DAILY CURRENT AFFAIRS 19-02-2025

GS-1

1. **Chhatrapati Shivaji Maharaj**

GS-2

2. **India-US TRUST Initiative**

GS-3

3. **mRNA cancer 'vaccine'**
4. **Denial of Service (DoS) attack**
5. **Pesticide impact on Species**

Chhatrapati Shivaji Maharaj

Syllabus: GS-1; Medieval History

Context

- Chhatrapati Shivaji Maharaj's birth anniversary celebrated on 19th February 2025.

About

- Chhatrapati Shivaji Maharaj (1630–1680) was the founder of the Maratha Empire and one of the greatest warriors and administrators in Indian history.
- His leadership, military strategies, and governance principles continue to inspire many.

Early Life and Background

- Born on **19th February 1630** in the **Shivneri Fort** (present-day Maharashtra).
- Son of **Shahaji Bhosale**, a general under the Deccan Sultanates, and **Jijabai**, who played a crucial role in his upbringing.
- Inspired by the stories of **Ramayana, Mahabharata**, and historical figures, shaping his vision for Swarajya (self-rule).

Establishment of the Maratha Empire

- At **16 years old**, he captured his first fort, **Torna**, in 1645, followed by several forts in the Sahyadri region.
- Adopted **guerrilla warfare** tactics, known as **Ganimi Kava**, to fight against the Mughals and Adilshahi forces.

Major Battles and Conflicts

- **Battle of Pratapgad (1659)** – Defeated **Afzal Khan** of Bijapur using tactical warfare.
- **Siege of Panhala (1660)** – Fought against Bijapur Sultanate, escaped with a strategic night move.
- **Sack of Surat (1664)** – Raided the rich Mughal port city to weaken Aurangzeb's economy.
- **Treaty of Purandar (1665)** – Signed with Mirza Raja Jai Singh of the Mughals, temporarily ceding 23 forts.
- **Escape from Agra (1666)** – Deceived Aurangzeb and escaped imprisonment in a dramatic turn of events.
- **Reassertion of Power (1670)** – Recaptured forts, including Sinhagad.
- **Coronation (1674)** – Declared himself **Chhatrapati** (sovereign ruler) at **Raigad Fort**, laying the foundation of **Hindavi Swarajya**.

Governance and Administration

- Established an **efficient administration** with a **council of eight ministers** (*Ashta Pradhan Mandal*):
  - **Peshwa** – Prime Minister (Moropant Trimbak Pingle)
  - **Amatya** – Finance Minister
  - **Sacheev** – Secretary
  - **Sumant** – Foreign Affairs Minister
  - **Senapati** – Commander-in-Chief
  - **Nyayadhish** – Chief Justice
  - **Panditrao** – Religious Head
  - **Mantri** – Intelligence Head
- **Military Reforms:**
  - Strengthened **navy** to protect the Konkan coast.
  - Established **fort-based defenses** (e.g., Raigad, Rajgad, Pratapgad).
  - Promoted **merit-based appointments** in the military.

- **Revenue System:**
  - Collected **Chauth (1/4th tax) and Sardeshmukhi (1/10th tax)** from neighboring regions.
  - Encouraged **agriculture** and protected peasants from excessive taxation.
- **Religious and Social Policies:**
  - Promoted religious tolerance and honored **Hindu and Muslim saints**.
  - Opposed social injustices like **untouchability**.
  - Ensured women's safety and strict laws against harassment.

Legacy and Death

- **Died on 3rd April 1680** at Raigad Fort.
- His son **Sambhaji Maharaj** took over but faced Mughal aggression.
- **Maratha Empire** expanded under successors like **Peshwas**.
- Inspired later freedom fighters, including **Mahatma Gandhi, Bal Gangadhar Tilak, and Veer Savarkar**.

India-US TRUST Initiative

Syllabus: GS-2: International Relations.

Context:

- India and the US launched the **TRUST (Technology and Rare Earth Utilization Strategy for Transformative Cooperation) Initiative** to enhance cooperation in the **recovery and processing of critical minerals**.
- Aims to **reduce barriers to technology transfer** and address **export controls**.
- Announced during **PM Narendra Modi's visit to Washington**.
- Focus on **creating robust supply chains** for essential materials like **lithium and rare earth elements (REEs)**.
- Strategic objective: **Counter China's dominance** in the critical minerals sector.

