Land use Change

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Land use change is a process which transforms the natural landscape by direct human-induced land use such as settlements, commercial and economic uses and forestry activities. It impacts the overall environment in terms of greenhouse gas emission, land degradation and climate change.

- Land use change promotes zoonoses like Covid-19 as the interaction and physical distance between animals and humans get closer.
- Land use change can be a factor in CO2 (carbon dioxide) atmospheric concentration, and is thus a contributor to global climate change.
- It represents almost 25% of total global emissions.
- According to the Intergovernmental Panel on Climate Change (IPCC) report on climate change and land, agricultural land for food, animal feed and fibre is behind the land use change.
- According to the United Nations Convention to Combat Desertification (UNCCD), the land use change, which prepares the ground for zoonoses like Covid-19, should be reversed.

Analysis

The ‘Global Resources Outlook 2019,’ a major global report on the status and trends of natural resource use and management, was released during the fourth session of the UN Environment Assembly (UNEA-4). The report shows that we are ploughing through this planet's finite resources as if there is no tomorrow, causing climate change and biodiversity loss along the way. By 2010, land-use changes had caused a loss of global species of approximately 11 percent. The report calls for an urgent systemic reform of resource use, to go beyond resource efficiency.

Introduction

- Land is a crucial natural resource and an important determinant of a country’s socioeconomic and ecological health. Given the finite supply of land resource, sustainable use and management of land resources is a necessity for the wellbeing of people of a country.
- Land-use change has broad lines of impact, with a potential for influencing economic growth, quality of life, management of environmental resources and national food supply.
- Land-use change takes place through human activity in several ways. For example, in Indonesia, about 500 sq km of forest area are cleared each year, much of which is replaced with oil palm plantations.
- Another pattern of changing land use is seen in expanding cities. In many countries, including India, cities are expanding well beyond their formal limits, either along intercity corridors or in other directions. The specific patterns of urban growth of a city and its periphery have implications for poverty, food, water, health, jobs and access to services.
- Various forces shape these patterns of urbanisation, transforming land use from
agriculture and forests into industry, residential and commercial buildings and associated infrastructure and horticulture.

- Often the contested spaces of peri-urban areas (outside city limits but not quite part of the rural hinterland) become sites from which groundwater is pumped and transported to the city, where new industrial zones are developed, where urban waste is dumped and where vegetables and other high-value crops are grown for nearby urban centres.
- Interventions like converting agricultural land for housing or industry, filling up ponds and building housing complexes on lake beds, etc. impact ecosystem services and climate adaptation.
- These especially affect the poor who are largely reliant on ecosystems for their livelihoods.

### Changing Land use Pattern in India

Land-use in a region, to a large extent, is influenced by the nature of economic activities carried out in the region. However, while economic activities change over time, land, like many other natural resources, is fixed in terms of its area. At this stage, one needs to appreciate three types of changes that an economy undergoes, which affect land-use.

India has undergone major changes within the economy over the past four or five decades and this has influenced the land-use changes in the country, these changes between 1960-61 and 2008-09 have been shown in figure. There are two points that we need to remember before we derive some meaning from this figure. Firstly, the percentage shown in the figure has been derived with respect to the reporting area. Secondly, since even the reporting area has been relatively constant over the years, a decline in one category usually leads to an increase in some other category.

While some categories have undergone increases, some have registered declines. Share of area under forest, area under non agricultural uses, net sown area and current fallow lands have shown an increase. The following observations can be made about these increases:

1. **The rate of increase is the highest in case of area under non-agricultural uses.** This is due to the changing structure of Indian economy, which is increasingly depending on the contribution from industrial and services sectors and expansion of related infrastructural facilities. Also, an expansion of area under both urban and rural settlements has added to the increase. Thus, the area under non-agricultural uses is increasing at the expense of wastelands and agricultural land.

2. **The increase in the share under forest,** can be accounted for by increase in the demarcated area under forest rather than an actual increase in the forest cover in the country.

