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# UNIT 7 EFFECTS OF OVEREXPLOITATION OF BIOLOGICAL RESOURCES

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## 7.1 INTRODUCTION

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Human beings evolved in the natural systems as a result of interactive forces among the pre-existing biological forms. Though late to arrive on the evolutionary scene, man is the only life form to initiate drastic interventions in nature. He has always been using natural resources around his dwellings to meet his basic, social and cultural needs. The customs, traditions, practices, beliefs, and rules ensured a balance between human needs and environmental conservation in ancient times. However, with passage of time this symbiotic relationship was gradually replaced by destructive dependence. His activities became so heavily dependent on his surroundings that the process of development became synonymous with divestment of natural ecosystems. At some point during this phase he apparently forgot that the ecosystem has certain carrying capacity that reflects a limit to its exploitability.

In the Units 1–3 of this course you have familiarised yourselves with some fundamental concepts like carrying capacity, species diversity, habitat, etc. You may recall the units on Environment and Resources in the Foundation Course on Science and Technology where you learnt that overexploitation of forest resources can lead to deforestation and related problems.

In this Unit you will learn how cutting of forests has led to environmental degradation and that indiscriminate industrialisation has led to deforestation and related problems of desertification and loss of wildlife. You will be able to see that desertification is the physical effect of deforestation whereas loss of wildlife is a biological effect of deforestation. Both of which result from overexploitation of natural resources.

## Objectives

After studying this unit you will be able to :

- enumerate the human activities that are responsible for deforestation, desertification and loss of wildlife
- quantify the extent to which human intervention has brought about deforestation, desertification and loss of wildlife at the global level with emphasis on India
- illustrate the changes brought about by human encroachment on components of physical environment such as soil, climate, and water bodies, and
- explain the effects of deforestation and desertification on components of biological environment such as flora and fauna.

## 7.2 CAUSES OF OVEREXPLOITATION

Overexploitation of biological resources is mainly because of increasing human greed. This has resulted in deforestation, desertification and loss of wildlife. We discuss below the causes of overexploitation of some of these biological resources.

### 7.2.1 Deforestation

Deforestation is a broad term. It means wanton cutting of trees including repeated lopping, felling, removal of forest litter, browsing, grazing and trampling of seedlings. It results mainly from

- i) shifting cultivation
- ii) development projects
- iii) demand for firewood
- iv) demand of wood for industry and for commercial purposes
- v) other causes.

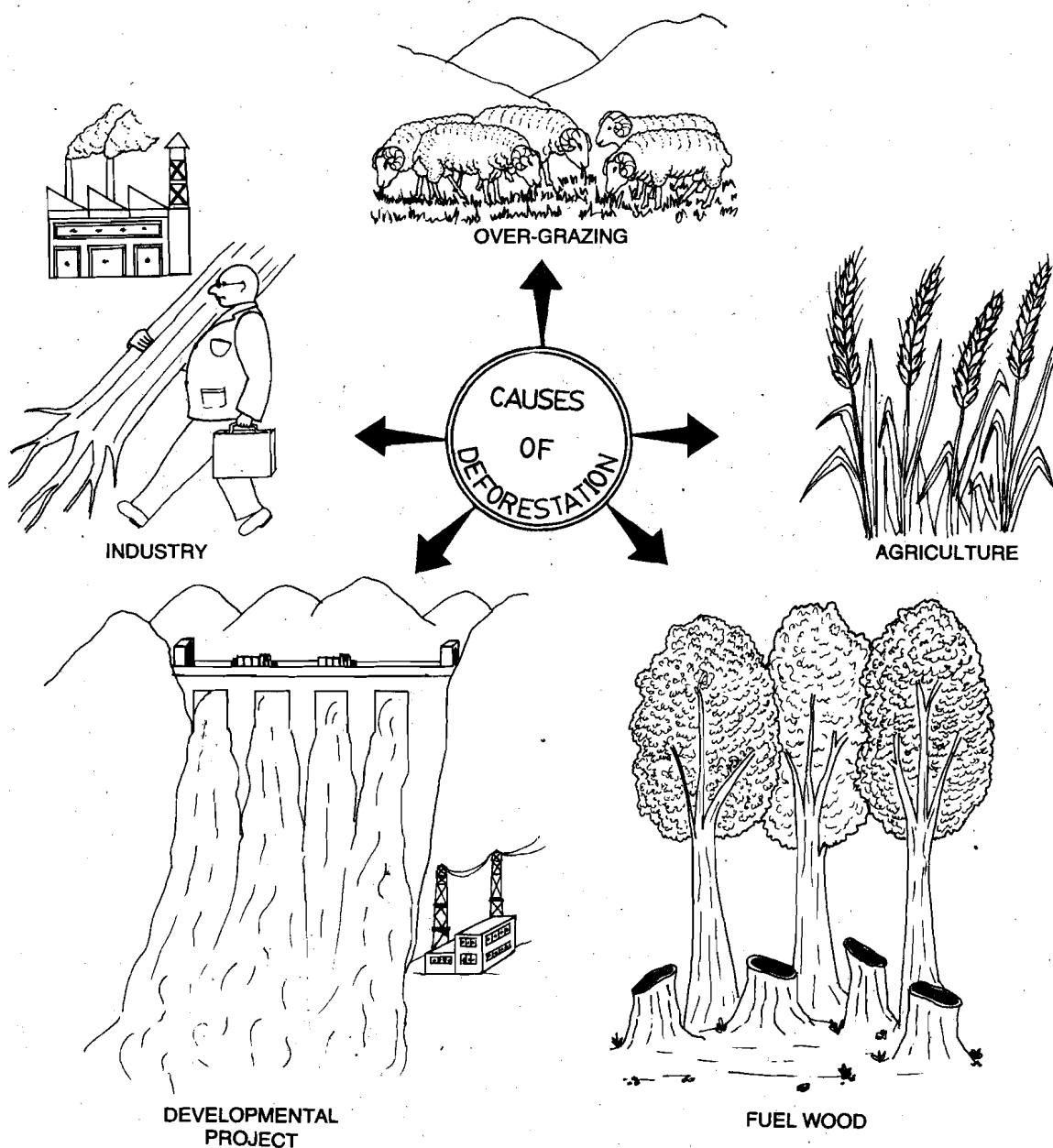


Fig 7.1: Causes of Deforestation

Under **shifting cultivation**, a patch of land on the hills is cleared of vegetation, and the plants are burnt. This ash eventually mixes with soil, which can support a crop of millet. This gives a modest yield to meet the immediate needs of the tribal farmer. When the crop is harvested, the land is abandoned and the tribals shift to adjoining areas, where the process is repeated.

