Environment & Ecology · GS - III

Define the concept of carrying capacity of an ecosystem as relevant to an environment. Explain how understanding this concept is vital while planning for sustainable development of a region.

EXAM YEAR	PAPER	SUBJECT
2019	GS - III	Environment & Ecology

MARKS	WORD LIMIT
15	~250 words

Answer Hint

Ecological limits; resource availability; regenerative capacity; waste-assimilation capacity; population pressure; land-use planning; tourism management; environmental impact assessment

Model Answer

Introduction

The carrying capacity of an ecosystem is the maximum level of population, resource use or human activity that it can sustain over time without unacceptable ecological degradation. It depends on available resources, ecosystem resilience and the rate at which natural systems regenerate and absorb waste.

Dimensions of Carrying Capacity

- **Ecological:** The ability of ecosystems to maintain biodiversity and essential ecological functions.
- **Resource-based:** The sustainable availability of water, food, energy, land and other resources.
- **Waste-assimilation:** The capacity to absorb or process pollution without serious environmental damage.
- **Social and infrastructural:** The ability of settlements and services to support residents and visitors without unacceptable pressure on living conditions.

Importance in Sustainable Regional Development

1. Land-Use Planning

Carrying-capacity assessments help determine where housing, industries, roads and tourism facilities can be developed safely.

2. Water Management

They identify limits to groundwater extraction and water consumption, helping prevent depletion and conflicts.

3. Biodiversity Conservation

Recognising ecological thresholds protects sensitive habitats, wildlife corridors and ecosystem services.

4. Tourism Regulation

In fragile mountain and coastal regions, visitor limits and infrastructure planning can reduce waste, erosion and overcrowding.

5. Pollution Control

The concept helps establish pollution limits consistent with the assimilative capacity of rivers, lakes and airsheds.

6. Climate Resilience

Planning within ecological limits reduces pressure on natural buffers such as wetlands, forests and coastal dunes.

7. Informed Environmental Assessment

Carrying-capacity studies can complement environmental impact assessments and guide cumulative-impact evaluation.

Examples

Excessive tourism and construction in ecologically fragile Himalayan areas, or groundwater over-extraction in water-stressed regions, illustrate the consequences of exceeding local environmental limits.

Conclusion

Carrying capacity is a planning guide, not a single fixed number. Integrating scientific assessment, local knowledge and periodic monitoring can align development with ecological resilience and intergenerational equity.