

Unit 1 Introduction

Definition

Our Environment is our surrounding. This includes living and non-living things around us. The non-living components of environment are land, water and air. The living components are germs, plants, animals and people.

Like wise, the term environment means the conditions or objects by which one is surrounded. But, in the context of the living belongs, it means much more. In our day to day life, we observe that every organism lives in the midst of various living and non living objects, happening influence natural as well as made, the aggregate of which forms its environment. The sum of all these living and non living being together makes the environment of an organism. Thus the environment denotes the sum of physical and biological factors that directly influence the survival, growth, development and reproduction of the production of organism.

Natural environment

The element of natural environment can be broadly classified into physical or abiotic and biological or biotic factors.

Physical factors

The most important physical factors are the climatic, physiographic and edaphic factors

Some of the factors are as follows:

Climatic

Light:

Light is an abiotic factor which controls the growth and development of an organism. The sources of light are sunlight, moonlight etc. light is the main source of the energy for the organism.

Temperature:

Animals and plants are sensitive to change the temperature. Changes in temperature may bring a positive or negative affect on the life of plants and animals. Any unusual change in temperature may effect the development of forests.

Precipitation

The water available to plant and animals from soil comes mainly as a result of rainfall. Precipitation is the chief source of water. The process occurs as in interchange of water between the earth's surface and the atmosphere forming the water cycle.

Humidity:

It is one of the forms of water in nature. In atmosphere water vapour remains in the form of invisible vapours which is called humidity. It is greatly influence by the intensity of solar radiation, temperature, altitude, wind and water content of soil.

Atmosphere:

The basal part of the atmosphere is the troposphere. This is the most important part for living organisms. In this part various process such as cloud formation, lightning and thunderstorm take place.

Physiographic

The main physiographic factors are altitude (height above the sea level/ height of the mountain), latitude (distance from the equator) and the steepness of a slope. These physiographic factors influence vegetation by producing in the climatic of geographical regions.

Edaphic:

Soil is the medium which immediately the organism with which it has its various important exchanges. Like air, water and temperature the soil is also an important factor for plants and animals. The composition and abundance of organisms depend on the soil of an area and its environmental conduction which are present in that medium.

Man made environment

Like the natural environment, the man made or socio-cultural environment also regarded as a whole set of interlocking system. Thus, it refers to all the physical infrastructure build by man and social and institutional system which he has developed. In other words, all the creation of man comes under this category. Thus the socio-economic environment includes historical, cultural, economic, political, moral and aesthetics aspects of human life. But human behaviour towards the earth and his responses to environment varied through time and varies between various religions and cultures. Man often forget that he is not the master of the earth. Man's impact on the earth is unevenly distributed over the earth surface. At an accelerated rate man is trying to change the environment to suit nature to himself rather than changing his practices in order to better adapted himself to the environment.

The socio-cultural environment consists of everything around us, developed by man himself through his tools, skills and intuitions. It comprises a complex society and social activities originating from culture. All aspects of culture are a human part of the man made environment. Thus it includes cropland, buildings, road and transport, cities, factories, bridges family, religions, economy, recreation, entertainment, etc. society, is a closely integrated group of organisms of the same species exhibiting division of labour and furnishing protection, continuity, security and identity.

Family:

Family is a unit of a community consisting of individuals of arising out of marriage. Marriage is a relation which keeps the continuity of the human race. But it is strongly affected by various factors, such as the size of the family, population growth, health status of the family members, surrounding environment etc. Again, the system and norm of marriage may vary from community to community.

Religion:

Religion usually involves devotional and ritual observances and often has a moral code for the conduct of human affairs. It also included institutionalized beliefs and practices generally accepted by a number of people and sets. It is a very ancient force determining social attitudes and values.

Culture:

A society is also shaped by its history, i.e. by the events achievements and experiences of the past. Thus the study of history is also important in understanding

the culture of the society and community. The evidences of the achievements and activities of the past are the archaeological objects which form the rich heritage of human beings. Man's cultural setting has also an important place in the various forms of entertainment and recreation apart art.

Education:

The success of the environmental programme depends on the overall response to environmental concerns in term of people's participation. So it is crucial how people perceive and respond to it. Public participation and involvement come through awareness and change in the value system.

