23rd Dec, 2024

1. India And Kuwait Are 'Strategic Partners' Now
GS 2 (International Relations)

- **Why in News: During Prime Minister Narendra Modi's recent visit to Kuwait (**first visit by an Indian Prime Minister to Kuwait in 43 years**),** India and Kuwait elevated their relationship to a "strategic partnership," focusing on key areas like trade, defence, and regional security.


PM VISIT: BOTH SIDES CONDEMN CROSS-BORDER TERROR

India, Kuwait boost ties: Strategic partnership, key pact on defence

Modi gets Kuwait's highest honour, 'The Order of Mubarak Al-Kabeer'

DIVYA A
NEW DELHI, DECEMBER 22

AS PRIME Minister Narendra Modi and Kuwait's Amir Sheikh Meshal Al-Ahmad Al-Jaber Al-Sabah held their first bilateral meeting on Sunday, the two countries elevated their relationship to a "strategic partnership" and signalled that trade and defence cooperation would form the key pillars of their ties.

This came on the day that Kuwait conferred its highest honour — 'The Order of Mubarak Al-Kabeer' — on Modi for his role in strengthening the relations between the two countries.

Modi arrived in Kuwait on Saturday for a two-day visit — the first by an Indian PM in 43 years. The last Indian PM to visit Kuwait was Indira Gandhi in 1981. Modi was accompanied by External Affairs Minister S Jaishankar and National Security Advisor (NSA) Ajit Doval.

Besides the Amir, Modi also met Crown Prince Sheikh Sabah Al-Khaled Al-Hamad Al-Mubarak Al-Sabah, who hosted a banquet in his honour, and held delegation-level talks with Kuwaiti Prime Minister Sheikh Ahmad Abdullah Al-Ahmad Al-Sabah.

EXPLAINED The next level

WITH A "strategic partnership", India and Kuwait have given new momentum to bilateral ties. Kuwait is among India's top trading partners, with bilateral trade valued at US$ 10.47 billion in 2023-24. The Indian community forms the largest expatriate group in Kuwait.

The two sides institutionalised defence cooperation through an overarching agreement that includes training, exchange of personnel and experts, joint exercises, supply of defence equipment, and collaboration in research and development, among others.

Besides defence, three other MoUs (Memoranda of Understanding) were inked to facilitate cooperation in the areas of sports, culture and solar energy.

Modi invited a delegation comprising the Kuwaiti Investment Authority and other

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Prime Minister Narendra Modi being awarded 'The Order of Mubarak Al-Kabeer' by Kuwait's Amir Sheikh Meshal Al-Ahmad Al-Jaber Al-Sabah on Sunday. PTI

- **Key Takeaways of the visit**
  - **Strategic Partnership**: India and Kuwait upgraded their bilateral ties to a strategic partnership, signaling enhanced cooperation in areas like trade, defence, security, infrastructure, and technology.
  - **Defence Cooperation**: A key agreement was signed to institutionalize defence ties, including joint exercises, personnel exchanges, supply of defence equipment, and collaboration in research and development.
  - **MoUs Signed**: Four Memoranda of Understanding (MoUs) were signed:
    - Kuwait's membership of **International Solar Alliance (ISA)**
    - Cooperation in the field of
    - Cultural Exchange Programme between India and Kuwait for the years 2025-2029.
    - Executive Programme between India and Kuwait on Cooperation in the field of Sports for 2025-2028 between the **Ministry of Youth Affairs and Sports**, Government of India and Public Authority for Youth and Sports, Government of the State of Kuwait.
  - **Economic and Investment Focus**: India invited Kuwaiti investors to explore opportunities in sectors like energy, pharmaceuticals, IT, and defence, with the aim to expand bilateral trade, which reached USD 10.47 billion in 2023-24.
  - Both sides also discussed expediting the **India-GCC Free Trade Agreement**
  - **Regional Security**: Both nations condemned terrorism in all forms, emphasizing the disruption of terrorism financing and dismantling terror infrastructure. They also stressed cooperation in regional stability, particularly in West Asia.
  - **Vision 2035**: Modi expressed India's commitment to support **Kuwait's "Vision 2035" development plan**, which focuses on transforming the country's economy.
  - **Award**: The Amir of Kuwait honored Modi with the prestigious ***Order of Mubarak Al-Kabeer*** for his role in strengthening bilateral relations.\
- **Impact:**
  - **Strengthened Bilateral Ties**: The strategic partnership between India and Kuwait will likely lead to more robust cooperation, not just in defence but also in economic and technological sectors.
  - **Increased Investment**: The visit could lead to greater Kuwaiti investment in India, especially in the energy, defence, and pharmaceutical sectors, enhancing economic ties between the two nations.
  - **Enhanced Regional Stability**: The focus on security and regional cooperation, particularly in countering terrorism, aligns India and Kuwait's interests, strengthening their role in promoting peace and stability in West Asia.
- **Order of Mubarak Al-Kabeer**
  - Prime Minister of India was awarded the Wisam Mubarak al-Kabeer, or the Order of Mubarak the Great, by Sheikh Meshal Al-Ahmad Al-Jaber Al-Sabah, the Amir of Kuwait.
  - **About Order of Mubarak Al-Kabeer:**
    - It is the highest national **award of Kuwait.**

- It is conferred by the Kuwaiti government **on Heads of State, Sovereigns of foreign countries**, and on members of foreign royal families as a sign of friendship and goodwill.
- **History**
  - The award was **instituted in 1974,** in the memory of Mubarak Al Sabah — also known as Mubarak al-Kabeer or Mubarak the Great — who ruled Kuwait from 1896 to 1915.
  - Under his reign, Kuwait got more autonomy from the Ottoman Empire. In 1899, Mubarak signed a deal with Britain to guard his kingdom from Turkey, effectively becoming a British protectorate. Mubarak is known for playing a major role in shaping the future of Kuwait.
  - The design of the award changed in 1992, after Kuwait was liberated from Iraq in the year before.
- **Other recipients:** Queen Elizabeth II of England, former American Presidents George HW Bush and Bill Clinton, King Salman of Saudi Arabia, former French President Nicolas Sarkozy.

2. Indian rupee falling against the US dollar
GS 3 (Economy)

- **Why in News:** The Indian rupee has weakened against the US dollar, crossing the 85 mark. In April, the exchange rate was around 83, and a decade ago, it was approximately 61. This reflects a steady decline in the rupee's value relative to the dollar.

Indian rupee continues to fall against US dollar: what determines exchange rate?

UDIT MISRA
NEW DELHI, DECEMBER 22

THE INDIAN rupee's exchange rate against the US dollar breached the 85 mark last week. In other words, one would have to pay Rs 85 to buy $1.