Fig. 7.1 illustrates some of these causes in a diagrammatic manner. As a result of deforestation forest cover has been extremely reduced. It is said that Himalayas and the Aravali hills are dying with the blasts of dynamite and onslaught of axes. Let us look at each of these causes in this subsection. Deforestation affects the existence of wildlife. Human activities such as hunting of animals for game or for skin also lead to loss of wildlife.

i) **Shifting cultivation** : Hunting and gathering (HAG) has been the main form of sustenance practised in the earlier parts of human history. The characteristic of HAG societies is the absence of any surplus and thus these communities have a subsistence living. Shifting cultivation or Jhoom farming is a 9,000-year old practice and a step towards transition from food collection to food production. It is also known as slash-and-burn method of farming. Annually about 5 lac ha of forest is cleared for this type of farming. In this cultivation man uses limited kinds of tools with not very high level of mechanisation. However, this method of cultivation causes extreme deforestation, as after 2-3 years of tilling, the land is left to the mercy of nature to recover. This type of cultivation was always meant to fulfil local needs or onsite demands to meet the requirements of the cultivating groups or villagers closeby. Even today, shifting cultivation is practised in India in the States of Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura, and Andaman and Nicobar Islands. The last happens to be the richest forested area of Indian sub-continent.

ii) **Development projects** : Now let us see how developmental activities cause deforestation. Forest dweller was geared to keeping a balance between human and environmental needs but today there has been a transition from a balanced use of forest resources to their overexploitation. As a result, the situation has changed. Apart from drawing raw materials from the forest, a development project starts destroying the forest even before it goes into production. The process begins with building of infrastructure in the form of roads, railway lines, buildings, dams, townships, electric supply etc. Hydro-electric projects and projects like irrigation dams, and canals use timber and other forest produce for raw materials also. Industrialisation is not a one-time event that destroys a few hectares of forest immediately under them. The developmental projects instead continue to cause deforestation before and long after their establishment. As a result of the sudden disappearance of trees from an area of several hectares, people living in the vicinity are at once deprived of the source of fuel, fodder, fibre and timber, which is essential for many of their daily needs like making implements, fences for feedlots and for livestock pens. This destruction of their source of sustenance begins a chain of reactions including reduction in income, deterioration of nutritional status, indebtedness, land alienation, reduction in cultivated area, and consequent deforestation of a much larger area because dependence on sale of firewood increases. It has been observed that tribals from a group of villages involved in irrigation projects and displaced persons from the dam areas subsist mainly on sale of firewood. The amount of firewood sold, as well as the number of persons selling it for survival have increased considerably and the sale is going to double by the turn of this century.

Nowadays you must be reading about the Tehri power project which envisages construction of a 260.5 m high earth and rockfill dam near the Tehri town in Garhwal Himalayas. The project site is situated a little downstream the junction of Bhagirathi and Bhilganga rivers. An estimated 4,600 ha of good forest land will be submerged under water. This will also displace an estimated 3,500 odd families. As a result of efforts made by "Chipko Andolan Activists" and "Tehri Bundh Virodh Sangharash Samiti" families have been compensated and about 90 per cent of the project staff recruited is from the residents of Tehri town.

Here it would be worthwhile to mention that public awareness of the effect of industrialisation and developmental projects has resulted in coming up of peoples' movements like 'Chipko Andolan'. It is a movement to hug trees, in order to save them from felling. The idea was to protect trees even at the cost of agitators' lives. In fact, it was women who took lead in this activity. Ms. Amrita Devi, her husband Ramoji and their three daughters sacrificed their lives in Khejrili village of Rajasthan. There are other similar incidents where brave villagers have been axed to death while saving their beloved trees. You may now realise how collective efforts of a group of enlightened people determine the course of decisions in favour of ecological balance.

iii) **Firewood** : Fifty four per cent of the total global wood produced fulfils fuel requirements of the world. A close look at the pattern of utilisation of wood produced will show that the developed countries utilise 16 per cent of their share for fuel requirements. On

the other hand, in developing countries, 82 per cent of their forest produce is burnt as firewood which is a wasteful way of spending this resource (Table 7.1). India consumes nearly 135–170 Mt (Million tonnes) of firewood annually and 10–15 ha of forest cover is being stripped off every year to meet the minimum fuel needs of urban and rural poor. Fuelwood consumption has gone up from 86.3 Mt in 1953 to about 135 Mt in 1980, indicating the pressure on forests. According to one estimate, the firewood demand is going to be of the order of 300 to 330 Mt by the year 2000 AD, and there may be a shortfall in firewood supply of about 137 Mt. According to the Report of the Advisory Board of Energy (1985), in the year 2000 AD, Rajasthan, Himachal Pradesh, Jammu & Kashmir, Madhya Pradesh, Gujarat and Maharashtra will manage to meet their firewood demand, Uttar Pradesh and Tamil Nadu will be hardput and Punjab, Haryana and Kerala would experience acute shortage. Nearly 70 per cent firewood demand pertains to rural areas and all the demand for fuel has to be met, at least in the rural sector, by firewood as the alternatives are yet out of reach of the rural poor.

