Light penetrates to bottom in most of the rivers. As the rivers reach the sea, there is greater accumulation of organic matters and salts. The region where river meets the sea is surrounded by swampy land and is forming delta. During rainy season, water in rivers and streams become muddy and sunlight may not penetrate the bottom. Plants and animals that live in these habitats depend upon the movement and speed of the water. Fishes and turtles are adopted to live in water in which currents may be high. Some animals living in water with high speed and current have hooks and suckers to attach themselves with rocks so that they cannot be swept away. Many other animals have adaptations that enable them to maintain their position in spite of rapid flow of water as they have streamline bodies. Some construct cases of sand and pebbles which protect them from water currents. Plants like Algae and Mosses attach themselves to the rocks. The producers in these waters are phytoplanktons and the consumers are insects, fishes, water snakes and turtles. Running water ecosystem in Indian rivers like Ganga, Yamuna, Narmada, Krishna, Godawari, etc. not only supports plant and animal life but also provides water for drinking and irrigation. Fresh water, whether stationary or running, thus represents an ecosystem which supports its own fauna and flora which are well adopted in this environment. Marine or Ocean Ecosystem Oceans cover more than 70% of the earth's surface. Oceans and seas have high salinity (salty water). Historically, oceans and seas have been the means of transportation and protection from invasion, besides being rich sources of food and wealth of some raw materials. They represent an interesting ecosystem. Not only the oceans and seas but also the coasts (area between land and season oceans) represent dynamic environment and constitute a significant aspect of

Environmental Studies Notes 62 environmental studies. Oceans influence the climate and play a crucial role in carbon and nitrogen cycles. This ecosystem offers a habitat for important animals and plants. Half of the world's population or more live within 100 km of shore line and many cities have been developed along the coastal region. As a result, there is a lot of pressure on coastal ecosystem and the oceans. Marine environment (seas and oceans) provides a variety and yet a stability of various physical and chemical properties. The water is always in circulation; therefore currents are created both at the surface and underneath. Waves and tides of seas are regulated by the pull of the sun and moon. Light intensity varies from intense bright light at surface to darkness at bottom. Temperature of surface water varies from zero degree in the Arctic and Antarctic to 28° to 30°C in the equator regions. All the physical and chemical characteristics of marine environment are the controlling factors for the growth of plants and animals living in it. Marine environment is divided into: 1. Open sea or pelagic environment 2. Ocean depths or benthic environment 3. Coastal environment Pelagic Environment The primary producers of these regions are algae and diatoms (which constitute phytoplanktons). Light penetrates to pelagic region but not beyond a certain depth. Phytoplankton's have high vitamin and protein contents. Also they are rich in minerals like potassium, sodium, zinc, iron and manganese. The animal life includes prawns, insects, fishes, shell animals, etc. and they are the consumers. Animals and plants of pelagic region are specialized and adapted in many aspects to pelagic mode of life. A common feature is that they remain floating in open water and in order to remain floating, they develop thin and light body. Some of them have floats. Large fishes and some animals keep themselves at water surface by active swimming. Benthic Environment Depending upon light penetration, benthic region of ocean can be divided into: 1. Light or littoral zone; 2. Dark or deep sea zone. The zone where sea and land meet is intertidal zone and rich zone in terms of plant and animal life. Zone between high tides and low tides is deep (200 meters) where plant or animal life is exposed to aquatic and aerial conditions that fluctuate daily.
Unit 3 - Ecosystems Notes 63 The sandy shore of intertidal region constitutes beaches. The sandy beaches do not support much life i.e., plants and animals do not grow here. Only a few grasses are capable of rooting in beaches and burrowing animals like worms represent animal life in beaches. Sandy shore, therefore, offers a harsh environment to plant and animal life. Deep Sea: Deep Sea is the largest biological environment with peculiar ecological characteristics. It extends from 200 meters to 10,000 meters in depth and has no waves and has not shown any variation in temperature. There is scarcity of food because the primary producers of plant kingdom are rare due to absence of light. The animal life living in deep seas exhibit unique adaptation because of water pressure, dark conditions and food chain which comprises of animal food. The animals are usually flat, have sensitive eyes and some exhibit bioluminescence (light producing property). Fishes, small and big, are found in deep-sea region. Besides fishes, other animal groups like corals and crabs are also found. Besides providing an extensive space for living to variety of animals and plants, the economic importance of ocean not only lies in providing food (fishes, prawns, crabs, shrimps, sea weeds, etc.) but also in supplying minerals and oil. Estuarine Ecosystem There are different kinds of habitats located in the coastal zone, and estuaries are one of them. The estuaries are coastal areas where fresh water from rivers and streams mixes with salty water of the sea. The water of estuaries has lower salinity than the water of oceans. Estuaries along with inland swamps and marshes provide a very rich fauna and flora. (Wetlands where land is flooded all or part of the year with fresh or salt water is another ecosystem which is equally rich in plant and animal life). Usually estuarine animals are marine living and include fishes, frogs and birds. Estuaries are threatened because of damage caused by pollution from oil spills and industrial effluents. Estuaries can absorb certain amount of pollution that can be dispersed without causing any deadly effects. Ecological Succession Habitats keep on changing either through natural event like cyclones or through human intervention like clearing of forests. This change causes disturbances in natural environment leading to destruction of animal and plant life. After the disturbance has stopped in the habitat whether it is aquatic (pond, lake, and river) or land, plant or animal life invade into the changed habitat and start establishing themselves there. Some animals and plants are more efficient than others in establishing as colonists and quickly Contd...

Environmental Studies Notes 64 occupy the recovered area. These are called pioneers. Others follow the pioneers and start establishing themselves, and the ecological system is gradually re-established. This process of recovery or reestablishment of ecosystem is called Ecological Succession. The process involves the following steps: 1. The living organisms or biota must migrate from the surrounding area to the disturbed site. 2. The new biota must establish itself. 3. The new biota must obtain sufficient resources to grow and reproduce to establish as a new population. As mentioned above, pioneers, the animals and plants that came first, start growing under new conditions and gradually get distributed through various dispersal methods during the initial years of recovery of habitat. Not all the plants and animals that reach the new habitat start growing rapidly. Some grow slowly like plants belonging to conifers group. The slow growing pioneers ultimately gather more resources and begin to dominate the first pioneers and they may even outnumber the first pioneers because first pioneers compete among themselves for nutrition and soil. This competition results in decrease in the population of first pioneers and ultimately leads to their decline and death. The organic matter left over by these pioneers is hospitable to the next group of invaders which are called serial community constituting one serial stage in the ecological succession. Self Assessment Fill in the blanks: 11. Ecosystems are broadly divided into: (i) Terrestrial and (ii) ..... 12. Forest ecosystem protects soil from ..... 13. In ..... ecosystem, grasses grow taller in the regions where rains are heavy. 14. Latitude plays an important role in the ..... of terrestrial ecosystems. 15. The desert ecosystem either does not have any vegetation or any scanty vegetation (excepting Oasis) which consists of mainly .....bushes.

Unit 3 - Ecosystems Notes 65 Ecotourism on the Roof of the World ising dramatically from the steamy southern jungles of the Ganges River Valley to the icy peaks of the Himalayan Mountains on the Tibetan border, Nepal is one of the most scenic countries in the world. Tourists savour the exotic culture of Kathmandu or Namche Bazar or hike through lush mountain forests of rhododendron and pine. Offering spectacular scenery, friendly people, and low prices, this charismatic country has become a premiere destination for adventure travellers. With an annual per capita income of only $170, Nepal is among the poorest countries in the world. The phenomenal increase in visitors over the past 20 years has brought much-needed income but also has caused severe environmental degradation. Forests along popular trekking trails have been decimated to provide firewood for cooking and heating of water for the numerous wealthy outsiders, while tons of garbage and discarded gear litter popular campsites. One of the most popular Nepalese trekking routes is a three- to four-week circuit of the Annapurna Range in the centre of the Himalayan Range. Crossing rushing rivers on swaying suspension bridges, passing between the 8167-m Dhaulagiri and the 8091-m Annapurna I (the seventh and tenth highest mountains in the world, respectively), and this ancient pilgrim trail follows the Kali Gandaki Valley to holy shrines at Muktinath. Surmounting the 5416-m (17,769-ft) Thorung La pass north of Annapurna, hikers follow the Marsyangdi valley back to the regional centre at Pokhara. First opened to foreigners in 1977, this trail now attracts over 45,000 visitors each year. Most Nepalese benefit very little from tourists who congest their villages, consume resources, and snap photographs incessantly, but the Annapurna region is different. An innovative project was launched in 1985 to alleviate the destructive impact of masses of trekkers and to maximize the income- generating potential of ecotourism. The Annapurna Conservation Area Project (ACAP) is a 2590-km 2 (1000-mi 2) biosphere reserve that serves as an encouraging model for conservation and development in the Third World. Far different from Western ideals of parks composed of empty, virgin land, the ACAP is home to more than 100,000 people who continue to use resources in traditional ways. The area is divided into five different zones: intensive farming lands around the periphery, protected forest and seasonal grazing areas in the foothills, special management zones along tourist routes, protected regions with high biological or cultural richness, and wilderness areas in the high peaks. R Contd...

Environmental Studies Notes 66 Recognizing that there can be no meaningful conservation without the active involvement of local people, fees paid by visitors to ACAP go directly to residents to manage the preserve. About $500,000 per year finances a variety of conservation, education, and development projects. More than 700 local entrepreneurs have been trained in lodge management, hygiene, and marketing. Forest guards have been hired, latrines built, trails repaired, and schools and clinics built for local people. Trekkers now are required to use kerosene rather than wood. Local tree nurseries provide stock for reforestation projects. Solar panels and water turbines provide renewable energy for both tourists and residents. The area is cleaner, healthier, and more enjoyable for everyone. This unique and successful experiment gives us a different view of the meaning and purpose of parks and nature preserves than the ideal of pristine, unchanging nature conveyed by most American national parks. It raises some interesting questions about competing needs of human and non- human residents and how they might be balanced sustainably. It also provides a model of how protected areas might be designed and managed in other developing countries. Questions: 1. What is ecotourism? 2. What do you infer from the given case? Source: http://www.mhhe.com/EnviroSci/CaseStudyLibrary/TopicBased/CaseStudy_EcotourismOnTheRoofOf.pdf SUMMARY z Ecosystems are broadly divided into terrestrial and aquatic. z Latitude plays an important role in the distribution of terrestrial ecosystems. z Forest ecosystem includes Tropical (0-20°), Subtropical (20°-40°) and Temperate (40°-60°) forest. z In grassland ecosystem, grasses grow taller in the regions where rains are heavy. In drier region, grasses are shorter. z There are three kinds of grasslands: (1) Tropical (2) Temperate and (3) Alpine. z The desert ecosystem either does not have any vegetation or any scanty vegetation (excepting Oasis) which consists of mainly thorny bushes. z The desert plants have roots located at the top of soil to easily absorb the water available during rains. z Leaves are reduced to thorns to reduce water loss. z The stems of the plants are protected by wax or hair to reduce water loss.
Unit 3 - Ecosystems Notes 67 z Inland water is classified into (i) Standing water or lentic habitats and (ii) Running water or lotic habitats. Fresh water has highly diversified and wide range of physical and chemical conditions. z Energy transformation in ecosystems is explained in relation to the laws of thermodynamics. The first law of thermodynamics is the Law of Conservation of Energy, according to which energy may be transformed from one form to another. z Energy is neither created, nor destroyed, it is transformed from one form to another and the decrease or increase occurs in the internal energy of the system itself. KEYWORDS Carnivores: Consumers who eat plants or their parts or products are called herbivores and when they eat animals, they are called carnivores. Consumers: Consumers are chiefly animals including humans. Decomposers: Decomposers are those living beings like bacteria or fungi which depend upon dead organic matter for their food. They break down complex organic matters found in dead animals and plants into simpler substances and release them for the producers. Desertification:

Ecosystem: Both the living (plants and animals) and the non-living (atmosphere, water, mountains and other physical components) components of environment interact and function together as a unit called ecosystem. Producers: Producers are those living beings which convert solar energy into chemical energy inside the body with the help of inorganic substances like water and carbon dioxide and organic substances such as enzymes. MULTIPLE CHOICE QUESTIONS Choose the correct answer from the following options: 1. What is true of ecosystem? (a) Primary consumers are least dependent on producers. (b) Primary producers outnumber producers. (c) Producers are more than primary consumers. (d) Secondary consumers are the largest and the most powerful. 2. In an ecosystem which one shows one way passage? (a) Nitrogen (b) Carbon (c) Potassium (d) Free energy
Environmental Studies Notes 68 3. Upper part of sea/aquatic ecosystem contains ..... (a) Plankton (b) Nekton (c) Benthos (d) Plankton and nekton 4. Food chain in which microorganism breakdown the food formed by primary producers is ..... (a) parasitic food chain (b) detritus food chain (c) consumer food chain (d) predator food chain 5. Association of animals when both partners are benefitted is called ..... (a) colony (b) mutualism (c) commensalisms (d) ammensalism 6. Pyramid of numbers deals with the number of ..... (a) species in area (b) subspecies in a community (c) individuals in a community (d) individuals in a tropic level 7. The sum total of the populations of the same kind of organisms constitute ..... (a) colony (b) Genus (c) Species (d) community 8. Pick up correct food chain: (a) Grass< chameleon< insect <bird (b) Grass<fox<rabbit<bird (c) Phytoplankton< zooplankton< fish (d) Fallen leaves <bacteria< insect larvae REVIEW QUESTIONS 1. Discuss about biotic component and various types of ecosystems. 2. Explain the functioning of ecosystem. 3. What is energy flow? Define. 4. Mention the characteristics of energy flow in ecosystem. 5. What is forest ecosystem? Discuss. 6. Throw light on grassland ecosystem. 7. Differentiate between desert ecosystem and aquatic ecosystem. 8. Write a detailed note on aquatic ecosystem.

Unit 3 - Ecosystems Notes 69 Answers: Self Assessment 1. ecosystem 2. ecosystem 3. environment 4. living 5. Abiotic 6. thermodynamics 7. Law of Conservation of Energy 8. internal energy of the system 9. Habitats 10. pioneers 11. Aquatic 12. erosion 13. grassland 14. distribution 15. thorny Answers: Multiple Choice Questions 1. (c) producers are more than primary consumers 2. (d) free energy 3. (a) plankton 4. (b) detritus food chain 5. (b) mutualism 6. (d) individuals in a tropic level 7. (c) species 8. (c) individuals in a community FURTHER READINGS Uberoi, N. K. (2009) Environmental Studies, Excel Books. Owen, Lewis & Unwin, Tim (1997) Environmental Management: Readings and Case Studies, Wiley. Barrow, C. J. (1999) Environmental Management: Principles and Practice, Routledge. Basak, Anindita (2009) Environmental Studies, Pearson Education. Rajgopalan, R. (2011) Environmental Studies from Crises to Cure, Oxford University Press. Dr Daniels, R. J. Ranjit & Dr Krishnaswamy, Jagdish (2009) Environmental Studies, Wiley India.
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Unit 4 - Biodiversity and Its Conservation Notes 71 UNIT 4 - BIODIVERSITY AND ITS CONSERVATION CONTENTS Learning Objectives Introduction 4.1 Definition of Biodiversity 4.2 Levels of Biodiversity 4.2.1 Genetic Biodiversity 4.2.2 Species Biodiversity 4.2.3 Ecosystem Biodiversity 4.3 Value of Biodiversity 4.4 Threats to Biodiversity 4.5 Conservation of Biodiversity Summary Keywords Multiple Choice Questions Review Questions Further Readings LEARNING

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OBJECTIVES After studying this unit, you should be able to:

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OBJECTIVES After studying this unit, you should be able to: z Define the Term Biodiversity z Explain the Various

60%	MATCHING BLOCK 49/213	W

OBJECTIVES After studying this unit, you should be able to: z Define the Term Biodiversity z Explain the Various

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OBJECTIVES After studying this unit, you should be able to:

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OBJECTIVES After studying this unit, you should be able to:

Levels of Biodiversity z Understand the Value of Biodiversity z Describe Threats to Biodiversity z Discuss Conservation of Biodiversity INTRODUCTION You must be aware of the fact that biodiversity is the degree of variation of life. This can refer to genetic variation, species variation or ecosystem variation within an area, biome, or planet. Terrestrial biodiversity tends to be the highest
Environmental Studies Notes 72 at low latitudes near the equator, which seems to be the result of the warm climate and high primary productivity. Marine biodiversity tends to be the highest

64%	MATCHING BLOCK 52/213	W

along coasts in the Western Pacific, whereas sea surface temperature is the highest and in mid-latitudinal band in all oceans. Biodiversity generally tends to cluster in hotspots, and has been increasing through time but will be likely to slow down in the future. 4.1

DEFINITION OF BIODIVERSITY Let's find out more about what exactly biodiversity is. Biodiversity means the variety and variability of all living organisms. Biodiversity constitutes the biological wealth. "

LEVELS OF BIODIVERSITY You need to know that biodiversity is divided into three levels: Genetic Diversity, Species Diversity and Ecosystem Diversity. 4.2.1 Genetic Biodiversity You must remember that genetic biodiversity means the variation of genes within a species. A species can have varieties and each variety has its own genes or genetic make-up. Diversity of genes within a species increases its ability to adapt to disease, pollution and other changes in environment. When varieties of a species are destroyed, genetic diversity gets diminished. 4.2.2 Species Biodiversity You will find it interesting to note that species biodiversity means

More species biodiversity means more biological wealth. 4.2.3 Ecosystem Biodiversity Remember, ecosystem biodiversity refers to a variety of ecosystems in a particular region or zone as for example, various ecosystems include forests, wetlands, arid zones, deserts, etc. All these ecosystems have their own fauna and flora (biodiversity). All the three levels are inter-linked and constitute a gene pool. The 1992, United Nations Conference on Environment and Development at Rio de Janeiro, put biological diversity on the international agenda by signing the Convention on Biological Diversity (CBD). This convention addresses many issues ranging from forests, agriculture to Intellectual Property Rights (IPRs). Unit 4 - Biodiversity and Its Conservation Notes 73 India as a Mega-diversity Nation You should be aware of the fact that India has a rich and varied heritage of biodiversity covering ten biogeographically zones—

You need to know that India's wide range of climatic and topographical features has resulted in a high level of ecosystem biodiversity encompassing forests, wetlands, grasslands, deserts, coastal and marine ecosystems, each with a unique assemblage of species. The forests cover an actual area of 63.73 million ha (19.39%) and consist of 37.74 million ha of dense forests, 25.51 million ha of open forests and 0.487 million ha of mangroves, apart from 5.19 million ha of scrub, comprise 16 major forest groups. These range from the tropical wet evergreen forests in the northeast to the sub-alpine and alpine forests of the Himalayas through the tropical dry deciduous and tropical thorn forests of Central and Western India. India has five distinct types of grasslands, and it constitutes a species diversity of about 1256, belonging to 245 genera. You will find it interesting to note that wetlands include a rich diversity of inland and coastal wetland habitats covering 4.1 million ha of the landmass. A number of rare and threatened species of plants and animals including Aldrovanda vesiculosa, Utricularia minor, Cervus eldii eldii (Manipur brow- antlered deer), Cervus duvaucelli (swamp deer), and Lepidochelys olivacea (Olive Ridley turtle) are associated with wetland habitats. The coastline of India extends over 7,500 km while the marine ecosystems cover 2.1 million sq. km. The under-explored marine world contributes 15% of the total faunal biodiversity of the country. India has some of the most unique mangrove swamps in the world, in the alluvial deltas of the Ganga, Mahanadi, Godavari, Krishna and Cauvery rivers and the Andaman and Nicobar islands., Coral reefs, considered the most productive marine ecosystems which occur in the Andaman and Nicobar islands, Lakshadweep, and the Gulfs of Kutch and Mannar. Deserts cover 2% of the Indian landmass that includes the sandy areas. These include Thar Desert of Western Rajasthan and adjoining states—the salt desert of Kutch and the high altitude cold deserts of Jammu and Kashmir and Himachal Pradesh. Surveys conducted so far in India have inventoried over 47,000 species of plants and over 89,000 species of animals over just 70% of the country's total area. India's biogeographically location at the junction of the Agro tropical, Indo-Malayan and Paleo-Arctic realms has contributed to the biological richness of the country. Amongst plants, significant diversity has been recorded in Pteridophytes with 1022 species and Orchidaceae with 1082 species. A total of 89,451 animal species have been recorded in India accounting for 7.31% of the faunal species in the world.

is
Environmental Studies Notes 74

known amphibian species and 50% of the lizards are endemic to India, the majority occurring in the Western Ghats. The country is bestowed with immense agro-biodiversity and a rich diversity in landraces/traditional cultivars/farmers' varieties. A number of crop plants (384) are reported to be cultivated in India. This includes 168 species earlier reported under the Hindustani centre, one of the eight Vavilovian centres of origin and diversity. India has 326 species of wild relatives of crop plants. A total of 49 indigenous major and minor crops have been reported in the 'History of Agriculture in India', which include 5 cereals and minor millets, 4 pulses, 1 oilseed crop, 9 vegetables, 5 tuber crops, 11 fruits, 5 spices, 1 sugar yielding plant and 7 fibre crops.

okra, bamboo, etc. The National Bureau of Plant Genetic Resources has over 1,59,080 varieties and 1,07,018 germplasm collections. Much of the country's agro biodiversity is in the custody of farming communities/tribal who followed age-old farming systems. Genetic diversity comprising native species and landraces is concentrated in the areas of the Western Ghats, north-eastern Himalayas, southern plateau, central India and north-western Himalayas. Wild relatives of wheat and barley are located in the Western and North-eastern Himalaya while a major centre for wild rice is the Eastern-Peninsular India. Domesticated livestock and poultry include 27 breeds of cattle, 8 breeds of buffalo, over 42 breeds of sheep, 20 breeds of goats, 7 breeds of camel, 8 breeds of horses, and a few types of pigs. Of about 20,000 species comprising the fish genetic resources of the world, nearly 11 per cent (or 2118 fish species) have been reported in India, including the finfishes from the Western and Eastern Ghats. Hot-Spots of Biodiversity Remember, this immense diversity has resulted in the inclusion of two Indian regions in the 25 global biodiversity hotspots. These 2 hotspots,

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the Western Ghats/Sri Lanka and the Indo-Burma region (covering the Eastern Himalayas)

89% **MATCHING BLOCK 62/213** **W**

the Western Ghats/Sri Lanka and the Indo-Burma region (covering the Eastern Himalayas)

89% **MATCHING BLOCK 63/213** **W**

the Western Ghats/Sri Lanka and the Indo-Burma region (covering the Eastern Himalayas)

encompassing parts of India and adjoining countries are amongst the top eight most important hotspots. As many as 14 Eco regions lying completely or in part within India figure amongst the Global 200, which are outstanding examples of the world's diverse ecosystems based on criteria such as species richness, species endemism, unique higher taxa, unusual ecological or evolutionary phenomena, and global rarity of major habitat types. The Indian Eco regions are the Chhota Nagpur Dry Forests, Eastern Deccan Plateau Moist Forests, Eastern Himalayan Alpine Meadows, Eastern Himalayan Broadleaf and Conifer Forests, Indus river delta, Maldives, Chagos, Lakshadweep Atolls,
Unit 4 - Biodiversity and Its Conservation Notes 75 NagaManipuri-Chin Hills Moist Forests, Rann of Kutch Flooded Grasslands, South-western Ghats Moist Forests, Sunder bans Mangroves, Terai-Duar Savannas and Grasslands, Tibetan Plateau Steppe, Western Ghats Rivers and Streams, Western Himalayan Temperate Forests. India accounts for 6% of the total number of Eco regions. This biological diversity is reflected in the cultural diversity of the people whose very existence is tied to the continued maintenance and sustainable use of biological resources. India has a rich ethos of biodiversity conservation and traditional knowledge systems, and these practices have given rise to informal and localised in situ conservation. Traditional farming practices are directly responsible for the country's treasure of agro-diversity. This respect for nature continues today, and the government has institutionalised biodiversity conservation by undertaking several activities for its conservation and sustainable use. Visit the tourist places of south India and make a list of hot spots for biodiversity. The Biogeographic Classification of India India is one of top rich countries in biodiversity. It has been classified into the following ten zones (biogeographically) on the basis of climate, soil, topography and biodiversity. z Trans-Himalayas. An extension of the Tibetan plateau, harbouring

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high-altitude cold desert in Laddakh (J&K) and Lahaul Spiti (HP) comprising 5.7% of the country's landmass. z Himalayas. The entire mountain chain running from north-western to north-eastern India, comprising a diverse range of biotic provinces and biomes, 7.2% of the country's landmass. z Desert. The extremely arid area west of the Aravalli hill range, comprising both salty desert of Gujarat and the sand desert of Rajasthan. It covers 6.9% of the country's

53% **MATCHING BLOCK 65/213** SA 003E1140_Environmental Studies.docx (D165652913)

high-altitude cold desert in Laddakh (J&K) and Lahaul Spiti (HP) comprising 5.7% of the country's landmass. z Himalayas. The entire mountain chain running from north-western to north-eastern India, comprising a diverse range of biotic provinces and biomes, 7.2% of the country's landmass. z Desert. The extremely arid area west of the Aravalli hill range, comprising both salty desert of Gujarat and the sand desert of Rajasthan. It covers 6.9% of the country's

53% **MATCHING BLOCK 66/213** SA 003E1140_Environmental Studies.docx (D164979189)

high-altitude cold desert in Laddakh (J&K) and Lahaul Spiti (HP) comprising 5.7% of the country's landmass. z Himalayas. The entire mountain chain running from north-western to north-eastern India, comprising a diverse range of biotic provinces and biomes, 7.2% of the country's landmass. z Desert. The extremely arid area west of the Aravalli hill range, comprising both salty desert of Gujarat and the sand desert of Rajasthan. It covers 6.9% of the country's

landmass. z Semi-arid. The

75% **MATCHING BLOCK 67/213** SA 003E1140_Environmental Studies.docx (D165652564)

zone between the desert and the Deccan plateau, including the Aravalli hill range. It covers 15.6% of the country's landmass. z Western Ghats. The

75% **MATCHING BLOCK 68/213** SA 003E1140_Environmental Studies.docx (D165652913)

zone between the desert and the Deccan plateau, including the Aravalli hill range. It covers 15.6% of the country's landmass. z Western Ghats. The

75% **MATCHING BLOCK 69/213** SA 003E1140_Environmental Studies.docx (D164979189)

zone between the desert and the Deccan plateau, including the Aravalli hill range. It covers 15.6% of the country's landmass. z Western Ghats. The

hill ranges and plains running along the western coastline, south of the Tapti River, covering an extremely diverse range
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85% **MATCHING BLOCK 70/213** SA 003E1140_Environmental Studies.docx (D165652564)

of biotic provinces and biomes. It covers 5.8% of the country's landmass. z Deccan

85% **MATCHING BLOCK 71/213** SA 003E1140_Environmental Studies.docx (D165652913)

of biotic provinces and biomes. It covers 5.8% of the country's landmass. z Deccan

85% **MATCHING BLOCK 72/213** SA 003E1140_Environmental Studies.docx (D164979189)

of biotic provinces and biomes. It covers 5.8% of the country's landmass. z Deccan

Peninsula. The largest of the zones, covering much of

70%	MATCHING BLOCK 73/213	SA	003E1140_Environmental Studies.docx (D165652564)

the southern and south-central plateau with predominantly deciduous vegetation. It covers 4.3% of the country's landmass. z Gangetic plain.

70%	MATCHING BLOCK 74/213	SA	003E1140_Environmental Studies.docx (D165652913)

the southern and south-central plateau with predominantly deciduous vegetation. It covers 4.3% of the country's landmass. z Gangetic plain.

70%	MATCHING BLOCK 76/213	SA	003E1140_Environmental Studies.docx (D164979189)

the southern and south-central plateau with predominantly deciduous vegetation. It covers 4.3% of the country's landmass. z Gangetic plain.

Defined by the Ganges river system, these plains are relatively homogenous. It covers 11% of the country's landmass. z North-east India. The

100%	MATCHING BLOCK 75/213	W

plains and non-Himalayan hill ranges of north- eastern India,

with a

73%	MATCHING BLOCK 77/213	SA	003E1140_Environmental Studies.docx (D165652564)

wide variation of vegetation. It covers 5.2% of the country's landmass. z Islands. The Andaman and Nicobar Islands in

73%	MATCHING BLOCK 78/213	SA	003E1140_Environmental Studies.docx (D165652913)

wide variation of vegetation. It covers 5.2% of the country's landmass. z Islands. The Andaman and Nicobar Islands in

73%	MATCHING BLOCK 79/213	SA	003E1140_Environmental Studies.docx (D164979189)

wide variation of vegetation. It covers 5.2% of the country's landmass. z Islands. The Andaman and Nicobar Islands in

59%	MATCHING BLOCK 80/213	SA	003E1140_Environmental Studies.docx (D165652564)

in the Bay of Bengal, with a highly diverse set of biomes. It covers 0.03% of the country's landmass. z Coasts. A large coastline distributed both to the west and east, with distinct differences between the two; Lakshadweep Islands are included in this

59%	MATCHING BLOCK 81/213	SA	003E1140_Environmental Studies.docx (D165652913)

in the Bay of Bengal, with a highly diverse set of biomes. It covers 0.03% of the country's landmass. z Coasts. A large coastline distributed both to the west and east, with distinct differences between the two; Lakshadweep Islands are included in this

with the per cent area being negligible. Apart from the biogeographic classifications described above, ecosystems can also be demarcated on the basis of purely geographical or geological features like mountains, islands, valleys, plateau, oceans; on the basis of vegetative cover like forests, grasslands, mangroves and deserts; on the basis of climatic conditions like arid and semi-arid areas, permanently snow-bound areas, high rainfall areas; on the basis of soil characteristic and other such criteria. In some descriptions, the biomes/ecosystems are clubbed together into very general habitat classifications. The main natural habitat types are: z Forests z Grasslands z Wetlands z Mangroves z Coral reefs z Deserts Self Assessment Fill in the blanks: 1. ..... means the variety and variability of all living organisms. 2. Biodiversity constitutes the ..... 3. Biodiversity is at three levels: Genetic Diversity, Species Diversity and ..... Diversity.

Unit 4 - Biodiversity and Its Conservation Notes 77 4. ..... biodiversity means the variation of genes within a species. 5. A ..... can have varieties and each variety has its own genes or genetic make-up. 4.3 VALUE OF BIODIVERSITY You need to know that the natural ecosystems of forests, savannahs, pastures, rangelands, deserts, tundra's, rivers, lakes, and seas contain most of earth's biodiversity. Fields and gardens are also important spots of biodiversity, while gene banks, zoos, botanical gardens and other germplasm repositories make a significant contribution. All the biodiversity found in the above places constitute resources that feed and clothe us and provide housing, medicine and recreation. The value of biodiversity is economic, social, aesthetic and plant biodiversity is a single resource that we have received from nature during the long cultural and civilizational development more than 300,000 species of plants (excluding bacteria and other microorganisms) have been described and a large number is yet to be documented. During the last century, the plant breeders have used rich gene pool to create high yielding plant varieties of crops and other food plants. Besides food, biodiversity of plants provides US oils, latex, gums, dyes, pulp, fibre, and other products of industrial use. And then, a large number of medicines and chemical substances come from plants. As mentioned above, the value of biodiversity in supplying food to us is the boon from nature that human kind has been given. A large number (roughly one third) of all plant species have edible values as fruits, stems, leaves, roots, seeds or nuts to provide sustenance to human kind right from the hunting period to the present age when the hunters and the food gatherers have become less in number and are well settled, as agriculture arose in many regions of the planet earth. These early inhabitants of earth focused their food production on plants that were amendable for repeated sowing and harvesting. From that period of early civilisation we have covered a long distance when today, we can use genetically engineered seeds or crops for better productivity and disease resistance. So far as the economic value of biodiversity is concerned, some authors have recommended the use of CBA (Cost-Benefit Analysis) for valuation purpose. CBA however, has limitations because it is difficult to take into consideration the future generations that are going to be affected. Also, CBA cannot deal with uncertainty of natural and social types. Biodiversity value means diversity at all levels—ecosystem, species and gene. The economic valuation can only provide (i) estimates of benefits derived from natural resources in general (ii) cost of implementation of conservation of biodiversity. So far as medicinal value is concerned, people everywhere rely on plants for staying healthy. One quarter of the prescription drugs contain active ingredients derived from plants. Plant-based drugs are part of standard medical procedures that implement plant screening programs as a primary means of identifying new drugs.