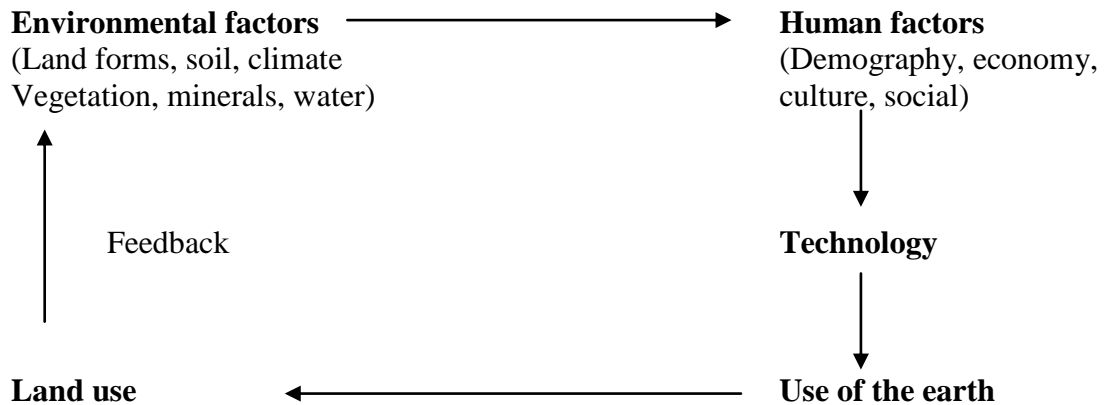
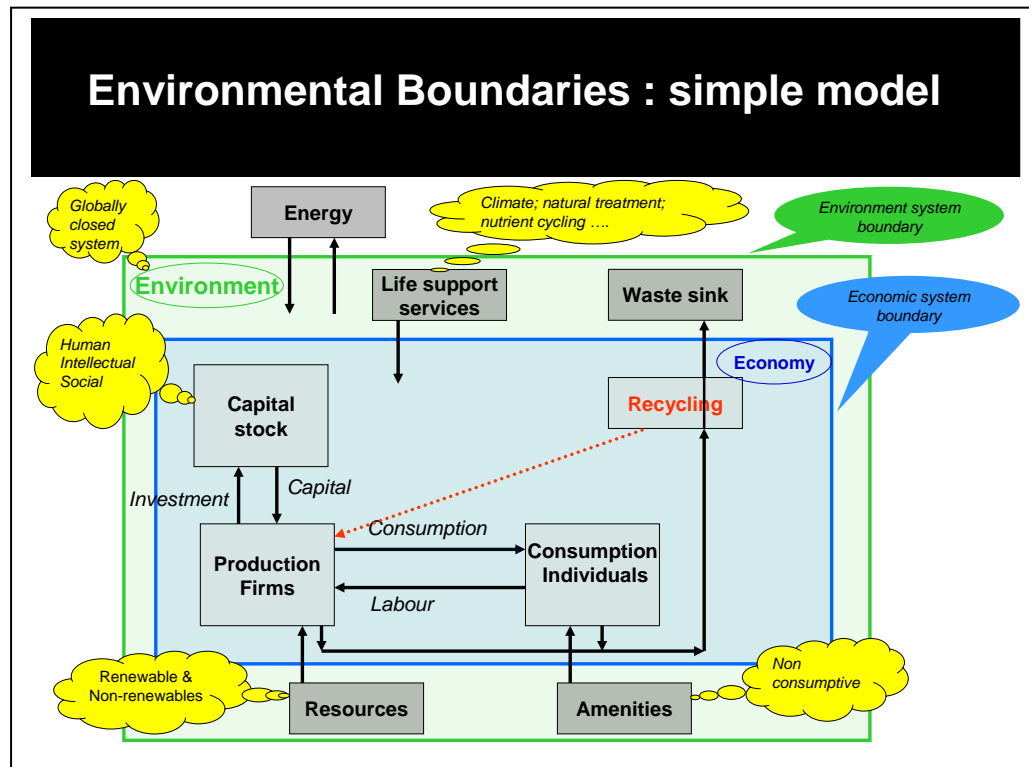


Figure Interlinkage of different factors

Environmental Boundaries



Environmental Dilemmas

- Current population is more than 6 billion humans. We are adding about 85 million more to the world every year.
- At least 1.1 billion people lack access to safe drinking water and twice that many don't have modern sanitation.
- Polluted water and lack of sanitation are estimated to contribute to the ill health of more than 1.2 billion people annually, including the death of 15 million children per year.
- Past 200 years, atmospheric carbon dioxide concentrations have increased about 30 percent.
- More than 2 billion metric tons of pollutants (not including carbon dioxide)
- Past century, more than 800 species have disappeared and at least 10,000 species are considered threat.

Scope

Agricultural Development

About 83 percent of people of Nepal depend upon agriculture. Agriculture is the main source of income of the country. Although the traditional practices still continues farmers prefer modern practices as they provide more yield with less labour. Thus new technologies and innovations in agriculture have been gradually introduced into the Nepalese farming system. The production of new and improved various of seeds, agrochemicals, agricultural tools and Modern farming techniques are some examples.

Forestry

Green forests are the wealth of Nepal. They are supports the development of the country by preserving soil and habitats. Balancing the weather, and keeping the environment stable. According to the master plan for the forest sector of Nepal, it was estimated that a total of about 37 percent of land in Nepal is covered by forest. Thus the protection of forests in the country has a wide scope from the point of view of the environment conservation.

Population growth

Scientific and technological developments have helped in reducing death rate and increasing life expectancy. Population explosion is therefore now underway population increases when birth rate is higher than death rate. The world population has increases abruptly since the 1950s. The world population is increasing about 80 million people each year. Consequently, natural resources have been over exploited which leaves and an adverse impact on environment.

Industry

Industry development is an important indicator of a developing country. When people get more job opportunities. It promotes the standard of living. Ultimately, it also increases the per capita income of the country. As a result, the economy of the country will be strengthened resulting in the higher social status of the people. In other word, it will develop a healthy social environment.

Health and sanitation

The human health and quality of life are greatly influenced by the environment. Although both the environment and genetic factors are involved in the production of

disease, environmental determinants such as water supply, urban environment quality, climate and human contacts receive more receive more emphasis.

One of the main causes of health problem is pollutant water supply and poor sanitation. Thus if the poor health of the people is due to poor sanitation on one hand, on the other, the people themselves are to be blamed for polluting their environment. This shows a direct relation between health and environment which needs more attention.

Science and technology

With advancement in science and technology, the world has become small and life has become easier today. Due to high levels of industrial and technological development and economic prosperity, developed countries are facing environmental problems of industrial pollution, fast depletion of minerals and energy resources and also various diseases and problems of over population.

