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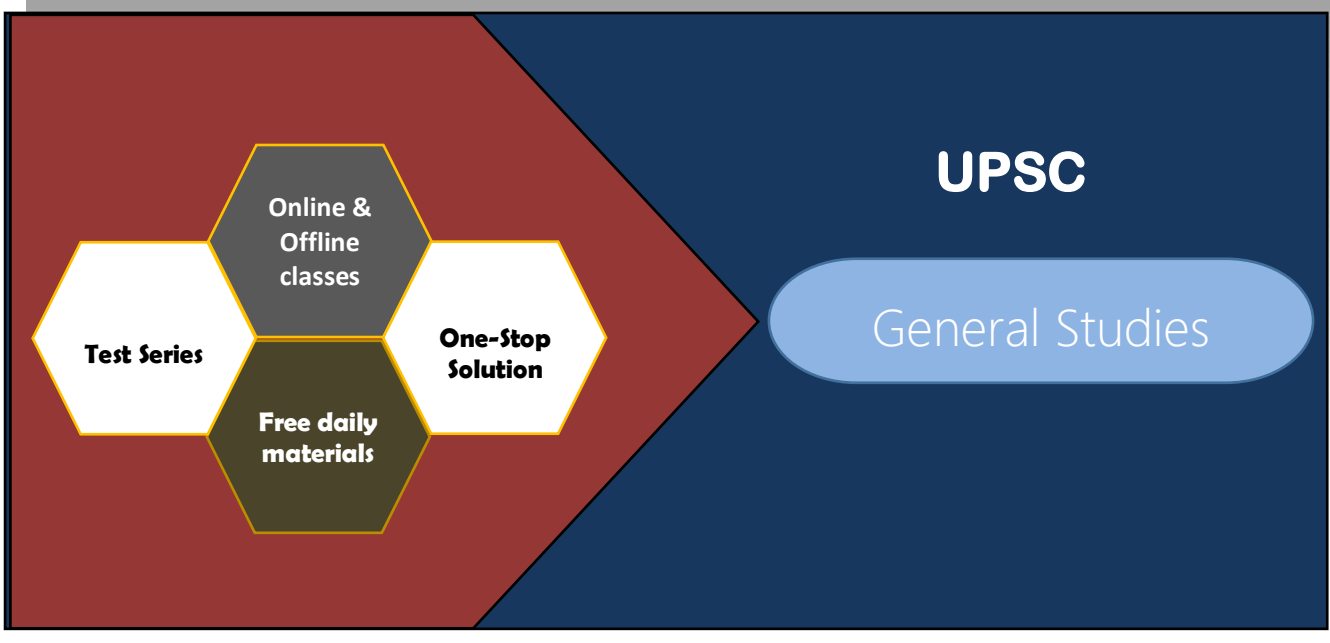
Articles of the day
THE HINDU & INDIAN EXPRESS



THE HINDU

GS 2 : Polity, Governance, International Relations

1. Global Minimum Tax Deal

A global deal to ensure big companies pay a minimum tax rate of 15% and make it harder for them to avoid taxation has been agreed by 136 countries.

In news

- The OECD said four countries – Kenya, Nigeria, Pakistan and Sri Lanka – had not yet joined the agreement.
- However, the countries behind the accord together accounted for over 90% of the global economy.

Global minimum tax

- With budgets strained after the COVID-19 crisis, many governments want more than ever to discourage multinationals from shifting profits – and tax revenues – to low-tax countries.
- Increasingly, income from intangible sources such as drug patents, software and royalties on intellectual property has migrated to these jurisdictions.
- This has allowed companies to avoid paying higher taxes in their traditional home countries.
- The minimum tax and other provisions aim to put an end to decades of tax competition between governments to attract foreign investment.

How would a deal work?

- The global minimum tax rate would apply to overseas profits of multinational firms with 750 million euros ($868 million) in sales globally.
- Govts could still set whatever local corporate tax rate they want.
- However, buif companies pay lower rates in a particular country, their home governments could "top up" their taxes to the 15% minimum, eliminating the advantage of shifting profits.
- A second track of the overhaul would allow countries where revenues are earned to tax 25% of the largest multinationals' so-called excess profit – defined as profit in excess of 10% of revenue.

What happens next?

- The next step is for finance ministers from the Group of 20 economic powers to formally endorse the deal, paving the way for adoption by G20 leaders at an end October summit.
- Nonetheless, questions remain about the US position which hangs in part on a domestic tax reform the Biden administration wants to push through the US Congress.
- The agreement calls for countries to bring it into law in 2022 so that it can take effect by 2023, an extremely tight timeframe given that previous international tax deals took years to implement.
- Countries that have in recent years created national digital services taxes will have to repeal them.

What will be the economic impact?

- The OECD, which has steered the negotiations, estimates the minimum tax will generate $150 billion in additional global tax revenues annually.
- Taxing rights on more than $125 billion of profit will be additionally shifted to the countries were they are earned from the low tax countries where they are currently booked.
- Economists expect that the deal will encourage multinationals to repatriate capital to their country of headquarters, giving a boost to those economies.
- However, various deductions and exceptions baked into the deal are at the same time designed to limit the impact on low tax countries like Ireland, where many US groups base their European operations.