In April, this "exchange rate" was around 83 and a decade ago, when Narendra Modi became prime minister, it was around 61. As such, the rupee has been weakening in value relative to the dollar — this is a long-term trend.

What is the exchange rate?

Within India, we buy goods (such as a pizza or a car) and services (such as a haircut or a hotel stay) using our money, the Indian rupee. But for things from outside the country — say an American-made car or Swiss vacation or indeed, crude oil — we would have to purchase the currency of another country, say the US (dollar) or Swiss currency (euro) using our domestic currency before we buy the final item. The rate at which one can swap currencies is the exchange rate. In other words, how many rupees would buy you a dollar or a euro.

In such a market – also referred to as the currency market – each currency is like a commodity itself. The value of each currency relative to another currency is called the exchange rate. These values can stay the same over time but more often than not they keep changing.

What decides it?

Like any other trade in life, the relative value of one currency against another depends on which is demanded more. If Indians demand more US dollars than Americans demand the Indian rupee, the exchange rate will tilt in favour of the US dollar. If this situation keeps repeating every day, such a trend will become stronger and the rupee will keep losing value relative to the US dollar.

This movement will show up in the form of the rupee's exchange rate weakening against the dollar.

What factors determine the demand for rupee vis à vis dollar?

Three main factors are at play here.

One big component of demand comes from trade of goods. For the sake of simplicity, imagine a world where there are only two countries – India and the US. If India imports more goods from the US than what it exports to the US, then the demand for US dollars will outstrip the demand for Indian rupee. This, in turn, will make the US dollar gain strength against the rupee, and its exchange rate versus the rupee will appreciate. Put differently, the rupee's exchange rate relative to the dollar will weaken. As a result, more rupees will be required to buy a single US dollar.

The other component is trade in services. If Indians buy more US services – say tourism – than Americans buy Indian services, then again, demand for dollars will outstrip the demand for rupee, and rupee will weaken.

The third component is investments. If Americans invest in India more than Indians invest in the US, then the demand for rupee will outstrip the dollar and rupee will appreciate against the dollar.

And what factors affect these three kinds of demands?

There are several factors that can affect these three demands.

Suppose the US decides that it will not allow Indian imports. In such a scenario, the demand for Indian rupees will plummet. After all, if the Americans can't buy Indian goods, why would they go to the currency market to buy Indian rupees?

End result: rupee will weaken. Something similar is expected to happen if, as President-elect Donald Trump has promised, the US slaps high tariffs against Indian goods, making them so costly that no one in the US will buy them.

Imagine a scenario where both India and the US are experiencing high inflation. By definition, inflation eats away the value of a currency because an inflation of 5% means that whatever one could buy for Rs 100 in year 1, requires Rs 105 to buy in the next year.

Now imagine that in 5 years' time, the US reduces its inflation to zero while in India it stays at 6%. This would mean that if an American decides to invest in the Indian stock market thinking that Indian companies/shares give an annual return of 10%, she would end up getting only a 4% real return because six out of the 10% would be eaten up by inflation. On the other hand, the US stock market might give a return of just 5% but since inflation is at 0%, the final return would be 5%.

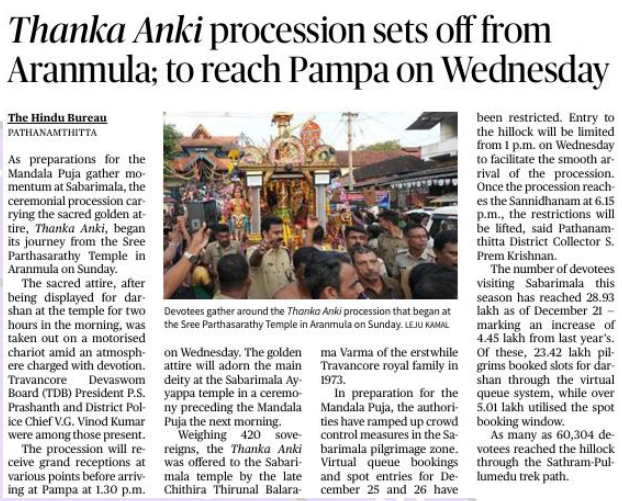
In such a scenario, an investor may not make any fresh investments into India; worse still, she may actually pull out money from India and invest it back in the US. Both these actions will reduce the demand for rupees relative to the dollar, and the rupee will weaken against the dollar. Something similar is happening at present as the investors pull out money from India.

- **Exchange rate**
  - **Understanding Exchange Rates**
    - We use the Indian rupee to buy domestic goods and services, but for international purchases like an American car or Swiss vacation, we first exchange rupees for foreign currencies like the US dollar or euro.
    - The exchange rate determines how many rupees are needed to buy one unit of a foreign currency.
    - In the currency market, where currencies are traded like commodities, these rates often fluctuate over time.
  - **Factors Influencing Exchange Rates**
    - Exchange rates are driven by demand and supply dynamics.
    - If Indians demand more US dollars than Americans demand Indian rupees, the dollar's value rises relative to the rupee, making it costlier.
    - Persistent demand imbalance strengthens this trend, causing the rupee to weaken against the dollar.
- **Factors determining the demand for rupee in comparison to dollar**
  - **Trade in Goods**
    - If India imports more goods from the US than it exports, the demand for US dollars exceeds that for Indian rupees.
    - This strengthens the dollar and weakens the rupee, requiring more rupees to buy one dollar.
  - **Trade in Services**
    - Similarly, if Indians purchase more US services (e.g., tourism) than Americans buy Indian services, the dollar's demand rises, causing the rupee to weaken.
  - **Investments**
    - If Americans invest more in India than Indians invest in the US, the demand for the rupee increases, leading to its appreciation against the dollar.

- **Factors affecting the three kinds of demands mentioned above**
    - **Trade Restrictions**
        - If the US bans or imposes high tariffs on Indian goods, demand for Indian rupees drops as Americans no longer need rupees to buy Indian products. This weakens the rupee.
    - **Inflation Differences**
        - High inflation in India compared to the US erodes the rupee's value.
        - Investors may avoid or withdraw investments from India due to lower real returns, reducing demand for rupees and further weakening its exchange rate.
- **Falling Rupee**
    - **About the news**
        - The rupee recently slid to 85.11 against the US dollar, driven more by a strengthening dollar than a weakening rupee.
        - While the rupee has depreciated against the dollar since September, it has appreciated against other major currencies like the euro, pound, and yen.
    - **Global Factors Driving Dollar Strength**
        - The dollar's rise stems from US policy concerns, including potential import tariffs, deportations, and tax cuts.
        - These measures could boost inflation, prompting the US Federal Reserve to maintain tight monetary policy.
        - This has led to higher US bond yields and a stronger dollar.
- **Impact of falling rupee**
    - **Negative impact**
        - **Impact on inflation management**
            - The most crucial impact would be on inflation as the country imports nearly 80% of its crude oil needs.
            - This would mean that imports would become costlier and travel through the value chain to raise input costs.
        - **Impact on current account deficit**
            - Since a large proportion of India's imports are dollar-denominated, these imports will get costlier.
            - Costlier imports, in turn, will widen the trade deficit as well as the current account deficit, which, in turn, will put pressure on the exchange rate.
    - **Positive impact**
        - One positive impact could be that remittances from overseas could become attractive.
        - A fall in the rupee can also benefit India's exporters - unless they import raw materials, which would become more expensive.
- **Policy Recommendations for India**
    - Focus on the rupee's effective exchange rate against a basket of currencies, not just the dollar.
    - Avoid using interest rates to defend the rupee; adjust rates based on domestic inflation trends.
    - Prioritize macroeconomic stability by addressing fiscal and current account deficits, adhering to inflation targets, and reinforcing confidence in India's growth potential.