Environmental Studies Notes 78 The World Health Organisation estimates that millions of people in developing countries rely on plant-based medicine for their primary health care. Ayurveda and other traditional healers in India use at least 1,800 different plant species in treatments. In China, where medicinal plant use goes back at least four millennia, healers employ more than 5,000 plant species. Traditional herbal therapies are growing rapidly in popularity in industrial countries as well. FAO estimates that between 4,000 and 6,000 species of medicinal plants are traded internationally, with China accounting for about 30 per cent of all such exports. In 1992, the U.S. retail market for herbal medicines reached nearly $1.5 billion, and the European market is even larger. People depend on plant diversity for household uses and to generate cash income. In India, at least 5.7 million people make a living harvesting non- timber forest products, a trade that accounts for nearly half the revenues earned by Indian state forests. Those who live in suburbs or urban areas may meet more of material needs with metals and plastics, but plant diversity still enriches our lives. Artisans who make musical instruments or furniture, value the unique acoustic qualities of hardwoods that they work with—aspects of biodiversity that ultimately benefit anyone who listens to classical music or purchases handcrafted furniture. Among the non-food plants traded internationally on commercial levels are timber trees, plants producing essential oils, species yielding latexes or gums, and species used as dyes and colorants. As with medicinal, the value that plant resources have for handicraft production, industrial use, or household needs has often not prevented their local or regional decline. 4.4 THREATS TO BIODIVERSITY In this section, we will learn about the threats to biodiversity. Article 48-A and Article 51-A (G) of the Directive Principles of State Policy in the Constitution of India state

71%	MATCHING BLOCK 84/213	W

that 'the State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife in the country',

80%	MATCHING BLOCK 90/213	SA	180E2340_Environmental Administration(Final 2 ... (D165106913)

the State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife in the country', and 'to protect and improve the national environment including forests, lakes, rivers and wildlife, and to have compassion for

87%	MATCHING BLOCK 83/213	SA	Jawinder Kaur_Environmental Studies-PDF e-book.pdf (D141737445)

to protect and improve the environment and to safeguard the forests and wildlife in the country',

91%	MATCHING BLOCK 86/213	W

to protect and improve the national environment including forests, lakes, rivers and wildlife, and to have compassion for

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to protect and improve the national environment including forests, lakes, rivers and wildlife, and to have compassion for

66%	MATCHING BLOCK 85/213	SA	Jawinder Kaur_Environmental Studies-PDF e-book.pdf (D141737445)

protect and improve the national environment including forests, lakes, rivers and wildlife, and to have

the living creatures'. A focused articulation of these concerns in programmes and policies was intensified after the 1992 Rio Summit and India's becoming a part to the Convention on Biological Diversity (CBD). The CBD has three main thrust areas: conservation of biodiversity, sustainable use of biological resources, and equitable sharing of benefits arising from its sustainable use. The CBD offers opportunities to India to realise benefits from its rich biological resources and associated traditional knowledge. Despite the measures taken for the protection, conservation and sustainable use of biodiversity, many species and ecosystems are seriously threatened. The

Unit 4 - Biodiversity and Its Conservation Notes 79 2000 IUCN Red List of Threatened Species (IUCN, 2000) is provided in Tables 4.1 and 4.2. Table 4.1: Threatened Species of India Taxonomic group Number of threatened species Mammals 86 Birds 70 Reptiles 25 Amphibian 3 Fish 3 Mollusks 2 Other Invertebrates 21 Plants 244 Total 459 Source: IUCN (2000). Red list of threatened animals. IUCN, Gland, Switzerland Table 4.2: Threatened Plants and Animals of India by Status Category Ex EW CR EN VU LR/cd LR/nt DD Plants 7 2 44 113 87 1 72 14 Animals 0 0 18 54 143 10 99 31 Legend: Ex – Extinct; EW – Extinct in the Wild; CR – Critically; EN – Endangered; VU – Vulnerable; LR/cd – Lower risk conservation dependent; LR/nt Source: IUCN (2000), Red list of threatened animals, IUCN, Gland, Switzerland The broad vision for biodiversity is its conservation and sustainable use accompanied by equitable benefit-sharing mechanisms. This includes a focus on enhancing national biodiversity protection measures involving the development of national strategies; mainstreaming of biodiversity concerns; ensuring the fair and equitable sharing of the benefits accruing from biodiversity; country-wide studies on biodiversity; fostering traditional methods and indigenous knowledge; encouraging biotechnological innovations along with the equitable sharing of their benefits and promoting regional and international cooperation. It also called for reinforcing at the national and international level, capacities for the assessment, study, and systematic observation and evaluation of biodiversity. Make a chart highlighting different extinct species in the sequence they extinct from the environment. Make a list of endangered species. Self Assessment Fill in the blanks: 6. ..... means the variety and variability of all living organisms.

Environmental Studies Notes 80 7. Biodiversity constitutes the ..... wealth. 8. ..... is one of top rich countries in biodiversity. 9. The value of biodiversity is economic, social, and ..... 10. The broad vision for biodiversity is its conservation and ..... use accompanied by equitable benefit sharing mechanisms. 4.5 CONSERVATION OF BIODIVERSITY You need to know that India has prepared a National Policy and Macro-level Action Strategy on Biodiversity through an extensive consultative process. This document is a macro-level statement of policies, gaps and further actions needed for conservation and sustainable use of biological diversity. In a major advancement for the cause of biodiversity conservation in the country and in compliance with requirements of the Convention on Biological Diversity, the country's National Biodiversity Strategy and Action Plan (NBSAP) with funding support from the Global Environmental Facility (GEF), is now available. The strategy and action plans are very broad in scope and comprehensive in coverage with detailed action plans at sub-state, state, regional and national levels based on the framework Policy and Action Strategy on Biodiversity. NBSAP is India's biggest planning and development process aiming at conservation and sustainable use of biological diversity. A decentralised approach has been adopted for developing the NBSAP. Under the NBSAP, about 20 local micro-planning process at village to district levels, 33 state and union territory level processes, 10 planning exercises at ecological regions cutting across states, are engaged in collecting a variety of area specific information and perspectives. In addition, national working groups are preparing action plans on 14 themes. About 75 executing agencies at various levels across the length and breadth of the country are involved in the preparation. The process is participatory, tapping into the knowledge of diverse stakeholders and incorporating a variety of strategies for its development such as workshops and public meetings, consultations, expert inputs, etc. For implementation of the NBSAP project, an arrangement between a private company, Biotech Consortium India Ltd. (BCIL) and an NGO, Kalpavriksh has been worked out. While BCIL acts as the coordinating agency to deal with administrative financial and logistic arrangements, Kalpavriksh is the coordinator of a Technical and Policy Core Group (TPCG) which is responsible for technical execution of the project.

Unit 4 - Biodiversity and Its Conservation Notes 81 Box 4.1: Kalam Calls for Value Addition to N-E's Rich Biodiversity Shillong: Former President APJ Abdul Kalam had once said that the north-eastern region could achieve prosperity by commercially exploiting its rich biodiversity in a sensible manner. Inaugurating the 72nd annual session of the Academy of Sciences and the Symposium on biodiversity at North-Eastern Hill University campus near here, Kalam said the biodiversity produce are going out of the region without value addition. He cautioned that the rich biodiversity of the region should not be senselessly destroyed. He called upon scientists to link new technologies for value addition to the bio-diversity produce so that India could increase its share in the over $60 billion global market of herbal produce. He said at the moment India's share in the biodiversity business was just about one billion while China accounts for six billion. Various conservation measures, wise-use practices and resource management initiatives have been taken over millennia dating back to people's earliest associations with nature. Since the forests and other natural resources served people in a myriad ways, providing them with medicinal plants, food, fuel and fodder, a body of local taboos, practices and folklore grew up around the forest and wildlife. This led to the creation of sacred forests, trees and tanks as well as the imbuing of several species of wildlife with supernatural powers or the advent of wise-use practices and management mechanisms. The earliest codified law on wildlife protection traces back to the third century BC when King Asoka made a law in the matter of preservation of wildlife and environment where he prohibited the killing of certain species of animals such as the parakeet, rhinoceros, etc. In modern times too, India has been at the forefront of biodiversity conservation and over the years the country has set in place several institutions and measures for the conservation and sustainable use of biodiversity. Numerous actions were taken long before the Earth Summit was even envisaged. The country had internalised biodiversity concerns in its policies in the early 1970s, after the Stockholm Conference was held and thus had implemented the greater proportion of Agenda 21's objectives prior to 1992. In subsequent years, more such measures have been taken. Self Assessment Fill in the blanks: 11. India has prepared a ..... and ..... on Biodiversity through an extensive consultative process. 12. India has an extensive system of protected areas encompassing at present ..... national parks and ..... sanctuaries. 13. The Indian National Gene Bank was set up by the ..... 14. The Government of India started a crocodile breeding and management project in ..... to save the three endangered crocodilian species, the fresh water crocodile, salt water crocodile and the gharial. Environmental Studies Notes 82 15. ..... sanctuaries have been declare specially for crocodile protection. Managing Biodiversity in Kaziranga National Park: A Case for Bioregional Planning he The biodiversity status of North East India is briefly reviewed together with Kaziranga NP that forms an integral part of the forested foothills of the Eastern Himalayas and grasslands and woodlands of the North and South Bank landscapes of the Brahmaputra River. Overlapping habitat ranges of many key plant and animal species within the region suggest biodiversity management within KNP should be carefully considered within the broader scope of a bioregional, conservation management plan for North East India. Data recently acquired from field surveys in the North Bank Landscape and Himalayan foothills are used to support this argument and to demonstrate the relative global conservation value of the region. Case studies were presented to briefly illustrate how critical baseline data and information can be acquired and maintained by regional forestry and park management using relatively low-cost, state-of-the-art technology. Such data can be vital for adaptive management in the face of unforeseen environmental change or for decision support in the selection and integration of park extensions. Balancing the Plant-Animal Conservation Image in Kaziranga The Kaziranga success story is unparalleled as far as the Indian subcontinent is concerned. It is the result of tireless efforts by government and conservation agencies combined with on-ground commitment by park personnel. The image presented to the world is one of continuing success in managing large mammals, especially the flagship species of rhino, elephant and tiger. While success is seen as the embodiment of the right kind of faunal management, an untold story surrounds the critical management of animal habitat that is reflected in its vegetation. Unlike most other areas of the Brahmaputra valley, the vegetation of KNP represents an unusually intact mosaic of successional and mature vegetation types that form the semi-evergreen forest and grassland mosaics of the south bank of the Brahmaputra River. While many of the forest species are endemic to the Indo-Burma region, the vegetation typifies many aspects of the palaeotropic dry forests that extend in a dry seasonal belt around the globe. These high-conservation-value dry forests and related grasslands are under extreme threat in many countries and have been targeted by many international conservation agencies as an urgent conservation priority. Apart T Contd...

Unit 4 - Biodiversity and Its Conservation Notes 83 from their conservation value, many species are highly attractive (e.g. deciduous flowering trees and shrubs and numerous species of orchids and gingers). Existing tourist routes within the park intercept the majority of vegetation types and animal habitat that present differing seasonal extremes of appearance. Release of the WWF-India publication Biodiversity Assessment in the North Bank Landscape, North East India. Question: Briefly explain the issue presented in the case study. Source: http://www.cbmglobe.org/kaz%20nat%20park%20case%20study%203.htm SUMMARY z Biodiversity means the variety and variability of all living organisms. Biodiversity constitutes the biological wealth. z Biodiversity is at three levels: Genetic Diversity, Species Diversity and Ecosystem Diversity. z India is one of top rich countries in biodiversity. z India has been classified into different zones on the basis of climate, soil, topography and biodiversity. z The value of biodiversity is economic, social, and aesthetic. z The plant biodiversity is a single resource that we have received from nature during the long cultural and civilizational development more than 300,000 species of plants (excluding bacteria and other microorganisms) have been described and a large number is yet to be documented. z The broad vision for biodiversity is its conservation and sustainable use accompanied by equitable benefit sharing mechanisms. z The role of individual species in ecosystem, (for example in food chain) cannot be undermined. Amphibians today are under a threat, their population has declined. z The Government of India started a crocodile breeding and management project in 1976 to save the three endangered crocodilian species, the fresh water crocodile, salt water crocodile and the gharial. z Thousands of crocodiles of these three species have been reared at 16 centres and several of these have been released into the wild. z Eleven sanctuaries have been declared specially for crocodile protection including the National Chambal Sanctuary in Madhya Pradesh. z India has prepared a National Policy and Macro-level Action Strategy on Biodiversity through an extensive consultative process.
Environmental Studies Notes 84 KEYWORDS Biodiversity: Biodiversity means the variety and variability of all living organisms. Biodiversity constitutes the biological wealth. Genetic Biodiversity: Genetic biodiversity means the variation of genes within a species. Species Biodiversity: Species biodiversity means variety of species within a region. Ecosystem Biodiversity: Ecosystem biodiversity refers to variety of ecosystems in a particular region or zone. MULTIPLE CHOICE QUESTIONS Choose the correct answer from the following options: 1. In which year was the Biodiversity Act of India passed? (

all of the above 4. Biological diversity include ..... (a) ecological diversity (b) genetic diversity (c) species diversity (d) all of the above 5. Biodiversity reflects ..... (a) number of living organism (b) variety of living organism (c) variability of living organism (d) all of the above 6. Flora and fauna diversity depends on ..... (a) climate (b) altitude (c) soils and the presence of other species (d) all of the above

Unit 4 - Biodiversity and Its Conservation Notes 85 7. Which one of the following is common currency for the study of biodiversity? (a) population (b) genus (c) individual (d) species 8. Biodiversity is the source of ..... (a) food (b) fibres, rubber, timber (c) medicines and pharmaceutical drugs (d) all of the above REVIEW QUESTIONS 1. What is biodiversity? Discuss. 2. Are genetic, species and ecosystem biodiversity inter-related? Explain. 3. Enumerate biogeographic classification of India. 4. How would you estimate value of biodiversity? 5. What are the effects of biodiversity at global, national and local levels? 6. Write a detailed note on "India as a mega-diversity nation". 7. Which are the hot-spots of biodiversity? Explain with examples. 8. Is there any threat to biodiversity? Discuss. 9. Write short notes explaining medicinal importance of the following: (i) Turmeric (ii) Neem 10. Explain the policy and strategy prepared by India regarding biodiversity. 11. Discuss in-situ conservation of biodiversity. 12. Discuss ex-situ conservation of biodiversity. 13. What are the policy and regulatory initiatives taken by national wildlife action plan? 14. Write explanatory report on 2010- international year of biodiversity. Answers: Self Assessment 1. Biodiversity 2. biological wealth 3. Ecosystem 4. Genetic 5. species 6. Biodiversity 7. biological 8. India 9. Aesthetic 10. Sustainable 11. National Policy, Macro-level Action Strategy
Environmental Studies Notes 86 12. 89, 496 13. NBPGR 14. 1976 15. Eleven Answers: Multiple Choice Questions 1. (c) 2002 2. (d) all of the above 3. (d) all of the above 4. (d) all of the above 5. (d) all of the above 6. (d) all of the above 7. (d) species 8. (d) all of the above FURTHER READINGS Uberoi, N. K. (2009) Environmental Studies, Excel Books. Owen, Lewis & Unwin, Tim (1997) Environmental Management: Readings and Case Studies, Wiley. Barrow, C. J. (1999) Environmental Management: Principles and Practice, Routledge. Basak, Anindita (2009) Environmental Studies, Pearson Education. Rajgopalan, R. (2011) Environmental Studies from Crises to Cure, Oxford University Press. Dr. Daniels, R. J. Ranjit & Dr. Krishnaswamy, Jagdish (2009) Environmental Studies, Wiley India. en.wikipedia.org/wiki/Biodiversity 14.139.41.16/unit4.pdf nvsrochd.gov.in/S_club/.../Biodiversity_and_Conservation.pdf en.wikipedia.org/wiki/Environmental_studies textbook.s-anand.net/ncert/class-xii/.../biodiversity-and- conservation en.wikipedia.org/wiki/Environmental science
Unit 5 - Environmental Pollution Notes 87 UNIT 5 - ENVIRONMENTAL POLLUTION CONTENTS Learning Objectives Introduction 5.1 Air Pollution 5.1.1 Classification

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Summary Keywords Multiple Choice Questions Review Questions Further Readings
Environmental Studies Notes 88 LEARNING

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OBJECTIVES After studying this unit, you should be able to:

z Explain Air Pollution; Its Classification, Sources, Effects and Prevention z Describe Water Pollution; Its Classification, Sources, Effects and Prevention z Discuss Soil Pollution; Its Classification, Sources, Effects and Prevention z Elaborate upon Noise Pollution; Its Classification, Sources, Effects and Prevention INTRODUCTION Our environment comprises ourselves, air, water, land, other living organisms, plants and animals. Our environment gets polluted when any substance coming either from human activity or occurring naturally having bad effect comes in contact with it. Factors such as sewage have their impact on air, water and land. They affect the quality of the environment. In this unit, you will study about various types of pollution that have adverse effects on our environment including air, water, soil and noise pollution. Further, you will also study about their individual classification, sources from which they arise, their effect on human health and how these kinds of pollutions can be prevented. We will start by understanding air pollution. 5.1 AIR POLLUTION In this section, you will learn about air pollution. Air pollution is caused due to the introduction of various chemicals, particles or biological materials that have bad effect on the health of human beings, natural environment or other living organisms for example, food crops, etc. The air is being polluted by the discharge of emissions originating from industrial plants, domestic sources, mobile vehicles and thermal power plants. Both in the developed and developing countries, the urban areas especially are exposed to such levels of air pollution that cause serious danger to public health and hygiene. Emission means any solid, liquid or gaseous substance coming out of any chimney, duct or any other outlet.
Unit 5 - Environmental Pollution Notes 89 Figure 5.1: Air Pollution 5.1.1 Classification of Air Pollutants The various classification of air pollutants are as follows: 1. Gases and Particles: Pollutants are present in the air in the form of gases or particles. The most important gaseous pollutants comprise sulphur dioxide (SO 2), nitrogen dioxide and nitric oxide, ozone and carbon monoxide (CO). Particles come from various different sources and differ greatly in size and composition. They are mixtures of organic and inorganic substances – sulphate, nitrate, ammonium, minerals and metals. Other pollutants occur in gaseous form or particles. They include metals such as lead, arsenic, nickel and mercury, which exist as vapour and Volatile Organic Compounds (VOCs) such as benzene 1, 3-butadiene and formaldehyde that occur as gases. 2. Primary and Secondary Pollutants: Pollutants can also be classified as primary pollutants or secondary pollutants. Primary pollutants are those that are directly released into the air from the pollutant source, while secondary pollutants are formed by chemical changes to primary pollutants. Example: Sulphur Dioxide is a primary pollutant produced by coal burning power stations. NO 2 (Nitrogen dioxide) is mainly a secondary air pollutant, formed by the oxidation of nitric oxide. Ozone is also a secondary pollutant, produced when sunlight breaks down pollutants such as NO 2 and VOCs. Particles can also be primary particles or secondary particles. ™ Primary particles are those that are directly emitted into the air. It comprises car exhaust and particles from coal-fired power stations. It also includes naturally occurring materials for instance, pollen grains and their fragments. ™ Secondary particles are those that are formed from other pollutants. For example - sulphates and nitrates formed from SO 2 and NO 2 . A common secondary particle constituent is ammonium sulphate formed from ammonia and sulphuric acid.
Environmental Studies Notes 90 3. Indoor and outdoor Pollutants: Pollutants in case of indoor air related to health include CO, NO 2 , VOCs and environmental tobacco smoke. However, ozone, sulphur dioxide and particles are more relevant in outdoor air. Concentrations of pollutants can differ to a great extent between outdoor and indoor air. Example: CO, though present in outdoor air, can reach hazardously high levels indoors if rooms are poorly ventilated. On other hand, levels of ozone, mainly in summer ozone, are much lower indoors than outdoors. 5.1.2 Sources of Air Pollution The various sources of air pollution are as follows: 1. Stationary and Area Sources: Stationary source is that source of air pollution which is a result of emission source that do not move. It is also called point source. Example: ™ Factories ™ Power plants ™ Dry cleaners ™ Degreasing operations Area source on the other hand includes many small sources of air pollution whose combined emissions can be significant. Example: ™ Construction of housing developments ™ Dry lake beds ™ Landfills 2. Mobile Sources: A mobile source of air pollution is that source of air pollution that is not stationary. Generally, mobile sources indicate ‘on- road’ transportation that comprise cars, sport utility vehicles and buses. Additionally, there is also a ‘non-road’ or ‘off-road’ category that comprises gas-powered lawn tools and mowers, farm and construction equipment, recreational vehicles, boats, planes and trains. 3. Agricultural Sources: Agricultural operations that raise animals and grow crops can generate emissions of gases and particulate matter. For example, animals confined to a barn or restricted areas (rather than field grazing) produce large amounts of manure.

Unit 5 - Environmental Pollution Notes 91 Various gasses are emitted by manure, particularly ammonia into the air. This ammonia can be emitted from the animal houses, areas where manure are stored, or from the land after the manure is applied. In production of crops, the misuse of fertilizers, pesticides and herbicides might result in aerial drift of these materials and harm may be caused. 4. Natural Sources: Apart from industrialisation and the use of motor vehicles that are the most noteworthy contributors to air pollution, there are other important natural sources of air pollution as well. These sources include dust storms; wild land fires and volcanic activity, which emit gases and pollute our atmosphere. Natural air pollution does not arise because of activities of human beings. An erupting volcano emits particulate matter and gases; forest and grassfires can give off huge quantities of 'pollutants'. The plants and trees naturally produce VOCs, which are oxidised and form aerosols that can cause a natural blue haze and dust storms can create large amounts of particulate matter. Wild animals in their natural habitat are also one of the natural sources of 'pollution'. Figure 5.2: Various Sources of Air Pollution 5.1.3 Effects of Air Pollution You must have studied in earlier units that air pollution has harmful effects on the environment. The following are few such effects: 1. Air pollution upsets respiratory system bringing about difficulties in breathing. It causes diseases such as asthma, bronchitis, tuberculosis, lung cancer and pneumonia. 2. Air pollution results in depletion of ozone layer as a result of which ultraviolet radiations can reach the earth and result in damage to eyes, cause skin cancer, and affect the immune system.
Environmental Studies Notes 92 3. Air pollution causes acid rain which damages trees, crop plants, monuments, buildings, statues and metal structures and furthermore, makes the soil acidic. 4. Air pollution may result in global warming, which leads to extreme heating of earth's atmosphere, additionally leading to weather variability and rise in sea level. This increase in temperature may result in melting of ice caps and glaciers that may cause floods. 5. Air pollution caused from certain metals, pesticides and fungicides causes serious ailments. ™ Some metals cause problem in kidney, liver, circulatory system and nervous system ™ Fungicides cause nerve damage and death ™ Lead (Pb) pollution causes anaemia, brain damage, fits and death ™ Pesticides such as Dichloro Diphenyl Trichloroethane (DDT) which are toxic enter into our food chain and get collected in the body initiating kidney disorders and problems of brain and circulatory system 5.1.4 Prevention of Air Pollution There are various methods that are used for the prevention of air pollution caused by gaseous pollutants and particulate pollutants. You will learn about them in this section. 1. Methods of Controlling Gaseous Pollutants: The air pollution caused by gaseous pollutants such as hydrocarbons, sulphur dioxide, ammonia, carbon monoxide, etc. can be controlled by using three different methods – Combustion, Absorption and Adsorption. ™ Combustion: This process is used when the pollutants are organic gases or vapours. The organic air pollutants are subjected to flame or catalytic combustion when they are transformed into less dangerous product like CO 2 and harmless product such as water. ™ Absorption: In this process, the polluted air comprising gaseous pollutants is passed through a scrubber having a suitable liquid absorbent. The liquid absorbs the injurious gaseous pollutants present in air. ™ Adsorption: In this process, the polluted air is passed through porous solid adsorbents kept in appropriate containers. The gaseous impurities are adsorbed at the surface of the porous solid and clean air passes through it. 2. Methods of Controlling Particulate Emissions: The air pollution which is caused by the particulate matter like dust, soot, ash, etc. can be controlled
Unit 5 - Environmental Pollution Notes 93 by using wet scrubbers, fabric filters, electrostatic precipitators and some mechanical devices. ™ Mechanical Devices: It works on the basis of the following: Gravity: In this method, the particulate settles down due to the gravitational force and gets removed. Sudden Change in the Direction of Air Flow: It separates the particles because they have greater momentum. ™ Fabric Filters: The particulate matter is passed through a porous medium made of woven or filled fabrics. The particulate matter that is present in the contaminated air is filtered. It then gets collected in the fabric filters while the gases are discharged. The method of controlling air pollution by using fabric filters is called 'bag filtration'. 3. Wet Scrubbers: They are used to trap sulphur dioxide, ammonia and metal fumes by passing the gases through water. 4. Electrostatic Precipitators: When the polluted air having particulate impurities is passed through an electrostatic precipitator, it prompts electric charge on the particles. Then, the aerosol particles get precipitated on the electrodes. Figure 5.3: Electrostatic Precipitator Some other methods of controlling air pollution include the following: 1. Tall chimneys should be connected in the industrial unit. 2. Improved designed tools and smokeless fuels must be used in homes and industries. 3. Renewable and non-polluting sources of energy like solar energy, wind energy, etc. should be used. 4. Automobiles should be appropriately preserved and must follow the control standards. 5. More afforestation should be done.

Environmental Studies Notes 94 Self Assessment Fill in the blanks: 1. Air pollutants can be primary or ..... 2. ..... refers to the presence of substances in air, water and land, whether they result from human activity or occur naturally which have adverse effects on humans and environment 3. ..... pollutants are carbon dioxide, nitrogen oxides, sulphur dioxide, carbon monoxide (all formed from the combustion of fossil fuels), CFC and particulate matter. 4. ..... pollutants are acid rain and ozone. 5.2 WATER POLLUTION In this section, you will learn about water pollution. Water pollution is a main worldwide problem which calls for on-going estimation and review of water resource policy at all stages. It has been held that it is an important universal cause of deaths and diseases. Approximately, five hundred and eighty people in India die due to water pollution related diseases daily. Water covers over seventy per cent of the earth's surface. It is a very essential resource for people and the environment. Water pollution pollutes drinking water, rivers, lakes and oceans all over the world. In many developing countries, it is generally a major reason of death.

Water pollution arises when pollutants are
directly or indirectly discharged into water bodies without suitable treatment to remove unsafe compounds. Water pollution affects fauna and flora living in the bodies of water. Nearly, in all the cases, the resulting effect is destructive not only to individual species and populations, but also to the natural biological communities. Figure 5.4: Water Pollution Unit 5 - Environmental Pollution Notes 95 Water pollution is the second most imperative environmental concern along with air pollution. 5.2.1 Classification of Water Pollution The two categorisations of water pollution are point and non-point. Point source water pollution occurs when harmful elements are directly put into water. An example is dumping of garbage by factories. Non-point sources are when unsafe ingredients are put into water ultimately through ecological changes. For example, rain can cause fertilizers to run off and flow into water. As the fertilizers flow in the water, the algae grow more rapidly as the fertilizers provide nourishment to them. The algae use the oxygen supply, affecting other organisms to suffocate. This overgrowth can also block river flows. Figure 5.5: Classification of Water Pollution 5.2.2 Sources of Water Pollution You need to know the sources of water pollution in farming. They are as follows: z Farms frequently use large quantities of herbicides and pesticides, both of which are toxic impurities. These elements are mainly dangerous to streams and lakes, life in rivers where toxic substances can build up over a period of time. z Farms regularly use huge chemical fertilizers that are eroded into the waterways and damage the water supply and the life within it. Fertilizers can raise the amounts of nitrates and phosphates in the water, which ultimately lead to the process of eutrophication. z If livestock is grazed in the nearby water sources, it might result in organic waste products being washed away into the waterways. This unexpected

Environmental Studies Notes 96 introduction of organic material increases the quantity of nitrogen in the water and can also lead to eutrophication. z Unnecessary amounts of residue in waterways because of runoff from the uncovered soil of agricultural fields can block sunlight. This prevents aquatic plants from photosynthesizing and can suffocate fish by blocking their gills. Figure 5.6: Agricultural Drainage Containing Pesticides and Fertilizers Business You must know how various activities cause pollution. The following statements will make it clear to you: z Clearing of land can lead to erosion of soil into the river. z Waste and sewage produced by industry can get into the water supply and introduces large organic impurities into the ecosystem. z Many industrial and power plants use the water of the rivers, streams and lakes to dispose of waste heat. As a result of this, the hot water can cause thermal pollution. Thermal pollution can have a disastrous effect on life in an aquatic ecosystem. This is because as temperature changes, the amount of oxygen in the water decreases, thus, decreasing the number of animals that can live there. z Water can become polluted with toxic or radioactive materials from industry, mine sites and abandoned dangerous waste sites. z Acid precipitation is produced when the burning of fossil fuels produces sulphur dioxide in the air. The sulphur dioxide reacts with the water in the atmosphere, making rainfall which comprises sulphuric acid. As acid precipitation falls into lakes, streams and ponds, it can reduce the overall pH of the waterway. It kills vital plant life, thus, affecting the entire food chain. It can also leach heavy metals from the soil into the water, killing fish and other aquatic organisms. Due to this, air pollution is possibly one of the most threatening forms of pollution to aquatic ecosystems.
Unit 5 - Environmental Pollution Notes 97 Figure 5.7: Acid Precipitation Homes Homes contribute to water pollution in the following ways: z Sewage produced by houses or runoff from infected tanks into nearby waterways introduce organic pollutants that can cause eutrophication. z Fertilizers, herbicides and pesticides used for lawn care can overflow and pollute the waterway. Similarly, agricultural fertilizers, home fertilizers can lead to the eutrophication of lakes and rivers. z Unsuitable disposal of harmful chemicals down the drain introduce toxic elements into the ecosystem, polluting the water supplies in a way that can harm aquatic organisms. z Leakages of oil and antifreeze from a car on a driveway can be eroded by the rain into nearby waterways, polluting it. Figure 5.8: Sewage 5.2.3 Effects of Water Pollution There are various factors causing water pollution. These factors depend upon what kind of chemicals and in which locations the pollution occurs. Numerous water bodies nearby urban cities and towns are extremely polluted. This is due to both debris dumped by individuals and hazardous chemicals legally or illegally dumped by manufacturing industries, health centres, schools and market places. z Death of aquatic (water) animals: The main cause of water pollution is that it kills life that depends upon these water bodies. Dead fish, birds,
Environmental Studies Notes 98 crabs and sea gulls, dolphins, and various other animals often wind up on beaches, killed by pollutants in their living environment. z Disruption of food chains: Pollution upsets the natural food chain also. Pollutants for example cadmium and lead are eaten by small creatures. Later, these animals are consumed by fish and shellfish, and the food chain remains disturbed at all higher levels. Figure 5.9: Disruption of Food Chains z Diseases: Sooner or later, humans are affected by this process as well. People can get diseases like hepatitis by the consumption of seafood that has been poisoned. In many poor nations, there is always outbreak of cholera and similar diseases. This is owing to poor drinking water treatment from polluted rivers. z Destruction of ecosystems: Ecosystems can be severely changed or destroyed by water pollution. Several areas are now being affected by careless human pollution, and this pollution is coming back to hurt humans in a number ways. Can you think of some other effects that water pollution is having in your area? 5.2.4 Prevention of Water Pollution Take note of the following measures, which can be taken so as to prevent water pollution from getting worse: 1. Conserve Soil: Today, the main cause of water pollution is soil erosion. Once you start taking measures so as to conserve soil, you are also sustaining water and water life. A few of the major possible methods for conservation of soil are: ™ Planting vegetative covers

