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PM-GATI SHAKTI-NATIONAL MASTER PLAN

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APTI PLUS

GENERAL STUDIES PAPER-II

Mandate for vehicles of category M1

Why in News

- In order to enhance the safety of occupants of the motor vehicle against lateral impact, The Ministry of Road Transport & Highways decided to enhance safety features by amending the ***Central Motor Vehicles Rules (CMVR), 1989***.
- A draft notification has been issued on 14thJanuary 2022, which mandates that vehicles of category M1, manufactured after 1st October 2022, shall be fitted with two ***side/side torso air bags***, one each for the persons occupying front row outboard seating positions, and two ***side curtain/tube air bags***, one each for the persons occupying outboard seating positions.

Background

- The Ministry made the *driver airbag a compulsory fitment on all Motor vehicles of category M1 (motor vehicles used for the carriage of passengers, comprising not more than eight seats, in addition to the driver's seat)*, manufactured on and after 1st July, 2019 in order to ensure the driver's safety.
    - An airbag is a vehicle occupant-restraint system which interferes between the driver and the vehicle's dashboard during a collision, thereby preventing serious injuries.
- Thereafter, the Ministry mandated implementation of the front Air bag for the person occupying the front seat, other than the driver, in all M1 category vehicles w.e.f. 01st January 2022.

Important Points

- "***Side/side torso air bag***" means any inflatable occupant restraint device that is mounted to the seats or side structure of the vehicle interior, and that is designed to deploy in a side impact crash to help mitigate primarily torso injury and/or occupant ejection, for the persons occupying front row outboard seating positions.
- "***Side curtain/tube air bag***" means any inflatable occupant restraint device that is mounted to the side structure of the vehicle interior, and that is designed to deploy in a side impact crash or rollover to help mitigate primarily head injury and/or occupant ejection for the persons occupying the outboard seating positions.

PM-Gati Shakti-National Master Plan (NMP)

- Prime Minister had launched the "***PM-Gati Shakti - National Master Plan (NMP)***" for multi-modal connectivity at a function in New Delhi on 13 October 2021.
    - Subsequently, on 21 October 2021, the ***Cabinet Committee on Economic Affairs (CCEA)*** approved PM-Gati Shakti National Master Plan including institutional framework for rolling out, implementation, and monitoring and support mechanism for providing multi-modal connectivity.
    - This will help in bringing down the logistics cost and translate into enormous economic gains to consumers, farmers, youth as well as those engaged in businesses.
- The PM-Gati Shakti NMP is intended to break Departmental Silos and bring in more holistic and integrated planning and execution of projects with a view to address the issues of multi-modal connectivity and last mile connectivity.

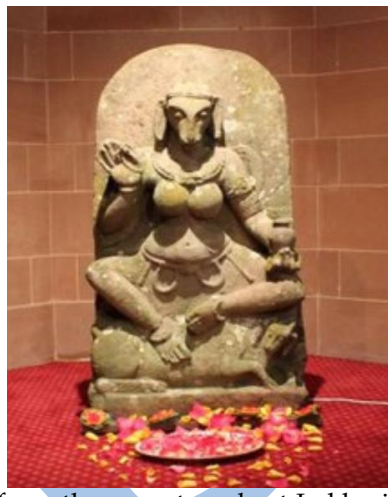
Stone idol of Goat Head Yogini

Context

- The Union Minister of Culture, Tourism and DONER has announced that a ***10th century stone idol of Goat Head Yogini*** that had been illegally removed from a temple in Lokhari, Banda, and Uttar Pradesh is being returned to India.

Background

- Sculpture had briefly surfaced in the art market in London in 1988.



- In October 2021, High Commission of India received information about the finding of a goat-headed Yogini Sculpture that had matched the description of the Lokhari set, in the garden of a private residence near London.
- India Pride project Singapore and Art Recovery International, London swiftly assisted High Commission of India, London in the identification and recovery of the Statue while the High Commission of India processed the requisite documentation with local and Indian authorities.

Key Highlights

- The sculpture is of a goat headed Yogini that originally belonged to a group of stone deities in sandstone and installed in Lokhari temple.
- These had been the subject of a study by Indian scholar on behalf of National Museum in New Delhi in 1986 which was later published under the title, "***Yogini Cult and Temples: A Tantrik Tradition***."
- A similar sculpture of the buffalo-headed Vrishanana Yogini, apparently stolen from the same temple at Lokhari village had been recovered and repatriated by Embassy of India, Paris in 2013. Thee Vrishanana Yogini was installed in the National Museum, New Delhi in September 2013.
- Lokhari is a small village situated in the Mau sub-division in Banda district of Bundelkhand, Uttar Pradesh.
- Yoginis are a group of powerful female divinities associated with the Tantrik mode of worship.
- They are worshipped as a group, often 64 and are believed to possess infinite powers.
- The Goat head Yogini received at the High Commission on the day of Makar Sankranti has been dispatched to the Archaeological Survey of India, New Delhi.

National Centre for Good Governance (NCGG)

Why in News?

- In order to promote inclusive good governance, strengthening of local institutions and effective implementation of government programmes, the National Centre for Good Governance (NCGG), Government of India and National Institute of Rural Development & Panchayati Raj (NIRD & PR), Hyderabad signed Memorandum of Understanding (MoU).

Details

- The main purpose of having this agreement is to focus on different collaborative activities by drawing upon the strengths of these two national institutions for bringing better good governance mechanisms into practice across all programmes and schemes.
- The MoU will help in application of good governance principles in true spirit and ensure their effective implementation in terms of transparency and accountability in utilisation of public funds in intended manner for delivering services to benefit rural communities.
- Many key mutual areas of interest were identified as actionable points, including
  - leveraging e-governance at panchayat level,
  - documenting good governance models at panchayat level,
  - Simplification of forms among others and best practices of the rural governance.
- NCGG has suggested to identify the bench mark of the indexing of Rural Governance at the panchayat level.

About NCGG

- It is an autonomous institute under the aegis of ***Department of Administrative Reforms and Public Grievances***, Government of India.
- Its head office is at New Delhi and branch office at Mussoorie.

Functions

- The NCGG has been set up to assist in bringing about governance reforms through studies, training, knowledge sharing and promotion of good ideas.
- It seeks to carry out policy relevant research and prepare case studies; curate training courses for civil servants from India and other developing countries; provide a platform for sharing of existing knowledge and pro-actively

seek out and develop ideas for their implementation in the government, both at the National and International Level.

Background

- It traces its origin to the ***National Institute of Administrative Research (NIAR)***.
- *NIAR was set up in 1995 by the Lal Bahadur Shastri National Academy of Administration (LBSNAA) the Government of India's apex training Institute for higher civil services*.
- During its 19 years of existence it provided research and training support to the Academy in areas of public administration.
- NIAR was subsequently rechristened with an expanded mandate, as National Centre for Good Governance, which was inaugurated on February 24th, 2014.

SAMARTH

Why in News?

- Union Power Secretary chaired the second meeting of Steering Committee for ***SAMARTH i.e. National Mission on Use of Biomass in coal based thermal Power Plants***.

About The National Mission on Use of Biomass in Thermal Power Plants

- In order to reduce stubble burning and to reduce carbon footprint of thermal power plants while increasing the income of farmers, the government has established the *National Mission on Use of Biomass in Thermal Power Plants*.
- For overall monitoring of the Mission and to facilitate the Mission on inter-ministerial issues/constraints, a Steering Committee under the chairmanship of Secretary, Ministry of Power (MoP) has been constituted.
- Under this mission, advertisement, awareness campaign and training activities are actively being pursued.
- With this mission, agro-residue/ biomass, earlier considered as a waste product, has now begun to produce zero-carbon electricity for the citizens of the country.
- In turn farmers are getting additional income by selling the stubble/ biomass for conversion into torrefied/ non-torrefied biomass pellets.

Important Facts

- The Ministry of Power's policy on "Biomass Utilization for Power Generation through Co-firing in Coal based Power Plants" issued in October 2021 mandates all thermal power plants in the country to use 5 to 10% biomass along with coal for power production.
- It has been observed that NTPC has emerged as a leader in biomass users.
- Among the State Governments, Haryana State Genco has been able to co-fire around 550 MT of biomass in two of its stations and float tenders worth 11 lakh metric tonnes.
- Some of the Public and Private generating companies have started co-firing small quantities of biomass in Punjab, UP and Maharashtra.

Banking on Electric Vehicles in India

Context

- NITI Aayog, Rocky Mountain Institute (RMI), and RMI India released a report, titled 'Banking on Electric Vehicles in India'.

Background

- Banks and non-banking financial companies (NBFCs) in India have the potential to achieve an electric vehicle (EV) financing market size of Rs 40,000 crore (USD 5 billion) by 2025 and Rs 3.7 lakh crore (USD 50 billion) by 2030. However, retail finance for EVs has been slow to pick up.
- Financial institutions have an important role to play in accelerating the adoption of EVs in India and supporting the decarbonisation of road transport.
- RBI's PSL mandate has a proven track record of improving the supply of formal credit towards areas of national priority.
    - It can provide a strong regulatory incentive for banks and NBFCs to scale their financing to EVs.

How can Priority Sector help?

- Priority-sector lending aims to expand financial access and support employment opportunities in India.
- In order to meet these goals, the report highlights that the RBI may consider various EV segments and use cases based on five parameters:

1. socio-economic potential,
2. livelihood generation potential,
3. scalability,
4. techno-economic viability,
5. Stakeholder acceptability.

- Buyers are unable to access low-interest rates and long loan tenures for EVs as banks are concerned about resale value and product quality.
- Priority-sector lending can encourage banks to fast-track India's transition to EVs and help achieve our 2070 climate goals.

Details

- It outlines the importance of priority-sector recognition for retail lending in the electric mobility ecosystem.
- The report provides considerations and recommendations to inform the inclusion of EVs in the Reserve Bank of India's (RBI's) priority-sector lending (PSL) guidelines.
- The report indicates that electric two-wheelers, three-wheelers, and commercial four-wheelers are early segments to prioritise under PSL.
- To maximise the impact of the inclusion of EVs, the report also recommends a clear sub-target and penalty mechanism for priority sector lending to renewable energy and EVs.
- Furthermore, it suggests recognition of EVs as an infrastructure sub-sector by the Ministry of Finance and the incorporation of EVs as a separate reporting category under the RBI.
- Multiprong solutions such as these are needed not only for EV penetration and businesses, but also for the financial sector and India's 2070 net-zero target.

Joint Electricity Regulatory Commission for Manipur and Mizoram

Why in News

- Central Government has recently constituted *Joint Electricity Regulatory Commission (JERC)* for Manipur and Mizoram in pursuance of provisions of the Electricity Act, 2003 and the Memorandum of Agreement signed by the State Governments of Manipur and Mizoram, authorizing Government of India to constitute a JERC on their behalf.

About the Commission

- It is a two-Member Commission, each Member representing the respective participating State.
- The Central Government appoints Members of the Commission from Manipur and Mizoram under the provisions of the Act and in pursuance of MoA.
- In accordance with the provisions in the MoA and the relevant provisions of Electricity Act, 2003, Shri *Rengthanvela Thanga has been appointed as Member from Manipur side for a period of five years or till the age of 65 years whichever is earlier.*

Function

- The major functions of the Commission under the Act, inter-alia, are to :
  a. Regulate the tariff for generation, supply.
  b. Transmission and wheeling of electricity.
  c. Whole sale, bulk or retail as the case may be within the State.
  d. Regulate the electricity purchase of distribution licensees.
  e. Facilitate intra-state transmission and wheeling of electricity.
  f. Issue licenses to transmission licensees.
  g. Distribution licensees and electricity traders.
  h. Promote cogeneration and generation of electricity from renewable sources of energy and adjudicate upon the disputes between the licensees and generating companies, etc.

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GENERAL STUDIES PAPER-III

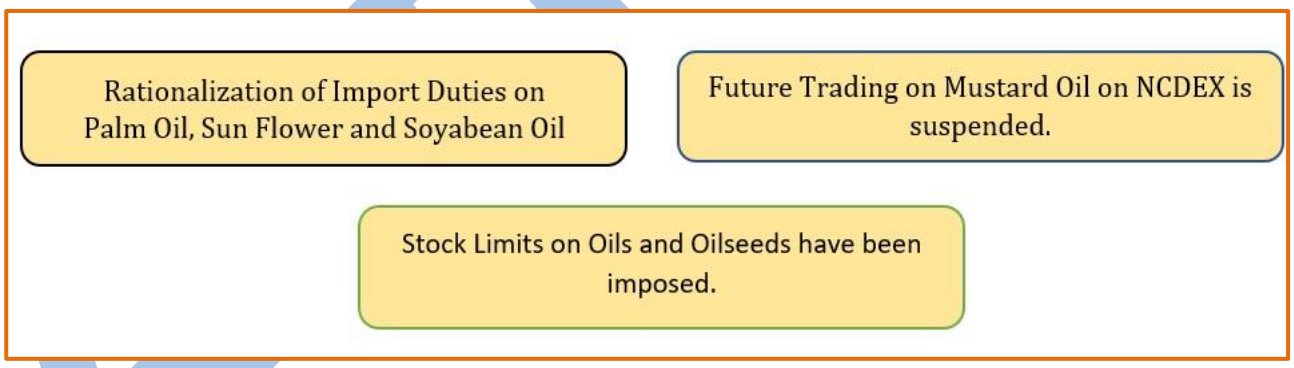
Edible oil prices

Why in News

- In a bid to rein in continuous rise in the cooking oil prices since past one year, the basic duty on Crude Palm Oil, Crude Soyabean Oil and Crude Sunflower Oil have been cut from 2.5% to Nil.
- The Agri-cess on these Oils has been brought down from 20% to 7.5% for Crude Palm Oil and 5% for Crude Soyabean Oil and Crude Sunflower Oil.
- Consequent upon the above reduction, *the total duty is now 7.5% for Crude Palm Oil and 5% for Crude Soyabean Oil and Crude Sunflower Oil*.
    - The basic duty on RBD Palmolein Oil has been slashed to 12.5% from 17.5% recently.
    - The basic duty on Refined Soyabean and Refined Sunflower Oil has been slashed to 17.5% from the current 32.5%.
    - Before reduction, the agricultural infrastructure cess on all forms of Crude Edible Oils was 20%.
    - Post reduction, the effective duty on Crude Palm Oil will be 8.25%, Crude Soyabean Oil and Crude Sunflower Oil will be 5.5% each.

Background

- India is one of the largest importer of edible oils as its domestic production is unable to meet its domestic demand.
    - The Country has to rely heavily on imports to meet the gap between demand and supply. Around 56-60% of the edible oils consumed in the country is met through imports.
    - International prices of Edible Oils are under pressure due to shortfall in global production and increase in export tax/levies by the exporting countries.
    - Therefore, domestic prices of Edible Oils are dictated by the prices of imported oils.
- As the domestic prices are governed by the international price trends, the prices of edible oils in the country have been ruling very high for the past one year. This has been a major cause of concern for the Government.



What else have been done?

- The department is regularly interacting with the oil industry associations and leading market players and has convinced them to reduce the MRP which will translate to passing on the benefit of duty reduction to end consumers.
- Stock limit on Soya Meal which is a major source of protein and constitutes almost 30% in Livestock Feed has been imposed with effect from 23rd December, 2021 till June 2022 by including it in the ***Schedule to Essential Commodities Act, 1955***.
    - This will cool down the prices and improve supply.
- The Govt. has also initiated certain long term & medium term plans to attain self-sufficiency in edible oils.
- Recently, the ***National Mission on Edible Oils – Oil Palm (NMEO-OP)*** a new Centrally Sponsored Scheme with a special focus on the North east region and the Andaman and Nicobar Islands has been launched.

Conclusion

- Due to the heavy dependence on imports for edible oils, it was important to make efforts for increasing the domestic production of edible oils in which increasing area and productivity of oil palm plays an important part.
- Overall, the reduction in import duty and other steps like imposition of stock limits to curb hoarding etc. has helped cool down domestic prices of all edible oils and granted much required relief to the consumers.