3. Thanka Anki
GS 1 (Art and Culture)

- **Why in News:** The annual ceremonial procession carrying the **'Thanka Anki,'** the sacred golden attire of **Lord Ayyappa**, began its journey to the **Sabarimala temple from Aranmula**. This event marks the start of the **'mandalam-makaravilakku' pilgrimage season,** a significant period for devotees of **Lord Ayyappa**.
- **About**
    - The 'Thanka Anki' is a gold garment weighing 453 sovereigns, presented to Lord Ayyappa by the Travancore royal family in the 1970s.
    - The sacred attire is kept at the Aranmula Parthasarathy temple and is transported to the Sabarimala temple every year during the pilgrimage season.
    - The procession carries this precious attire in a grand ceremony that has become an essential part of the annual pilgrimage.
    - During the Mandala Puja, the **'Thanka Anki'** is placed on the idol of Lord Ayyappa.
        - **Mandala Pooja**at **Sabarimala Ayyappa Temple** is observed on 11th or 12th day during **Dhanu Masam**.
        - Mandala Pooja is the last day of 41 days long austerity observed by devotees of **Lord Ayyappa**. The fasting begins 41 days before Mandala Puja i.e. on the first day of **Vrishchikam Masam**according to Malayalam Calendar.
        - Mandala Puja is considered to be an important ritual which is observed at the Sabarimala Ayyappa Temple in Kerala.



Thanka Anki procession sets off from Aranmula; to reach Pampa on Wednesday

The Hindu Bureau
PATHANAMTHITTA

As preparations for the Mandala Puja gather momentum at Sabarimala, the ceremonial procession carrying the sacred golden attire, *Thanka Anki*, began its journey from the Sree Parthasarathy Temple in Aranmula on Sunday.

The sacred attire, after being displayed for darshan at the temple for two hours in the morning, was taken out on a motorised chariot amid an atmosphere charged with devotion. Travancore Devaswom Board (TDB) President P.S. Prashanth and District Police Chief V.G. Vinod Kumar were among those present.

The procession will receive grand receptions at various points before arriving at Pampa at 1.30 p.m. on Wednesday. The golden attire will adorn the main deity at the Sabarimala Ayyappa temple in a ceremony preceding the Mandala Puja the next morning.

Weighing 420 sovereigns, the *Thanka Anki* was offered to the Sabarimala temple by the late Chithira Thirunal Balarama Varma of the erstwhile Travancore royal family in 1973.

In preparation for the Mandala Puja, the authorities have ramped up crowd control measures in the Sabarimala pilgrimage zone. Virtual queue bookings and spot entries for December 25 and 26 have been restricted. Entry to the hillock will be limited from 1 p.m. on Wednesday to facilitate the smooth arrival of the procession. Once the procession reaches the Sannidhanam at 6.15 p.m., the restrictions will be lifted, said Pathanamthitta District Collector S. Prem Krishnan.

The number of devotees visiting Sabarimala this season has reached 28.93 lakh as of December 21 — marking an increase of 4.45 lakh from last year's. Of these, 23.42 lakh pilgrims booked slots for darshan through the virtual queue system, while over 5.01 lakh utilised the spot booking window.

As many as 60,304 devotees reached the hillock through the Sathram-Pulumedu trek path.

Devotees gather around the *Thanka Anki* procession that began at the Sree Parthasarathy Temple in Aranmula on Sunday. LEJU KAMAL

- **About Sabarimala Sree Dharma Sastha Temple**
    - The Sabarimala Temple in Kerala is a world famous **Swamy Ayyappan temple.**
    - It is located in the **western ghats** at a height of 914 m above sea level and is accessible only via foot (4 km)
    - The temple is situated amidst 18 hills of the Western Ghats. It is surrounded by mountains and dense forests that are a part of the **Periyar Tiger Reserve.**
    - It is dedicated to Lord Ayappa (also known as Hariharputra) who is said to be born from the union of the female avatar of Lord Vishnu (Mohini) and Lord Shiva.
    - **Naming:** During the period of Ramayana, an ascetic woman name 'Shabri' was living in this region of 18 hills. She was doing a strict penance only to meet Lord Ayappa. The temple got its name 'Sabarimala' from the woman's name.

4. The global warming fight has a challenge for India
GS 3 (Environment)

- **Why in News:** COP29, held in Azerbaijan, has been criticized for its failure to deliver meaningful progress in combating climate change, particularly concerning global emissions reductions. Amid political transitions, especially with the potential return of the Trump administration, the world faces mounting pressure for countries like India to act on emissions peaking by 2025. Despite this pressure, India's development needs complicate its energy transition, as it seeks to meet growing energy demands while mitigating climate impacts.
- **Global Climate Challenges**
    - **Disappointing COP29 Outcome:** COP29's outcome was seen as inadequate in addressing the critical need for rapid emissions reductions. With global climate negotiations stuck, nature continues its shift towards a hotter planet.
    - **Energy Transition Deadlines:** Developed countries target net-zero emissions by 2050, while China and India aim for 2060 and 2070, respectively. This sets a challenging framework for India's energy demands and development needs.

- **Pressure for Early Emissions Peaking:** The global call for emissions peaking by 2025, led by the G-7 and major economies, puts pressure on India, which is yet to commit to such a deadline, while other nations like the EU and the US are already on track.

The global warming fight has a challenge for India

The outcome of the climate conference (COP29) in Azerbaijan has been disappointing. The meeting took place at a time of transition in American politics. While international climate negotiations remain stalemated, nature is moving inexorably towards becoming a hotter planet. The fight against global warming requires reducing emissions. Developed countries have accepted 2050, China 2060, and India 2070 as the deadline for energy transition to net zero emissions by 2070.