2. A 'Taiwan flashpoint' in the Indo-Pacific

In News

If the rising confrontation between the United States and China erupts into a clash of arms, the likely arena may well be the Taiwan Strait.

Historical background of the Taiwan issue

- The Guomindang (KMT) forces under Chiang Kai-shek lost the 1945-49 civil war to the Chinese Communist Party (CCP) in 1949. forces under Mao Zedong.

- Chiang retreated to the island of Taiwan and set up a regime that claimed authority over the whole of China and pledged to recover the mainland eventually.
- The CCP in turn pledged to reclaim what it regarded as a "renegade" province and achieve the final reunification of China.
- **Role of the U.S.:** Taiwan could not be occupied militarily by the newly established People's Republic of China (PRC) as it became a military ally of the United States during the Korean War of 1950-53.
- This phase came to an end with the **U.S. recognising the PRC as the legitimate government** of China in 1979, ending its official relationship with Taiwan and abrogating its mutual defence treaty with the island.
- **Strategic ambiguity policy of the US:** Nevertheless, the U.S. has declared that it will "maintain the ability to come to Taiwan's defence" while not committing itself to do so.
- This is the policy of "strategic ambiguity".
- The PRC has pursued a typical carrot and stick policy to achieve the reunification of Taiwan with the mainland.
- It has held out the prospect, indeed preference for peaceful reunification, through promising a high degree of autonomy to the island under the **"one country two systems".**
- The "one country two systems" formula first applied to Hong Kong after its reversion to Chinese sovereignty in 1997.

China-Taiwan economic links

- Taiwan business entities have invested heavily in mainland China and the two economies have become increasingly integrated.
- Between 1991 and 2020, the stock of Taiwanese capital invested in China reached U.S. $188.5 billion and bilateral trade in 2019 was U.S. $150 billion, about 15% of Taiwan's GDP.
- By the same token, China is capable of inflicting acute economic pain on Taiwan through coercive policies if the island is seen to drift towards an independent status.

Prospects for peaceful reunification

- Taiwan has two major political parties.
- The KMT, dominated by the descendants of the mainlanders remains committed to a one-China policy.
- The **Democratic Progressive Party (DPP)**, on the other hand, is more representative of the indigenous population of the island, and favours independence.

- Faced with aggressive threats from China and lack of international support, the demand for independence has been muted.
- Ever since the DPP under Tsai Ing-wen won the presidential elections in 2016, **China has resorted to a series of hostile actions** against the island, which include economic pressures and military threats.
- One important implication of this development is that **prospects for peaceful unification have diminished.**
- Sentiment in Taiwan in favour of independent status has increased.

Role of the US

- While the U.S. does not support a declaration of independence by Taiwan, it has gradually reversed the policy of avoiding official-level engagements with the Taiwan government
- The first breach occurred during the Donald Trump presidency.
- The Joe Biden officials have continued this policy.
- The Taiwanese representative in Washington was invited to attend the presidential inauguration ceremony (Biden), again a first since 1979.
- Reports have now emerged that U.S. defence personnel have been, unannounced, training with their Taiwanese counterparts for sometime.

Implications for Quad and India

- The recent crystallisation of the Quad, of which India is a part, and the announcement of the AUKUS, with Australia being graduated to **a power with nuclear-powered submarines**, may act as a deterrent against Chinese moves on Taiwan.
- But they may equally propel China to advance the unification agenda before the balance changes against it in the Indo-Pacific.
- For these reasons, Taiwan is emerging as a potential trigger point for a clash of arms between the U.S. and China.

Conclusion

In pursuing its Indo-Pacific strategy, India would do well to keep these possible scenarios in mind.

3. Iran makes 20% more enriched uranium

In News:

Iran's nuclear chief has said that the country has produced more than 120 kg of 20% enriched uranium.

Issue:

- The nuclear deal, known as the Joint Comprehensive Plan of Action, or JCPOA, promises Iran economic incentives in exchange for limits on its nuclear programme, and is meant to prevent Iran from developing a nuclear bomb.
    - Under the terms of the nuclear deal, Iran was prohibited from enriching uranium above 3.67 per cent with the exception of its research reactor activities.
    - Enriched uranium above 90 per cent can be used in a nuclear weapon.
- The U.S. unilaterally pulled out of the deal in 2018 under then-President Donald Trump, but Britain, France, Germany, China and Russia have tried to preserve the accord.
- Under the 2015 nuclear deal with world powers, the other signatories were to provide Iran with 20% enriched uranium needed for its research reactor. But according to Iran, it was not delivered.
- The 20 per cent uranium enrichment process was launched as a part of Iran's Strategic Action Plan to counter US sanctions, which was approved by the Iranian parliament in December 2020.

4. Study sought into rabies deaths despite vaccination

In News

A proper study has been sought into recent deaths due to rabies among people who are vaccinated against the infection.

- Rabies is a fatal infection in which the chances of death are 100%.
- Patients are given four to five doses of the anti-rabies vaccine in intervals from the day of the bite, along with the anti-rabies serum.
- The vaccine gives full protection only 14 days after it is administered.

Rabies:

- Rabies is a viral disease that is spread through the animal bite such as the dog.
- The infection caused by this leads to encephalomyelitis i.e the inflammation of the brain as well as the spinal cord.

- The transmission of the virus happens through the saliva and affects the CNS or Central nervous system. This virus belongs to a family called Rhabdoviridae.