Background of the TRUST Initiative

- Builds on previous collaborations:
  - **Minerals Security Finance Network (MSFN)**
  - **Minerals Security Partnership (MSP)**
- Unlike earlier **multilateral agreements**, TRUST emphasizes **bilateral engagement** to **accelerate critical mineral supply chain security**.

Objectives of the Initiative

- Encourage **innovation** across key sectors:
  - **Defence**
  - **Artificial Intelligence (AI)**
  - **Semiconductors**
  - **Quantum Computing**
  - **Biotechnology**
  - **Energy**
  - **Space**
- Foster collaboration between **governments, academia, and the private sector**.

Focus on Pharmaceuticals

- Strengthens supply chains for **pharmaceuticals**, particularly **Active Pharmaceutical Ingredients (APIs)**.
- APIs rely on **critical minerals** like **lithium and magnesium**.
- India: **2nd largest manufacturer of APIs globally** → Ensuring mineral security is vital for sustaining the **pharmaceutical industry**.

National Programmes Supporting TRUST

- **United States**:
  - **US Energy Act** allocated **funds for critical minerals and materials**.
- **India**:
  - **National Critical Minerals Mission** approved with **a substantial budget**.
- Focus areas:
  - **Exploration**
  - **Recycling**
  - **Research & Development (R&D)** in critical minerals.

Deepening Cooperation

- Addresses **technology transfer barriers** and enhances **high-tech commerce**.
- TRUST does **not provide tax benefits** under the **US Inflation Reduction Act**, but expands **collaboration opportunities**.
- Builds on the **Minerals Security Finance Network** to create synergies between:

- **Development finance institutions**
- **Export credit agencies**

Importance of Critical Minerals

- Essential for **strategic industries** like **defence and energy**.
- **Key elements**:
  - **Neodymium** → High-performance magnets.
  - **Lithium** → Electric vehicle batteries, energy storage.
- **Securing diversified supply chains** is crucial for **technological sovereignty and national security**, given **China's dominance** in REE processing.

Challenges Ahead

- **Heavy dependence on imports** for critical minerals, especially **heavy rare earth elements (HREEs)**.
- Need for **developing domestic capabilities** in mineral extraction, processing, and refining.
- Enhancing **India's self-reliance** in critical minerals is crucial for **the success of TRUST**

mRNA cancer 'vaccine'

Syllabus: GS-3: Science and Technology –Biotechnology

Context:

- In December 2023, Russia announced the development of an mRNA-based personalised cancer vaccine.
- Expected to be available for free to patients by early 2025.
- Pre-clinical trials suggest it suppresses tumour development and metastases.

What is an mRNA Cancer Vaccine?

- **mRNA (Messenger RNA) Technology:** Gained prominence during the COVID-19 pandemic.
- **Mechanism:**
  - Unlike traditional vaccines that use weakened pathogens, mRNA vaccines provide genetic instructions.

- Teaches the body's cells to produce specific antigens that trigger an immune response.
- In cancer vaccines, these antigens help the immune system recognize and attack cancer cells.

How Does the mRNA Cancer Vaccine Work?

- **A Form of Immunotherapy:**
  - Immunotherapy aims to enhance the immune system's ability to detect and destroy cancer cells.
  - Unlike chemotherapy, immunotherapy selectively targets cancer cells, reducing side effects.
- **Other Immunotherapy Approaches:**
  - Use of antibodies.
  - CAR T-cell therapy.
  - Immune checkpoint inhibitors.
- **Personalised Treatment:**
  - Targets specific antigens unique to an individual's tumour.
  - More effective compared to general cancer treatments.

Global Research on Cancer Vaccines

- **Russia:** Developing an mRNA-based personalised vaccine.
- **United Kingdom:**
  - NHS launched the **Cancer Vaccine Launch Pad** with BioNTech.
  - Aims to accelerate clinical trials for personalised cancer vaccines.
- **United States:**
  - Biopharmaceutical company **CureVac** developed the **CVGBM cancer vaccine** for glioblastoma (brain cancer).
  - Over **120 clinical trials** are ongoing worldwide, focusing on lung, breast, prostate, melanoma, pancreas, and brain cancers.

Challenges and Considerations

- **Cancer vs. Infectious Diseases:**
  - Cancer is not caused by a single pathogen, making vaccine development complex.

- **Existing Cancer Prevention Vaccines:**
  - **HPV Vaccine:** Prevents cervical cancer (caused by Human Papillomavirus).
  - **Hepatitis B Vaccine:** May reduce the risk of liver cancer.
- **Concerns Regarding Russian Vaccine:**
  - Lack of publicly available clinical trial data.
  - Drug development typically involves multiple phases, requiring years of testing.
  - Uncertainty regarding safety and efficacy.