Unit 5 - Environmental Pollution Notes 99 ™ Strict erosion management ™ Implementing beneficial farming methods 2. Dispose of toxic chemicals properly: It is always a better idea to make use of lower volatile organic compounds products in your home whenever possible. If you do use toxic chemicals, for example – paints, stains or cleaning supplies, dispose them off properly. Paints can be recycled and oils can be reused after treatment. Proper disposal keeps these substances out of waterways, storm drains and septic tanks. 3. Keeping Machinery in Good Working Order: One of the largest polluter of water in the world is oil. It is projected that only the transportation of oil is answerable for .0001 per cent of oil contamination in water. Take measures to make sure that you are not contributing to this problem by repairing oil leaks in cars and machinery the moment they are spotted. Clean up the remainder and dispose of the used oils as it should be. 4. Cleaning up Beaches and Waterways: Just picking up waste and untidiness anywhere it is seen can help considerably in keeping debris and pollutants out of the water. You should be responsible for taking your own trash and other wastes that you see in a surrounding area and dispose them to a nearby facility. 5. Avoid plastics whenever possible: Plastic bags are a major factor contributing to water pollution. You can avoid this problem and can keep your water from getting contaminated by switching from use of plastic bags to reusable grocery bags whenever possible. Figure 5.10: Plastic Pollution In developing countries, seventy per cent of industrial wastes are dumped untreated into waters where they pollute the usable water supply. 5.3 SOIL POLLUTION: DEFINITION, SOURCES, EFFECTS AND PREVENTION In this section, you will learn about soil pollution. Soil pollution can be defined as 'the accumulation in soils of persistent toxic chemicals, compounds,

Environmental Studies Notes 100 radioactive materials, salts or disease causing agents, which have bad effects on proper growth of plants and health of animals'. The earth's surface is covered by a layer of organic materials and inorganic materials known as soil. The dark upper-most top soil comprises 'organic materials that is made up of the decayed remains of plants and animals. The inorganic part of the earth's surface take account of rock fragments that are formed over thousands of years by physical and chemical weathering of bedrock. Productive soils are necessary for agriculture to supply the world with sufficient food. 5.3.1 Sources of Soil Pollution You need to know the various sources of soil pollution. They are as follows: 1. Industrial Activity: The biggest contributors to the problem of soil pollution in the last century are the activities of the industry, particularly from the time when the amount of manufacturing and mining has increased. Most industries are dependent on extracting minerals from the Earth. Whether it is iron ore or coal, the by-products are polluted and they are not disposed of in a manner that can be considered suitable. Therefore, the industrial waste remains in

Since technology provided us with modern pesticides and fertilizers, chemical utilization has gone up tremendously. They are full of chemicals that are not produced in nature and cannot be broken down by it. Therefore, they seep into the ground and after they mix with water, the fertility of the soil gradually decreases. Other chemicals harm the composition of the soil and make it easier to erode by air and water. Plants absorb a number of these pesticides and when they decompose, they cause soil contamination from the time when they turn out to be a part of the land. 3. Waste Disposal: Finally, an increasing concern is regarding the way we dispose of our waste. Industrial waste is sure to cause contamination but there are other ways in which we are adding to the pollution. A certain amount of personal waste products by way or urine and faeces is produced by every human. While much of it moves into the sewer system, there is also a large amount that is dumped directly into landfills in the form of diapers. Also, the sewer system ends at the landfill, where the biological waste contaminates the soil and water. This is the reason that our bodies are full of chemicals and toxins which are now seeping into the land and causing pollution of soil. 4. Accidental Oil Spills: Storage and transportation can lead to oil leakages, which can be observed at most of the fuel stations. The quality of the soil is affected by the chemicals present in the fuel thereby, making it unsafe for

Unit 5 - Environmental Pollution Notes 101 cultivation. Furthermore, water can also get contaminated as these chemicals can enter into the groundwater through soil. 5. Acid Rain: Acid rain is caused as soon as

pollutants present in the air mix up with the rain and fall back on the earth. The polluted water may perhaps dissolve away

a number of essential nutrients present in the soil and change the structure of the soil. Figure 5.11: Soil Pollution 5.3.2 Effects of Soil Pollution You need to understand the effects of soil pollution. The following points will help you understand the same: 1. Effect on Health of Humans: Considering how soil is the reason we are able to sustain ourselves, soil pollution has significant effects on human health. Crops and plants grown on contaminated soil absorb much of the pollution and then, pass this on to us. This can lead to sudden increase in small and terminal illnesses. The genetic make-up of the body can be badly affected by long-term exposure to such soil, leading to congenital illnesses and chronic health problems that cannot be cured easily. Truthfully, it can sicken the livestock to a great extent and grounds for food poisoning over a long period of time. The soil pollution can even lead to severe scarcities if the plants are not able to grow in it. 2. Effect on Growth of Plants: The ecological balance of any system gets affected owing to the severe contamination of the soil. Most plants are unable to adapt when the composition of the soil changes so often in a short period of time. Fungi and bacteria found in the soil that bind it together begin to decline that leads to an additional problem of soil corrosion. The fertility slowly reduces, making land unsuitable for farming. The soil contamination causes large pieces of land to become hazardous to health. Unlike deserts, which are appropriate for its native vegetation, such land cannot support most forms of life. 3. Decreased Soil Fertility: The fertility of the soil is reduced due to the presence of toxic chemicals in the soil, thereby, decreasing soil yield. The
Environmental Studies Notes 102 contaminated soil is then used to yield fruits and vegetables which lack quality nutrients. This may contain some poisonous substance to cause serious health problems in people consuming them. 4. Toxic Dust: The environment also gets polluted leading to serious health issues due to the emission of toxic and foul gases from landfills. 5. Changes in Soil Structure: The death of many soil organisms for example earthworms in the soil can cause alteration in soil structure. Apart from that, it could also force other predators to move to other places in search of food. 5.3.3 Prevention of Soil Pollution You need to understand the following methods that can be employed in order to prevent soil pollution: 1. Enacting Laws: Strict laws and regulations should be made in order to prevent soil contamination. Defaulters should be liable for strict actions. 2. Educating People: Public awareness and participation to fight the weeds like Parthenium and Eupatorium. 3. Improved Agricultural Techniques and Reduction of Chemical Fertilizer and Pesticide: Agriculture methods should be improved so as to diminish the washing of fertilisers into water-ways. Fertility of land can be increased by crop rotation or mixed cropping. Use of chemical fertilizers and pesticides can be reduced by applying bio-fertilizers and manures and thereby minimise soil pollution. 4. Proper Solid Waste Management: The most important method for the prevention of soil pollution is solid waste management. In order to deal with domestic solid waste, an efficient system of disposal should be developed. Physical, chemical and biological methods can be employed so as to reduce waste generated by industries until they are less harmful. Acidic and alkaline wastes should be neutralised first. Then, the insoluble material if biodegradable should be allowed to degrade under controlled conditions before being disposed. Solid wastes should be pre-treated and recycled and only minimum quantity of such wastes should be discharged. 5. Recycling: Another method for the prevention of soil pollution is recycling. Recycling of paper waste, plastics and other materials decreases the volume of garbage in landfills, which is another common reason of soil pollution. 6. Reforestation: Pollution of soil can be prevented to a great extent by way of reforestation and plantation of grasses. Control of land loss and soil erosion can be attempted by way of restoring forest and grass cover to check wastelands, soil erosion and floods.

Unit 5 - Environmental Pollution Notes 103 Self Assessment Fill in the blanks: 5. Water pollution is the ..... of water bodies. 6. ..... pollution is the second most imperative environmental concern along with air pollution. 7. ..... source water pollution happens when harmful substances are put directly into water. 8. ..... is one of the biggest causes of water pollution today. 9. ..... is one of the largest polluters of water in the world. 5.4 NOISE POLLUTION In this section, you will learn about noise pollution. In our everyday life, we get use to the sounds that we hear. The television, loud music, the traffic, people talking on their phone and even pets barking in the middle of the night – all of these have become a part of the urban culture and hardly disturb us. On the other hand, when the high volume of the television makes you uncomfortable during sleep at night leading to headache, it is no longer just noise but becomes noise pollution. When there is an excessive amount of noise or an unpleasant sound that leads to temporary disruption in the natural balance, it is called noise pollution. Nowadays, it has become very difficult to escape from noise. In general, lack of urban planning increases the exposure to unwanted sounds. For this reason understanding noise pollution is essential to control it in time. Figure 5.12: Noise Pollution 5.4.1 Sources of Noise Pollution There can be numerous sources from where the noise comes from. Some of the sources of noise are given below: 1. Household Sources: Appliances used in houses such as gadgets like vacuum cleaner, washing machine and dryer, food mixer, grinder, cooler, air conditioners can be very noisy and injurious to health. Others include
Environmental Studies Notes 104 loud speakers of sound systems and televisions, iPods and ear phones. Another example may be your neighbour's dog barking all night every day at every shadow it sees, disturbing everyone else in the apartment. 2. Social Events: Social events like discos and gigs, parties also create a lot of noise for the people living in that area. In various market areas, people sell through loud speakers while others shout out offers and try to attract customers to buy their goods. It is important to note that whey these events are not often, they can be called 'Nuisance' rather than noise pollution. 3. Commercial and Industrial Activities: Commercial and industrial activities such as printing presses, construction sites, manufacturing industries contribute to noise pollutions in large cities. In several industries, it is a must that people at all times wear earplugs to minimise their exposure to heavy noise. It is also essential to wear noise-proof gadgets by people who work with tractors, lawn mowers and noisy equipment. 4. Transportation: Aeroplanes flying over houses near busy airports, over ground and underground trains, vehicles on road—are continuously making a lot of noise and people always struggle to cope with them. Can you think of your own examples of noise pollution in your city, town or village? 5.4.2 Effects of Noise Pollution There are many harmful effects of noise pollution. These are discussed below: 1. Hearing Problems: Hearing problems can arise due to

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any unwanted sound that our ears have not been built to filter.

Our ears are capable of only considering certain range of sounds without getting damaged. Man made noises for example

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jackhammers, machinery, horns, airplanes and even vehicles can be too loud for our range

of hearing that our ears are capable off. Persistent exposure to loud levels of noise can certainly result in the damage of our ear drums and loss of hearing. It also decreases our sensitivity to sounds that our ears pick up automatically to regulate our body's rhythm. 2. Health Issues: An individual can also be prone to psychological health issues due to

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excessive noise pollution in working areas, for example, offices, construction sites, bars and even in our homes.

According to research studies, occurrence of aggressive behaviour, constant stress, disturbance of sleep, fatigue and hypertension can be related to excessive
Unit 5 - Environmental Pollution Notes 105 noise levels. These consecutively can lead to more severe and chronic health issues in later course of life. 3. Sleeping Disorders: Your sleeping habit can be hampered by loud noise that ultimately results in irritation and uncomfortable situations. Problems such as fatigue can occur due to lack of comfortable sleep. Additionally, your personal and professional performance can be affected

as well. Thus, it is always advisable to take a sound sleep to give your body appropriate rest. 4.

Cardiovascular Issues: Today, there is an increasing concern for problems related to blood pressure levels, cardio-vascular disease and stress related heart problems. According to the research high intensity of noise causes high blood pressure and increases heart beat rate as it upsets the normal blood flow. Bringing them to a manageable level depends on our understanding of noise pollution and how we handle it. 5. Effect on Wildlife: Wildlife faces far more problems as compared to humans. Animals develop a better sense of hearing compared to humans since their survival depends on it. The ill effects of excessive noise begin at home. Pets react more violently in households where there is continuous noise. They become confused more easily and face many behavioural problems. In nature, animals may be prone to hearing loss, which makes them easy prey and leads to decreasing populations. 5.4.3 Prevention of Noise Pollution The following are some of the measures that can be taken by the people and the government: 1. Construction of sound proof rooms should be encouraged for noisy machines in industrial and manufacturing installations. This is also important for residential building; additionally noisy machines should be installed far from sleeping and living rooms, for example in a basement or garage. 2. Motorbikes with damaged exhaust pipes, use of horns with jarring sounds, noisy trucks must be banned. Industries that produces sounds, bus and transport terminals, railway stations and airports, should be far situated from living places. 3. Misuse of loudspeakers, worshipers, outdoor parties and discos as well as public announcements systems should be checked by the community law enforcers. 4. Community laws must create silence zones near schools/colleges, hospitals, etc.

Environmental Studies Notes 106 5. Vegetation (trees) along roads and in residential areas can be one of the good measures in order to reduce noise pollution as they absorb sound. Prepare a chart on various noise control devices. Self Assessment Fill in the blanks: 10. ..... noise can certainly hamper your sleeping pattern and may lead to irritation and uncomfortable situations. 11. The ill effects of excessive noise begin at..... 12. Better ..... planning can help in creating 'No-Noise' zones, where honking and industrial noise are not tolerated. 13. Removal of public ..... is another way in which the pollution can be countered. Water Pollution in the Yamuna River, New Delhi, India ith growing population in New Delhi, pollution levels are at an all-time high and continue to become increasingly dangerous to city residents. Water pollution has been a major issue in New Delhi and there have been numerous acts already set in part to help alleviate the issue. New Delhi government and the Pollution Control Board initiated the Environmental Protection Act in 1986. The Act was partially successful, promoting greener vehicle use and even cleaner oil. The pressures behind India's environmental problem are largely industrial. Major amounts of pollutant wastes are dumped straight into the Yamuna River. Adding to this hefty problem is the fact that the economic boom further increased the population. Of major note is the sewage situation; little has been done to cleanly accommodate these newcomers. The handling of waste in general is simply terrible; a recent survey indicates that two in every five New Delhi residents have pollution-related health problems. Yet lack of government motivation and lack of knowledge allows this poor state to worsen. The pollution of the Yamuna River has a variety of impacts on New Delhi's environment. Most noteworthy would be the risk the pollution poses for the citizens' health. This poisonous river is one of the only sources of water for many of the city's inhabitants. W Contd...

Unit 5 - Environmental Pollution Notes 107 Unfortunately, the state of the biodiversity situated around this vital river is greatly influenced by the river's contamination. The Yamuna River is a crucial asset to much of India's ecosystem, which is why its pollution has the potential to be so detrimental. Many forest groves thrive off the shores of the river; it is a support system for a variety of trees such as the Sal and Chir Pine forests. Also, the Asian Elephant survives off the water from the Yamuna River. If the water continues to be polluted at the same rate, the elephants, the forests, and many other forms of wildlife would have to relocate or face extinction. Questions: 1. Discuss the type and source of the problem discussed in the case. 2. What is the solution to the problem discussed in the case? Source: www.enviro.lclark.edu:8002/servlet/SBReadResourceServlet?rid...634 SUMMARY z Our environment consists of water, air, land and their interrelationship with human beings, other living creatures, plants and micro-organisms. z Pollution is defined as the presence of substances in air, water and land, whether they arise from human activity or occur naturally which have adverse effects on humans and on environment. z Air pollution is the state of environment in which the outer atmosphere gets polluted with gases and other materials in concentration which are harmful to humans and environment. z The pollution in air occurs for the reason that the pollutants cannot be absorbed by natural environmental cycles. z Soil pollution is defined as the build-up in soils of persistent toxic compounds, chemicals, salts, radioactive materials, or disease causing agents, which have adverse effects on plant growth and animal health. z Water pollution is a main global concern which necessitates on-going evaluation and revision of water resource policy at all levels. z Noise pollution is an excessive amount of noise or an unpleasant sound that leads to temporary disruption in the natural balance of humans and animals. KEYWORDS Absorption: In this process, the polluted air comprising gaseous pollutants is passed through a scrubber having a suitable liquid absorbent. Adsorption: In this process, the polluted air is passed through porous solid adsorbents kept in appropriate containers. Environment: It includes water, air, land and their interrelationship with human beings, other living creatures, plants and micro-organisms.

Environmental Studies Notes 108 Noise Pollution: It is the disturbing or excessive noise that may harm the activity or balance of human or animal life. Pollution: It refers to the presence of substances in air, water and land, whether they result from human activity or occur naturally which have adverse effects on human and on environment. Soil Pollution: It is defined as the build-up in soils of persistent toxic compounds, chemicals, salts, radioactive materials or disease causing agents, which have adverse effects on plant growth and animal health. Stationary Source: It is that source of air pollution that results from emission source that do not move. Stationary source is also called point source. MULTIPLE CHOICE QUESTIONS Choose the correct answer from the following options: 1. The ..... is being polluted by the discharge of emissions originating from industrial plants, domestic sources, mobile vehicles and thermal power plants. (a) Air (b) Water (c) Land (d) Soil 2. ..... source is that source of air pollution that results from emission source that do not move (a) Point (b) Non-point (c) Primary (d) Secondary 3. ..... sources indicate 'on-road' transportation (a) Agriculture (b) Mobile (c) Stationary (d) Area 4. In ..... process, the polluted air comprising gaseous pollutants is passed through a scrubber having a suitable liquid absorbent. (a) Absorption (b) Adsorption (c) Condensation (d) Both (a) and (b) 5. In adsorption process, the polluted ..... is passed through porous solid adsorbents kept in appropriate containers. (a) Air (b) Water (c) Soil (d) All of the above 6. Water covers over ..... per cent of the Earth's surface. (a) Eighty (b) Fifty (c) Ninety (d) Seventy

Unit 5 - Environmental Pollution Notes 109 7. The two categorisations of water pollution are ..... (a) Point and non-point (b) Stationary and Area (c) Primary or secondary (d) Both (b) and (c) 8. A few of the major possible methods for conservation of soil are: (a) Planting vegetation (b) Strict erosion management and (c) Implementing beneficial farming methods (d) All of the above 9. One of the largest polluter of water in the world is ..... (a) Soil (b) Oil (c) Insects (d) All of the above 10. Some of the sources of noise are: (a) Household sources (b) Social events (c) Commercial and industrial activities (d) All of the above REVIEW QUESTIONS 1. Define the term pollution. 2. What do you mean by air pollution? Discuss its sources. 3. What are the ways in which you can prevent water pollution? 4. What are the sources and effect of soil pollution? 5. Discuss noise pollution in detail. Answers: Self Assessment 1. Secondary 2. Pollution 3. Primary 4. Secondary 5. Contamination 6. Water 7. Point 8. Erosion 9. Oil 10. Loud 11. Home 12. Urban 13. Loudspeakers Answers: Multiple Choice Questions 1. (a) 2. (d) 3. (b) 4. (a)

Environmental Studies Notes 110 5. (a) 6. (d) 7. (a) 8. (d) 9. (b) 10. (d) FURTHER READINGS Uberoi, N. K., (2010). Environmental Studies. New Delhi: Excel Books. Owen, L. & Unwin, T., (1997). Environmental Management: Readings and Case Studies. Wiley. Barrow, C. J., (1999). Environmental Management: Principles and Practice. Routledge. Rajgopalan, R., (2005). Environmental Studies from Crises to Cure. Oxford University Press. Dr. Daniels, R. J. R. & Dr. Krishnaswamy, J., (2009). Environmental Studies. India: Wiley. www.support.wwfindia.org/ www.en.wikipedia.org/wiki/Environmental_studies www.journals.elsevier.com/environmental-pollution www.meridian.aag.org/sustainable/gallery/projects/gathambo.pdf

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Unit 6 - Social Issues and Environment Notes 111 UNIT 6 - SOCIAL ISSUES AND ENVIRONMENT CONTENTS Learning Objectives Introduction 6.1 Sustainable Development 6.2 Water Conservation 6.3 Watershed Management 6.3.1 Main Features of Watershed Management 6.4 Rainwater Harvesting 6.4.1 Why to Harvest Rainwater? 6.4.2 How to Harvest Rainwater? 6.5 Climate Change 6.6 Global Warming 6.6.1 Effects of Global Warming 6.6.2 How to Fight Global Warming? 6.6.3 Greenhouse Gases (GHGs) 6.7 Acid Rain 6.8 Ozone Layer Depletion 6.8.1 Harmful Effects 6.8.2 The Ozone Depleting Substances 6.8.3 Ozone Hole 6.9 Nuclear Accidents and Holocaust: Basic Concepts and their Effect on Climate 6.10 Concept of Carbon Credits and their Advantages 6.10.1 Advantages 6.10.2 Disadvantages Summary Keywords Multiple Choice Questions Review Questions Further Readings
Environmental Studies Notes 112 LEARNING

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OBJECTIVES After studying this unit, you should be able to: z Define

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Water Conservation, Watershed Management and Rainwater Harvesting z Discuss Climate Change, Global Warming, Acid Rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust

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Climate Change, Global Warming, Acid Rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust

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Climate Change, Global Warming, Acid Rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust

z Analyse the Concept of Carbon Credits INTRODUCTION In this unit, you will study the concepts of development and sustainable development. Besides, you will further learn about water conservation, watershed management and rainwater harvesting. Finally, you will study about climate change, global warming, acid rain, ozone layer depletion and carbon credit. 6.1 SUSTAINABLE DEVELOPMENT In this section, you will learn that the environmental management is most important, yet most neglected discipline. It concerns life support system and is closely linked with development and economic growth. At times, the two (development and environmental management) become conflicting. Today, we stand at the crossroads in choosing between environment and development. The industrial countries have achieved high level of development and high standard of living at the cost of environment and depletion of natural resources. The question is how long this kind of development will be sustainable? The developing countries, on the other hand, are still struggling to attain a minimum standard of living though they are also contributing to environmental damage. Thus, both the industrialised countries and underdeveloped or developing countries, damage, deplete and pollute the environment. The developing countries need growth to fulfil the basic needs of their people, but should they repeat the mistakes of the industrial countries? It is a fact that both the consumption and the life style of people have relevance to environmental problems. Therefore, living habits, attitudinal and ethical questions have now entered into the environmental management area. These issues, sometimes, become disputable and need a deeper study to help us in understanding the environmental problems. The basic question remains is, what is the pattern of growth and development that you must follow? What is the kind of model of development and the business model we should follow so that we don't ignore the principles
Unit 6 - Social Issues and Environment Notes 113 underlying sustainability? For this, we need changes at local, national, regional and global levels together with an economic and social transformation at the levels of individuals and communities. Sustainable development is defined

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as development that meets the needs of the present without compromising with the ability of future generations to meet their own needs. Sustainable development is a

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development that meets the needs of the present without compromising with the ability of future generations to meet their own needs.

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development that meets the needs of the present without compromising with the ability of future generations to meet their own needs. Sustainable development is

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development that meets the needs of the present without compromising with the ability of future generations to meet their own needs. Sustainable development is

concept. It emphasises that rate of consumption or use of natural resources should approximate the rate at which these resources can be substituted or replaced. It further requires that a nation or society is able to satisfy its requirements — social, economic and others— without putting the interest of future generations under risk. Nature has been offering its resources and services and also serving as a vessel for absorbing wastes for too long a time. Realisation must come to us that nature today is delicate. Nature is limited. The experts have evidence to prove that we have almost reached a critical threshold beyond which ecological decline would lead to disaster. But these experts do not always have a say in policy matters. They may support the "limit to growth" philosophy. But, they are standing against those who believe that modern economy with market regulation, backed by technological innovations, will be magical for ecological situation. Developing this concept of sustainable development further, we must include in its scope what is called the principle of justice and equity (equal distribution) between the people of the North and the South. This means that both the national leaders and international institutions have responsibility for sound developmental, economic and environmental issues keeping in view the principle of equity, and those principles that determine the discrimination between the two generations. Another aspect of sustainability is that it is about systems analysis. It means that how economic, social and environmental systems interact at various scales of operation in a way that would lead to sustainable development. This is the kind of development that strikes optimal balance among the three sub-systems. Sustainable development must lead to reducing poverty of people in developing countries by means that minimise resource depletion, environmental damage and social instability. 6.2 WATER CONSERVATION In this section, you will learn that our country has come a long way since Independence in improving access to basic services, especially to the poor and those in far-flung remote areas. India has also struggled to attain self- sufficiency in food grain requirements. At the same time, as discussed above, there still remain issues of concern.

Environmental Studies Notes 114 z On the policy front, it is recognised that long-overdue price reforms be undertaken such that the prices of water and related inputs, such as fertilisers and power in the case of agriculture, reflect the cost of providing these services and to the extent possible the environmental externalities, while satisfying the national social obligations. Price reforms will encourage resource conservation on one hand and provide additional financial support for the fund-starved municipal service providers on the other. It needs to be added that any attempt at rationalising water tariffs must go hand in hand with improvements in supply efficiency and service quality. It is also necessary to introduce market-based instruments to arrest water misuse and quality degradation. Economic instruments should be supported by environmental management tools such as performance benchmarking, ISO 14000 standards and environmental rating to improve not only environmental performance but also the international image and competitiveness of Indian industry. z Institutional reform can be implemented if the service sector, be it irrigation projects or municipal services, is allowed adequate freedom. This would involve transfer of administrative and financial responsibilities. In addition to this, it involves the community and the private sector as much as possible in the provision of these services. The need to involve the community in the management and maintenance of water projects has been reemphasised in the Approach Paper to the Tenth Plan (Planning Commission, 2001). Necessary legislation also needs to be enacted for preservation of existing water bodies by preventing encroachment. z The move towards a river-basin approach to water management must be strengthened. This is because the issues related to an adequate and sustainable supply of quality water usually moves beyond local boundaries. They need to be addressed in harmony with other resources such as land. Appropriate legislation is required to set up planning units such as river- basin authorities which will act as independent institutions with policy formulation, planning, financial, and regulatory powers. z With the supplies of usable surface water at about 35% of the total available run-off, it is necessary to save the available resources to the maximum possible extent. The need is to (i) develop surface-irrigation sources, (ii) harvest rainwater, and (iii) prevent run-off. The run-off can be tapped by building appropriate water-harvesting structures in the lower reaches, especially during June-November when the rivers generally carry water in excess of 90%. The agricultural practice is such that the land receives massive amounts of chemical fertilisers leading to run-off pollution. Replacement of chemical fertilisers and pesticides by natural fertilisers and pesticides (neem) is possible. Drip irrigation is another method to save agricultural water. z The concept of watershed development which effectively contributes to the revival of local traditional water control works has also to be adopted more

Unit 6 - Social Issues and Environment Notes 115 seriously. The possibilities of inter-basin transfers of water also need to be explored to make optimal use of the country's water resources. The National Water Development Agency envisages the utilisation of 200-250 billion cubic meters of water by such transfers. z Demand management has to form an integral part of water management. It is necessary that water conservation practices in the day-to-day use of water be encouraged through appropriate policies; promotion of low-cost and water efficient technological options, R&D efforts and awareness building. Reuse options for domestic wastewater also need to be explored. Figure 6.1: Water Conservation 6.3 WATERSHED MANAGEMENT You must know that watershed is an area of high land where streams on one side flow into one river or sea and streams on the other side flow into a different river or sea. Watersheds contain a number of natural resources like soil, water, vegetation (in the form of grasses, trees, crops and livestock). When rain falls on watershed, water is delivered to lake or river through small surface streams or underground aquifers. Thus, watersheds are very important for preventing depletion of groundwater. Watersheds therefore, control the amount of water in river or lake and act as natural water purifiers. Hence, watershed management is very important. Previously, watershed management was focused on large rivers so that it would prevent rapid run off of water and would slow down the process of soil erosion and floods. Now watershed management is equally focused on rural development, especially in developing countries. It is not only focused on stabilising soil, water, vegetation and livestock but also on increasing the productivity of resources that are environmentally sustainable. Productivity, for example, for fisheries and other livestock can be raised by increasing supply of vegetation and other organisms in watershed development plan. In India, most of the lands under watersheds are under the control of State governments, forest department or village communities. This means that for management of watersheds, various agencies have to be involved. Most important are village people who are very important in the process of management. An interface between government agencies and private owners for sharing common resources is another aspect of watershed management.
Environmental Studies Notes 116 The Government of India in 1994, published guidelines on Watershed Management, which was a significant step for decentralisation and allocation of funds. NGOs have done a lot of work in watershed management; therefore, the Government's guidelines are drawn from the experience of NGOs. In India, two kinds of watersheds have been identified: 1. Small (micro-watersheds) with an area of 500-1000 hectares, and 2. Large or macro watersheds which encompass many thousands of hectare equivalent to river basins in size. U.P. Government has adopted a policy of associating local communities, especially women, in the management of their environment including watersheds. The Doon Valley Integrated Watershed Management Project was launched by the Government of UP with funds from European Union. The project involves establishment of four developmental blocks in Dehradun District for sustaining the project. Local people have been encouraged to generate funds for developing the watersheds. They generated income by social forestry, livestock and horticulture development. Figure 6.2: Watershed Figure 6.3: Watershed Conservation 6.3.1 Main Features of Watershed Management You need to know that emphasis for watershed management has been on the participation of local communities. District Rural Development Agencies (DRDA) and Zilla Parishads have the overall responsibility for the programme. DRDA appoints a watershed development advisory committee which includes official and non-official members. This committee suggests and advises DRDA on watershed development, selection, planning, training and implementation.

Unit 6 - Social Issues and Environment Notes 117 The emphasis is on increasing the livelihoods of local people through watershed management as a part of development process. There are a number of difficulties in implementing the watershed development projects. The main difficulty is in incorporating watershed development as a part of strategy for Rural Development Initiatives. Also a strong link between the local agencies, state government and central government is required for the success of watershed development that has a great potential for rural upliftment. If implementation problems can be overcome, then great benefits can be expected from watershed development. The economists have done cost-benefit analysis and found that improper planning can lead to poor economic gains if appropriate investment is done. With proper planning, the benefits would be the following: 1. There is reduction in rainwater loss so that vegetation is regenerated along with soil and water conservation measures, especially in hill slopes. 2. The water tables rise when the projects of watershed areas are completed. The villages dig more wells. 3. With improved water supply of the ground, supplemented with fertilisers, the crop production increases. 4. Based on the results of case studies of certain projects, it is found that fuel wood availability of the villagers increases as a result of tree planting, especially in the hilly areas. 5. Livestock population, especially buffaloes, increases when the project is completed. The population of sheep and goat decreases because grazing ground decreases as a result of increasing cultivated area. Despite decrease in grazing area, fodder production increases due to regeneration of hill slopes with grasses and legumes. To conclude this vast subject, it would be justified to say that for watershed management programmes that are being carried out in different parts of India, emphasis should shift from achievement of targets to capacity building of local communities and promotion of decentralisation. A review of the various projects has to be taken to examine the procedures, strategies and impacts. Training and education of all those concerned with the watershed development projects need to be strengthened because ultimately it is the human resource that is the solution of each and every problem. UN established a World Commission on Environment and Development. In 1987, this Commission submitted a report (Brundtland Report), called "Our Common Future".
Environmental Studies Notes 118 6.4 RAINWATER HARVESTING In

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this section, you will be able to understand the importance and need of

rainwater harvesting. You need to know that the accumulation and deposition of rainwater for reuse is known as rainwater harvesting. In order to arrest ground water decline, one of the methods for management of water resource is rainwater harvesting. Rainwater harvesting (RWH) leads to: z Water recharge in aquifers; z Conservation of surface water run off during monsoons; z Reduction in power consumption; z Arresting sea water entry. RWH has now become a legal requirement at few places in India for new commercial buildings and group housing complexes that would come up henceforth. There are companies that undertake providing RHW facility for various projects and individual building complexes. The governments, both at state and central level, are encouraging the local bodies for RWH. Figure 6.4: Rain Water Harvesting 6.4.1 Why to Harvest Rainwater? The important reasons to harvest rainwater are as follows: z To reduce soil erosion z To beneficiate water quality in aquifers z To conserve surface water runoff during monsoon z To arrest ground water decline and augment ground water table z To develop a culture of water conservation 6.4.2 How to Harvest Rainwater? Broadly there are two ways of harvesting rainwater: (i) Surface runoff harvesting (ii) Roof-top rainwater harvesting
Unit 6 - Social Issues and Environment Notes 119 Figure 6.5: Natural Water Cycle Self Assessment Fill in the blanks: 1. Most countries of North America and Europe which had become industrialised at an earlier stage have become economically ..... 2. Countries that were economically well developed and where people were relatively richer were called ..... nations. 3. Countries where poverty was wide spread and were economically backward were called ..... countries. 4. Many decades ago, Mahatma Gandhi envisioned a reformed village community based on sound ..... 5. .....

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development is defined as meeting the needs of the present without making any compromises with the ability of future generations to meet their own needs. 6.5

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the needs of the present without making any compromises with the ability of future generations to meet their own needs. 6.5

CLIMATE CHANGE In this section, you will learn that after the Rio Summit, climate negotiators met in Geneva in December 1992, to negotiate schedules for future meetings. It was decided that the working group on financial, procedural, institutional and legal matters would meet in March 1993, in time to send a report to a GEF meeting in Beijing.

