



Revolt of 1857

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REVOLT OF 1857

The first expression of organised resistance against the East India Company (EIC), occurred when Lord Canning was Governor General of India (tenure - 1856-62)

Centre of Revolt	Leader	British Officials (suppressed the revolt)
Delhi	Bahadur Shah Zafar	John Nicholson
Lucknow	Begum Hazrat Mahal	Henry Lawrence
Kanpur	Nana Saheb	Sir Colin Campbell
Jhansi & Gwalior	Rani Lakshmbai & Tantia Tope	General Hugh Rose
Bareilly	Khan Bahadur Khan	Sir Colin Campbell
Bihar	Kunwar Singh	William Taylor
Allahabad & Banaras	Maulvi Liyakat Ali	Colonel Ocell

CAUSES OF REVOLT

- Political - British expansion policy (Doctrine of Lapse)
- Military - Inferior treatment of Indian soldiers who mainly had farmer background
- Economic - Heavy tax imposition on farmers, stringent revenue collection ways, ruin of local industries by introducing British goods
- Socio-Religious - Rapidly spreading Western Civilisation, abolition of Sati pratha and female infanticide, introduction of western education methods, belief about converting Indians to Christianity
- Immediate Cause - Rumours about cartridges of new enfield rifles being greased with cow and pig fat violating religious beliefs

FAILURE OF REVOLT


- Limited uprising - princely states, southern provinces didn't join
- No effective leadership
- Limited resources - men, money and arms
- English-educated middle class, rich merchants, traders and zamindars of Bengal helped suppress the revolt

CONSEQUENCES

- EIC's rule in India ended
- Direct rule of British crown in India
- Viceroy replaced Governor General
- Doctrine of Lapse abolished - adoptive sons approved as legal heirs
- Ratio of British officers to Indian soldiers increased

Books written on the Revolt of 1857

- The Indian War of Independence by Veer Savarkar
- Rebellion, 1857: A Symposium by Puran Chand Joshi
- The Indian Mutiny of 1857 by George Bruce Malleon
- Great Mutiny by Christopher Hibbert
- Religion and Ideology of the Rebels of 1857 by Iqbal Hussain
- Excavation of Truth: Unsung Heroes of 1857 War of Independence by Khan Mohammad Sadiq Khan



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Gaps in AePS Exploited by Cybercriminals

For Prelims: Aadhaar-enabled Payment System (AePS), Aadhar Lock, Silicone thumbs

For Mains: Vulnerabilities associated with the AePS, Challenges of using biometric authentication in financial transactions, Role of financial literacy and digital skills in preventing AePS frauds

Why in News?

The [Aadhaar-enabled Payment System \(AePS\)](#) in India has recently faced exploitation by [cybercriminals](#), leading to **unauthorized access to users' bank accounts**.

- Scammers have been **using leaked biometric details to bypass the need for One Time Passwords (OTPs)** and drain funds from unsuspecting victims.
- A series of recent scams have exposed the **vulnerabilities of the AePS** and how cybercriminals are exploiting the loopholes in the system to defraud unsuspecting customers.

What is AePS?

- **About:**
 - Th AePS is a bank-led model that allows **online interoperable financial transactions at Point of Sale (PoS) or micro-ATMs** through the **Business Correspondent (BC)** of any bank using the **Aadhaar authentication**.
 - It was taken up by the [National Payments Corporation of India \(NPCI\)](#) - a joint initiative of [Reserve Bank of India \(RBI\)](#) and [Indian Banks' Association \(IBA\)](#).
 - The AePS is meant to provide **easy and secure access to banking services** for the poor and marginalized sections of society, especially in rural and remote areas.
 - It **eliminates the need for OTPs, bank account details**, and other financial information.
 - Transactions can be carried out with only the **bank name, Aadhaar number, and captured fingerprint during Aadhaar enrollment**.
- **Benefits:**
 - **Deepening Social Security:**
 - The AePS helps in deepening social security by facilitating cash **transfers from various government schemes such as PM-KISAN, MGNREGA**, etc., directly into the beneficiaries' bank accounts.
 - **Enabling Interoperability:**
 - The AePS enables interoperability among different banks and financial institutions, **allowing customers to access their bank accounts through any BC or micro-ATM** of any bank.
- **Drawbacks:**
 - Neither Unique Identification Authority of India (UIDAI) **nor NPCI mentions clearly whether AePS is enabled by default**.

How is AePS Exploited?

- **Leaked Biometric Details:**
 - **Cybercriminals obtain leaked biometric information**, which includes fingerprints captured during Aadhaar enrollment.
 - They use this stolen data to **operate biometric POS devices and ATMs** without the need for **two-factor authentication or OTPs**. By bypassing these security measures, they can transfer money from users' bank accounts.
- **Silicone Thumbs:**
 - Scammers have been known to use silicone thumbs to deceive biometric devices.
 - They **place the artificial thumb on the fingerprint sensor**, tricking the system into authenticating their fraudulent transactions.
 - This method allows them to perform unauthorized financial activities on behalf of the account holder.
- **Lack of Transaction Notifications:**
 - In some cases, victims of AePS scams **do not receive any notification** from their banks **regarding unauthorized transactions**.
 - They remain **unaware of the fraudulent activity until they notice discrepancies** in their bank account balance.
 - This lack of immediate alerts enables scammers to continue draining funds

undetected.

▪ **Exploiting Weak Security Measures:**

- Gaps in the AePS system's security protocols, such as **inadequate identity verification or authentication processes**, provide opportunities for cybercriminals to carry out their fraudulent activities. They take advantage of these weaknesses to exploit the system and access users' bank accounts.

▪ **Systemic Issues:**

- The AePS also faces issues such as **biometric mismatches**, poor connectivity, weaker systems of certain banking partners, etc., that affect its performance and reliability.
 - Sometimes, the **transactions fail** due to these reasons but the money gets debited from the customers' accounts without their knowledge.

How to Prevent AePS Frauds?

▪ **Amendments to Aadhaar Regulations 2016:**

- UIDAI proposes an amendment to the [Aadhaar \(Sharing of Information\) Regulations, 2016](#).
 - The amendment requires entities in possession of an Aadhaar number to not share details unless Aadhaar numbers have been redacted or blacked out.