The Chips to Startup (C2S) Programme

Why in News

- The ***Ministry of Electronics and Information (MeitY)*** invites applications under the Chips to Startup (C2S) Programme from academia, R&D organisations, start-ups and MSMEs.

Aim

- The Chips to Star-tup (C2S) Programme aims to train 85,000 number of high-quality and qualified engineers in the area of Very large-scale integration (VLSI) and Embedded System Design as well as result in development of 175 ASICs (Application Specific Integrated Circuits), Working Prototypes of 20 System on Chips (SoC) and IP Core repository over a period of 5 years.
- This will be a step towards leapfrogging in the Electronics System Design & Manufacturing (ESDM) space by way of inculcating the culture of SoC/ System Level Design at Bachelors, Masters and Research level and act as a catalyst for growth of Start-ups involved in fabless design.

Key Highlights

- The programme would be implemented at about 100 academic institutions/R&D organisations across the Country (including IITs, NITs, IIITs, Government/Private Colleges and R&D Organisations).
- Start-ups and MSMEs can also participate in the programme by submitting their proposals under Academia-Industry Collaborative Project, Grand Challenge/Hackathons/RFP for development of System/SoC/IP Core(s).
- The C2S Programme addresses each entity of the value chain in electronics viz. quality manpower training, research and development, hardware IPs design, System design, application-oriented R&D, Prototype design and deployment with the help of academia, industry, start-ups and R&D establishments.
- Under the Programme, based on the Institutions' expertise, Technology Readiness Level (TRL) and design experience acquired during earlier SMDP Programmes, proposals are invited in three different categories, i.e.,
  a. Design and Development of Systems/SoCs/ASICs/Reusable IP Core(s),
  b. Development of Application Oriented Working Prototype of IPs/ASICs/SoCs,
  c. Proof of Concept oriented Research and Development of ASICs/FPGAs.
- ***C-DAC (Centre for Development of Advanced Computing)***, a scientific society operating under MeitY, will serve as the nodal agency for the programme.

"Purple Revolution" is Jammu & Kashmir's contribution to "Start-ups India"

Context

- Union Minister says, "Purple Revolution" is Jammu & Kashmir's contribution to "Start-ups India", an initiative launched by Prime Minister Narendra in 2016.

About The Purple Revolution

- The Purple or Lavender Revolution was launched by the Union Ministry of Science & Technology through the ***Council of Scientific & Industrial Research's (CSIR) Aroma Mission***, which aimed at increasing lavender cultivation in Jammu and Kashmir.
- Lavender cultivation is practiced in almost all the 20 districts of Jammu & Kashmir. Particularly, the districts of Kathua, Udhampur, Doda, Ramban, Kishtwar, Rajouri, Srinagar, Pulwama, Kupwara, Bandipora, Budgam, Ganderbal, Anantnag, Kulgam, and Baramulla have made huge progress in this direction.
  - Under the mission, first-time farmers were given free lavender saplings, while those who had cultivated lavender before were charged Rs. 5-6 per sapling.

Objectives
- To take advantage of the geographical conditions and increase the homegrown market along with farmers' income.
- To empower domestic farmers and support India's aromatic crop-based agro-economy by reducing imports of aromatic oils and increasing homegrown varieties.

About the Aroma Mission
- The Mission is envisaged to bring transformative change in the aroma sector through desired interventions in the areas of agriculture, processing and product development for fuelling the growth of aroma industry and rural employment.
- It promotes the cultivation of aromatic crops for essential oils that are in great demand by aroma industry.
- Under the Mission, initially, CSIR introduced high-value essential oil-bearing lavender crop through its Jammu-based laboratory, ***Indian Institute of Integrative Medicines (IIIM)*** for cultivation in districts Doda, Kishtwar, Rajouri. However, the crop is native to Europe.
- Apart from providing planting material, distillation units are provided and farmers are trained in the extraction process. As a result, many of them have become entrepreneurs specializing in lavender oil.

Significance
- Aroma/ lavender cultivation has become a popular option in farming for agricultural startups.
- It has generated rural employment of farmers, spurred entrepreneurship in aromatic oils and other aromatic products manufacturing, and lowered the import of essential and aromatic oils.
- According to the Ministry of Science & Technology, with CSIR's Aroma Mission, important medicinal and aromatic plants are being cultivated in 6,000 hectares of land.
- Further, it has also generated 10 to 12 lakh man-days of rural employment, and more than 500 tonnes of essential oil worth Rs. 60 crores being produced during the last two years.
- As a result of the Lavender revolution, farmers are now able to grow lavender, make profits, and also improve their lives.

Phase-II of Aroma Mission
- In commemoration of AzadikaAmritMahotsav, Dr Jitendra Singh announced that CSIR has launched Phase-II of Aroma Mission after the completion of Phase-I.
- Aroma Mission is attracting Start-ups and agriculturists from across the country, and during Phase-I CSIR helped cultivation on 6000 hectares of land and covered 46 Aspirational districts across the country.
- More than 44,000 persons have been trained and several crores of farmers' revenue generated.
- In the second Phase of Aroma Mission, it is proposed to engage over 45,000 skilled human resources with the aim of benefitting more than 75,000 farming families across the country.

World Economic Forum's Davos Agenda
Context
- The Prime Minister delivered ***'State of the World'*** special address at the World Economic Forum's Davos Agenda.

About
- The ***Davos Agenda*** virtual event has taken place 17-21 January 2022.
- It was feature heads of state and government, CEOs and other leaders to address critical challenges.
  - They will discuss the critical challenges facing the world today and present their ideas on how to address them.
- The ***Davos Agenda*** virtual event offers the first global platform of 2022 for world leaders to come together to share their visions for the year ahead.
- The event also marked the launch of several Forum initiatives including efforts to accelerate the race to net-zero emissions, ensure the economic opportunity of nature-positive solutions, create cyber resilience, strengthen global value chains, build economies in fragile markets through humanitarian investing, bridge the vaccine manufacturing gap and use data solutions to prepare for the next pandemic.

Key Highlights of PM

- **During Corona time, India saved many lives by supplying essential medicines and vaccines while following its vision of 'One Earth, One Health'**.
  - *India is world's third largest pharmaceutical producer and is considered 'pharmacy to the world'*.
- **India is committed to become world's reliable partner in global supply-chains** and is making way for free trade agreements with many countries.
- **Not only India is focussing on easing the processes in its quest for self-reliance, it is also incentivizing investment and production**.
- **India is making policies keeping in mind the goals of next 25 years. In this time period, the country has kept the goals of high growth and saturation of welfare and wellness.**
  - **This period of growth will be green, clean, sustainable as well as reliable**.
- 'Throw away' culture and consumerism has deepened the climate challenge. It is imperative to rapidly move from today's ***'take-make-use-dispose' economy to a circular economy***.
- Referring to the ***Mission LIFE***, making LIFE into a mass movement can be a strong foundation for P-3 i.e 'Pro Planet People.
- ***LIFE i.e. 'Lifestyle for Environment'***, is a vision of resilient and sustainable lifestyle that will come handy in dealing with the climate crisis and other unpredictable challenges of the future.
- **It is imperative that every democratic nation should push for reforms of the multilateral bodies so that they can come up to the task dealing with the challenges of the present and the future**.

Assistive Technology

Why in News?

- Minister of State for Education addressed the ***Assistive Technology Innovation Showcase*** for inclusive Education organised by Department of School Education and Literacy, Ministry of Education in association with Atal Innovation Mission, NITI Aayog.

Key Highlights

- Highlighted the revision of NEP-2020 that mandates equitable & inclusive education so that every citizen has an equal opportunity to dream, thrive and contribute to the growth of the nation.
- Schools & school complexes are working to provide all ***Children with Special Needs (CWSN)*** accommodations and support mechanisms tailored to suit their needs, ensuring their full participation and inclusion in the classroom.
- Mentioned about the textbooks conversion into ***Indian Sign Language (ISL)*** and ministry's innovation ecosystem to take forward assistive-tech innovations through incubation and acceleration support.
- Assistive technology for education should not only be considered as a social venture but it has a solid business model of its own and the same needs to be developed further.

About the Event

- The highlight of the event was presentation by 12 start-ups, having compilation of top solutions in the form of applications or devices which have been created by young entrepreneurial minds of India.
  - These young minds are leveraging frontier technologies such as AI to provide socially relevant solutions to aid the learning of children who suffer from various disabilities such as Autism, Dyslexia, Hearing and Speech impairment disorder, Visual impairment disorder, Cerebral Palsy etc.
- The event also featured innovations from young innovators from schools.
  - Children from Atal Tinkering Labs presented their innovations ranging from innovative device to convert sign language to speech to a device that scans and converts printed text in any book or newspaper into an audio clip.
- The Event designed to promote and give start-ups a platform to showcase innovations received an overwhelming response.

About Assistive technology (AT)

- It is any item, piece of equipment, software program, or product system that is used to increase, maintain, or improve the functional capabilities of persons with disabilities.
- It helps people who have difficulty speaking, typing, writing, remembering, pointing, seeing, hearing, learning, walking, and many other things.
- Different disabilities require different assistive technologies.
- It promotes greater independence by enabling people to perform tasks they were formerly unable to accomplish, or had great difficulty accomplishing, by providing enhancements to, or changing methods of interacting with, the technology needed to accomplish such tasks.
    - For example, wheelchairs provide independent mobility for those who cannot walk, while assistive eating devices can enable people who cannot feed themselves to do so.
- Due to assistive technology, people with disability have an opportunity of a more positive and easy-going lifestyle, with an increase in "social participation," "security and control," and a greater chance to "reduce institutional costs without significantly increasing household expenses.

Open Data Week

Context

- Ministry of Housing and Urban Affairs (MoHUA) announced the initiation of the Open Data Week to encourage adoption of open data and promote innovation across India's urban ecosystem.

Details

- Open Data Week is part of a series of pre-event initiatives being undertaken by MoHUA to promote awareness and use of open data. It will be conducted during the third week of January, i.e., from 17th January 2022 to 21st January 2022.
- The Event will see participation from all 100 Smart Cities that will be publishing high quality datasets and data blogs on the Smart Cities Open Data Portal.
- It aims to show the benefits of open data such as increased efficiency, transparency, a spur in innovation, and economic growth.
- It is divided into two segments –
    - Uploading of datasets, visualizations, APIs and data blogs on the Smart Cities Open Data Portal from 17th January 2022 to 20th January 2022,
    - Celebration of a ***Data Day*** by all smart cities on ***21st January*** 2022.
- The idea is to provide a platform that offers ample opportunities on how to continue creating and promoting the use of data that addresses complex urban issues, such as the ongoing COVID-19 pandemic.

Way Forward

- New combinations of data can create new knowledge and insights, which can lead to whole new fields of application.
- This can help governments in solving some of the most common problems faced by the citizens of any city and replicating the successful ideas in other cities.
- All 100 smart cities are geared up for the event, making it a collaborative effort towards making Indian cities '*Data Smart*'.

CSIR's newly developed Disinfection technology

Context

- CSIR's newly developed Disinfection technology is being installed to combat pandemic in railway coaches, AC buses, closed spaces etc.

Background

- The technology has been developed according to the requirements for deactivation of SARS COV-2 virus contained in an aerosol with necessary ventilation measures, necessary safety and user guidelines and tested Bio-safety standards etc. UV-C deactivates viruses, bacteria, fungus and other bio - aerosols etc. with appropriate dosages using 254nm UV light.

- UV-C air duct disinfection system can be used in auditoriums, large conference rooms, class-rooms, malls etc. which provides a relatively safer environment for indoor activities in the current pandemic.

Details

- The ***UV-C technology*** is developed by the Ministry of Science & Technology through ***CSIR-CSIO (Central Scientific Instruments Organisation)***.
  - It is totally effective for mitigation of airborne transmission of SARS-COV-2 and will also remain relevant in post-COVID era.
- The technology has been successfully tried in Railways, AC Buses and even the Parliament House and is now open for general roll-out for use by common masses.

Precaution

- Even after installation of this disinfection technology, everybody is advised to strictly adhere to COVID appropriate behaviour including use of Face Mask, maintaining social distance, avoiding crowds etc.

Motion of some stars holds clue of dark matter shape in barred galaxies

Context

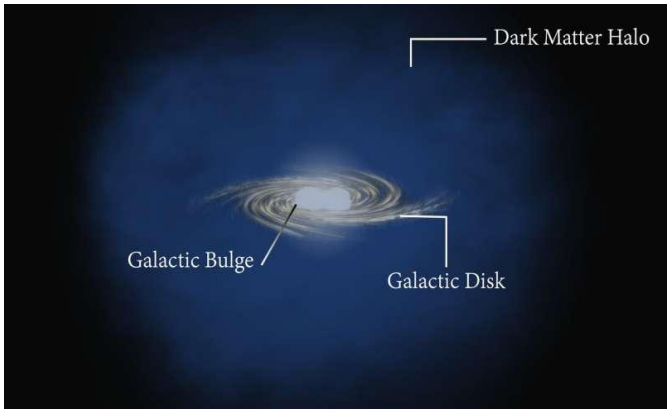
- Dark matter forms the skeleton on which galaxies form, evolve, and merge.
- Scientists investigating how the shape of dark matter halo affects the motion of stars in stellar bars (found at the centre of some galaxies) have found that out-of-plane bending events of the bar explain the shape of dark matter halos in barred galaxies.
- Out of plane bending of the bar in barred galaxies (central bar-shaped structure composed of stars) is a rare violent bar thickening mechanism known as buckling.

Background

- It is the first time that three-bar buckling events have been reported in any study. The boxy/peanut shape bulges, which formed as a result of bar buckling, are stronger in prolate dark matter halo, and the signatures of bar buckling are the most durable in them.
- This work has been published in the peer-reviewed journal *"Monthly Notices of the Royal Astronomical Society"*.
- They concluded that the rarity of observed buckling events along with multiple buckling event in our prolate halo (a sphere squashed from the sides) simulation indicate that the shapes of dark matter halos in most of the barred galaxies maybe oblate (a sphere squashed from the top and bottom) or spherical.

Structure of Galaxy

- The trillions of galaxies in our Universe have different shapes and sizes, which are determined by the motion of their stars.
- Our own galaxy, the Milky Way, is a disk galaxy made up of stars moving in circular orbits around the centre in a flattened disk, with a dense collection of the stars at the centre called the ***Bulge***.
  - These bulges can have shapes ranging from nearly spherical to as flat as the galaxy disk.
- Milky Way has a flat boxy or peanut-shaped bulge in its centre.
  - Such bulges are formed due to thickening of the stellar bars in galaxies.
  - One of the interesting and violent thickening mechanism is buckling, where bar bends out of the plane of the galaxy disk.



Significance

- Many recent numerical and observational studies suggest that dark matter halos are spherical, prolate (a sphere squashed from the sides), or oblate (a sphere squashed from the top and bottom) in shape. However, its effect on stellar kinematics in the bulges and bars of galaxies is not well understood.
- In our Universe, detection of the ongoing buckling events is very rare. This study suggests that most barred galaxies may have more oblate or spherical halos rather than prolate halos
- They explained that each event of the buckling thickens the bar further.
    - During the first buckling, the innermost region of the bar gets thicker, while in the subsequent buckling events outer region of the bar gets thicker.
    - Since the bar in prolate halo shows three distinct buckling events, the bar becomes the thickest in prolate halo. As a result, most strong boxy/peanut bulge formed in prolate halo.

MoU between IFSCA & III

Why in News

- The International Financial Services Centers Authority (IFSCA), with an objective of capacity building of professionals in the insurance sector in International Financial Services Centres (IFSCs), has entered into a Memorandum of Understanding (MOU) with the Insurance Institute of India (III).