There are two developments that will cut short the transition time. The European Union's (EU) Carbon Border Adjustment Mechanism (CBAM), which will be effective from 2026, will result in penal customs duties on imports unless the carbon tax in exporting countries is linked to the EU level. The second is increasing pressure to accept the 'peaking' of emissions. The G-7 Summit in Hiroshima last year, and Apulia in June 2024, called on the 'major economies' to accept the peaking of emissions by 2025. This was a reference to China and India as the EU and the United States have already accepted 'peaking'.

The incoming Donald Trump administration may take the U.S. out of the climate agreements again. Regardless of this, we must take action to achieve a clean environment, for our own sake. But we cannot ignore India's development imperative. We need more electricity to replace fossil fuels. India's electricity consumption is a third of the global average. While developed countries and China have to diversify to clean energy sources, India has to grow and diversify.

These twin challenges entail much higher costs and require a longer transition time. However, we do not have the luxury of waiting till 2070 as pressure mounts for the 'peaking' of emissions. The 'peaking' year is an intermediate stage where emissions plateau before declining to the net zero stage. China has accepted the goal of peaking by 2030. India cannot remain an outlier indefinitely. At the most, we may have a decade where our emissions will be capped. A more compressed transition schedule means that we have to depend upon existing technologies. Small modular reactors and hydrogen will take more than a decade to become commercially viable.

Ramp up generation

Can we escape pressure for early peaking? While targets in climate negotiations may be voluntary, they will be enforced through bilateral tariff measures and international financing conditions. The peaking level will determine the quantum of energy available for future growth. We need to rapidly ramp up electricity generation to establish our claim to an energy level that is sufficient to sustain future growth before we are constrained to accept the peaking of emissions. China has 200 GW of new coal-based power plants sanctioned or under construction.

Reaching net zero emissions (NZE) will entail growth in demand for electricity based on clean sources, as new sectors such as transport and industry are brought under electrification. This increase will be of a much higher order of magnitude than existing trends which are derived from the power sector alone. What is the minimum quantum of electricity needed to reach NZE? Which is the cheapest generation mix needed to achieve the minimum level? A Vivekananda International Foundation (VIF) Task Force on India's Energy Transition in a Carbon-Constrained World mandated IIT Bombay to answer these two questions based on mathematical modelling.

It estimated the minimum quantum of demand for electricity as 21,000 Terawatt hours (TWh) by 2070. An International Energy Agency report has pegged India's energy demand at 1,400 TWh by 2040. Different timelines make a comparison difficult. But it is worth keeping in mind that India's energy consumption in 2020 according to NITI Aayog data was 6,200 TWh. Is it realistic to peg its energy demand two decades later at half the level of 2020, the pandemic year, when the economic activities were slow? This is a prescription for energy deficit and slow growth.

The Economist has suggested decoupling growth with energy. The West has not followed this paradigm. Will India's service economy minimise the need for energy? Server banks needed to power the digital economy require a huge amount of energy. Generative AI will increase energy demand exponentially. This is why Microsoft and other tech giants are turning to nuclear power, which is the only source of clean, firm power at scale.

Cost and land

For energy transition, the choice lies between renewables and nuclear, the two forms of energy that are emission-free. But which of the two entails lower cost and land? The current renewables tariff does not fully take into account storage and transmission costs. A paper by the Central Electricity Authority last year acknowledged that the cost of renewables round the clock ranges from ₹4.98 per unit to ₹7.5 a unit (on the assumption of only six hours of storage). This is higher than the tariff for nuclear power at ₹3.80 a unit. The VIF-IIT Bombay study has also brought out that the renewable high option will cost the most ($15.5 trillion), while the nuclear high option will cost the least ($11.2 trillion) by 2070.

The VIF report has shown that the renewable high approach will require 4,12,033 square kilometres – double the total surplus land of 2,00,000 sq.km available in India. The nuclear high approach will require 1,83,565 sq.km. The renewable route for the production of green hydrogen will increase the demand for electricity for electrolysis and make land constraints worse.

On the margins of COP28 in the United Arab Emirates, a group of over 20 countries, including the U.S., France, and Japan have pledged to triple nuclear power by 2050. Nuclear power already provides 20% of electricity generation in the U.S. and 70% in France. Japan joined this group despite the legacy of the Hiroshima and Nagasaki bombings, and the Fukushima accident. In India's case, there is a need for a sharper increase, as the share of nuclear power in generation is as low as 3%.

Ramping up nuclear power requires government support, as resources on this scale cannot be internally generated by the Nuclear Power Corporation of India Limited (NPCIL). Nuclear power also needs to be given the status of green energy as it is emission free. Besides operationalising existing joint ventures between the NPCIL and public sector units, public-private partnerships with industries in hard-to-abate sectors should be encouraged given the looming EU deadline for enforcing the CBAM. The bulk of the additional demand for generation will have to be met by larger 700 MW-1,000 MW reactors.

The issue of finance

At COP29, developed countries committed a paltry $300 billion per year from diverse sources by 2035 against the demand by developing countries for $1.3 trillion. Will this distant goal survive the Trump presidency? Most of this will be non-concessional finance. Many developing countries cannot absorb loans. Multilateral development banks have their statutes, which will require amendment.

Green finance from private sources will come only if the tariff is raised, and the health of DISCOMs is restored. The government cannot bear the fiscal burden of energy transition. The public has to be sensitised to steep hikes in tariffs given the investment in creating new-generation assets. This requires political courage.

COP29 has finalised the rules for carbon trading. This amounts to rich countries buying the carbon entitlement of the poorer countries to cushion their lifestyle changes. If we cannot diversify to clean sources by the peaking year, we will need carbon for our growth rather than a trade-off.

The energy transition is a fight for limited carbon space. No major economy is likely to diversify to clean energy before the global carbon budget runs out in the next 10 years. An equitable share in the remaining carbon space is crucial for future growth. We must establish our claim by establishing high-generation capacity. The EU and the U.S. have already claimed entitlement to remaining carbon space by unilaterally establishing their peaking levels. China will keep expanding its claim till 2030.

D.P. Srivastava

a former Ambassador and Coordinator of the Vivekananda International Foundation (VIF) Task Force on India's Energy Transition in a Carbon-Constrained World

India's development needs cannot be ignored, as it has to grow and diversify to clean energy sources. this would mean higher costs and a longer transition time

- **Cost and Land Constraints:** Renewables, while emission-free, have higher costs due to storage and transmission, and demand excessive land use. Nuclear power offers a more cost-effective and land-efficient alternative but requires significant government support.