Metrology:

Metrology is the science of the atmosphere or the study of atmospheric condition, which helps in forecasting the weather. It leads to a more or less complete picture of the physical state of the atmosphere. Climate largely influences the type of plants. It thus clear that the study of atmosphere provides a wide scope for understanding environment.

Hydrology:

Water is the most basic and important ingredient of human life. Hydrology is the science of water on the earth, its occurrence, circulation and distribution, its chemical and physical properties and reaction with the environment including its relation to living things. Hydrological cycle is a natural phenomenon that helps in the study of relations between man and its his surroundings. Hydrology also considers the major problems of nature such as flood, droughts, erosion and pollution.

Environmental Studies

Environmental education (EE) is the only effective short and long term instrument to bring about desired changes in the world. The solution of environmental problems lies in importing EE to all sectors of the population. Out of the five objectives in the Tbilisi Declaration on environmental education awareness, knowledge, attitude, skill and participation at all levels is the most essential and vital element for working towards the resolution of environmental problems.

National Association for EE and Society for EE is the process of recognizing values and clarifying the concepts in order to develop skills, attitudes necessary to understand and appreciate the interrelatedness among man his culture and biophysical surroundings. Environmental education also entails practice in decision making and self formulation of code of behaviour about issues concerning environmental quality.

Goals of Environmental Education

EE programme programmes should focus on humanity's relationship with the environment. These programmes should develop programme objectives in view of the holistic nature of the environment. The Belgrade workshop made serious attempts towards identifying the goals and objectives of environmental education.

Environmental Degradation

Urbanization and overpopulation

Urbanization is the physical growth of urban areas into rural or natural land as a result of population in-migration to an existing urban area. Effects include change in density and administration services. While the exact definition and population size of urbanized areas varies among different countries, urbanization is attributed to growth of cities. Urbanization is also defined by the United Nations as movement of people from rural to urban areas with population growth equating to urban migration. The UN projects half the world population will live in urban areas at the end of 2008.

Urbanization occurs naturally from individual and corporate efforts to reduce expense in commuting and transportation while improving opportunities for jobs, education, housing, and transportation. Living in cities permits individuals and families to take advantage of the opportunities of proximity, diversity, and marketplace competition. People move into cities to seek economic opportunities. In rural areas, often on small family farms, it is difficult to improve one's standard of living beyond basic sustenance. Farm living is dependent on unpredictable environmental conditions, and in times of drought, flood or pestilence, survival becomes extremely problematic.

Population is one of the fundamental driving forces shaping the water environmental base in the Kathmandu Valley. The population density increased from 457 persons/km² in 1952-54 to 1830 persons/km² in 2001. This has increased the demand for water enormously.

Trends of Nepalese Urbanisation

The population of the three districts of Kathmandu Valley increased from 1,107,370 in 1991 to 1,647,092 in 2001. The annual population growth rate in Kathmandu district was 4.71%. The population of Kathmandu district was 675,341 in 1991 (3.6% of Nepal's population) and 1,081,845 in 2001 (4.6% of Nepal's population). The population density of Kathmandu district was 1,069 in 1981; 1,710 in 1991, and 2,739 in 2001.

Table 1: Population Density by District, 1981-2001 (person/sq. km)

District	Area	1981	1991	2001
Lalitpur	385	479	670	877
Bhaktapur	119	1,343	1,453	1,895
Kathmandu	395	1,069	1,710	2,739
KVD	899	852	1,230	1,830

Source: CBS 2003b

Kathmandu-centric development has resulted in rapid urbanisation in the valley. Kathmandu Valley has five of the 58 municipalities in the country and is home to about 30% of the total urban population. The city of Kathmandu is by far the largest city in the country, with more than 20% of the total urban population, and the second largest city – Biratnagar – has less than one fourth the population of Kathmandu. The population in the valley is increasing at twice the national rate of 2.2%.

Urban Area is experiencing high population change while compared with rural areas of Kathmandu valley.

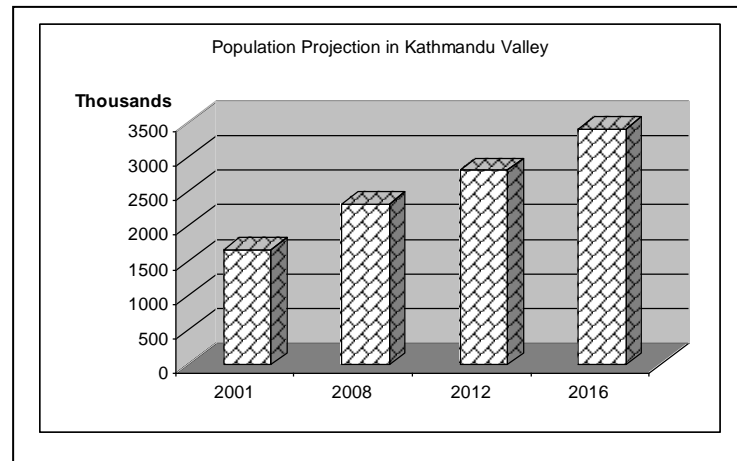


Fig. 2: Population projection in Kathmandu Valley

Deforestation

Forest can be defined both as a resource and as an ecosystem. The resource approach defines forest as an area set aside for the production of timber and other forest produce or maintained under woody vegetation for certain indirect benefits, which it provides. Forest provides, wood, food, fodder, fuel, medicines, habitat, recreation, carbon sink, etc. FAO has given ecosystem based definition, according to which, forest refers to an ecosystem with a minimum of 10 Percent crown cover of trees, and bamboo, generally associated with wild flora and fauna and natural soil conditions and not subject to agricultural practices.

