PLUTUS IAS

CURRENT AFFAIRS

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INVASIVE ALIEN SPECIES

THIS ARTICLE COVERS 'DAILY CURRENT AFFAIRS' AND THE TOPIC DETAILS OF "INVASIVE ALIEN SPECIES ". THIS TOPIC IS RELEVANT IN THE "ENVIRONMENT AND ECOLOGY" SECTION OF THE UPSC CSE EXAM.

WHY IN THE NEWS?

In 2024-2025, the Kerala government's decision to grant permission to the Kerala Forest Development Corporation (KFDC) to plant eucalyptus trees stirred up controversy. Environmentalists swiftly voiced their concerns, arguing that such a move would have **detrimental effects on forests and exacerbate human-animal conflicts i**n the future.

Consequently, on May 20, the government took steps to amend its initial order. The revised directive now strictly limits permission to the **removal of exotic tree species solely from lands under the control** . This adjustment aims to address the environmental and ecological concerns raised by various stakeholders while still allowing the KFDC to pursue its financial objectives within defined parameters.

WHAT ARE EXOTIC PLANTS?

Exotic plants are non-native species that have been introduced to a region or ecosystem where they did not originally occur. These plants are typically brought in deliberately or accidentally by humans, often for **ornamental purposes, agriculture, or landscaping.**
Exotic plants can sometimes thrive in their new environment, **outcompeting native species and disrupting the balance of the ecosystem**. In some cases, they may become **invasive, spreading rapidly and causing harm to the environment, agriculture, or human health**.

Examples of exotic plants include certain species of invasive weeds, ornamental flowers, and agricultural crops introduced to new regions.

WHAT ARE INVASIVE ALIEN SPECIES?

Invasive alien species, often referred to simply as invasive species, are plants, animals, fungi, or microorganisms that are introduced to a new environment and cause significant harm to the ecosystem, economy, or human health.

These species typically thrive in their new environment due to a lack of natural predators, competitors, or diseases that would normally keep their populations in check in their native habitats.

Invasive alien species can outcompete native species for resources such as food, water, and habitat, leading to declines in biodiversity and ecosystem health.

Invasive species are considered one of the greatest threats to biodiversity worldwide and can have severe economic impacts, such as **reducing agricultural yields, damaging infrastructure, and increasing the cost of controlling their populations**.

Examples of invasive alien species include plants like **kudzu and water hyacinth, animals like the cane toad** and **Asian carp, and pathogens like the chytrid fungus,** which has devastated amphibian populations in many parts of the world.

IMPACT OF INVASIVE ALIEN SPECIES

The impact of invasive alien species on ecology can be profound and wide-ranging:

1. **Biodiversity Loss:** Invasive species can outcompete native species for resources such as food, water, and habitat. This competition can lead to a decline in native species populations, potentially resulting in local extinctions and reducing overall biodiversity.
2. **Altered Ecosystem Dynamics:** When invasive species become dominant in an ecosystem, they can disrupt natural ecological processes such as nutrient cycling, pollination, and seed dispersal. This disruption can have cascading effects throughout the ecosystem, affecting the abundance and distribution of other species.
3. **Habitat Degradation:** Invasive species often have high reproductive rates and aggressive growth habits, allowing them to quickly colonize and dominate habitats. This can lead to the degradation or loss of native habitats such as forests, wetlands, and grasslands, further exacerbating the decline of native species.
4. **Changes in Community Structure:** The introduction of invasive species can alter the composition and structure of ecological communities. For example, invasive predators can decimate populations of native prey species, leading to imbalances in predator-prey relationships and ecosystem function.
5. **Genetic Pollution:** Invasive species can hybridize with native species, leading to genetic pollution and loss of genetic diversity within native populations. This can weaken the adaptive capacity of native species to respond to environmental changes and threats.
6. **Increased Vulnerability to Other Threats:** Invasive species can make ecosystems more vulnerable to other stressors such as habitat destruction, pollution, and climate change. By reducing the resilience of ecosystems, invasive species can exacerbate the impacts of these threats on native biodiversity.

