4. Invasive Alien Species - Environment

Conservation scientists warn that invasive alien species are destroying local biodiversity and habitats in India.

Invasive Alien Species (IAS) - Overview

Definition - Invasive alien species (IAS) are organisms introduced, either accidentally or intentionally, into regions outside their natural range.

Intentional introductions - For ornamental purposes (plants), aquaculture (fish), land restoration, or erosion control.

Accidental introductions - Via shipping, ballast water discharge, trade of live organisms, or contaminated agricultural products.

Key Characteristics of IAS -

1. Lack natural predators, competitors, or pathogens in the new environment.
2. Rapid reproduction and growth allow them to spread extensively.
3. Outcompete native species for resources such as light, nutrients, and space.
4. Alter habitats, food webs, and ecosystem functioning, leading to biodiversity loss.

Ecological and Socioeconomic Impacts -

1. Biodiversity Threat - Can cause local or global extinctions by displacing endemic species.
2. Habitat Degradation - Change soil chemistry, hydrology, or forest structure.
3. Economic Loss - Affect agriculture, fisheries, forestry, and water resources.
4. Health Hazards - Some species, like Parthenium, cause allergies or toxicity to humans and livestock.

Common Invasive Alien Species in India

Species	Type	Impacts
Lantana camara	Terrestrial plant	Invades forests and grasslands, forms dense thickets, outcompetes native flora, hinders forest regeneration.
Parthenium hysterophorus (Congress grass)	Terrestrial plant	Colonizes farmland and wastelands; toxic to livestock; causes skin allergies and respiratory problems in humans.
Eichhornia crassipes (Water hyacinth)	Aquatic plant	Chokes rivers, lakes, and wetlands; reduces dissolved oxygen; affects fisheries and water transport.
African Catfish (Clarias gariepinus)	Aquatic fish	Highly predatory; outcompetes native fish; disrupts aquatic food webs; threatens indigenous biodiversity.
Prosopis juliflora	Terrestrial tree/shrub	Invades arid and semi-arid lands; affects soil fertility; displaces native vegetation.
Pomacea canaliculata (Golden apple snail)	Aquatic snail	Damages rice fields and wetlands; spreads rapidly; affects agricultural livelihoods.

Pathways of Introduction

Intentional Introduction - Ornamental plants and flowers for landscaping. Aquarium fish or exotic pets. Afforestation, soil erosion control, or land reclamation projects.

Unintentional Introduction - Contaminated crop seeds or nursery plants. Ballast water from ships carrying larvae or seeds. Timber, soil, and machinery transporting seeds, spores, or insects.

Impacts of Invasive Alien Species

Ecological Impacts -

1. Displacement of native species and local extinctions.
2. Loss of pollinators or keystone species.
3. Alteration of soil chemistry, hydrology, and fire regimes.
4. Disruption of food webs and ecosystem services.

Economic Impacts -

1. Reduced crop yields and fisheries productivity.
2. Increased costs for removal and control programs.
3. Loss of revenue from tourism in affected ecosystems (e.g., lakes clogged by water hyacinth).

Health Impacts -

1. Allergic reactions and toxicity from invasive plants like Parthenium.
2. Vector habitat creation for diseases (e.g., waterborne mosquitoes in water hyacinth-infested wetlands).

Control and Management Measures

1. Prevention

Quarantine Measures - Stricter controls on imports of plants, animals, and soil. Screening live organisms for invasive potential.

Ballast Water Management - Treating or exchanging ballast water in ships to prevent marine invasions.

Public Awareness - Educating stakeholders and local communities about risks of IAS.

2. Control Methods

Biological Control -

Introducing natural predators, pathogens, or parasites to target invasive species.

Example - Specific insects released to control Lantana camara.

Pros - Cost-effective and environmentally friendly.

Cons - Requires careful research to avoid non-target effects.

Mechanical Control -

Manual removal, cutting, dredging, or uprooting.

Effective for localized infestations but labor-intensive.

Chemical Control -

Herbicides or pesticides applied selectively.

Must be used cautiously to avoid ecological damage and contamination.

3. Eradication and Ecosystem Restoration

Early Detection and Rapid Response (EDRR) - Quick identification and containment of new infestations.

Restoration Measures - Reintroduction of native species post-removal. Rehabilitation of degraded habitats to restore ecological balance.

4. Policy and Institutional Support - National Biodiversity Authority (NBA) and State Biodiversity Boards oversee control of IAS. Biodiversity Act, 2002 provides legal framework for managing alien species. Integration with forest, agriculture, fisheries, and water resource departments ensures multi-sectoral coordination.

Best Practices and Recommendations

Integrated Management Approach - Combine biological, mechanical, chemical, and policy measures.

Community Participation - Involve local communities in removal and monitoring programs.

Research and Monitoring - Maintain databases on invasive species, monitor spread, and assess ecological impacts.

International Cooperation - Exchange knowledge with countries managing similar IAS issues.

Restoration Ecology - Prioritize re-establishment of native biodiversity after invasive species removal.

Conclusion

Invasive alien species are one of the major threats to biodiversity, agriculture, water systems, and human health in India. Prevention remains the most cost-effective and sustainable strategy. Early detection, combined with biological, mechanical, and chemical interventions, can minimize ecological and economic losses. Long-term success depends on integrated policy frameworks, community engagement, and continuous monitoring, ensuring the protection of India's native ecosystems and biodiversity heritage.

Source - https - //www.thehindu.com/sci-tech/energy-and-environment/indias-invasive-aliens-problem-complicates-wait-to-understand-scope/article70139073.ece


P. L. RAJ IAS & IPS ACADEMY
SINCE 2006
MAKING YOU SERVE THE NATION