▪ **Aadhaar Lock:**

- Users are advised to **lock their Aadhaar information** using the **UIDAI website or mobile app**.
- Locking Aadhaar prevents the **unauthorized use of biometric information** for financial transactions.
- Aadhaar can be unlocked when **biometric authentication is required**, such as for property registration or passport renewals.
 - After the necessary authentication, Aadhaar can be locked again for security purposes.

▪ **Other Preventive Measures:**

- It is advisable **to avoid scanning QR codes or clicking on links** sent by unknown or suspicious sources.
- Exercise caution and **refrain from trusting individuals who offer assistance in withdrawing money** from locations other than authorized bank branches or ATMs.
- Prior to providing a fingerprint on a PoS machine, it is recommended **to verify the displayed amount and request a receipt for every transaction**.
- Regularly **check the balance and transaction alerts of the bank account** linked to the mobile number.
- In the event of any suspicious or fraudulent activity, promptly report it to both the bank and the police.
 - According to the [RBI](#), customers are entitled to **zero liability for unauthorized transactions if promptly reported within three working days**.

What are the Challenges of AePS?

▪ **Lack of Awareness and Literacy:**

- Many customers are not aware of the benefits and features of the AePS or how to use it safely and securely. They also lack financial literacy and digital skills, which makes them vulnerable to fraud and errors.

▪ **Inadequate Infrastructure and Connectivity:**

- The AePS depends on the availability and quality of infrastructure and connectivity, such as biometric devices, PoS machines, internet, power supply, etc. However, these are often lacking or unreliable in rural and remote areas, where the AePS is most needed.

▪ **Regulatory and Policy Issues:**

- The AePS also faces some regulatory and policy issues, such as **the legal validity of Aadhaar authentication, the privacy and security of biometric data**, the MDR charges for transactions, the grievance redressal mechanism for customers, etc.

Way forward

- **Strengthening the Security and Authentication of AePS Transactions:**
 - **Implement encryption** and digital signatures to protect transaction data.
 - Incorporate **biometric liveness detection to prevent cloning or spoofing** of biometric data.
 - **Certify devices used for AePS transactions** and monitor transactions for suspicious activity.
- **Raising Awareness:**
 - **Educate users about the risks associated** with sharing Aadhaar number and biometrics.
 - Utilize the **Aadhaar lock/unlock feature to control access to biometrics.**
 - **Ensure service providers follow guidelines** and standards issued by authorities and comply with data protection laws.
- **Enhancing Coordination and Cooperation among Stakeholders:**
 - Facilitate information sharing among UIDAI, [NPCI](#), RBI, banks, [fintech companies](#), law enforcement agencies, and civil society organizations.
 - Develop joint strategies and action plans to address cybercrime challenges.
 - Provide technical assistance and capacity building to stakeholders.
 - Establish a platform for reporting and resolving grievances related to AePS.

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Prelims

Q1. In India, under cyber insurance for individuals, which of the following benefits are generally covered, in addition to payment for the loss of funds and other benefits? (2020)

1. Cost of restoration of the computer system in case of malware disrupting access to one's computer
2. Cost of a new computer if some miscreant wilfully damages it, if proved so
3. Cost of hiring a specialised consultant to minimise the loss in case of cyber extortion
4. Cost of defence in the Court of Law if any third party files a suit

Select the correct answer using the code given below:

- (a) 1, 2 and 4 only
- (b) 1, 3 and 4 only
- (c) 2 and 3 only
- (d) 1, 2, 3 and 4

Ans: (b)

Q2. In India, it is legally mandatory for which of the following to report on cyber security incidents? (2017)

1. Service providers
2. Data centres
3. Body corporate

Select the correct answer using the code given below:

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

Ans: (d)

Q3. Consider the following statements: (2018)

1. Aadhaar card can be used as a proof of citizenship or domicile.
2. Once issued, Aadhaar number cannot be deactivated or omitted by the Issuing Authority.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

Ans: (d)

Mains

Q. What are the different elements of cyber security ? Keeping in view the challenges in cyber security, examine the extent to which India has successfully developed a comprehensive National Cyber Security Strategy. (2022)

Source: TH

Model Prisons Act 2023

For Prelims: [The Prisons Act of 1894](#), [Prisons](#), [State Subject](#), [NCRB](#), [NALSA](#), [E-Prison](#).

For Mains: Model Prisons Act 2023, Issues Related to Prisons in India.

Why in News?

The Ministry of Home Affairs (MHA) has prepared the '**Model Prisons Act 2023**' that will **replace a British-era law, (the Prisons Act of 1894)**, to overhaul the prison administration that **will focus on the reformation and rehabilitation of inmates**.

What is the Model Prisons Act 2023?

- **Need:**
 - There are "several lacunae" in the old pre-Independence act, **Prisons Act of 1894 and there was "conspicuous omission" of the correctional focus** in the existing Act.
 - The Prison Act 1894 mainly focuses on **keeping the criminals in custody and enforcement of discipline** and order in [Prisons](#). There is **no provision for reform and rehabilitation** of prisoners in this Act.
- **Salient Features of the New Act:**
 - Provisions of punishment for **prisoners and jail staff for use of prohibited items** such as mobile phones in jails.
 - Establishment and management of **high security jails**, open jail (open and semi-open).
 - Provisions for **protecting society from the criminal activities** of hardened criminals and habitual offenders.
 - Providing legal aid to prisoners, parole, furlough and premature release to incentivize good

conduct.

- Security **assessment and segregation of prisoners**, individual sentence planning; grievance redressal, prison development board, attitudinal change towards prisoners and provision of separate accommodation for women prisoners, transgender, etc.
- There are provisions for use of technology in prison **administration with a view to bring transparency in prison administration**, provision for videoconferencing with courts, scientific and technological interventions in prisons, etc.

▪ **Significance:**

- In India, prisons and the 'persons detained therein' are a **State subject**. The Model Prisons Act, 2023 may serve as a **guiding document for states for adoption in their jurisdiction**.
- The Prisoners Act of 1900 and the Transfer of Prisoners Act, 1950 are also decades-old and relevant provisions of these Acts have been assimilated in the Model Prisons Act, 2023, expecting to bring **much-needed reforms to the Indian prison system and align it with international standards**.