GS 3 : Economy, Science and Technology,Environment

5. Using Paddy Straw as Cattle Feed

Punjab has now proposed to use the paddy crop residue as fodder for animals, especially cattle.

Why such a move?

- In Punjab, the total availability of paddy straw is about 20 million tones per annum.
- The total value of this straw is Rs 400 crore approx., calculated on an average rate of Rs 200/quintal. Almost all of it is burnt in fields.
- This accounts for economic loss apart from the loss of 77,000 tonnes of nitrogen and 5.6 million tonnes of Total Digestible Nutrients (TDN) which could be used for ruminant production.
- Also nearly 30.4 per cent of rice straw is used for animal feed in Southeast Asia, Mongolia and China.

Economics behind paddy straw

- High silica and lignin content reduces its digestive properties.
- Higher selenium content in paddy straw also limits its use as fodder in animals as compared to wheat straw.
- However, if given in moderate quantities (up to 5 kg per animal per day), selenium poses no health hazard to the animal.
- Paddy straw also contains oxalates (2-2.5%) which leads to calcium deficiency so mineral mixture should always be fed along with the straw.

Treatments for feeding paddy straw to animals

- Paddy Straw cannot be directly fed to animals. It has to undergo some treatments.
- Two of them are: Urea-only treatment and urea plus molasses treatment.

[A] Urea treatment of paddy straw

- 14 kg of urea is dissolved in 200 litres water and spray on chopped paddy straw.
- The fermented straws have soft texture with 6.0-8.0 per cent crude protein, 3.0-4.0 percent DCP and 55-60 per cent TDN.
- This involves a combination of physical, chemical and biological treatments.
- The paddy straw is chaffed and moistened (physical) with urea solution (chemical).
- The breakdown of urea release ammonia gas, a part of which is utilised by microbes (biological) for their proliferation (enriching the straw with microbial protein).
- This in turn results in breakage of lingo-cellulosic bonds making cellulose and hemi-cellulose assessable for utilization by microbes in the rumen.
- The digestibility of cellulose increases from 40-45% in untreated paddy straw to 70-75 per cent in fermented wheat straw.

[B] Urea plus molasses treatment

- Also called "Urea-Molasses impregnated straw", this method involves treating paddy straw with urea and molasses.
- Urea 1 kg and molasses 3 kg was mixed thoroughly and mixed with water 10 kg. This is mixed with chaffed paddy straw and fed to animals on same day.
- The experts however clarify that for maintenance of body weight in animals, paddy straw alone is not sufficient.
- Minerals and green fodder supplementation is required.

How does the nutritional value of paddy straw increase after urea treatment?

- The TDN values in urea treated paddy straw increased manifold as compared to untreated straw.
- Crude protein (CP) increased from 4.5% to 8%, digestible crude protein (DCP) from 1.5% to 4% and total digestible nutrients (TDN) from 40% to 55%.
- The feeding of urea treated straw (6 kg/day) to lactating buffaloes giving about 10 kg milk/day can result in saving about 60 per cent of oilseed cake in the ration.
- Feeding of paddy straw should be mixed with berseem, cowpea or Lucerne as it forms a maintenance ration.
- The straw should be fed with concentrate mixture and additional DCP or limestone should be given to the animals to reduce the effect of oxalates.
- Oxalates also interfere in carbohydrate metabolism perhaps due to non-availability of calcium as cofactor.

What are the potentially harmful effects?

- The intake of siliceous forages has been associated with urinary siliceous calculi in drier regions where water may be limited.
- There have been no definitive studies in India, but urinary calculi are associated with rice straw consumption.
- It has high selenium (0.5 to 4.5 %) content which can cause serious health problems in dairy animals.

6. Linear No-Threshold (LNT) Model for Radiation Safety

The U.S. Nuclear Regulatory Commission (NRC) decisively upheld the Linear No-Threshold (LNT) model to prescribe radiation safety standards, ending the protracted controversy on the topic.

What is the LNT Model?

- The LNT is a dose-response model used in radiation protection to estimate stochastic health effects such as radiation-induced cancer, genetic mutations etc. on the human body due to exposure to ionizing radiation.
- The LNT model states that biological effects such as cancer and hereditary effects due to exposure to ionising radiation increase as a linear function of dose, without threshold.
- It provides a sound regulatory basis for minimizing the risk of unnecessary radiation exposure to both members of the public and radiation workers.

Why in news?

- LNT model continues to provide a sound basis for a conservative radiation protection regulatory framework that protects both the public and occupational workers.
- The model helps the agencies to regulate radiation exposures to diverse categories of licensees, from commercial nuclear power plants to individual industrial radiographers and nuclear medical practices.
- There are also studies and findings that support the continued use of the LNT model, including those by national and international authoritative scientific advisory bodies.

7. A homecoming

In News

- The government has announced its decision to sell all its stake in Air India (AI) as well as AI's stake in two other businesses — Air India Express Ltd (AIXL) and Air India SATS Airport Services Pvt Ltd (AISATS).

Background

- The sale of Air India to a private player has been in the offing for a long time.
- AI was started by the Tata Group in 1932, but in 1947, as India gained independence, the government bought a 49% stake in AI.
- In 1953, the government bought the remaining stake, and AI was nationalised.

