DAILY CURRENT AFFAIRS 09-09-2024

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NHAI to track 100 toll plazas with GIS-based software

Syllabus: GS-1; Urbanization, GS-3; Infrastructure development, Transportation policies

Context

- *The National Highway Authority of India has identified around 100 toll plazas across the national highways for live monitoring on GIS-based software.*
- *This is aimed at enabling the free flow of traffic and a hassle-free toll experience.*

About

- *The GNSS-based* **Electronic Toll Collection (ETC)** *system refers to the use of Global Navigation Satellite System (GNSS) technology for automatic toll collection in road transport infrastructure.*
- *Unlike the traditional tolling methods such as manual toll booths or Radio Frequency Identification (RFID)-based systems, GNSS-based ETC systems enable toll collection based on the distance traveled, type of vehicle, and the routes taken, without requiring physical toll gates.*

Key Components of GNSS-Based ETC System:

- **Global Navigation Satellite System (GNSS):** *GNSS refers to a constellation of satellites providing signals from space that transmit positioning and timing data to GNSS receivers on the ground.*
  These satellites include systems like GPS (USA), GLONASS (Russia), Galileo (EU), and BeiDou (China).
- **Onboard Unit (OBU):** *Vehicles are equipped with an OBU that receives GNSS signals to track the vehicle's location in real-time.*
  The OBU uses the positional data to calculate the toll based on the distance traveled and sends this information to a central system.
- **Central Processing System:** *This backend system receives the tolling data from vehicles' OBUs, processes it based on predefined toll rates (depending on the type of vehicle, route, etc.), and charges the toll to the user.*
- **Telecommunication Infrastructure***: The data from OBUs is transmitted to the central system through mobile networks (e.g., 4G/5G).*
  This requires robust and continuous communication for real-time tolling.

Working Mechanism:

- **Real-time Tracking:** *Vehicles are continuously tracked using GNSS signals.*
  The OBU records the position, speed, and route taken by the vehicle in real-time.

- **Distance-based Tolling:** *The OBU calculates the toll based on the distance traveled on toll roads, eliminating the need for stopping at toll plazas.*
- **Automatic Payment:** *The calculated toll is sent to the central system, where it is processed, and the appropriate toll fee is charged automatically to the user's linked payment method, such as a bank account or mobile wallet.*
- **Data Storage & Monitoring:** *The system maintains records of vehicle movements and toll charges, which can be accessed for audits or in case of disputes.*

Benefits:

- **Reduction of Traffic Congestion:** *Since there are no physical toll booths, vehicles do not need to stop, reducing traffic congestion, especially at busy toll points.*
- **Enhanced Efficiency:** *Toll collection becomes faster and more efficient, eliminating the need for manual toll collection and reducing human error.*
- **Lower Operational Costs:** *The GNSS-based system eliminates the infrastructure and maintenance costs associated with physical toll plazas and RFID systems.*
- **Pay-per-use Model:** *Unlike fixed-point tolling systems, GNSS-based ETC systems allow for distance-based tolling, promoting a fairer system where users pay based on how much of the toll road they use.*
- **Improved Environmental Impact:** *By reducing the need for vehicles to stop and accelerate at toll booths, the system decreases fuel consumption and emissions, contributing to environmental conservation.*
- **Scalability:** *The system can easily be expanded to cover additional roads, urban areas, and even multiple countries, making it ideal for national or cross-border road networks.*

Challenges:

- **Initial Setup Costs:** *Installing OBUs in vehicles and setting up the necessary telecommunication and processing infrastructure involves significant initial investment.*
- **GNSS Signal Disruption:** *GNSS signals may face interference in tunnels, mountainous areas, or dense urban environments, leading to possible inaccuracies in toll calculation.*
- **Data Privacy Concerns:** *Continuous tracking of vehicle locations may raise concerns about data privacy and misuse of personal information.*
- **User Acceptance:** *Transitioning from existing tolling systems (manual or RFID) to GNSS-based systems may face resistance from users who are unfamiliar with the technology.*
- **Legal & Regulatory Framework:** *Countries need to establish clear laws and policies for GNSS-based tolling systems, addressing issues like data privacy, dispute resolution, and cross-border compatibility.*