- **Financial and Political Implications**
  - **Global Finance Shortfall:** Developed countries have committed only $300 billion annually for climate finance by 2035, far below the $1.3 trillion demanded by developing nations like India. The uncertain political landscape, including the potential return of Trump, further complicates the future of this financial support.
  - **Carbon Trading Mechanism:** COP29 finalized rules for carbon trading, allowing wealthier nations to offset emissions by purchasing carbon entitlements from developing countries. This poses a challenge for India if it cannot diversify to cleaner energy sources before its emissions peaking deadline.
  - **Need for Political Consensus:** For India's energy transition to succeed, a political consensus is necessary to ensure investments in generation assets and fair pricing mechanisms, as public and private sectors must collaborate to meet the looming energy demands.

5. Pointing the beacon at India's undersea warfare capabilities
GS 2 (Security)

- **Why in News:** The Indian Navy's strategic focus in 2024 has been on enhancing its undersea warfare capabilities, highlighted by key developments in nuclear and conventional submarine programs, as well as niche technologies like unmanned underwater vehicles (UUVs). The commissioning of **INS Arighaat**, the launch of the **K-4 submarine-launched ballistic missile (SLBM),** and the approval of **Project-77** for nuclear-powered attack submarines have reinforced India's naval strength in the Indo-Pacific. The Navy's efforts also focus on addressing challenges like budgetary issues and enhancing indigenous content in defense platforms.

Pointing the beacon at India's undersea warfare power

The year 2024 started on a high note for the Indian Navy, with Operation Sankalp expanding from the Strait of Hormuz to the Red Sea to ensure the safety and the security of shipping from piracy and providing assistance to ships targeted by the Houthis. The Navy's continued response in addressing piracy, hijacking, and drone attacks on international merchant shipping has reinforced its status as a preferred security partner and first responder. In 2024, while several salient episodes marked the Navy's operational preparedness, an area that witnessed several critical developments was undersea warfare.

Pivotal developments

One key development was the commissioning of India's second indigenous nuclear-powered ballistic missile capable submarine (SSBN), INS *Arighaat*, in August 2024. Adding value to the third leg of India's nuclear triad – and hence nuclear deterrent value – the SSBN mirrors its predecessor, INS *Arihant*, in size and propulsion. The two, as submarines are known colloquially, has a higher indigenous content than INS *Arihant*. The advanced sonar and propulsion systems and upgraded acoustic dampening are a distinctive addition to India's underwater warfare capabilities. These capabilities were emblematically enhanced by the recent testing of the K-4 submarine-launched ballistic missile (SLBM) from INS *Arighaat*, with a range of 3,500 kilometres. While the firing was successful, the results of the test parameters are awaited. Successful tests and the induction of the missile as a composite weapon package of SSBNs would place most of China under striking range.

About a month after the commissioning of INS *Arighaat*, the Cabinet Committee on Security cleared the long-pending Project-77 (P-77), giving its final approval to construct two nuclear-powered attack submarines (SSNs) at a cost of ₹40,000 crore. Delivery of the first SSN is scheduled for 2036-37 and the platform is expected to include *over* 90% indigenous content. The addition of the SSNs would enhance the Navy's underwater warfare capabilities, which essentially includes providing protection to deployed SSBNs. With the induction of the SSNs, India would become the only non-P5 nation operating SSBNs and SSNs.

On conventional submarines

While nuclear boats open up new vistas of capabilities, conventional boats will always be relevant. In the past, there has been discussion in the U.S. about the re-induction of non-nuclear boats, as not all undersea missions require nuclear power. In India's case, Project-75, in collaboration with France, will see the commissioning of the sixth Scorpene boat, INS *Vaghsheer* soon. The Navy is looking to order three more such boats, which will add the required punch and help fill the void with the decommissioning of older boats. The efficacy of non-nuclear boats has increased with the advent of air independent propulsion (AIP). Therefore, Project 76(I), which seeks to induct AIP-enabled boats, involves Spain and Germany as contenders to build such boats, and is expected to reach its logical conclusion when the technical and financial evaluations are completed. In all cases, indigenous content is expected to increase. For example, the follow-on three Scorpene boats are expected to feature 65% indigenous content. In the case of Project 75(I), with the bidders, Germany's ThyssenKrupp Marine Systems (TKMS) and Spain's Navantia, accepting India's transfer of technology and indigenous content requirements, the first boat is likely to include a minimum of 45% indigenous content, rising to 60% in the sixth boat.

Another domestic development in niche undersea naval technologies is the approval of building 300-tonne Unmanned Underwater Vehicles (UUVs) at a cost of ₹2,300 crore. UUVs would add to India's undersea capabilities as a low-cost option with a high return on investment. This project is symbolic of India's positioning of niche technologies as strategic enablers to address increasingly complex and evolving threats in the maritime space.

Some of the hurdles

The approach to enhance the Navy's undersea capabilities in tandem with surface and aviation elements underscores the importance placed at various levels of the Indian government on ensuring maritime stability and security. This approach would create a balanced blue water force. However, this calls for addressing long-drawn budgetary issues to manage the mismatch between planned acquisitions and modernisation allocations and excessive time delays. Sustained funding for projects with long gestation periods, streamlined processes on specifying requirements, shortlisting original equipment manufacturers, and issuance and evaluation of tenders would require focus. A balanced force would ensure fulfilling the Navy's strategic and operational requirements, which are indispensable for addressing the threats, challenges, and risks emanating from the maritime domain while also taking advantage of the opportunities that arise.

These opportunities, especially cooperation and collaboration with strategic partners and other friendly maritime nations, would augur well not only for India's growth as a maritime nation but also support India's maritime visions of Security and Growth for All in the Region (SAGAR) and a free, open, and inclusive Indo-Pacific.

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The approach to enhance the Indian Navy's undersea capabilities highlights the government's move to ensure maritime stability and security

- **Key Developments in Undersea Warfare**
  - **INS Arighaat Commissioned**: In August 2024, India's second indigenous nuclear-powered ballistic missile submarine (SSBN), INS Arighaat, was commissioned, adding to India's nuclear triad. It is designed with advanced sonar and propulsion systems, and higher indigenous content than its predecessor, INS Arihant.
  - **Testing of K-4 SLBM:** The successful testing of the K-4 submarine-launched ballistic missile (SLBM) from INS Arighaat, with a range of 3,500 km, enhances India's nuclear deterrent and places significant portions of China within striking range, bolstering India's regional security posture.
  - **Approval of Project-77 (P-77):** The Cabinet Committee on Security cleared Project-77, allowing the construction of two nuclear-powered attack submarines (SSNs) at Rs. 40,000 crore, scheduled for delivery

by 2036-37. These SSNs would complement India's SSBNs and make India the only non-P5 nation to operate both types.