Table 7.1 : Use of Wood

Region	Total Wood Consumption (in billion cubic metres)	Wood Use (in billion m <sup>3</sup> )		Wood Use (%)	
		Industrial	Fire-wood	Industrial	Fire-wood
Global	3.2	1.5	1.7	46	54
Developing Countries	1.8 (57 %)	0.324	1.476	18	82
Developed Countries	1.4 (43 %)	1.176	0.224	84	16

iv) **Demand of wood for industry and for commercial purposes :** Wood, the versatile forest produce, is used for several industrial purposes, such as making boxes, crates, packing cases, furniture, match boxes, paper and pulp, plywood, etc. In the last 20 years (1951–71), 1.24 lakh ha of forest have been cut for various industrial uses. The industrial wood requirement which in 1970 was 15.9 Mm<sup>3</sup> (Million cubic metres) escalated to 25 Mm<sup>3</sup> in 1980. Today, the global annual requirement for industrial wood is about 40 Mm<sup>3</sup>, whereas only 13 Mm<sup>3</sup> is available. Nearly, 46 per cent of the annual recorded production of wood is used for industrial purposes. To meet this demand, it will be necessary to bring about 1,00,000 ha of land under forest cover annually for establishing new plants. Unthoughtful and unrestricted exploitation of timber as well as other products for commercial purposes is the main cause of forest degradation. The paper industry accounts for about 2 per cent of country's annual consumption of wood. In the beginning of 1983, there were a total of 175 paper mills in the country, and the wood requirement to meet their demand was 3.09 Mt. Fifty one per cent of this requirement is met by bamboo wood. This has led to the depletion of bamboo stocks in most of the peninsular India. The apple industry in the Himalayan region has led to the destruction of fir and other species because of the use of fir wood as a packing material. Similarly, plywood crates are needed for packing of other produce, particularly tea. Today, there are more than 52 plywood factories operating in Assam. Depletion of raw forest produce has gone to such an extent that Assam's forest can meet only 22 per cent of the requirements of the state's plywood mills. The rest comes from Arunachal Pradesh, Meghalaya and Nagaland.

v) **Other causes :** Forests may sometimes suffer from natural enemies such as termites, diseases, floods and forest fires as well; but human greed exceeds all boundaries. Some of the so called forest fires are actually deliberate burning of trees by smugglers. Often with the knowledge or even connivance of the forest guard, the trees are set on fire. Later, this timber is auctioned as 'burnt trees' at a very low price and the smugglers buy the same.

Illegal felling, official connivance and desire to earn more foreign exchange have caused conversion of protected forest to reserve category of forest by the government, which means allowing felling of trees, in a forest where earlier it was not permitted. In this competition between needs of the industry and the needs of common man, government favours the more powerful one, i.e. industry.

In addition to the above causes, deforestation can also result from overgrazing and agriculture, which we will be discussing in the next unit. Let us here discuss desertification and its causes. But before that we would like you to try the following SAQ.

### SAQ 1

Fill in the blank spaces using appropriate words :

- i) Though a comparatively later arriver in the evolutionary ladder, man is the only life form to initiate drastic ..... in nature.
- ii) Shifting cultivation causes deforestation as after 2-3 years of tilling, the land is left to the mercy of nature to .....
- iii) Industrialisation is not a one time event that destroys a few ..... of forest immediately under the project site. The industries continue to cause ..... before and long after their establishment.
- iv) Burning the wood is most uneconomic way of utilising this costly resource and ..... countries loose a major chunk of their share in this activity.

### 7.2.2 Desertification

In the Asia and Pacific region an area of about 4.361 lac ha. has resulted from **natural desertification**. These areas can be classified as sub-tropical, cool coastal, rain shadow and interior continental deserts. Besides these, polar regions of the world also represent a type of desert, where water is no doubt present in plenty, but being in the form of ice, it is not available for plants and animals. The Gobi desert of north-western Asia is a cold desert. The Ladakh region of Jammu and Kashmir covering an area of 0.7 lakh sq. km., and located at an altitude of about 11,000 feet where extreme cold conditions prevail for about 5-6 months in a year, is also a cold desert.

Desertification and deforestation are closely linked phenomena. Forests maintain humidity of an area. When the air is humid; not only does less solar heat penetrate to ground during the day but also less of it escapes to the outer atmosphere during the night. Forests thus tend to provide seasonal stability to the terrain. Desertification is a systemic phenomenon resulting from excessive felling of trees which manifests itself as loss of fertility, high wind velocity, low precipitation, extreme aridity and extremes of temperature in the affected terrain. Desert supports scanty vegetation and animals which are especially adapted to extremely unfavourable conditions. Although desertification can develop from natural causes alone, in a majority of instances human intervention causes an accentuation of arid conditions in an already desert terrain. This can happen in any climatic zone or ecosystem, resulting from exploitative interaction of man with the natural ecosystem. Accentuation of desertification is caused mainly by deforestation. Most of the deserts of recent origin have resulted from the following human activities.

- Uneconomic land use for agriculture by cultivation on marginal lands affecting adjacent fertile lands and soil erosion.
- Uncontrolled grazing and indiscriminate cutting of trees or overexploitation of grazing lands and forest resources leading to drought, soil erosion, deterioration of soil fertility and stunted plant growth.
- Intensive and uneconomic exploitation of water resources leading to rise in water table, seepage and problems of increased salinisation of soil.
- Excessive mining in arid and semi-arid regions for extraction of ore, coal or lime resulting in loss of trees, bushes and green cover, and leading to total destruction of conditions conducive to vegetation.

We shall now discuss each of the above causes of desertification in more detail.

i) **Uneconomic land use** : Uneconomic land use and exploitation of resources for the purpose of agriculture is one of the main causes of desertification making the deserts uninhabitable. Indian arid zone, being the most highly populated amongst other deserts of the world, offers very few opportunities for non-agricultural occupations for its growing population. With the result, even sand dunes and marginal lands are being put under intensive agriculture. This causes loosening of the soil particles which become susceptible to be carried away by winds. The wind-borne sand falls on the adjacent fertile areas and ultimately deteriorates them. This leads to the formation of sandy hummocks.