Fiscal deficit

Syllabus: GS-3; Indian Economy

Context

- *India's fiscal deficit hits 17.2% at ₹2.77 lakh crore of FY25 target in April-July: CGA*

About

- *Fiscal Deficit refers to the situation when a government's total expenditure exceeds its total revenue (excluding borrowings).*
- *In simple terms, it shows how much money the government needs to borrow to meet its expenses.*

Definition

- **Fiscal deficit** = *Total Expenditure - Total Revenue (excluding borrowings). It indicates the shortfall in a government's finances and the amount it needs to borrow.*

Components

- **Expenditure:** *Includes government spending on various sectors like defense, infrastructure, education, subsidies, etc.*
- **Revenue:** *Comprises tax revenues (direct and indirect taxes) and non-tax revenues (dividends, fees, etc.).*

Causes of Fiscal Deficit

- *High government expenditure, especially on subsidies and welfare schemes.*
- *Low tax revenue or poor tax collection.*
- *Increased government borrowing and debt servicing.*
- *Economic slowdowns that reduce overall revenues.*

Implications

- **Inflationary Pressure:** *Excessive borrowing can lead to increased money supply, causing inflation.*
- **Higher Interest Rates:** *As the government borrows more, interest rates may rise, affecting private sector investments.*
- **Debt Trap***: Continuous high fiscal deficits can lead to a higher debt burden, making it difficult for the government to meet its obligations in the future.*

How It Is Funded

- **Internal Borrowings:** *The government borrows from domestic sources like banks, institutions, or the public by issuing bonds.*
- **External Borrowings:** *Borrowing from foreign sources or international organizations.*

Fiscal Deficit vs. Revenue Deficit

- **Revenue Deficit:** *Occurs when revenue expenditure exceeds revenue receipts.*
- **Fiscal Deficit:** *Includes both revenue deficit and capital expenditure shortfall.*

Measures to Reduce Fiscal Deficit

- *Rationalizing subsidies.*
- *Improving tax collection through reforms like the GST.*
- *Promoting privatization or disinvestment of public enterprises.*
- *Reducing unnecessary expenditures.*

FRBM Act (Fiscal Responsibility and Budget Management Act, 2003)

- *This act aims to bring down the fiscal deficit of the central government and promote financial discipline.*
- *The government sets a target to keep the fiscal deficit under control, typically around 3% of GDP.*

National Tiger Conservation Authority (NTCA)

Syllabus: GS-3; Biodiversity- Institutions, Frameworks

Context

- *A recent letter by the National Tiger Conservation Authority (NTCA) — the apex body tasked with tiger conservation — asking 19 States to "prioritise" the removal of villagers who are residents in the core tiger zones has drawn the ire of several organisations and activists, who have written to Union Environment Minister Bhupender Yadav protesting these directions.*

About

- *The National Tiger Conservation Authority (NTCA) is a statutory body under the* **Ministry of Environment, Forests, and Climate Change (MoEFCC).**

- *It was established in December 2005 following the recommendations of the Tiger Task Force, which was set up to address the growing concerns about tiger conservation in India.*

Objective:

- *The primary objective of NTCA is to strengthen tiger conservation by ensuring the implementation of various conservation measures, ensuring the safety and habitat of tigers, and coordinating efforts to prevent poaching and illegal wildlife trade.*

Legal Framework:

- *The NTCA was created under the provisions of the* **Wildlife (Protection) Act, 1972,** *through an amendment made in 2006.*
- *The act gave legal backing to the authority to take the necessary steps to ensure tiger conservation.*

Key Functions of NTCA:

