ENVIRONMENTAL SCIENCE AND SUSTAINABILITY

Unit – 1 ENVIRONMENT AND BIODIVERSITY

Introduction to biodiversity

- Biodiversity is all the different kinds of life you'll find in one area—the variety of animals, plants, fungi, and even microorganisms like bacteria that make up our natural world. Each of these species and organisms work together in ecosystems, like an intricate web, to maintain balance and support life. Biodiversity supports everything in nature that we need to survive: food, clean water, medicine, and shelter.

Values of biodiversity

- Biodiversity is commonly defined in terms of species or groups of independent living organisms that can produce offspring. Marine mammals, fair-skinned deer, pine forests, fresh flowers, and micron-sized bacteria that cannot be seen with the naked eye are some of the examples of species that inhabit the earth.

- Biodiversity has fundamental values, which can be categorised into:

1. Environmental values

2. Social values

3. Ecosystem services

4. Economic values

5. Value of consumptive use

6. Value of productive use

7. Moral and ethical values

8. Aesthetic values

- **1. Ecosystem values**: The environmental values of biodiversity can be evaluated by ana functions of the ecosystem. Ecosystem services, such as intensive agricultural production ecosystems, help in maintaining human needs and activities. These include the establishment and maintenance of fertile soil, retention of fresh groundwater resources through vegetation and the output of oxygen by ground plants and microalgae.

- **2. Economic Value:** Biodiversity has a tremendous economic perspective on food, livestock feed, medicative, ethical, and social ideals. Biodiversity is an important resource for many industry sectors that regulate the world economy.

- **3. Consumptive use value**: This refers to natural products that are used for food, such as livestock feed, wood products, fuelwood, and other purposes. Humans consume 40,000 flora and fauna species daily. Many people remain dependent on wildlife for the majority of their necessities, such as nutrition, temporary housing, and clothing.

- **4. Productive Use Value:** This implies products that are sourced and commercially marketed. Almost all of the crops grown today have evolved from wild varieties. Biotechnologists are continuously experimenting with wild plant species to create new, more productive disease-resistant variants.

- **5.Ethical and Moral Value:** Biodiversity has enormous economic potential in terms of food, livestock feed, medications, etc. Biodiversity is vital for many areas of the economy.

- **6.Aesthetic Value:** The beauty of our planet is due to biodiversity. Otherwise, it would have looked like any other deserted planet, which is scattered throughout the universe. Biological diversity enhances the quality of life and contributes significantly to some of nature's most beautiful aspects. Biodiversity makes a significant contribution to the gorgeousness of the landscape.

threats to biodiversity

- So what's causing this biodiversity crisis?
- Climate change
- Pollution
- habitat loss
- overexploitation of species and invasive species

have been identified as the five major threats to biodiversity, globally.

Climate change

- Climate change is shifting ecosystems, the services they provide, and the imperiled species they support, threatening their continued health and survival.
- For example: melting ice is cutting off polar bear access to critical food sources and warming waters contribute to the disappearance of coral reefs.
- Climate change can also exacerbate droughts, drying out the habitats of species like the Sonoyta mud turtle. These are just the tip of the (melting) iceberg when it comes to the detrimental and irreversable affects climate change might have.

Overexploitation of species

- Humans have a long history of overhunting species to the point of extinction.
- In the 17th and 18th century the dodo and Steller's sea cow were hunted out of existence and many know the story of how the passenger pigeon went from the most abundant bird in North America to disappearing forever in 1914 due to large-scale harvesting.
- Many don't realize, however, that the iconic southern sea otter nearly met the same fate, and now only occupy 13 percent of their historical range. Nearly a fifth of all Endangered Species Act-listed species are at risk of overexploitation.

Pollution

- Air pollution, water pollution, soil pollution among others are all ubiquitous across the globe and nature is paying the price. A startling statistic underscoring the wide-reaching affects of pollution is that more than 430 species at the time of their listing under the **Endangered Species Act** were described as being significantly impacted by pollution.
- Marine plastic pollution alone has increased tenfold since 1980, affecting at least 267 species, including sea turtles, seabirds, and many marine mammals.

Habitat loss

- According to the United Nations Environment Programme, more than 1,621,629 square miles of forest habitat has been lost since the 1990's.
- Habitat loss in general is estimated at two football fields per minute. Eighty percent of Endangered Species Act-listed species are impacted by habitat loss.

Invasive Species

- Invasive species have been a factor in the decline of more than 40 percent of species listed under the Endangered Species Act and can cause damages on average of $20 billion per year in the US.
- Many of the other drivers of the biodiversity crisis have allowed nearly one-fifth of the Earth's surface to be at risk of invasion from non-native species.

  Invasive species are expected to increase by 40 percent by 2050.