Overall, the ecological impacts of invasive alien species can be long-lasting and difficult to reverse. Prevention, early detection, and rapid response are critical for managing and mitigating the effects of invasive species on ecosystems.

Ankit Kumar

SPACE ZERO DEBRIS CHARTER

THIS ARTICLE COVERS 'DAILY CURRENT AFFAIRS' AND THE TOPIC DETAILS OF **" SPACE ZERO DEBRIS CHARTER".** THIS TOPIC IS RELEVANT IN THE "**SCIENCE AND TECHNOLOGY**" SECTION OF THE UPSC CSE EXAM.

Why in the News?

Recently, **Space Zero Debris Charter** was signed by Twelve countries at the ESA/EU Council to make Space activities debris-free by 2030. The twelve nations that have signed the Zero Debris Charter at the ESA/EU Space Council are:
Austria, Belgium, Cyprus, Estonia, Germany, Lithuania, Poland, Portugal, Romania, Slovakia, Sweden, and the United Kingdom.

WHAT IS THE ZERO DEBRIS CHARTER?

- **Charter Principles:** The charter outlines key guiding principles that stress the importance of international collaboration and coordinated efforts to address space debris issues effectively.
- **Goals:** The charter sets ambitious, collaboratively defined goals for zero debris by 2030.
- **Debris Mitigation:** The charter aims to lower the likelihood of space debris creation to less than 1 in 1,000 per object, ensuring that space missions are designed to minimize debris production.
- **Global Collaboration:** The charter highlights the need for worldwide cooperation to facilitate data sharing, coordinated responses, and the pooling of resources and expertise to tackle space debris effectively.
- **Long-term Sustainability:** The charter focuses on maintaining the long-term sustainability of space activities by addressing the escalating problem of space debris and encouraging responsible conduct in space operations.

SIGNIFICANT IMPACT OF ZERO DEBRIS CHARTER

- **Enhanced Safety:** The charter's goal of making space activities debris-neutral by 2030 aims to improve the safety of space missions by minimizing collision risks with space debris, thereby protecting spacecraft, satellites, and astronauts.
- **Sustainability:** Focusing on mitigating space debris, the charter seeks to ensure the long-term sustainability of space activities, keeping orbits viable for future missions and decreasing the chances of uncontrolled re-entries or collisions with debris.
- **Technological Innovation:** The Zero Debris Charter will spur technological advancements in debris mitigation and remediation, leading to the development of sophisticated systems for cleaning up space debris and enhancing the safety of space operations.
- **Global Collaboration:** Emphasizing international cooperation, the charter promotes collaboration among countries and organizations to address the challenges posed by space debris collectively.
- **Cost Reduction:** By lowering the risk of collisions with space debris, the charter aims to reduce costs related to collision avoidance manoeuvres and spacecraft protection, making space missions more economically efficient over time.
- **Preservation of Space Assets:** The Zero Debris Charter seeks to safeguard valuable space assets, such as satellites and spacecraft, from potential damage caused by space debris, ensuring their longevity and functionality for future missions.