Environmental Studies Notes 120 The Inter-governmental Negotiation Committee (INC) met six times after the Rio Summit to prepare for the First Conference of Parties (CoP1), and completed its work by February 1995. By the end of March 1995, 127 countries and the EU had ratified the climate convention. Saudi Arabia, which was yet to sign the convention, and other members of the OPEC, who feared that a stronger convention would mean carbon emission cuts and taxes on oil consumption, managed to delay substantive work of the INC until August 1993. Figure 6.6: Climate Change 6.6 GLOBAL WARMING In this section, you will know about global warming and the greenhouse gases. You must have heard this term many times. It means gradual increase in world temperatures caused by greenhouse gases (GHGs). The main greenhouse gas is carbon dioxide (CO_2); others are nitrous oxide, CFCs (chlorofluorocarbons), methane and some organochloride compounds like perflurocarbons (PFCs) and sulphuric fluoride. GHGs come from various sources, mostly from burning of fossil fuels. These gases trap the sun's rays in the earth's atmosphere causing the temperature to rise resulting in what is known as greenhouse effect or global warming. The Inter-governmental Panel on Climate Change (IPCC) has estimated that earth's temperature will rise from 1-3 degrees Celsius in the next few decades. It is believed that global warming is leading to extreme weather changes. Hurricanes may be the result of such a change. In view of the serious effects of global warming and subsequent change in climate, Rio Conference in the discussion on climate change pledged to stabilise GHGs emissions at 1990 level by the end of 20th century. Figure 6.7: Global Warming

Unit 6 - Social Issues and Environment Notes 121 6.6.1 Effects of Global Warming You need to know that it is the domain of scientists to predict the effects of greenhouse gases. They do it by constructing computer models to assess climate changes. Reliability of conclusions from these models can be questioned and thus, the entire theory on climate change due to global warming may not be valid. However, scientists agree that: (i) actual warming has been taking place during the last 100 years; (ii) warming would further raise the temperature of earth by 3-5°C if increase in CO 2 doubles; (iii) if warming continues, coastal areas would see a rise in sea level. If temperature rises further by 3-50°C, sea levels may rise by 0.5 ft. to 5.0 ft. because of melting of mountain glaciers and expansion of oceans. This would result in islands getting submerged and many coastal cities getting flooded, forcing the people to leave their original homes. They would be environmental refugees looking for new habitats. Not only the rising water levels, there are other changes occurring due to global warming. These include hot summers for many parts of the world which would mean more consumption of electricity. It would also affect agricultural production and ecological balance. 6.6.2 How to Fight Global Warming? You need to know that at the Earth Summit held at Rio de Janeiro (1992) 153 nations signed the convention on climate change and committed themselves to reduce emissions of CO 2 and other GHGs. Thus, there is already agreement among nations that global warming is a serious problem and rather than adopting wait and watch attitude, steps must be taken towards reducing consumption of fossil fuels. This can be done by finding out alternative sources of renewable energy, better energy management system and to reverse deforestation. It is a documented fact that burning coal produces twice as much CO 2 per unit of heat as natural gas. It is, therefore, important to control CO 2 production from burning of coal which can be possible by use of alternative source of energy like solar and wind power. There is another aspect to the issue of greenhouse gases. Even if effects of CO 2 on global warming are not too great, less use of fossil fuels and alternative sources of energy would not only reduce CO 2 emission but also lessen pollution. It is true that all the strategies to reduce worldwide reduction in CO 2 emission would incur astronomical costs—not billions but trillions of currency— however, steps in this direction need to be taken in a phased manner. The following steps have been suggested by experts: 1. Cleaning up coal for which technology exists. This can lead to lesser pollution. Also, conversion of coal to gas is possible. This would further reduce pollution. 2. More use of natural gas than coal because natural gas contains only half the carbon of coal and no sulphur.

Environmental Studies Notes 122 3. Renewable sources of energy would ultimately tackle the problem of CO 2 emission and pollution. Wind power and solar energy are obvious choices. But there are other renewable sources like photo voltaic (photo voltaics convert sunlight directly into electricity). These sources produce little or no pollution and involve no safety risks. 4. Manufacturing fuel efficient vehicles is another step. 5. Deforestation Reversal. This is a major step to reduce CO 2 concentration. It is possible to reclaim more land to plant more trees but requires help from social, political and financial institutions. 6.6.3 Greenhouse Gases (GHGs) The following are the Greenhouse gases that you must know about: Carbon Dioxide (CO 2) z Main greenhouse gas. z Arises from burning of fossil fuels. z Levels increase as a consequence of deforestation. Methane (CH 4) z About 20% of greenhouse effect is due to methane. z Arises from: (i) rice paddies; (ii) wetlands; (iii) faecal matter from cattle; (iv) burning of wood; (v) landfills. Chlorofluorocarbons (CFCs) z Responsible for about 15% of the greenhouse effect. z Thousand times more effective (heat absorbing) than CO 2 . z Reaches the atmosphere from: (i) refrigeration; (ii) air-conditioning industry; (iii) foam packing industries. Nitrous Oxide (NO 2) z Responsible for 5% of greenhouse effect.

Unit 6 - Social Issues and Environment Notes 123 z Arises from: (i) coal burning; (ii) biomass burning; (iii) breakdown of chemical fertilisers. 6.7 ACID RAIN In this section, you will be able to learn about acid rain. The acid (Sulphuric/Nitrate) and acid forming compounds in wet form, that fall from the atmosphere to the earth surface is referred to as Acid Rain. As mentioned earlier, various substances including the nutrients that organisms need to live, grow and reproduce are continuously cycled from the physical environment (land, air, water, soil) to living organisms (plants and animals) and back again. These constitute what are called nutrients cycles or biogeochemical cycles. These cycles include oxygen, carbon, nitrogen, water and mineral cycles. Sulphur circulates through the atmosphere in sulphur cycle. Sulphur enters the atmosphere from many natural resources. Sulphur dioxide is the gas that is released from volcanoes. It reacts with oxygen in the atmosphere to produce sulphuric acid droplets. Sulphur dioxide is also released from burning of coal and reacts with other chemicals in the atmosphere to produce particles of sulphur salts. The droplets and particles fall on the earth as acid deposition or acid rain. The nitric acid arises from nitrogen oxide which is generated by combustion from engines and power plants. Besides producing pollution, the gases also give rise to acid rain. Acid rain also contains tracks of toxic metals like mercury from the atmosphere. It causes many environmental problems. When acid rain enters rivers and lakes, plants and animals' life is badly effected including death of fish and other mammals. When acid rain falls on soil, it breaks down the useful minerals of soil resulting in loss of fertility. The trees and crops are affected. Acid rain releases aluminium that is attached to soil compounds. Free aluminium hinders uptake of water by plants. Acid rain is also a threat to water system posing a health hazard. Figure 6.8: Acid Rain You must know that dealing with acid rain means controlling emission of gases which means dealing with sulphur dioxide emissions by coal burning plants

Environmental Studies Notes 124 since we cannot deal with sulphur dioxide released from volcanoes. Techniques are now available to make coal free of sulphur or reducing sulphur contents. The controlling of nitrogen oxide seems difficult because of absence of technology for this purpose. Other measures include distributing materials that neutralise the acid rain in vulnerable areas. But this is very costly. Using internet collect more information on acid rain. 6.8 OZONE LAYER DEPLETION In this section, you will learn that ozone depletion is another global problem that became a serious cause of concern during the 1980s. Ozone layer in the stratosphere forms a shield for earth against harmful ultraviolet radiation (UV- B) from outer space. Ozone is a colourless gas. Depletion of ozone results in the formation of holes in its shield. UV-B arising from sun would reach the earth if there are ozone holes. 6.8.1 Harmful Effects You will find it interesting to know that the sun emits light rays of varying wavelengths. These rays have varying effects on earth's surface, on its living beings, on its ecosystem. The shorter the wavelength of rays, more damage these can do to plants and animals. Ozone layer/shield as mentioned above acts as a barrier to UV. You must know that without this shield, the ecological balance of earth would change and life would be paralysed. Though most of the plants and animals have some kind of protective mechanisms from UV, a longer exposure to these rays, result in penetration to lower layers of body. This leads to skin cancer and damage to eyes in human beings. In plants, the process of photosynthesis (the process by which plants manufacture their food) is affected. UV B can penetrate the surface of the oceans with the result that the marine life and the entire food chain are affected. There is scientific evidence that the adverse effects of UV radiation could reach the depth of 90 feet. Small plants (phytoplankton) and animals (zoo plankton) living in sea get killed by UV radiation. An incident was reported in 1992 (after Rio) that in southern part of Chile as a result of low levels of ozone, people suffered severe burns of skin from short exposure to sunlight. Also, cattle became blind, trees wilted and the animals died because of starvation. NASA in 1992 reported that ozone depleting chlorine is found in Contd...
Unit 6 - Social Issues and Environment Notes 125 high level in Northern Hemisphere and this could lead to ozone hole similar to that over Antarctica. Figure: Ozone Depletion 6.8.2 The Ozone Depleting Substances It was in 1974 that Mario Molina and Sherwood Rowland of University of California found that chlorofluorocarbons (CFCs) destroy the ozone in the stratosphere. CFCs are inert substances and can remain intact for years. CFCs rise through atmosphere to reach upper layer – the stratosphere where they cause ozone depletion. CFCs are a whole family of chemicals and contain chlorine and fluorine. The most common are CFC11, CFC12, CFC22, and CFC113. CFCs are broken down by solar radiation releasing their chlorine atoms which in turn break ozone. The chlorine atoms remain as chlorine even after this reaction (chlorine atoms, therefore, act as catalyst). Thus, chlorine atoms are capable of destroying ozone molecule repeatedly. A single chlorine molecule can break up thousands of molecules of ozone. There is another family of compounds, called Halons, which contain bromine. These compounds are 100 times more capable in destroying ozone than CFCs. It may be worth mentioning that CFCs when first discovered proved useful substances, especially for refrigeration industry because these are neither inflammable nor toxic. Besides refrigeration industry, these compounds are used as aerosol propellants, as solvents for grease or glues as a component of foam packaging, etc. 6.8.3 Ozone Hole You must know that the Ozone hole was first discovered by British Antarctic Survey in 1983 over Antarctica. It was found that levels of ozone were dropping very fast, though a small percentage was being recharged during fall season. But, by 1987 ozone had dropped by considerable level. It was also found that ozone levels were dropping in other parts of the world too. Alarmed over such declining levels of ozone, United Nation Environment Programme (UNEP) called a meeting of few developed nations to consider the issue of ozone depletion vis-a-vis CFCs and phasing out use of ozone depleting compounds. Initially, USA resisted but later agreed to 50% reduction in the use of these compounds. This formed the basis of Montreal Protocol (1987) on substances that deplete the ozone layer.
Environmental Studies Notes 126 6.9 NUCLEAR ACCIDENTS AND HOLOCAUST: BASIC CONCEPTS AND THEIR EFFECT ON CLIMATE You will find it interesting to note that a nuclear and radiation

the environment or the facility." Examples include life-taking effects to individuals, large radioactivity release to the environment or reactor core melt." Nuclear holocaust refers to complete destruction of human civilisation by nuclear warfare. At any stage of nuclear fuel cycle, nuclear accidents can occur. These accidents can cause a serious disaster. The best example of nuclear accident and Holocaust is Chernobyl (Ukraine) incident occurred on April 26, 1986. The Chernobyl nuclear power plant exploded, releasing large amounts of radioactive chemicals into the atmosphere. The power station is located nine miles from Chernobyl. The manner, in which the accident was handled, raised questions about the safety and future of nuclear power. The Chernobyl accident resulted from several factors: flaws in the engineering design, failure of the plant management to enforce these procedures and the decision of the engineers to conduct a risky experiment. They wanted to test whether the plant's turbine generator could provide enough power to the reactor in the case of a power shutdown. This experiment required disconnecting the reactor's emergency core cooling pump and other safety devices. The explosion that occurred was not a nuclear explosion such as would occur with an atomic bomb but its effects were just as devastating. Some 50 tons of nuclear fuel and 800 tons of reactor graphite remained in the reactor vault for several days even after the accident. The amount of radioactive material which went into the atmosphere was equivalent to 10 Hiroshima bombs. Officials at first denied that there had been a serious accident at the power plant. The government in Moscow was led to believe for several hours after the explosion and fire at Chernobyl that the reactor core was still intact. This delayed the evacuation for a critical period during which local citizens were exposed to high radiation levels. The evacuation of Chernobyl and local villages was spread out over eight days. A total of 135,000 persons were evacuated from the area. Tests showed that air, water, and soil around the plant had significant contamination. Children, in particular, were the worst victims and so they were evacuated on priority basis. At the time of the accident, and for several days thereafter, the winds carried the radioactive waste to the north. The radioactive cloud split into two lobes, one spreading west and then north through Poland, Germany, Belgium, and Holland, and the other through Sweden and Finland. In May, the wind direction changed and the radioactive fallout went south over to Italy. Large areas of Europe were affected, and many farmers destroyed their crops for fear
Unit 6 - Social Issues and Environment Notes 127 of contamination. Forests had been cleared and large amounts of earth were removed in order to clean up radioactivity. Plastic film had been laid in some areas in an effort to contain radioactive dust. Many heroic deeds were reported during this emergency. Fire-fighters exposed themselves to deadly radiation while trying to stop the fire. Everyone eventually died from radiation exposure. Bus drivers risked their lives by making repeated trips into contaminated areas in order to evacuate villagers. Over 600,000 people were involved in the rescue operation in Chernobyl. The number of rescue workers who were badly affected by this exposure is still unknown. The Chernobyl accident focused international attention on the risks associated with operating a nuclear reactor for the generation of power. Public apprehension has forced some governments to review their own safety procedures and to compare the operation of their nuclear reactors with Chernobyl's. In a review of the Chernobyl accident by the Atomic Energy Authority of the United Kingdom, an effort was made to contrast the design of the Chernobyl reactor and management procedures with those in practice in the United States and the United Kingdom. Unfortunately, several nuclear reactors are still operating in former Soviet bloc nations in order to meet the power requirement. These reactors are as hazardous as Chernobyl. However, the operational procedures are under constant review to avoid another accident. There are many other examples of nuclear explosion. SD means a balance between socio-economic needs and ecological or environmental requirements. Self Assessment Fill in the blanks: 6. Falling of acid (Sulphuric/Nitrate) and acid forming compounds from the atmosphere to the earth surface is referred to as ..... 7. Sulphur circulates through the atmosphere in ..... 8. ..... is the gas that is released from volcanoes. 9. ..... in the stratosphere forms a shield for earth against harmful ultraviolet radiation (UV-B) from outer space. 10. ..... can penetrate the surface of the oceans with the result that the marine life and the entire food chain are affected.

Environmental Studies Notes 128 6.10 CONCEPT OF CARBON CREDITS AND THEIR ADVANTAGES You must understand that the carbon credits are also known as carbon offsetting or carbon trading. Basically, the way it works is that if an individual or organisation produces too many pollutant emissions, they can offset their carbon footprints. This can be done by buying credits from other individuals or organisations that use alternative fuels or produce less emissions. For example, many celebrities who advocate for greener environments know that they are not practicing what they preach when they fly across the world on a regular basis. In order to offset the amount of pollutants they put into the world, they buy credits from others who produce fewer emissions such as wind farms. Since the wind farm is producing fewer emissions, they are helping to offset the amount of pollutants created by the celebrity's plane. In accordance with the Kyoto protocol, consumers of fossil fuels are assigned CO 2 emission levels. In many cases, achieving these emission levels requires massive upgradation or rebuilding of facilities; incurring costs too huge to justify the investment. Such parties are allowed to pay others to store carbon for them. This is in exchange for the right to release carbon in excess of their limits into the atmosphere. This forms the basis of carbon credits. The concept of carbon credits involves buying carbon units mainly in tons from a middle entity that collects contracts from suppliers (farmers) who meet the criteria of carbon separation through adoption of conservation practices. The carbon units are then sold to a buyer in the industrial sector needing to offset the CO2 emitted to the atmosphere through their manufacturing activities. Carbon credits can form a massive source of revenue for the developing world. However, this requires that carbon separation is adopted on a large scale in these regions. Carbon separation is the process by which carbon credits can be earned and subsequently traded in the world market. 6.10.1 Advantages The following are the advantages of carbon credits: It's an investment in alternative fuels In order to create a cleaner atmosphere, the world needs to stop using the damaging gases and other fuels that damage the ozone and cause health problems. Because of this, many companies have started creating alternative fuel sources that help reduce the carbon footprint. The use of carbon credits continues as an investment in the creation of alternative fuels. These funds allow the organisations to continue working on their alternative methods and will make them more affordable for everyone when they're available.
Unit 6 - Social Issues and Environment Notes 129 It can change a country's financial situation If an underdeveloped country is willing to take on a project that uses fewer emissions in order to offset a project by a developed country that uses too many emissions, the underdeveloped country can be largely compensated. If the project is something that can continue to be used as an offset, such as a wind farm or tree planting, then, this underdeveloped country can easily continue to profit from the project, which can change the entire financial situation of that country. 6.10.2 Disadvantages The disadvantages of carbon credits are as follows: It gives a false sense of Pollution Everyone should try and do their part to actually reduce the amount of emissions. Carbon credits give some people the belief that as long as they pay to help offset the amount of pollution they create, they're still being green. But all that carbon credits do is actually offset and not completely reduce, and reduction is the main goal. It's not regulated The use of carbon credits is still a relatively new idea, and there is no true regulation of the credits that people buy and the alternative methods used to offset them. Because of this, there is no real way to track if the credits that individuals or organisations buy are truly being offset appropriately. And if nobody is truly regulating what is going on, then, it's possible that people and organisation are paying to offset their emissions when their emissions are not even being offset, which makes the entire idea null and void. Harvesting of Rain Water (Chennai) he Chennai branch of National Water Harvesters Network (NWHN) reports a success story of Rainwater Harvesting (RWH). Under the leadership of A. Vaidyanathan, Chennai has made a remarkable progress in terms of water harvesting. Since, builders have a crucial role in rain- water harvesting, in June, 1999 a meeting of NWHN was organised with the builders and others. At this meeting discussions were held as to how to promote the concept of RWH. It was also pointed out that installation of RWH structures involve low expenditure and quality of ground water has shown improvements in those areas where RHW projects have been in operation. The wells now provide iron-free water. According to a resident of Korattur who has been harvesting rain water at his residence T
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Environmental Studies Notes 130 for the last nine years, the quality of well water has improved over the years. There was a consensus to implement RWH not only in residential areas but also in the commercial areas. It was felt that lack of information has been major impediment in the use of RWH. Chennai Metro Water Supply and Sewage Board have brought out a booklet in Tamil. It was suggested to revise this booklet to include line drawing, cost estimates and names of the persons who have expertise in constructing RWH structures. The Board approved this. It was also suggested that evaluation for assessing the impact of RWH projects of Chennai Metro Water Supply Board be undertaken. Involvement of architects was also highlighted as they have a major task to perform in RWH schemes. The Madras Institute of Development, Chennai has agreed to undertake a project to assess existing RWH programmes in Chennai. The CSE in New Delhi is supporting this project. Questions: 1. Analyse the case and interpret it. 2. Discuss how did Chennai made progress in rain water harvesting? Source: Environmental Studies by N K Uberoi, Excel Books Self Assessment Fill in the blanks: 11. ..... means gradual increase in world temperatures caused by greenhouse gases (GHGs). 12. If effects of CO 2 on global warming are not too great, less use of fossil fuels and alternative sources of energy would not only reduce ..... emission but also lessen pollution. 13. Falling of acid (Sulphuric/Nitrate) and acid forming compounds from the atmosphere to the earth surface is referred to as ..... 14. Ozone layer in the stratosphere forms a shield for earth against harmful ultraviolet radiation (UV-B) from ..... 15. Ozone is a ..... gas. SUMMARY z Global warming means gradual increase in world temperatures caused by greenhouse gases (GHGs). z The main greenhouse gas is carbon dioxide (CO 2); others are nitrous oxide, CFCs (chlorofluorocarbons), methane and some organochloride compounds like perflurocarbons (PFCs) and sulphuric fluoride. z GHGs come from various sources, mostly from burning of fossil fuels.

Unit 6 - Social Issues and Environment Notes 131 z These gases trap the sun's rays in the earth's atmosphere causing the temperature to rise resulting in what is known as greenhouse effect or global warming. z The Inter-governmental Panel on Climate Change (IPCC) has estimated that earth's temperature will rise from 1-3 degrees Celsius in the next few decades. z It is believed that global warming is leading to extreme weather changes. z It is the domain of scientists to predict the effects of greenhouse gases. z They do it by constructing computer models to assess climate changes. Reliability of conclusions from these models can be questioned and thus, the entire theory on climate change due to global warming may not be valid. z There is another aspect to the issue of greenhouse gases. z Even if effects of CO 2 on global warming are not too great, less use of fossil fuels and alternative sources of energy would not only reduce CO 2 emission but also lessen pollution. z It is true that all the strategies to reduce worldwide reduction in CO 2 emission would incur astronomical costs—not billions but trillions of currency—however, steps in this direction need to be taken in a phased manner. z Falling of acid (Sulphuric/Nitrate) and acid forming compounds from the atmosphere to the earth surface is referred to as Acid Rain. z As mentioned earlier various substances including the nutrients that organisms need to live, grow and reproduce are continuously cycled from the physical environment (land, air, water, soil) to living organisms (plants and animals) and back again. z This constitutes what are called nutrients cycles or biogeochemical cycles. z These cycles include oxygen, carbon, nitrogen, water and mineral cycles. z Ozone depletion is another global problem that attracted the attention in the 1980s. z Ozone layer in the stratosphere forms a shield for earth against harmful ultraviolet radiation (UV-B) from outer space. Ozone is a colourless gas. z Depletion of ozone results in the formation of holes in its shield. z UV-B arising from sun would reach the earth if there are ozone holes. z The sun emits light rays of varying wavelengths. z These rays have varying effects on earth's surface, on its living beings, on its ecosystem.

Environmental Studies Notes 132 z The shorter the wavelength of rays, more damage these can do to plants and animals. KEYWORDS Watershed: Watershed is an area of high land where streams on one side flow into one river or sea and streams on the other side flow into a different river or sea. Watershed Management: Watershed management was focused on large rivers so that it would prevent rapid run off of water and would slow down the process of soil erosion and floods. Carbon Credit: If an individual or organisation produces too many pollutant emissions, they can offset their carbon footprint by buying credits from other individuals or organisations that use alternative fuels or produce less emissions. Ozone Hole: It was found that levels of ozone were dropping very fast, though a small percentage was being replenished during fall season.

the environment or the facility." Examples include lethal effects to individuals, large radioactivity release to the environment, or reactor core melt. Nuclear Holoblast: Nuclear holocaust refers to complete destruction of human civilisation by nuclear warfare. MULTIPLE CHOICE QUESTIONS Choose the correct answer from the following options: 1. The major pollutant from automobile exhaust is: (

a) NO (b) CO (c) SO 2 (d) SOOT 2. The greenhouse gases otherwise called radioactively active gases includes: (a) carbon dioxide (b) CH 4 (c) N 2 O (d) All

of these 3. Algal bloom results in: (a) global warming (b) salination (c) eutrophication (d) bio magnification. 4. High biological oxygen demand (bod) indicates that: (a) water is pure (b) absence of microbial action. (c) low level of microbial pollution (d) high level of microbial pollution.
Unit 6 - Social Issues and Environment Notes 133 5. The effect of radioactive pollutant depends on: (a) rate of diffusion (b) energy releasing capacity (c) rate of deposition of contamination. (d) all of these 6. The range of normal hearing is in the range of: (a) 10 Hz to 80 Hz (b) 50 Hz to 80 Hz (c) 50 Hz to 15000 Hz (d) 15000 Hz and above. 7. The pollution that does not persistent harm to life supporting system is: (a) Noise pollution (b) Radiation pollution (c) Organochlorine pollution. (d) All of these. 8. Soap and detergents are the source of organic pollutants like: (a) glycerol (b) polyphosphates (c) sulphonated hydrocarbon (d) all of these 9. ..... refers to complete destruction of human civilisation by nuclear warfare. (a) Nuclear holocaust (b) Ozone Depletion (c) Civil warfare (d) None of the above 10. Watershed is an area of high land where: (a) streams on two different sides flow in two different rivers or seas. (b) streams on both the ends go to the same river or sea (c) water accumulates (d) None of the above REVIEW QUESTIONS 1. What is meant by sustainable development? 2. Discuss national action plan for climate change. 3. Discuss classification of countries using criteria on global climate change. 4. What are the two global environmental problems? Explain. 5. Define the term acid rain. 6. What do you know about ozone layer depletion? Answers: Self Assessment 1. more advanced 2. advanced 3. developing 4. environmental management
Environmental Studies Notes 134 5. Sustainable 6. Acid Rain 7. sulphur cycle 8. Sulphur dioxide 9. Ozone layer 10. UV B 11. Global warming 12. CO 2 13. Acid Rain 14. outer space 15. colourless Answers: Multiple Choice Questions 1. (b) CO 2. (d) all of these 3. (c) eutrophication. 4. (d) high level of microbial pollution. 5. (d) all of these 6. (c) 50 Hz to 15000 Hz. 7. (a) noise pollution. 8. (d) all of these 9. (a) Nuclear holocaust 10. (a) streams on two different sides flow in two different rivers or seas. FURTHER READINGS Uberoi, N. K., (2010). Environmental Studies. New Delhi: Excel Books. Owen, L. & Unwin, T., (1997). Environmental Management: Readings and Case Studies. Wiley. Barrow, C. J., (1999). Environmental Management: Principles and Practice. Routledge. Rajgopalan, R., (2005). Environmental Studies from Crises to Cure. Oxford University Press. Dr. Daniels, R. J. R. & Dr. Krishnaswamy, J., (2009). Environmental Studies. India: Wiley.
Unit 6 - Social Issues and Environment Notes 135 en.wikipedia.org/wiki/Environmental_studies www.slideshare.net/.../social-issues-and-the-environment- 12529457 howmany.org/environmental_and_social_ills.php www.ugc.ac.in/oldpdf/modelcurriculum/Chapter6.pdf - en.wikipedia.org/wiki/Environmental_science
Environmental Studies Notes 136 UNIT 7 - ENVIRONMENTAL PROTECTION CONTENTS Learning Objectives Introduction 7.1 Environmental Protection Act 7.1.1 Objective 7.1.2 Definitions 7.1.3 Power of the Central Government 7.1.4 Rule Making Power 7.1.5 Power of Preventing, Controlling Environment Pollution and Abatement of the Same 7.2 Environment (Protection) Act, 1986 – Notification and Rules 7.2.1 The Environment (Protection) Rules, 1986 7.2.2 The National Environment Appellate Authority Act, 1997 7.2.3 Hazardous Wastes 7.3

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Air (Prevention and Control of Pollution) Act 7.4 Water (Prevention and Control of Pollution) Act 7.4.1

Central and State Water Boards 7.5 Wildlife Protection Act 7.5.1 Control of Illegal Trade 7.5.2 Revision of Wildlife (Protection) Act, 1972 7.5.3 Indian Board for Wildlife (IBWL) 7.6 Forest Conservation Act 7.7 Population Growth: Aspects, Importance and Effect on Environment 7.7.1 Population Growth—Variation among Nations 7.7.2 How to Ease Pressure Caused by Population Explosion? 7.7.3 Population Explosion and Family Welfare Programmes 7.8 Human Health 7.9 Human Rights 7.9.1 Achievements of Human Rights Declaration 7.10 Human Right - Legal or Moral Contd...
Unit 7 - Environmental Protection Notes 137 Summary Keywords Multiple Choice Questions Review Questions Further Readings LEARNING

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OBJECTIVES After studying this unit, you should be able to:

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OBJECTIVES After studying this unit, you should be able to: z Understand the Provisions of Environmental Protection Act z Explain the

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OBJECTIVES After studying this unit, you should be able to:

Provisions of Air (
Prevention and Control of Pollution) Act z Discuss

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Water (Prevention and Control of Pollution) Act z Elaborate upon Wildlife Protection Act z Discuss Forest Conservation Act

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Water (Prevention and Control of Pollution) Act z Elaborate upon Wildlife Protection Act z Discuss Forest Conservation Act

z Explain Population Growth: Aspects, Importance and Effect on the Environment z Describe Human Health and Human Rights INTRODUCTION In this unit, you will study about Environmental Protection Act. Further, you will study Air, Water, Wildlife Protection Act and Forest Conservation Act. You will learn about population growth and its impact. We will also discuss human health and human rights. 7.1 ENVIRONMENTAL PROTECTION ACT Now let us begin by understanding the objectives behind the conception of Environmental Protection Act. Further, you will study the definitions, power of the central government and the rule making power. 7.1.1 Objective It is interesting to know that India had been a party to

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the United Nations Conference on Human Environment held in Stockholm

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the United Nations Conference on Human Environment held in Stockholm in June 1972. The objective of

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the United Nations Conference on Human Environment held in Stockholm in June 1972.

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the United Nations Conference on Human Environment held in Stockholm in June 1972. The

the Conference was that the nations of the world should take appropriate steps for the protection and improvement of human environment. The Environment Protection Act, 1986 has been passed to implement the decision of the Conference relating to

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protection and improvement of environment and the prevention of hazards to human beings, living creatures and property.

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protection and improvement of environment and the prevention of hazards to human beings, living creatures and property.