Any definition of forest, in fact, needs to include:

- Closed or open formations
- Continuity of forest
- Crown cover and
- Shrub vegetation
- Limit between shrub and tree height

In absence of the clear indications of these things, the area under forest at any time becomes useless for consideration because whenever there is no constancy in defining these parameters, total statistics of forest vary.

There have been documented changes in the total status and statistics of the forest area in Nepal. Changes in the forest area is analyzed by National Forestry Inventory, NFI, in the report ‘Forest and Shrub Cover of Nepal, 1989-96’. These results are compared with the results from the Land Resource Mapping Project from 1978/79. NFI conducted through satellite image analysis, air photo delineation, and systematic grid of air photo points has established the following facts regarding the current status of forest:

Out of the total land area (14.72 M Ha), forest covers about 29 % (4.27 M Ha) and shrub covers 10.6 % (1.56 M Ha). In 1960, forest covered about 47 % (5.2 M ha area). Both forest and shrub together cover 39.6 % of total land area of the country.

In terai plains, forest area has decreased at an annual rate of 1.3 % from 1978-79 to 1990-91.

In hilly area, annual decrease rate has been 2.3 % in this period.

- In the whole country, from 1978-79 to 1990-94, forest area has decreased at an annual rate of 1.7 %.
- Forest and shrub together have decreased at an annual rate of 0.5 %.
- The total stem volume of the reachable forest of Nepal is 387.5 Million cubic meters and total biomass of 428.5 million tones.

The major reasons of declining forest area in Nepal are: deforestation and human encroachment for expanding agriculture, settlement, urbanization, construction, and limited afforestation.

However, the area still could be very less if there was no community forestry. Still, Community forestry is criticized for punk and bald reasons.

Table: Relative proportion share of woody vegetation (000 ha) by physiographic region

Physiographic regions	Spatial Extent		Forest		Shrub		Total	
	Area	%	Area	%	Area	%	Area	%
Mountain	3507.8	23.8	118.1	3.4	79.2	2.2	197.3	5.6
Hill	7203.2	49	2434.4	33.8	1379.3	19.1	3813.8	52.9
Tarai	4007.1	27.2	1196.6	29.9	133	15.4	1816.9	45.3
Total	14718.1	100	4268.8	29	1559.2	10.6	5828	39.6

Source: FSD, 1999.

Table 4.4: Per capita forest distribution by physiographic zone

Physiographic regions	Area (000 ha)	Population (million) 2001	Forest area Per 100 ha	Per capita forest area
Mountain	3507.8	1.69	3.37	0.08
Hill	7203.2	10.26	33.8	0.29
Tarai	4007.1	11.21	29.86	0.14
Total/Average	14718.1	23.151	29	0.23

The major features of forest resources could be highlighted as below:

- About 80 percent of the total populations depend on forests for fuel wood (WECS 2002).
- The trend of energy consumption from fuel wood source increased from 6068 thousand tonnes oil equivalent (TOE) in the year 2001 to 6590 thousand TOE in the year 2004 (WECS, 2004). Per capita fuel wood consumption in the Hills is estimated to be 640 kg, while it is 479 kg/person/year for the Terai. The per capita timber consumption per annum was estimated at 0.07 m³/year in 1985 and is estimated to have increased to 0.11 m³/year by the year 2000 on the basis of the

national timber demand projected to be about 2.5 million m³/year by 2000 (GoN/ADB/FINNIDA, 1998).

- About 42 percent of the fodder supply for total digestible nutrient (TDN) for cattle is met from forests. It is also predicted that there will be a deficit in the available TDN for cattle by about 0.2 million tones by the year 2010 in the country as a whole (GoN /ADB/FINNIDA, 1998).

Table 4.5: Fuel wood consumption by sector

Year	Total fuelwood	Percent of fuel wood consumption		
	(000 TOE)	Industry	Domestic	Commercial
1990	4096	1.3	98.4	0.4
1991	4204	2.1	97.5	0.4
1992	4282	2.1	97.4	0.5
1993	4469	3.7	95.8	0.5
1994	4610	3.6	95.8	0.5
1995	4692	1.5	97.8	0.7
1996	5769	1.5	98.1	0.4
2001/02	6315	0.25	99.1	0.65
2002/03	6451	0.26	99	0.74
2003/04	6590	0.25	99	0.75

Source: WECS, 2004

Forest depletion has a straight linkage with the decline in agricultural production. Rural people face difficulty in meeting the energy and fodder demand. Forest depletion also increases soil loss, landslide and floods. It may have also increased the emission of green house gases (GHGs). Furthermore, drying up of springs, and loss of biodiversity or change in wildlife habitat are also attributed to forest depletion

Impact

Diminishing forest area can be attributed primarily to the rapid growth of population. The number of people dependent on agriculture is rising; and as a result agricultural land has increased, mostly by encroaching upon forest areas. One of the major challenges faced by the country is how to conserve forest resources. Some programmes, such as community forestry programmes, have carried out exemplary work on conserving forest resources. But, on the other hand, there are also activities responsible for the dwindling of forest resources in the country. It is important in this context to understand the status of forest resources in terms of use and misuse, measures undertaken to conserve the forests, and programmes laid down for the future by the national government. However, the forest data available are characterised by being both scanty and scattered

The shrub area in relation to the forest area has increased since 1978, as shown in Table 3.10. This means that forest quality has decreased. The annual reduction rate in forest area between 1978/79 and 1994 was 1.7%; the annual reduction rate in forest and shrub combined was 0.5% (DFRS 1999). The forest area decreased in all regions from east to west, in different ratios from 1978-94. During these years, the average ratio of the decrease in forests was 24%, while shrub increased at an average of 126%

(DFRS 1999). The far-west of Nepal has the lowest forest coverage and the highest rate of loss (31%).