What are the Problems of Prisons in India?

▪ **Overcrowding of the Prisons:**

- Overcrowding has been one of the grave issues of the prison system in India. As to a report by the **National Crimes Record Bureau that the occupancy rate** of jails is 118.5% of the prison capacity.
 - It was observed that there were about 4,78,600 prisoners in different prisons, but the capacity of the prisons was just 4,03,700.
- Overcrowding leads to poor living conditions. It also leads to the **transmission of many communicable diseases**.

▪ **Health and Hygiene:**

- A lot of jails do not have proper medical facilities. This creates **neglect towards the prisoners and most of them remain untreated**. Hygiene is also not proper among the prisoners.

▪ **Delay in Trials:**

- A lot of cases are pending for many years. This leads to a **disruption in the prison administration system**. However, the Supreme Court, in **Hussainara Khatoun v. Home Secretary 1979** recognized the right to speedy trial of the prisoners.

▪ **Custodial Torture:**

- Custodial tortures among prisoners are quite prevalent. Though third-degree torture by police is **not allowed after the landmark judgment in D.K Basu's case 1986**, there is still a prevalence of brutal violence inside the prisons.
- According to the Ministry of Home Affairs, a total of 146 cases of death in police custody were reported during 2017-2018, in the last five years, the highest number of **custodial deaths (80) has been reported in Gujarat, followed by Maharashtra (76), Uttar Pradesh (41)**.

▪ **Women and Children:**

- Women criminals are relatively low in number. They face both **physical and mental problems including lack of sanitation** facilities, lack of care during pregnancy, lack of educational training.
- Children are mostly kept in **correctional homes rather than jails so that they can reform themselves** and go back to their normal life. However, they also face a lot of abuse and undergo psychological traumas.

How to Overcome these Problems?

- The Supreme Court has set up a committee in 2018 headed by its retired judge **Justice Amitava Roy** on Prison Reforms.
- Some recommendations were made to **overcome the problem of overcrowding i.e. speedy trials**, increasing lawyer to prisoners ratio, the introduction of special courts, avoiding adjournment.
- They also recommended a free phone call for every new prisoner in his/her first week of jail. The committee also recommended modern kitchen facilities.

- **Section 304** of the Indian Penal Code states the punishment for custodial deaths. **Section 30** of the Protection of Human Rights Act states about the issuance of CCTV's inside the jails.

What are the Initiatives Related to Prison Reforms in India?

- **Modernization of Prisons Scheme:** The scheme for modernisation of prisons was launched in 2002-03 with the objective of improving the condition of prisons, prisoners and prison personnel.
- **Modernisation of Prisons Project (2021-26):** Government has decided to provide financial assistance to **States and UTs, through the Project for using** modern-day security equipment in Prisons for:
 - Enhancing the security of jails.
 - To facilitate the task of reformation and rehabilitation of prisoners through correctional administration programmes.
- **E-Prisons Project:** The **E-Prisons project** aims to introduce efficiency in prison management through digitization.
- **Model Prison Manual 2016:** The **manual** provides detailed information about the legal services (including free services) available to prison inmates.
- **National Legal Services Authority (NALSA):** It was constituted under the Legal Services Authorities Act, 1987 which came into force on 9th November, 1995 to establish a nationwide uniform network for providing free and competent legal services to the weaker sections of the society.

Conclusion

- The prison system in India has undergone significant reforms since ancient times, but it still requires further improvement in modern times.
- Despite the various prison reforms implemented in India, **the situation has not improved significantly**. It is important to recognize that **while prisoners have committed crimes, they still possess certain rights** that cannot be taken away from them.

Source: [IE](#)

6th Indian Ocean Conference

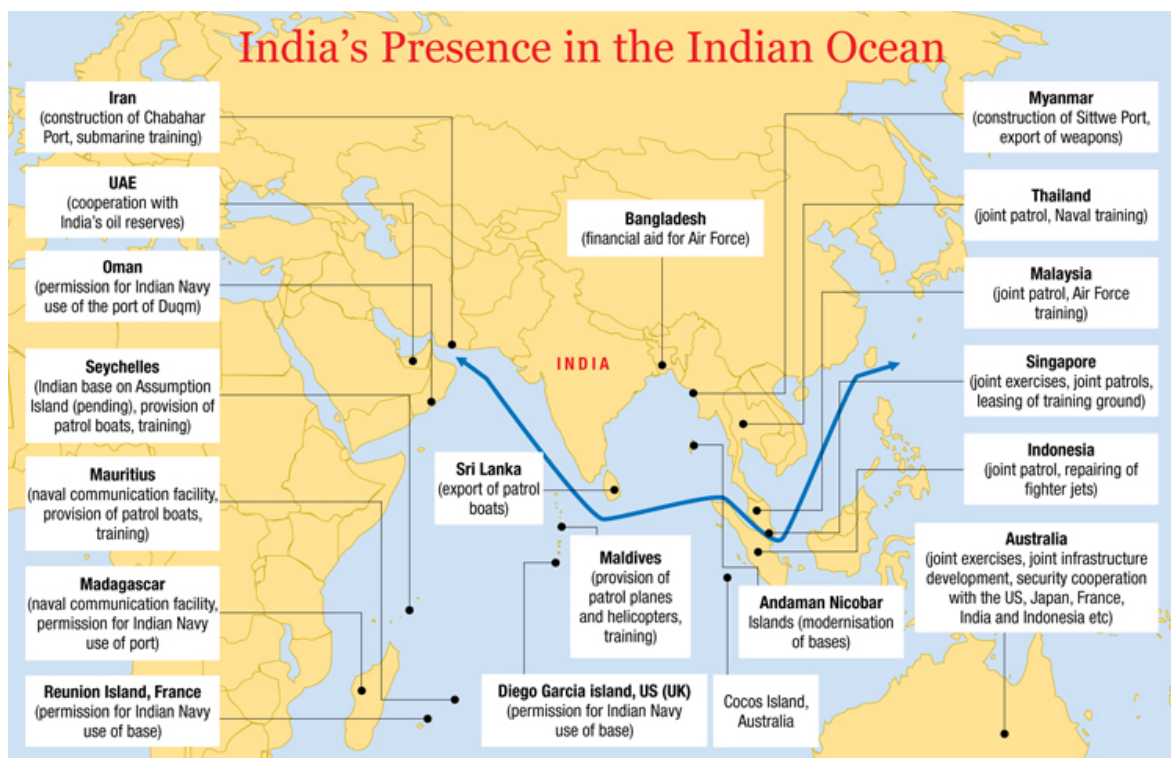
For Prelims: [Indian Ocean region](#), [Association of Southeast Asian Nations \(ASEAN\)](#), [Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation \(BIMSTEC\)](#), [Climate change](#), [Marine pollution](#).