LPG reforms

- With economic liberalization and the growing presence of private players, the dominance of Air India came under serious threat.
- Ideologically too, the government running an airline did not quite gel with the mantra of liberalization.

Attempts to privatize

- The first attempt to reduce the government's stake was made in 2001 under the then NDA government.
    - But that attempt to sell a 40% stake failed because of high losses.
- In 2018, the Narendra Modi government made another attempt to sell the government stake — this time, 76%. But it did not elicit even a single response.
- Another attempt started in January 2020, and now the government has been able to finally conclude the sale.

How was the Govt able to conclude the sale?

- One, in the past the government retained a partial stake and private players did not seem interested.
    - That's because the mere idea of government ownership, even if it was as little as 24%, made private firms wonder if they would have the operational freedom needed to turn around such a heavy loss-making airline.
    - Unlike all the past attempts, this time the government put 100% of its stake on sale.

- Two, the sheer mountain of debt on AI's books, not to mention the ongoing losses.
    - Earlier, the government expected the bidders to pick up a certain amount of the debt along with the airline. That approach did not work.
    - This time, the government let the bidders decide the amount of debt they wanted to pick up.

Significance

From the government's perspective:

- The Centre, for its part, can finally heave a sigh of relief at having successfully exited the commercial aviation space, a high-cost industry that most governments around the world have left in the hands of private carriers so as to ensure taxpayers' money is deployed more meaningfully in social and strategic sectors.
- It underscores the government's commitment to saving taxpayers from paying for daily losses of AI.

From the Tatas' perspective:

- Apart from the emotional aspect of regaining control of an airline that they started, AI's acquisition is a long-term bet.

Challenges

- One of the immediate challenges facing the new owners will be to find office space.
    - The deal does not include the airline's other assets and the buildings like the Air India building at Nariman Point and the Airlines House in Delhi.
    - As a result, one of the Tata Group's first jobs will be to locate office accommodation for Air India's employees.
- In a bid to protect the interests of the more than 13,000 permanent and contractual staff at the airline and its unit, the government has bound Talace to ensure there should be no job cuts for at least one year.
    - Therefore, integrating the sizeable workforce is going to be one among the many serious challenges.
- The Tata Group will also have to launch a global manhunt for top personnel who will need to pick up the reins very quickly.
    - Currently, Air India has no CEO and Rajiv Bansal, its chairman and managing director, is an IAS officer, who is also the Civil Aviation Secretary.

Way forward

- Indian carriers have allowed the Gulf carriers to grab a large chunk of Indians travelling abroad.
    - It is said that Dubai's Emirates gets about 20 per cent of its revenue from Indian passengers. The same's true for Etihad and Qatar Airways.
- Similarly, Indians travelling eastwards have divided their preferences between airlines like Singapore Airlines, Thai Airways and Cathay Pacific.
- Air India gets two-thirds of its income from its international routes and is the leading player from India in the international market.
- Therefore, the Tatas have a huge opportunity in the international markets and it could build on this in coming years.

THE INDIAN EXPRESS

GS 2 : Polity, Governance, International Relations

1. First 'PM-WANI' project launched in Kurnool

In News The first Prime Minister's Wi-Fi Access Network Interface (PM-WANI) project of Andhra Pradesh was recently launched in Kurnool district.

Key takeaways

- As part of the project, Public Data Offices (PDOs) will work like Public Call Offices (PCOs) to facilitate users' data service at cheaper rates so that every citizen can enjoy Internet facilities.
- It was launched under the brand name 'Wi-DOT'.
- The project is being executed by Tess and Tera Techno Solutions Private Ltd.
- **Benefits:** This move will accelerate the proliferation of public broadband services through Wi-Fi networks and it will enable local entrepreneurs such as chaiwalas, kirana stores and eateries to earn additional revenue,"

About Prime Minister's Wi-Fi Access Network Interface (PM-WANI)

- The scheme aims to bring large scale deployment of Wi-Fi hotspots through the country to drive up connectivity options and improve digital access.

- **Ministry:** Ministry of communications

- **Benefits:** Public Wi-Fi will serve as a low-cost option to reach unserved citizens and grow the economy.
    - It can revolutionise the tech world and significantly improve Wi-Fi availability across the length and breadth of India.
- The scheme envisages setting up of public Wi-Fi networks and access points by local Kirana and neighbourhood shops through public data offices
- As per the National Digital Communication Plan, the Central government has set a target of setting up millions of Wi-Fi hotspots by 2022 and the PM-WANI scheme will facilitate this.

2. Nuclear Regulatory Commission (NRC)

In News: Nuclear Regulatory Commission (NRC) recently upheld the Linear No-Threshold (LNT) model to prescribe radiation safety standards, ending the protracted controversy on the topic.

Background

- Over six years ago, during February 2015, petitions were filed requesting the NRC, "to amend its regulations based on their evidence that contradicts the linear no-threshold (LNT) dose-effect model.
- The petitioners support "radiation hormesis," a concept that proposes that low doses of ionising radiation protect against the deleterious effects of high doses of radiation and result in beneficial effects to humans. This was denied by the NRC.