- **Conventional Submarines and Strategic Importance**
  - **Project-75 and Scorpene Submarines:** The sixth Scorpene-class submarine, INS Vaghsheer, is set to be commissioned under Project-75, which has strengthened India's conventional submarine fleet. The Navy is also set to acquire three more such boats to replace decommissioned submarines and enhance operational capacity.
  - **Project-75(I) for AIP Submarines:** Project-75(I), aimed at inducting air-independent propulsion (AIP) enabled submarines, involves bidders from Spain and Germany. These AIP-enabled submarines will have a significant increase in indigenous content, further strengthening India's undersea capabilities.
  - **Indigenous Content in Submarine Programs:** India has committed to increasing indigenous content in its submarine programs, with follow-on Scorpene submarines expected to have 60% indigenous content, and the first AIP submarine under Project-75(I) likely to feature 45% indigenous content, with the goal of 60% by the sixth boat.
- **Challenges and Strategic Goals**
  - **Budgetary and Delays in Modernization:** The Navy faces challenges in modernizing its forces due to mismatches between planned acquisitions and budget allocations. Delays in procurement processes and long gestation periods for defense projects further hinder the effective enhancement of undersea capabilities.
  - **Focus on Strategic Enablers**: The approval of 100-tonne unmanned underwater vehicles (UUVs), costing Rs. 2,500 crore, highlights India's focus on low-cost, high-return technologies for strategic maritime security. These UUVs will complement the Navy's capabilities in addressing evolving threats.
  - **Cooperation with Strategic Partners**: India is focused on enhancing maritime stability through cooperation with strategic partners and friendly nations, particularly in the Indo-Pacific region. This collaboration is aligned with India's vision of promoting a free, open, and inclusive maritime order under the SAGAR (Security and Growth for All in the Region) framework.

6. New Interception Rules and Safeguards
GS 2 (Governance)

- **Why in News:** The Union Government notified new **Telecommunications (Procedures and Safeguards for Lawful Interception of Messages) Rules, 2024**. These rules allow certain government agencies to intercept phone messages under specific conditions, replacing the older **Indian Telegraph Rules, 1951** (Rule 419A). The new rules aim to regulate how interception orders are issued and implemented, particularly in emergency situations or in remote areas.

What are the new interception rules and safeguards?

What do the new Telecommunications (Procedures and Safeguards for Lawful Interception of Messages) Rules, 2024 state? Will it override Rule 419A of the Indian Telegraph Rules, 1951?

R.K. Vij

The story so far:

The Union Government, on December 6, notified the Telecommunications (Procedures and Safeguards for Lawful Interception of Messages) Rules, 2024 which empower some enforcement and security agencies to intercept phone messages under certain conditions. These rules supersede Rule 419A of the Indian Telegraph Rules, 1951.

What do the new rules state?

The new rules authorise the Union Home Secretary and the Secretary to the State government in-charge of the Home Department as the competent authority to order the interception of any message or class of messages. An officer not below the rank of a Joint Secretary to the Union Government, may also issue such order of interception in 'unavoidable circumstances' (without defining such circumstances). The Central Government may also authorise any law enforcement or security agency to intercept messages for reasons specified under Section 20(2) of the Telecommunications Act, 2023.

'In remote areas or for operational reasons', the head or the second senior most officer of the authorised agency at the central level, and head or the second senior most officer of the authorised agency (not below the rank of IG Police) at the State level may also issue an order of interception, but the officer will have to submit such an order to the competent authority within three working days of the date of its issuance. If such order is not confirmed by the competent authority within seven working days from the date of issue, such interception shall henceforth cease. The rules also mandate the destruction of records relating to interception every six months by the authorised agency and review committee (unless required for functional requirements or court directions).

How are the new rules different?

First, the condition of interception by authorised agencies only in 'emergent cases', has been relaxed. Interception by authorised agencies is now possible if it is not feasible for the competent authority to issue orders in 'remote areas or for operational reasons'. Second, under Rule 419A, there was no limit for the number of IGP rank officers at the State level who could be authorised for interception. But now, in addition to the head of the authorised agency, only (one) the second senior most officer can be authorised for interception. Third, in case the interception order by an authorised agency is not confirmed within seven days, any messages intercepted shall not be used for any purpose, including as evidence in court.

The Indian Telegraph Act of 1885 had provided the Union Government to make rules for 'the precautions to be taken for preventing the improper interception or disclosure of messages', but no such safeguards were framed for a long time. The safeguards and procedure of interception under Rule 419A were notified only in March, 2007, consequent to the directions issued by the Supreme Court in *People's Union for Civil Liberties (PUCL) versus. Union of India and Another* in 1996. The Supreme Court, in this case, not only elaborated the terms 'public emergency or in the interest of the public safety', but also held that the right to privacy cannot be curtailed arbitrarily without laying down safeguards which are just, fair and reasonable.

What are concerns about new rules?

While the pre-requisite of 'emergent cases' for interception by authorised agencies has been relaxed without additional checks, the rules are criticised for not fixing any accountability for the wilful misuse of powers of interception by authorised agencies. The rules are silent about punitive actions if any authorised agency abuses the powers of interception for a period up to seven days, before its confirmation by the competent authority.

R.K. Vij is a former Indian Police Service officer.

THE GIST

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The Indian Telegraph Act of 1885 had provided the Union Government to make rules for 'the precautions to be taken for preventing the improper interception or disclosure of messages', but no such safeguards were framed for a long time.

The rules are silent about punitive actions if any authorised agency abuses the powers of interception.

- **Key Takeaways**
  - These rules, framed under the **Telecommunications Act, 2023**, replaced earlier **Indian Telegraph Rules of 1951** concerning interception.
  - **Interception** refers to the act of secretly accessing and monitoring communication, such as phone calls, text messages, or emails, typically by a government or law enforcement agency, for specific purposes.
  - **Competent Authorities for Interception Orders**: The **Union Home Secretary** and the **State Home Department Secretary** can order interception of phone messages. In unavoidable circumstances, a **Joint Secretary** from the Union Government can issue interception orders, though "unavoidable circumstances" are not clearly defined.
  - **Interception in Remote Areas or Operational Reasons**: If it's difficult for the competent authority to issue an order due to remote locations or operational needs, the **head** or **second senior most officer** of the concerned agency at the central or state level (at least of **IG Police** rank) can issue an order.

- Such orders must be confirmed by the competent authority within **7 days**. If not confirmed, interception must cease, and the messages cannot be used for any purpose, including court evidence.

  - **Destruction of Interception Records**: Agencies must destroy interception records after **6 months**, unless they are needed for functional purposes or legal requirements (like court orders).
  - **Relaxation of Conditions**: The previous requirement that interceptions could only happen in "**emergent cases**" has been relaxed. Now, agencies can act in situations where it is difficult for the competent authority to issue orders due to geographical or operational constraints.
  - **Changes in State-Level Interception Authorization**: Earlier, there was no limit on the number of officers (IG rank) who could be authorized for interception at the state level. Now, only the **head** and **second senior most officer** can issue interception orders.
  - **Seven-Day Confirmation Requirement**: If an interception order issued by an agency is not confirmed by the competent authority within **7 days**, the interception will be considered invalid, and the messages will not be usable as evidence.