For Mains: Major Challenges Related to the Indian Ocean Region.

Why in News?

Improving and enhancing connectivity in the [Indian Ocean region](#) emerged as a top priority during the **6th Indian Ocean Conference held in Dhaka, Bangladesh**.

- The conference, with the theme "**Peace Prosperity and Partnership for a Resilient Future**," brought together delegates from over 25 countries to discuss ways to promote **economic development while maintaining peace and stability in the region**.



What are the Major Highlights of the Conference?

- Connectivity:** India, being a significant player in the **Indian Ocean region**, faces distinct challenges in achieving enhanced connectivity.
 - Establishing a land connection with Southeast Asia** poses unique difficulties for India. Despite the challenges, there is a call for collective efforts to overcome obstacles and improve connectivity.
 - The Indian Foreign Minister emphasized the potential game-changing impact of establishing an effective and efficient connectivity with the **Association of Southeast Asian Nations (ASEAN)**.
 - India also aspires to develop **multi-model connectivity to the Gulf and Central Asia**.
 - To tackle the connectivity challenges and promote regional development, countries in the Indian Ocean region need to embrace cooperation and adopt a **long-term perspective**:
 - Examples like the **Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC)** demonstrate the significance of deeper cooperation and shared efforts.
- Upholding Legal Obligations and Agreements:** Disregarding legal obligations or violating long-standing agreements can **undermine trust and confidence among member nations**. Taking a long-term view of cooperation is essential to ensure sustained progress.
 - Adherence to international law, norms, and rules is vital for building a stable international order.
- Sustainable Projects and Debt:** Unsustainable debt generated by unviable projects is a concern for countries in the region. **(Example-Sri Lanka)**.
 - Encouraging transparent lending practices** and considering market realities are necessary to avoid future complications.
- Shared Responsibility and Focus:** The Indian Ocean region requires shared responsibility and focused efforts to ensure its stability and prosperity:
 - Ensuring maritime security is a collective responsibility** that should not be compromised for individual dominance. Practical action is needed, complementing diplomatic positions.
 - The conference also highlighted the **importance of climate action and counter-terrorism initiatives**. Nations must also address the threats posed by **extremism and fundamentalism, safeguarding their social fabrics**.

What is Indian Ocean Conference?

- Indian Ocean Conference is a flagship consultative forum of the Indian Ocean countries to deliberate upon the prospects of regional cooperation for [Security and Growth for All in Region \(SAGAR\)](#).
- The first edition of the Indian Ocean conference was held in Singapore in 2016 and fifth in 2021 in Abu Dhabi, United Arab Emirates.

What are the Major Challenges Related to the Indian Ocean Region?

- **Geopolitical Competition:** The Indian Ocean region is a hotspot for geopolitical competition among **major powers and regional actors**. The competition involves **strategic interests, influence, and access to resources, leading to tensions and potential conflicts**.
 - The **Indian Ocean** occupies a central position between the major global powers, including **India, China, the United States**, and countries of the Middle East and Africa.
 - Its location allows for power projection and influence over regional affairs. The presence of key chokepoints such as the **Strait of Hormuz, the Bab el-Mandeb Strait, and the Malacca Strait** further enhances its strategic significance.
- **China's Militarization Move:** China has been a **challenge to India's interests and stability in the Indian Ocean**.
 - India's neighbors are receiving **military and infrastructural assistance from China**, including **submarines for Myanmar, frigates for Sri Lanka, and its overseas military base in Djibouti (Horn of Africa)**.
 - Also, [China has a hold over Hambantota port \(Sri Lanka\)](#), which is just a few hundred miles off the shores of India.
- **Maritime Security Threats:** The IOR is vulnerable to various maritime security threats, **including piracy, smuggling, illegal fishing, and terrorism**.
 - Also, the vastness of the Indian Ocean makes it challenging to **monitor and secure its maritime domain effectively**.
- **Environmental Challenges:** [Climate change, rising sea levels, coral reef degradation, and marine pollution](#) are significant environmental challenges in the IOR.
 - These issues affect **coastal communities, marine ecosystems**, and the livelihoods of millions of people.

Way Forward

- **Driving Blue Economy Initiatives:** The IOR is rich in marine resources, and leveraging the blue economy can drive sustainable economic growth. There is a need to include **promoting renewable energy generation** from ocean resources, supporting sustainable fisheries, **developing marine biotechnology, and fostering eco-tourism**.
- **Maritime Security Collaboration:** Given the strategic importance of the IOR, enhancing maritime security is crucial.
 - There is a need to involve **strengthening information-sharing mechanisms, leveraging technology for maritime domain awareness, promoting joint naval exercises and patrols**, and fostering cooperation in countering maritime threats such as **piracy, illegal fishing, and smuggling**.
- **Climate Change Resilience:** The IOR is highly vulnerable to the impacts of climate change, including rising sea levels, extreme weather events, and ocean acidification. Innovative strategies could focus on **implementing climate-resilient infrastructure, developing early warning systems, promoting sustainable coastal management practices**, and facilitating **regional cooperation for climate change adaptation and mitigation**.