Environmental Studies Notes 138 7.1.2 Definitions The Act defines environment, environmental pollutant, environmental pollution, hazardous substance and some other terms. 7.1.3 Power of the Central Government Generally speaking, the Central Government has been conferred with powers

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to take all such measures as it deems necessary or expedient for the purpose of protecting and improving the quality of the environment and

preventing, controlling and abating environmental pollution. In particular, it has been empowered to take measures in the following matters: (a) Co-ordination of actions by the State Governments, officers and other authorities: (i) Under this Act, or the rules made thereunder; or (ii) Under any other law for the time being in force which is relatable to the objects of this Act; (b)

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Planning and execution of nation-wide programme for the prevention, control and abatement of environmental pollution; (

c)

85% **MATCHING BLOCK 170/213** SA Sem I_B21ES01AC.pdf (D165341028)

Laying down standards for the quality of environment in its various aspects; (d) Laying down standards for emission or discharge of environmental pollutants from

92% **MATCHING BLOCK 168/213** W

Laying down standards for emission or discharge of environmental pollutants from various sources

92% **MATCHING BLOCK 169/213** W

Laying down standards for emission or discharge of environmental pollutants from various sources

whatsoever: Provided that different standards for emission or discharge may be laid down under this clause from different sources having regard to the quality or composition of the

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emission or discharge of environmental pollutants from such sources; (e) Restriction of areas in which any industries, operations or processes or class of industries, operations or processes shall not be carried out or shall be carried out subject to certain safeguards; (

f) Laying

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down procedure and safeguards for the prevention of accidents which may cause environmental pollution and remedial measures

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down procedure and safeguards for the prevention of accidents which may cause environmental pollution and remedial measures

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down procedure and safeguards for the prevention of accidents which may cause environmental pollution and remedial measures

for such accidents; (g)

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Laying down procedure and safeguards for the handling of hazardous substances; (h) Examination of such manufacturing processes, materials and substances as are likely to cause environmental pollution; (i) Carrying out and sponsoring investigations and research relating to problems of environmental pollution; (j) Inspection of any premises, plant, equipment machinery, manufacturing or other processes, materials or substances and giving, by order, of such

Unit 7 - Environmental Protection Notes 139 direction to such authorities, officers

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or persons as it may consider necessary to take steps for the prevention, control and abatement of environmental pollution; (

k) Establishment or recognition of environmental laboratories and institutes to carry out the functions entrusted to such environmental laboratories and institutes under this Act; (l) Collection and dissemination of information in respect of matters relating to environment pollution; (m)

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Preparation of manuals, codes or guides relating to the prevention, control and abatement of environmental pollution;

The Central Government has power to take any other measures that it deems necessary or expedient for the purpose of securing effective implementation of the Act. The Central Government has power to appoint officers for carrying out the provisions of the Act. 7.1.4 Rule Making Power You must understand that the Central Government has power to make rules for giving effect to the objectives and purposes of the Act. Among other matters, it may make rules for establishing: (a) the standards of quality of air, water or soil for various areas and purposes; (b) the maximum allowable limits of concentration of various environmental pollutants (including noise) for different areas; (c) the procedure and safeguards for handling hazardous substances; (d) the prohibition and restrictions of the handling of hazardous substances in different areas; (e) the prohibition and restriction on the location of industries and the carrying on of process and operations in different areas; and (f) the procedure and safeguards for the prevention of accidents which may cause environmental pollution and for providing for remedial measures for such accidents. 7.1.5 Power of Preventing, Controlling Environment Pollution and Abatement of the Same No person carrying on any industry, operation or process shall discharge or emit or permit to be discharged or emitted, any environmental pollutant in excess of such standards as may be prescribed. The persons handling hazardous substance are required to comply with the procedural safeguards. The industry has to furnish information to the authorities and agencies regarding environmental pollution. The Act empowers
Environmental Studies Notes 140 the Central Government authorities and officers to enter and inspect any establishment, take samples and establish environmental laboratories, regarding environmental pollution. Penalties and punishments have been laid down for violation of any provisions of the Act and rules made thereunder. 7.2 ENVIRONMENT (PROTECTION) ACT, 1986 – NOTIFICATION AND RULES This section emphasises on the Environment (Protection) Act, 1986. This Act

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is an umbrella legislation designed to provide a framework for the coordination of central and state authorities established under the Water (Prevention and Control) Act, 1974 and Air (Prevention and Control) Act, 1981. Under this Act, the central government is empowered to take measures necessary to protect and improve the quality of

the environment by setting standards for emissions and discharges;

regulating the location of industries; management of hazardous wastes, and protection of public health and welfare. From time to time the central government issues notifications under the EPA for the protection of ecologically-sensitive areas or issues guidelines for matters

under EPA. Some notifications issued under this Act are: z Doon Valley Notification (1989): Prohibits the setting up of an industry in which the daily consumption of coal/fuel is more than 24 MT (million tons) per day in the Doon valley. z Coastal Regulation Zone Notification (1991): Regulates activities along coastal stretches. As per this notification, dumping ash or any other waste in the CRZ (Coastal Region Zones) is prohibited. The thermal power plants (only foreshore facilities for transport of raw materials, facilities for intake of cooling water and outfall for discharge of treated waste/cooling water) require clearance from the MoEF (Ministry of Environment and Forests). z Dhanu Taluka Notification (1991): The district of Dhanu Taluka has been declared an ecologically fragile region and setting up power plants in its vicinity is prohibited. z Revdanda Creek Notification (1989): Prohibits setting up industries in the belt around the Revdanda Creek as per the rules laid down in the notification. z The Environmental Impact Assessment of Development Projects Notification (1994 and as amended in 1997). As per this notification: ™ All projects listed under Schedule I require environmental clearance from the MoEF.
Unit 7 - Environmental Protection Notes 141 ™ Projects under the delicenced category of the New Industrial Policy also require clearance from the MoEF. ™ All developmental projects whether or not under the Schedule I, if located in fragile regions must obtain MoEF clearance. ™ Industrial projects with investments above ` 500 million must obtain MoEF clearance and are further required to obtain a LOI (Letter of Intent) from the Ministry of Industry, and an NOC (No Objection Certificate) from the SPCB (State Pollution Control Board) and the State Forest Department if the location involves forest land. Once the NOC is obtained, the LOI is converted into an industrial licence by the state authority. ™ The notification also stipulated procedural requirements for the establishment and operation of new power plants. As per this notification, two-stage clearance for site-specific projects such as pithead thermal power plants and valley projects is required. Site clearance is given in the first stage and final environmental clearance in the second. A public hearing has been made mandatory for projects covered by this notification. This is an important step in providing transparency and a greater role to local communities. z Ash Content Notification (1997): Requires the use of beneficiated coal with ash content not exceeding 34% with effect from June 2001, (the date later was extended to June 2002). This applies to all thermal plants located beyond one thousand kilometres from the pithead and any thermal plant located in an urban area or sensitive area irrespective of the distance from the pithead except any pithead power plant. z Taj Trapezium Notification (1998): provides that no power plant can be set up within the geographical limit of the Taj Trapezium assigned by the Taj Trapezium Zone Pollution (Prevention and Control) Authority. z Disposal of Fly Ash Notification (1999): the main objective of which is to conserve the topsoil, protect the environment and prevent the dumping and disposal of fly ash discharged from lignite-based power plants. The salient feature of this notification is that no person within a radius of 50 km from a coal or lignite based power plant shall manufacture clay bricks or tiles without mixing at least 25% of ash with soil on a weight-to-weight basis. For the thermal power plants, the utilization of the flash would be as follows: ™ Every coal or lignite-based power plant shall make available ash for at least ten years from the date of publication of the above notification without any payment or any other consideration, for the purpose of manufacturing ash-based products such as cement, concrete blocks, bricks, panels or any other material or for construction of roads, embankments, dams, dykes or for any other construction activity.

Environmental Studies Notes 142 ™ Every coal or lignite-based thermal power plant be commissioned subject to environmental clearance conditions stipulating the submission of an action plan for full utilization of fly ash shall, within a period of nine years from the publication of this notification, phase out the dumping and disposal of fly ash on land in accordance with the plan. Rules for the Manufacture, Use, Import, Export and Storage of Hazardous Micro-organisms/Genetically Engineered Organisms or Cell were introduced in 1989 with the view to protect the environment, nature and health in connection with gene technology and micro-organisms under the Environmental Protection Act, 1986. The government in 1991 further decided to institute a national level scheme for environmentally-friendly products called the 'ECOMARK'. The scheme attempts to provide incentives to manufacturers and importers to reduce adverse environmental impacts, reward genuine initiatives by companies, and improve the quality of the environment and sustainability of available resources. Besides the above attempts, notifications pertaining to Recycled Plastics Manufacture and Usage Rules, 1999 were also incorporated under the Environment (Protection) Act of 1986. 7.2.1 The Environment (Protection) Rules, 1986 These Rules lay down the procedures for setting standards of emission or discharge of environmental pollutants. The Rules prescribe the parameters for the Central Government, under which it can issue orders of prohibition and restrictions on the location and operation of industries in different areas. The Rules lay down the procedure for taking samples, serving notice, submitting samples for analysis and laboratory reports. The functions of the laboratories are also described under the Rules along with the qualifications of the concerned analysts. 7.2.2 The National Environment Appellate Authority Act, 1997 This Act provided for the establishment of a National Environment Appellate Authority to hear appeals with respect to

allowed to carry out subject to certain safeguards under the Environment (Protection) Act, 1986. In addition to these, various Acts specific to the coal sector have been enacted. The first attempts in this direction can be traced back to the Mines Act, 1952, which promoted health and safety standards in coal mines. Later the Coal Mines (Conservation and Development) Act (1974) came up for conservation of coal during mining operations. For conservation and development of oil and natural gas resources a similar legislation was enacted in 1959.
Unit 7 - Environmental Protection Notes 143 7.2.3 Hazardous Wastes You must understand that there are several legislations that directly or indirectly deal with hazardous wastes. The relevant legislations are the Factories Act, 1948, the Public Liability Insurance Act, 1991, the National Environment Tribunal Act, 1995 and some notifications under the Environmental Protection Act of 1986. Under the EPA 1986, the MoEF has issued several notifications to tackle the problem of hazardous waste management. These include: z Hazardous Wastes (Management and Handling) Rules, 1989, which brought out a guide for manufacture, storage and import of hazardous chemicals and for management of hazardous wastes. z Biomedical Waste (Management and Handling) Rules, 1998, were formulated along parallel lines for proper disposal, segregation, transport, etc. of infectious wastes. z Municipal Waste (Management and Handling) Rules, 2000, whose aim was to enable municipalities to dispose municipal solid waste in a scientific manner. z Hazardous Wastes (Management and Handling) Amendment Rules, 2000, a notification issued with the view to providing guidelines for the import and export of hazardous waste in the country. 7.3 AIR (PREVENTION AND CONTROL OF POLLUTION) ACT In this section, you will learn about the Air (Prevention and Control of Pollution) Act. To counter the problems associated with air pollution, ambient air quality standards were established, under the Air Act (1981). The Act provides means for the control and abatement of air pollution. The Act seeks to combat air pollution by prohibiting the use of polluting fuels and substances, as well as by regulating appliances that give rise to air pollution. Under the Act, establishing or operating of any industrial plant in the pollution control area requires consent from state boards. The boards are also expected to test the air in air pollution control areas, inspect pollution control equipment, and manufacturing processes. National Ambient Air Quality Standards (NAAQS) for major pollutants were notified by the CPCB in April 1994. These are deemed to be levels of air quality necessary with an adequate margin of safety, to protect public health, vegetation and property. The NAAQS prescribe specific standards for industrial, residential, rural and other sensitive

Environmental Studies Notes 144 areas. Industry-specific emission standards have also been developed for iron and steel plants, cement plants, fertilizer plants, oil refineries and the aluminium industry. The ambient quality standards prescribed in India are similar to those prevailing in many developed and developing countries. It is fascinating to know that to empower the Central and State Pollution Boards to meet grave emergencies, the Air (Prevention and Control of Pollution) Amendment Act, 1987, was enacted. The Boards were authorised to take immediate measures to tackle such emergencies and recover the expenses incurred from the offenders. The power to cancel consent for non-fulfilment of the conditions prescribed has also been emphasized in the Air Act Amendment. The Air (Prevention and Control of Pollution) Rules, formulated in 1982, defined the procedures for conducting meetings of the Pollution Control Boards, the powers of the presiding officers, decision-making, the quorum, manner in which the records of the meeting were to be set, etc. They also prescribed the manner and the purpose of seeking assistance from specialists and the fee to be paid to them. Complementing the above Acts is the Atomic Energy Act of 1982, which was introduced to deal with radioactive waste. In 1988, the Motor Vehicles Act was enacted to regulate vehicular traffic, besides ensuring proper packaging, labelling and transportation of the hazardous wastes. Various aspects of vehicular pollution have also been notified under the EPA of 1986. Mass emission standards were notified in 1990, which were made more stringent in 1996. In 2000, these standards were revised yet again and for the first time separate obligations for vehicle owners, manufacturers and enforcing agencies were stipulated. In addition, fairly stringent Euro I and II emission norms were notified by the Supreme Court on April 29, 1999 for the city of Delhi. The notification made it mandatory for car manufacturers to conform to the Euro I and Euro II norms by May 1999 and April 2000, respectively, for new non-commercial vehicles sold in Delhi. You must understand that the poor air quality especially of urban India shows a dismal picture. Legislation to deal with the problem came only as reactions to serious episodes of accidental industrial gas leaks like the Bhopal disaster. Whatever little legal development took place up to the 1990s, it was focused on stationary sources of pollution like industries and thermal power plants – and remained almost blind to air pollution crisis from mobile sources like vehicles. Regulations to deal with vehicular emissions came into force only

The Act provided for prevention, control and abatement of air pollution. In areas notified under this act, no industrial pollution causing activity could come up without the permission of the concerned state pollution Control Board. But this act was not strong enough to play either a precautionary or a corrective role. After the Bhopal disaster, a more comprehensive Environment Protection Act (EPA) was passed in 1986.
Unit 7 - Environmental Protection Notes 145 EPA (1986)

Central Government to coordinate activities of various central and state authorities established under previous laws such as the Water Act and Air Act. This Act for the first time conferred enforcement agencies with necessary punitive powers to restrict any activity that can harm the environment. The central authority could now issue directives to order closure of industries for non-compliance or stop supply of power and water to the defaulting units. Soon it followed other policies to control the problem of industrial air pollution. The Central Action Plan (1992) was promulgated by the Government of India to speed up enforcement against non-compliance with emission standards. Eight industry categories were identified as highly polluting and were debarred from coming up in ecologically sensitive areas. These are cement, thermal power plants, iron and steel, fertiliser, zinc, copper, aluminium smelters and oil refineries. Under the action plan, strict compliance with environmental standards and industry-specific minimal national standards are required to be achieved within the set time limits. Self Assessment Fill in the blanks: 1. Environment (Protection) Act, 1986

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is an ..... legislation designed to provide a framework for the coordination of central and state authorities established under the Water (Prevention and Control) Act, 1974 and Air (Prevention and Control) Act, 1981. 2. Under Environment (Protection) Act, 1986, the ..... government is empowered to take measures necessary to protect and improve the quality of

the environment by setting standards for emissions and discharges;

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regulating the location of industries; management of hazardous wastes, and protection of public health and welfare. 3. From time to time the central government issues notifications under the ..... for the protection of ecologically-sensitive areas or issues guidelines for matters

under EPA. 4. To counter the problems associated with air pollution, ambient air quality standards were established, under the Air Act (.....). 5. National Ambient Air Quality Standards (NAAQS) for major pollutants were notified by the CPCB in .....
Environmental Studies Notes 146 7.4 WATER (

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PREVENTION AND CONTROL OF POLLUTION) ACT In this section, you will be acquainted with the water (prevention and control of pollution) Act.

In terms of Acts, water pollution means

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contamination of water or alteration of the physical, chemical or biological properties of water due to discharge of any sewage or industrial effluent or any other liquid, gaseous or solid substance into water whether directly or indirectly as may or as likely to, render such water harmful to public health or safety, or to domestic, commercial, industrial, agricultural or other legitimate uses, or to the life and health of animals or plants

including micro-organisms. In this connection, sewage effluents are defined to mean effluent from any sewerage system or sewage disposal works and include silage from open drain. Sewer means any conduit pipe or channel open or closed carrying sewage or industrial effluent. Industrial effluent includes any liquid, gaseous or solid substance which is discharged from any premises used for carrying on any trade or industry, other than domestic sewage. You must understand that stream is defined very widely in the Act. It includes: (i) river (ii) water course (whether stagnant or temporarily dry) (iii)inland water (whether natural or artificial) (iv) subterranean waters (v) sea, coastal or tidal waters to such extent or, as the case may be, to such point as the State may, by notification in the Official Gazette, specify in this behalf. 7.4.1 Central and State Water Boards You must understand that water (Prevention and Control) Act of 1974 was amended in 1988 to conform closely to EPA of 1986. It also set up the Central Pollution Control Board (CPCB). The Act also provides for the constitution of the Central Water Board and State Water Boards. Section 16 of the Water Act sets out the functions of the Central Board and Section 17 of the Act lays down the functions of the State Boards. The functions of the Central Board are both advisory and supervisory. z The Central Board is required to advise the Central Government on any matter concerning the prevention and control of water pollution and to co- ordinate the activities of the State Boards. z The Central Board is also required to provide technical assistance and guidance to the State Boards, carry out and sponsor investigations relating to problems of water pollution and prevention, control or abatement of water pollution.
Unit 7 - Environmental Protection Notes 147 The Functions of State Boards In addition to advising the State Governments on any matter concerning the prevention, control or abatement of water pollution, a State Board is required among other things: (i) to plan a comprehensive programme for the prevention, control or abatement of pollution of streams and wells in the State and to secure the execution thereof; (ii) to collect and disseminate information relating to water pollution and the prevention, control or abatement thereof; (iii) to encourage, conduct and participate in investigations and research relating to problems of water pollution and prevention, control or abatement of water pollution; (iv) to inspect sewage or trade/industrial effluents, works and plants for the treatment of sewage and effluents; (v) to review plans, specifications or other data relating to plants set up for the treatment of water works for the purification thereof and the system for the disposal of sewage or trade/industrial effluents or in connection with the grant of any consent as required by the Water Act; (vi) to evolve economical and reliable methods of treatment of sewage and trade/industrial effluents, having regard to the peculiar conditions of soils, climate and water resources of different regions and more especially the flow characteristics of water in streams and wells which render it impossible to attain even the minimum degree of purification; (vii) to lay

particular stream taking into account the minimum fair weather dilution available in that stream and the tolerance limits of pollution permissible in the water of the stream, after the discharge of such effluents; (viii) to lay down, modify or annul effluent standards for the sewage and trade effluents and for the quality of receiving waters (not being water in an inter-State stream) resulting from the discharge of effluents and to classify waters of the State; (ix) To evolve methods of utilization of sewage and other suitable effluents in agriculture; (x) to evolve efficient methods of disposal of sewage and effluents on land, as are necessary on account of the predominant conditions of scant stream flows that do not provide for major part of the year the minimum degree of dilution; (xi) to make, vary or revoke any order: (a) for the prevention and control of abatement of discharges of waste into streams or wells;

Environmental Studies Notes 148 (b) requiring any person concerned to construct new systems for the disposal of sewage and trade effluents or to modify, alter or extend any such existing system or to adopt such remedial measures as are necessary to prevent control or abate water pollution; (xii) to lay down effluent standards to be complied with by persons while causing discharge of sewage or silage or both and to lay down, modify or annul effluent standards for the sewage and trade effluents; (xiii) to advise the State Government with respect to the location of any industry which is likely to pollute a stream or well; (xiv) To perform such other functions as may be prescribed or as may, from time to time, be entrusted to it by the Central Board or the State Government. Powers of the State Boards With a view to carrying out its function, each State Board has been given several powers. These include: (i) to obtain information and conduct survey of any area and gauge and keep record of the flow and other characteristics of any stream or well in the area; (ii) to take samples of water, trade or any other effluent or of any sewage or effluents for the purpose of making analysis; (iii) to enter and inspect any premises for the purpose of performing its functions under the Act and to see whether direction of the Board are carried out, and to examine any plant etc. and records of the establishment; (iv) to prohibit disposal of effluent in the streams and wells; (v) to restrict new outlets, discharge for sewage and industrial effluents. Standards and Consent Orders The Act requires that no person shall knowingly cause or permit any poisonous, noxious, or polluting matter determined in accordance with such standards as may be laid down by a Board to enter (whether directly or indirectly) in any stream or well. Further there is a prohibition on a person to discharge sewage or trade effluent into a stream without the consent of the Board. 7.5 WILDLIFE PROTECTION ACT This section emphasises on the wildlife protection act. Usually the large animals (mostly birds and mammals) which are not domesticated constituted wildlife. But recently, certain other animal groups like fishes; (due to their commercial value) amphibians like frog and toads and other smaller animals and plants have been included under wildlife category.

Unit 7 - Environmental Protection Notes 149 Preservation and protection of wildlife is important from the ecological point of view. The role of individual species in ecosystem, (for example in food chain) cannot be undermined. Amphibians today are under a threat, their population has declined. This is a cause of ecological concern because some habitats, and biomass of amphibians can exceed all other large animals combined. Their role in food chain is crucial; they eat both plants and small animals like insects including mosquitoes, and amphibians themselves constitute food for birds, mammals, man, reptiles and fishes. Wildlife, besides its crucial role in preventing ecological degradation, has other values like serving as a genetic pool for livestock improvement, for pharmaceutical industry and other commercial value like providing furs and wools. Taking example of amphibians again, it has been discovered that many species of these animals have been found containing compounds that are being used in painkilling medicines and for treatment of burns. It is a documented fact that tribal in Eucador have been using secretions from the skin of frogs for killing pains. A pharmaceutical company is engaged in research in developing a drug from the secretions of frog. In addition, the aesthic value of wildlife is another important aspect. Bird watching, seeing seals, dolphins or whales not only create recreational value, but also are a reminder of bounties of nature. Before examining the issue of management and strategy of wildlife, it may be desirable to understand what a threatened or endangered species is. An endangered species is one having very few individual survivors and the species could soon disappear (become extinct) from its natural habitat. Protection of such species then becomes an important task for restoring its population. A significant threat to wildlife is related to exploitation for commercial use of animal products. Pollution is another threat. Pesticides not only affect human, they also affect wildlife. Then the changes in the habitat either due to human intervention/global warming threaten the wildlife, their resting and roosting. Species have a specific requirement for habitat that provides food. If the habitats are changed, the forests are cleared, swamps and streams are eliminated, the wildlife is adversely affected. Various activities relating to wildlife conservation and implementation of the Wildlife (Protection) Act, 1972 are being carried out by government and its agencies. The details are as follows: Enforcement of Wildlife (Protection) Act, 1972 and Export-Import Policy The Wildlife (Protection) Act, 1972, the provisions of the Convention of International Trade in Endangered Species (CITES) and Export and Import Policy of India continue with the help of State Wildlife departments, the state police departments, BSF and Coast Guards . During the year 2001-2002, ban on export of 29 species of plant, plant portions and their derivatives obtained

Environmental Studies Notes 150 from wild were continued. Export of six species of exotic birds was continued subject to pre-shipment inspection and CITES permit wherever required. During recent years, exploitation of fishes like sharks and rays has increased due to demand for human consumption in the international market especially in South-Asian countries. Since, corals are also a major component of marine eco-system, decline in the coral population over the years has adversely affected the other marine species. In view of this, the MEF has, in consultation with scientific institutions and experts working in this field, included the following marine species under the purview of the Wildlife (Protection) Act, 1972: z Ten species of sharks and rays (These are fishes) z Nine species of molluscs z All species of sea horses 7.5.1 Control of Illegal Trade As per the decision of the "Special coordination and Enforcement Committee of the government for strengthening measures for control of poaching and illegal trade in wildlife" under the Chairmanship of Secretary, the State/UT Governments were advised to set up State level/District level Coordination Committees to control poaching and illegal trade in wildlife. Accordingly, 17 States/UTs have set up State level/District level coordination committees. A Tiger Enforcement Task Force meets regularly to work out a strategy for controlling illegal trade in tiger parts and products. It was decided to organize training courses at international level at the S.V.P. National Police Academy on intelligence gathering, search, anti-poaching operation, evidence, etc. 7.5.2 Revision of Wildlife (Protection) Act, 1972 You must know that in order to make the provisions of the Wildlife (Protection) Act, 1972 more effective, a draft Bill to amend the Act has been prepared. The Bill has been vetted by the Law Ministry. 7.5.3 Indian Board for Wildlife (IBWL) The IBWL is the apex advisory body in the field of Wildlife Conservation in the country and is headed by the Honourable Prime Minister of India. It has been reconstituted w.e.f. 7.12.2001. The XXI meeting of the IBWL was held in 2002 under the Chairmanship of the Prime Minister and the following resolutions were adopted: z Wildlife and forest shall be declared priority sector at the national level for which funds should be earmarked. z Law enforcement agencies must ensure that those engaged in poaching, illicit trade in wildlife and wildlife products, destruction of their habitat, and such other illegal activities are given quick and deterrent punishment.

Unit 7 - Environmental Protection Notes 151 z We should fully tap the potential in wildlife tourism and at the same time take care that it does not have adverse impact on wildlife and protected areas. The revenue earned from increased tourism should be used entirely to augment available resources for conservation. z Protecting interests of the poor and tribal living around protected areas should be handled with sensitivity and with maximum participation of the affected people. They should have access to the minor forest produce, in the forest outside of national park and sanctuaries. Employment and means generation for these people is crucial for maintaining symbiosis between the forests, wildlife and the people. People should be encouraged to take up afforestation and conservation in new areas. z While strengthening protective measures against traditional threats to wildlife, we should also respond to newer threats such as toxic chemicals and pesticides. z There should be greater governmental as well as societal recognition and support for the many non-governmental organisation engaged in wildlife conservation. Mainstream media to better highlight their activities as also successes of governmental initiatives that have worked. z It is proposed that Prasar Bharati and our private channels along with the agencies like WWF for Nature should collaborate and increase original Indian content in different languages on our television. z No diversion of forest land for non-forest purposes from critical and ecologically fragile wildlife habitat shall be allowed. z Land falling within 10 km. of the boundaries of National Parks and Sanctuaries should be notified as eco-fragile zones. z Removal of encroachments and illegal activities from within forest lands and protected areas. z The settlement of rights in National Parks and Sanctuaries should not be used to exclude or reduce the areas that are crucial and integral part of the wildlife habitat. z Every protected area should be managed by forest officers trained in wildlife management. z Forest Commission should be set up to look into restructuring, reform and strengthening the entire forest set up and affiliated institutions in the country. z A working group shall be constituted to monitor implementation of Wildlife Action Plan. Using internet, collect recent information on 'project tiger'.

Environmental Studies Notes 152 7.6 FOREST CONSERVATION ACT This section will focus on the Forest Conservation Act. India has a diverse ecosystem and diverse forest spread over from North East to Western Coast and Andaman Nicobar islands to alpine forests of Himalayas. It is essential to note that forestry is a concurrent subject in the Indian Constitution, being under the purview of both the central and state governments. Systematic management of forests, began in the mid-nineteenth century. The first Forest policy of India enunciated in 1894 focused on commercial exploitation of timber and gave importance to permanent cultivation. The 1952 revision of the policy recognized the protective role of forests and proposed that one-third of the land area of the country be retained under forest and tree cover. The new Forest policy of 1988 focused on environmental stability and maintenance of ecological balance. The initiatives and developments that have addressed the concerns of the forestry sector are summarised in Table 7.1: Table 7.1: Highlights of Major Developments in the Forestry Sector Year Action taken Scope 1972 (amended in 1991) Wildlife (Protection) Act To protect wild animals, birds and plants including their habitat. 1976 42nd amendment of the Constitution of India Article 48A under the Directive Principles of State Policy of the fundamental duties in the Constitution mention

63% **MATCHING BLOCK 192/213** W

that the 'State shall endeavour to protect and improve the environment and safeguard forests and wildlife in the country

76% **MATCHING BLOCK 197/213** SA 180E2340_Environmental Administration(Final 2 ... (D165106913)

the 'State shall endeavour to protect and improve the environment and safeguard forests and wildlife in the country and protect and improve the natural environment including forests, lakes, rivers, wildlife and have compassion for living creatures' 1980

78% **MATCHING BLOCK 194/213** SA Jawinder Kaur_Environmental Studies-PDF e-book.pdf (D141737445)

to protect and improve the environment and safeguard forests and wildlife in the country

64% **MATCHING BLOCK 195/213** SA Jawinder Kaur_Environmental Studies-PDF e-book.pdf (D141737445)

protect and improve the natural environment including forests, lakes, rivers, wildlife and have compassion for living creatures' 1980

94% **MATCHING BLOCK 196/213** W

protect and improve the natural environment including forests, lakes, rivers, wildlife and have compassion for living creatures' 1980

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protect and improve the natural environment including forests, lakes, rivers, wildlife and have compassion for living creatures' 1980

Forest Conservation Act Control diversion of forest land for non-forestry use. 1981 The Forest Survey of India To assess forest cover for planning and monitoring purposes 1985 Ministry of Environment and Forests Nodal agency for planning, coordination and implementation of environmental and forestry programmes. 1988 National Forest Policy Maintenance of Environment Stability 1990 Joint Forest Management To protect and regenerate degraded forests through peoples' participation. 1991 Coastal Regulation Zones Notification issued under the Environment (protection) Act, 1986 for the protection of coastal areas. 1992 National Afforestation and Eco-development Board (NAEB) To promote afforestation and Eco development. 1994 Environmental Impact Issued under the Environment (Protection) Act 1986 making EIAs mandatory for 30 sectors. 1996 Convention to Combat Desertification To combat desertification. Contd...
Unit 7 - Environmental Protection Notes 153 1999 National Forestry Action Programmed (NFAP) A comprehensive strategy and long-term work plan for the next 20 years formulated to address the issues underlying the major problems of the forestry sector in line with the National Forest Policy, 1988 2000 National Forestry Research Plan Prioritises and carries out research on various aspects of forestry required for sustainable development. Self Assessment Fill in the blanks: 6. In terms of Acts, ... means

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contamination of water or alteration of the physical, chemical or biological properties of water due to discharge of any sewage or industrial effluent or any other liquid, gaseous or solid substance into water. 7. .....

effluents are defined to mean effluent from any sewerage system or sewage disposal works and include silage from open drain. 8. ..... means any conduit pipe or channel open or closed carrying sewage or industrial effluent. 9. ..... includes any liquid, gaseous or solid substance which is discharged from any premises used for carrying on any trade or industry, other than domestic sewage. 10. India has a ..... ecosystem. 7.7 POPULATION GROWTH: ASPECTS, IMPORTANCE AND EFFECT ON ENVIRONMENT Now in this section, you will learn about the aspects, importance and effect on environment of population growth. Human population of the world has got doubled during the last 50 years. According to UN projections, population of the world will increase from present 6.1 billion to 10 billion or so in 2050 and according to another estimate, it may be more than 10 billion or it may be about 8 billion in 2050. Especially, after the World War II, the population of the countries of the South (Africa, Latin America and Asia excepting South Asia) began to outpace that of the countries of the North (North America, Europe, USSR, South Asia). Even with a modest increase in World's population, the developing countries have been struggling to cope with the growing number in terms of providing food, shelter, education, health services, employment and water. The effect of growing population on environment and its resources and on health and other social factors is a matter of great concern. The carrying capacity of the planet earth will be greatly stretched and exceeded if the present rate of population growth continues. The population in certain western countries has got stabilized. Population has not been stabilized in all the countries of the world.

Environmental Studies Notes 154 In many countries of the South, population is going to be doubled before it gets stabilized. You must understand that those who study population dynamics have described the reasons for growing population as under. First, as the rates of birth and death are high, this leads to population growth to a small extent. Second, when mortality or death rate falls, and birth rates remain high, population growth increases. In the third situation, there is low birth rate as well as death rate; this results in stability of population. The third situation is ideal and it is under this situation that living standards become better. Fortunately, today we do not find any country where both birth and death rates are high. Countries either fall under second or third situation. There is optimism that the rate of population growth will slow down in the coming decades, though there would be increase in the absolute numbers annually. As mentioned earlier, you must have observed that rising population growth would not be sustainable because demand for food, water and other essential requirements for life would not be able to match the supply. The results in case of rising birth rates would be a stress on natural resources and deterioration in environment. This in turn will lead to high death rates due to starvation or diseases or both. There would be a great deal of stress on land and water tables resulting in lower productivity of food. Diseases or epidemics like AIDS (Acquired Immune Deficiency Syndrome) would also result in high death rate. Our planet earth has been offering us natural resources. With the advent of industrial revolution in 19th century, rate of population growth started rising and then everything changed – especially the exploitation of natural resources started at an increasing speed. The nature took billions of years to deposit non- living natural resources (coal, petroleum) and evolution took millions of years to provide living resources for us to use. This use as described in a book The Population Explosion, by Paul and Anne Erilich has to be like interest accrued on the deposit in a bank, the problem with us is that instead of living on interest we are utilising the principal. Our deposits of coal and petroleum are being exploited for the last 100 years and according to modest projections, at the current rate of consumption, these resources will not last beyond the present century. The resources for which the nature has taken billions or millions of years will be used up in 200 years. Take another example, the land. It is estimated that due to modern methods of agriculture for producing food for growing population, we are losing tons of topsoil every year with the result that fertility of the soil is reduced and it no longer remains arable. Therefore, we can say that soil erosion, desertification and soil poisoning because of effluents from the industries are the result of increasing demands by the growing population. Another impact of expanding population on environment is deforestation. Reducing forest cover to meet the demand of population has adverse effects on our life support system.