- **Key Differences from Previous Rules**
  - **Relaxation on 'Emergent Cases'**: Earlier, interceptions were only allowed in "emergent cases". Now, interception is allowed even in situations where it is not feasible for the competent authority to issue orders in **remote areas** or for **operational reasons**.
  - **Limitation on Seniority of Officers**: Under the older rules, multiple IG-level officers could be authorized at the state level for interception. The new rules limit this to the **head** and **second senior most officer**.
  - **Time Limit for Interception Confirmation**: If an interception order is not confirmed within **7 days**, it becomes invalid, and any messages intercepted cannot be used, unlike the previous rules, where such a time limit didn't exist.
- **Concerns About the New Rules**
  - **Lack of Accountability**: While the new rules expand the conditions under which interception can occur, they do not provide sufficient **accountability** for misuse of interception powers. Specifically, there is no mention of **punitive action** if interception orders are misused, particularly in the **7-day window** before they are confirmed by the competent authority.
  - **Relaxation of Safeguards**: The removal of the "**emergent cases**" condition without additional safeguards has raised concerns that the new rules may allow more frequent and potentially unwarranted interception of messages, increasing the risk of **privacy violations**.
  - **Privacy Concerns**: The broader conditions under which interceptions can occur raise concerns about the **violation of privacy**, particularly due to the lack of checks and balances regarding misuse of the powers.

7. Speed gun
GS 2 (Governance)

- **Why in News:** Speed guns are widely used by law enforcement officials to monitor traffic speed and in various other industries.
- **About Speed gun:**
  - It is a device to **measure the speed of a moving object** without having to be in contact with the object.
  - To achieve this, the device bounces electromagnetic radiation of a specific frequency off the object, capturing the reflection and **using the Doppler effect to infer the object's speed.**
  - Speed guns are electronic, and use complex circuitry to emit the radiation used to make the measurement.
  - The speed gun was originally **developed during World War II** for military use and applies the effect using radio waves rather than sound waves.
  - **How it works?**
    - A speed gun has a **radio transmitter and a receiver**.

The principle behind the working of a speed gun, used for motion tracking

A speed gun is a device to measure the speed of a moving object without having to be in contact with the object. Speed guns are widely used by law enforcement officials to monitor traffic speed, by coaches to gauge the performance of their athletes, and in various other industries

Amartya Srinivasan
Vasudevan Mukunth

The world of today is a world in motion. People constantly want to get somewhere. The heavens are filling up with satellites, our skies with airplanes and rockets, our seas with ships and submarines, and our land with cars, bikes, and trains. Humans have developed laws, rules, technologies, and subsequently entire industries to make sure all these vehicles move smoothly, without harming humans or each other. A small but significant piece of this picture is the speed gun.

What is a speed gun?
A speed gun is a device to measure the speed of a moving object without having to be in contact with the object. To achieve this, the device bounces electromagnetic radiation of a specific frequency off the object, capturing the reflection and using the Doppler effect to infer the object's speed. Speed guns are electronic, and use complex circuitry to emit the radiation used to make the measurement.

These devices are widely used by law enforcement officials to monitor traffic speed, by coaches to gauge the performance of their athletes, and in various other industries in need of accurate motion tracking.

What is the Doppler effect?
The Doppler effect is named for the Austrian physicist Christian Doppler and relies on the simple concept of relative velocity. Say there's a man sitting at the centre of a field blowing a whistle. The sound waves move out in a circular, concentric pattern with the whistle at the centre, and evenly spread out. A woman standing at the edge of the field will receive these waves at frequent intervals – as and when the waves' crests reach her. (Since sound waves move at 343 m/s in air, human ears can't hear the gaps.)

Each wave has a frequency and a wavelength. A higher frequency produces a higher pitch and vice versa.

Now, say the whistling man is moving around the field on a buggy. If the buggy is moving towards the woman, the waves in front of the vehicle become bunched up. In other words, from the woman's perspective, the waves would have acquired both the speed of the buggy in addition to the speed of the sound wave. Thus the waves will reach the woman more frequently, and she will perceive a higher pitch. (For the same reason, the sound will have a lower pitch in a direction behind the buggy.)

This is why, when a train moves into a station, people on the platform will hear the horn blowing at a higher pitch than when the train is leaving the station. This effect is the Doppler effect.

The speed gun was originally developed during World War II for military use and applies the effect using radio waves rather than sound waves. A speed gun has a radio transmitter and a receiver. The transmitter emits radio waves, which the person holding the speed gun can direct at an object. The receiver collects the waves reflected by the object back in the direction of the speed gun.

If the object is approaching the speed gun, the frequency of the returning waves will be slightly higher than that of the transmitted waves. A simple computer in the gun can deduce the object's speed based on this difference.

How are the speed and the effect linked?
All electromagnetic waves have a fixed speed – equal to the speed of light in that medium. In vacuum, this value is denoted c: 299,792,458 m/s. Any change in the frequency the speed gun detects directly corresponds to the Doppler shift caused by the object's motion. This principle is powerful because it allows the speed gun to work accurately over a wide range of distances and velocities without being affected by air resistance.

A speed gun can calculate the speed of a moving object by multiplying the difference (between received and emitted frequencies) with c and dividing by the emitted frequency times 2.

This relationship shows how the difference is directly proportional to the speed of the object: the faster it moves, the more pronounced the difference will be. In other words, the only condition is that the object should be moving much slower than the speed of light – which is the case in most, if not all, practical applications of the speed gun.

Do speed guns have shortcomings?
The technology to emit radio waves is ubiquitous today. The principle is simple: when an antenna is excited by an alternating current with a radio-wave frequency, it emits radio waves. Radio-wave frequency is in the range of 30 Hz to 300 billion Hz.

For a long time, the equipment to produce the waves was bulky. This changed when scientists invented transistors in the 1940s. Electronic circuits built using transistors considerably simplified the process of producing radio waves and also made the transmitters much smaller.

However, radio waves have intrinsic shortcomings that transmitters can't fully adjust for. For example, radio waves diverge as they move through the air. If an antenna is 5 cm long, the waves it emits will diverge by 22° to either side, producing a beam that is 44° wide overall.

Such a beam could strike more than one moving vehicle and produce inaccurate speed readings.

A continuous-wave radar – which emits radio waves and tracks their reflections continuously – may also produce readings due to multiple vehicles.

Engineers have developed systems to compensate for these errors but the resulting setups have been more sophisticated and more expensive.

For such reasons, LIDAR speed guns have been replacing radar counterparts. The name is short for 'light detection and ranging'. LIDAR uses laser light instead of radio waves; the gun's operation is otherwise similar. Laser light has very low divergence and thus offers better targeting.