Background

- The Insurance Institute of India (III) in involved in devising and continuously upgrading the curriculums and imparting the training programs for the professionals in the insurance industry in India and abroad, to meet the needs of the ever-dynamic insurance sector.
    - The certification by the institute is recognized by the insurance industry, regulators, and other internationally reputed insurance education providers.
    - The Institute is also the member of the Institute of Global Insurance Education (IGIE).

Key Points

- III would undertake study to make changes to the academic curriculum in meeting the current needs of the insurance industry participants in IFSCA with the view to introduce certificate courses and professional examinations.
- III would be working on fulfilling the medium- and long-term capacity building requirements of insurance professionals resulting into deepening of insurance business activities in the IFSCA.
- III would jointly with IFSCA conduct seminars/ workshops/ conferences to pool knowledge of professional workforce for the insurance industry at the infrastructure and facilities available with III for academic activities.
- III would promote research topics/ subjects relating to working of IFSCA to the students enrolling for doctoral studies under its agreement with the University of Mumbai.
- On the request of IFSCA, III would nominate its faculties for training and research on global insurance reinsurance laws and regulations of major financial hubs.

Role of IFSCA & III

- IFSCA sets regulatory framework for insurance requires periodic professional examinations and training.
- III would design and conduct such examinations and training for professional in IFSC which would aid in having skilled talent in IFSC eco-system.

APTI PLUS

FOREIGN AFFAIRS

Topic	Details
U.S	• In pursuant to the 12th India – USA TPF meeting held on 23 Nov, 2021 Department of Agriculture and farmer's welfare (DAC&FW) and US Department of Agriculture (USDA) have signed a framework agreement for implementing the 2 Vs 2 Agri market access issues i.e. inspection / oversight transfer for Indian mangoes & pomegranate and market access for pomegranate arils from India and market access for US cherries and U.S Alfalfa hay.
U.K	• Union Minister addresses India-UK meet on "Sustaining Food Production under Environmental Stress". • He called for collaboration between the two nations on issues of mutual concern like achieving the goals of food security and zero hunger.
Denmark	• India & Denmark agreed to initiate joint research and development on green fuels including green hydrogen, during the Joint S&T Committee meeting.
Sri-Lanka	• India and Sri Lanka extended the existing S&T cooperation for 3 more years, with focus on new areas like waste-water technologies, biotech, sustainable agriculture, aerospace engineering, robotics, big data analytics, and artificial intelligence, as well as industrial collaborations at the India-Sri Lanka 5th Joint Committee on S&T Cooperation.
Israel	• Experts from India and Israel deliberated on widening the scope of India-Israel Industrial R&D and Technological Innovation Fund (I4F) at its 8th Governing Body meeting. • They approved 3 joint R&D projects worth 5.5 million $ and suggested measures to create a broader India-Israel collaborative ecosystem.

SHORT LINERS

1. ***Ms Vini Mahajan***, IAS (Punjab: 1987) assumed the charge as Secretary in the Ministry of Jal Shakti, Department of Drinking Water and Sanitation. Prior to this, she was serving as Punjab Chief Secretary from 26th June 2020.

2. ***Shri G Asok Kumar***, Additional Secretary, Ministry of Jal Shakti took over as the new Director General for the National Mission for Clean Ganga, Ministry of Jal Shakti. He belongs to the Indian Administrative Services Telangana Cadre 1991 batch.

- Shri Asok Kumar is also the recipient of several awards such as the SKOCH Award for Public Services 2021, Jal-Mitra award from the Government of Andhra Pradesh and the first Telangana Excellence Award by the Government of Telangana for outstanding work done in Public Administration.

3. Prime Minister Shri Narendra Modi has recently inaugurated the New Integrated Terminal Building of ***Maharaja Bir Bikram (MBB) Airport*** and launched key initiatives like *Mukhyamantri Tripura Gram Samriddhi Yojana* and ***Project Mission 100*** of Vidyajyoti Schools.

- Governor of Tripura, SatyadeoNarain Arya, and Chief Minister of Tripura Shri Biplab Kumar Deb, Union Ministers Shri JyotiradityaScindia andSmtPratimaBhoumik were among those present on the occasion.

4. The Department for Promotion of Industry and Internal Trade (DPIIT) is organizing the first-ever ***Startup India Innovation Week*** from 10th -16th of January 2022.

- This virtual week-long innovation celebration aims to commemorate the 75th year of India's independence 'Azadi Ka Amrit Mahotsav' and is designed to showcase the spread and depth of entrepreneurship across India.
- In the startup world, 2021 has been recognised as the 'year of unicorns,' with 40+ unicorns added in the year.
- Our startups represent 55 industries, spread across 633 districts with at least one startup from every State and UT of the country have created over 6 lakh jobs since 2016.

5. ***India has emerged as the largest exporter of gherkins in the world. India has exported cucumber and gherkins to the tune of 1, 23,846 Metric Tonnes with a value of USD 114 million during April-October, 2021***.

- Gherkins are exported under two categories -- cucumbers and gherkins, which are prepared and preserved by vinegar or acetic acid and cucumbers and gherkins, which are provisionally preserved.
- Nearly 15% production of the world's gherkin requirement is grown in India.

6. **Man Portable Anti-Tank Guided Missile (MPATGM)**: Defence Research and Development Organisation (DRDO) successfully flight tested the final deliverable configuration of Man Portable Anti-Tank Guided Missile (MPATGM) on January 11, 2022.
- The indigenously developed anti-tank missile is a low weight, fire & forget missile and is launched from a man portable launcher, integrated with thermal sight.
- The missile impacted the designated target and destroyed it.
- The final impact event was captured on camera and the test has validated the minimum range successfully.

7. **Union Minister of State (Independent Charge) Science & Technology, Dr Jitendra Singh has recently launched Artificial Intelligence (AI) driven Start-Up by IIT alumni for water purification through innovative technology**.
- The facility aims to provide clean drinking water at a price much lesser than the market price.
- A MoU was also signed between Technology Development Board (TDB), a statutory body of Department of Science & Technology, Government of India and M/s Swajal Water Private Limited, a tech Start Up company founded by ex-IITians based in Gurugram.

8. **Colombo Security Conclave**:The first Colombo Security Conclave Virtual Workshop on "Developing Regional Cyber Security Capabilities on Defensive operations, Deep/Dark Web handling and Digital Forensics" was hosted by the National Security Council Secretariat (NSCS), Government of India in association with National Forensics Science University, Gandhinagar (Gujarat) and the Secretariat of the Colombo Security Conclave, over two days on 10-11 January 2022.

9. **Subhash Chandra Bose AapdaPrabandhanPuraskar:**For the year 2022, (i) Gujarat Institute of Disaster Management (in the Institutional category) and (ii) Professor Vinod Sharma (in the Individual category) have been selected for the Subhash Chandra Bose Aapda Prabandhan Puraskar for their excellent work in Disaster Management.
- The award carries a cash prize of Rs. 51 lakh and a certificate in case of an institution and Rs. 5 lakh and a certificate in case of an individual.

10. **PASSEX:**Indian Navy's indigenously designed and built guided missile destroyer, INS Kochi, exercised with Russian Federation Navyon 14 January 2022 in the Arabian Sea.

11. Padma Shri awardee and social activist Shanti Devi has recently passed away. She served the poor for nearly six decades, dedicating her life to the education and upliftment of tribal girls.
- She is also known for the eradication of Yaws, a chronic bacterial infection.

12. ***Birju Maharaj***, a legend of classical Indian dance and among the country's most well-known performing artists, passed away.
- Pandit Birju Maharaj (born Brijmohan Nath Mishra) was an Indian dancer, composer, singer and exponent of the ***Lucknow "Kalka-Bindadin" Gharana of Kathak dance***in India.

13. ***To further strengthen the vocational and technical training framework, the Ministry of Skill Development & Entrepreneurship signed a Memorandum of Understanding (MoU) with Indira Gandhi Open University (IGNOU)***.
- This MoU is in alignment with the Sustainable Development Goal 4.4 and the National Education Policy (NEP) 2020 for increasing Gross Enrolment Ratio (GER) in higher education including vocational education to 50 % by 2035.

14. India will host five events in 2022, namely BRICS Startups Forum meeting, Working Groups meetings on Energy; Biotechnology & Biomedicine; ICT & High-Performance Computing; STIEP (Science, Technology, Innovation and

Entrepreneurship Partnership) Working Group Meeting and the launching of BRICS innovation Launchpad, as a microsite(Knowledge Hub).

- The decision was taken at the 15th meeting of the BRICS Science Technology Innovation (STI) Steering Committee on 17th January 2022.
- *The theme for BRICS 2022 is "Foster High-Quality BRICS Partnership Usher in a New Era for Global Development".*

15. ***The Cabinet Committee on Economic Affairs approved the equity infusion of Rs.1500 crore in Indian Renewable Energy Development Agency Limited (IREDA).***

- This equity infusion will help in employment generation of approximately 10200 jobs-year and CO2 equivalent emission reduction of approximately 7.49 Million Tonnes CO2/year.

16. ***Deendayal Antyodaya Yojana - National Rural Livelihood Mission (DAY-NRLM)*** has observed 'Agri Nutri Garden Week' from 10th to 17th January, 2022 through awareness campaign and encouraging establishment of 'Agri Nutri Gardens' in the rural households.

- To support every rural poor household to have Agri Nutri Garden to fulfil the need of the family's nutrition and any excess production can also be sold for income generation.

17. ***BrahMos supersonic cruise missile, with increased indigenous content and improved performance, was recently successfully test-fired from Integrated Test Range, Chandipur off the coast of Odisha.***

18. **Koyla Darpan Portal :** In order to share Key Performance Indicators (KPIs) related to the Coal Sector a portal "Koyla Darpan" has been launched by Secretary, Ministry of Coal.
    - As an initial step, the portal has the following KPIs - 1. Coal/Lignite Production, 2. Coal/Lignite Offtake, 3. Exploration Data, 4. Central Sector Schemes, 5. Status of Coal Stock in Thermal Power Plants, 6. Infrastructure Projects, 7. Allocation of Blocks (CMSP/MMDR), 8. Monitoring of Major Coal Mines(CIL), 9. Coal Price.

19. **Rural Area Development Plan Formulation and Implementation (RADPFI)**: RADPFI Guidelines were recently released , keeping in mind the vision to transform rural India and to ensure empowerment of rural India and to promote rural prosperity.

- RADPFI guidelines would supplement the efforts of the Central Government such as the SVAMITVA Scheme of Ministry of Panchayati Raj and RURBAN Mission of Ministry of Rural Development and facilitate better utilisation of Geospatial information.

20. ***TCIL, a Mini Ratna Category-1 Status Company under the Department of Telecommunications, Ministry of Communications, with support of SDMC launched first e-vehicle charging station in South Delhi area.***

- This e-vehicle charging station is first one in series of 65 e-charging stations to be setup by TCIL in progressive manner in next four months in South Delhi area within easy reach of citizens of Delhi.
- Each charging station can charge 6 Two/Three/ Four wheeler vehicle at a time.

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- This equity infusion will help in employment generation of approximately 10200 jobs-year and CO2 equivalent emission reduction of approximately 7.49 Million Tonnes CO2/year.

22. The Union Cabinet has approved the payment of ex-gratia amount of Rs. 973.74 crore pertaining to remaining claims submitted by Lending Institutions (LIs) under Scheme for grant of ex-gratia payment of difference between compound interest and simple interest for six months to borrowers in specified loan accounts.

23. **As part of the celebrations of Azadi ka Amrit Mahotsav, Ministry of Culture organized the 'Umang Rangoli Utsav' on 24th January 2022**.

- The day is celebrated as National Girl Child Day every year, so to commemorate the day, this year, and a nationwide eventcelebrating the Girl Child was organized where the participantsdrewrangoli decorations on the roads and squares named after the female freedom fighters or the female role models of the country.

24. *The 12th National Voters' Day was celebrated across the country on January 25, 2021.*

25. ***Coal Controller's Organization, a subordinate office under the Ministry of Coal, released one of its flagship publications, the 'Coal Directory of India 2020-21'.***

- The 'Coal Directory of India 2020-21' contains information regarding the performance of Coal and Lignite sectors during the financial year 2020-21.

26. **Project Monitoring Group (PMG) portal: PMG portal of Invest India is a unique institutional mechanism to facilitate resolution of bottlenecks in infrastructure projects with investments upward of ₹ 500 crores and do milestone-based project monitoring of the same**.

- Presently, PMG is monitoring 1,351 under implementation projects with total anticipated investment of approximately INR 48.94 lakh crore.
- Projects of infrastructure ministries such as Road, Transport and Highways; Railways; Petroleum and Natural Gas; New and Renewable Energy; Power; etc are listed on the portal.

27. **National Tourism Day is observed on 25th January each year**.

28. **The DARPG and Government of Jammu & Kashmir will collaborate on:**

a. Creation of an online portal for monitoring progress in 58 District Good Governance Index Indicators.
b. Adoption of e-HRMS in the Jammu Secretariat and Srinagar Secretariat.
c. Monitor online the citizen satisfaction in 150 e-Services through Jammu & Kashmir e-Services Delivery Assessment framework.

29. **REC has become the only CPSE to secure a Perfect score amongst the 123 CPSEs across 32 sectors (including power, railways, steel, mines, heavy industries, petroleum, and defence among others) which were a part of the MoU evaluation exercise for the FY 21**.

- The Net Worth of the company also climbed by 24% to reach its highest ever at ₹43,426 crores as on 31st March 2021.

30. V.O. Chidambaranar Port witnessed another landmark this week with handling wind blades of length 81.50 metres, the longest of its kind handled through VOC Port. The loading of the 81.50 metre long wind blades (each weighing 25 Tonnes) was carried out diligently using Ship's Hydraulic cranes with utmost care to the safety of the cargo and cargo handling workers.

31. Ministry of Housing & Urban Affairs (MoHUA), Government of India, in partnership with Department of Promotion of Industry and Internal Trade (DPIIT) and Agence Française de Développement (AFD) has recently launched the Swachhata Start-Up Challenge to provide an impetus to innovative start-ups to come forward and drive catalytic transformation in the sanitation and waste management sector.

32. **The village of South Maubuang in Aibawk block of Aizawl district in Mizoram has been declared a model ODF Plus village, having fulfilled all the criteria as per SBM-G Phase II guidelines.** The parameters are :

a. ODF Sustainability.
b. Biodegradable Waste Management.
c. Liquid Waste Management.
d. Plastic Waste Management.
e. Faecal Sludge Management.

****

YOJANA

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APTI PLUS

India as a Space Power

Introduction

- Being originated in 1960s, the Indian Space programme, over the span of six decades, has grown from strength to strength.
- It is administered by the Department of Space (DOS) and primarily executed by its R&D arm- the Indian Space Research Organization (ISRO).
- India , today, is widely recognized as a global space power having developed end to-end capabilities cutting across various domains viz. space transportation systems, space infrastructure, and space applications such as Earth Observation, Communication, Navigation, Meteorology, Space Science, etc.