UPSC Civil Services Examination, Previous Year Question (PYQ)

Prelims

Q. India is a member of which among the following? (2015)

1. Asia-Pacific Economic Cooperation
2. Association of South-East Asian Nations
3. East Asia Summit

Select the correct answer using the code given below:

- (a) 1 and 2 only
(b) 3 only
(c) 1, 2 and 3
(d) India is a member of none of them

Ans: (b)

Mains

Q.1 What is the significance of Indo-US defense deals over Indo-Russian defense deals? Discuss with reference to stability in the Indo-Pacific region. (2020)

[Source: IE](#)

Thawing Permafrost in Arctic and Industrial Contamination

For Prelims: [Thawing Permafrost in Arctic](#), [Industrial Contamination](#), [NASA](#), [Permafrost](#), [Mining](#), [Climate Change](#).

For Mains: Thawing Permafrost in Arctic and Industrial Contamination.

Why in News?

According to a New Study, “**Thawing Permafrost poses an environmental threat to thousands of sites with legacy industrial contamination**”, thawing of [Permafrost](#) may result in the spread of toxic substances in the [Arctic Region](#).

What is Permafrost?

- Permafrost is **essentially any ground that stays frozen** — 0 degree Celsius or lower — for at **least two years straight**.
- These permanently frozen grounds **are often found in Arctic regions** such as Greenland, Alaska (the United States), Canada, Russia and Eastern Europe.
- According to the [National Aeronautics and Space Administration \(NASA\)](#), permafrost is composed of “**a combination of soil, rocks and sand that are held together by ice**”. The soil and ice in permafrost stay frozen all year long.
 - However, although the **ground remains perennially frozen**, permafrost regions aren't always covered with snow.

What are the Findings of the Study?

- **Contaminated Sites In the Region:**
 - 4,500 industrial facilities in the permafrost regions **have most likely produced between 13,000 and 20,000 contaminated sites.**
 - As of now, around 1,000 of the known industrial sites and 2,200 to 4,800 of the known contaminated sites are **already at risk of destabilising due to thawing permafrost.**
- **Industrial Waste in Arctic:**
 - Known industrial waste types in the region include **drilling and Mining wastes**, toxic substances like drilling muds and fluids, mine waste heaps, heavy metals, spilled fuels, and **Radioactive Waste.**
- **Rapid Thawing and Destabilizing Industrial Site:**
 - The **Arctic is getting warmer nearly four times as fast as the rest** of the planet due to **Climate Change**, and therefore permafrost is thawing rapidly, which could destabilize not only the industrial sites **but also the contaminated areas.**
 - Nearly 2,100 industrial sites and between **5,600 and 10,000 contaminated sites are under threat of destabilization** by the end of this century.
- **Reasons for building Such Sites:**
 - Once believed to be perennially stable and reliable, the Arctic is far from an uninhabited and untouched region.
 - It's dotted with countless **industrial facilities such as oilfields and pipelines**, mines and military bases.
 - All this infrastructure is built on permafrost, the toxic waste from these industrial facilities has been buried in the permafrost, on the assumption **that it would stay locked away permanently.**
 - But danger looms as the planet continues to heat up.
 - The Arctic region experienced **increased development during the Cold War**, becoming a hub for **resource extraction and military operations.**
 - As a result, industrial and toxic waste accumulated on or within the permafrost, and no measures were taken to remove it.

What are the Implications of Thawing Permafrost?

- One of its most dangerous consequences is the **release of Greenhouse Gases (GHG)** into the atmosphere.
 - A 2022 report by NASA said, "Arctic permafrost alone holds an estimated 1,700 billion metric tons of carbon, **including methane and carbon dioxide.** That's **roughly 51 times the amount of carbon the world released as fossil fuel emissions in 2019.**
- Plant matter frozen in permafrost doesn't decay, but when permafrost thaws, microbes **within the dead plant material start to break the matter down**, releasing carbon into the atmosphere.
 - A 2022 study by Columbia University observed that **thawing permafrost would unleash thousands of dormant viruses and bacteria.**
 - Some of these "could be new viruses or ancient ones for which humans lack immunity and cures, or diseases that society has eliminated, such as **smallpox** or **Bubonic plague.**"

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Prelims

Q. Which of the following statements is/are correct about the deposits of 'methane hydrate'? (2019)

1. Global warming might trigger the release of methane gas from these deposits.
2. Large deposits of 'methane hydrate' are found in Arctic Tundra and under the sea floor.
3. Methane in atmosphere oxidizes to carbon dioxide after a decade or two.

Select the correct answer using the code given below.

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

Ans: (d)

Exp:

- **Methane hydrate is a crystalline solid that consists of a methane molecule** surrounded by a cage of interlocking water molecules. It is an “ice” that only occurs naturally in subsurface deposits where temperature and pressure conditions are favourable for its formation.
- Regions with suitable temperature and pressure conditions for the formation and stability of methane hydrate- **sediment and sedimentary rock units below the Arctic permafrost;** sedimentary deposits along continental margins; deep-water sediments of inland lakes and seas; and, under Antarctic ice. **Hence, statement 2 is correct.**
- Methane hydrates, the sensitive sediments, can rapidly dissociate with an increase in temperature or a decrease in pressure. The dissociation produces free methane and water, which can be triggered by global warming. Hence, statement 1 is correct.
- Methane is removed from the atmosphere in about 9 to 12-year period by oxidation reaction where it is converted into Carbon Dioxide. Hence, statement 3 is correct.
- **Therefore, option (d) is the correct answer.**

Mains

Q. How do the melting of the Arctic ice and glaciers of the Antarctic differently affect the weather patterns and human activities on the Earth? Explain. **(2021)**

Source: IE

Land Reclamation

For Prelims: Land reclamation, [Coastal zones](#), [Rising sea levels](#), [Coastal flooding](#), [Global warming](#), [Mangroves](#).

For Mains: Current Extent of Land Reclamation, Issues Associated with Land Reclamation

Why in News?

The **increasing economic importance of [coastal zones](#)**, particularly in **East Asia, the Middle East, and West Africa**, has led to significant **land reclamation projects** worldwide. Despite the economic benefits, these projects face **environmental challenges** and potential risks from **[rising sea levels](#)** and **[storm surges](#)**.

What is Land Reclamation?