3. **The trend of current fallow fluctuates a great deal over years, depending on the variability of rainfall and cropping cycles.** The categories that have registered a decline are barren and wasteland, culturable wasteland, area under pastures and tree crops. The possible explanation can be:

As the pressure on land increased, both from the agricultural and non agricultural sectors, the wastelands and culturable wastelands have witnessed decline over time. The decline in land under pastures and grazing lands can be explained by pressure from agricultural
land. Illegal encroachment due to expansion of cultivation on common pasture lands is largely responsible for this decline.

Interaction between Land Use Pattern and Climate Change

Land use and land use changes can significantly contribute to overall climate change. Vegetation and soils typically act as a carbon sink, storing carbon dioxide that is absorbed through photosynthesis. When the land is disturbed, the stored carbon dioxide—along with methane and nitrous oxide—is emitted, re-entering the atmosphere. Carbon dioxide, methane and nitrous oxide are greenhouse gases, which contribute to global warming. The clearing of land can result in soil degradation, erosion and the leaching of nutrients; which can also possibly reduce its ability to act as a carbon sink. This reduction in the ability to store carbon can result in additional carbon dioxide remaining in the atmosphere, thereby increasing the total amount of greenhouse gases.

There are two types of land use change: direct anthropogenic (human-caused) changes and indirect changes. Examples of anthropogenic changes include deforestation, reforestation and afforestation, agriculture and urbanization. Indirect changes include those changes in climate or in carbon dioxide concentrations that force changes in vegetation. A 2002 NASA study argued that human-caused land surface changes in areas like North America, Europe and Southeast Asia redistribute heat within the atmosphere both regionally and globally. On a global scale, carbon dioxide emissions from land use changes represent an estimated 18% of total annual emissions; one-third of that from developing countries and over 60% from the lesser developing countries.

The effect of land use on the climate primarily depends on the type of land cover present within an area. For example, if rainforest is removed and replaced by crops, there will be less transpiration (evaporation of water from leaves) leading to warmer temperatures in that area. On the other hand, if irrigation is used on farmland, more water is transpired and evaporated from moist soils, which cools and moistens the atmosphere. The additional transpiration can also affect levels of precipitation and cloudiness in an area.

In regions with heavy snowfall, reforestation or afforestation would cause the land to reflect less sunlight, resulting in the absorption of more heat on the land. This would, in turn, result in a net warming effect despite the removal of carbon dioxide from the atmosphere through the process of photosynthesis during the growing season. Additional reforestation could increase transpiration, leading to more water vapor in the air. In the troposphere, water vapor is considered to be the biggest greenhouse gas contributor to global warming.

Urbanization is another change in land use that can affect the climate, sometimes significantly. Local climates tend to be warmer due to the increased amount of heat released within a densely populated area. Average temperatures in city centers can increase even more due to the high density of construction materials such as pavement and roofing materials since they tend to absorb, rather than reflect, sunlight. The phenomenon of higher urban temperatures, compared to lower temperatures in the surrounding rural areas, is known as the urban heat island effect. Forestry and land use practices hold considerable potential for counteracting the effect of greenhouse gas emissions, helping to prevent significant climate change. These practices include focusing on planting
trees, preserving and properly managing forests and changing cultivation practices to account for increased carbon storage in the soil. Such practices could make it possible to increase carbon sinks while further reducing the emission of greenhouse gases.

**United Nations Convention to Combat Desertification**

Established in 1994, the United Nations Convention to Combat Desertification (UNCCD) is the sole legally binding international agreement linking environment and development to sustainable land management.

- It is the only convention stemming from a direct recommendation of the Rio Conference’s Agenda 21.
- **Focus Areas:** The Convention addresses specifically the arid, semi-arid and dry sub-humid areas, known as the drylands, where some of the most vulnerable ecosystems and peoples can be found.
- From India, the Ministry of Environment, Forest and Climate Change are the nodal Ministry for this Convention.