Background

a. **The Taking-off**: It was with the formation of the *Indian National Committee for Space Research (INCOSPAR) in 1962*, followed by the first sounding rocket launch from *Thumba Equatorial Rocket Launching Station (TERLS) in 1963* that the space programme formally took off.

b. **Cluster Approach**: *Dr. Sarabhai*, the architect of the Indian Space Programme, initiated the creation of dedicated clusters.
   - Trivandrum became the hub for sounding rockets, solid propellants, etc., with the setting up of Space Science & Technology Centre [SSTC, present-day VSSC (*Vikram Sarabhai Space Centre*)].
   - Payload development and related electronics was at Ahmedabad in the form of Experimental Satellite Communication Earth Station [ESCES, present-day SAC (*Space Applications Centre*)].

c. **Formation of ISRO:** The Indian Space Research Organization (ISRO) was formed in 1969, superseding INCOSPAR. ISRO's establishments are functioning in many parts of the country with each concentrating on a specific specialized domain.
   - With the establishment of the ***Space Commission and the Department of Space (DOS) in 1972***, ISRO was brought under DOS and the structured space programme was now poised to soar under the leadership of ***Dr. Satish Dhawan***.

d. **70s:** ***India's first satellite Aryabhata, which was launched on 19 April 1975***, from a launch centre in the former Soviet Union. Aryabhata laid a firm foundation for the later immensely successful Indian satellite Programme.
- ***Bhaskara-I and II, the two experimental earth observation satellites***, provided the rich experience and the confidence to build complex operational remote sensing satellites.
- ***APPLE- Ariane Passenger Payload Experiment, India's first experimental communication satellite***, although launched by the European Ariane rocket, reached its final geosynchronous orbital home in June 1981, with the help of a rocket motor developed in India.
- Two further significant satellite communication experiments, SITE–Satellite Instructional Television Experiment (1975-76) and STEP– Satellite Telecommunication Experimental Project (1977-79), comprehensively establishing the usage of satellites for communication and broadcasting and providing hands-on experience for the same, paving the way for *INSAT (Indian National SATellite)* series of satellites.
- Commissioning of the ***Satellite Launch Vehicle-3 (SLV-3)*** project in the early 1970s, the first indigenous experimental satellite launch vehicle, that served as the beginning of an enduring partnership between ISRO and Indian industries.
  - The ***SLV-3 had its successful launch on 18 July 1980***, thrusting India into the select league of six countries with the capability to launch satellites on their own.
  - ***ASLV- Augmented Satellite Launch Vehicle*** project was launched in the early 1980s.
  - ***Polar Satellite Launch Vehicle (PSLV) project*** was commissioned in mid-1980s.
- ***INSAT-1B, India's first multipurpose operational satellite was launched in 1983***, demonstrating its ability to bring about a rapid and major revolution in India's telecommunications, television broadcasting, and weather-forecasting domains.

e. **Remote Sensing Satellites*:*** India's ability to design, build, and maintain a complex remote sensing satellite was demonstrated in 1988 when IRS-1A, the first operational satellite built in India, startedimaging the earth.
- The images sent by that satellite circlingthe Earth from its 900 km high polar orbit were utilized in various diverse fields such as agriculture, groundwaterprospecting, mineral survey, forestry, etc.

Modern Era- Post 1990s

- During the 1990s, ISRO began building INSAT-2 series of multipurpose satellites indigenously.

- At the same time, systematic usage of imagery from our remote sensing satellites for tasks like crop yield estimation, groundwater and mineral prospecting, forest survey, urban sprawl monitoring, and wasteland classification and fisheries development began.
- The optimal usage of onboard capabilities of INSAT and remote sensing satellites was coordinated using inter-ministerial mechanisms such as INSAT Coordination Committee (ICC) and *National Natural Resources Management System (NNRMS)*.

- *High Throughput Satellites (HTS)* such as GSAT-11, GSAT-29, and GSAT-19 are supporting the Digital India campaign by boosting the broadband connectivity to the rural and inaccessible Gram Panchayats in the country.
- The transponders on these satellites will bridge the digital divide of users including those in Jammu & Kashmir and the North-Eastern regions of India.
- ***On 15 February 2017, PSLV created a world record by successfully placing 104 satellites in orbit during a single launch.***
- The real significance of the achievement is the immense confidence reposed by foreign countries in the capability of the Launch Vehicle.
- ISRO has also successfully established and operationalized ***Navigation with Indian Constellation (NavIC)*** which provides highly accurate Position, Navigation, and Time information to users in India and its surroundings.
- The Global Standards body– *3rd Generation Partnership Project (3GPP)*, which develops protocols for mobile telephony, has approved NavIC and major mobile chipset manufacturers have incorporated NavIC in their releases.
- **Cryogenic Technology:** Cryogenic technology involves the storage of liquid hydrogen & liquid oxygen at very low temperatures.
- Materials used to operate at these very low temperatures, chilling processes, and interplay of engine parameters make the development of the cryogenic stage a very challenging and complex task.
- With the successful qualification of the indigenously developed Cryogenic Upper Stage (CUS) in the GSLV-D5 flight on 5 January 2014, ISRO demonstrated its mastery of cryogenic rocket propulsion.
- The next-generation launch vehicle of ISRO, with a capability for putting 4T payload in GTO, came in the form of GSLV-Mk III designed with two solid strap-ons, a core liquid booster, and a cryogenic upper stage.
  - With the injection of ***Chandrayaan-2 into Earth Parking Orbit in July 2019***, GSLV Mk III successfully entered into its operational phase.

Exploration of Moon

- On 14 November 2008, when a TV set sized 'Moon Impact Probe' separated from Chandrayaan-1 spacecraft and successfully impacted the surface of the moon, India became the fourth country to send a probe to the lunar surface after the United States, the Soviet Union, and Japan.
  - When Chandrayaan-1 conclusively discovered water molecules on the lunar surface, it was widely hailed as a path-breaking discovery.
- The Chandrayaan-2 Mission- India's second mission to the moon was successfully launched on 22 July 2019. Chandrayaan-2 Orbiter spacecraft was placed in its intended orbit.

Exploration of Mars

- Launched by PSLV on 5 November 2013, the 1340 kg Mars Orbiter Spacecraft encountered Mars on 24 September 2014. With this, ISRO has become the fourth space agency to successfully send a spacecraft to Mars orbit.
- **AstroSat**: AstroSat, launched by PSLV in September 2015, is the first dedicated Indian astronomy mission aimed at studying celestial sources in X-ray, optical, and UV spectral bands simultaneously.
- AstroSat recently made a major breakthrough by discovering one of the earliest galaxies in extreme-Ultraviolet light.

Conclusion

- Indian Space Programme has always focused on the development and utilization of Space- Technologies to achieve the overall development of the country.
- Despite its emphasis on applications, ISRO has pursued many space science projects to perform meaningful exploration of space.
- The space science missions of India– Chandrayaan-1, Mars Orbiter Mission, AstroSat, and Chandrayaan-2– have caught the attention of millions of Indians as well as the outside world.

APTI PLUS

- The "Gaganyaan Programme" approved by the Government of India in 2018 marks a point of inflexion in the Indian space journey, marking its entry into the new age of human space exploration.
  - The Human Space Flight Centre (HSFC) was constituted in ISRO in January 2019, for implementing the vision on the human space flight programme.
  - ISRO successfully proved a crucial technology element of Human spaceflight in July 2018- The Pad Abort Test (PAT), which is the first in the series of tests to qualify the Crew Escape System (CES).
- Empowering the department PSU- New Space India Limited (NSIL) to 'own' the operational launch vehicles and space assets of ISRO, opens up a new chapter in the management of space activities in the country.
- Further, the present supply-based model was changed to a demand-driven model, wherein NSIL shall act as an aggregator of user requirements and simultaneously obtain commitments.

Indian Armed Forces

Introduction

- The journey of the Indian Armed Forces over the last hundred years has in many ways mirrored the momentous history of the birth, struggles, and victories of India.
- It straddles a colonial period in which the armed forces of India owed allegiance to a foreign sovereign and could readily be used to fight an alien power's wars and promote its strategic objectives.

Issues and Challenges

War in Kashmir (1947-48) To 1962 India-China war	• This period saw relatively young and inexperienced Indian officers being catapulted overnight into mid-level and senior positions in the armed forces. • The doctrines, training, and experience that guided them so well during WWII was ill-suited.
	• A decade of budgetary cuts that followed further compounded the problem, leaving the Indian Army without adequate weapons or manpower when things came to a head with China in the late 1950s.
Lessons learnt through Indo-China war	• One of the greatest lessons of the 1962 conflict perhaps was the realization that with regard to territory the old adage held true, that possession was nine-tenths of the law. • An army must be well equipped with the latest weaponry to protect India's territorial integrity.

Phase-II

1962 to 1988	• The period after the 1962 war saw the size of the army increase from about 5,50,000 to approximately 8,25,000 troops and over time, it also witnessed structural, training, and doctrinal shifts. • The layered military strategy adopted by India in the 1971 War saw a nuanced approach that dealt with each theatre and sector according to its ground reality. • The modernization of the armed forces was also accompanied by a willingness to venture beyond India's borders in support for calls from neighbours for assistance. • Operation Cactus launched in Maldives against an attempted coup produced appreciable results in 1988. • These lessons included gaps in coordination, equipment deficiencies, weaknesses in joint structures, and readiness to operate beyond the Indian shores.

Phase-III

	• While India had managed to keep in check sub-conventional threats such as insurgencies in the North-East of the country and terrorism in Punjab, the threats to the nation were magnified by the adversities encounteredin the deployment in ***Operation Pawan in Sri Lanka*** and the spike in Pak-sponsored cross-border

1988 to 2014	terrorism in Kashmir. • A people-centric approach also meant that the armed forces would take higher casualties. • *The Kargil War (1999)*also questioned about structures and institutions, to develop more effective and timely responses to future challenges based on the recommendations of the **Kargil Review Committee (KRC)** and Group of Ministers (GoM). • The 2008 terror attacks in Mumbai occasioned the revamping of the National Security Guard (NSG) and beefing-up of maritime security through the Indian Coast Guard and the Indian Navy acting in tandem with state police.

Phase-IV

	• A proactive approach was adopted to enhance the budget for all three wings of the armed forces. • The Indian Navy and the Indian Coast Guard in particular, received generous funding to meet emerging maritime threats, both traditional and non-traditional. • A policy of zero tolerance was adopted in regard to terrorism from across the border. o This resulted in a cross-LoC strike against terrorist camps in 2016 after an attack at an army camp at Uri. o In recent years, the armed forces have also undertaken a tough stance against border violations by China along the LAC.

Self-Reliance

- A wide-ranging set of measures have been undertaken to give a fillip to Make in India through a tandem between thepublic and private sector.
- Entrepreneurs representing the small and medium sectors have been provided supportand opportunities to contribute to this endeavour.
- They have also been granted access to testing facilities ofDRDO to support their attempts at manufacturing in India as part of the Atmanirbhar Bharat initiative.
- The focus on indigenization is not aimed at creating absolute autarky in defence manufacturing. Current policies leave enough space for foreign Original Equipment Manufacturers (OEMs) to participate in joint ventures and Transfer of Technology (ToT).

Gender equality

- Gender equality is a laudable achievement. Nowadays most wings of the armed forces have seen the entry of women.
  - In addition to permanent commissions, women are also flying combat aircraft, deploying on naval vessels, and will soon be permitted to train alongside their male counterparts at the prestigious National Defence Academy.

Chief of Defence Staff

- On 15 August 2019, the Prime Minister announced the path-breaking decision of the Government to create the post of Chief of Defence Staff and the Department of Military Affairs.

Conclusion

- The last seventy years have been both a challenge and an opportunity for the armed forces. This account seeks to suggest that many tough challenges have been met with great resilience by India's Armed Forces.
- An outstanding and consistent feature of the Indian Armed Forces remains their secular tradition as well as apolitical professionalism under civilian governments.
- There is little doubt that the armed forces will continue to remain steadfast in dealing robustly against external threats and simultaneously supporting the government's actions to improve internal security.

- This will increasingly be done through improved structures and a technologically-driven organization, supported by the clear vision of resolute political leadership.

Swadeshi Entrepreneurship

Introduction

- The idea of 'economic swadeshi' emerged by the second half of the 19th century, thanks to the writings of R C Dutt, Dadabhai Naoroji, and M G Ranade.
  - Gopal Hari Deshmukh was one of the firsts to advocate economic swadeshi in 1849.
  - But the credit for translating it to a call to action goes to the 'college faction 'of the Arya Samajists in Punjab.

Pre-Swadeshi Movement

- A group of middle-class, western-educated Punjabis–prominent among them were Lala Lajpat Rai, Lala Harkishan Lal, and Sir Dayal Singh Majithia came together to found the Punjab National Bank (1894).
  - This was the first major Indian-owned bank.
- In Bombay, a Parsi lawyer ***Ardeshir Burjorji Sorabji Godrej*** (1868-1936) founded Godrej & Boyce in 1897.
- ***Acharya Prafulla Chandra Ray***(1861-1944), a pioneering chemist, founder of Bengal Chemicals (India's first pharmaceuticals company), and a devoted nationalist spent his entire life (and life's savings) in promoting education and scientific research.
- *In Bengal, at least since 1867*, when some members of the Tagore family helped ***Nabagopal Mitra*** to organize a fair to promote swadeshi enterprises, there had been regular calls for self-reliance or atmasakti.

- Two families took lead in this –first, the Roy family of Bhagyakul, who developed a flourishing trade in rice and jute, and were the chief organizers of the Bengal National Chamber of Commerce (1887); second, the Tagore family, especially Jyotirindranath, launched a major venture in 1884 with his Inland River Steam Navigation Service.

Swadeshi in Everyday Lives

- Boycott of foreign goods and the use of India-made products– the trend that started in Bengal in 1905, spread to the rest of the country with ***Mahatma Gandhi and his advocacy of khadi***.
- With rising nationalism, people wanted to use India-made/local products as a badge of their patriotism. This led to the emergence of a swadeshi retail network.
- Thus, production, distribution, advocacy, and usage of such products (even when of inferior quality and costly) became an extension of one's patriotism and a way to contribute to nation-building.
  - *Godrej promoted their soap as the first vegetable soap in the world (and it was endorsed by Rabindranath Tagore).*
  - All Indian sugar companies insisted that their swadeshi sugar was 'pure', meaning no chemical had been used.

Emergence of Swadeshi Enterprises

The 1st Wave -Partition of Bengal-1905

- The announcement of the Partition of Bengal (1905) unleashed a surge of nationalism and rekindled the Bengali entrepreneurial spirit. The real achievement of the Bengali swadeshi entrepreneurs was to venture into new industries based on their technical knowledge. However, most of these ventures ended in failure.
  - They were built on the limited finances of petty landlords and thesavings of professionals.
  - They had thetechnical knowledge but not always thebusiness acumen to deal with supplybottlenecks or distribution challenges.
  - They were often more focused on developing technical knowledge, replacing foreign goods, and contributing to nation-building.

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- Landlords and professionals came together to found the short-lived *Bengal National Bank (1908)*.
- Calcutta also saw a spate of insurance ventures, especially the National Insurance Company (1906) and the famous *Hindustan Cooperative Insurance (1907)*.
- Bengal's leading landlords, businessmen, and political leaders came together to launch the most high-profile swadeshi venture – ***Banga Luxmi Cotton Mill (1906)***.
- The biggest beneficiary of the boycott of Manchester cloths turned out to be Bombay and Ahmedabad, where 39 mills came up between 1904 and 1910 to cater to swadeshi demands.

The Second Wave-1930's

- This time in response to Gandhiji's call forthe boycott of foreign goods, even rural India responded,leading to capacity expansion/setting up of new textile mills in Bombay and Ahmedabad.
- Apart from a variety of other experiments, two major ventures stood out:

a. Taking advantage of the opportunities presented by the Second World War, Walchand Hirachand launched a series of projects, including India's first modern shipyard (Hindustan Shipyard, Vishakhapatnam), first car factory (Premier Automobiles, near Bombay), and first aircraft factory (Hindustan Aircrafts in Bangalore, today's Hindustan Aeronautics Limited or HAL).

b. *Another remarkable venture was Chemical, Industrial and Pharmaceuticals Laboratories (Now Cipla), founded in 1935 by a visionary scientist Khwaja Abdul Hamied.*

Education Sector

- One of the great contributions of the swadeshi period was the promotion of science. Meritorious students were sent to Japan, Germany, and the USA for technical education.
  - Some of them came back to set up successful businesses like Calcutta Chemicals, Calcutta Potteries, and Bengal Waterproof.
- The ***National Education Movement (1905-1938)*** helped set up colleges and schools, and oneof the institutions associated with it metamorphosed into Jadavpur University.
  - In Bombay, a chemistry professor, ***Tribhuvandas Kalyandas Gajjar (1863-1920)***and B D Amin set up Alembic, Western India's first chemical company (1907).
  - In Madras, firebrand nationalist leader ***V O Chidambaram Pillai launched his Swadeshi Steam Navigation Company from Tuticorin (1906)***.