- **About:**

- Land reclamation refers to the **process of creating new land by altering the topography of existing bodies of water**, such as seas, rivers, lakes, or marshes.
 - It is **typically done along coastlines** but can also **occur inland, involving the conversion of [wetlands](#) or other water bodies**.
- Land reclamation has a long history of being used to **expand coastal areas for [agriculture](#) and industrial purposes**.
- **Traditional Land Reclamation:**
 - Traditionally, land reclamation meant building a **series of dikes to enclose [tidal marshes](#) or shallow offshore waters** and draining these enclosures to create dry land.
 - In some cases, **streams were diverted to carry additional sediment into these areas**, building up the land to a higher level.
 - **Soil and stone could also be excavated from the mainland and dumped along the shore** or on the coast of existing islands, **gradually expanding the land into the sea**.
- **Modern Land Reclamation:**
 - Today, **major engineering projects** involve the **construction of kilometres of offshore concrete barrier walls**, which are filled with substantial amounts of sand, earth, clay or rock, often shipped in from far afield.
 - The reclamation site can also be **filled with dredged soil from the nearby seafloor mixed with water**, in a process known as **hydraulic reclamation**.
- **Current Extent of Land Reclamation:**
 - The study, which examined satellite imagery of **coastal cities with a population of at least 1 million**, found that reclamation projects in **106 cities around the world had altogether created around 2,530 square kilometres (more than 900 square miles) of coastal land**.
 - Nearly **90% of new coastal land was created in East Asia** over the last two decades, most often to make way for industry and port facilities catering to the globalised economy.
 - From 2000 to 2020, **China alone added around 350 square kilometres**, with **Singapore and Incheon, in South Korea**, also raising vast new areas.

What are the Issues Associated with Land Reclamation?

- **Coastal Flooding:** Most coastal land expansion in the past couple of decades happened in **low-lying areas**, with more than **70% of that land “at high risk from [coastal flooding](#) between 2046 and 2100,”** due in part to storm surges linked to **[global warming](#)** and the risk of land subsidence.
 - **Stronger storms and increasingly destructive flooding** are already taking coastal communities by surprise.
- **Distortion of Seabed Ecosystem:** Using materials like **[sand](#) which are obtained from the [marine](#) and river environment** can mean the **destruction of habitats** and spawning grounds of organisms.
 - Several countries have already banned the export of sand for land reclamation. The **resulting sand shortage has forced some construction companies to extract sand and clay from the ocean floor, destroying the seabed ecosystem in the process**.
- **Loss of Wetlands:** Coastal wetlands, such as **[mangroves](#), salt marshes, and [estuaries](#)**, are highly productive ecosystems that provide numerous ecological benefits.
 - Land reclamation often involves **draining or filling these wetlands, resulting in their destruction or alteration**.
 - This loss of wetlands can disrupt the natural balance of coastal ecosystems, affecting **water quality, fish nurseries, and the overall resilience of the coastal zone**.

Way Forward

- **Strategic Coastal Planning:** There is a need to develop **comprehensive coastal zone management plans** that consider the long-term effects of land reclamation and **balance economic development with environmental sustainability**.
- **Green Engineering Solutions:** There is a need to employ innovative engineering techniques that minimise the impact of land reclamation on coastal ecosystems.

- For example, **adopting "soft" engineering solutions like permeable structures, floating islands, and sand-filled geotextile containers that allow water flow and minimise disruption to coastal processes.**
- **AI for Coastal Monitoring:** There is a need for using [artificial intelligence](#) and [remote sensing techniques](#) to monitor **coastal changes, predict erosion hotspots, and assess the effectiveness of coastal management interventions.**

UPSC Civil Services Examination, Previous Year Question (PYQ)

Q. What are the environmental implications of the reclamation of the water bodies into urban land use? Explain with examples. (2021)

[Source: IE](#)

Transformers in Machine Learning

Why in News?

In recent times, **Machine Learning (ML)** is experiencing a transformative shift with **the rise of transformer models.**

- Transformers have gained significant attention due to their **ability to revolutionize language processing, image understanding,** and more.
- The impact of transformers on diverse domains and their potential for positive outcomes have made them a hot topic in the news.

What are Transformers in ML?

- **About:**
 - Transformers are a type of **deep learning model** used for **natural language processing (NLP) and computer vision (CV) tasks.**
 - They utilize a mechanism called **"self-attention"** to process sequential input data.
 - Transformers can process the entire input data at once, capturing context and relevance.
 - They can handle longer sequences efficiently and overcome the vanishing gradients problem faced by recurrent neural networks (RNNs).
 - Transformers were introduced in 2017 through the paper **"Attention is All You Need"** by Google Brain.
 - They have become popular and led to the development of pre-trained system [Generative Pre-trained Transformer\(GPT\).](#)
- **Understanding Transformers:**
 - Transformers consist of an **encoder and a decoder,** which work together to process input and generate output.
 - The encoder converts **words into abstract numerical representations and stores them in a memory bank.**
 - The decoder generates **words one by one, referring to the generated output and consulting the memory bank through attention.**
- **Function:**
 - **Self-Attention Mechanism in Transformers:**
 - Attention in ML allows models to **selectively focus on specific parts of the input when generating outputs.**

- It enables transformers to **capture context and build relationships between different elements in the data.**
- **Transformer Applications in Language Processing:**
 - Transformers have revolutionized tasks such as **language translation, sentiment analysis, text summarization, and natural language understanding.**
 - They process entire sentences or paragraphs, capturing intricate linguistic patterns and semantic meaning.
- **Transformer Applications in Image Understanding:**
 - Transformers have made significant strides in computer vision tasks, surpassing **traditional convolutional neural networks (CNNs).**
 - They analyze **images by breaking them into patches and learning spatial relationships,** leading to improved image classification, object detection, and more.
- **Versatility and Cross-Modal Applications:**
 - Transformer's ability to process multiple modalities, such as **language and vision,** has paved the way for joint vision-and-language models.
 - These models enable tasks like **image search, image captioning, and answering questions about visual content.**
- **Evolution:**
 - **Evolution from Hand-Crafted Features to Transformers:**
 - Traditional machine learning approaches relied on **manually engineered features,** specific to narrow problems.
 - Transformers, on the other hand, eliminate the need for hand-crafted features and learn directly from raw data.
 - **Transformers in Computer Vision:**
 - Transformers have **found success in computer vision by dividing images into patches, resembling words in a sentence.**
 - Trained on large datasets, transformers outperform traditional convolutional neural networks (CNNs) in image classification, object detection, and more.
- **Recent Developments:**
 - **Large-Scale Transformer Models:**
 - Recent advancements have seen the development of transformer models with billions or trillions of parameters.
 - These models, known as **large language models (LLMs) like [ChatGPT,](#)** exhibit impressive capabilities in tasks like question answering, text generation, and image synthesis.
- **Challenges and Considerations:**
 - Evaluating the performance and **limitations of large-scale transformer** models remains an ongoing challenge for researchers.
 - Concerns related to **ethical use, privacy, and potential biases** associated with these models need to be addressed.