- **Policy Formulation and Guidelines:**
  - *Formulates policies for the protection of tigers and their habitats.*
  - *Prepares guidelines for tiger conservation, habitat management, and human-tiger conflict resolution.*
- **Monitoring and Coordination:**
  - *Ensures compliance with prescribed standards for tiger conservation.*
  - *Oversees the implementation of Project Tiger in designated Tiger Reserves.*
  - *Coordinates with various agencies, including state governments and NGOs, to improve tiger conservation efforts.*
- **Approval of Tiger Conservation Plans:**
  - *Approves the annual tiger conservation plans for Tiger Reserves prepared by the respective states.*
  - *Reviews these plans periodically to ensure they align with national conservation priorities.*
- **Ensuring Financial Support:**
  - *Provides financial support and technical assistance to states under the Project Tiger scheme.*
  - *Ensures adequate funding for the maintenance and protection of Tiger Reserves.*
- **Tiger Population Monitoring:**
  - *Conducts All India Tiger Estimation exercises every four years to assess the tiger population across India.*

- *Uses modern technology such as camera traps and satellite telemetry for tracking and monitoring tigers.*

- **Human-Tiger Conflict Resolution:**
  - *Provides support for the prevention and mitigation of human-tiger conflicts.*
  - *Promotes awareness programs among local communities living in or around Tiger Reserves.*

Structure of NTCA:

- **Chairman:** *The Minister of Environment, Forests, and Climate Change.*
- **Vice-Chairman:** *The Minister of State for Environment and Forests.*
- **Members:** *Includes experts in tiger conservation, wildlife management, tribal welfare, and a representative from the non-governmental sector.*

Project Tiger:

- *NTCA oversees Project Tiger, one of the most well-known conservation programs globally, launched in 1973. Its goal is to:*
  - *Ensure the survival and protection of tigers in India.*
  - *Protect tiger habitats from degradation and encroachment.*
  - *Promote sustainable development around Tiger Reserves to reduce human pressure on tiger habitats.*

Important Achievements:

- **Increased Tiger Population:** *Through its efforts, India has seen a significant rise in its tiger population. The latest Tiger Census (2018) reported a population of 2,967 tigers, making India home to around 75% of the world's tiger population.*
- **Expansion of Tiger Reserves:** *India now has 53 Tiger Reserves covering a total area of about 75,796 sq. km.*
- **Global Leadership:** *India is recognized globally for its tiger conservation efforts, and NTCA is a key player in this success. It collaborates with international bodies like the Global Tiger Forum (GTF) and follows international conservation protocols.*

Challenges Faced by NTCA:

- **Poaching and Illegal Wildlife Trade:** *Despite stringent laws, poaching remains a major challenge for tiger conservation in India.*
- **Human-Wildlife Conflict:** *Increasing human encroachment into tiger habitats leads to conflicts, resulting in both human and tiger casualties.*
- **Depleting Habitat:** *Deforestation, infrastructure projects (like roads, railways, and mining), and urbanization are leading to the fragmentation of tiger habitats, reducing their natural range and affecting their population growth.*

- **Climate Change:** *Rising temperatures, changing rainfall patterns, and other climate-related issues affect the ecosystems where tigers thrive.*

Recent Developments:

- **Tiger Relocation Programs:** *NTCA has been involved in translocating tigers from areas of high density to other protected areas to reduce the risk of inbreeding and ensure balanced populations.*
- **Technology-Driven Conservation:** *NTCA is actively using technology such as M-Stripes (Monitoring System for Tigers – Intensive Protection and Ecological Status) to monitor tiger movement and prevent poaching.*

India's First Bio-Hydrogen Project

Syllabus: GS-3: Energy sector in India.