Emergence of Modern Banking

- A large number of Indian banks were founded between 1900 and the First World War (1914-1919), and helped to extend modern banking facilities to Indian customers, butdue to the lack of managerial experience, most of them failed.

Way after Independence

- By the late 1930s, it was clear that the days of the British Raj were numbered and the nation-building had to be a joint exercise between the political and industrial leaderships. There are two major landmarks in the evolution of this relationship:
  a. ***In 1938, Congress President Subhas Chandra Bose set up a National Planning Commission under the chairmanship of Jawaharlal Nehru***.
- This Commission had prominent industrialists like Purushottamdas Thakurdas, Walchand Hirachand, A D Shroff, and Ambalal Sarabhai as members, along with technocrat M Visvesvaraya and scientist Meghnad Saha.
  b. ***Bombay Plan*** : In 1944-45, eight leading industrialists – J R D Tata, G D Birla, Ardeshir Dalal, Lala Shri Ram, Kasturbhai Lalbhai, A D Shroff, Purushottamdas Thakurdas, and John Matthai came out with a blueprint for independent India's economic development.
- This 'Bombay Plan' outlined the strategy for doubling of the agricultural output and fivefold increase in the industrial sector within 15 years.
- Though it was never officially accepted but the post-independence economic planning did follow the same path of State interventions and a mixed economy with large-scale public sector.

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Conclusion

- Right from the late 19th century, the general trajectory of Indian business has been a shift from trading to manufacturing.
  - Taking advantage of their accumulated capital, control of distribution and raw materials, large traders belonging to traditional trading communities gradually shifted to entrepreneurship.
  - Since then, we have repeatedly seen this trend of new waves of entrepreneurs, creating disruptions based on their technical knowledge.
- It expanded the social base of the Indian business class, showed the youth a constructive way of contributing to nation-building, and provided tremendous inspiration for future generations.

Global Agricultural Powerhouse

Introduction

- India is efficiently feeding and managing nearly 18% of the world population with only 2.4% and 4% of global land and water resources respectively.
- Consistent agricultural and land reforms, progressive and inclusive policies, and application of 'Science and Technology' at the ground level pushed-up productivity, production, and quality of agricultural products at a remarkable pace.
  - Consequently, India is now the largest producer of pulses, jute, and milk, and ranks as the second-largest producer of rice, wheat, sugarcane, cotton, and groundnuts in the world.
  - It also holds the second position in global fruit and vegetable production with a high rank in the production of mango, banana, papaya, and lemon.

Background

- Agriculture was first recognized as a 'subject of scientific improvement' in *1871 when British rulers established a 'Department of Revenue and Agriculture and Commerce'*.
  - The Imperial Bacteriological Laboratory (1889)was the earliest institution established in Pune, which later evolved as the prestigious ICAR-Indian Veterinary Research Institute with headquarter at Izatnagar, Bareilly, UP.
- The Royal Commission on Agriculture, appointed in 1926, recommended the setting up of an Imperial Council of Agricultural Research to endorse, direct, and organize agricultural veterinary research across the country.
  - ***Thus, a central research coordination agency came up in 1929 which later evolved and was renamed the Indian Council of Agricultural Research (ICAR).***
- The first Agricultural School was opened at Saidapet, Chennai in 1868.

Post-Independence: Towards Self-Reliance

- After independence, Indian policy planners accorded top priority to agricultural development with the ultimate goal to make the country self-reliant in staple food-grains, i.e., wheat and rice.

1st Five Year Plan	• Majorirrigation projects were launched and land titles were givento actual cultivators under land reforms. • Co-operativecredit institutions got a boost due to better financing andan initiative was taken up to bring institutional changes in the agriculture support system. • Consequently, India harvested nearly 70 mT of food-grains (wheat, rice, coarse cereals, and pulses) during 1956-57, butdue to the growing population, it could not lessen the country's reliance on imports.
2nd Five Year Plan	• Agriculture was shifted downwards in the priority list to accommodate industrial development. • During the 1960s, India continued with the escalation of imports, mainly from the USA under the ***PL-480 scheme***. • In and around 1965, the country suffered three major setbacks on the food front– severe drought, war with Pakistan, and imposition of strict curbs by the USA on delivery of wheat. ○ India somehow managed to avoid the severe trap of famine and hunger by importing an all-time high, 10 million tonnes of food-grains in 1966 from various

	sources.
3rd Five Year Plan	• Government made a strong commitment to making the country self-reliant in food-grains production, mainly through scientific and technological interventions, and implementation of conductive policies at farm-level. • The Government of India permitted trials of Mexican wheat varieties in fields. Over 1,000 trials/ demonstrations were conducted in farmers' fields across the north Indian wheat belt under the mentorship of eminent Plant Geneticist *Dr M S Swaminathan*. • The clam our for new high-yielding seeds grew rapidly across wheat-growing areas due to the excellent performance of new wheat varieties and personal motivation to farmers by the great duo- Dr Borlaug and Dr Swaminathan. • Agriculture departments and R&D institutions facilitated a regular supply of quality seeds, fertilizers, machinery, irrigation facilities, and more importantly, scientific advisories. • In 1968, our nation reaped a bumper harvest of nearly 17 million tonnes of wheat that was just 11 million tonnes in 1966. This was the biggest leap of wheat production ever recorded globally. o This spectacular achievement was recognised as 'Green Revolution' over the world. • *The Government of India indented seeds of dwarf and high-yielding rice variety IR-8, developed by the International Rice Research Institute at Manila, Philippines*.

- During the post-Green Revolution period, policy planners focused more on research, extension, education,input supply, credit support, marketing, price support,and institution building.
- As per fourth advance estimates, for 2020- 21, total food-grain production in the country is estimated at a record 308.65 million tonnes.
- Horticulture production is expected to reach a record level of 329.86 million tonnes in 2020-21 (2nd advance estimates).
  - Thus, India has travelled a long journey from being a famine-afflicted and food-scarce nation to a proud food- surplus nation.

Network Building

- During the 1950s and 1960s, the Government of India decided to build a public agricultural research system withICAR as an apex body to plan, coordinate, and undertakeresearch across commodities.
  - Now, the system has grown into one of the world's largest networks of agricultural R&D, education, and extension institutions.
  - In addition to research and education, ICAR also supports technology assessment, demonstration, and capacity development activities through a network of 11 Agricultural Technology Application Research Institutions and 721 Krishi Vigyan Kendras (KVKs) across the country.
    - KVKs are small entities at the district level that perform frontline extension activities and are responsible for the implementation of 'Lab to Land' programmes.
    - The first KVK was opened in Pondicherry in 1974.

Agriculture in Education

- In 1948, the country has only 17 agriculture colleges that were working under the administrative control of agriculture departments of respective States.
- During 1948-49, the then Chairman of the University Grants Commission Dr Sarvepalli Radhakrishnan advocated opening rural universities for scientific training and skilling of rural youth.
- During the Fourth Five Year Plan (1960-65), seven State Agricultural Universities (SAUs) were established in Uttar Pradesh, Orissa, Rajasthan, Punjab, Andhra Pradesh, Madhya Pradesh, and Karnataka.

Achievements

- The nation harvested a record 110 million tonnes of wheat during 2020-21 (4th advance estimate).

- The Basmati variety '***Pusa-1121'*** has earned the unique distinction of being the 'longest grain' variety in the world with an exceptionally high cooked kernel elongation ratio of 2.5 and volume expansion more than four times.
- India harvested a record 122.27 million tonnes of rice during 2020-21 (4th advance estimate).
- The recent introduction of exotic oil palm as an oilseeds crop by developing production technologies suitable to Indian conditions has shown promise. Due to consistent efforts, oilseed production in the country has reached a record of 36.10 million tonnes during 2020-21.
- Special intervention made to raise the production and productivity of pulses has led to record production of nearly 26 million tonnes in 2020-21.
- Currently, India ranks number one in the productivity of banana, grapes, papaya, cassava, and green peas.

White Revolution

- '*Operation Flood*', was launched in 1970 that addressed production and productivity issues with major reforms in the marketing of milk and milk products.
    - Soon, the efforts paid dividends and in 1998, India became the largest producer of milk in the world, surpassing the USA.

Blue Revolution

- The targeted programme of 'Blue Revolution' transformed the fisheries sector with an all-time high production of nearly 14.16 million tonnes between 2019 and 2020.
    - On the global map, India is the second-largest aquaculture-producing country and the third-largest fish producer.

Way Forward

- Despite splendid growth, Indian agriculture is facing some major challenges such as small and fragmented land holdings, post-harvest losses, and poor market infrastructure.
    - Recently, the Government has launched several new schemes and programmes to address such issues by adequate fund allocation and devising innovative measures that include cutting-edge S&T interventions.
    - Digital transformation is changing the face of agriculture and farmers by providing the right knowledge, resources, and technology on a real-time basis.
    - Online marketplaces (e-Mandis) and regular market updates are empowering farmers to maximize their income.
- However, the future of Indian agriculture lies in the development of sustainable agriculture, which means development policies related to agriculture and farmers must include conservation of natural resources and create an enabling policy environment for future agriculture.
    - Generation and distribution of appropriate technologies, improvement in support services, and enhancement in physical infrastructure are other issues that need immediate attention.
- Integration of resources, technologies, knowledge, and policies is paving the way for better agriculture and a brighter tomorrow.

Economic Transformation

Introduction

- India gained independence in 1947 under the tumultuous economic and political conditions.
    a. The treasury was bankrupt with little or no foreign exchange reserves.
    b. The immediate need was to obtain political consensus on inter-state disputes, a new constitution, and a plan for economic development.
    c. There was the issue of how to engage in international economic relations with the dominant western powers from which India had just gained independence.
- The bankruptcy of the treasury implied that any development programme initiated could not be foreign exchange intensive.
- India's political relations with economic powers like the US and UK were not very good. This led to closer economic and political relations with the then USSR, helped by the rupee-ruble exchange programme with the Soviet Union where exports of Indian products like tea were exchanged for imports of essential items like crude oil.
    - All payments were to be in national currencies so that this was equivalent to barter trade.

Background

a. Feldman Model

- **Close relations with the Soviet Union also led to the adoption of the Feldman model of economic development based on a planned expansion of State-led heavy industries.**
  - However, the strategy of adding to the production capacity of the capital goods sector was ill-conceived as these capital goods were themselves import-dependent and needed scarce foreign exchange.
  - While this model of planned development worked for a while, the inefficiency of the Feldman model became apparent when the production of capital goods became constrained by the need for imported components.
  - Parallelly, the growing population created a shortage of basic foodstuffs culminating in India and it was being forced to import wheat from the US under the PL480 programme.

b. Five Year Model

- The Five Year Plan model hinted that the state would direct production in the private sector. The need to limit consumption and conserve foreign exchange implied that production by the private sector had to be limited by an industrial licensing system where all imports requiring scarce foreign exchange were prohibited.
- In the decade of the 1970s, two major socialist initiatives were undertaken: one, the complete takeover of the wholesale trade in food-grains and, two, nationalization of the major banks.
  - The first measure was a complete failure and had to be repealed quickly.

c. Foreign Exchange Crisis:

- The shortage of foreign exchange reserves was exacerbated by the dramatic increase in the price of oil in the world market.
- The reforms of 1991 were a consequence of this, leading to both domestic and external economic liberalization and abandonment of the Feldman model of economic development.

Economic Growth

- The period of real economic growth began after 1991 when domestic production was opened up completely and foreign exchange controls were also lifted, while the rupee was allowed to devalue to control imports via a market mechanism.
- The gains of the shift of strategy showed up immediately so that by the end of the 1990s, India's foreign exchange reserves increased from USD 5.8 billion to USD 38 billion and foreign exchange ceased to be a constraint on industrial development.
- Liberalization of foreign investment policy in terms of both sectors and extent of foreign equity ownership has continued since 1991 with almost no policy reversals in policies despite two or three major political changes in the centre.
- While India in the 1960s was faced with an extreme shortage of food-grains like wheat and rice, today food-grains production has increased exponentially with larger stocks of grains.
  - In fact, it emerged as a dominant exporter of these items in the1990s.
  - Presently, agricultural production is also no long era constraint on development.

Bottlenecks

- While economic theory is clear that the government has "no business being in business", yet attempts to reduce the government participation in areas like civil aviation, hospitality, etc., have faced strong political opposition.
- The declining share in agricultural production in GDP is actually an indication of economic development and operation of the so called Engel's Law.
  - It indicates that while India has effectively engaged with the world economy, the required structural adjustment from an agrarian economy to modern industrial society is still incomplete.

Conclusion

- The switch to an open economy after 1991 had implied that India was able to lock into world trade.
  - Since1980, global trade has been growing at about 8 per cent in real terms up till 2008.
  - India participated in this growth as well, with the share of total trade in GDP increased from around 15 per cent in the early 1990s to between 45 to 50per cent today.
- To a certain extent, the last few decades have seen this 'structural adjustment' taking place in the Indian economy.
- *This is particularly true in the industrial sector and the manufacturing economy which now accounts for about 25 per cent of the GDP.*

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- It is clear that in trade or in industrial/service sector policy, future reforms must relate to the required structural adjustment in the agricultural sector.

Infrastructure: History & Challenges

Introduction

- During independence, the country was poor as a result of steady de-industrialization by the British.
  - Less than a sixth of Indians were literate.
  - The abject poverty and sharp social differences had cast doubts on India's survival as one nation.
  - Cambridge historian Angus Maddison's work shows that India's share of world income shrank from 22.6% in 1700 (almost equal to Europe's share of 23.3%) to 3.8% in 1952.

Infrastructure Development Model

- The Industrial Policy Resolution (IPR) of 1948 proposed a mixed economy. India set up the Planning Commission in 1950 to oversee the entire range of planning, including resource allocation, implementation, and appraisal of five-year plans.
  - These Plans were centralized economic and social growth programmes modeled after those prevalent in the USSR.
- The First Five-Year Plan was based on the ***Harrod–Domar model*** with few modifications. By the end of the Plan in 1956, five Indian Institutes of Technology (IITs) were started as major technical institutions.
  - The University Grants Commission (UGC) was set up to take care of funding and take measures to strengthen higher education in the country.
  - Contracts were signed to start five steel plants, which came into existence in the middle of the Second Five-Year Plan.
- The Second Five-Year Plan and the Industrial Policy Resolution 1956 (long considered the economic constitution of India) paved the way for the development of the public sector and ushered in the License Raj.
  - The Second Plan focused on the development of the public sector and 'rapid Industrialisation'.
  - The Plan followed the ***Mahalanobis model***, an economic development model developed by the Indian statistician Prasanta Chandra Mahalanobis in 1953.
  - Hydroelectric power projects and five steel plants at Bhilai, Durgapur, and Rourkela were established with the help of the Soviet Union, Britain (the UK), and West Germany respectively.
  - Coal production was increased enormously.
  - More railway lines were added in North East.
  - The Tata Institute of Fundamental Research (TIFR) and the Atomic Energy Commission of India were established as research institutes.
  - In 1957, a talent search and scholarship programme was begun to find talented students to train for work in nuclear power.
  - Power and steel were identified as the key bases for planning. The 680ft Bhakra multi-purpose project on the Sutlej river in Himachal Pradesh was considered a new landmark of a resurgent India.
- Nationalisation of 14 public sector banks was a major event during the Fourth Plan (1969- 74) which had a huge impact on the Indian economy & infrastructure.
- The Indian National Highway System was introduced and many roads were widened to accommodate the increasing traffic during the Fifth Plan (1974-78).

Recent Achievements

- In order to promote affordable housing, the Government has made several efforts to create an enabling environment.
- Infrastructure status has been granted to affordable housing which will enable these projects to avail the associated benefits such as lower borrowing rates, tax concessions, and increased flow of foreign and private capital.