About LNT model

- The linear no-threshold model (LNT) is a dose-response model used in radiation protection to estimate probable health effects such as radiation-induced cancer, genetic mutations on the human body due to exposure to ionizing radiation.
- The LNT model helps the agencies to regulate radiation exposures to diverse categories of licensees, from commercial nuclear power plants to individual industrial radiographers and nuclear medical practices.

What is Nuclear Regulatory Commission (NRC)?

- It is an independent agency of the USA government tasked with protecting public health and safety related to nuclear energy.
- It was established by the Energy Reorganization Act of 1974.
- **Functions:** Overseeing reactor safety and security

- administering reactor licensing and renewal
- licensing radioactive materials
- managing the storage, security, recycling, and disposal of spent fuel.

3. OECD/G20 Inclusive Framework tax deal

Context The two-pillar solution under the OECD/G20 Inclusive framework will be delivered to the G20 Finance Ministers meeting in Washington DC on 13 October, then to the G20 Leaders Summit in Rome at the end of the month.

- Countries are aiming to sign a multilateral convention during 2022, with effective implementation in 2023.

- India has already joined the G20–OECD inclusive framework deal.
- It seeks to reform international tax rules and ensure that multinational enterprises pay their fair share wherever they operate.
- 130 countries and jurisdictions, representing more than 90% of global GDP, have signed the deal.

Two pillars of framework

- **Dealing with transnational and digital companies**: It ensures that large multinational enterprises, including digital companies, pay tax where they operate and earn profits.
- **Dealing with low-tax jurisdictions to address cross-border profit shifting and treaty shopping**: It seeks to put a floor under competition among countries through a global minimum corporate tax rate, currently proposed at 15%.

4. A 'Taiwan flashpoint' in the Indo-Pacific

Context: In a new incident last week, a U.S. nuclear-powered submarine reportedly ran into an "unidentified object" while in the South China Sea. China has objected to these U.S. actions vociferously.

The rising confrontation between the United States and China erupts into a clash of arms, the likely arena may well be the Taiwan Strait.

Brief Background of Taiwan:

- Taiwan is the unfinished business of China's liberation under the Chinese Communist Party (CCP) in 1949.
- The Guomindang (KMT) forces under **Chiang Kai-shek lost the 1945-49 civil war** to the CCP forces under Mao Zedong.
- **Chiang retreated to the island of Taiwan** and set up a regime that claimed authority over the whole of China and pledged to recover the mainland eventually.
- The **CCP in turn pledged to reclaim** what it regarded as a "renegade" province and achieve the final reunification of China.
- Taiwan could not be occupied militarily by the newly established People's Republic of China (PRC) as it became a military ally of the United States during the Korean War of 1950-53.
- It was described as an "**unsinkable aircraft carrier"** underscoring its strategic significance.
- This phase came to an end with the U.S. recognising **the PRC as the legitimate government of China in 1979**, ending its official relationship with Taiwan and abrogating its mutual defence treaty with the island.

Strategic ambiguity of US & China vis-à-vis Taiwan

- U.S. has declared that it will "maintain the ability to come to Taiwan's defence" while not committing itself to do so. This is the policy of **"strategic ambiguity" of USA**
- China, on the other hand, is committed to pursuing peaceful unification but retains the right to use force to achieve the objective. This is its **China's version of strategic ambiguity.**

What has been the policy of China towards Taiwan?

- China has pursued a typical carrot and stick policy to achieve the reunification of Taiwan with the mainland.
- It has held out the prospect, indeed preference for **peaceful reunification**, through promising a **high degree of autonomy** to the island under the "**one country two systems"** formula first applied to Hong Kong after its reversion to Chinese sovereignty in 1997.
- According to this formula, Hong Kong would retain its free market system and its political and judicial institutions and processes for a period of 50 years, thus enabling an extended and gradual transition.
- The **same was promised to Taiwan,** but with the added assurance that it could also retain its armed forces during the transition period.

Economic Links between China and Taiwan

- With China itself adopting market-oriented reforms since 1978 and becoming a significant economic and commercial opportunity globally, Taiwan business entities have invested heavily in mainland China and the two **economies have become increasingly integrated.**

- Between 1991 and 2020, the stock of **Taiwanese capital invested in China** reached U.S. $188.5 billion and bilateral trade in 2019 was U.S. $150 billion, about 15% of Taiwan's GDP.
- By contrast the stock of Chinese capital invested in Taiwan is barely U.S. $2.4 billion

- China hopes that burgeoning economic relationship with Taiwan would **weaken opposition to unification.**
- At the same time, China is **capable of inflicting severe economic pain** on Taiwan through coercive economic policies if Taiwan is seen to move towards an independent status.

Hong Kong & impact on Taiwan

- Recently, China adopted a series of hardline policies in Hong Kong, abandoning the 'One Country Two Systems' formula.
- As a result, Public opinion in Taiwan swung in **favour of The Democratic Progressive Party (DPP)**, who is more representative of the indigenous population of the island, and **favours independence.**
- One important implication of this development is that **prospects for peaceful unification have diminished.**

Is China prepared to carry out military operations to invade and occupy Taiwan?

- In March 2021, the U.S. Pacific Commander, warned that China could invade Taiwan within the next six years as part of its strategy of displacing U.S. power in Asia. He suggested that Chinese military capabilities had been developed in order to achieve this objective.
- The recent initiatives of the Quad and AUKUS may act as a deterrent against Chinese moves on Taiwan.
- But they may equally propel China to advance the unification agenda before the balance changes against it in the Indo-Pacific.
- For these reasons, Taiwan is emerging as a potential trigger point for a clash of arms between the U.S. and China.