What is ML?

- Machine learning is a branch of **artificial intelligence.**
- It involves developing algorithms that **can learn and improve from data.**
- Machine learning enables **computers to make predictions** or take actions without being explicitly programmed.
- It uses **statistical techniques and algorithms to analyze and interpret complex data sets.**
- Machine learning has various applications, such as in predictive modeling, image recognition, natural language processing, and recommendation systems.

[Source: TH](#)

Alzheimer's Disease

Why in News?

After the **US Food and Drug Administration (FDA)** granted “accelerated” approval for a drug to treat Alzheimer's disease, developed by Biogen and Eisai and called **lecanemab**, another pharmaceutical company, Eli Lilly, has released its **own candidate Alzheimer's treatment, donanemab**.

- Donanemab is currently not approved for use in either the US or Europe.

What is Donanemab and Lecanemab?

- **About:**
 - Donanemab belongs to a class of **antibody-based therapies** that target **amyloid-beta (A β) proteins**. These proteins can form amyloid plaques in the brain, leading to cognitive decline.
 - Donanemab aims to **remove these plaques** and slow the progression of the disease.
 - Lecanemab belongs to a class of drugs called **monoclonal antibodies**. These antibody-mediated drugs also **target beta amyloid and disrupt cell function**.
- **Safety Concerns and Side Effects:**
 - Both donanemab and lecanemab carry a high risk of side effects, including **amyloid-related imaging abnormalities (ARIA)**, such as **brain swelling or bleeding**.
 - Tragically, three patients in the donanemab trials **lost their lives due to these side effects**.

What is Alzheimer's Disease?

- **About:**
 - Alzheimer's disease is a **progressive neurodegenerative disorder** that affects the **brain, leading to memory loss, cognitive decline**, behavioral changes, problems with words in speaking or writing, poor judgment, changes in mood and personality, confusion with time or place, etc.
 - Alzheimer's disease is the most **common cause of dementia**, accounting for **60-80% of dementia cases**.
- **Causes and Risk Factors: Currently the causes of Alzheimer is not fully known, still factors that may contribute to Alzheimer's include:**
 - **Age:** Advancing age is the primary risk factor, with the **majority of cases occurring in individuals over 65**.
 - **Genetics:** Certain gene mutations, such as those in the **APP, PSEN1, and PSEN2 genes**, can increase the risk of developing Alzheimer's.
 - **Amyloid Protein:** Alzheimer's disease is thought to be caused by the abnormal build-up of amyloid-beta and tau proteins in and around brain cells.
 - Amyloid-beta protein clumps together to form plaques between nerve cells in the brain, while tau protein forms twisted tangles inside neurons.
 - **Lifestyle Factors:** Chronic conditions like **cardiovascular disease, diabetes, obesity, smoking**, and a sedentary lifestyle may contribute to the risk.
- **Diagnosis:**
 - Cognitive and neuropsychological tests to assess memory, thinking, and problem-solving abilities.
 - Imaging techniques (MRI, PET scans) to identify brain changes.
 - **Biomarker tests (cerebrospinal fluid analysis, amyloid PET)** to detect amyloid plaques.
- **Treatment and Management:**
 - There's currently **no cure for Alzheimer's disease**. But there is medicine and supportive therapies available that can temporarily reduce the symptoms.

- **Prevalence:**

- Alzheimer's disease affects a significant number of people worldwide, with **at least 55 million individuals suffering from the condition.**
- In India, As India's population ages, the number of people with **dementia and Alzheimer's** is set to rise to **7.6 million by 2030.**

Dementia

- **Dementia** is an umbrella term that refers to a **group of symptoms characterized by a decline in cognitive abilities** severe enough to interfere with daily functioning.
- Dementia is currently **the seventh leading cause of death** and one of the major causes of disability and dependency among older people globally.

[Source: IE](#)

Rapid Fire Current Affairs

Dust-Raising Winds and High PM10 Levels: Impact on AQI in Delhi

Recently, **Delhi witnessed a surge in Particulate Matter (PM)10 levels** with strong **winds raising dust** and **reducing visibility**. According to [India Meteorological Department\(IMD\)](#), the dust-raising winds are a result of **low rainfall, heating, and gusty winds prevailing over the past few days**, with **temperatures remaining above 40 degrees Celsius**. IMD scientists explained that the **high temperatures caused the dry soil to be suspended in the air due to strong winds**. The **PM10 levels were 19 times higher than the 24-hour standard**, and the PM2.5 levels also saw an increase. The 24-hour average [Air Quality Index \(AQI\)](#) for the city was categorized as 'very poor' or 'poor' at most monitoring stations.

Inhalable particulate matter in the air can cause respiratory symptoms such as coughing, and aggravated asthma. The source of dust in summer was attributed to dry conditions and higher wind speeds. The sub-committee for invoking actions under the [Graded Response Action Plan \(GRAP\)](#) met but decided not to invoke any actions as the situation is likely to improve in the next few days.

Read more: [Air Quality and Health in Cities](#)

Bangladesh Withdraws "Extra Security Escort" for Diplomats

Bangladesh has decided to **withdraw extra security provided to top diplomats** from India, the United States, the United Kingdom, and Saudi Arabia, deeming it **discriminatory and unnecessary due to the country's well-controlled law and order situation**. The decision comes after **heightened security measures were implemented following a militant attack in 2016**. The foreign minister stated that the current law and order situation does not warrant additional security for specific envoys, suggesting that **private security services can be hired if needed**. **Normal security measures** for diplomatic missions, in line with **international conventions, will continue to be upheld by the host country**.