Unit 7 - Environmental Protection Notes 155 The depletion of fresh water resources is the most obvious example of high population impact on environment. China and India constitute world's one- third population. Both have water shortage and may face water famine. Water shortage not only affects human consumption, but also it affects both agricultural and industrial output. Growing population in developing countries means higher demand for energy, though it may not be of same magnitude as in developed ones. The import of oil of every country is rising and it will keep on rising due to population growth and higher living standards. Increase in energy demand due to over population and over consumption means faster rate of depletion of fossil fuels. Relationship between food production and population growth is a well-known fact. Increase in demand for food due to rising population led to green revolution which created new problems like use of fertilizers and pesticides. The use of fertilizers have impact on soil and causes pollution. The situation on food front is very peculiar. While expanding population in the developing countries causes food shortages, high consumption and wasting of food in developed countries present another dimension. Finally, it is not out of place to mention that increasing population in the developing countries has enormous implications for economic and political stability. Economic and political reasons in turn have implications for environmental protection. 7.7.1 Population Growth—Variation among Nations It is important to know that population of the world was 3.0 billion in 1960. From 1960 to 2000, population rose to 6.0 billion. Today, population-doubling time is 35 years or so. The first expansion of population occurred with the advent of agriculture. The second expansion of population occurred as a result of industrial revolutions which began in Europe. The rate of population growth has been different in developed and developing countries. Africa: It has the fastest population growth. Between 1965 and 1995, its population increased from 311 million to 728 million i.e., an increase of more than 100%, whereas the increase between 1925 and 1950 was 40% only. The rate of population growth is still rising in Africa. The factors responsible for high population growth are high birth rate and falling death rate. Africa has a very large landmass, which is capable of sustaining large population. But it is the development which is lacking. Asia: It is heavily populated and has constituted more than half of the world's population. East Asia has the highest population. However, among the East Asian countries, China, which has world's largest population, is now showing drop in population growth from 14% in 1965 to 10% in 2000. Among East Asian countries, Eastern China, Japan and Korea are very densely populated. South Asia which includes India has added 600 million people in the 30 years (between 1965 and 1995). In Southeast Asia, Indonesia is the largest country Environmental Studies Notes 156 and recorded a population of 200 million in 2000. Other countries of South East Asia are Vietnam and Singapore representing extremes; the latter is among the richest countries and had a population of 4 million in 2000. Vietnam had the population of 78 million in 2000 and is expected to grow to 105 million in 2025 whereas Singapore population is expected to grow to 5 million by 2025. Philippines and Thailand, part of Southeast Asian region had a population of 75 and 62 million and projected figures are 107 and 77 in 2025 respectively. Europe: From 1700 to 1900, Europe's population had been growing very fast (it included immigrants also). But after World War II (1945), Europe's population growth was the slowest and in many regions of Europe it is stable and is expected to decline. Eastern Europe especially had an annual growth of 0.1% in 1995. It is the only region in the world where population has declined. In Western Europe, birth and death rates are almost equal and if there is any increase in population, it may be due to migration only. South America: It includes people of European descent and is thinly populated. The population was 332 million in 2000 and its annual growth rate has fallen from 2.8% to 1.8% during the last 30 years. Brazil is highly populated among South American countries and had a population of 166 million in 2000. Central America: It had a population of 131 million in 2000. Mexico has the largest population in this region. It had a population of 96 million and is expected to have 130 million in 2025. North America: It has shown a slow rate of population growth, its population increased from 214 million to 293 between 1965 and 1995. Its growth rate has fallen from 1.5% to 1.0% annually. The increase in its population is largely due to migrants. Unlike Europe, North America is thinly populated. Oceania: The countries of Oceania are thinly populated. Australia and New Zealand are the major countries. They are thinly populated and their growth rate has fallen from 2.1% in 1965 to 1.4% in 1995. Here, too, only migration increases population. The above data show that there are significant variations in the rate of growth and change in population in different parts of the world. The future projections are also revealing. For example, China today has more population than India but in 2050, India's population will be more than that of China. Not only there are variations in population growth between developed and developing countries but also there are significant variations among the developing countries. In nine African countries, population-doubling time is 20 years while in many countries of South America and Asia, doubling time is 40 years. And in many European countries, doubling time may be 100 years or more. The reasons for variations are economic, social, cultural and political.

Unit 7 - Environmental Protection Notes 157 7.7.2 How to Ease Pressure Caused by Population Explosion? You will find it interesting to know that expanding population of the world, especially of the developing countries means more pressure on natural resources. One method of reducing population and fertility is to adopt family welfare programmes. About 800 million couples in developing countries are of reproductive age. Of these, about 440 million currently use family planning methods; while at least another 100 million married women of reproductive age have need for family planning. According to population projections, most likely 1.6 billion couples will be in the reproductive age group in 2020, nearly twice as many as at present. If there will be no change in the percentage of people using family planning in 2020, then there will be nearly 880 million needing family planning. Over the past few decades, as fertility rates have fallen, world population growth has slowed down. Population is growing at an annual rate of 1.2% as estimated in 2000, compared with 2.1% in the 1960s. Nevertheless, the world's population is growing by almost 80 million per year – about one billion every 12 years. Even if fertility rates continue to fall as projected, the number of people will continue growing substantially. According to UN Report, (2000), fertility has fallen to or below replacement level in 61 countries, 13 of them in the developing world. In 123 countries, fertility is still above replacement level. In most countries, couples still have at least three children. About 1.7 billion people live in 47 countries where fertility averages between three and five children per woman. Another 730 million people live in 44 countries in which a woman has five children or more on an average. According to population reports of Population Reference Bureau (USA), family welfare programs have shown high improvement. Since the 1960s, family planning programs have played a key role in slowing down population growth. Between 20% and 50% of the fertility decline in developing countries has come as a direct result of family planning programmes. This suggests that many women who want to control their own fertility have not been able to do so. You must understand that in developing countries, as contraceptive use has risen from 10% on average in the 1960s to over 50% today, the total fertility rate has fallen by half. In fact, the relationship between contraceptive prevalence and fertility level in a country is a positive and direct relationship. In countries where family planning prevalence is high, the fertility is low; where family planning prevalence is low, the fertility is high. Differences in average family size have a large impact within a few generations. For example, consider the impact over four generations if each woman has only two children instead of having three or five. If a woman has only two children, as in many developed countries today, and each of these

Environmental Studies Notes 158 children has two children each, and so do their children also, the woman will have only 8 great-grandchildren. If the women had three children and so did their children, she would have 27 great grandchildren. As these numbers indicate, unintended births can make a huge difference in future population size. 7.7.3 Population Explosion and Family Welfare Programmes The world is adding one billion people after every 12 years and this happens mostly in the developing countries. Twentieth century ended with more than six billion people on the planet earth. The population was only 2.3 billion in 1950. The world population has grown more in the last 50 years than any other time in the history. 7.8 HUMAN HEALTH Let us now come to discussing about the human health in today's time. It has been mentioned elsewhere in this book that environment provides life-support system. But we must remember that environment is also a source of health hazard. No doubt, we have seen major breakthroughs and improvements in health during the last few decades. Many infectious diseases have been controlled, nutrition status has been improving, concern for sanitation and better living conditions has been growing and as a result, life span has increased. During the last 100 years life expectancy rose from 30 years to over 60 years. Yet we find that in many countries, preventable and environment- related diseases and hazards take a heavy toll in which more than 10 million children die every year. You may already be aware that in many countries including India where economies are growing the development process has been proceeding rapidly, pollution of air and water has become a problem. In developing countries, risks to health result from traditional environmental problems which are largely due to poverty and poor hygienic conditions. We have then modern agricultural practices like use of fertilizers and pesticides which are health hazards of high magnitude both in developed and developing countries. In developed countries, environmental threats to health emerge primarily from industrial pollution resulting in water and air pollution that leads to release of toxic gases and chemicals into environment. There is evidence that small amount of pollutant in the environment, like dioxins affect human immune system and other health problems. These problems also exist in developing countries. In fact, in India and many other countries of South, polluting industries like tanneries or thermal power stations have exposed people to hazardous chemicals causing ill health. Exposure to lead is very high in developing countries (though one source of lead poisoning has been eliminated in some places through use of unleaded petrol). Lead causes mental retardation in children.

Unit 7 - Environmental Protection Notes 159 Environmental changes affect the health directly by exposing people to harmful substances or indirectly by affecting the ecosystem. Release of greenhouse gases like carbon dioxide due to excessive industrial activities especially in rich countries result in global warming or climate changes. (Greenhouse gases result from burning of fossil fuels coal and petroleum.) Global warming leads to changes in the ecosystem. Disruption of ecosystem may cause diseases by providing breeding conditions for germs. There is no doubt that industrialisation, rising energy requirement and modern agricultural practices though have major effect on environment, play an important role in economic growth. Yet they can be a source of avoidable health hazard provided we adopt a new approach to manufacturing, agricultural practices, forest and land management, watershed management, coastal management, water harvesting and such other steps. You may already know that transboundry shipment of toxic wastes is a serious health hazard. Rich countries export tons of hazardous materials like pesticides to poor countries, though these materials are banned in their own countries. Indonesia has been able to reduce pesticide-related health risks by reducing pesticide subsidies. Environmental hazard to health can be divided into (i) health hazards associated with poor development and economic conditions and (ii) hazards associated with unsustainable development. In the former category is included (a) lack of access to safe drinking water (b) insanitary conditions (c) indoor pollution due to burning of oil, coal and cow dung. Global environmental problems like ozone depletion and global warming take their own toll of human health. As mentioned above, global warming affects the life of plants and animals. It has been seen that 1-2 degrees centigrade rise in temperature can extend the range of malaria-causing mosquito to new areas. Ozone hole permits the UV radiation reaching the earth. Effects of UV radiation are seen in the form of increase in cataract and skin cancer. The most important effect of UV radiation is on immune system of humans, which if weak, can lead to serious ailments of numerous types. Thus, you must understand that various health problems related to environments are diseases resulting from: (i) Poor sanitation and water supply (ii) Poor waste disposal (iii) Air Pollution (iv) Indoor Pollution (Burning of coal, gas, kerosene oil) (v) Fertilizers and Pesticides (vi) Climate change (vii) Ozone depletion (viii) Deforestation Environmental Studies Notes 160 (ix) Loss of Biodiversity (x) Natural calamities like earthquakes, floods, droughts, landslides 7.9 HUMAN RIGHTS This section emphasises on the human rights under certain standards. Human Rights are internationally agreed standards or rules regulating the conduct of states towards their own citizens and non-citizens. Fifty years ago, the idea of human rights was not much prevalent among people, though some of the governments in the West were caught up in legal and moral discussion and debate on this subject. Situation has changed today; human rights movement is spreading throughout the world. In 1948, United Nations adopted Universal Declaration of Human Rights and decided that Dec. 10 should be observed as Human Rights Day throughout the World. You must note that it is not that idea of human rights became known fifty years ago; the concept of human dignity is old; it existed in major religions of the world since ancient times. The League of Nations after World War I asked the governments to ensure that their nationals are protected and there is respect of the rights of ethnic, linguistic and religious groups. It is only after World War II that human rights concept was given an institutional meaning and its meaning became broader in scope embracing moral, social and legal aspects. Everywhere, individuals want to be treated with dignity, want to voice their own opinions and worship when and where they want. Today, the language of human rights is almost universal in the sense that how a country treats people within its own borders including its own citizens. It is an issue of concern for all nations. But this does not mean that there is no variation in the extent and exercise of human rights among various cultures and political groups; different cultures may interpret certain rights in their own way. Many countries have agencies and commissions that deal with the problems concerning human rights. These problems refer to claims relating to discrimination of groups or sects, children, women for environment, food or life. The universal Declaration of Human Rights, mentioned above, has resulted in emergence of many Human Rights NGO's. The NGO's have been pushing hard for implementation of rights specifically if these are directed against torture, racial and gender discrimination and other such acts perpetuated by oppressive regimes. 7.9.1 Achievements of Human Rights Declaration Even since the Declaration of Human Rights in 1948, UN has played a key role in implementation of human rights by various governments. UN has been playing an important role in developing human rights standards and devising mechanisms for monitoring the compliance of human rights and also censoring the governments or other agencies that violate the rights. The UN Conference on Human Rights and Development in 1993 was a milestone because it provided and fostered a forum in which society could raise concern about

Unit 7 - Environmental Protection Notes 161 abuse of people or women. Even prior to 1993, many Human Rights Treaties were signed and ratified by various governments. In fact, you should consider that after 1948 Declaration, two organizations were formed namely International Convention on Economic, Social and Cultural Rights and the International Convention on Civil and Political Rights. The first deals with right to self-determination, work, education, food, health, housing, clothing, social security and the cultural life of the community. The second deals with the right or freedom to speech, freedom of thought and religion and to prohibit against torture or cruelty. These two organizations constitute International Bill of Human Rights of UN. You should take into consideration that human Rights in both the categories were later elaborated to include right of migrants, minorities, prisoners, refugees, healthy environment and development. Several conventions were set up dealing with rights in a subject-wise manner. Some of these are given below: 1. Convention on the status of Refugees; 2. Convention on Political Rights of Women; 3. International Convention on the elimination of all forms of Racial Discrimination; 4. Convention against Torture and other Cruel Inhuman and Degrading Treatments or Punishments; 5. Convention on the Rights of the Child. In addition, there have been many declarations of UN General Assembly and also of many countries of regions of Africa, Asia and Latin America. A Commission and a High Commissioner on Human Rights was established at UN. Human Rights movements initially were led by states with the support of individual groups. Later, NGO's and other agencies became the champions of the cause. In case of governments serving as the main agents of Human Rights movement, it was observed that this was more or less a political instrument for obtaining sanctions against another political ideology. Example: The civil rights movement of USA was a reminder to the then governments of communist countries led by Soviet Union that the democratic system of the west has a lead over authoritarian regimes in the matter of human rights. At the time when the Human Rights Movement acquired a global character, Regional instruments that have been serving as forum for raising protests against violations also became active. For many aspects of Human Rights, the movements or activism started in the West and spread to other parts of world. But some other aspects like freedom against colonial rule, the movements started within the countries that include mostly the countries of South - (Asia,
Environmental Studies Notes 162 Africa, Latin America). Also the movements for freedom and human rights in the countries of Eastern Europe and Soviet Union in 1980's are the examples of movements that originated outside West. In fact, in 1979, human rights movement was spreading to all regions of the world and to almost all areas of human concern and prior to that the rights to self-determination led many third world countries to get freedom from colonial rule to become independent. 7.10 HUMAN RIGHT – LEGAL OR MORAL It is important to note that human rights have been identified and they are enforced through commissions or committees in many countries. But unless, the governments of various countries ratify the standards laid down in different areas of human rights, they do not become legally binding instruments. They even don't become morally binding. Even after ratification, problem of implementation remains to be solved, despite pressures from NGO's. Some of the violations against human rights like genocide or crime against humanity can be brought to International Criminal Court, which is a forum for redressal of acts of violation. Human Rights movements, their existence, ratification and implementation face a great challenge when the violation or abuse is done by the state (e.g. genocide, racial discrimination or religious persecution). The NGO's and other groups then find it difficult to get even right access to information regarding the violation. The international NGO's in association with local organizations have been taking up the cause of human rights, this has led to local organization becoming activist groups. Example: Greenpeace have fought many battle on rights to clean water, rehabilitation of indigenous people uprooted on account of clearing forests and such other matters. Their role in confronting the governments or business corporation continues to be a source of great inspiration for serving the cause of human rights. Self Assessment Fill in the blanks: 11. The effect of growing population on environment and its resources and on health and other ..... factors is a matter of great concern. 12. The ..... of the planet earth will be greatly stretched and exceeded if the present rate of population growth continues. 13. The population in certain western countries has got ..... 14. Human Rights are ..... agreed standards or rules regulating the conduct of states towards their own citizens and non-citizens. 15. In many countries of the South, population is going to be ..... before it gets stabilized.

Unit 7 - Environmental Protection Notes 163 Environmental Protection in China ne-fifth of the population of the world live in China. China is the biggest developing country in the world. China also has a higher biodiversity and is the most abundant World Natural and Cultural Heritage country, so Chinese environmental protection is very important to the globe. China is facing the crucial period of developing the economy and protecting the environment. At present in China, the top officials have understood the importance of protecting the environment for Chinese sustainable development in the new century and have attached great importance to environmental protection. This is a good opportunity to carry out the basic national policy and protecting the ecological environment. Nevertheless, there are more difficulties in doing this in China than in the U.S. These reasons are as follows: First of all, the level of the Chinese economy and technology is not very high. Developing the economy is a task of primary importance to the local government. They can't put more money into environmental protection. In some regions, the common people have to harm the environment in order to live. For example in the southwest of China, the resources of plants and animals are quite abundant. The area of the northwest is about one half of China and it's the source of the main rivers, including the Yellow River, the Yangtze River, and the Lancang River. The government should pay much attention to both areas. Furthermore, the northwest of China is a very ecologically sensitive area. The key ecological issues are drought and the shortage of sufficient water, and the ecosystem is very fragile in that vast area. A developing economy needs not only money but also more resources, and these bring pollution; so there are conflicts with the environment to some degree. However, the level of the economy and technology in this region is relatively low. The funds put into the environmental protection are so limited. The local government has a dilemma and has to make a choice between economic development and environmental protection. Especially currently, the national strategy of developing the western area challenges the ecological environment. If we lack scientific process in the decision- making policy and enough evaluation of the ecological environment, we will take great risks. Secondly, the environmental consciousness of our common people is not very strong. Although the Chinese government has already done many educational programs on environmental protection, many persons are restricted by their level of scientific and cultural awareness, and are affected by the traditional concepts. For example, those who live on a mountain rely on the mountain; those living near the water rely on the water. People make O Contd...

Environmental Studies Notes 164 use of local resources more and more, without taking steps to recover them and protect the environment promptly. Third, the government should improve the laws for environmental protection. On the one hand, the government should perfect the current law. On the other hand, the government should reform the current systems in many aspects. That is to say, the government should govern the country according to the law and enforce the law strictly. The three aspects that I have mentioned above are tightly connected and affect each other. These will determine the present and future of the environmental protection of China. But how do we solve the three problems that I have mentioned? I have some suggestions. First, the development of the economy and technology is a relatively long process. We should try our best to improve it. We should do our utmost to keep the balance of economic development and environmental management. We should increase investment in environmental protection and ecological construction. Meanwhile, we need help from developed countries and we need to import advanced technology and management. Second, it is our responsibility to improve everyone's environmental sense. It is also the most important task of the Centre for Environmental Education of Capital Normal University (CNU). If we want to improve the environmental sense of the whole nation, we should first improve the environmental sense of all educators, because it is they who are in charge of educating several hundred millions of young people in China. Third, reforming the system and improving the law also are a long process. We shall push this process forward. We know that in the system of China, the leaders and policy designers play an important role in protecting the environment. At the same time, with reform, the common people have more and more chances to give their advice to the government. The environmental issue is very complex. It concerns nature and human society, and it is restricted by natural and economic conditions. Especially, the environment is affected by people's economic activities and people's thoughts and behaviours. Questions: 1. What is environment protection? 2. What do you conclude from the given case study? Source: http://www.mhhe.com/EnviroSci/CaseStudyLibrary/International/CaseStudy_Int_EnvironmentProtect.pdf SUMMARY z The Environmental Protection Act, 1986 has been passed to implement the decision of the Conference relating to protection and improvement of

Unit 7 - Environmental Protection Notes 165 environment and the prevention of hazards to human beings, living creatures and property. z No person carrying on any industry, operation or process shall discharge or emit or permit to be discharged or emitted any environmental pollutant in excess of such standards as may be prescribed. z The persons handling hazardous substance are required to comply with the procedural safeguards. z All developmental projects whether or not under the Schedule I, if located in fragile regions must obtain MoEF clearance. z

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is an umbrella legislation designed to provide a framework for the

Central Government to coordinate activities of various central and state authorities established under previous laws such as the Water Act and Air Act. z Human Rights movements, their existence, ratification and implementation face a great challenge when the violation or abuse is done by the state (e.g. genocide, racial discrimination or religious persecution). z The NGO's and other groups then find it difficult to get even right access to information regarding the violation. z The international NGO's in association with local organizations have been taking up the cause of human rights; this has led to local organization becoming activist groups. KEYWORDS Environmental Protection Act: The Act defines environment, environmental pollutant, environmental pollution, hazardous substance and some other terms. Water Pollution: Water pollution means

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contamination of water or alteration of the physical, chemical or biological properties of water due to discharge of any sewage or industrial effluent or any other liquid, gaseous or solid substance into water whether directly or indirectly as may or as likely to, render such water harmful to public health or safety, or to domestic, commercial, industrial, agricultural or other legitimate uses, or to the life and health of animals or plants

including micro-organisms. Human rights: Human Rights are internationally agreed standards or rules regulating the conduct of states towards their own citizens and non-citizens. MULTIPLE CHOICE QUESTIONS Choose the correct answer from the following options: 1. The world as World Environmental day is celebrated on: (a) December 1 (b) June 5 (c) November 14 (d) August 15
Environmental Studies Notes 166 2. The provisions for environmental protection in the constitution were made in: (a) 1976 (b) 1950 (c) 1982 (d) 1960 3. The provisions of environmental protection in the constitution were made under: (a) Article 5A (b) Article 21B (c) Article 27B (h) (d) Article 48A and Article 51A (g) 4. The first of the Major Environmental Protection Act to be promulgated in India was: (a) Water Act (b) Air Act (c) Environmental Act (d) Noise Pollution Rule 5. The Forest (Conservation)

Forest (Conservation) Act extends to the whole of India except: (a) Uttar Pradesh (b) Karnataka (c) Jammu and Kashmir (d) Haryana 7. Penalty for conservation of the provisions of the Forest Act is under: (a) Section 3A (b) Section 4A (c) Section 12A (d) Section 8A 8. Offences by the Authorities and Government Department in Forest Act are under: (a) Section 5B (b) Section 5A (c) Section 3B (d) Section 8A 9. The Wildlife (Protection)

power to declare an area as a sanctuary or national park of Central Government is Wildlife (Protection) Act is under: (a) Section 38 (b) Section 39 (c) Section 18 (d) Section 27
Unit 7 - Environmental Protection Notes 167 11. The Wildlife (Protection) Act contains: (a) 7 Chapters (b) 6 Chapters (c) 5 Chapters (d) 8 Chapters 12. The Wildlife (Protection) Act contains: (a) 66 Sections (b) 6 Sections (c) 7 Sections (d) 46 Sections REVIEW QUESTIONS 1. Write the main provisions of Environmental Protection Act. 2. Explain

main provisions of Wildlife Protection Act. 5. Write the main provisions of Forest Conservation Act. 6. Define population growth and explain its aspects, importance and effects on environment. 7. What are the essentials of human health? 8. What are different human rights? Answers: Self Assessment 1. Umbrella 2. central 3. EPA 4. 1981 5. April 1994 6. Water pollution 7. Sewage 8. Sewer 9. Industrial effluent 10. Diverse 11. Social 12. carrying capacity 13. stabilized 14. internationally 15. doubled Answers: Multiple Choice Questions 1. (b) June 5 2. (a) 1976 3. (d) Article 48A and Article 51A (g) 4. (a) Water Act

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Environmental Studies Notes 168 5. (c) 1980 6. (c) Jammu and Kashmir 7. (a) Section 3A 8. (c) Section 3B 9. (d) 1972 10. (a) Section 38 11. (a) 7 Chapters 12. (a) 66 Sections FURTHER READINGS N K Uberoi, Environmental Studies, Excel Books. Lewis Owen, Tim Unwin, Environmental Management: Readings and Case Studies, Wiley. Barrow, C. J., Environmental Management: Principles and Practice, Routledge. Anindita Basak, Environmental Studies, Pearson Education. R. Rajgopalan, Environmental Studies from Crises to Cure, Oxford University Press. Dr. R. J. Ranjit Daniels, Dr. Jagdish Krishnaswamy, Environmental Studies, Wiley India. en.wikipedia.org/wiki/Environmental_studies en.wikipedia.org/wiki/Environmental_protection eponline.com www.businessdictionary.com/.../environmental-protection.html en.wikipedia.org/wiki/Environmental_science

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Matching text As the text appears in the source.

1/213	SUBMITTED TEXT	90 WORDS	34%	MATCHING TEXT	90 WORDS
Nature of Environmental Studies 5 Unit 2 Natural Resources and Associated Problems 29 Unit 3 Ecosystems 51 Unit 4 Biodiversity and Its Conservation 71 Unit 5 Environmental Pollution 87 Unit 6 Social Issues and Environment 111 Unit 7 Environmental Protection 136 Unit 1 - Nature of Environmental Studies Notes 5 UNIT 1 - NATURE OF ENVIRONMENTAL STUDIES CONTENTS Learning Objectives Introduction 1.1 Definition and				NATURE OF ENVIRONMENTAL STUDIES Unit II ECOSYSTEMS Unit III BIODIVERSITY AND ITS CONSERVATION Unit IV ENVIRONMENTAL POLLUTION Unit V SOCIAL ISSUES AND THE ENVIRONMENT Manonmaniam Sundaranar Tirunelveli - 12 4 Manonmaniam Sundaranar University, Tirunelveli - 12 5 UNIT 1 THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES CONTENTS 1.0 Aims and Objectives 1.1 Definition, scope and		

W https://www.msuniv.ac.in/Download/Pdf/6c931ea73ba8487

2/213	SUBMITTED TEXT	90 WORDS	34%	MATCHING TEXT	90 WORDS
Nature of Environmental Studies 5 Unit 2 Natural Resources and Associated Problems 29 Unit 3 Ecosystems 51 Unit 4 Biodiversity and Its Conservation 71 Unit 5 Environmental Pollution 87 Unit 6 Social Issues and Environment 111 Unit 7 Environmental Protection 136 Unit 1 - Nature of Environmental Studies Notes 5 UNIT 1 - NATURE OF ENVIRONMENTAL STUDIES CONTENTS Learning Objectives Introduction 1.1 Definition and				NATURE OF ENVIRONMENTAL STUDIES Unit II ECOSYSTEMS Unit III BIODIVERSITY AND ITS CONSERVATION Unit IV ENVIRONMENTAL POLLUTION Unit V SOCIAL ISSUES AND THE ENVIRONMENT Manonmaniam Sundaranar Tirunelveli - 12 4 Manonmaniam Sundaranar University, Tirunelveli - 12 5 UNIT 1 THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES CONTENTS 1.0 Aims and Objectives 1.1 Definition, scope and		

W https://www.msuniv.ac.in/Download/Pdf/c6b12f0e3a0a473

3/213	SUBMITTED TEXT	11 WORDS	100%	MATCHING TEXT	11 WORDS
OBJECTIVES After studying this unit, you should be able to:					

SA 003E1140_Environmental Studies.docx (D165652564)

Ouriginal by Turnitin

4/213	SUBMITTED TEXT	18 WORDS	67%	MATCHING TEXT	18 WORDS

OBJECTIVES After studying this unit, you should be able to: z Define Environmental Studies z Explain the

OBJECTIVES After studying this unit, you should be able to: ? importance of environmental studies. ? Explain the

W https://www.msuniv.ac.in/Download/Pdf/6c931ea73ba8487

5/213	SUBMITTED TEXT	18 WORDS	67%	MATCHING TEXT	18 WORDS

OBJECTIVES After studying this unit, you should be able to: z Define Environmental Studies z Explain the

OBJECTIVES After studying this unit, you should be able to: ? importance of environmental studies. ? Explain the

W https://www.msuniv.ac.in/Download/Pdf/c6b12f0e3a0a473

6/213	SUBMITTED TEXT	11 WORDS	100%	MATCHING TEXT	11 WORDS

OBJECTIVES After studying this unit, you should be able to:

SA 003E1140_Environmental Studies.docx (D165652913)

7/213	SUBMITTED TEXT	11 WORDS	100%	MATCHING TEXT	11 WORDS

OBJECTIVES After studying this unit, you should be able to:

SA 003E1140_Environmental Studies.docx (D164979189)

8/213	SUBMITTED TEXT	52 WORDS	94%	MATCHING TEXT	52 WORDS

the area in which we live, we observe that our surroundings were formerly a natural landscape such as a forest, a river, a mountain, a desert, or a combination of these elements. Most of us live in landscapes that have been heavily modified by human beings, in villages, towns or cities.

the area in which we live, we found that our surroundings were originally a natural landscape such as a forest, a river, a mountain, a desert, or a combination of these elements. Most of us live in landscapes that have been heavily modified by human beings, in villages, towns or cities.

W https://www.bhumipublishing.com/wp-content/uploads/2021/02/Environmental-Science.pdf

9/213	SUBMITTED TEXT	28 WORDS	90%	MATCHING TEXT	28 WORDS

are dependent on natural landscapes such as forests, grasslands, rivers, seashores, for resources such as water for agriculture, fuel wood, fodder, and fish. Thus, our daily needs

are further dependent on natural landscapes such as forests, grasslands, rivers, seashores, for resources such as water for agriculture, fuel wood, fodder and fish. For our daily basic needs,

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Ouriginal by Turnitin

10/213	SUBMITTED TEXT	19 WORDS	80%	MATCHING TEXT	19 WORDS

most traditions focus to our environment as 'Mother Nature.' Most traditional societies have understood that respecting nature is

most traditions refer to our environment as „Mother Nature" and most traditional societies have learned that respecting nature is

W https://www.bhumipublishing.com/wp-content/uploads/2021/02/Environmental-Science.pdf

11/213	SUBMITTED TEXT	26 WORDS	56%	MATCHING TEXT	26 WORDS

natural resources are deteriorating and our environment is being largely ruined by human activities, it is clear that something required to be

natural resources are continuously diminishing and our environment is being degraded by human interference, it is obvious that something needs to be

W https://www.bhumipublishing.com/wp-content/uploads/2021/02/Environmental-Science.pdf

12/213	SUBMITTED TEXT	15 WORDS	78%	MATCHING TEXT	15 WORDS

on the community of living plants and animals which form a web of life,

on the community of living plants, animals and other living organism which form a web of life.

W https://www.bhumipublishing.com/wp-content/uploads/2021/02/Environmental-Science.pdf

13/213	SUBMITTED TEXT	23 WORDS	86%	MATCHING TEXT	23 WORDS

our environment by our actions is economically more viable than cleaning up the environment once it is damaged. Individually we can play

our environment by our practices is economically more suitable than cleaning up the environment once it is damaged. Individually we can play

W https://www.bhumipublishing.com/wp-content/uploads/2021/02/Environmental-Science.pdf

14/213	SUBMITTED TEXT	29 WORDS	69%	MATCHING TEXT	29 WORDS

As the earth's natural resources are deteriorating and our environment is being largely ruined by human activities, it is clear that something required to be

As the Earth's natural resources are rapidly dwindling and our environment is being increasingly degraded by human activities, it is evident that something needs to be

W http://103.38.12.142:8081/jspui/bitstream/123456789/550/1/Environmental%20Studies.pdf

15/213	SUBMITTED TEXT	29 WORDS	69%	MATCHING TEXT	29 WORDS

As the earth's natural resources are deteriorating and our environment is being largely ruined by human activities, it is clear that something required to be

As the Earth's natural resources are rapidly dwindling and our environment is being increasingly degraded by human activities, it is evident that something needs to be

W http://www.tmv.edu.in/pdf/Management/Environmental%20Studies.pdf

Ouriginal by Turnitin

16/213	SUBMITTED TEXT	24 WORDS	93%	MATCHING TEXT	24 WORDS

natural resources and we can act as watchdogs that inform the Government about sources that lead to pollution and degradation of our environment.

natural resources and we can act as watchdogs to inform the Government about sources that lead to pollution and degradation of our environment.

W https://www.bhumipublishing.com/wp-content/uploads/2021/02/Environmental-Science.pdf

17/213	SUBMITTED TEXT	22 WORDS	90%	MATCHING TEXT	22 WORDS

this can only be made possible through mass public awareness. Mass media such as newspapers, radio, television, strongly influence public opinion.

This can only be made possible through public awareness. Mass media such as newspapers, radio and television strongly influence public opinion.

W http://103.38.12.142:8081/jspui/bitstream/123456789/550/1/Environmental%20Studies.pdf

18/213	SUBMITTED TEXT	42 WORDS	91%	MATCHING TEXT	42 WORDS

once it is damaged. Individually we can play a major role in environment management. We can reduce wasting natural resources and we can act as watchdogs that inform the Government about sources that lead to pollution and degradation of our environment.

once it is damaged. Individually, we can play a major role in environment management. We can reduce wastage natural resources and we can act as watchdogs that inform the government about sources that lead to pollution and degradation of the environment.

W http://103.38.12.142:8081/jspui/bitstream/123456789/550/1/Environmental%20Studies.pdf

19/213	SUBMITTED TEXT	22 WORDS	90%	MATCHING TEXT	22 WORDS

this can only be made possible through mass public awareness. Mass media such as newspapers, radio, television, strongly influence public opinion.

This can only be made possible through public awareness. Mass media such as newspapers, radio and television strongly influence public opinion.

W http://www.tmv.edu.in/pdf/Management/Environmental%20Studies.pdf

20/213	SUBMITTED TEXT	22 WORDS	92%	MATCHING TEXT	22 WORDS

this can only be made possible through mass public awareness. Mass media such as newspapers, radio, television, strongly influence public opinion.

This can only be made possible through mass awareness. Mass media such as newspapers, radio, television, strongly influence public opinion.

W https://www.bhumipublishing.com/wp-content/uploads/2021/02/Environmental-Science.pdf

Ouriginal by Turnitin

21/213	SUBMITTED TEXT	32 WORDS	100%	MATCHING TEXT	32 WORDS

If each of us feels strongly about the environment, the press and media will add to our efforts. Politicians in a democracy always respond positively to a strong publicly supported movement.

If each of us feels strongly about the environment, the press and media will add to our efforts. Politicians in a democracy 4 always respond positively to a strong publicly-supported movement.

W http://103.38.12.142:8081/jspui/bitstream/123456789/550/1/Environmental%20Studies.pdf

22/213	SUBMITTED TEXT	32 WORDS	100%	MATCHING TEXT	32 WORDS

If each of us feels strongly about the environment, the press and media will add to our efforts. Politicians in a democracy always respond positively to a strong publicly supported movement.