Context:

- *Bio-hydrogen is a sustainable form of hydrogen* **produced from organic materials** *such as agricultural waste, food scraps, and certain microorganisms.*
- *Unlike* **conventional hydrogen**, *which is typically derived from fossil fuels like coal and natural gas, bio-hydrogen is generated through natural processes, making it a cleaner and eco-friendly energy source.*

Key methods of producing bio-hydrogen include:

- **Biophotolysis**: *Using sunlight to split water molecules in organisms such as algae, releasing hydrogen.*
- **Dark Fermentation**: *Bacteria break down organic matter without oxygen, producing hydrogen as a byproduct.*
- *India's latest bio-hydrogen project, led by* **Gensol Engineering in collaboration with Matrix Gas & Renewables,** *is valued at Rs 164 crore and aligns with the National Green Hydrogen Mission.*
- *This project plans to use the* **Plasma-Induced Radiant Energy-Based Gasification System (GH2-PREGS)** *to convert 25 tonnes of bio-waste into 1 tonne of green hydrogen daily, making it a key initiative in India's clean energy transition.*

Why is Bio-Hydrogen Important for India?

- **Fossil Fuel Reduction**: *India is focusing on reducing its reliance on fossil fuels and moving towards renewable energy. Bio-hydrogen, produced from abundant agricultural waste, offers a cleaner alternative.*
- **Environmental Benefits**: *Utilizing agricultural waste to produce hydrogen helps reduce pollution and the environmental footprint of industries like steel and cement, which are traditionally emission-heavy.*
- **Support for Rural Communities**: *Bio-hydrogen projects could create local employment and empower rural areas by converting farm waste into energy.*

Opportunities in India's Bio-Hydrogen Sector

- *With around* **380 million tonnes of agricultural waste** *produced annually, India holds vast potential for bio-hydrogen production.*
- *This sector can* **drive sustainability by addressing pollution** *and providing clean energy for industries, offering a critical contribution to India's green energy future.*
- *The project's focus on* **waste-to-energy conversion** *not only promotes eco-friendly practices but also opens new pathways* **for job creation and industrial decarbonization**.

INS Arighat

Syllabus: GS-3: Science and Technology – Defence.

Context:

- *India's commissioning of its* **second nuclear-powered** *ballistic missile submarine (SSBN),* **INS Arighaat**, *is a significant advancement in the country's naval capabilities.*
- *This milestone comes after the commissioning of* **INS Arihant** *in 2016, India's first SSBN, marking a major achievement in self-reliance and defense technology.*

Key Features of INS Arighaat:

- **Enhanced Missile Range**: *INS Arighaat is equipped with missiles capable of striking targets over* **3,500 km**, *a substantial improvement compared to the 750 km range of the INS Arihant.*
- **Indigenous Content**: *The submarine includes a large amount of locally designed and manufactured components, in line with India's* **self-reliance** *goals in defense technology.*

- **Advanced Technology**: *INS Arighaat incorporates* **new and advanced design features**, *highlighting India's progress in naval engineering and submarine technology.*

Strategic Importance:

- *Both INS Arihant and INS Arighaat play a critical role in India's* **nuclear deterrence strategy**, *forming part of India's* **nuclear triad**—*the ability to launch nuclear weapons from land, air, and sea.*
- *These submarines enhance India's* **second-strike capability**, *essential for maintaining regional security and deterrence against potential threats.*

INS Arihant Overview:

- **Commissioned**: *2016.*
- **Length**: *111 meters;* **Weight**: *approximately 6,000 tons.*
- **Armament**: *Can carry* **12 K-15 Sagarika missiles**, *with a range of 750 km.*
- **Design**: *Built with a* **double-hulled structure** *for stealth and survivability.*
- **Nuclear Reactor**: *Developed under the* **Advanced Technology Vessel (ATV) program**.

Future Expansion:

- *India plans to commission a* **third SSBN** *soon, reflecting the country's ongoing efforts to* **expand its nuclear submarine fleet** *and further bolster its maritime defense capabilities.*
- *This expansion underscores India's commitment to securing its position in regional waters and ensuring a credible nuclear deterrent.*