

## 5. Climate Crisis and Ecological Restoration

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#### **Abstract:**

*The climate crisis causes potential changes to ecosystems. Fossil fuel burning, deforestation, and livestock farming contribute to a raised level of greenhouse gases that increase the atmospheric temperature. The excess temperature results in global warming. Ecological restoration includes forest revitalization and degraded land rehabilitation. The ecological degradation caused by anthropogenic activities the ecosystem conservation and restoration practices needs to mitigate the climate change and its impact. Climate change raises the temperature, promotes drought in agricultural land, induces fire over the forest, causes a negative impact on photosynthetic activity, and unbalances carbon storage. Ecological engineering with the scientific principle for long-term sustainability is far better than unscientific restoration practices that cause adverse effects on the ecosystem. The ecological restoration design needs to incorporate nature's demands i.e., maintain biodiversity and promotion of indigenous species during restoration practices, for long-term sustainability. This chapter consisted of the principle and strategies behind climate change and ecological restoration in the Indian context along with relevant acts passed by the government in India.*

#### **5.1 Introduction:**

The climate crisis is a key concern related to environmental safety. The major climate crisis-related issues are greenhouse gases mediated temperature fluctuation, droughts, and tropical storms in the ocean. All of them are consequences of temperature elevation due to environmental pollutants.

The climate crisis damaged the ecosystem hence the concept of ecosystem revival came into the picture. Ecological restoration (ER) ensures biodiversity resilience and helps to revive the ecosystem. Historically, World Environment Day (WED) was first announced in 1972 at Stockholm Conference under General Assembly of United Nations (also called *UNGA*), and later first theme broadcast was "Only One Earth" in 1974 on the occasion of WED. Ecosystem Restoration was the theme of WED in 2021. The prime focus of ER is to recreate

and accelerate ecosystem recovery. The ER practice is interconnected with natural resource conservation. Some authors raised the question about the restoration program's outcome and enforce the importance of people's awareness and discipline over ER rather than making sophisticated restoration strategies. Society for Ecological Restoration (SER) makes policy for ER and scientifically works to implement it for sustainable biodiversity, improve climate, and ensure a healthy relationship between nature and socio-culture aspects.

Empirical research on ER has been conducted to assess the restoration measures to accomplish the set goals. The SER focused on a practical approach for ER. They define the type of ecology where the restoration could be applied viz., damaged, degraded, or destroyed ecosystem under the attribute of abundance, vegetation, diversity, and ecological framework as indicators of the ecosystem. The degree of ER is measured underneath the ecological, economic, and social range set under the ER indicators based on empirical assessment.

## **5.2 Principle of Climate Crisis and Ecological Restoration:**

The exhaustive burning rate of fossil fuels increases the greenhouse gas in the environment, deforestation reduces the floral density and diversity that balance the excessive carbon dioxide emission from burning fossils, and excessive livestock farming i.e, cattle are the major reasons behind the climate crisis.

Transportation, oil manufacturing settings, and power plants also contribute to the climate crisis. However, the population increase is forcing such affairs to some extent. The climate crisis further damages biodiversity and ecosystem sustainability. Thereby the concept of Ecological Restoration (ER) has come into existence. ER needs to be well-planned before implementation to get effective results.

The biodiversity includes living organism's viz., humans, bacteria, plants, and animals which contribute to maintaining energy flow in the ecosystem by mutual relationship to ensure a sustainable ecosystem. Biodiversity is categorized into species-diversity, genetic-diversity, ecosystem-diversity, and functional-diversity.

Every ecosystem has its biodiversity components (biotic and abiotic). When anthropogenic activities harm any of those components the entire biodiversity will affect and the degradation of the ecosystem is started. So, protecting biodiversity is the prime importance for living organisms' well-being.

Clean water is then an important aspect for biological cells and the contamination of the aquatic body severely influences the aquatic ecosystem and other related ecosystems. Each network has its environmental condition for growth and reproduction apart from nutrient needs, but due to man-made pollutants destroy the freshness of the environment and also inhibit natural environment restoration mechanisms. Hence, it results in climate change that harshly damages the ecosystem. The other elements of ecological restoration are control of erosion of agricultural land, coastal region, and river sides by wind and water. Reforestation of destroyed forest lands and introduction of native flora and fauna in the ecosystem to revive the sustainable ecosystem.



### **5.2.1 The Effect of Climate Crisis On the Earth's Crust Are as Follow:**

A greenhouse gas raises surface temperature which severely affects the reserved Antarctic ice.

- a. Rising ocean level
- b. More severe ocean storms
- c. More often drought happened
- d. Biodiversity Loss
- e. Ecosystem destruction
- f. Increased health risk to mankind's

### **5.2.2 Strategies to Mitigate Climate Crisis:**

- a. Promotion renewable energy
- b. More research is required on sustainable transport vehicles.
- c. Encourage vegetarian culture and vegan diets
- d. Forestation with a diverse group of plantations to absorb carbon
- e. Protect and conservation of forest region
- f. Mitigate human carbon footprint.