The forest in Nepal has three important functions: production of goods, protection of natural environment, and regulation of atmospheric conditions. In the Nepalese context, the production function of the forest is to be enhanced for the economic benefit of the community, while the protection and regulation functions are for ecological betterment. The ongoing trend of deforestation is having a negative impact on both the production and the protection functions of forests. Impacts of deforestation are perceived on the following fronts.

- a. forest structure
- b. biodiversity
- c. ecosystem
- d. the atmosphere
- e. forest access
- f. export of forest products

Impact on forest structure

One major impact of deforestation is on the forest structure of Nepal. The inventory of forests shows that the growing stock of the forests has decreased in all three physiographic regions. In 1985/86, the total growing stock was 522 million m³ over bark up to 10 cm top diameter (MPFS 1988). DFRS (1999) estimated that the stock dwindled to 387.5 million m³ in 1999.

Impact on biodiversity

Another conspicuous impact of deforestation is on the flora and fauna. Various plant species are considered threatened as a result of deforestation and increasing pressure on their uses. A total of 60 non-endemic and 47 endemic plant species have been documented (SOE, 2001). The latter are found to be under immense threat. Nepal's threatened animal species, such as mammals and birds, constitute 3.8 and 2.3%, respectively, of the world's threatened species

Impact on ecosystem

The occurrence of landslides, soil erosion, and floods is an every year phenomenon in Nepal. Deforestation may be leading to an increase in some of these natural disasters. A thin over storey canopy of trees with virtually no regeneration, severe erosion, and low organic matter content of soil, characterize most of the degraded forest. Over the sloping areas of the middle hills, the farmers have cleared forests for cultivation to meet their food requirements. This has resulted in environmental degradation in the form of accelerated soil erosion leading to and degradation, declining productivity, and sedimentation in downstream areas (SOE, 2001).

The occurrence of floods and landslides as a result of deforestation has affected not only the degradation of land but also human lives and property. Table 3.11, 4.7, 4.8 and Fig 3.1 depicts the consequences of floods and landslides in the country. The degree to which lives and property are lost and land degraded has been found to vary in different years.

Impact on the atmosphere

The burning of forest fuelwood has changed the local atmosphere, particularly in rural areas of the country where fuelwood is the main source of heat energy. Due to burning fuelwood and deforestation, the concentration of carbon dioxide (CO₂) in

the atmosphere has increased.. The increase in CO₂ in the atmosphere has added to the greenhouse effect and, as a result, the amount of radiant energy has also increased, thereby warming the local climate. It is estimated that annual deforestation of 26,602 ha has emitted 7.77 million tonnes of carbon into the atmosphere (SEAMCAP 2000).

Impact on forest access

As a result of deforestation, the distance traveled by rural people to reach the forests has increased considerably. In 1985/86, the total accessible forestland in the country was 5.8 million ha. In 1992/93, it declined to 4.6 million ha (CBS 1998). This means that rural people had to travel increasing distances to collect forest products, thereby reducing the time available for other productive activities (SOE, 2001).

Export of forest products

Export of forest products, including timber and non-timber varieties, to India declined sharply from 1975 to 1985. Total exports, including to India, have remained more or less stable since 1990. According to the statistics of MoF (1999), in 1975 timber export reached a maximum value of about US\$ 28 million and then declined sharply to a minimum of US\$ 0.1 million in 1981. Compared to timber, non-timber exports remained more or less constant. In 1980, the value of non-timber exports was US\$ 5.6 million and this declined to US\$ 2.7 million in 1998. Note that timber export was banned in 1984.

Desertification

Desertification is the process which turns productive into non-productive desert as a result of poor land-management. Desertification occurs mainly in semi-arid areas (average annual rainfall less than 600 mm) bordering on deserts.

Desertification is the spread of desert-like conditions induced by human activities with consequent decrease in biomass production. It is manifested by loss of productive soils, water and wind erosion, creation and movement of dunes, water logging, reduced quantity and quality of surface and subsurface water, and rapid depletion of vegetative cover.

Causes of Desertification

Overgrazing is the major cause of desertification worldwide. Plants of semi-arid areas are adapted to being eaten by sparsely scattered, large, grazing mammals which move in response to the patchy rainfall common to these regions. Early human pastoralists living in semi-arid areas copied this natural system. They moved their small groups of domestic animals in response to food and water availability. Such regular stock movement prevented overgrazing of the fragile plant cover.

In modern times, the use of fences has prevented domestic and wild animals from moving in response to food availability, and overgrazing has often resulted. However, when used correctly, fencing is a valuable tool of good herd management.

- The use of boreholes and windmills also allows livestock to stay all-year round in areas formerly grazed only during the rains when seasonal pans held water. Where

not correctly planned and managed, provision of drinking water has contributed to the massive advance of deserts in recent years as animals gather around waterholes and overgraze the area.