Real Estate (Regulation and Development Act) [RERA]

- Proactive measures, such as the Real Estate (Regulation and Development) Act, 2016 (RERA), Real Estate Investment Trusts (REITs), the Benami Transactions (Prohibition) Amendment Act 2016, higher tax breaks on home loans, the Goods and Services Tax (GST), land-related reforms, optimising development control rules,

rationalising of the stamp duty and registration charges, digitalisation, etc., have also been introduced by the Government.

PMAY-Urban

- Responding to the demand and supply gap in affordable housing, the Government of India launched Pradhan Mantri Awas Yojana (PMAY)- Urban in 2015.
- The larger goal is to fulfill the housing needs of homeless urban poor and enable them to own decent pucca houses with basic infrastructure facilities by 2022.

Bharatmala Pariyojana

- It is a new umbrella programme for the highways sector that focuses on optimising the efficiency of freight and passenger movement across the country by bridging critical
- infrastructural gaps through effective interventions like the development of Economic Corridors, Inter Corridors, and Feeder Routes, National Corridor Efficiency Improvement, Border and International
- connectivity roads, Coastal and Port connectivity roads, and Green-field expressways.

Urban Mass Rapid Transport

- The concept of mass rapid transit for New Delhi first emerged from a traffic and travel characteristics study which was carried out in the city in 1969.
- DMRC, a special-purpose organisation, is vested with great autonomy and powers to execute this gigantic project.
- *The Delhi Metro became the second underground rapid transit system in India, after the Kolkata Metro*, when the VishwaVidyalaya–Kashmere Gate section of the Yellow Line opened on 20 December 2004.

Conclusion

- Infrastructure development remains a key constraint in India's economic development. Although investments in infrastructure alone do not guarantee growth, in general, scholarly studies estimate that a strong association exists between the availability of infrastructure provisions and economic growth measured in terms of gross domestic product (GDP).
- Infrastructure provisioning requires massive investments, often over a prolonged duration of time, coupled with procedural delays and returns expected after a long period of investment.
    - Consequently, given the high fiscal requirements, particularly of large-scale infrastructure development projects, public investments alone may not be sufficient to fund infrastructure development in India.
    - Time and again there have been recommendations to encourage private participation in infrastructure development through various forms of Public-Private Partnerships (PPPs).
- Over the short term, unbundled private participation for all new/expansions of existing metro systems may be taken up. Herein, various high capital expenditure components such as stations, rolling stock, maintenance facilities, etc., should be undertaken through long-term contract/concession for private investment.

Voyage of Indian Cinema

Silent Films

Raja Harishchandra

a. Phalke's ***Raja Harishchandra***, a four-reel film portraying a story of a truthful king, started the trend of filming the mythological stories of India's past on the screen.
    - Phalke later established the Hindustan Cinema Film Company with partners and started making films almost all by himself.
    - *A male artist called Salunke played the part of Queen Taramati in Raja Harishchandra.*

b. ***Keechaka Vadham was the first silent film made in South India***. Produced and directed by Nataraja Mudaliar, it was shot in Madras in 1917 and released to a wide reception.

Indian Cinematograph Act, 1918

- It paved the way for the system of film censorship in the country.Thus, the Board of Film Censors was set up in 1920 to scrutinize and certify the films before their exhibition.

- The Indian Cinematograph Committee headed by T Rangachariar was formed to look into conditions of the nascent Indian film industry in 1927-28.

Films with Sound

- ***Ardeshir Irani released Alam Ara on 14 March 1931***. The film, made under the banner of Imperial Pictures, had spoken dialogues along with songs,and it was described as an 'all talking, singing, dancing picture'.
- *Sant Tukaram, based on the life of the popular Saint-poet, received accolades at the prestigious Venice Film Festival in 1937.*

1930s and 1940s

- The decades of the 1930s and 1940s saw the emergence of social themes being depicted in large numbers in Indian cinema.
  - Evils of bigamy, child marriage, widow remarriage, women's education, social equality, religious harmony were the topics that defined such 'social' films.
  - At the same time, India's freedom struggle too got portrayed in cinemas of different languages across the country.
  - Gandhian themes and principles such as non-violence, communal harmony, sanitation, swadeshi, village development, etc. were actively portrayed in such films.

Colour Film

- ***Ardeshir Irani took the lead by producing Kisan Kanya, the first colour film shot and processed in India.***
- As Indian cinema completed twenty-five years in 1938, a Motion Picture Congress was held in Bombay to celebrate the occasion.

Post-Independence

- ***Film Enquiry Committee was constituted under the chairmanship of SK Patil***.
  - It eventually led to the establishment of the Film Institute of India to teach the art of filmmaking, The Film Finance Corporation of India to assist the budding filmmakers, and the Children's Film Society of India.
  - The National Film Archive of India was also established to preserve the cinematic heritage of our country.
- ***The first International Film Festival of India was held in 1952***.

Influence of Satyajit Ray

- ***It was Satyajit Ray, whose Pather Panchali, released in 1955***, revolutionized the Indian cinema.
  - Without compromising on the art of storytelling, Ray portrayed the reality of Indian village which was commended as 'the best human document' at the prestigious Cannes Film Festival.
  - He followed it with Apur Sansar and Aparajito, a trilogy, that depicted life in Bengal with deep humanity.
- ***Raj Kapoor's Jagte Raho*** followed the suit in asimilar style and technique but was placed in an urban milieu.
- ***Ritwik Ghatak*** was another torchbearer of realism with a series of films including Meghe Dhake Tara and Komal Gandhar that charted a different path.
- ***Mrinal Sen***, with his low- budget Bhuvan Shome that was supported by Film Finance Corporation, initiated a trend that was called a new cinema movement.

1970s

- The issues of unemployment and identity in the 1970s gave birth to a phenomenon called Angry Young Man on the screen. With an intense portrayal by Amitabh Bachchan of such characters backed by spirited story and dialogues by Salim-Javed, a series of such films became an instant hit striking a chord with the young generation.
- In the South too, this became a rage thanks to powerful acting performances by Kamal Haasan and Rajinikanth.
- On the other hand, the films with disco and pop music gave voice to the aspiring youth.

Introduction of Television

- The arrival of television in India brought films directly into households. The studio system gave way to the beginning of corporatization of the industry.
- The boom in the video industry also gave tough competition to the regular exhibition circuit. Old formulas and stereotypes became irrelevant and once again content became the king.

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- With the help of subtitles in English, the good films made in any language found an eager audience both in India and abroad. The advent of animation and visual graphics opened the doors to new possibilities and films like Bahubali became huge hits.

OTT Platforms

- The over-the-top (OTT) technology is a harbinger to newer vistas for the film industry. Instead of a regular release in theaters, the films are now being released on the digital platform.
- Even, films are being made exclusively for such platforms. The community way of consuming the content is slowly being replaced by private viewing in the comforts of one's home.
- At the same time, the new filmmaker is no longer dependent on the vagaries of the regular commercial distribution system.

Role of Media

Introduction

- Journalism is one of the most effective tools for the rapid transformation of society. When the publication of the *first Hindi newspaper 'Udant Martand' began, its motto was 'For the interest of Indians'*. The value of journalism is distinctly imbibed in this phrase.
- Journalism aims to safeguard the interests of the common citizens. It was started in India with the goal of development and in its long journey, the media has proven that it is the fourth pillar of democracy in the true sense.
- However, Public education, the prime objective of journalism, is getting neglected now-a days.

Objective

- It has a critical role in spreading awareness and creating a public opinion on any prevalent issue.
- The media, on one hand, acts as a communication link between the government and the public, while on the other hand, it also keeps a check on the functioning of the government.
- The media has a vital role in communicating the problems and issues of the people to the government.
- By bringing together the ideas of all concerned people, the media allows them to understand and analyze them.

Background and Evolution

- The development of newspapers in India began in ***1780 when James Augustus Hicky launched India's first newspaper, 'Bengal Gazette', in English***. Its motto was- 'Open to all yet not influenced by anyone.'
- Presently, the world is connected through the internet and computer networks, allowing all places to stay interconnected. This connectivity has resulted in the birth of ***digital media***, which is also known as new media.
    - ***The 21st century is being considered as the century of the 'Internet and Social Media'***.

Influence of Social-Media

- According to a report, the number of social media users worldwide has increased to 51 per cent of the world's population.
- It has also been concluded that the number of social media users worldwide has increased by over 10 per cent in the last years.
- Today, India is emerging as the largest market for the internet and smartphones.
- India is the biggest market for these media, and through them, fake news is garnering maximum publicity today.
    - The citizens of developed countries faced this situation a little earlier. Hence, they are in a position to decide what would be the correct information for them to use.
    - But in a developing country like India, where education and awareness levels differ, people vacillate between multiple news and information choices.
    - Sometimes they cannot check the facts and accept wrong as right.
- ***A survey report by Microsoft in 2019 pointed out that internet users in India are the most vulnerable to fake news***. The most important thing about this report is that family or friends also play an essential role in spreading fake news.

Conclusion

- Media has played a significant role in awakening social consciousness since the time of the independence movement.
- The sustained spread of the information revolution in India and the advent of new technologies like social media is the reason why many sources of information have become available to people. Earlier, information reached the people only through an approved process. Limited people were managing them who followed the rules and the law. But technology changed everything. Today, everyone is a creator and publisher.
- Technology has given this opportunity to everyone.

'Reforming' Caste in New India

Introduction

- Caste has been a subject of considerable debate and reform in Indian society, predating the struggles for independence and a constant accompaniment to the same as well. The debate is tumultuous, often embroiled in pitched political battles and not lending itself to rational policy decisions.
    - And yet, it is also very evident that the contours of the caste equations have been 'reformed', changed in several positive ways in the past seventy-five years.

Background

- In pre-independence India, caste was seen as a 'social' question; it was a subject of social reform which necessitated the creation of more universal opportunities in sectors such as education and jobs (by the government).
- Caste discrimination was a subject of considerable debate in the Constituent Assembly and the adoption of specific provisions for prevention of discrimination was ensured.

Phases

- The adequacy of transformations initiated by reservation, and their outcomes are a subject of more substantive debate.
    - However, it is undeniable that they have enabled the organization of the Dalit castes, given an impetus to mobilisation and organisation of other castes in subsequent years, and more importantly, created a critical space and voice within State organisations that can speak for the excluded.
- The second shift, i.e. the transformation of the agency is perhaps even more significant as it has been responsible for expanding the opening given by the constitutional commitment.

Challenges

- We are far from an equal society. The lower castes and several sections of Dalits bear the unfair burden of these inequalities. Within this structure, Dalit women bear these burdens even more.
- Furthermore, some of the dreams as articulated at the time of independence are turning out to be sour.
    - For example, Dr Ambedkar viewed cities and urbanisation as possible sites of liberation for Dalits from tradition and suffering-bound villages and rural societies.
    - As urbanisation becomes a significant phenomenon, it is seen that cities only shift the domains of caste expression.
    - Thus, certain 'unclean, insanitary' occupations are considered to be exclusively practiced by Dalits, thereby perpetuating the tradition.
- Similarly, the predominance of Dalits in slums in the cities can be seen as an expression of their legacy of spatial exclusion from the villages.
- Elections at all levels of the government accept and build on caste equations and mobilisations.

Conclusion

- Institutionalization of practices such as reservations in education, jobs, and election of people's representatives has been much easier than the transformations in the structure of these institutions and the texture of actual governance.
- Caste is ever-present and visibilised in even more domains of our everyday life but what needs to be noted is that visibilisation is a progression over invisibility, perpetuated neglect, and systematised exclusion.

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- A review of our efforts in the last seventy-five years indicates that we have been successful in changing the contours of the caste question.
- We have not been as successful in creating effective alternate principles for inclusion and in the distribution of opportunities.
- However, the track for a positive change has certainly been set in motion.

Preparing Future Leaders

Introduction

- Over 67 per cent of Indians are between the ages of 15 and 65, or of working age. A remarkable statistic, this demographic dividend–defined as the larger share of working age population than nonworking population–reflects the country's immense potential for growth in the coming decades.
- The visionary Atmanirbhar Bharat initiative seeks to capitalize this inherent potential and generate employment for the 12 million Indians who join the workforce every year.
- This would catapult India to economic ascendency and help it attain the goal of a USD 5 trillion economy by 2024.

Background

- Skills are generally classified under three broad categories:
  a. Transferrable or functional skills that can be deployed across multiple industries.
  b. Attitudinal skills that define personality characteristics.
  c. Knowledge-based skills that pertain to the subjects, procedures, and information necessary to perform particular tasks.

Steps Taken

a. Ministry of Skill Development and Entrepreneurship (MSDE)

- The objective of the Ministry of Skill Development and Entrepreneurship (MSDE)is the coordination of skill development efforts across the country, integration of demand and supply of skilled manpower, and upgradation of skills and encouragement of innovative thinking.
- MSDE manages short-term schemes like the Skill India Mission, Pradhan Mantri Kaushal Vikas Yojana and various other long-term training initiatives that promise to train an aspiring Indian populace not only to qualify for potential opportunities but also to excel in them.
- Furthermore, under the Ministry, the number of Industrial Training Institutes (ITIs) has grown by over 40 per cent and is currently at more than 15,000.

b. SANKALP

- The Ministry of Skill Development and Entrepreneurship, with loan assistance from the World Bank, manages a programme called Skill Acquisition and Knowledge Awareness for Livelihood Promotion (SANKALP).
- It aims to improve short-term skill training qualitatively and quantitatively through strengthening institutions, bringing in better market connectivity, and enhancing the inclusion of marginalized sections of society.
- Launched in January 2018, SANKALP will run through March 2023.

c. The ***National Skill Development Mission*** was launched in July 2015 on World Youth Skills Day.The mission is committed to providing sustainable skilling that endures a beneficiary's lifetime. The emphasishas been on the creation of an end-to-end implementation framework for skill development that provides life-longlearning.

d. Pradhan Mantri Kaushal Vikas Yojana (PMKVY)

- It is a flagship scheme of the Ministry of Skill Development & Entrepreneurship that aims to train Indian youth between the ages of 15and 45 to take up industry-relevant skill training and secure a better livelihood.
- PMKVY 3.0, for the Financial Year 2020-21, has a financial outlay of Rs 948.90 crore for eight lakh beneficiaries.
- The Scheme is particularly targeted towards marginalized groups including transgenders and people with disabilities.
- PMKVY also has provisions for recognizing prior learning (RPL) and helping individuals obtain certification for their skills that is in accordance with National Skills Qualifications Framework (NSQF) norms.

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e. Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDU-GKY)

- The Ministry of Rural Development heads the Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDU-GKY). It is a scheme dedicated to creating employment opportunities in rural India, with a special focus on the youth population, aged between 15 and 35.

Conclusion

- The Government of India has rightly identified India's strengths and determined a goal for the country that leverages these strengths. It has also charted a path that helps the country bridge the gap between its capabilities and its ambitions.
- As India strives to gain its rightful place in the family of nations, it is dependent on the calibre and abilities of its future generations who will drive this rise to pre-eminence.
- The government's measures to skill and train these future leaders are, therefore, of paramount relevance.

Architecture in India

Introduction

- Architecture is a form of communication. It is usually the representation of cultures, achieved principally through visuals.
  - It is also an indicator of the distribution of political and economic power of society as has been noted by many authors.
- Architecture or architectural design principles often characterize the aspirations of a society and, therefore, they give birth to different schools of thought.
- Like everything else, architecture also thrives on change. Its expression changes depending on the socio-political and economic conditions in the area it develops in.
- During Post-independence Stage, India is trying to create a new identity for itself and while doing so trying to break away from its colonial past.
  - This period can also be seen as a period moving towards modernism in architectural thought.