Cultivation of such marginal lands and sand dunes as found in Bikaner, Nagaur, Churu and Pali districts of Rajasthan has caused shifting of the sands in these areas and formation of new sandy hummocks along fertile areas of these districts. The sandy wastes along Tilonia in Ajmer district appear to be due to the fresh deposition of sands due to cultivation of marginal lands along the Aravalis in Nagaur district. In the west and north-west of Ajmer, cultivation on marginal lands and sandy river beds has resulted in slow advancement of the sandy material through the gorge of Luni river, engulfing more fertile lands east of Aravalis. This has also caused disorganisation of drainage system. Similar problems are coming up in several other parts of this desert tract. Uneconomic land use also affects highways, railways and settlements as evident in Ganganagar, Bikaner, Churu and Jaisalmer districts in Western Rajasthan.

ii) **Uncontrolled grazing** : The grazing pressure on vegetal cover of Rajasthan is considerably high due to immense increase in livestock population. Increased pressure of livestock on the grazing lands, results in overexploitation of resources. This also causes soil erosion leading to desertification. Uncontrolled grazing associated with indiscriminate felling and lopping of trees makes the desertification more intense. The trees, shrubs and even their roots are often used by rural population for top feed and fodder.

iii) **Overexploitation of ground water** : Excessive and uneconomic drawing of ground and surface water resources for irrigation is known as intensive irrigation. This leads, on one hand, to depletion of ground water and on the other, to rise in water table, waterlogging and increased salinisation in arid zones. Uneconomic and intensive use of canal water in Ganganagar, Bikaner and Jaisalmer districts has developed similar alarming problems. In the Nachana area of Jaisalmer district, where canal water has been recently introduced through Indira Gandhi Canal, seepage problem has been noticed.

iv) **Excessive mining** : The processes of mining include surface or open casting and underground mining. In the former case vegetation and soil have to be removed to get access to deposits. Thus, loss of productive soil and associated flora and fauna is unavoidable. Generally, the mining debris forms twice the mined ore or material. The overburden or piled up soils are subject to erosion besides occupying large land surface. In case of underground mining, tunnels and shafts are needed which also cause problem of debris. Besides, land subsidence or landslides in the areas where extraction has been done extensively, cause a further loss of land which might be under natural vegetation or cultivation. The area thus lost is quite large.

### 7.2.3 Loss of Wildlife

Man, because of his vanity and greed has become one of the greatest enemies of wildlife. Man has tried to control all the adverse factors for his survival without any concern for the other animals living around him. Increasing human population with its increasing food requirements has resulted in reduction of area under forest cover, because large tracts of forest area have been put under intensive agriculture. This has resulted in a severe disruption of ecological equilibrium.

Projects like taming of the rivers for irrigation projects, draining of marshes for agriculture and urbanisation etc. have thoroughly altered and in some cases even destroyed the natural habitat of wild animals causing a great reduction in their population size which may also lead to their extinction.

Besides natural enemies like parasites and predators, various climatic and accidental hazards like droughts, floods, earthquake and fire, man's greed has contributed greatly in limiting the population of these animals. Excessive hunting of animals for game or skin has endangered the very survival of a large number of wild fauna.

Animals provide for one of the most lucrative black markets in the world. Every year, the worldwide trade in animals takes a toll of an estimated 40,000 primates, a part of which are bred in captivity, 40 lakh birds, 35 crore of ornamental fish and innumerable lizards and snakes. Animal products which are traded include 5 crore furs, upto 500 tonnes of ivory, one crore reptile skins and three crore manufactured exotic leather items. The declared world wildlife trade is at least Rs. 7,500 crore a year, and includes some 20,000 different animal species.

#### SAQ 2

i) State which one of the following statements most aptly describes the situation :

Man only accentuates the process of desertification; he does not initiate it. Most of the deserts of recent origin have resulted from

- a) uneconomic land use
- b) uncontrolled grazing
- c) overdraft of ground water
- d) excessive mining
- e) all of the above reasons.

ii) Fill in the blanks using appropriate words from text :

Man's greed for commerce, pet trade and excessive ..... of ..... for game or skin has endangered the very survival of a large number of wild fauna.

iii) Forests provide seasonal ..... to a terrain.

iv) Animals provide for one of the most lucrative ..... in the world.

## 7.3 EXTENT OF OVEREXPLOITATION

After learning the causes of overexploitation of biological resources you would like to know how widespread this phenomenon is, at the global as well as the national levels.

### 7.3.1 Global Extent of Deforestation

The total forest area of the world estimated in 1900 was about 7,000 Mha. By 1975 it was reduced to 2,890 Mha, and if this trend continues, by the year 2000 there would remain only 2,370 Mha of area under forest cover. Of this, the reduction in the temperate region would be only 0.6 per cent of total, while in tropics and subtropics it would be of the order of 40.2 per cent of total forested area, out of which nearly 50 per cent reduction is expected to take place in Asia and Pacific region. According to one estimate all tropical forests in the world would probably disappear in the next 50 to 75 years, if the present state of deforestation is allowed unabated.

### 7.3.2 Deforestation in Our Country

Deforestation is an environmental holocaust in which India is steadily losing about 15 lakh ha of good forest land annually. Today, the number of trees that are felled annually could be almost equal to the country's consumption of oil, coal and electricity put together. India will soon be heading towards a situation of zero forest in about 20 years. At present, forests cover about 67.2 Mha of land, forming around 22.1 per cent of the total area. Though, according to Government Reports, forest cover has increased from about 14 per cent of the total area in 1950-51 to 22 per cent in 1984-85, it is still much short of the 33 per cent forest cover recommended by the Indian Forest Policy of 1952.