- Cultivation of marginal lands, i.e. lands on which there is a high risk of crop failure and a very low economic return, for example, some parts of South Africa where maize is grown.
- Destruction of vegetation in arid regions, often for fuelwood.
- Poor grazing management after accidental burning of semi-arid vegetation.
- Incorrect irrigation practices in arid areas can cause salinization, (the build up of salts in the soil) which can prevent plant growth.

When the practices described above coincide with drought, the rate of desertification increases dramatically.

Increasing human population and poverty contribute to desertification as poor people may be forced to overuse their environment in the short term, without the ability to plan for the long term effects of their actions. Where livestock has a social importance beyond food, people might be reluctant to reduce their stock numbers.

Effects of Desertification

Desertification reduces the ability of land to support life, affecting wild species, domestic animals, agricultural crops and people. The reduction in plant cover that accompanies desertification leads to accelerated soil erosion by wind and water. South Africa losing approximately 300-400 million tonnes of topsoil every year. As vegetation cover and soil layer are reduced, rain drop impact and run-off increases.

Water is lost off the land instead of soaking into the soil to provide moisture for plants. Even long-lived plants that would normally survive droughts die. A reduction in plant cover also results in a reduction in the quantity of humus and plant nutrients in the soil, and plant production drops further. As protective plant cover disappears, floods become more frequent and more severe. Desertification is self-reinforcing, i.e. once the process has started, conditions are set for continual deterioration.

Widespread Desertification

About one third of the world's land surface is arid or semi-arid. It is predicted that global warming will increase the area of desert climates by 17% in the next century. The area at risk to desertification is thus large and likely to increase.

Worldwide, desertification is making approximately 12 million hectares useless for cultivation every year. This is equal to 10% of the total area of South Africa or 87% of the area of cultivated lands in our country.

In the early 1980s it was estimated that, worldwide, 61% of the 3257 million hectares of all productive dry lands (lands where stock are grazed and crops grown, without irrigation) were moderately to very severely desertified. The problem is clearly enormous.

Desertification Management

Preventive measures should be applied for managing desertification. Following points are considered for managing the desertification.

- Population increases and associated human activities in regions with arid, semi-arid or dry sub-humid climate put pressure on natural ecosystems. The exploitation of natural resources, including the natural vegetation resources and land and water resources, causes serious soil erosion that has led to desertification of these regions.
- Overgrazing on the grassland is a wide spread problem in rural areas. The quality of plant species, vegetation coverage and community structure of the grasslands are greatly reduced; grassland steppe is more vulnerable to conversion into desert, steppe or bare land.
- Over cultivation and loss of original irrigation conditions on farmland due to insufficient water supply encourages land desertification or desertification in areas with a dry and windy climate. Strong winds and water shortages cause farmland to be desertified and converted into desert, even in oases.
- Over cutting of fuelwood from natural woodlands has caused serious destruction of vegetation and soil erosion in the upland areas of the arid or semi-arid regions. Extensive over cultivation of woodland or grassland has led to soil erosion or desertification of the cultivated area.

Acid Rain

Acid Rain means in common language the presence of excessive acids in the rain water. It has been one of the effects of air pollution. Every source of energy that we use coal, fuel wood or petroleum products, have sulphur and nitrogen. These two elements when burnt in the presence of atmospheric oxygen are converted into their respective oxides sulphur dioxide and nitrogen dioxide, which are highly soluble in water. During rain these oxides react with large quantities of water vapour of the atmosphere to form acids like sulphuric acid, sulphurous acid and nitric acid, nitrous acid which then return to the earth's surface, with rain water or may remain in the atmosphere in clouds and fog.

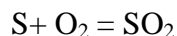
Effects of Acid Rain

The most worrying aspect has been that the area affected by precipitation has been increasing year by year, and its association with our energy consuming world leaves little prospect of alleviation, even with stricter emission control. The repercussions on the environment have been difficult to quantify because they are a function of soil type and bed rock. Generally the acidic characteristics of water is measured by PH, where normal is 6.5 to 8.5. If the pH of rainfall is less than 6, is considered as acidic.

- The acid rain reduces the pH of streams and lakes, which kills aquatic life and reduces the growth of plankton and reproduction of fish. Several types of bacteria are essential to aquatic life which can not survive in acid environment.
- Acid rain is harmful to forest and vegetation. It causes damage to leaves and accelerates leaf surface erosion.

- Acidity affects the soil. A plant nutrient such as potassium is gradually leached out of the soil.
- Acid rain also disturbs the microbial activity of soil. The microbes in the soil which transforms the organic matter in the soil into nutrients to plant life.

Cases: Nitrogen, sulphur, hydrocarbons are major contributing factors of acid rain. Automobiles, power plants, burning fuels are major sources



Natural rainfall has pH of 5.6



Pollution/ waste

a) Air pollution

General

The atmosphere is a mixture of about 5,500 millions tones of gases, predominantly nitrogen (78.09 per cent) and Oxygen (20.94 per cent). Other gases like Argon, Carbon dioxide, Carbon monoxide, Ozone, Sulphur dioxide etc. present in the atmosphere constitutes less than 1 per cent. The atmosphere is, therefore, the multi-layered gas envelope surrounding the earth and protecting the living being from the ultraviolet radiation.