Background of Indian Architecture

British Period:

- As soon as the British took formal control of the country post-1857, to project their supremacy and authority over the region, they started imposing themselves by introducing new elements to the existing settings.
  - This was by means of town planning techniques and architectural styles that the Indians were not familiar with.
  - To create this thrust, the ***British used European architecture*** – Classical, Romanesque, Gothic, Renaissance and Baroque – to produce images that would represent them and their authority.
- New structures were built under the ***new building codes and bylaws*** that they created to enhance hygiene and building quality.
  - But these codes and by laws were far from being in sync with the lifestyle, customs, and traditional practices, because of which they were openly negated.
- The aftermath of the events of 1857–58 was particularly devastating for Delhi.
  a. The habitation around the Red Fort was cleared out and buildings demolished irrespective of residential or religious relevance.
  b. The railways were introduced, piercing through its center– the building of the station completely changed the integrity of the glorious medieval city.
  c. Gradually, the water channel that characterized Chandni Chowk was also lost.
- By the 1920s, due to the limitations in the ***ideologies of swadeshi and nationalism***, revivalist art emerged. But it was getting difficult to progress intellectually because of its restrictive nature.
  - ***Temples, built during this period, do not follow the Hindu tenets of building and the use of the Vastu-Purushamandala***.
  - Theyexperiment with the ***sikhara, vimana, and gopuram***.

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Era after Independence

- ***In 1959, at the 'Seminar on Architecture'*** when a group of architects and policymakers met at Sahitya Kala Akademi in Delhi to deliberate the way forward for the post-1947 architecture in India, two styles became front runners – the revivalist and the modernist.
- This group resolutely chose modernist ***free expression over a state-driven revivalist style***. Even though the course was decided, the buildings of this period project the nation's conciliation with its past and the formation of a strong identity for the future.
    - If we look at two examples from Delhi, i.e., the Ashoka Hotel and the Vigyan Bhawan, both differ from the previous examples of revivalist architecture.

Modern Stage and Way Forward

- The articulation of architecture till the 1980s/90s has been difficult and the change now continues into the 2020s.
- With the planned redevelopment/relocation of Teen Murti Bhawan and the Central Vista that includes, National Museum, Indira Gandhi Centre for the Arts, and other government office buildings around the Rajpath, India is heading towards a new vocabulary.
    - One that is in its nascent stage and will unfold gaining clarity and individuality in the years to come.

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KURUKSHETRA

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Agri-startups and Enterprises

Introduction

- India's digital ecosystem is presently booming. Affordability and availability of high speed internet is helping the digital content ecosystem. The confluence of these factors presents an exciting opportunity for innovation in agriculture.
- Increasing demand of innovation in agriculture and declining last mile delivery to farmers has put up a pressure on the public extension system to take up new roles like :
  a. Organising user/producer group.
  b. Linking farmers to markets.
  c. Engaging in research, planning and technology selection.
  d. Enable changes in policies.
  e. Linking producers to a range of other support and service networks.
- However, the Indian extension system has been considerably weakened over the last two decades in terms of human resources and capacity.

About Start-Ups

- A start-up is a company, a partnership or temporary organisation designed to search for a repeatable and scalable business model.
  - Through the start-up phase, new ideas are brought to the market and transformed into economically sustainable enterprises.
- Agri-start-ups are providing relevant and innovative solutions to a number of challenges faced all across the agricultural value chain.
  - These act as a link between the farmers, input dealers, wholesalers, retailers and consumers; connecting each of them and providing strong marketing linkages and quality produce on time.
  - They are not only creating new employment avenues but are also leaving a ripple effect on the socio-economic fabric of Indian demography in which they are operating.

Background

- India is an agrarian economy, with Agriculture sector contributing to more than 15 % of the country's GDP. Also, it is one of the biggest employers with approximately70 % of the rural population employed in the agricultural space. However, it has certain drawbacks like following :
  a. Slow in the adoption of technology.
  b. Lack of Information regarding farming inputs for increasing their yield.
  c. Vast unorganised credit structure.
  d. **Absence of proper market linkages**.

Role of Agri-tech start-ups

a. Agritech startups with technologies such as AI, ML and data analytics are making it easier for farmers to improve their methods of farming such as identifying the right crop to be sown for better yield.
   - Additionally, they are also offering mechanised equipments on a rental basis.

b. Agri-tech startups are taking it up a notch with mobile applications, making it even more convenient for farmers to access information regarding farming and market linkages in a more efficient way.

c. Agritech startups ensure that there is financial inclusion by enabling farmers to upload their records digitally and apply for credit, freeing them from the clutches of local moneylenders who may charge unreasonable rates of interest.

d. Farming-as-a-Service model (FaaS model) is also emerging as the future of agriculture. It offers innovative solutions for agriculture and allied services through a subscription-based or pay-per-use model.

Present Scenario

- Apart from government initiatives, significant impact is being created by startups in the agri-tech space.
  - Investors pumped in $ 500 million to Indian agritech deals in 2020. $10 billion will be invested in Indian agritech startups over the next 10 years.
  - ***According to a NASSCOM report***, the Indian Government specifically supports agritech startups through its Startup India Program.

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- Ministry of Agriculture and Farmers' Welfare supported the startups through initiatives like the ***Agriculture Grand Challenge*** which further validates our belief that data mining and analysis is of high value to the agriculture sector.
- ***Fasal's microclimate forecasts*** are tailored to each farm location and are performed at a point scale and not at a kilometer-wide spatial scale, so that farmers can benefit from real-time, actionable information relevant to day-to-day operations at the farm.

Government Initiatives

a. **Startup India:** Startup India is a flagship initiative of the Government of India, intended to catalyse startup culture and build a strong and inclusive ecosystem for innovation and entrepreneurship in India.

- The three pillars of this action plan are as follows:
  1. Simplification and hand holding
  2. Funding and Incentives
  3. Incubation and industry partnerships academia.
- To be eligible under it, the Startup should be incorporated as a private limited company or registered as a partnership firm or a limited liability partnership.
  - *Turnover should be less than Rs. 100 crores in any of the previous financial years.*
  - Eligible start-ups are ***exempted from paying income tax for three consecutive financial years*** out of their first ten years since incorporation.

b. **Startup India Seed Fund Scheme (SISFS):** Department for Promotion of Industry and Internal Trade (DPIIT) has recently created the scheme with an outlay of Rs. 945 crore.

- Its aims to provide financial assistance to startups for proof of concept, prototype development, product trials, market entry, and commercialisation.

c. **Innovation and Agri-Entrepreneurship Development:** In order to promote entrepreneurship in agriculture, the Department of Agriculture, Cooperation and Farmers Welfare (DACFW) has launched a new component called 'Innovation and Agri-Entrepreneurship Development'.

- It has been launched under the Rashtriya Krishi Vikas Yojana (RKVY-RAFTAAR).
- Under this programme, for idea/ pre-seed stage, a selected startup shall be eligible for a maximum financial assistant Rs. 5 lakh. For seed stage, Rs. 25 lakh.

d. **Initiative for Development of Entrepreneurs in Agriculture (IDEA):** Ministry of Development of North Eastern Region has launched this.

- It intends to promote agri-business ventures in the northeast region and assist in establishing agri-business as a profitable venture.

e. **Startup Accelerators of MeitY for Product Innovation, Development and Growth (SMRIDH) Scheme**: Introduced on August 25, 2021, designed to provide funding support to startups along with helping them bring skill sets together which will help them to grow successful.

f. **Dairy Processing and Infrastructure Development Fund (DIDF)**: GOI, in the Union Budget of 2017-18 announced the creation of DIDF under the apex development bank, NABARD with the total corpus of Rs. 8000 crores over a period of 3 years (2017-18 to 2019-20).

g. **Dairy Entrepreneurship Development Scheme:** The Scheme is by the Department of Animal husbandry, Dairying and Fisheries to generate self-employment opportunities in the dairy sector. ***The nodal agency is NABARD.***

Key Challenges

- Small and scattered landholdings is leading to poor cost effectiveness.
- Rate of return on technology investment has not proven very profitable.
- Hard to retain technical talent working in this sector.
- Technology adoption and penetration is a very slow process which certainly diminishes investors' interest.
- High-priced technology solutions are unaffordable for a large user group.
- Most of the technology solutions available are not localised to emerging market.
- Complex Regulations.
- Facilitating adoption of proven technologies through subsidy is yet to gain momentum.

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Way Forward

- Funding in the Indian agritech sector is 10 percent of global funding but startups struggle to scale up. There is a need for large companies to effectively collaborate with startups.
  - Government needs to help set up agritech-focused incubators and grants.
  - Academia should encourage more entrepreneurs to focus on this growing sector.
  - Banks and financial organisations also need to offer more creative models of financing for farmers, entrepreneurs, incubators, and accelerators.
- In order to make agri-startups successful, we need to develop a new way for the farmer to buy products and get information as well as credit on one unified platform. Merely providing content on an app is not going to solve the issues of the farming community.
  - Technology is just one component; an evolved distribution system with a human touch is what will make the model scalable over time.

e-NAM: Helping Farmers to Earn Better

About e-NAM

- ***National Agricultural Market (e-NAM)*** is an electronic trading portal which connects buyers and sellers, was launched on 14th April, 2016.
- It underscores one of the important recommendations of the ***Ashok Dalwai Committee on doubling farmers' income*** and strives to ensure increased income through appropriate and transparent price discovery of farm products.

Objectives and Aims

- The objective of the portal is to create a unified national virtual market for agricultural commodities.
- It is aimed at aiding farmers in getting better price discovery on a real time basis and providing them with marketing options.

Implementation

- On behalf of the Ministry of Agriculture and Farmers Welfare, the ***Small Farmers' Agribusiness Consortium (SFAC) acts*** as the leading implementing agency of e-NAM.
  - It operates and maintains the platform with the help of a strategic partner, NFCL.
- *Under the e-NAM, the Government provides free software and one time assistance of Rs. 75 lakh per mandi for computer hardware and IT infrastructure.*
  - The hardware includes quality assaying equipment and creation of infrastructure like cleaning, grading, sorting, packaging and compost unit, etc'.

Background

- As per ***"United Nation's Food and Agriculture Organisation***", market prices are unpredictable for most farmers in developing countries.
  - These applications instil price stability by assuring the right price for the farm produce and through direct connect between the farmers and farm-product buyers/traders/wholesalers.
  - In this context, e-NAM has brought Indian agriculture closer to the perfect competition market structure.
- The Government of India has initiated a number of reforms to make the agriculture sector vibrant and sustainable.
  - World Banks' ***'Enabling the Business of Agriculture'*** reviews regulations which affect farmers, and in 2019, ***India was ranked 49***.
  - The 3rd Advance Estimates for 2020-21 indicate that the total food production of the country increased from 297.50 million tonnes in 2019-20 to 305.44 million tonnes in 2020-21.

Present Scenario and Issues

- All States and UTs are not yet on the e-NAM portal. Moreover, not all mandis are engaged in online trading.
- In Budget 2021-22, an announcement had been made to integrate another 1,000 mandis'.
  - As on 31't October, 2021, 1.7 crore farmers and 1.98 lakh traders have registered themselves on the e-NAM portal'.

  - The total value of agri-produce traded on e-NAM is Rs. 1,50,664 crore.
- Besides e-NAM, the Ministry of Rural Development also stresses on the need for developing rural hoots into Gramin Agricultural Markets and linking rural markets through ***Pradhan Mantri Gram Sadak Yojana***.

Non-Uniformity of State Laws

- Agriculture being in the State List of the Constitution, States have their own ***Agriculture Produce Market Committee (APMC) Acts***. These Acts are not uniform.
  - Agricultural markets are fragmented and this is an obstacle in the free flow of agricultural commodities.
  - A number of intermediaries between the primary producer and the final consumer means multiple levies and a colossal gap between the price paid by the latter and the one received by the former.

Inconsistency in Price Discovery

- The lack of a mutually agreeable price discovery, essentially caused due to information asymmetry, always makes the farmer/ producer feel that the price received is less than optimal, while the consumer invariably perceives the price paid to be on the higher side.
  - The issue is further complicated by the presence of middlemen and adoption of malpractices.
  - The e-payment facility of e-NAM ensures quick and transparent transfer of sales proceeds to farmers.

Transportation and Marketing

- Some commodities being traded on e-NAM have relatively shorter shelf lives.
- Adequate and state-of-the-art storages at collection points, bolstered marketing infrastructure and quality testing facilities may mitigate this issue to a large extent.
- These issues underscore the need for having well equipped cold chains, storage and facilities as envisaged in ***Kisan Rail and Krishi Udaan***, which were announced in Budget 2020-21.
  - During the lockdown in 2020, the Ministry of Agriculture & Farmers Welfare had launched a mobile application, viz. '***Kisan Rath***' to facilitate farmers to find suitable transport vehicles for transportation of their agriculture and horticulture produce.

Benefits of e-NAM

- e-NAM increases the choices which the farmer has when he brings his produce to the mandi for sale.
  - While local traders can bid for the produce, the traders of other States/UTs/mandis can also bid through the electronic platform and it is up to the farmer to accept either the local offer or the online one.
- Successful integration of e-NAM will be able to attract the much needed investment into this sector.

Conclusion

- While the supply of agricultural production, in terms of quantum and quality, is governed by Agro-climatic and geographical conditions, the demand for the same is spread across the country.
- e-NAM needs to have a national character and be linked to all States/UTs. Besides, the issue of perishables needs to be dealt by having cold chain-like transportation and storage facilities. The transportation cost needs to be transparently built into the bidding system.
- A multi-pronged approach which incorporates these points would go a long way in ensuring better incomes for farmers and through them a better developed rural economy.

Agriculture Beckons Digital Transformation

Introduction

- Agricultural practices have largely been conventional in India. However, after the Green Revolution and Liberalisation, things are changing at a faster rate as we are seeing strong growth in per capita income, better literacy levels, and a policy level intent to bring the benefits of advancements in science and technology to the Indian farming community.
- ***Mechanisation*** had a great potential to benefit Indian farming in many ways including an increase in production, efficiency, per capita productivity, crop yield and farm income.
- ***Digital technologies*** are about smart devices, applications, soft-wares, services and communication systems where information is gathered, processed, distributed and utilised.

Digital Agriculture

- Agricultural practices empowered by digital technologies are referred to as smart farming, digital agriculture and precision agriculture.
    - This is an agricultural concept in which various types of data is used to build new methods for planning, production, management and sale of agricultural produce.
    - They help farmers take informed decisions based on authentic data and overall trends.
    - Some usage of digital technology includes remote sensing, soil sensors, unmanned aerial surveying, weather information systems and market analysis and insights.
    - They help the farming community to collect data to analyse crop and soil health conditions at different stages of production, in a convenient and cost-effective way.
- With the help of actionable data, the power of Artificial Intelligence, Machine Learning algorithms, and modern predictive analytics farmers can even be informed about the potential success of a particular crop.
- The challenge is to develop simplified versions of applications and solutions which the farmers can easily learn to use and access without feeling intimidated by the advancements in technology.

Challenges

- Small and scattered landholdings is leading to poor cost effectiveness.
- Rate of return on technology investment has not proven very profitable.
- Technology adoption and penetration is a very slow process which certainly diminishes investors' interest.
- High-priced technology solutions are unaffordable for a large user group.
- Most of the technology solutions available are not localised to emerging market.
- Facilitating adoption of proven technologies through subsidy is yet to gain momentum.

Recent Initiatives and Scenario

a. **Digital Agriculture Mission 2021-2025**: In September 2021, the Union Minister of Agriculture and Farmers' Welfare, Narendra Singh Tomar, announced the initiation ofthe Digital Agriculture Mission 2021-2025.

- The Mission aims to support and accelerate projects based on new technologies, like AI, blockchain, remote sensing, geographical information systems, and use of drones and robots.

b. **National e-Governance Plan in Agriculture (NeGPA)**:It is already in the second decade of its existence and covers all states and two union territories.

- This aims to achieve rapiddevelopment in India through use of Information and Communication Technology (ICT) for timely access to agriculture related information forthe farmers.
- ***The revised NeGPA guidelines say that funds from 2020-21 will be released to the States/UTs only for the projects involving use of modern information technologies***.

c. **Ashok Dalwai Committee on doubling farmers' income :** The Committee recognises the importance of smart farming.