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  - All electromagnetic waves have a fixed speed — equal to the speed of light in that medium.
  - In vacuum, this value is denoted c: 299,792,458 m/s. Any change in the frequency the speed gun detects directly corresponds to the Doppler shift caused by the object's motion.
  - This principle is powerful because it allows the speed gun to work accurately over a wide range of distances and velocities without being affected by air resistance.
  - A speed gun can **calculate the speed of a moving object** by multiplying the difference (between received and emitted frequencies) with c and dividing by the emitted frequency times 2.
  - This relationship shows how the **difference is directly proportional** to the **speed of the object**: the faster it moves, the more pronounced the difference will be.
- **Uses:** It is widely used by **law enforcement officials** to monitor traffic speed, by coaches to gauge the performance of their athletes, and in various other industries in need of accurate motion tracking.

8. Similipal Tiger Reserve (STR)
GS 3 (Environment)

- **Why in News:** A three-year-old female tiger strayed from the Similipal Tiger Reserve (STR) in Odisha into the Bandwan area of Purulia district in West Bengal
- **About Similipal Tiger Reserve (STR)**
  - **Location**:
    - Situated in **Mayurbhanj District**, in the **northernmost part of Odisha**.
    - Surrounded by **high plateaus and hills**, the highest peaks are **Khairiburu** and **Meghashini** (1515 meters above sea level).
  - **Designation**: Declared a **Tiger Reserve** in **1956** and included under **Project Tiger** in **1973**.
    - Recognised as part of the **World Network of Biosphere Reserves** by **UNESCO** in **2009**.
  - **Terrain**: The landscape is **undulating and hilly**, interspersed with **open grasslands** and **wooded areas**.

Tiger from Similipal forest in Odisha strays into Purulia in West Bengal

Shiv Sahay Singh
KOLKATA

A three-year-old tiger has strayed into the Bandwan area of West Bengal's Purulia district from the Similipal Reserve Forest in Odisha. The animal crossed over to Purulia from Jhargram district, where it had remained for several days. This region in south Bengal, with fragmented forests, does not have a tiger population. Forest officials said it does not have a prey base to sustain a tiger population.

The female tiger had been brought to Similipal from Maharashtra and is fitted with a radio collar.

A senior State government official said the West Bengal Forest Department was trying to drive the tiger back to Similipal by the same route. Efforts are also being made to capture the animal and release it into a wild habitat to avoid human-animal conflict, the State forest official said. To avoid crowding, officials have not disclosed the exact location of the animal.

Local police and forest officials have been urging people to not venture into the forests. Central Armed Police Force personnel are assisting the police in avoiding human-animal conflict.

In June 2018, a tiger was hunted down by locals after it had strayed into the same region of the State. West Bengal has a population of about 100 tigers in the Sundarbans mangrove forests.

In the wild: The tiger had been brought to Similipal from Maharashtra and is fitted with a radio collar. BISWARANJAN ROUT

  - **Vegetation**: A mix of **forest types**, with **Northern tropical moist deciduous forests** dominating, alongside **semi-evergreen patches**.
    - Notably, it is the **only place in the world home to melanistic tigers** (black tigers).
  - **Flora**: Features an astounding **1078 plant species**, including **94 species of orchids**.
    - **Sal** is the dominant tree species.
  - **Fauna**: Hosts a diverse array of wildlife, including
    - **Large Mammals**: Leopard, Gaur, Elephant, Barking Deer, Spotted Deer, and Sloth Bear.
    - **Small Mammals**: Langur, Mongoose, Pangolin, Flying Squirrel, and Porcupine.
    - **Reptiles**: Python, Monitor Lizard, and Turtle.
    - **Birds**: Several bird species inhabit the reserve.
  - **Cultural importance**: Home to various **tribes**, including **Kolha**, **Santhala**, **Bhumija**, **Bhatudi**, **Gondas**, **Khadia**, **Mankadia**, and **Sahara**.

9. Aerogel

GS 3 (Science and Tech)

- **Why in News:** A group of researchers from Pune have developed a novel hybrid aerogel capable of easily extracting gold from electronic waste.
- **About Aerogel:**
  - Aerogels are among the **lightest solid materials**.
  - They are created by **combining a polymer** with a **solvent to form a gel**, and then removing the liquid from the gel and replacing it with air.
  - **Properties:** They are extremely **porous and very low in density and** they offer advantages like adjustable surface chemistry
  - They are also known **as 'solid air'** or **'frozen smoke'** are excellent adsorbents (a solid substance used to remove contaminants) and are incredibly lightweight solids composed mostly of air.
  - Aerogels are most preferred in **environment and oil spill clean up,** for insulation purposes
- **Key facts about the newly developed Hybrid Aerogel**
  - Researchers have designed and synthesised aerogel: the sponge-like absorbents, light in weight and porous synthetic materials for this purpose.
  - The aerogel's unique structural composition was **treated with iron nitrate salts** and maintained at room temperature for about two to five minutes.
  - This specially designed aerogel was found to be **effective in extracting** and retrieving upto 99 per cent of **gold ions from the e-waste.**
  - In daylight, the hybrid aerogel could extract 1689mg/gram of e-waste and 2349mg / gram under blue light.
  - As there were dual processes involved, that of adsorption and reduction — the quality of the recovered gold was **reasonably pure** thereby reducing the need for further purifying processes.

MCQ Current Affairs
23rd Dec, 2024

1. Consider the following statements with reference to the SpaDeX Mission:

A. It is launched by Indian Space Research Organisation (ISRO).
B. It uses PSLV-C60 as the launch vehicle to demonstrate in-space docking technology.

Which of the statements given above is/are correct?

a) A only
b) B only
c) A and B
d) Neither of two

2. The Similipal Tiger Reserve (STR) is located in which one of the following states?

a) Kerala
b) Andhra Pradesh
c) Odisha
d) Assam

3. 'Order of Mubarak Al-Kabeer', which was recently awarded to the Prime Minister of India, is the highest national award of:

a) Saudi Arabia
b) Kuwait
c) Indonesia
d) Bangladesh

4. Consider the following statements regarding Aerogels:

A. They are created by combining a polymer with a solvent to form a gel.
B. They are extremely porous and very low in density.

Which of the statements given above is/are correct?

a) A only
b) B only
c) A and B
d) Neither of two

5. With reference to the Speed gun, consider the following statements:

A. It is a device to measure the speed of a moving object without being in contact with the object.
B. It uses the Doppler Effect to infer the object's speed.
C. It is used to monitor the speed of the traffic.

How many of the above statements are correct?

a) One only
b) Two only
c) All three
d) None

MCQ Current Affairs
23rd Dec, 2024

1. c
2. c
3. b
4. c
5. c