Definition:

Pollution is an undesirable change in the physical, chemical or biological characteristics of our environment. In other words, the presence of unwanted substances in the air in such a level that is detrimental to health is called the air pollution. The present condition of air pollution is very serious in the city. The quality of air is decreasing each day due to the lack of proper management of solid waste, poor condition of inside roads and low quality of fuel used in the automobiles, the vehicles are not operated at a good condition. If we take an example of Kathmandu valley, the atmosphere is covered with smog (mixture of carbon dioxide, Sulphur dioxide, methane and dust particles). Temperature of the many cities has been observed increasing in the last so many years. It is due to the addition of the carbon dioxide to the atmosphere each year in those cities. Today man has confronted with new reoccurring grave air pollution problem because of his carelessness.

Sources:

Natural sources:

It includes the process eg. ocean waves, volcanoes, pollen transport etc. that release pollution into the atmosphere.

Anthropogenic sources:

These sources include the human activities eg burning of fuel, driving of vehicle, industrial releases etc. on the basis of the points of generation, the sources of pollution can be classified

under three groups, these are single point source like industries, power plants etc, Multiple point source like agricultural land, wetland etc and line source like pesticides spray by aeroplane.

Effects

Adverse effect on the health of the man and animal and on the growth of plants is the main impacts of the air pollution. Aquatic plants and animals can not be developed well in water, even die if the air is of polluted type. Some of the rare species of the plants and animals are disappearing from the earth by an unfavorable air condition to them. Air pollution weakens people's natural resistance and makes them more susceptible to many kinds of illness. For instance, children exposed to vehicle fumes will have lower intelligence as a result

वायु प्रदुषण : मृत्यु कति टाढा छ ?	
सन् १९०९ मा	स्कटल्यान्डको ग्लोसो शहरमा वायु प्रदुषणले १ हजार ६३ जनाको मृत्यु
सन् १९३० मा	बेल्जियमको म्युस भ्यालीमा वायु प्रदुषणबाट ६० जनाको मृत्यु
सन् १९४८ मा	अमेरिकाको डोनोरा शहरमा सल्फरडाई अक्साईडबाट २० जनाको मृत्यु
सन् १९५२ मा	लन्डनमा सल्फरडाई अक्साईडको तुवालोबाट ४ हजार जनाको मृत्यु
सन् १९५३ मा	न्यूयोर्कमा वायु प्रदुषणबाट ३०० जनाको मृत्यु
सन् १९५६ मा	लन्डनमा सल्फरडाई अक्साईडको तुवालोबाट ४०० जनाको मृत्यु
सन् १९६३ मा	न्यूयोर्कमा वायु प्रदुषणबाट ३०० जनाको मृत्यु
सन् १९६४ मा	क्यामरुनमा कार्बन मनोअक्साईडबाट १ हजार ७०० जनाको मृत्यु
सन् १९८४ मा	भारतको भोपालमा मिथाइल आइसोसाइटबाट २ हजार ५०० जना भन्दा बढीको मृत्यु

of lead they breathe in. Main effects of the major pollutants present in the air are: Carbon dioxide-green house effect, Carbon monoxide--it reacts with hemoglobin forming carboxyl hemoglobin and retard the oxygen carrying capacity of the blood, Oxide of nitrogen--it takes part in various photochemical reactions forming the harmful smog, Sulphur dioxide-"Acid rain" damages the trees, crops and buildings, CFC-ozone layer depletion, Lead -damage to the brain and nervous system, especially in children, Dust-bronchitis and other lung diseases.

Conclusion:

Radio and television programmes on the cause and effects of air pollution, pamphlet distribution in communities, campaigning etc. are some of the useful methods in this regard. Education and awareness campaigning against air pollution be conducted at the bottom levels of the community and society. Unplanned urbanisations, industrialisation and chemical use has to be controlled. Improved skills within the Municipality to plan and manage the traffic system and to monitor and control pollution from vehicles are essential.

b) Water Pollution

Definition:

Water pollution can be defined as any chemical, physical or biological change in water quality that adversely affects living organisms or makes water unsuitable for any desired uses.

Sources:

There are many causes for water pollution but two general categories exist: direct and indirect contaminant sources. Direct sources include effluent outfalls from factories, refineries, waste treatment plants etc. that emit fluids of varying quality directly into urban water supplies. In the United States and other countries, these practices are regulated, although this doesn't mean that pollutants can't be found in these waters. Indirect sources include contaminants that enter the water supply from soils/groundwater systems and from the atmosphere via rain water. Soils and ground waters contain the residue of human agricultural practices (fertilizers, pesticides, etc.) and improperly disposed of industrial wastes. Atmospheric contaminants are also derived from human practices (such as gaseous emissions from automobiles, factories and even bakeries).

Effects of water pollution

The effects of water pollution are varied. They include poisonous drinking water, poisonous food animals (due to these organisms having bioaccumulated toxins from the environment over their life spans), unbalanced river and lake ecosystems that can no longer support full biological diversity, deforestation from acid rain, and many other effects. These effects are, of course, specific to the various contaminants.

Solution:

Science provides many practical solutions to minimizing the present level at which pollutants are introduced into the environment and for remediating (cleaning up) past problems. All of these solutions come with some cost (both societal and monetary). In our everyday lives, a great deal can be done to minimize pollution if we take care to recycle materials whose production creates pollution and if we act responsibly with household chemicals and their disposal. Additionally, there are choices we make each day that also can affect the quantity of pollutants our actions will introduce into the environment. Heavily packaged foods, for instance, contain boxes, cartons, bottles etc.. made with polluting dyes, many of which are released from groundwater at municipal land fills. Whether we choose to drive to the corner store rather than walk or ride a bicycle will determine how much we personally contribute to acid and hydrocarbon emissions to the atmosphere (and ultimately to global fresh water supplies).