Conclusion

In pursuing its Indo-Pacific strategy, India would do well to keep these possible scenarios in mind.

GS 3 : Economy, Science and Technology,Environment

5. Indian meteorite helps study Earth's formation

The researchers from the Geological Survey of India collected about 30 meteorite fragments with the largest weighing around a kilogram near the town of Katol in Nagpur in 2012.

Significance of meteor study

- Now, by studying the composition of these meteorite fragments, researchers have unraveled the composition expected to be present in the Earth's lower mantle which is at about 660 km deep.
- Studying the meteorite could also tell us more about how our Earth evolved from being a magma ocean to a rocky planet.

Key component of the Meteor: Olivine

- Initial studies revealed that the host rock was mainly composed of olivine, an olive-green mineral.
- Olivine is the most abundant phase in our Earth's upper mantle.
- Our Earth is composed of different layers including the outer crust, followed by the mantle and then the inner core.

How to study a meteorite?

- The researchers took a small sample of the meteorite and examined it using special microscopy techniques.
- The mineralogy was determined using a laser micro-Raman spectrometer.
- These techniques helped the team identify, characterise the crystal structure of the meteorite and determine its chemical composition and texture.

What does the new study show?

- The international team of scientists examined a section of this highly-shocked meteorite. It resembles to the first natural occurrence of a mineral called bridgmanite.
- The mineral was named in 2014 after Prof. Percy W. Bridgman, recipient of the 1946 Nobel Prize in Physics.

- Various computational and experimental studies have shown that about 80% of the Earth's lower mantle is made up of bridgmanite.
- By studying this meteorite sample, scientists can decode how bridgmanite crystallized during the final stages of our Earth's formation.

Bridgmanite: On Earth vs. on Meteorite

- Katol meteorite is a unique sample and it is a significant discovery.
- The bridgmanite in the meteorite was found to be formed at pressures of about 23 to 25 gigapascals generated by the shock event.
- The high temperature and pressure in our Earth's interior have changed over billions of years causing crystallisation, melting, remelting of the different minerals before they reached their current state.
- It is important to study these individual minerals to get a thorough idea of how and when the Earth's layers formed.

How does it help understand evolution of Earth?

- The inner planets or terrestrial planets or rocky planets Mercury, Venus, Earth, and Mars are formed by accretion or by rocky pieces coming together.
- They were formed as a planet by increased pressure and high temperature caused by radioactive elements and gravitational forces.
- Our Earth was an ocean of magma before the elements crystallised and stabilised and the different layers such as core, mantle were formed.
- The heavier elements like iron went to the core while the lighter silicates stayed in the mantle.
- By using the meteorite as an analog for Earth, we can unearth more details about the formation.

6. Hermann Bacher

Hermann Bacher, popularly known as the 'father of community-led watershed development in India', passed away at the ripe old age of 97 years in Switzerland September 14, 2021.

Hermann Bacher

- Born in 1924, Bacher, came to India in 1948 at the young age of 24 years.
- He was to spend the next 60 years of his life here, most of it in Maharashtra.
- Struck by the poverty he saw in rural Maharashtra, he dedicated his life to the upliftment of the poor, the landless and rural women.

- Bacher was given Germany's highest civilian award, the Federal Cross of the Order of Merit in 1994, in recognition of his outstanding efforts.
- In 2017, the United Nations Convention to Combat Desertifiucation (UNCCD) awarded WOTR the prestigious 'Land for Life Award 2017'.
- He is widely regarded and respected as a true 'man of God' for whom selfless service of the poor was worship at its most sublime. He is fondly remembered as 'Bacher Baba'.

Notable works

- The 1972 droughts in Maharashtra led him to re-calibrate his developmental approach.
- This meant that in rain-dependent rural Maharashtra, a shift had to be made from 'resource exploitation' to sustainable resource use, or 'resource mobilisation', as he described it.
- He helped thousands of landless labourers' secure title to land under the Land Reforms Act, 1957, beginning in 1965.
- He also organised lakhs of farmers to develop their farms and increase their agricultural productivity by helping them access irrigation, improved and hybrid seeds etc.

Pioneering water harvest

- Since rain fell in the watersheds and landscapes villagers lived in, the only way to harvest and conserve rainwater wherever it fell was to undertake watershed development measures.
- The idea was that "running water must be made to walk; walking water made to stop and sink underground".
- This meant, planting trees and grasses, conserving forests, undertaking soil and water conservation works such as digging contour trenches, raising farm bunds, etc.
- It also meant building water harvesting structures on the streams (check dams, earthen bunds, etc) in a systematic manner across the entire landscape of the village, beginning from the top.

Establishing the IGWDP

- Through his work, was born the idea which later became the large-scale Indo-German Watershed Development Program (IGWDP) that he conceived and launched in Maharashtra in 1989.
- This was in collaboration with and the support of the Governments of India, Maharashtra and Germany, NABARD and the non-profit sector.