If each of us feels strongly about the environment, the press and media will add to our efforts. Politicians in a democracy 4 always respond positively to a strong publicly-supported movement.

W http://www.tmv.edu.in/pdf/Management/Environmental%20Studies.pdf

23/213	SUBMITTED TEXT	41 WORDS	96%	MATCHING TEXT	41 WORDS

However, someone has to bring this about. If each of us feels strongly about the environment, the press and media will add to our efforts. Politicians in a democracy always respond positively to a strong publicly supported movement. Thus if

However, someone has to bring this about. If each of us feel strongly about the environment, the press and media will add to our efforts. Politicians in a democracy always respond positively to a strong publicly supported movement. Thus, if

W https://www.bhumipublishing.com/wp-content/uploads/2021/02/Environmental-Science.pdf

24/213	SUBMITTED TEXT	42 WORDS	91%	MATCHING TEXT	42 WORDS

once it is damaged. Individually we can play a major role in environment management. We can reduce wasting natural resources and we can act as watchdogs that inform the Government about sources that lead to pollution and degradation of our environment.

once it is damaged. Individually, we can play a major role in environment management. We can reduce wastage natural resources and we can act as watchdogs that inform the government about sources that lead to pollution and degradation of the environment.

W http://www.tmv.edu.in/pdf/Management/Environmental%20Studies.pdf

Ouriginal by Turnitin

25/213	SUBMITTED TEXT	26 WORDS	84%	MATCHING TEXT	26 WORDS

We are living on spaceship earth with a limited supply of resources. Everyone is responsible for exposing this message to as many people as possible.

We are living on spaceship earth with a limited supply of resources. Each of us is responsible for spreading this message to as many people as possible.

W http://103.38.12.142:8081/jspui/bitstream/123456789/550/1/Environmental%20Studies.pdf

26/213	SUBMITTED TEXT	26 WORDS	84%	MATCHING TEXT	26 WORDS

We are living on spaceship earth with a limited supply of resources. Everyone is responsible for exposing this message to as many people as possible.

We are living on spaceship earth with a limited supply of resources. Each of us is responsible for spreading this message to as many people as possible.

W http://www.tmv.edu.in/pdf/Management/Environmental%20Studies.pdf

27/213	SUBMITTED TEXT	32 WORDS	87%	MATCHING TEXT	32 WORDS

conservation, politicians will make green policies. We are living on spaceship earth with a limited supply of resources. Everyone is responsible for exposing this message to as many people as possible.

conservation, politicians will make green policies. We are living on spaceship earth with a limited supply of resources. Each of us is responsible for spreading this message to as many people as possible.

W https://www.bhumipublishing.com/wp-content/uploads/2021/02/Environmental-Science.pdf

28/213	SUBMITTED TEXT	13 WORDS	95%	MATCHING TEXT	13 WORDS

human interaction with the environment in the interests of solving complex problems.

SA 180E2340_Environmental Administration(Final 21.10.22).docx (D165106913)

29/213	SUBMITTED TEXT	19 WORDS	96%	MATCHING TEXT	19 WORDS

the importance of environmental studies. 4. Write an essay on “Multidisciplinary Nature of Environmental Studies”. 5. Discuss the

the importance of environmental studies. 2. Write an essay on the multidisciplinary nature of environmental studies. 3. Discuss the

W https://dokumen.pub/environmental-studies-9780071072656-0071072659.html

30/213	SUBMITTED TEXT	11 WORDS	100%	MATCHING TEXT	11 WORDS

OBJECTIVES After studying this unit, you should be able to:

OBJECTIVES After studying this unit, you should be able to: ?

W https://www.msuniv.ac.in/Download/Pdf/6c931ea73ba8487

Ouriginal by Turnitin

31/213	SUBMITTED TEXT	11 WORDS	100%	MATCHING TEXT	11 WORDS

OBJECTIVES After studying this unit, you should be able to:

OBJECTIVES After studying this unit, you should be able to: ?

W https://www.msuniv.ac.in/Download/Pdf/c6b12f0e3a0a473

32/213	SUBMITTED TEXT	19 WORDS	96%	MATCHING TEXT	19 WORDS

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W https://dokumen.pub/environmental-studies-9780071072656-0071072659.html

33/213	SUBMITTED TEXT	19 WORDS	96%	MATCHING TEXT	19 WORDS

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the importance of environmental studies. 2. Write an essay on the multidisciplinary nature of environmental studies. 3. Discuss the

W https://dokumen.pub/environmental-studies-9780071072656-0071072659.html

34/213	SUBMITTED TEXT	11 WORDS	100%	MATCHING TEXT	11 WORDS

OBJECTIVES After studying this unit, you should be able to:

SA 003E1140_Environmental Studies.docx (D165652564)

35/213	SUBMITTED TEXT	11 WORDS	90%	MATCHING TEXT	11 WORDS

renewable and non-renewable resources, forest resources, water resources, mineral resources

renewable and non-renewable resources. It describes forest resources, water resources, mineral resources,

W https://dokumen.pub/environmental-studies-9780071072656-0071072659.html

36/213	SUBMITTED TEXT	11 WORDS	90%	MATCHING TEXT	11 WORDS

renewable and non-renewable resources, forest resources, water resources, mineral resources

renewable and non-renewable resources. It describes forest resources, water resources, mineral resources,

W https://dokumen.pub/environmental-studies-9780071072656-0071072659.html

37/213	SUBMITTED TEXT	11 WORDS	90%	MATCHING TEXT	11 WORDS

renewable and non-renewable resources, forest resources, water resources, mineral resources

renewable and non-renewable resources. It describes forest resources, water resources, mineral resources,

W https://dokumen.pub/environmental-studies-9780071072656-0071072659.html

Ouriginal by Turnitin

38/213	SUBMITTED TEXT	11 WORDS	100%	MATCHING TEXT	11 WORDS

OBJECTIVES After studying this unit, you should be able to:

SA 003E1140_Environmental Studies.docx (D165652913)

39/213	SUBMITTED TEXT	11 WORDS	100%	MATCHING TEXT	11 WORDS

OBJECTIVES After studying this unit, you should be able to:

OBJECTIVES After studying this unit, you should be able to: ?

W https://www.msuniv.ac.in/Download/Pdf/6c931ea73ba8487

40/213	SUBMITTED TEXT	11 WORDS	100%	MATCHING TEXT	11 WORDS

OBJECTIVES After studying this unit, you should be able to:

OBJECTIVES After studying this unit, you should be able to: ?

W https://www.msuniv.ac.in/Download/Pdf/c6b12f0e3a0a473

41/213	SUBMITTED TEXT	11 WORDS	100%	MATCHING TEXT	11 WORDS

OBJECTIVES After studying this unit, you should be able to:

SA 003E1140_Environmental Studies.docx (D164979189)

42/213	SUBMITTED TEXT	24 WORDS	50%	MATCHING TEXT	24 WORDS

OBJECTIVES After studying this unit, you should be able to: z Understand the Concept of Ecosystem z Identify the Structure and Functions of

SA 003E1140_Environmental Studies.docx (D165652564)

43/213	SUBMITTED TEXT	24 WORDS	50%	MATCHING TEXT	24 WORDS

OBJECTIVES After studying this unit, you should be able to: z Understand the Concept of Ecosystem z Identify the Structure and Functions of

SA 003E1140_Environmental Studies.docx (D165652913)

Ouriginal by Turnitin

44/213	SUBMITTED TEXT	24 WORDS	50%	MATCHING TEXT	24 WORDS

OBJECTIVES After studying this unit, you should be able to: z Understand the Concept of Ecosystem z Identify the Structure and Functions of

SA 003E1140_Environmental Studies.docx (D164979189)

45/213	SUBMITTED TEXT	16 WORDS	66%	MATCHING TEXT	16 WORDS

It is the process in which fertile land is turned into desert or barren land.

SA UNIT 2F- THE EARTH'S ENVIRONMENT.docx (D124561402)

46/213	SUBMITTED TEXT	16 WORDS	66%	MATCHING TEXT	16 WORDS

It is the process in which fertile land is turned into desert or barren land.

SA UNIT 2F- THE EARTH'S ENVIRONMENT.docx (D124561402)

47/213	SUBMITTED TEXT	11 WORDS	100%	MATCHING TEXT	11 WORDS

OBJECTIVES After studying this unit, you should be able to:

SA 003E1140_Environmental Studies.docx (D165652564)

48/213	SUBMITTED TEXT	20 WORDS	60%	MATCHING TEXT	20 WORDS

OBJECTIVES After studying this unit, you should be able to: z Define the Term Biodiversity z Explain the Various

OBJECTIVES After studying this unit, you should be able to: ? and explain the importance of environmental studies. ? Explain the various

W https://www.msuniv.ac.in/Download/Pdf/6c931ea73ba8487

49/213	SUBMITTED TEXT	20 WORDS	60%	MATCHING TEXT	20 WORDS

OBJECTIVES After studying this unit, you should be able to: z Define the Term Biodiversity z Explain the Various

OBJECTIVES After studying this unit, you should be able to: ? and explain the importance of environmental studies. ? Explain the various

W https://www.msuniv.ac.in/Download/Pdf/c6b12f0e3a0a473

Ouriginal by Turnitin

50/213	SUBMITTED TEXT	11 WORDS	100%	MATCHING TEXT	11 WORDS

OBJECTIVES After studying this unit, you should be able to:

SA 003E1140_Environmental Studies.docx (D165652913)

51/213	SUBMITTED TEXT	11 WORDS	100%	MATCHING TEXT	11 WORDS

OBJECTIVES After studying this unit, you should be able to:

SA 003E1140_Environmental Studies.docx (D164979189)

52/213	SUBMITTED TEXT	45 WORDS	64%	MATCHING TEXT	45 WORDS

along coasts in the Western Pacific, whereas sea surface temperature is the highest and in mid-latitudinal band in all oceans. Biodiversity generally tends to cluster in hotspots, and has been increasing through time but will be likely to slow down in the future. 4.1

along coasts in the Western Pacific, where sea surface temperature is highest, and in the mid-latitudinal band in all oceans. There are latitudinal gradients in species diversity. Biodiversity generally tends to cluster in hotspots, and has been increasing through time, but will be likely to slow in the future

W http://en.wikipedia.org/wiki/Biodiversity

53/213	SUBMITTED TEXT	27 WORDS	85%	MATCHING TEXT	27 WORDS

the trans-Himalayan, the Himalayan, the Indian desert, the semi-arid zone(s), the Western Ghats, the Deccan Peninsula, the Gang etic Plain, North-East India, the islands and coasts.

the Trans Himalayan, The Himalayan, The Indian Desert, The Semi Arid Zone (s), The Western Ghat, The Deccan Peninsula, the Gangetic Plain, North East India, the Islands and Coasts.

W http://103.38.12.142:8081/jspui/bitstream/123456789/550/1/Environmental%20Studies.pdf

54/213	SUBMITTED TEXT	27 WORDS	85%	MATCHING TEXT	27 WORDS

the trans-Himalayan, the Himalayan, the Indian desert, the semi-arid zone(s), the Western Ghats, the Deccan Peninsula, the Gang etic Plain, North-East India, the islands and coasts.

the Trans Himalayan, The Himalayan, The Indian Desert, The Semi Arid Zone (s), The Western Ghat, The Deccan Peninsula, the Gangetic Plain, North East India, the Islands and Coasts.

W http://www.tmv.edu.in/pdf/Management/Environmental%20Studies.pdf

55/213 **SUBMITTED TEXT** 38 WORDS **MATCHING TEXT** 38 WORDS

Biodiversity" is most commonly used to replace the more clearly defined and long established terms, species diversity and species richness. Biologists most often define biodiversity as the "totality of genes, species, and ecosystems of a region". 4.2

100% Biodiversity" is most commonly used to replace the more clearly-defined and long-established terms, species diversity and species richness.[15] Biologists most often define biodiversity as the "totality of genes, species and ecosystems of a region".[16][17]

W http://en.wikipedia.org/wiki/Biodiversity

56/213 **SUBMITTED TEXT** 20 WORDS **86%** **MATCHING TEXT** 20 WORDS

variety of species within a region. Such diversity can be measured on the basis of species in a region.

SA ESC - book.docx (D110527582)

57/213 **SUBMITTED TEXT** 27 WORDS **88%** **MATCHING TEXT** 27 WORDS

the trans-Himalayan, the Himalayan, the Indian desert, the semi-arid zone(s), the Western Ghats, the Deccan Peninsula, the Gang etic Plain, North-East India, the islands and coasts.

SA ESC - book.docx (D110527582)

58/213 **SUBMITTED TEXT** 14 WORDS **100%** **MATCHING TEXT** 14 WORDS

The endemism of Indian biodiversity is high–about 33% of the country's recorded flora

SA ESC - book.docx (D110527582)

59/213 **SUBMITTED TEXT** 26 WORDS **88%** **MATCHING TEXT** 26 WORDS

endemic to the country and is concentrated mainly in the North-East, Western Ghats, North-West Himalaya and the Andaman and Nicobar islands. About 62% of the

SA ESC - book.docx (D110527582)

60/213 **SUBMITTED TEXT** 18 WORDS **62%** **MATCHING TEXT** 18 WORDS

India is the centre of origin of 30,000-50,000 varieties of cultivated plants including rice, pigeon pea, mango,

SA ESC - book.docx (D110527582)

Ouriginal by Turnitin

61/213	SUBMITTED TEXT	13 WORDS	100%	MATCHING TEXT	13 WORDS

the Western Ghats/Sri Lanka and the Indo-Burma region (covering the Eastern Himalayas)

SA ESC - book.docx (D110527582)

62/213	SUBMITTED TEXT	13 WORDS	89%	MATCHING TEXT	13 WORDS

the Western Ghats/Sri Lanka and the Indo-Burma region (covering the Eastern Himalayas)

The Western Ghats – Sri Lanka region and 2) The Indo – Burma region covering Eastern Himalayas (The Eastern Himalayas

W https://www.iare.ac.in/sites/default/files/ENS_LECTURE_NOTES%20ECE_0.pdf

63/213	SUBMITTED TEXT	13 WORDS	89%	MATCHING TEXT	13 WORDS

the Western Ghats/Sri Lanka and the Indo-Burma region (covering the Eastern Himalayas)

The Western Ghats – Sri Lanka region and 2) The Indo – Burma region covering Eastern Himalayas (The Eastern Himalayas

W https://skyupsmediablog.files.wordpress.com/2016/04/es-notes-image-marked.pdf

64/213	SUBMITTED TEXT	73 WORDS	53%	MATCHING TEXT	73 WORDS

high-altitude cold desert in Laddakh (J&K) and Lahaul Spiti (HP) comprising 5.7% of the country's landmass. z Himalayas. The entire mountain chain running from north-western to north-eastern India, comprising a diverse range of biotic provinces and biomes, 7.2% of the country's landmass. z Desert. The extremely arid area west of the Aravalli hill range, comprising both salty desert of Gujarat and the sand desert of Rajasthan. It covers 6.9% of the country's

SA 003E1140_Environmental Studies.docx (D165652564)

65/213	SUBMITTED TEXT	73 WORDS	53%	MATCHING TEXT	73 WORDS

high-altitude cold desert in Laddakh (J&K) and Lahaul Spiti (HP) comprising 5.7% of the country's landmass. z Himalayas. The entire mountain chain running from north-western to north-eastern India, comprising a diverse range of biotic provinces and biomes, 7.2% of the country's landmass. z Desert. The extremely arid area west of the Aravalli hill range, comprising both salty desert of Gujarat and the sand desert of Rajasthan. It covers 6.9% of the country's

SA 003E1140_Environmental Studies.docx (D165652913)

66/213 **SUBMITTED TEXT** 73 WORDS **53%** **MATCHING TEXT** 73 WORDS

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SA 003E1140_Environmental Studies.docx (D164979189)

67/213 **SUBMITTED TEXT** 25 WORDS **75%** **MATCHING TEXT** 25 WORDS

zone between the desert and the Deccan plateau, including the Aravalli hill range. It covers 15.6% of the country's landmass. z Western Ghats. The

SA 003E1140_Environmental Studies.docx (D165652564)

68/213 **SUBMITTED TEXT** 25 WORDS **75%** **MATCHING TEXT** 25 WORDS

zone between the desert and the Deccan plateau, including the Aravalli hill range. It covers 15.6% of the country's landmass. z Western Ghats. The

SA 003E1140_Environmental Studies.docx (D165652913)

69/213 **SUBMITTED TEXT** 25 WORDS **75%** **MATCHING TEXT** 25 WORDS

zone between the desert and the Deccan plateau, including the Aravalli hill range. It covers 15.6% of the country's landmass. z Western Ghats. The

SA 003E1140_Environmental Studies.docx (D164979189)

70/213 **SUBMITTED TEXT** 15 WORDS **85%** **MATCHING TEXT** 15 WORDS

of biotic provinces and biomes. It covers 5.8% of the country's landmass. z Deccan

SA 003E1140_Environmental Studies.docx (D165652564)

71/213 **SUBMITTED TEXT** 15 WORDS **85%** **MATCHING TEXT** 15 WORDS

of biotic provinces and biomes. It covers 5.8% of the country's landmass. z Deccan

SA 003E1140_Environmental Studies.docx (D165652913)

72/213 **SUBMITTED TEXT** 15 WORDS **85%** **MATCHING TEXT** 15 WORDS

of biotic provinces and biomes. It covers 5.8% of the country's landmass. z Deccan

SA 003E1140_Environmental Studies.docx (D164979189)

73/213 **SUBMITTED TEXT** 20 WORDS **70%** **MATCHING TEXT** 20 WORDS

the southern and south-central plateau with predominantly deciduous vegetation. It covers 4.3% of the country's landmass. z Gangetic plain.

SA 003E1140_Environmental Studies.docx (D165652564)

74/213 **SUBMITTED TEXT** 20 WORDS **70%** **MATCHING TEXT** 20 WORDS

the southern and south-central plateau with predominantly deciduous vegetation. It covers 4.3% of the country's landmass. z Gangetic plain.

SA 003E1140_Environmental Studies.docx (D165652913)

75/213 **SUBMITTED TEXT** 9 WORDS **100%** **MATCHING TEXT** 9 WORDS

plains and non-Himalayan hill ranges of north- eastern India,

Plains and non-Himalayan hill ranges of north eastern India 9.

W https://www.bhumipublishing.com/wp-content/uploads/2021/02/Environmental-Science.pdf

Ouriginal by Turnitin

76/213	SUBMITTED TEXT	20 WORDS	70%	MATCHING TEXT	20 WORDS

the southern and south-central plateau with predominantly deciduous vegetation. It covers 4.3% of the country's landmass. z Gangetic plain.

SA 003E1140_Environmental Studies.docx (D164979189)

77/213	SUBMITTED TEXT	20 WORDS	73%	MATCHING TEXT	20 WORDS

wide variation of vegetation. It covers 5.2% of the country's landmass. z Islands. The Andaman and Nicobar Islands in

SA 003E1140_Environmental Studies.docx (D165652564)

78/213	SUBMITTED TEXT	20 WORDS	73%	MATCHING TEXT	20 WORDS

wide variation of vegetation. It covers 5.2% of the country's landmass. z Islands. The Andaman and Nicobar Islands in

SA 003E1140_Environmental Studies.docx (D165652913)

79/213	SUBMITTED TEXT	20 WORDS	73%	MATCHING TEXT	20 WORDS

wide variation of vegetation. It covers 5.2% of the country's landmass. z Islands. The Andaman and Nicobar Islands in

SA 003E1140_Environmental Studies.docx (D164979189)

80/213	SUBMITTED TEXT	44 WORDS	59%	MATCHING TEXT	44 WORDS

in the Bay of Bengal, with a highly diverse set of biomes. It covers 0.03% of the country's landmass. z Coasts. A large coastline distributed both to the west and east, with distinct differences between the two; Lakshadweep Islands are included in this

SA 003E1140_Environmental Studies.docx (D165652564)

81/213	SUBMITTED TEXT	44 WORDS	59%	MATCHING TEXT	44 WORDS

in the Bay of Bengal, with a highly diverse set of biomes. It covers 0.03% of the country's landmass. z Coasts. A large coastline distributed both to the west and east, with distinct differences between the two; Lakshadweep Islands are included in this

SA 003E1140_Environmental Studies.docx (D165652913)

Ouriginal by Turnitin

82/213	SUBMITTED TEXT	44 WORDS	59%	MATCHING TEXT	44 WORDS

in the Bay of Bengal, with a highly diverse set of biomes. It covers 0.03% of the country's landmass. z Coasts. A large coastline distributed both to the west and east, with distinct differences between the two; Lakshadweep Islands are included in this

SA 003E1140_Environmental Studies.docx (D164979189)

83/213	SUBMITTED TEXT	17 WORDS	87%	MATCHING TEXT	17 WORDS

to protect and improve the environment and to safeguard the forests and wildlife in the country',

SA Jawinder Kaur_Environmental Studies-PDF e-book.pdf (D141737445)

84/213	SUBMITTED TEXT	22 WORDS	71%	MATCHING TEXT	22 WORDS

that 'the State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife in the country',

that "The states shall to protect and improve the environment and to safeguard the forest and wildlife of the country".[52]

W http://en.wikipedia.org/wiki/Environmental_protection

85/213	SUBMITTED TEXT	16 WORDS	66%	MATCHING TEXT	16 WORDS

protect and improve the national environment including forests, lakes, rivers and wildlife, and to have

SA Jawinder Kaur_Environmental Studies-PDF e-book.pdf (D141737445)

86/213	SUBMITTED TEXT	19 WORDS	91%	MATCHING TEXT	19 WORDS

to protect and improve the national environment including forests, lakes, rivers and wildlife, and to have compassion for

to protect and improve the natural environment including forests, lakes, rivers, and wildlife and to have compassion for

W http://en.wikipedia.org/wiki/Environmental_protection

87/213 **SUBMITTED TEXT** 49 WORDS **25%** **MATCHING TEXT** 49 WORDS

a) 1990 (b) 1995 (c) 2002 (d) 2006 2. Exotic organism is ..... (a) predator (b) parasite (c) aggressive (d) all of the above 3. Which of the following is a world heritage site? (a) Sunder bans national park (b) Kaziranga national park (c) Ghana national park (d)

a) rhinoceroses (b) tigers (c) birds (d) crocodiles 16. 'Van Mahotsava' is celebrated for (a) deforestation (b) afforestation (c) cleanliness (d) None of the above 17. Which National Park is a natural abode of the Indian Rhino? (a) Kanha National Park, Madhya Pradesh (b) Corbett National Park, Uttarakhand (c) Kaziranga National Park, Assam (d)

W https://dokumen.pub/environmental-studies-9780071072656-0071072659.html

88/213 **SUBMITTED TEXT** 49 WORDS **25%** **MATCHING TEXT** 49 WORDS

a) 1990 (b) 1995 (c) 2002 (d) 2006 2. Exotic organism is ..... (a) predator (b) parasite (c) aggressive (d) all of the above 3. Which of the following is a world heritage site? (a) Sunder bans national park (b) Kaziranga national park (c) Ghana national park (d)

a) rhinoceroses (b) tigers (c) birds (d) crocodiles 16. 'Van Mahotsava' is celebrated for (a) deforestation (b) afforestation (c) cleanliness (d) None of the above 17. Which National Park is a natural abode of the Indian Rhino? (a) Kanha National Park, Madhya Pradesh (b) Corbett National Park, Uttarakhand (c) Kaziranga National Park, Assam (d)

W https://dokumen.pub/environmental-studies-9780071072656-0071072659.html

89/213 **SUBMITTED TEXT** 49 WORDS **25%** **MATCHING TEXT** 49 WORDS

a) 1990 (b) 1995 (c) 2002 (d) 2006 2. Exotic organism is ..... (a) predator (b) parasite (c) aggressive (d) all of the above 3. Which of the following is a world heritage site? (a) Sunder bans national park (b) Kaziranga national park (c) Ghana national park (d)

a) rhinoceroses (b) tigers (c) birds (d) crocodiles 16. 'Van Mahotsava' is celebrated for (a) deforestation (b) afforestation (c) cleanliness (d) None of the above 17. Which National Park is a natural abode of the Indian Rhino? (a) Kanha National Park, Madhya Pradesh (b) Corbett National Park, Uttarakhand (c) Kaziranga National Park, Assam (d)

W https://dokumen.pub/environmental-studies-9780071072656-0071072659.html

Ouriginal by Turnitin

90/213	SUBMITTED TEXT	40 WORDS	80%	MATCHING TEXT	40 WORDS

the State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife in the country', and 'to protect and improve the national environment including forests, lakes, rivers and wildlife, and to have compassion for

SA 180E2340_Environmental Administration(Final 21.10.22).docx (D165106913)

91/213	SUBMITTED TEXT	19 WORDS	91%	MATCHING TEXT	19 WORDS

to protect and improve the national environment including forests, lakes, rivers and wildlife, and to have compassion for

SA Sem I_B21ES01AC.pdf (D165341028)

92/213	SUBMITTED TEXT	44 WORDS	37%	MATCHING TEXT	44 WORDS

of Air Pollution 5.1.3 Effects of Air Pollution 5.1.4 Prevention of Air Pollution 5.2 Water Pollution 5.2.1 Classification of Water Pollution 5.2.2 Sources of Water Pollution 5.2.3 Effects of Water Pollution 5.2.4 Prevention of Water Pollution 5.3

SA XII Chapter 16.pdf (D115094734)

93/213	SUBMITTED TEXT	48 WORDS	43%	MATCHING TEXT	48 WORDS

Air Pollution 5.2 Water Pollution 5.2.1 Classification of Water Pollution 5.2.2 Sources of Water Pollution 5.2.3 Effects of Water Pollution 5.2.4 Prevention of Water Pollution 5.3 Soil Pollution: Definition, Sources, Effects and Prevention 5.3.1 Sources of Soil Pollution 5.3.2 Effects of

air pollution 5.5 Water pollution 5.5.1 Forms of water pollution 5.5.2 Effects of water pollution 5.5.3 Biomagnification 5.5.4 Eutrophication 5.5.5 Indicators of water pollution 5.5.6 Control of water pollution 5.5.7 water pollution by proper sewage 5.6 Marine pollution 5.6.1 Sources of pollution 5.6.2 Effects of

W https://www.bhumipublishing.com/wp-content/uploads/2021/02/Environmental-Science.pdf

94/213	SUBMITTED TEXT	31 WORDS	81%	MATCHING TEXT	31 WORDS

of Soil Pollution 5.3.3 Prevention of Soil Pollution 5.4 Noise Pollution 5.4.1 Sources of Noise Pollution 5.4.2 Effects of Noise Pollution 5.4.3 Prevention of Noise Pollution

of soil pollution 5.7.7 Control of soil pollution 5.8 pollution 5.8.1 Causes and Sources of Noise Pollution 5.8.2 Effects of noise pollution 5.8.3 Control of noise pollution 5.8.4

W https://www.bhumipublishing.com/wp-content/uploads/2021/02/Environmental-Science.pdf

95/213 **SUBMITTED TEXT** 54 WORDS **64%** **MATCHING TEXT** 54 WORDS

of Air Pollutants 5.1.2 Sources of Air Pollution 5.1.3 Effects of Air Pollution 5.1.4 Prevention of Air Pollution 5.2 Water Pollution 5.2.1 Classification of Water Pollution 5.2.2 Sources of Water Pollution 5.2.3 Effects of Water Pollution 5.2.4 Prevention of Water Pollution 5.3 Soil Pollution: Definition, Sources,

SA Jawinder Kaur_Environmental Studies-PDF e-book.pdf (D141737445)

96/213 **SUBMITTED TEXT** 32 WORDS **65%** **MATCHING TEXT** 32 WORDS

Water Pollution 5.2.1 Classification of Water Pollution 5.2.2 Sources of Water Pollution 5.2.3 Effects of Water Pollution 5.2.4 Prevention of Water Pollution 5.3 Soil Pollution: Definition, Sources,

SA EVS book.pdf (D143746725)

97/213 **SUBMITTED TEXT** 38 WORDS **73%** **MATCHING TEXT** 38 WORDS

Sources of Soil Pollution 5.3.2 Effects of Soil Pollution 5.3.3 Prevention of Soil Pollution 5.4 Noise Pollution 5.4.1 Sources of Noise Pollution 5.4.2 Effects of Noise Pollution 5.4.3 Prevention of Noise Pollution

SA Jawinder Kaur_Environmental Studies-PDF e-book.pdf (D141737445)

98/213 **SUBMITTED TEXT** 11 WORDS **100%** **MATCHING TEXT** 11 WORDS

OBJECTIVES After studying this unit, you should be able to:

OBJECTIVES After studying this unit, you should be able to: ?

W https://www.msuniv.ac.in/Download/Pdf/6c931ea73ba8487

99/213 **SUBMITTED TEXT** 11 WORDS **100%** **MATCHING TEXT** 11 WORDS

OBJECTIVES After studying this unit, you should be able to:

OBJECTIVES After studying this unit, you should be able to: ?

W https://www.msuniv.ac.in/Download/Pdf/c6b12f0e3a0a473

Ouriginal by Turnitin

100/213	SUBMITTED TEXT	23 WORDS	86%	MATCHING TEXT	23 WORDS

Pollution 5.4 Noise Pollution 5.4.1 Sources of Noise Pollution 5.4.2 Effects of Noise Pollution 5.4.3 Prevention of Noise Pollution

SA EVS book.pdf (D143746725)

101/213	SUBMITTED TEXT	35 WORDS	54%	MATCHING TEXT	35 WORDS

Pollution 5.3.2 Effects of Soil Pollution 5.3.3 Prevention of Soil Pollution 5.4 Noise Pollution 5.4.1 Sources of Noise Pollution 5.4.2 Effects of Noise Pollution 5.4.3 Prevention of Noise Pollution

SA XII Chapter 16.pdf (D115094734)

102/213	SUBMITTED TEXT	11 WORDS	100%	MATCHING TEXT	11 WORDS

OBJECTIVES After studying this unit, you should be able to:

SA 003E1140_Environmental Studies.docx (D165652564)

103/213	SUBMITTED TEXT	11 WORDS	100%	MATCHING TEXT	11 WORDS

OBJECTIVES After studying this unit, you should be able to:

SA 003E1140_Environmental Studies.docx (D165652913)

104/213	SUBMITTED TEXT	11 WORDS	100%	MATCHING TEXT	11 WORDS

OBJECTIVES After studying this unit, you should be able to:

SA 003E1140_Environmental Studies.docx (D164979189)

105/213	SUBMITTED TEXT	16 WORDS	75%	MATCHING TEXT	16 WORDS

Water pollution is the contamination of water bodies e.g. lakes, rivers, oceans, aquifers and groundwater.

SA mitalisharma.ghy@gmail.com.pdf (D154531899)

Ouriginal by Turnitin

106/213 **SUBMITTED TEXT** 16 WORDS **75%** **MATCHING TEXT** 16 WORDS

Water pollution is the contamination of water bodies e.g. lakes, rivers, oceans, aquifers and groundwater.

SA deepjoytinarzary@gmail.com.docx (D154324495)

107/213 **SUBMITTED TEXT** 16 WORDS **75%** **MATCHING TEXT** 16 WORDS

Water pollution is the contamination of water bodies e.g. lakes, rivers, oceans, aquifers and groundwater.

SA deepjoytinarzary@gmail.com.doc (D154531890)

108/213 **SUBMITTED TEXT** 16 WORDS **75%** **MATCHING TEXT** 16 WORDS

Water pollution is the contamination of water bodies e.g. lakes, rivers, oceans, aquifers and groundwater.

SA deepjoytinarzary@gmail.com.doc (D154553785)

109/213 **SUBMITTED TEXT** 16 WORDS **75%** **MATCHING TEXT** 16 WORDS

Water pollution is the contamination of water bodies e.g. lakes, rivers, oceans, aquifers and groundwater.

SA resubmit.deepjoytinarzary@gmail.com.pdf (D154645884)

110/213 **SUBMITTED TEXT** 24 WORDS **80%** **MATCHING TEXT** 24 WORDS

pollutants present in the air mix up with the rain and fall back on the earth. The polluted water may perhaps dissolve away

pollutants present in the air mix up with the rain and fall back on the ground. The polluted water could dissolve away

W https://www.bhumipublishing.com/wp-content/uploads/2021/02/Environmental-Science.pdf

111/213 **SUBMITTED TEXT** 16 WORDS **75%** **MATCHING TEXT** 16 WORDS

Water pollution is the contamination of water bodies e.g. lakes, rivers, oceans, aquifers and groundwater.