In the end, there are many choices on the personal and societal level that we must make (consciously or not) that affect the amount of pollution our town or country will be forced to live with. Our standard of living and very way of life is based upon practices which are inherently "dirtier" than those of our distant ancestors, although they too polluted their environment to some extent. Without taking a step backward in terms of our standards of living, the answer seems to lie in a combination of many small changes in our daily practices and paying more for goods and services, so that manufacturers of various materials and drivers of automobiles (for instance) will have cleaner devices with which to conduct their activities.

c) Noise pollution

Noise pollution is displeasing human or machine created sound that disrupts the activity or happiness of human or animal life. A common form of noise pollution is from transportation, principally motor vehicles.

Sources of noise

The source of most noise worldwide is transportation systems, motor vehicle noise, but also including aircraft noise and rail noise.^{[3][1]} Poor urban planning may give rise to noise pollution, since side-by-side industrial and residential buildings can result in noise pollution in the residential area.

Other sources are office equipment, factory machinery, construction work, appliances, power tools, lighting hum and audio entertainment systems.

Effects

Noise health effects are both health and behavioral in nature. The unwanted sound is called noise pollution. This unwanted sound can damage physiological and psychological health. Noise pollution can cause annoyance and aggression, hypertension, high stress levels, tinnitus, hearing loss, sleep disturbances, and other harmful effects. Furthermore, stress and hypertension are the

leading causes to health problems, whereas tinnitus can lead to forgetfulness, severe depression and at times panic attacks.

Chronic exposure to noise may cause noise-induced hearing loss. Older males exposed to significant occupational noise demonstrate significantly reduced hearing sensitivity than their non-exposed peers, though differences in hearing sensitivity decrease with time and the two groups are indistinguishable by age. A comparison of Maaban tribesmen, who were insignificantly exposed to transportation or industrial noise, to a typical U.S. population showed that chronic exposure to moderately high levels of environmental noise contributes to hearing loss.

High noise levels can contribute to cardiovascular effects and exposure to moderately high levels during a single eight hour period causes a statistical rise in blood pressure of five to ten points and an increase in stress and vasoconstriction leading to the increased blood pressure noted above as well as to increased incidence of coronary artery disease.

Mitigation:

There are a variety of strategies for mitigating roadway noise including: use of noise barriers, limitation of vehicle speeds, alteration of roadway surface texture, limitation of heavy duty vehicles, use of traffic controls that smooth vehicle flow to reduce braking and acceleration, and tire design. An important factor in applying these strategies is a computer model for roadway noise, that is capable of addressing local topography, meteorology, traffic operations and hypothetical mitigation. Costs of building-in mitigation can be modest, provided these solutions are sought in the planning stage of a roadway project.

Aircraft noise can be reduced to some extent by design of quieter jet engines, which was pursued vigorously in the 1970s and 1980s. This strategy has brought limited but noticeable reduction of urban sound levels. Industrial noise can be reduced by redesign of industrial equipment, shock mounting assemblies and physical barriers in the workplace.

d) Solid Waste

Definition

We consume different materials at all echelon of our socio-economic development. Any solid material, which we as the owner do not want to retain, is a solid waste (SW). Very often, people have begun to say that it is the matter in the wrong place. The important thing to note is that SW comprises all the wastes arising from human activities that are normally solid and that are discarded as useless or unwanted.

‘Refuse from places of human or animal habitation’ or ‘useless or worthless material; stuff to be thrown away.’

The production of SW is clearly linked with our behavior and our attitudes. With the rapid growth of population, industries, commercial enterprises, and change of consumption pattern, the amount of SW has also increased considerably both in absolute terms as well as in per capita terms.

Sources of waste into different categories:

Domestic Wastes: from residential buildings comprising kitchen wastes, paper, cartoon, plastics, rubber, leather, bones, metals, etc.

Commercial Wastes: from variety of sources which includes stores, tea stalls, business premises, restaurants, markets, fruit vendors, offices, hotels, guest houses, print shops, workshops, etc.

Industrial Wastes: from industry including construction sites, demolition debris, food processing, leather industries, carpet factory, chemical plants, and tourist drainage.

Agricultural Wastes: Dairies, chicken farm, and livestock produce these wastes.

Institutional Wastes: from industry with sources being schools, banks, offices, hospitals, etc.

SW Management (SWM) is a common phrase these days to mean the handling process of SW materials from generation at the source to the disposal. For SWM, we need to encourage the people to bring fundamental change in the consumption pattern and throwaway nature of the society.

Management

The final stage of solid waste management is the waste disposal. The choice of an appropriate method of disposal saves money, gives opportunity for the recycling of the waste. Selection of the appropriate disposal method mainly depends upon the heterogeneity or homogeneity of the waste. There are several disposal techniques which are being in practice throughout the world are:

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|-----------------|--------------|--------------------|---------------|
| Hog feeding | Open dumping | Sanitary landfills | Incineration |
| Composting | Pyrolysis | Ocean dumping | Pulverization |
| Control tipping | | | |

Waste Minimization

- | | |
|------------------|--|
| Rethink: | Before buying |
| Reduce: | Not accepted Plastic bag in your shopping |
| Reuse: | Glass bottles |
| Recycle: | Plastics, Metals, Paper |
| Remanufacturing: | Disassembling the product |
| Repair: | Chair, door, cupboard, cloths, shoes, electronic goods |