- Its unique and ground-breaking feature was that it put the villagers in the driver's seat — the community would plan the programme, implement it and maintain the watershed assets.
- Funds, substantial amounts, would be given directly to them and they would have to manage and account

7. India needs a carbon policy for agriculture

In News

The UK is set to host the 26th UN Climate Change Conference of the Parties (CoP26) in Glasgow from October 31 to November 12 with a view to accelerate action towards the Paris Agreement's goals. The focus should be on climate finance and transfer of green technologies at low cost.

Cause of concern for India

- According to the Global Carbon Atlas, India ranks third in total greenhouse gas emissions by emitting annually around **2.6 billion tonnes (Bt) CO2eq**, preceded by China (10 Bt CO2eq) and the United States (5.4 Bt CO2eq), and followed by Russia (1.7Bt) and Japan (1.2 Bt).
- India ranked seventh on the list of countries most affected due to extreme weather events, incurring losses of $69 billion (in PPP) in 2019 (Germanwatch, 2021).
- The fact that **22 of the 30 most polluted cities** in the world are in India is a major cause of concern.
- Delhi is the world's **most polluted capital** as per the World Air Quality Report, 2020.

Issues raised in global negotiation on climate change

- Nations are still quibbling about historical global emitters and who should take the blame and fix it.
- Global negotiations on climate change often talk about emissions on a per capita basis and **the emission intensity of GDP.**
- **Per capita emission:** Of the top five absolute emitters, the US has the highest per capita emissions (15.24 tonnes), followed by Russia (11.12 tonnes).
- **India's per capita emissions is just 1.8 tonnes,** significantly lower than the world average of **4.4 tonnes per capita.**

- If one takes emissions per unit of GDP, of the top five absolute emitters, China ranks first with 0.486 kg per 2017 PPP $ of GDP, which is very close to Russia at 0.411 kg per 2017 PPP $ of GDP.
- India is slightly above the world average of **0.26 (kg per 2017 PPP $ of GDP)** at 0.27 kg, while the USA is at 0.25, and Japan at 0.21.
- In our Nationally Determined Contributions (NDCs) submitted in 2016, India committed to "reduce emission intensity of its GDP by **33 to 35 per cent by 2030 from 2005 level."**

Sector-wise emission and share of agriculture in it

- Global emissions show that electricity and heat production and agriculture, forestry and other land use make up 50 per cent of the emissions.
- But the emissions pie in India owes its **largest chunk (44 per cent) to the energy sector**, followed by the **manufacturing and construction sector (18 per cent)**, and **agriculture, forestry and land use sectors (14 per cent),** with the remaining being shared by the transport, industrial processes and waste sectors.
- The share of agriculture in total emissions has gradually declined from **28 per cent in 1994 to 14 per cent in 2016.**
- However, **in absolute terms, emissions from agriculture have increased to about 650 Mt CO2 in 2018**, which is similar to China's emissions from agriculture.
- Agricultural emissions in India are primarily from the livestock sector (54.6 per cent) **in the form of methane emissions due to enteric fermentation** and the **use of nitrogenous fertilisers** in agricultural soils (19 per cent) which emit nitrous oxides; rice cultivation (17.5 per cent) in **anaerobic conditions** accounts for a major portion of agricultural emissions followed by livestock management (6.9 per cent) and burning of crop residues (2.1 per cent).

Way forward: Carbon policy for agriculture

- **Reward farmers through carbon credit:** A carbon policy for agriculture must aim not only to reduce its emissions but also **reward farmers through carbon credits** which should be **globally tradable.**
- **Focus on livestock:** With the world's **largest livestock population (537 million),** India needs better feeding practices with smaller numbers of cattle by raising their productivity.
- **Switch areas from rice to maize:** While direct-seeded rice and alternative wet and dry practices can **reduce the carbon footprint in rice fields**, the real solution lies in switching areas from rice to maize or other less water-guzzling crops.

- **Efficient fertiliser use:** Agricultural soils are the **largest single source of nitrous oxide (N2O) emissions** in the national inventory.
- Nitrous oxide emissions from use of nitrogen-fertiliser increased by approximately 358 per cent during 1980-81 to 2014-15.
- An alternative for better and efficient fertiliser use would be to promote **fertigation and subsidise soluble fertilisers.**
- **Incentives and subsidies:** The government should **incentivise and give subsidies on drips** for fertigation, switching away from rice to corn or less water-intensive crops, and promoting soluble fertilisers at the same rate of subsidy as **granular urea.**

Conclusion

Carbon policy for agriculture in India would help it meet its goals in reducing emissions while making agriculture climate-resilient.

Prelims Practice Questions

1. Olivine is the most abundant component in the Earth's

a. Inner Core
b. Upper Mantle
c. Crust
d. Atmosphere

Answer: b

Explanation:

- The mineral olivine is a magnesium iron silicate with the chemical formula $(Mg^{2+}, Fe^{2+})_2 SiO_4$.
- It is a type of nesosilicate or orthosilicate.
- It is the primary component of the Earth's upper mantle

2. Which of the following joint exercises is/are held between India-UK?

1. AJEYA WARRIOR
2. PASSEX
3. Konkan
4. Garuda Shakti

Select the correct answer using the code given below:

A 1 and 4 only
B 2 only
C 1, 2 and 3 only
D 1, 2, 3 and 4

Answer : C

Explanation

- Recently, the **6th Edition of India - UK Joint Company Level Military Training Exercise AJEYA WARRIOR** has commenced **in Uttarakhand.**
  - The exercise is conducted **alternatively in the United Kingdom and India.**
  - The exercise is **part of an initiative** to develop interoperability and sharing expertise with friendly foreign nations.
- India and the UK participated in a two-day bilateral **Passage Exercise (PASSEX)** in the Bay of Bengal.
- **Other Joint Exercises between India and UK:**
  - **Navy: Konkan**
  - **Air Force: Indradhanush**
- **Garuda Shakti** is a **bilateral exercise** between **special forces of armies of India** and **Indonesia.** This joint military exercise is a part of India and Indonesia defence cooperation.
- **Hence, option C is correct.**

3. Which among the following greatly depend on wind conditions during migration?

1. Globe skimmer dragonflies
2. Jacobin Cuckoo
3. Amur Falcon

Options:

a. 1 only

b. 2 and 3 only
c. 1 and 2 only
d. 1, 2 and 3

Answer: d

Explanation:

- Recent study by Lund University, Sweden has found that it was possible for the dragonflies to migrate from India to East Africa and return to India. The globe skimmer dragonfly does not rely on fat stored in its body to fly such long distances. Instead, it takes advantage of favorable winds present during certain periods of the year.
- Jacobin Cuckoo (Clamator jacobinus) is one of the most iconic migrants in the Indian Subcontinent, and their arrival in north India is considered to herald the first monsoon rains. Although resident in South India, central and northern populations of this brood parasite migrate to Africa for the winter.
- Amur Falcons migrate from breeding grounds in eastern Asia to wintering grounds in southern Africa. Along the way, they fly 2,400 miles across the Indian Ocean.

4. Consider the following statements:

1. Ethanol is derived from corn and sugarcane using the fermentation process.
2. Biodiesel is derived from vegetable oils and animal fats by a transesterification process.

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

Answer : C

Explanation

- **Ethanol** is derived from corn and sugarcane using the **fermentation process. Hence, statement 1 is correct.**
    - A litre of ethanol contains approximately two thirds of the energy provided by a litre of petrol.

- When mixed with petrol, it improves the combustion performance and lowers the emissions of carbon monoxide and sulphur oxide.

- **Biodiesel** is derived from **vegetable oils** like soybean oil or palm oil, vegetable waste oils, and **animal fats** by a biochemical process called **"Transesterification." Hence, statement 2 is correct.**
  - It produces very less or no amount of harmful gases as compared to diesel.
  - It can be used as an alternative for the conventional diesel fuel.

5. Consider the following statements regarding the State of Climate Services Report 2021:

1. It is released by the World Meteorological Organization (WMO).
2. India's average Terrestrial Water Storage (TWS) loss in the last two decades is higher than the global average.

Which of the statements given above is/are correct?

A 1 and 2 only
B 2 only
C 1 and 3 only
D 1, 2 and 3

Answer : A

Explanation

- Recently, the **World Meteorological Organization (WMO)** released the **State of Climate Services report 2021.** It focuses on Terrestrial Water Storage (TWS). **Hence, statement 1 is correct.**
- TWS is the sum of all water on the land surface and in the subsurface, i.e. surface water, soil moisture, snow and ice and groundwater.
- **Global Scenario: TWS dropped at a rate of 1 cm per year in 20 years** (2002-2021).
  - The biggest losses have occurred in Antarctica and Greenland. But many highly populated, lower latitude locations have also experienced TWS losses.
- **Indian Scenario:** The **TWS has been lost at a rate of at least 3 cm per year.** In some regions, the loss has been **over 4 cm per year too. Hence, statement 2 is correct.**
  - India has recorded the highest loss in terrestrial water storage if the loss of water storage in Antarctica and Greenland is excluded.

- India is the 'topmost hotspot of TWS loss'. The **northern part of India has experienced the maximum loss** within the country.

6. Consider the following statements:

1. India is the founder-member of the High Ambition Coalition (HAC) for Nature and People.
2. HAC membership is limited to Asian countries only.
3. The HAC aim is to prevent nuclear proliferation.

Which of the statements given above is/are correct?

A 1 and 2 only
B 3 only
C 1, 2 and 3
D None of the Above

Answer : D

Explanation

- India recently joined the group. It was founded by **Costa Rica, France** and **Britain** in **2019. Hence, Statement 1 is incorrect.**
- It has **more than 70 countries** which are a mix of countries in the global north and south, **European, Latin American, Africa and Asia countries** are among the members. **Hence, Statement 2 is incorrect.**
- Its aim is **to promote an international agreement** to protect **at least 30% of the world's land and ocean by 2030 (Global 30×30 target).** HAC has no relation to nuclear proliferation. **Hence, Statement 3 is incorrect.**

Mains Practice Questions

1Q. Including more women in science and applied technologies is critical for the advancement of society. Discuss.

Approach

- Start the answer by mentioning the status of gender equality in India.
- Discuss the status of women in Science, Technology, Engineering, Mathematics (STEM) fields.
- Suggest some measures to improve women's participation in STEM fields.
- Conclude Suitably.

2Q. What do you understand by DeepFake? Discuss the challenges posed by DeepFake. (150 words)

Approach

- Explain how the deepfake works.
- Highlight some challenges posed by deepfake technology.
- In conclusion highlight some measures to overcome these challenges