In the context of diplomatic security, the [Vienna Convention](#) on Diplomatic Relations of 1961 plays a significant role. This international treaty establishes the framework for diplomatic relations between independent countries. The convention grants diplomatic agents and missions various privileges and immunities to ensure their effective performance and protection from undue interference by the host state. Article 22 of the convention emphasizes the inviolability of the mission premises, with the receiving

state having the duty to protect them against any intrusion or damage. Furthermore, Article 29 highlights the inviolability of the person of a diplomatic agent, with the **receiving state being obligated to treat them with respect and prevent any attack on their person, freedom, or dignity. The convention also grants diplomatic agents immunity from criminal jurisdiction.** However, it also mandates that diplomatic agents respect the laws and regulations of the receiving state and refrain from interfering in its internal affairs. These provisions ensure the security and functioning of diplomatic missions and personnel.

Read more: [Vienna Convention](#)

Indigenous Dengue Vaccine Trials in India

Serum Institute of India and Panacea Biotec, two prominent drug manufacturers, have taken a significant step towards **developing India's first vaccine against dengue.** They have submitted applications to the **Indian Council of Medical Research (ICMR)** in response to the '**Expression of Interest**' for collaborative **Phase-III clinical trials** for indigenous manufacturers. Phase-III trials are conducted **to evaluate the efficacy, safety, and immunogenicity** of the tetravalent dengue vaccine candidate developed by Indian manufacturers.

Dengue virus disease poses a substantial health burden globally, with **India reporting 2 to 2.5 lakh cases annually.** The **World Health Organization (WHO)** has recognized dengue as **one of the top ten global health threats.** Presently, there is no specific treatment for dengue, underscoring the urgent need for effective vaccines.

Dengue is a mosquito-borne tropical disease caused by the **dengue virus (Genus Flavivirus),** transmitted by several species of female mosquito within the genus *Aedes*, principally *Aedes aegypti*. This mosquito also transmits [chikungunya](#), yellow fever and [Zika infection](#).

Read more: [Dengue](#)

Sikkim's Statehood Day



On the occasion of **Sikkim's Statehood Day**, Prime Minister extended his greetings to the people of Sikkim. Celebrated annually on **May 16**, this day marks the acknowledgment of **Sikkim's integration with India and its establishment as the 22nd state of the country in 1975.**

The formation of the state of Sikkim came about through the **36th Amendment of the Indian**

Constitution. Sikkim has a rich history that dates back to the 17th century when the **Namgyal dynasty founded the Kingdom of Sikkim.** It is a former British protectorate, maintained its **administrative independence under the Chogyal rulers.** After India's independence, **Sikkim continued as a protectorate with India overseeing its external relations,** defense, and communications. However, in 1973, the people's agitation led to changes in governance. The Chogyal became a titular figure, and **Sikkim was designated an "associated state."** In 1975, Sikkim was granted statehood, integrating it into India and abolishing the monarchy on May 16.

Sikkim is bordered by the [Tibet Autonomous Region](#) of [China](#) to the north and northeast, by [Bhutan](#) to the southeast, by the Indian state of [West Bengal](#) to the south, and by [Nepal](#) to the west.

Mount Kanchenjunga, India's highest peak and the world's third highest mountain **lies in Sikkim.** The [Kanchenjunga National Park](#) (KNP) (established in **1977**), near the peak is among the largest of India's high-elevation conservation areas. KNP was designated a [World Heritage Site](#) in **2016** under the **'mixed' category** (sites containing elements of both natural and cultural significance). Sikkim is drained by the [Teesta river and its tributaries](#) such as the Rangit, Lhonak, Talung and Lachung. [Teesta river water conflict](#) is one of the most contentious issues between [India and Bangladesh.](#) Teesta river is a **tributary of Brahmaputra River.**

Read more: [Sikkim's Statehood Day](#)

National Federation Cup Senior Athletics Championships 2023

The 26th Edition of **National Federation Cup Senior Athletics Championships** is going at [Birsamunda Stadium, Ranchi](#) (Jharkhand) from 15 May 2023. The Competition is **organized in Men and Women section.** It is a **domestic tournament** of the Indian athletics season. It is organised by the **Athletics Federation of India (AFI).** Some of the Events are Jumps; throws- shot put, discus throw, javelin throw; Sprinting Events etc.

The AFI is the apex body for running and managing athletics in India and affiliated to the **International Amateur Athletic Federation (IAAF), Amateur Athletic Association (AAA) and Indian Olympic Association.** The AFI has as many as 32 affiliated state units and institutional units. The AFI came into existence in 1946 and the federation organises the National Championships, trains the Indian Athletics National Campers and **selects the Indian Athletics Teams for various international competitions,** including the Olympics, Asian Games, World Championships, Asian Championships and other international meets.

ICC Implements Changes to Playing Conditions

The [International Cricket Council \(ICC\)](#) has made some changes to the playing conditions of cricket matches. One of the major changes is that the **'soft signal'** by on-field officials has been scrapped. According to ICC rules, a soft signal is the **visual communication by the bowler's end umpire to the third umpire of his/her initial on-field decision prior** to initiating an Umpire Review. This signal **was used to determine whether catches taken inches off the ground were valid or not.** It was often criticized by experts for creating more confusion, and the TV umpire found it difficult to make decisions based on this signal.

Another significant change is that **helmets are now mandatory for high-risk positions,** including batters facing fast bowlers, wicketkeepers standing up to the stumps, and fielders standing close to the batter in front of the wicket. Additionally, there has been a minor addition to the **free hit rule,** which states that **any runs scored off a free hit when the ball hits the stumps will be counted as runs scored.** These changes will come into effect on June 1st, 2023, with the **Lord's Test between England and Ireland being** the first match to follow the new rules. The ICC made these changes after the Cricket Executive Committee approved the recommendations from the men's and women's cricket committees.

ICC is the **global governing body for cricket.** Representing **104 members,** the ICC governs and administers the game and works with its members to grow the sport. It has its headquarters in **Dubai, UAE.**

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