Future Prospects

- Immunotherapy, including mRNA cancer vaccines, offers promising potential but is not a universal solution for all cancers.
- Ongoing research will determine its long-term efficacy and suitability for different cancer types.
- Patients must be aware that these treatments are therapeutic, not preventive.

Denial of Service (DoS) attack

Syllabus: GS-3; Science & Technology

Context

- In January 2025, Karnataka's property registration portal, Kaveri 2.0, faced severe server outages due to a **Distributed Denial of Service (DDoS) attack**, disrupting property registrations.
- The Revenue and E-Governance Departments confirmed it was a deliberate cyberattack.

What is a DDoS Attack?

- A **DDoS attack** overwhelms a server with traffic using a botnet of compromised systems. Unlike a **Denial of Service (DoS) attack**, which uses a single source, DDoS attacks come from multiple sources, disrupting services and potentially serving as a distraction for other cyber intrusions.

Impact on Kaveri 2.0

- **Fake Accounts & Database Overload**: 62 fake email accounts linked to 14 IP addresses flooded the system.
- **Traffic Surge**: In January 2025, malicious users generated 6.2 lakh requests in two hours, crippling the portal.
- **Registration Disruptions**: Property registrations and encumbrance certificate (EC) searches suffered.

Preventing Future Attacks

- **Traffic Filtering & Monitoring**: Detect and block suspicious activity.
- **Rate Limiting**: Restrict excessive user requests.
- **Bot Detection**: Use CAPTCHA and behavioral analysis.
- **Security Audits & Cybersecurity Collaboration**: Regular assessments and partnerships with security agencies.
- **User Awareness**: Promote strong passwords and multi-factor authentication.

Restoration & Lessons Learned

- Kaveri 2.0 was restored on **February 5, 2025**, but the attack highlights the urgent need for **stronger cybersecurity defenses** in government services.

Notable DDoS Attacks

- **X Platform (Aug 2024)**: Elon Musk's X faced a major DDoS attack before a scheduled conversation with Donald Trump.
- **GitHub (2015)**: A China-based botnet targeted GitHub to disrupt tools bypassing censorship.

These incidents stress the importance of **cybersecurity vigilance** to prevent service disruptions and financial losses.

Pesticide impact on Species

Syllabus: GS-3: Environmental Pollution & Biodiversity Loss.

Context:

- Recent studies highlight the **adverse effects of pesticides** on over **800 species** beyond their intended targets.
- Research published in *Nature Communications* reveals the **pervasive ecological consequences** of pesticide use.

About Pesticides

- **Definition**: Chemical substances (insecticides, fungicides, herbicides) used to manage pests in agriculture.
- **Unintended Effects**: Harm extends to **non-target organisms**, disrupting ecological balance and biodiversity.

Scope of the Study

- Conducted by researchers from **China and Europe**.
- Analyzed **20,212 pesticide effect estimates** from **1,705 studies**.
- Covered **terrestrial and aquatic ecosystems** in **temperate and tropical climates**.
- Examined **microbes, fungi, plants, insects, fish, birds, and mammals**.

Negative Effects on Organisms

- **Growth and Reproduction**: Pesticides **inhibit growth** and **reduce reproductive success**.
- **Pollinators**: Insecticides contribute to the **decline of pollinator populations**.
- **Beneficial Fungi**: Fungicides harm fungi that **aid plant nutrient absorption**.
- **Plants**: Herbicides impact **pollen viability** and **plant metabolism**.

Regulatory Assessments

- **Current Focus**: Limited to **rats and honeybees**, missing broader ecological impacts.
- **Need for Reform**: Calls for **comprehensive risk assessments** covering diverse species.

Regional Variations

- **Temperate Regions**: Show **greater pesticide harm** compared to tropical areas.
- **Climatic Influence**: Climate and ecosystem type affect pesticide impact levels.

Recommendations for Policy Changes

- **Reduce Pesticide Use**: Advocate for **green pesticides** as alternatives.
- **Biodiversity Monitoring**: Post-licensing monitoring to track **long-term and cumulative effects**.

Alternative Agricultural Practices

- **Regenerative Agriculture**: Encourages **sustainable farming techniques**.
- **Sustainable Farming Incentive (UK)**: Aims to **reduce pesticide dependence** while maintaining productivity.