Ecological Carrying Capacity

Mains: *GS3 – Economic Development | Inclusive growth and issues arising from it.*

Why in News?

The Joshimath disaster in 2023 highlights the urgent need to address carrying capacity in fragile ecosystems and increased awareness of the consequences of unplanned development in mountain regions.

Why carrying capacity is important than sustainability?

- **Sustainability** – It is a process that begins with subsistence, leads to surplus, and results in sharing resources.
- **Issues with sustainability** - It is defined based on convenience rather than true ecological balance or resource repayment.
- Projects labeled as sustainable may not genuinely adhere to ecological principles and often misunderstood.
- **Carrying capacity** – This term was introduced by the Western world, especially in the 1970s, when American ecologists began to use it.
- It refers to the *maximum level of resource exploitation an environment can sustain* without negative consequences.
- ***Environmental thresholds*** refer to critical points in an ecosystem where slight changes can trigger significant negative impacts.
- Ignoring these can lead to consequences like habitat destruction and increased vulnerability to natural disasters.
- **Importance of carrying capacity** – It gained mainstream attention due to systemic breakdowns in human settlements, particularly following the Joshimath disaster.
    - **For example**, Joshimath is a small village on top of a fragile mountain whose unplanned development led to severe consequences.

How developments are related to disasters?

- **Causes** – *Unplanned and hasty infrastructure projects* are often undertaken without thorough environmental assessments.
- When ecological debt is not repaid, it results in diminished natural buffers against disasters, making communities more susceptible to catastrophic events, such as landslides or flash floods.
    - **For example**, development projects in Uttarakhand contributed to over-extraction of resources like timber, water, & minerals that led to the degradation of forests & water bodies.

Ecological debt *refers to the cumulative impact of resource exploitation exceeding the planet's regenerative capacity.*

- Utilizing *construction techniques that do not align with local climatic and soil conditions* can destabilize foundations and infrastructure, increasing the likelihood of structural failures during adverse weather.
- *Rapid urbanization without adequate planning* can lead to over-concentration of populations in vulnerable areas, thereby increasing disaster risk.
    - **For example**, unregulated tourism and urban sprawl in areas like Shimla and Mussoorie are closely linked to increased landslide incidents.
- **Induce natural disasters –** These developments leads to soil destabilization, increased runoff, and reduced natural drainage, increasing the risk of landslides and flooding during heavy rains.
- It is showcasing the link between construction practices and ecological vulnerability.
    - *Himachal Pradesh frequently faces landslides and flash floods* due to the combination of deforestation, soil erosion, and the alteration of natural watercourses.

Impacts of Unplanned Infrastructure in Delhi's Neighborhood
• Delhi city is collapsing under the pressure of heavy traffic and overpopulation. • Life in the city is increasingly difficult, with basic services and health under constant threat. • Studies reveal that air pollution is a leading cause of child mortality in Delhi. • Groundwater is heavily contaminated with harmful chemicals. • The Yamuna River, once a lifeline, is now one of the dirtiest rivers.

Why carrying capacity is relevant in Western Himalayan States?

- **Western Himalayan states** – In India, it includes Himachal Pradesh, Uttarakhand and Union Territory of Jammu & Kashmir and Union Territory of Ladakh.
- **Fragility** – The mountainous terrain of the Western Himalayas is inherently fragile, with ecosystems that are *sensitive to changes*.
    - **For instance**, landslides, soil erosion, and deforestation are prevalent issues, emphasizing the vulnerability of these regions to human impact.
- **Marginality –** Inaccessibility in mountain regions limits development and access to essential services, reinforcing fragile ecosystems' low carrying capacity and amplifying the risk of resource overexploitation and ecological degradation
- **Policy issues** – Governments prioritized connectivity and economic growth *without sufficient regard for sustainable practices*, leading to ecological degradation and social inequities.
- Historically, infrastructure development in these regions has taken precedence over ecological considerations.

Himachal Pradesh	It has encountered numerous natural disasters due to reckless development.
Jammu & Kashmir	It has been stunted by socio-political issues.

Uttarakhand	It has experienced repeated catastrophes due to a combination of environmental negligence and rapid urbanization.

What lies ahead?

- Reassess carrying capacity in ecologically sensitive areas can be done.
- Future policies prioritizing ecological balance and community are needed to prevent further disasters.
- Recommendations from expert committees could be acted upon to guide sustainable development.

Reference

Down To Earth| Ecological Carrying Capacity

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