It is a well-known fact that of the 329 Mha of Indian land mass, nearly 80 per cent was covered with forests around 3000 B.C. There are known to be forests around Harappa and Mohanjodaro during the period of the Indus Valley Civilisation, which date back from 4000 BC to 1500 B.C. During the Mughal times many forested areas were converted into agricultural land. The British increased the rate of conversion of forest into agricultural land followed by exploitation of forests for timber and fuel. At the time of Independence nearly 75 lakh ha or about 23 per cent of the land was under forest cover. Owing to expanding industrialisation, urbanisation and population growth, the forest cover now stands reduced to hardly 10 per cent. The data released in mid-1984 show that India lost 13 lakh ha of forest every year between 1972-75 to 1980-82 (Table 7.2). According to official admission, the actual land under forest cover in the country is only 62.20 M ha, comprising just about 19 per cent of the total geographic area out of which forest cover of good quality is only 8 per cent.

Table 7.2 : State-wise Forest Area Obtained From Satellite Survey Data

(Mha = million hectares)

State/Union Territory	Forest Area Mha	
	1972-75	Satellite Data for 1980-82
Andhra Pradesh	4.90	4.04
Assam	2.11	1.98
Bihar	2.27	2.01
Gujarat	0.95	0.51
Haryana	0.08	0.04

			Effects of Overexploitation of Biological Resources
Himachal Pradesh	1.51	0.91	
Jammu & Kashmir	2.23	1.44	
Karnataka	2.95	2.57	
Kerala	0.86	0.74	
Madhya Pradesh	10.86	9.02	
Maharashtra	4.07	3.04	
Manipur	1.51	1.38	
Meghalaya	1.44	1.25	
Nagaland	0.82	0.81	
Orissa	4.84	3.94	
Punjab	0.11	0.05	
Rajasthan	1.13	0.60	
Sikkim	0.18	0.29	
Tamil Nadu	1.67	1.32	
Tripura	0.63	0.51	
Uttar Pradesh	2.59	2.10	
West Bengal	0.83	0.65	
Andaman & Nicobar Islands	0.33	0.64	
Arunachal Pradesh	5.14	5.21	
Dadar & Nagar Haveli	0.02	0.01	
Goa, Daman & Diu	0.12	0.11	
Mizoram	1.39	1.20	
Total Forest Area	55.54	46.37	
Forest Cover, % of Total Land Area	16.88	14.09	

Source : From Satellite Imagery; National Remote Sensing Agency.

### 7.3.3 Extent of Desertification

In India most of the deserts are located in the states of Rajasthan and Western Gujarat, where about 23.8 Mha area has been affected by desertification. About 4.34 per cent of this area lies in the extreme West of Rajasthan in Jaisalmer district. This desert is concentrated along a belt in Ganganagar, Churu, Bikaner, Jaisalmer, Barmer, Jodhpur, Jalore, Jhunjhunu and Nagaur districts. The predominant processes of desertification in this belt are the expansion of sand cover, and shifting sand dunes by wind erosion. About 76.15 per cent of the total Indian desert area has resulted from manmade desertification process. Another 19.5 per cent of the total area is subjected to medium or slight desertification. This area is concentrated mostly along the eastern Rajasthan in the north-east to south-west zone parallel to the foothills of Aravalis. The dominant processes in this zone are water erosion, enlargement of rock out-crops, viz. formation of undulated horizon in surface, which result mainly from water erosion.

A case study of Thar desert will be taken up in section 7.4.2 of this unit to emphasise the damage caused by desertification.

#### SAQ 3

Fill in the blanks :

- According to one estimate all tropical forests in the world would probably disappear in next 50 to 75 years if ..... is allowed unabated.
- The predominant processes causing desertification in north eastern to south western belt of Rajasthan are water erosion, and .....

### 7.3.4 Global Extent of Loss of Wildlife

It is estimated that over the past 2000 years, 600 species of animals have become extinct or are going to be extinct from the earth. Similarly, about 3,000 species of plants need to be conserved. The shrinkage of green cover has had adverse effects on the stability of the ecosystem. Poaching is another factor causing depletion of wildlife. The roll call of victims is endless. In Africa, in recent years, nearly 95 per cent of the black rhino populations have been exterminated by poachers for their horns. In the last seven years alone, over one third of



Africa's elephants have been wiped out for some 3,000 tonnes of ivory. The scarlet macaw once common throughout South America, has been eliminated from most of its range in Central America. Several species of spotted cats such as the ocelot and jaguar have been jeopardised by the demand for their fur. In 1962, nearly 70,000 whales were slaughtered. International trade in whale products is now banned. A moratorium instituted by the International Whaling Commission restricts whaling until 1990. As a result, whaling industry has almost disappeared. Only Japan, Ireland and Norway carry out whaling in the name of research. In 1988 fewer than 600 whales were harvested.

### 7.3.5 Loss of Wildlife in India

India has nearly 45,000 species of plants and 75,000 species of animals. This biological diversity ought to be preserved for maintaining stability of the ecosystem. The existing species, at a given time, contain all the genetic information necessary to produce combinations for evolution to proceed further. Evolution is a one-way process in which loss of genetic information is irreplaceable. There is no way in which it can be replaced or reconstituted. Unfortunately, deforestation coupled with desertification has destroyed this natural treasure of the earth to a large extent. Several species of plants and animals are on the verge of extinction. The provision of shelter to countless birds and animals is at stake.

Wildlife which is important has been wantonly destroyed. It is evident from the fast diminishing populations of elephant, lion and tiger in the country; 'cheetah' is already extinct. Elephants once found all over India have now disappeared from Andhra Pradesh, Madhya Pradesh and Maharashtra. The Asiatic lion which was very common in Asian continent has practically vanished from Asia except for a few hundred square kilometres of Gir forest in India. Tiger prefers thick forests and preys on herbivorous animals. The overexploitation of forest resources has forced this animal to live in a shrunken habitat. Thoughtless shooting and indiscriminate killing for game and skin trade has also decelerated the population of tigers.

