Invasive Alien Species

For Prelims: Invasive Alien Species, Biodiversity, Water hyacinth, Kunming-Montreal Global Biodiversity Framework, Convention on Biological Diversity, Convention on the Conservation of Migratory Species, Convention on International Trade in Endangered Species of Wild Fauna and Flora.

For Mains: Factors Responsible for Rising Invasive Species, Impact of Invasive Species & Strategies to Mitigate them.

Source: TH

Why in News?

A recent study estimates that the **global economic cost** of **Invasive Alien Species** (1960–2022) exceeds **USD 2.2 trillion**, with **management costs** underreported up to **16 times**.

- For India, the study highlights a **hidden cost discrepancy of 1.16 billions of times** higher than reported figures indicating **gross underestimation of financial and administrative measures** to manage **invasive species.**

What are Invasive Alien Species?

- **About: Invasive Alien Species** are **non-native organisms (plants, animals, fungi, or even microbes)** introduced beyond their **natural range**, forming **self-sustaining populations**.
  - They **outcompete native species**, **disrupt ecosystems**, and cause significant **ecological, economic, and social impacts**.
  - According to the **Convention on Biological Diversity (CBD)**, IAS are species that can **"arrive, survive, and thrive"**, often **outcompeting native species** for resources.
  - In India, the **Wildlife Protection Act, 1972** defines IAS as **non-native species** that **threaten wildlife or habitats**.
- **Key Invasive Alien Species in India: Animal species like African catfish, Nile tilapia, red-bellied piranha, alligator gar,** Red-eared Slider **(a North American turtle) and plants like Lantana, Water Hyacinth, and Prosopis juliflora, are among the most widespread invasive species in India.**
- **Factors Responsible for the Rise of Invasive Alien Species:**
  - **Globalisation-Linked Dispersal: Increased trade and travel** facilitate unintentional spread of species via **cargo, ballast water, and transport vehicles**.
    - For instance, the **Black Rat**, introduced to Australia in the 1800s, is listed among the **"World's Worst" invasive species** by the IUCN.
    - Also, the **Zebra mussel,** native to Eurasia, was introduced to the **Great Lakes of North America** via the **ballast water of cargo ships**.
  - **Climate-Driven Proliferation:** Changes in **temperature and precipitation** create favourable conditions for invasive species and **disrupt native species' life**

cycles, making them vulnerable to competition and predation.
        - **Eg:** Warmer conditions accelerate spread of **invasive insects**, **cinnamon fungus**, and **aquatic species** (fish, mollusks), intensifying **competition** and **predation** on native species.
    - **Habitat Disturbance and Degradation:** Human activities that **disturb or degrade natural ecosystems**, like **deforestation, urbanization, and agriculture,** can create opportunities for invasive species to colonize.
        - **Eg: Parthenium hysterophorus**, commonly known as **carrot grass**, thrives in **disturbed habitats like roadsides and agricultural fields**. Its presence is often a sign of environmental degradation.
    - **Human Introduction of Exotic Species:** Across the world, many invasive alien species have been deliberately introduced by humans for purposes such as **ornamental gardening, landscaping, aquaculture, or pest control.**
        - However, these introductions often backfire, as species escape into the wild and outcompete native biodiversity.
        - For instance, **Water hyacinth** or **"Terror of Bengal"** was introduced in India because of its beautiful foliage and flowers.

What are the Key Impacts of Invasive Alien Species?

- **Ecological Impact:** Globally, **Invasive Alien Species** are one of the **5 major direct drivers of biodiversity loss**.
    - They cause the **decline or extinction of native species** through **competition, predation, or disease**, disrupting **ecosystem functions** and leading to **ecological imbalance and habitat loss**.
    - Eg: **Brown tree snake,** accidentally introduced to **Guam after World War II,** has caused significant ecological damage, leading to the **extirpation (local extinction) of many native forest bird species.**
- **Economic Impact:** They impose substantial **financial burdens** on countries and sectors worldwide, affecting **livelihoods** in developing countries by impacting **agriculture, forestry, and fisheries**.
    - Among Invasive Alien Species, **plants** are the most economically damaging, with **management costs of USD 926.38 billion**, followed by **arthropods** and **mammals**.
        - Aquatic species like **Water Hyacinth** in Lake Victoria have led to **tilapia depletion**, impacting local fisheries.
    - **Europe** incurs the highest absolute costs (**71.45% of global expenditure**) due to higher **agricultural values** and **management expenses**.
- **Health Impact:** Invasive Alien Species such as **Aedes albopictus** and **Aedes aegypti** transmit **malaria, Zika, and West Nile Fever**, affecting human health.
    - Many Invasive Alien Species are **allergenic or toxic**, e.g., **Parthenium** causes respiratory disorders and skin allergies.
    - Also, **crop contamination by invasive weeds** also introduces **toxic alkaloids into food chains,** impacting long-term health.
- **Threat Multiplier:** IAS like **Lantana** alter **fire regimes**, displace **native flora**, reduce **carbon sequestration**, and weaken **climate regulation**.
    - Climate change accelerates their spread, making them a **threat multiplier** that undermines **ecosystem resilience** and **adaptation capacity**.