SA resubmit.deepjoytinarzary@gmail.com.pdf (D154645999)

112/213 **SUBMITTED TEXT** 17 WORDS **76%** **MATCHING TEXT** 17 WORDS

the soil surface for a long time and makes it inappropriate for use. 2. Agricultural Activities:

SA pooja.arora200893@gmail.com.docx (D141822321)

Ouriginal by Turnitin

113/213	SUBMITTED TEXT	24 WORDS	73%	MATCHING TEXT	24 WORDS

pollutants present in the air mix up with the rain and fall back on the earth. The polluted water may perhaps dissolve away

SA pooja.arora200893@gmail.com.docx (D141822321)

114/213	SUBMITTED TEXT	13 WORDS	100%	MATCHING TEXT	13 WORDS

any unwanted sound that our ears have not been built to filter.

SA upasanaroy380@gmail.com.docx (D156776461)

115/213	SUBMITTED TEXT	15 WORDS	82%	MATCHING TEXT	15 WORDS

jackhammers, machinery, horns, airplanes and even vehicles can be too loud for our range

SA upasanaroy380@gmail.com.docx (D156776461)

116/213	SUBMITTED TEXT	13 WORDS	87%	MATCHING TEXT	13 WORDS

OBJECTIVES After studying this unit, you should be able to: z Define

OBJECTIVES After studying this unit, you should be able to: ? Define

W https://www.msuniv.ac.in/Download/Pdf/6c931ea73ba8487

117/213	SUBMITTED TEXT	13 WORDS	87%	MATCHING TEXT	13 WORDS

OBJECTIVES After studying this unit, you should be able to: z Define

OBJECTIVES After studying this unit, you should be able to: ? Define

W https://www.msuniv.ac.in/Download/Pdf/c6b12f0e3a0a473

118/213	SUBMITTED TEXT	18 WORDS	82%	MATCHING TEXT	18 WORDS

excessive noise pollution in working areas, for example, offices, construction sites, bars and even in our homes.

SA upasanaroy380@gmail.com.docx (D156776461)

Ouriginal by Turnitin

119/213	SUBMITTED TEXT	20 WORDS	61%	MATCHING TEXT	20 WORDS

as well. Thus, it is always advisable to take a sound sleep to give your body appropriate rest. 4.

SA upasanaroy380@gmail.com.docx (D156776461)

120/213	SUBMITTED TEXT	18 WORDS	61%	MATCHING TEXT	18 WORDS

OBJECTIVES After studying this unit, you should be able to: z Define Sustainable Development z Describe the

SA 003E1140_Environmental Studies.docx (D165652564)

121/213	SUBMITTED TEXT	18 WORDS	61%	MATCHING TEXT	18 WORDS

OBJECTIVES After studying this unit, you should be able to: z Define Sustainable Development z Describe the

SA 003E1140_Environmental Studies.docx (D165652913)

122/213	SUBMITTED TEXT	14 WORDS	100%	MATCHING TEXT	14 WORDS

Climate Change, Global Warming, Acid Rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust

Climate Change 6.7 Global Warming 6.8 Acid Rain 6.9 Ozone Layer Depletion 6.10 Nuclear Accidents and Holocaust 6.11

W https://dokumen.pub/environmental-studies-9780071072656-0071072659.html

123/213	SUBMITTED TEXT	14 WORDS	100%	MATCHING TEXT	14 WORDS

Climate Change, Global Warming, Acid Rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust

Climate Change 6.7 Global Warming 6.8 Acid Rain 6.9 Ozone Layer Depletion 6.10 Nuclear Accidents and Holocaust 6.11

W https://dokumen.pub/environmental-studies-9780071072656-0071072659.html

124/213	SUBMITTED TEXT	14 WORDS	100%	MATCHING TEXT	14 WORDS

Climate Change, Global Warming, Acid Rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust

Climate Change 6.7 Global Warming 6.8 Acid Rain 6.9 Ozone Layer Depletion 6.10 Nuclear Accidents and Holocaust 6.11

W https://dokumen.pub/environmental-studies-9780071072656-0071072659.html

Ouriginal by Turnitin

125/213 **SUBMITTED TEXT** 18 WORDS **61%** **MATCHING TEXT** 18 WORDS

OBJECTIVES After studying this unit, you should be able to: z Define Sustainable Development z Describe the

SA 003E1140_Environmental Studies.docx (D164979189)

126/213 **SUBMITTED TEXT** 22 WORDS **83%** **MATCHING TEXT** 22 WORDS

development that meets the needs of the present without compromising with the ability of future generations to meet their own needs.

development which meets the needs of the generation without compromising the ability of future generations to meet their own needs (

W https://dokumen.pub/environmental-studies-9780071072656-0071072659.html

127/213 **SUBMITTED TEXT** 23 WORDS **61%** **MATCHING TEXT** 23 WORDS

Water Conservation, Watershed Management and Rainwater Harvesting z Discuss Climate Change, Global Warming, Acid Rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust

SA Jawinder Kaur_Environmental Studies-PDF e-book.pdf (D141737445)

128/213 **SUBMITTED TEXT** 22 WORDS **92%** **MATCHING TEXT** 22 WORDS

development that meets the needs of the present without compromising with the ability of future generations to meet their own needs.

SA 180E2340_Environmental Administration(Final 21.10.22).docx (D165106913)

129/213 **SUBMITTED TEXT** 25 WORDS **91%** **MATCHING TEXT** 25 WORDS

development that meets the needs of the present without compromising with the ability of future generations to meet their own needs. Sustainable development is

SA 003E1140_Environmental Studies.docx (D165652564)

130/213 **SUBMITTED TEXT** 25 WORDS **91%** **MATCHING TEXT** 25 WORDS

development that meets the needs of the present without compromising with the ability of future generations to meet their own needs. Sustainable development is

SA 003E1140_Environmental Studies.docx (D165652913)

Ouriginal by Turnitin

131/213	SUBMITTED TEXT	25 WORDS	91%	MATCHING TEXT	25 WORDS

development that meets the needs of the present without compromising with the ability of future generations to meet their own needs. Sustainable development is

SA 003E1140_Environmental Studies.docx (D164979189)

132/213	SUBMITTED TEXT	22 WORDS	67%	MATCHING TEXT	22 WORDS

the needs of the present without making any compromises with the ability of future generations to meet their own needs. 6.5

the needs of the present generation without the ability of future generations to meet their own needs (

W https://dokumen.pub/environmental-studies-9780071072656-0071072659.html

133/213	SUBMITTED TEXT	22 WORDS	67%	MATCHING TEXT	22 WORDS

the needs of the present without making any compromises with the ability of future generations to meet their own needs. 6.5

the needs of the present generation without the ability of future generations to meet their own needs (

W https://dokumen.pub/environmental-studies-9780071072656-0071072659.html

134/213	SUBMITTED TEXT	27 WORDS	86%	MATCHING TEXT	27 WORDS

as development that meets the needs of the present without compromising with the ability of future generations to meet their own needs. Sustainable development is a

SA Sem I_B21ES01AC.pdf (D165341028)

135/213	SUBMITTED TEXT	14 WORDS	76%	MATCHING TEXT	14 WORDS

this section, you will be able to understand the importance and need of

SA EVS book.pdf (D143746725)

Ouriginal by Turnitin

136/213 **SUBMITTED TEXT** 27 WORDS **56%** **MATCHING TEXT** 27 WORDS

development is defined as meeting the needs of the present without making any compromises with the ability of future generations to meet their own needs. 6.5

SA 003E1140_Environmental Studies.docx (D165652564)

137/213 **SUBMITTED TEXT** 21 WORDS **77%** **MATCHING TEXT** 21 WORDS

accident is defined by the International Atomic Energy Agency as "an event that has led to significant consequences to people,

accident is defined by the International Atomic agency as an "happening that has led to important consequences to people,

W https://www.bhumipublishing.com/wp-content/uploads/2021/02/Environmental-Science.pdf

138/213 **SUBMITTED TEXT** 26 WORDS **68%** **MATCHING TEXT** 26 WORDS

Nuclear and Radiation Accident: Nuclear accident is defined by the International Atomic Energy Agency as "an event that has led to significant consequences to people,

Nuclear accidents and holocaust A nuclear accident is defined by the International Atomic agency as an "happening that has led to important consequences to people,

W https://www.bhumipublishing.com/wp-content/uploads/2021/02/Environmental-Science.pdf

139/213 **SUBMITTED TEXT** 27 WORDS **56%** **MATCHING TEXT** 27 WORDS

development is defined as meeting the needs of the present without making any compromises with the ability of future generations to meet their own needs. 6.5

SA 003E1140_Environmental Studies.docx (D165652913)

140/213 **SUBMITTED TEXT** 22 WORDS **70%** **MATCHING TEXT** 22 WORDS

the needs of the present without making any compromises with the ability of future generations to meet their own needs. 6.5

SA 180E2340_Environmental Administration(Final 21.10.22).docx (D165106913)

141/213 **SUBMITTED TEXT** 27 WORDS **56%** **MATCHING TEXT** 27 WORDS

development is defined as meeting the needs of the present without making any compromises with the ability of future generations to meet their own needs. 6.5

SA 003E1140_Environmental Studies.docx (D164979189)

142/213 **SUBMITTED TEXT** 17 WORDS **100%** **MATCHING TEXT** 17 WORDS

Air (Prevention and Control of Pollution) Act 7.4 Water (Prevention and Control of Pollution) Act 7.4.1

Air (Prevention and Control of Pollution) Act 5.6 Water (Prevention and Control of Pollution) Act 5.7

W https://www.msuniv.ac.in/Download/Pdf/6c931ea73ba8487

143/213 **SUBMITTED TEXT** 17 WORDS **100%** **MATCHING TEXT** 17 WORDS

Air (Prevention and Control of Pollution) Act 7.4 Water (Prevention and Control of Pollution) Act 7.4.1

Air (Prevention and Control of Pollution) Act 5.6 Water (Prevention and Control of Pollution) Act 5.7

W https://www.msuniv.ac.in/Download/Pdf/c6b12f0e3a0a473

144/213 **SUBMITTED TEXT** 17 WORDS **100%** **MATCHING TEXT** 17 WORDS

Air (Prevention and Control of Pollution) Act 7.4 Water (Prevention and Control of Pollution) Act 7.4.1

Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act.

W https://dokumen.pub/environmental-studies-9780071072656-0071072659.html

145/213 **SUBMITTED TEXT** 17 WORDS **100%** **MATCHING TEXT** 17 WORDS

Air (Prevention and Control of Pollution) Act 7.4 Water (Prevention and Control of Pollution) Act 7.4.1

Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act.

W https://dokumen.pub/environmental-studies-9780071072656-0071072659.html

146/213 **SUBMITTED TEXT** 33 WORDS **37%** **MATCHING TEXT** 33 WORDS

a) NO (b) CO (c) SO 2 (d) SOOT 2. The greenhouse gases otherwise called radioactively active gases includes: (a) carbon dioxide (b) CH 4 (c) N 2 O (d) All

SA ESC - book.docx (D110527582)

147/213 **SUBMITTED TEXT** 17 WORDS **100%** **MATCHING TEXT** 17 WORDS

Air (Prevention and Control of Pollution) Act 7.4 Water (Prevention and Control of Pollution) Act 7.4.1

Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act.

W https://dokumen.pub/environmental-studies-9780071072656-0071072659.html

Ouriginal by Turnitin

148/213 **SUBMITTED TEXT** 17 WORDS **100%** **MATCHING TEXT** 17 WORDS

Air (Prevention and Control of Pollution) Act 7.4 Water (Prevention and Control of Pollution) Act 7.4.1

SA Jawinder Kaur_Environmental Studies-PDF e-book.pdf (D141737445)

149/213 **SUBMITTED TEXT** 11 WORDS **100%** **MATCHING TEXT** 11 WORDS

OBJECTIVES After studying this unit, you should be able to:

SA 003E1140_Environmental Studies.docx (D165652564)

150/213 **SUBMITTED TEXT** 22 WORDS **54%** **MATCHING TEXT** 22 WORDS

OBJECTIVES After studying this unit, you should be able to: z Understand the Provisions of Environmental Protection Act z Explain the

OBJECTIVES After studying this unit, you should be able to: ? and explain the importance of environmental studies. ? Explain the

W https://www.msuniv.ac.in/Download/Pdf/6c931ea73ba8487

151/213 **SUBMITTED TEXT** 22 WORDS **54%** **MATCHING TEXT** 22 WORDS

OBJECTIVES After studying this unit, you should be able to: z Understand the Provisions of Environmental Protection Act z Explain the

OBJECTIVES After studying this unit, you should be able to: ? and explain the importance of environmental studies. ? Explain the

W https://www.msuniv.ac.in/Download/Pdf/c6b12f0e3a0a473

152/213 **SUBMITTED TEXT** 19 WORDS **58%** **MATCHING TEXT** 19 WORDS

Water (Prevention and Control of Pollution) Act z Elaborate upon Wildlife Protection Act z Discuss Forest Conservation Act

Water (Prevention and Control of Pollution) Act 5.7 Wildlife Protection Act 5.8 Forest Conservation Act 5.9

W https://www.msuniv.ac.in/Download/Pdf/6c931ea73ba8487

153/213 **SUBMITTED TEXT** 11 WORDS **100%** **MATCHING TEXT** 11 WORDS

OBJECTIVES After studying this unit, you should be able to:

SA 003E1140_Environmental Studies.docx (D165652913)

Ouriginal by Turnitin

154/213 **SUBMITTED TEXT** 11 WORDS **100%** **MATCHING TEXT** 11 WORDS

OBJECTIVES After studying this unit, you should be able to:

SA 003E1140_Environmental Studies.docx (D164979189)

155/213 **SUBMITTED TEXT** 19 WORDS **58%** **MATCHING TEXT** 19 WORDS

Water (Prevention and Control of Pollution) Act z Elaborate upon Wildlife Protection Act z Discuss Forest Conservation Act

Water (Prevention and Control of Pollution) Act 5.7 Wildlife Protection Act 5.8 Forest Conservation Act 5.9

W https://www.msuniv.ac.in/Download/Pdf/c6b12f0e3a0a473

156/213 **SUBMITTED TEXT** 19 WORDS **58%** **MATCHING TEXT** 19 WORDS

Water (Prevention and Control of Pollution) Act z Elaborate upon Wildlife Protection Act z Discuss Forest Conservation Act

Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act.

W https://dokumen.pub/environmental-studies-9780071072656-0071072659.html

157/213 **SUBMITTED TEXT** 19 WORDS **58%** **MATCHING TEXT** 19 WORDS

Water (Prevention and Control of Pollution) Act z Elaborate upon Wildlife Protection Act z Discuss Forest Conservation Act

Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act.

W https://dokumen.pub/environmental-studies-9780071072656-0071072659.html

158/213 **SUBMITTED TEXT** 19 WORDS **58%** **MATCHING TEXT** 19 WORDS

Water (Prevention and Control of Pollution) Act z Elaborate upon Wildlife Protection Act z Discuss Forest Conservation Act

Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act.

W https://dokumen.pub/environmental-studies-9780071072656-0071072659.html

159/213 **SUBMITTED TEXT** 19 WORDS **58%** **MATCHING TEXT** 19 WORDS

Water (Prevention and Control of Pollution) Act z Elaborate upon Wildlife Protection Act z Discuss Forest Conservation Act

SA Jawinder Kaur_Environmental Studies-PDF e-book.pdf (D141737445)

Ouriginal by Turnitin

160/213	SUBMITTED TEXT	11 WORDS	100%	MATCHING TEXT	11 WORDS

the United Nations Conference on Human Environment held in Stockholm

SA EVS book.pdf (D143746725)

161/213	SUBMITTED TEXT	17 WORDS	70%	MATCHING TEXT	17 WORDS

the United Nations Conference on Human Environment held in Stockholm in June 1972. The objective of

The landmark United Nations Conference on the Human Environment was held in Stockholm in 1972, the concept of

W http://en.wikipedia.org/wiki/Environmental_protection

162/213	SUBMITTED TEXT	21 WORDS	58%	MATCHING TEXT	21 WORDS

protection and improvement of environment and the prevention of hazards to human beings, living creatures and property.

Protection and improvement of environment (air, water, land). b) Prevention of hazards to all living creatures and property (

W https://www.msuniv.ac.in/Download/Pdf/6c931ea73ba8487

163/213	SUBMITTED TEXT	21 WORDS	58%	MATCHING TEXT	21 WORDS

protection and improvement of environment and the prevention of hazards to human beings, living creatures and property.

Protection and improvement of environment (air, water, land). b) Prevention of hazards to all living creatures and property (

W https://www.msuniv.ac.in/Download/Pdf/c6b12f0e3a0a473

164/213	SUBMITTED TEXT	14 WORDS	95%	MATCHING TEXT	14 WORDS

the United Nations Conference on Human Environment held in Stockholm in June 1972.

SA Sem I_B21ES01AC.pdf (D165341028)

165/213	SUBMITTED TEXT	15 WORDS	88%	MATCHING TEXT	15 WORDS

the United Nations Conference on Human Environment held in Stockholm in June 1972. The

SA XII Chapter 16.pdf (D115094734)

166/213 **SUBMITTED TEXT** 25 WORDS **97%** **MATCHING TEXT** 25 WORDS

to take all such measures as it deems necessary or expedient for the purpose of protecting and improving the quality of the environment and

SA Sem I_B21ES01AC.pdf (D165341028)

167/213 **SUBMITTED TEXT** 16 WORDS **81%** **MATCHING TEXT** 16 WORDS

Planning and execution of nation-wide programme for the prevention, control and abatement of environmental pollution; (

SA Sem I_B21ES01AC.pdf (D165341028)

168/213 **SUBMITTED TEXT** 14 WORDS **92%** **MATCHING TEXT** 14 WORDS

Laying down standards for emission or discharge of environmental pollutants from various sources

Laying down the standards for the emission or discharge of environmental pollutants from various sources.

W https://www.msuniv.ac.in/Download/Pdf/6c931ea73ba8487

169/213 **SUBMITTED TEXT** 14 WORDS **92%** **MATCHING TEXT** 14 WORDS

Laying down standards for emission or discharge of environmental pollutants from various sources

Laying down the standards for the emission or discharge of environmental pollutants from various sources.

W https://www.msuniv.ac.in/Download/Pdf/c6b12f0e3a0a473

170/213 **SUBMITTED TEXT** 25 WORDS **85%** **MATCHING TEXT** 25 WORDS

Laying down standards for the quality of environment in its various aspects; (d) Laying down standards for emission or discharge of environmental pollutants from

SA Sem I_B21ES01AC.pdf (D165341028)

171/213 **SUBMITTED TEXT** 42 WORDS **86%** **MATCHING TEXT** 42 WORDS

emission or discharge of environmental pollutants from such sources; (e) Restriction of areas in which any industries, operations or processes or class of industries, operations or processes shall not be carried out or shall be carried out subject to certain safeguards; (

SA Sem I_B21ES01AC.pdf (D165341028)

172/213 **SUBMITTED TEXT** 18 WORDS **61%** **MATCHING TEXT** 18 WORDS

down procedure and safeguards for the prevention of accidents which may cause environmental pollution and remedial measures

SA 003E1140_Environmental Studies.docx (D165652564)

173/213 **SUBMITTED TEXT** 18 WORDS **61%** **MATCHING TEXT** 18 WORDS

down procedure and safeguards for the prevention of accidents which may cause environmental pollution and remedial measures

SA 003E1140_Environmental Studies.docx (D165652913)

174/213 **SUBMITTED TEXT** 18 WORDS **61%** **MATCHING TEXT** 18 WORDS

down procedure and safeguards for the prevention of accidents which may cause environmental pollution and remedial measures

SA 003E1140_Environmental Studies.docx (D164979189)

175/213 **SUBMITTED TEXT** 66 WORDS **68%** **MATCHING TEXT** 66 WORDS

Laying down procedure and safeguards for the handling of hazardous substances; (h) Examination of such manufacturing processes, materials and substances as are likely to cause environmental pollution; (i) Carrying out and sponsoring investigations and research relating to problems of environmental pollution; (j) Inspection of any premises, plant, equipment machinery, manufacturing or other processes, materials or substances and giving, by order, of such

SA Sem I_B21ES01AC.pdf (D165341028)

176/213 **SUBMITTED TEXT** 20 WORDS **92%** **MATCHING TEXT** 20 WORDS

or persons as it may consider necessary to take steps for the prevention, control and abatement of environmental pollution; (

SA Sem I_B21ES01AC.pdf (D165341028)

177/213 **SUBMITTED TEXT** 17 WORDS **87%** **MATCHING TEXT** 17 WORDS

Preparation of manuals, codes or guides relating to the prevention, control and abatement of environmental pollution;

SA Sem I_B21ES01AC.pdf (D165341028)

178/213 **SUBMITTED TEXT** 53 WORDS **58%** **MATCHING TEXT** 53 WORDS

is an umbrella legislation designed to provide a framework for the coordination of central and state authorities established under the Water (Prevention and Control) Act, 1974 and Air (Prevention and Control) Act, 1981. Under this Act, the central government is empowered to take measures necessary to protect and improve the quality of

SA Sem I_B21ES01AC.pdf (D165341028)

179/213 **SUBMITTED TEXT** 40 WORDS **89%** **MATCHING TEXT** 40 WORDS

regulating the location of industries; management of hazardous wastes, and protection of public health and welfare. From time to time the central government issues notifications under the EPA for the protection of ecologically-sensitive areas or issues guidelines for matters

SA Sem I_B21ES01AC.pdf (D165341028)

180/213 **SUBMITTED TEXT** 25 WORDS **60%** **MATCHING TEXT** 25 WORDS

restriction of areas in which any industry operation or process or class of industries, operations or processes could not carry out or would be

SA Sem I_B21ES01AC.pdf (D165341028)

181/213 **SUBMITTED TEXT** 16 WORDS **78%** **MATCHING TEXT** 16 WORDS

in 1990s. The Air (Prevention and Control of Pollution) Act came into being in 1981.

SA deepjoytinarzary@gmail.com.docx (D154324495)

Ouriginal by Turnitin

182/213	SUBMITTED TEXT	16 WORDS	78%	MATCHING TEXT	16 WORDS

in 1990s. The Air (Prevention and Control of Pollution) Act came into being in 1981.

SA deepjoytinarzary@gmail.com.doc (D154531890)

183/213	SUBMITTED TEXT	16 WORDS	78%	MATCHING TEXT	16 WORDS

in 1990s. The Air (Prevention and Control of Pollution) Act came into being in 1981.

SA deepjoytinarzary@gmail.com.doc (D154553785)

184/213	SUBMITTED TEXT	16 WORDS	78%	MATCHING TEXT	16 WORDS

in 1990s. The Air (Prevention and Control of Pollution) Act came into being in 1981.

SA resubmit.deepjoytinarzary@gmail.com.pdf (D154645884)

185/213	SUBMITTED TEXT	16 WORDS	78%	MATCHING TEXT	16 WORDS

in 1990s. The Air (Prevention and Control of Pollution) Act came into being in 1981.

SA resubmit.deepjoytinarzary@gmail.com.pdf (D154645999)

186/213	SUBMITTED TEXT	12 WORDS	100%	MATCHING TEXT	12 WORDS

is an umbrella legislation designed to provide a framework for the

SA Sem I_B21ES01AC.pdf (D165341028)

187/213 **SUBMITTED TEXT** 57 WORDS **51%** **MATCHING TEXT** 57 WORDS

is an ..... legislation designed to provide a framework for the coordination of central and state authorities established under the Water (Prevention and Control) Act, 1974 and Air (Prevention and Control) Act, 1981. 2. Under Environment (Protection) Act, 1986, the ..... government is empowered to take measures necessary to protect and improve the quality of

SA Sem I_B21ES01AC.pdf (D165341028)

188/213 **SUBMITTED TEXT** 15 WORDS **76%** **MATCHING TEXT** 15 WORDS

down standards of treatment of sewage and trade/industry effluents to be discharged into any

down the standards of treatment of sewage and industrial effluents to be discharged into any

W https://www.msuniv.ac.in/Download/Pdf/6c931ea73ba8487

189/213 **SUBMITTED TEXT** 42 WORDS **92%** **MATCHING TEXT** 42 WORDS

regulating the location of industries; management of hazardous wastes, and protection of public health and welfare. 3. From time to time the central government issues notifications under the ..... for the protection of ecologically-sensitive areas or issues guidelines for matters

SA Sem I_B21ES01AC.pdf (D165341028)

190/213 **SUBMITTED TEXT** 15 WORDS **76%** **MATCHING TEXT** 15 WORDS

down standards of treatment of sewage and trade/industry effluents to be discharged into any

down the standards of treatment of sewage and industrial effluents to be discharged into any

W https://www.msuniv.ac.in/Download/Pdf/c6b12f0e3a0a473

191/213 **SUBMITTED TEXT** 30 WORDS **45%** **MATCHING TEXT** 30 WORDS

PREVENTION AND CONTROL OF POLLUTION) ACT In this section, you will be acquainted with the water (prevention and control of pollution) Act.

SA Sem I_B21ES01AC.pdf (D165341028)

192/213	SUBMITTED TEXT	20 WORDS	63%	MATCHING TEXT	20 WORDS

that the ‘State shall endeavour to protect and improve the environment and safeguard forests and wildlife in the country

that "The states shall to protect and improve the environment and to safeguard the forest and wildlife of the country".[52]

W http://en.wikipedia.org/wiki/Environmental_protection

193/213	SUBMITTED TEXT	73 WORDS	86%	MATCHING TEXT	73 WORDS

contamination of water or alteration of the physical, chemical or biological properties of water due to discharge of any sewage or industrial effluent or any other liquid, gaseous or solid substance into water whether directly or indirectly as may or as likely to, render such water harmful to public health or safety, or to domestic, commercial, industrial, agricultural or other legitimate uses, or to the life and health of animals or plants

SA pooja.arora200893@gmail.com.docx (D141822321)

194/213	SUBMITTED TEXT	15 WORDS	78%	MATCHING TEXT	15 WORDS

to protect and improve the environment and safeguard forests and wildlife in the country

SA Jawinder Kaur_Environmental Studies-PDF e-book.pdf (D141737445)

195/213	SUBMITTED TEXT	19 WORDS	64%	MATCHING TEXT	19 WORDS

protect and improve the natural environment including forests, lakes, rivers, wildlife and have compassion for living creatures’ 1980

SA Jawinder Kaur_Environmental Studies-PDF e-book.pdf (D141737445)

196/213	SUBMITTED TEXT	19 WORDS	94%	MATCHING TEXT	19 WORDS

protect and improve the natural environment including forests, lakes, rivers, wildlife and have compassion for living creatures’ 1980

protect and improve the natural environment including forests, lakes, rivers, and wildlife and to have compassion for living creatures".[53]

W http://en.wikipedia.org/wiki/Environmental_protection

197/213 **SUBMITTED TEXT** 38 WORDS **76%** **MATCHING TEXT** 38 WORDS

the 'State shall endeavour to protect and improve the environment and safeguard forests and wildlife in the country and protect and improve the natural environment including forests, lakes, rivers, wildlife and have compassion for living creatures' 1980

SA 180E2340_Environmental Administration(Final 21.10.22).docx (D165106913)

198/213 **SUBMITTED TEXT** 19 WORDS **94%** **MATCHING TEXT** 19 WORDS

protect and improve the natural environment including forests, lakes, rivers, wildlife and have compassion for living creatures' 1980

SA Sem I_B21ES01AC.pdf (D165341028)

199/213 **SUBMITTED TEXT** 36 WORDS **83%** **MATCHING TEXT** 36 WORDS

contamination of water or alteration of the physical, chemical or biological properties of water due to discharge of any sewage or industrial effluent or any other liquid, gaseous or solid substance into water. 7. .....

SA pooja.arora200893@gmail.com.docx (D141822321)

200/213 **SUBMITTED TEXT** 14 WORDS **87%** **MATCHING TEXT** 14 WORDS

The Air (Prevention and Control of Pollution) Act came into being in 1981.

SA deepjoytinarzary@gmail.com.docx (D154324495)

201/213 **SUBMITTED TEXT** 14 WORDS **87%** **MATCHING TEXT** 14 WORDS

The Air (Prevention and Control of Pollution) Act came into being in 1981.

SA deepjoytinarzary@gmail.com.doc (D154531890)

Ouriginal by Turnitin

202/213	SUBMITTED TEXT	14 WORDS	87%	MATCHING TEXT	14 WORDS

The Air (Prevention and Control of Pollution) Act came into being in 1981.

SA deepjoytinarzary@gmail.com.doc (D154553785)

203/213	SUBMITTED TEXT	14 WORDS	87%	MATCHING TEXT	14 WORDS

The Air (Prevention and Control of Pollution) Act came into being in 1981.

SA resubmit.deepjoytinarzary@gmail.com.pdf (D154645884)

204/213	SUBMITTED TEXT	17 WORDS	100%	MATCHING TEXT	17 WORDS

Act was enacted in the year: (a) 1986 (b) 1974 (c) 1980 (d) 1972 6. The

Act was enacted in the year (a) 1974 (b) 1976 (c) 1980 (d) 1982 22. The

W https://dokumen.pub/environmental-studies-9780071072656-0071072659.html

205/213	SUBMITTED TEXT	14 WORDS	87%	MATCHING TEXT	14 WORDS

The Air (Prevention and Control of Pollution) Act came into being in 1981.

SA resubmit.deepjoytinarzary@gmail.com.pdf (D154645999)

206/213	SUBMITTED TEXT	12 WORDS	100%	MATCHING TEXT	12 WORDS

is an umbrella legislation designed to provide a framework for the

SA Sem I_B21ES01AC.pdf (D165341028)

207/213	SUBMITTED TEXT	17 WORDS	100%	MATCHING TEXT	17 WORDS

Act was enacted in the year: (a) 1986 (b) 1974 (c) 1980 (d) 1972 6. The

Act was enacted in the year (a) 1974 (b) 1976 (c) 1980 (d) 1982 22. The

W https://dokumen.pub/environmental-studies-9780071072656-0071072659.html

208/213	SUBMITTED TEXT	17 WORDS	100%	MATCHING TEXT	17 WORDS

Act was enacted in the year: (a) 1986 (b) 1974 (c) 1980 (d) 1972 6. The

Act was enacted in the year (a) 1974 (b) 1976 (c) 1980 (d) 1982 22. The

W https://dokumen.pub/environmental-studies-9780071072656-0071072659.html

Ouriginal by Turnitin

209/213	SUBMITTED TEXT	73 WORDS	86%	MATCHING TEXT	73 WORDS

contamination of water or alteration of the physical, chemical or biological properties of water due to discharge of any sewage or industrial effluent or any other liquid, gaseous or solid substance into water whether directly or indirectly as may or as likely to, render such water harmful to public health or safety, or to domestic, commercial, industrial, agricultural or other legitimate uses, or to the life and health of animals or plants

SA pooja.arora200893@gmail.com.docx (D141822321)

210/213	SUBMITTED TEXT	17 WORDS	100%	MATCHING TEXT	17 WORDS

Act was enacted in the year: (a) 1986 (b) 1974 (c) 1994 (d) 1972 10. The

Act was enacted in the year (a) 1974 (b) 1976 (c) 1980 (d) 1982 22. The

W https://dokumen.pub/environmental-studies-9780071072656-0071072659.html

211/213	SUBMITTED TEXT	17 WORDS	100%	MATCHING TEXT	17 WORDS

Act was enacted in the year: (a) 1986 (b) 1974 (c) 1994 (d) 1972 10. The

Act was enacted in the year (a) 1974 (b) 1976 (c) 1980 (d) 1982 22. The

W https://dokumen.pub/environmental-studies-9780071072656-0071072659.html

212/213	SUBMITTED TEXT	17 WORDS	100%	MATCHING TEXT	17 WORDS

Act was enacted in the year: (a) 1986 (b) 1974 (c) 1994 (d) 1972 10. The

Act was enacted in the year (a) 1974 (b) 1976 (c) 1980 (d) 1982 22. The

W https://dokumen.pub/environmental-studies-9780071072656-0071072659.html

213/213	SUBMITTED TEXT	24 WORDS	54%	MATCHING TEXT	24 WORDS

Air (Prevention and Control of Pollution) Act. 3. Describe the main provisions of Water (Prevention and Control of Pollution) Act. 4. Discuss the

SA Sem I_B21ES01AC.pdf (D165341028)