A case study will be taken up in Unit 22 to show how overexploitation of biological resources has led to dwindling of the tiger population, which was once abundant in forest terrains; and how a follow up programme by Government of India has helped conserve this species. As a result of measures taken by WWF, their number has increased from 4,000 in 1984 to 4,334 in 1989.

In the last 100 years or so, the Indian sub-continent has suffered extinction of some four species of mammals, and three species of birds. Another 40 species of mammals, twenty species of birds and twelve species of reptiles are considered as highly endangered species due to overexploitation, habitat alteration and destruction by man. Now, assess your understanding of what we discussed in the foregoing section by answering the following questions.

#### SAQ 4

- i) Tiger preys upon which of the following herbivorous animals : (mark the correct ones)  
gaur, wild buffalo, antelope, deer, wild boar, langur, monkeys, cattle.
- ii) State whether the following statements are true or false.
  - a) Elephants once found all over India have now disappeared from India except Andhra Pradesh, Madhya Pradesh and Maharashtra.
  - b) As a result of measures taken by World Wildlife Fund, the number of tigers has increased from 4000 in 1984 to 4334 in 1989.
  - c) Asiatic lion which was very common in Asian continent has practically vanished from Asia except for a few hundred square kilometres of Gir forest in India.

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## 7.4 EFFECTS OF OVEREXPLOITATION

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After becoming familiar with the causes and extent of overexploitation you would like to know the effects of overexploitation on physical and biological components of environment.

### 7.4.1 Physical Environment

As you have studied earlier, forests play an important role in maintaining oxygen supply and freshness of the air we breathe. They bind soil, intercept heavy rainfall and help in recharging the underground waters. They act as environmental buffers regulating climate and atmospheric humidity. They stop erosion of soil by reducing the speed of run off waters and velocity of strong surface winds. Thus, they help prevent degradation in the physical environment. If forests are cut down, land is degraded, soil is eroded and transported with surface run off thus polluting the water. The destruction of natural vegetation cover causes loss of top soil. It is virtually irreplaceable as nature takes about a hundred odd years to build an inch of top soil. As a consequence of heavy desertification, Aravali hills, for example, have become woefully naked. Vast portions of the land are turning into waste lands. There has developed a discernible desert that stretches from Rajasthan to West Madhya Pradesh, Maharashtra and Karnataka. Denuded areas are converted from a relatively stable zone into one of unpredictable climate. Chronic draughts in some parts of Rajasthan and Gujarat, and floods in some other parts of the country bear a testimony to this. Similarly, water level of the rivers is decreasing at an alarming rate.

A shrinking forest cover coupled with over exploitation of ground water has accelerated erosion along the slopes of the lower Himalayas, and Aravali hills, making them prone to landslides. Forest cover in this area has reduced by nearly 13 per cent during the past 23 years. Secondly, destruction of the forest has had a fatal impact on the rainfall pattern. You will read in a later section how desertification in the Aravali hills (Section 7.4.2) has led to serious problems. Lack of adequate forest cover has resulted in water flowing off the ground, washing away the top soil which is finally deposited as silt in the river beds. Unofficial sources claim that the quantum of top soil displaced in our country by water erosion alone was 6,000 Mt a year in the early 1970s. The extent of erosion itself has almost doubled over the last 19 years. The estimated cost of 12,000 Mt of soil works out to be 6,000 crore rupees. The overall actual losses would be even more if calculated in terms of agricultural, animal and forestry production that is being lost every year as a result of soil erosion. It is estimated that the country loses 30-50 Mt. of food grains every year as a result of soil erosion. The loss of top soil is maximum in India, being 18.5 per cent of the global soil loss. This is indeed very serious, considering the fact that India has only 2.4 per cent of the land area of the world.

Denudation in catchment areas of rivers and reservoirs is of serious concern so far as floods are concerned. Heat build-up in the atmosphere which is one of the critical problems of the century, is also a result of forest degradation. The following few lines will explain what we mean by heat build-up. Forests lock up carbon dioxide through the process of photosynthesis, destruction of forests coupled with burning of fossil fuels and industrialisation raises the levels of carbon dioxide in the earth's atmosphere. This leads to increased insolation, which means that more heat energy enters the atmosphere in the form of sunlight than is able to escape back through the exterior layers, because carbon dioxide is a good absorber of heat. As a result, the temperature of the atmosphere rises. This leads to heat build-up or **green house effect**. The entire Himalayan ecosystem is threatened and is under severe imbalance as snow-line has thinned and perennial springs have dried up. Annual rainfall has declined by 3 to 4 per cent. Chronic droughts have begun even in areas like Tamil Nadu and Himachal Pradesh where they were not common earlier.

Mining on hill slopes disrupts the natural physiographic linkages amongst mountain slopes, plateaus and plains. As you have already learnt, for every tonne of saleable ore about 2 tonnes of mine spoils must be removed and dumped. This process destroys original vegetation on slopes and also retards natural regenerative capability while scarce cultivated terraces or orchards are irreversibly lost. Under such conditions even from a small area of 25 hectares in Doon Valley, where limestone was being quarried, as much as 740 tonnes of boulders tumbled down the slope in one year. Coal mining is extensive in Bihar, West Bengal, Madhya Pradesh, Orissa, Maharashtra and Andhra Pradesh. There are 4052 working mines, including 478 coal mines, many of these are open cast type. Ironically these mines are generally located in thick forests and agricultural areas. The associated land degradation is through deforestation, spoil dumps and over-burden subsidence.

Mining disturbs natural hydrologic process, disrupts flow lines and storage. One of the most pronounced ill effects of mining is hydrologic deterioration, which leads to depletion of ground water in aquifers. Limestone quarrying in Doon Valley has decreased drinking water

potential of 18 villages by 50%. Ore fines and toxic substances carried by rainwater pollute the water flows and make it unfit for human consumption. Washings from waste heaps, in addition to untreated effluents are released in streams and lakes. These get filled with silt and destroy the chemistry of water as well.