### **Ecological Restoration in India**

Some important wildlife animal restoration has been initiated to meet sustainability in an ecosystem.

### **5.3 Plant Flora and Soil Ecosystem Restoration Strategies for Sustainable Ecosystem:**

India is a country of villages and agriculture is the prime occupation of farmers in India. The agriculture ecosystem is severely affected by the green revolution in India. The green revolution in India was started in the 1960s to increase rice and wheat crop-yielding using

fertilizers to meet the food demand in India against hunger and poverty. M. S. Swaminathan was the architect of the green revolution in India. But after a decade the side effect of using long-term fertilizers came into the picture. To revive the agriculture ecosystem now the scientific communities, suggest three major replacements (a) tillage should be replaced with increasing earthworms' density in crop fields so that the circulate soils better, (b) biofertilizer and biocontrol agents should be used in place of synthetic fertilizers and biocides, (c) crop rotation should be done. The unused government lands should be planted with a diverse group of trees rather than a single type of tree.

The ecological restoration program in India was conducted in National parks, lakes, and dense forests to conserve animals. The major ecological restoration programs of India are as follows:

- a. **Project Tiger:** The Project Tiger was launched in Jim Corbett National Park (Dhikala core region), Uttarakhand, and India by the Ministry of Environment and Forest, Government of India. The objective of Project Tiger was to raise the visible population of tigers in the Jim Corbett National Park. The population of the tiger was drastically mitigated due to the afforestation, timber works, artificial plantation, and hunting and trafficking activities for black marketing of animal products to the international market. The Project tiger was the most efficacious ER project for habitat protection. The Jim Corbett National Park is composed of grassland, dense forest, and hilly areas.
- b. **Project Elephant:** Asiatic elephants migrated toward nearby villages, farmland, and highways due to anthropogenic activities inside the forest. Thereby, the Ministry of Environment and Forest planned ER to protect elephants in their own habitat by spreading awareness among nearby villagers to mitigate anthropogenic activities and maintain peace in their habitat. The "Project Elephant" was first initiated in 1992 at Mysore Elephant Reserve, Karnataka state. Apart from Karnataka, Assam, Arunachal Pradesh, Chhattisgarh, Jharkhand, Kerala, Meghalaya, Odisha, Tamil Nadu, Uttarakhand, Uttar Pradesh, and West Bengal have elephant reserves.
- c. **Project Dolphin:** This project was initiated from Chilika Lake, Odisha by the Ministry of Environment and Forest with the objective of protecting the Gangetic River Dolphin by enriching aquatic ecosystem biodiversity. Chilka Lake Development Authority also works on excessive fishing and prawn culture as well as salinity control.
- d. **Crocodile Conservation Project:** This project was launched by the Government of India to protect the Indian Crocodiles in their habitat and promote their breeding programs.
- e. **UNDP Sea Turtle Project:** The United Nations Development Program launched Sea Turtle Project via the Wildlife Institute of India, Dehradun to conserve the Olive Ridley Turtles in 1999. The project is launched for 10 states of India having coastal regions. The Odisha has actively participated to map out breeding sites and migratory routes for Olive Ridley Turtles and other sea turtles. This project is focused to guard the turtle and increase their mortality rate.
- f. **Snow Leopard Project:** This was initiated in 2009 by the Ministry of Environment Forest & Climate Change to conserve the Snow Leopard in their habitat. Snow Leopard is marked as 'Vulnerable' by International Union for Conservation of Nature. The Snow Leopards are inhabiting over the Arunachal Pradesh, Jammu, Kashmir, Sikkim, and Uttarakhand.
- g. **Hangul Project:** This project was the joint venture of the Jammu and Kashmir Government, the International Union for Conservation of Nature, and the World

Wildlife Fund which was initiated in 1970 to protect the Hangul (Red stag) and its habitat as well as implemented artificial breeding for them. Their population was noted as more than 5000 in 1900 but they disappear drastically and from 5000 to 150 by 1970. Acts Passed by the Government of India for Ecological Restoration (ER) are depicted in Figure 5.1.



**Figure 5.1: Acts Passed by the Government of India for Ecological Restoration (ER)**

#### 5.4 Conclusion:

The concept of ecological restoration (ER) is three decades old. More than 370 research articles are published in around 70 journals mentioning ecological restoration. The three journals that are solely devoted to ecological restoration are Ecological Restoration, Ecological Restoration, and Management Restoration Ecology. ER policy strictly adheres to mitigating environmental degradation and ecosystem recovery. ER has three working areas i.e., soil biology, hydrology, and bio-conservation along with agronomy and forestry.

### **5.5 Further Reading:**

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