MAJOR GLOBAL INITIATIVES TO ELIMINATE THE SPACE DEBRIS

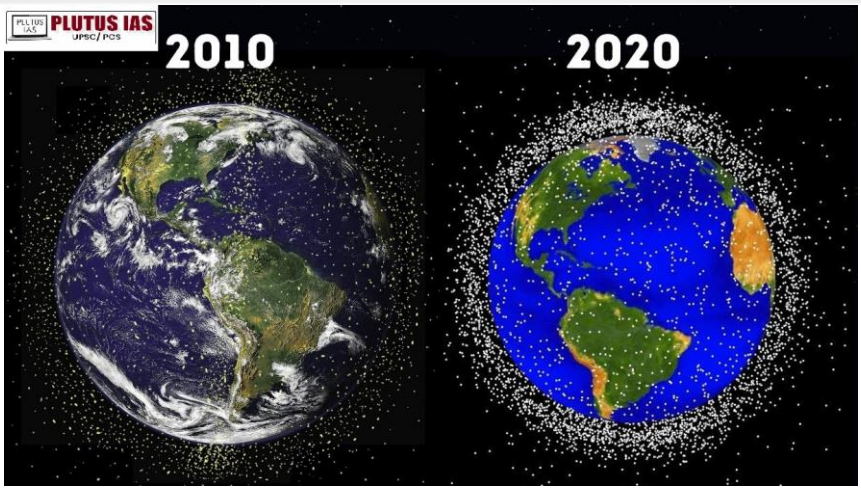
- **Inter-Agency Space Debris Coordination Committee (IADC):** Formed in 1993, the IADC is an international governmental forum that coordinates efforts among spacefaring nations to tackle space debris issues.
- **United Nations Committee on the Peaceful Uses of Outer Space (COPUOS):** COPUOS focuses on creating guidelines for the long-term sustainability of outer space activities, including measures to mitigate space debris.
- **European Space Agency (ESA) Clean Space Initiative:** The ESA's Clean Space Initiative aims to reduce space debris and promote sustainable space activities.
- **Project NETRA:** India's ISRO has developed Project NETRA, an early warning system to detect debris and other hazards to Indian satellites.
- **System for Safe and Sustainable Operations Management (IS 4 OM):** ISRO has established IS 4 OM to monitor objects that pose collision threats continuously, predict space debris's evolution, and mitigate associated risks.
- **Centre for Space Debris Research:** ISRO has set up the Centre for Space Debris Research to monitor and mitigate the threat posed by space debris.
- **Global Commons Perspective:** This approach views space debris as a collective action issue within a global commons, advocating for polycentric governance to

enhance communication among governance nodes, empower lower-level decision-making, and build stakeholder trust.

- **Discourse Network Analysis**: This analysis explores the emerging global socio-technical regime for addressing space debris, emphasizing the need for sustainability in orbit and the development of technological solutions.

IMPACT OF HIGH SPACE DEBRIS

- **Collision Risks:** Space debris heightens the risk of collisions between operational satellites and debris, potentially damaging or destroying satellites. This can lead to substantial financial losses and disruptions in essential services such as communication and navigation.
- **Orbital Congestion**: The accumulation of space debris in certain orbital regions can restrict the availability of desirable orbital slots for new satellites, complicating the launch and operation of new missions.
- **Increased Costs:** Managing space debris increases satellite operational costs due to the need for additional resources for collision avoidance manoeuvres, debris mitigation, and maintenance, significantly raising the overall expense of satellite operations.
- **Reduced Lifespan**: Space debris can damage key components like solar panels, shortening satellites' lifespans. This can lead to premature satellite retirement and increased costs for replacement or repair.
- **Threat to Marine Life:** Large pieces of space debris that fall into the oceans can endanger marine life and contribute to pollution.
- **Impact on Space Situational Awareness:** Space debris can compromise the effectiveness of space situational awareness systems, making it more difficult to monitor and track operational satellites and other space objects.
- **Increased Complexity**: The growing volume of space debris necessitates more complex and sophisticated tracking and mitigation strategies, which can be resource-intensive and costly.



KESSLER SYNDROME

- Kessler Syndrome, also known as the Kessler Effect or collisional cascading, is a theoretical scenario in which the density of objects in low Earth orbit (LEO) is high enough that collisions between objects could cause a cascade effect. This means that each collision generates more debris, which in turn increases the likelihood of further collisions. The concern is that this self-sustaining chain reaction could significantly increase space debris, rendering certain orbits unusable and posing a severe risk to satellites, space missions, and the International Space Station (ISS).

Prelims Based Question

Q1. Consider the following statements regarding Project NETRA:

1. It is one of the Flagship Projects of DRDO.
2. Under the project, DRDO plans to develop an unmanned aerial vehicle to surveil border districts.

Choose the correct answer using the codes given below:

(a). 1 Only
(b). 2 Only
(c). Both 1 and 2
(d). Neither 1 nor 2

ANSWER: D

Mains Based Question

Q1.What are the major concerns associated with Space debris in Satellite operations? How are various countries and organisations responding to the issue of Space debris?

Vikas Agarwal