Extensive irrigation, dryland farming, cultivation on marginal lands, excessive mining, and other exploitative uses of natural resources have adversely affected physical environment in the Rajasthan desert, leading to widespread environmental degradation. Some of the effects of this are as follows:

- i) Increased incidence of dust, sand storms and sand collection due to loosening of soil particles,
- ii) Movement of sand and piling of sand dunes,
- iii) Formation of soil crusts and depletion of organic matter in soil,
- iv) Considerable increase in the degree of salinisation and alkalisation of the soil,
- v) Deterioration in the depth and quality of water, and
- vi) Transformation of weather and climate.

#### 7.4.2 Biological Environment

So far, we have learnt that every ecosystem maintains dynamic equilibrium between its living and non-living components. Like other biotic components, the wild animals also require an environment that provides living and foraging space, right type of nourishment for growth and better chances of escape from enemies. Besides their natural enemies, man's greed has led to a great loss of wildlife and elimination of habitat of the species which play an important role in ecosystem functioning. The increasing demand for wildlife products has led to indiscriminate slaughter of many species. Many Himalayan bears have been killed for their gall bladder, which is powdered and sent to Japan where it is valued as an aphrodisiac. Large scale smuggling of snake skin has endangered several species of snakes particularly king cobra, pythons and rat snakes. Japan is the world's largest trader in endangered species. Japan and to some extent France are responsible for decimating the rare musk deer from Nepal. Over the first nine months of 1987, the Japanese market imported 818 kg of musk to be used as aphrodisiac. With about 80 deer required to produce one kg of musk, some 80,000 deer were slaughtered in this period alone — a substantial part of their existing population.

The Thar desert makes a marked example of effect of over exploitation of its surroundings by man. The following is a brief account of how environmental degradation has affected the flora and fauna of the area :

##### Thar Desert – A Case Study

The Thar desert exhibited spectacular biological diversity because of its evolutionary history and geographical location. Some biota possessed Saharan affinities, others were Malayan, while certain elements were Deccanean. In addition, quite a few were widely distributed types.

**I) Animals :** The past history of wildlife inhabiting Thar Desert is fascinating. The Asiatic lion, which is struggling for its survival today in the Gir forest, used to inhabit the plains of Rajasthan, Punjab and Sind in the recent past. It is on record that the last lions occurring in the desert were shot during 1976. The cheetah now extinct in India was at one time found in the Kathiawad region. Similarly, leopards and caracal lynx (Fig 7.2), once fairly well known in the Indian desert are becoming extremely rare animals. The wild boar, wild ass, Asiatic wolf, etc. have also met the same fate. Among other mammalian fauna, Indian gazelle, blue bull and black buck are also in the list of endangered animal species.

Predominant bird species are also very scanty, particularly in sandy habitats of western Rajasthan. Three hundred species of birds were reported from this region in 1938 and a few of them are at present considered as endangered species due to alarming decline in their populations in this region. The great Indian bustard (Fig 7.3), houbara, and lesser florican populations in the Thar desert are dwindling as compared to that in the recent past. Pea-fowl, being a national bird, is well protected by people.

Among reptiles, two species of crocodiles and turtles are now restricted to Jawai-Dam in Sirohi district at the foot hills of Aravali. It is evident from the records that these two aquatic

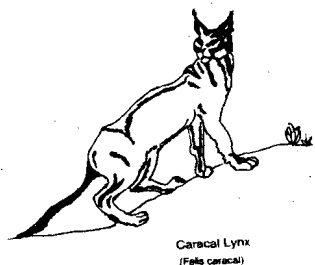


Fig. 7.2 Caracal Lynx  
(Felis Caracal)



Fig 7.3 Great Indian  
Bustard

reptiles are near extinction due to poaching and habitat destruction. The large terrestrial reptile, the rock python found on the foot hills of Aravali is also vanishing from the desert.

Thus, looking at the past history of Thar desert, we see that a large number of animals have either vanished or are at the verge of extinction due to overexploitation of natural resources by human beings leading to destruction of the habitat of animals.

**II) Plants :** Ecologically, vegetation of the major part of Thar desert region falls under the category of 'thorn forest type'. However, the natural vegetation cover has become progressively transformed due to prolonged and intense human interference. Much of the area has come under agro-pastoral system and even natural green cover is much less than that permitted by the soil-climate conditions. Nevertheless, natural vegetation makes a substantial contribution to the productivity of trees like **Khejri** which are highly valued and conscientiously maintained. There are as many as 700 species of plants amongst which grasses alone account for 107 species. Large-scale destruction of natural vegetation from this part of the country is due to heavy pressure of overgrazing by livestock, making the plant regeneration process in the desert very difficult. The desertification has adversely affected vegetation in terms of canopy cover, above ground biomass distribution and frequency of key species leading to the extinction of many plant species.

#### SAQ 5

Fill in the blanks using appropriate words :

- Extensive irrigation, ....., ....., ....., cultivation on marginal lands, excessive ..... and other ..... uses of natural resources have adversely affected physical environment in the Rajasthan desert.
- Like other biotic components, the wild animals also require an environment that provides living and ..... space, right type of ..... for growth and better chances of ..... from enemies.
- A large number of animals in the Thar desert have either vanished or are at the verge of .....

## 7.5 ENVIRONMENTAL PROTECTION

The conservationists and the economists should now set up mutually compatible goals and aspirations so that whatever biological resources exist today are properly managed. For example, instead of extending arable land at the cost of forested area, production per unit area should be increased by adopting improved scientific methods and proper environmental strategies. The endeavour should be towards sustainable development in which neither a resource is indiscriminately depleted nor has mankind to go without making appropriate use of it. Thus, well managed biological resources will be recognised by their extensive species diversity, stable ecosystem and usefulness to mankind while allowing certain level of exploitation without losing the ecological balance.