What are the Initiatives Related to the Management of Invasive Alien Species?

- **Global**
    - **CBD (Convention on Biological Diversity):** Urges Parties, including **India**, to **prevent, control, or eradicate alien species** (**Article 8(h)**) and provides **guidelines, priorities, and coordination**.
    - **Kunming-Montreal Global Biodiversity Framework: Target 6** aims to **reduce invasive alien species impacts on biodiversity and ecosystem services by 50% by**

2030.
    - **IUCN Invasive Species Specialist Group (ISSG):** Manages the **Global Invasive Species Database (GISD)** and **Global Register of Introduced and Invasive Species**, providing **information for global IAS management**.
    - **CITES (1975):** Regulates **international trade of wild fauna and flora** to ensure **it does not threaten their survival.**
- **India-Specific Initiatives:**
    - **National Biodiversity Action Plan (NBAP) :** Focuses on **prevention and management of invasive species**.
    - **National Action Plan on Invasive Alien Species (NAPINVAS) :** Launched by **MoEFCC**, emphasizes **prevention, early detection, control, and management** of **invasive species**.
    - **National Invasive Species Information Center (NISIC):** Provides **information, resources, and awareness** on **invasive species** in India.
    - **Plant Quarantine Order, 2003:** Administered by **Department of Agriculture and Cooperation (DAC)**, regulates **import of plants and plant material** to prevent **invasive species** introduction.

What are the Core Challenges Confronting India in Tackling Invasive Alien Species and the Measures Required?

Challenges	Way Forward / Management Strategies
Underreporting & Lack of Data: Limited centralised databases and fragmented reporting lead to **underestimation of ecological and economic costs.**	**Strengthening Data & Monitoring Systems: Establish a centralised database for invasive species**, strengthen data collection, monitoring, scientific documentation, and expenditure tracking.
Resource Constraints: Limited financial and human resources hinder effective surveillance, control, and eradication.	**Allocating Dedicated Resources: Allocate dedicated funding** and enhance human resources, ensure surveillance, control, and eradication programs are adequately supported
High Eradication Costs: Large-scale removal of invasive species (e.g., Lantana, Prosopis) requires **huge financial and human resources.**	**Community-Centric Solutions:** Adopt **cost-effective biological control methods**; promote **community participation** in eradication drives. ▪ For instance, the **Kadar tribe of Vazhachal, Kerala,** has taken on **active restoration of natural forests degraded by invasive alien species.**
Policy Gaps: Fragmented coverage under **Biodiversity Act, 2002, Wildlife Protection Act, and Plant Quarantine Rules.** Weak enforcement of existing biosecurity norms	**Institutional and Policy Fortification:** Ensure **effective operationalisation of the Biological Diversity Act, 2002 t**hrough **stricter enforcement, robust institutional coordination**, and integration with sectoral policies. ▪ Enhance coordination among MoEFCC, State Forest Departments, agricultural universities, and research bodies. ▪ Mainstream invasive species management into **National Action Plan on Climate Change (NAPCC)** and related biodiversity policies.

Conclusion:

Mitigating Invasive Alien Species requires the three **I's – strong Institutions for enforcement, Integration with biodiversity–climate strategies, and Involvement of communities for sustainable action.** Together, these pillars can balance ecological resilience with economic growth.

Drishti Mains Question:

What are the challenges in managing invasive species and suggest strategies and initiatives to mitigate their adverse effects?

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Prelims

Q. With reference to the International Union for Conservation of Nature and Natural Resources (IUCN) and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which of the following statements is/are correct? (2015)

1. IUCN is an organ of the United Nations and CITES is an international agreement between governments.
2. IUCN runs thousands of field projects around the world to better manage natural environments.
3. CITES is legally binding on the States that have joined it, but this Convention does not take the place of national laws.

Select the correct answer using the code given below:

(a) 1 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

Ans: (b)

Mains:

Q. How does biodiversity vary in India? How is the Biological Diversity Act, 2002 helpful in conservation of flora and fauna? (2018)