**Measures taken by the Government of India :** Since 1972, India has banned the export of over a hundred endangered wildlife species. These range from animals like the Andaman wild pig and the mousedeer to birds like the hooded crane and the Nicobar pigeon. Also banned is the export of wildlife products such as ivory and snake skin. But poaching remains a problem because of the great demand for skins, furs of leopard cubs, and feathers of falcons, peacocks and hill mynas.

The USA, Europe and the Gulf countries particularly encourage illegal export. Middlemen hire tribals for a pittance to trap the already rare animals, which are then sold to smugglers. Government has taken several measures to control illegal trade. In 1986, it coordinated anti-poaching measures in Tamil Nadu, Kerala and Karnataka. Officials were provided with sophisticated weapons, speedier vehicles and better communication facilities. This has cut down the number of animals killed from nearly a hundred per year in the late 1970s to around ten in 1980s. Proper policing of rhino sanctuaries in Assam and West Bengal has also led to a rise in the rhino population, from 900 in 1970 to 1,500 in 1984, the latest available figure.

A tradition of respect for all forms of life coupled with an increased awareness about ecological conservation has resulted in 53 national parks and 247 wildlife sanctuaries being

set up all over the country. These have been demarcated by the Government to provide the animals with primal habitat conditions where they can live safely, undisturbed by human greed and insensitivity. A lot more, however, is being done about which you will read in Unit 20 of Environmental Management. In the next unit you will read about the effects of agriculture and use of man made chemicals on natural environment.

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## 7.6 SUMMARY

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In this unit we have tried to review the various causes and effects of overexploitation of biological resources. Also, we have studied the extent to which overexploitation has caused the loss of wild life and affected the physical environment. We have learnt that

- Excessive utilisation of a natural resource without caring to replenish it is called 'overexploitation'.
- Denudation of rich forest is caused by factors like: shifting cultivation, industrialisation, collection of small timber for firewood, demand of wood for paper pulp and commercial timber, and mining operations.
- When a dam is built it not only occupies certain area of good forest directly under it but also initiates a chain of reactions necessitating more and more deforestation in time to come. Similarly, development projects and industrial activities result in a vicious cycle of deforestation followed by further deforestation repeatedly increasing in intensity with each onslaught of the cycle.
- Burning the wood is most wasteful means of utilising the forest produce and developing countries lose a major chunk of their tree wealth in this activity. India is going to face an acute shortage of fuelwood in the year 2000 A.D., especially in states of Punjab, Haryana and Kerala.
- Mining activities cause defacement of earth surface, qualitative and quantitative deterioration of water resources and loss of vegetational cover.
- Shifting cultivation which means slash-and-burn method of cultivation is a very coersive way of cultivation, because it requires 2 to 3 years before the cleared land can recover, after stopping the tilling practice.
- Desertification is a natural phenomenon which is often accentuated by man, through misuse of land, overdraft of water, excessive irrigation and mining in arid zones.
- Hunting of animals for game and skin is called poaching. Trade of skins of various animals in black market has resulted in depletion of populations of lion, elephant and tiger.
- Deforestation and desertification are problems strongly linked to each other, and each one of them arises mainly from exploitative human intervention in natural ecosystems.
- Physical effects of both the above phenomena include removal of top soil, silting of reservoirs, recurrence of floods, indeterminate climate, heat build-up, onset of draught, accumulation of salts in soil and exhaustion of ground water. The sorry state of Thar desert is a glaring example of effects of overexploitation.
- Man sometimes does irreparable damage to his living world by causing total disappearance of certain species from earth. This is an outcome of overexploitation.

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## 7.7 TERMINAL QUESTIONS

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Answer the following questions in 4-5 lines.

- 1) List the major features of desert.

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2) How does deforestation cause alterations in stability of climate of an area ?

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3) What is the effect of desertification on soil and water bodies in Rajasthan.

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4) Name a few areas in Rajasthan which have suffered from desertification.

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5) Match the following sets of statements.

- |   |  |
|---|--|
| a) Elephants once found all over India  | a) can live safely, undisturbed by human greed and insensitivity.                  |
| b) Many Himalayan bears   | b) is struggling for its existence today in the Gir forest.                        |
| c) The Asiatic lion which was once found in the plains of Rajasthan. Punjab and Sind in the recent past   | c) has eliminated the rare musk deer from Nepal.                                   |
| d) With a little help from France and Japan   | d) have now disappeared from Andhra Pradesh, Madhya Pradesh and Maharashtra.       |
| e) Fifty three national parks and 247 sanctuaries have been established in India to provide the animals with primal habitat conditions where they | e) have been killed for their gall bladders, which are powdered and sent to Japan. |

## 7.8 ANSWERS

### Self Assessment Questions

- 1) i) interventions  
ii) recover.  
iii) hectares, deforestation  
iv) developing
- 2) i) e)  
ii) hunting, animals  
iii) stability  
iv) black markets
- 3) i) the present rate of deforestation  
ii) enlargement of rock out crops
- 4) i) all of the animals mentioned here are hunted by tiger  
ii) a) False

- b) True
- c) True
- 5) a) dryland farming, mining, exploitative
- b) foraging, nourishment, escape
- c) extinction

**Terminal Questions**

- 1) Deserts are characterised by low humidity, poor soil fertility and extremes of temperature. Plants and animals specially adapted to lack of water are found here.
- 2) Forests maintain humidity of an area. When the air is humid not only does less solar heat penetrate to ground during day but also less of it escape to the outer atmosphere during night. This provides seasonal stability to a forested terrain.
- 3) Desertification leads to increased salinisation and alkalinisation of soils, deterioration in water quality, loosening of soil particles and transformation of climate.
- 4) Bikaner, Nagaur, Churu, Pali, Ganganagar, Jaisalmer, Ajmer, Jodhpur, Jalore, Jhunjhunu and Nagaur districts are particularly suffering from desertification in Rajasthan.

5) Left Side

Answers

- |    |    |
|----|----|
| a) | d) |
| b) | e) |
| c) | b) |
| d) | c) |
| e) | a) |