- The committee, in its report appreciated the role of digital technology, which can play a transformational role in modernising and organising how rural India performs its agricultural activities.
- The committee lists the possible components for modern management of agriculture as the following:
    - Remote Sensing.
    - Geographical Information System.
    - Data Analytics.
    - Artificial Intelligence and Machine Learning.
    - Internet of Things.

d. Direct Benefit Transfer (DBT): The Central Agri Portal which is serving as a unified central portal for agricultural schemes across the country. The portal helps farmers adopt modern farm machineries through government subsidies.

e. e-National Agriculture Market (eNAM) : It links the existing Agricultural Produce Market Committee (APMC) mandis. This helps farmers in selling their products directly to the buyers, without being dependent on the middlemen.

f. In June 2021, The Ministry of Agriculture and Farmers' Welfare signed an MoU with Microsoft to run a pilot programme for 100 villages in 6 states.

- *Under the MoU, Microsoft will create a 'Unified Farmer Services Interface' through its cloud computing services.*

g. Ministry of Agriculture and Farmers' Welfare had also signed 5 MoUs for pilot projects with five private companies - CISCO, Ninjacart, Jio Platforms Limited, ITC Limited and NCDEX e-Markets Limited (NeML).

- *The Jio Platforms Limited will conduct its pilot project to provide advisories to farmers in two districts of Maharashtra- Jalna and Nasik.*
- The ITC Limited has signed the MoU for building a Customised 'Site Specific Crop Advisory' service.
- Cisco will conceptualise a 'Proof of Concept' in effective knowledge sharing between farmers, administration, academia and industry.
- The NCDEXe Markets Limited (NeML) will work on four services-Market Linkages, Aggregation of Demand, Financial Linkages and Data Sanitisation.

Conclusion

- Indian agriculture is set to experiment a big change. It will be a long process though, but if successful, the farming sector in India may get transformed resulting in the financial empowerment of the Indian farmer and a significant growth in the contribution of Indian agriculture to our economy.

Agriculture Sector Contributing in Rural Development

Introduction

- Agriculture and allied sectors play a crucial role in the process of economic development by playing a vital role in gross value addition, employment generation and foreign exchange earnings.
- There is a strong mutual linkage between agriculture and other sectors (industry, trade and services) of the economy.
    - The large scale industries of the country like sugar, tea, jute, textile, paper, and food processing etc. directly depend upon agriculture and allied sectors for the supply of raw materials.
    - On the other hand, agriculture also draws inputs like chemical fertilisers, pesticides, power, agricultural machinery (tractors, harvesters, combines, pump sets), tools and implements from industry.
- This interdependence between agriculture and industry becomes strengthened through the appropriation and generation of various production and demand linkages in these sectors.

Role of Agriculture in Rural Economy

- While all other sectors including manufacturing, construction and services were hit the hardest during the lockdown forced by the COVID-19 pandemic, Agriculture emerged as the only sector which contributed positively to the overall Gross Value Added during the period.
- The ***Real Gross Value Added (RGVA)*** at constant prices by primary sector has registered a compound growth rate of 3.99 percent per annum.
- On the other hand, RGVA by secondary sector witnessed the highest annual compound growth rate (ACGR) of 6.51 percent.
- Although, due to structural changes in the economy, the contribution of the primary sector to gross value added has steadily declined from 53.71 percent in 1951 to 18.85 percent in 2020-21.
- However, the declining share of this sector does not undermine its significance in employment generation, foreign exchange earnings and providing food security to the ever increasing population of the country.

Role of Agriculture in Employment Generation

- Agriculture, along with the allied sectors, serves as the source of livelihood for the large proportion of rural population of the country.
    - *As per census 2011, of the 313 million main workers in the country, 166 million (56.6 percent) were engaged in these activities.*
- The ***Periodic Labour Force Survey (PLFS)*** conducted by the ***National Statistical Office (NSO)*** for the year 2018-19, estimated the size of labour force to be 51.82 crore persons (48.79 crore employed and 3.04 crore unemployed) in India.
    - Agriculture with 42.5 percent of workforce is still the largest employer in the country.
    - Among the total employed persons, self-employment is the major source with close to 52 percent of the employed workforce in India.

Agricultural Production

- The total food grain production in India has increased from 50.8 million tonnes in 1950-51 to 308.65 million tonnes 2021-21. At present, India is the largest producer (25 percent of global), consumer (27 percent of global) and importer (14 percent of global) of pulses in the world.
    - It is the second-largest producer of rice, wheat, sugarcane, cotton and groundnuts.
    - It is the second largest producer of fruits and vegetable in the word after China.
    - India has been the largest producer of milk in the world continuously for last more than two decades with over 198 million tonnes of production and per capita availability of 407 grams per day as against the world average of 299 grams.

Agricultural Trade

- India is not only self-sufficient in respect of demand for food, but is also a net exporter of agri-products occupying seventh position in the world.
    - India's export of agricultural and allied products (such as rice, pulses, fruits, vegetables, tea, coffee, tobacco, spices, sugar and molasses, cashew, raw cotton, fish, meat and processed food etc.) went up to Rs. 2,40,729 crore in 2020-21.
    - On the other hand, agricultural imports showed a faster and steep increase of more than 123 times to reach at Rs. 1,47,975 in 2020-21 from Rs. 1,206 crore in 1990-91,witnessing a compound growth rate of 17.39 percent per annum.
- It is noteworthy that whereas the overall balance of trade of India has always been negative, the trade balance of agricultural goods has not only been positive but also increased nearly by 19 times during the last three decades, which reflects the significance of agriculture in generating foreign exchange for the country.
- Due to structural changes in the economy, the contribution of agricultural and allied products to foreign exchange earnings (share in exports) has slid down from 44.24 percent in 1960-61 to 19.91 percent in 1990-91 and further to 11.15 percent in 2020-21.

Issues and Challenges

a. Decline in Export Import Ratio from almost 5:1 to 1.6:1 is a big issue in this regard.
b. Despite a multi-fold expansion in agricultural exports, India's agri-export basket accounts for a little over 2.5 percent of global agri-trade.
- Its overall share in total world exports has always been less than 1.7 percent.

c. The agriculture sector is plagued by several challenges with low productivity, inadequate capital inflow, environmental issues and operational gaps etc.
d. The country has achieved self-sufficiency in food grains but the production is lopsided being cereal centric, regionally biased and resource intensive.
e. The resource intensive ways of Indian agriculture have raised serious sustainability issues.
- Increasing stress on water resources of the country is also critical one which definitely needs the realignment and rethinking of policies in this context.
- Agriculture crop residue burning and demolition of waste also continues to be a major concern.

Government Initiatives

a. **Soil Health Card Scheme:** To improve soil fertility on a sustainable basis, the Soil Health Card Scheme was launched in February 2015.
- Under this scheme, samples of soil are taken and tested in the labs to assess the health of soil in the form of presence/absence of required micro-nutrients.

b. **Pradhan Mantri Krishi Sinchayee Yojana (PMKSY):** In order to provide improved access to irrigation and enhanced water efficiency, Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) was launched on 1st July 2015 with the motto of Har Khet Ko Paani.

c. **Pramparagat Krishi Vikas Yojana (PKVY):** In order to promote organic farming in the country, a scheme named Pramparagat Krishi Vikas Yojana (PKVY) was launched in 2015 by the Government of India.
- Under this scheme, the willing farmers are required to form a group of minimum 50 farmers with total area of not less than 50 acres.

- Each farmer enrolling in the scheme is provided a sum Rs. 20,000 (spread over three years) per acre by the government. This fund can be utilised for obtaining agriculture inputs and transporting the produce to the market.

d. **Pradhan Mantri Fasal Bima Yojana (PMFBY):**In order to stabilise the income of farmers by protecting them from the natural calamities a scheme, Pradhan Mantri Fasal Bima Yojana (PMFBY) was launched in February 2016.

- Under the scheme, in event of any loss to the notified crop (food crop, commercial/ horticultural crop and oil seeds) due to any natural calamity, pest or disease, eligible farmers are paid compensation based on the difference between the threshold and actual yield.

e. **Sub-Mission on Agricultural Mechanisation (SMAM):** In order to strengthen the agricultural mechanisation in the country, a scheme named as Sub-Mission on Agricultural Mechanisation (SMAM) was launched in 2014-15 by the Ministry of Agriculture and Farmers' Welfare.

- It aims at increasing the reach of farm mechanisation to small and marginal farmers and to the hinterland where the use of agriculture machinery is low.

f. **Pradhan Mantri Kisan Samman Nidhi (PM-KISAN) yojana:** In February 2019, Pradhan Mantri Kisan Samman Nidhi (PM-KISAN) yojana was launched to augment the income of farmers with land holding up to 2 hectares, subject to certain exclusions.

- The scheme aims at supplementing the financial needs of the of families of small and marginal farmers to enable them to take care of expenses related to their occupation as well as domestic needs.
- In the union budget 2021-22, a major allocation of Rs. 65,000 crore was allocated for PM-KISAN, under which the government provides Rs. 6,000 to each beneficiary in three equal instalments to the eligible farmers.

g. **Digital Agriculture Mission for 2021-25:** With a view to modernise the agriculture, the union government has initiated Digital Agriculture Mission for 2021-25 for agriculture projects based on new technologies such as artificial intelligence, block chain, remote sensing and GIS technology, drones, robots and others modern digital devices.

h. **Transport and Marketing Assistance (TMA):** In 2019, the Government of India came out with Transport and Marketing Assistance (TMA) scheme to provide financial assistance for transport and marketing of agriculture products in order to boost agriculture exports.

- It is likely to mitigate disadvantage of higher cost of transportation of agriculture exports due to trans-shipment and to promote brand recognition for Indian agricultural products in the overseas markets.

i. **Production Linked Incentive (PLI) scheme:** In order to promote Indian brands of food products in the international market through the creation of global food manufacturing champions commensurate with India's natural resource endowment, the government of India has approved the Production Linked Incentive (PLI) scheme for the food processing sector in April 2021.

- With an incentive outlay of Rs. 10,900 crore over a period of six years starting from FY 2021-22, the scheme has been formulated under Aatma Nirbhar Bharat Abhiyaan for enhancing exports of agriculture products.

Way Forward

- Agriculture and allied sector play a vital role in a developing economy like India by reducing poverty, unemployment and Inequality, ensuring food security and achieving sustainable development.
- The dynamics of agricultural growth in India reflect a decline in the share of agriculture in national gross value added, employment generation and foreign exchange earnings. But, it still remains the single largest employment generation sector and source of livelihood to a large proportion of population.
- Reducing rural poverty and inequality through a socially inclusive employment strategy encompassing both farm as well as non-farm sector is also a major challenge before the policy makers and the government.

Renewable Energy: Transforming the Face of Rural India

Introduction

- Renewable Energy (RE) provided clean energy support to various development programmes and improved quality of life of millions of rural dwellers.
- *India was among the first countries in the world which institutionalised development and deployment of RE by creating an exclusive department under union government (1982).*
  - In due course, it evolved into a full-fledged ministry, now known as Ministry of New and Renewable Energy (MNRE).

Background

- During initial phases, R&D efforts were primarily focused on assessment of potential of various RE sources in India.
  - Soon, Government of India launched ambitious programmes for development of appropriate technologies; creation of capacity; and deployment of RE devices in various social-economic sectors.
  - Various policy initiatives including central finance schemes helped proliferate RE at ground level, especially in rural areas.
- Core drivers for growth and expansion of RE in India have been energy security, energy access, increasing power demand and climate change.
- India has an estimated RE potential of about 900 GW from commercially exploitable sources; namely, Wind - 102 GW (at 80 metre mast height), Small Hydro - 20 GW, Bio-energy - 25 GW, and Solar - 750 GW (assuming 3 percent wasteland).

Recent Scenario

- India is in 4th position in terms of total installed RE capacity, 5th in solar power and 4th in wind power installed capacities. Recently,
- India has crossed the milestone of 100 Gigawatt (GW) installed capacity, while another 50 GW is under installation and 27 GW is under tendering.
  - India has also enhanced its target to install 450 GW of RE capacity by 2030.
  - Additionally, India is also aiming to achieve 40 percent of installed electric power capacity from non-fossil sources by 2030.

Biogas and Biomass

a. Biogas is the first clean and renewable source of energy that was developed specifically for rural areas in 1980s.

- In rural areas, this is a reliable and cost effective source of clean, low-cost and environment friendly fuel for cooking, lighting and fulfilling small power needs of farmers, cattle owners and individual households.
- Currently, *MNRE is running a comprehensive 'New National Biogas and Organic Manure Programme' (NNBOMP)* for dissemination and deployment of biogas plants in remote, rural, and semi-urban areas of the country.
  - Under the programme, central subsidy is provided for installing biogas plants.

b. Biomass is another abundant source of clean power in rural areas which is being promoted. Gasifiers are generally installed to recover energy from biomass resources (agricultural residues/wastes, bio wastes from industries, biogases of sugar mills, etc) for power generation.

- It helps in environmentally safe utilisation of surplus agro-residues.
- The total estimated potential for biomass power is 26,000 MW - 18,000 MW from agricultural and agro industrial residues; and around 8,000 MW from biogases cogeneration sugar mills.

Solar Power

- MNRE runs a comprehensive Off-grid and Decentralised Solar Photovoltaic (PV) Applications Programme for deployment of solar street lights, solar study lamps and solar power packs to meet out the electricity and lighting needs in rural areas.
- Central Financial Assistance is provided to local communities, institutions and individual households for deployment of solar devices through State Nodal Agencies.
- During 2020-21, over three lakh solar study lamps have been distributed to school going children in north-eastern states and left wing extremism affected districts.
- Government of India approved *'Pradhan Mantri Kisan Urja Suraksha Evam Utthaan Mahabhiyan (PM-KUSUM)'* on February 19, 2019 with the objective to provide energy and water security to farmers, enhance farmers income, de-dieselise the farm sector and reduce environmental pollution.

Small Hydro Power

- MNRE runs a special Small Hydro Power (capacity up to 25 MW) Programme to meet power requirements of remote and isolated areas in a decentralised manner.
  - Such projects also create employment opportunities to local people and enhance livelihood opportunities in rural areas.

- Against the target of 5,000 MW aggregate capacity by the year 2022, an aggregate capacity of 4,750.46 MW has been achieved (up to 31.12.2020).

Conclusion

- The wide and vast renewable energy programme has
  - Improved quality of life.
  - Created and strengthened livelihood resources.
- Supply of renewable power to schools, hostels, panchayats and other public service institutions is helping communities at large and also contributing in enhancing participation of women in education, social and livelihood activities.
- Amid current COVID-19 crisis, local renewable energy solutions in villages can generate new livelihoods for internal migrants.
- Apart from supporting jobs and entrepreneurship with better power supply, renewable energy has ample potential to address critical issues such as energy poverty, agri-productivity, food security, health and climate variability.

Transforming Lives of Rural Youth

Introduction

- India youth population provides a unique demographic advantage. With the sustained growth in Indian economy, creating a competent and trained manpower pool for meeting the rising demand of industry assumes paramount importance.
- However, the employment sector is posing a great challenge in terms of its structure which is dominated by informal workers.
  - For dealing with these challenges concerning availability of skilled labour, the Government of India has taken several skill development initiatives in the recent years.
- It is a huge challenge not only for the government, but also for the Private sector and educational institutions to rise up and specialise to make the country's youth employable and ensure that there is no mismatch between demand and the supply of skilled labour.

Background

- India is facing a paradoxical situation, where on the one hand, youth entering the labour market are not able to find the suitable jobs matching to their qualification.
  - On the other hand, industries have been raising issues about unavailability of suitably skilled man-power.

Recent Initiatives

Programme	Brief Details
Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDU-GKY)	• It was launched on 25th September 2014. • It is a nationwide placement linked skill training program being financially supported by the Ministry of Rural Development (MoRD), Government of India (GoI). • It is a demand driven scheme and under the scheme, funds are released to States as per demands against approved Action Plans. • There is a provision of payment of post placement support of Rs. 1000 per candidate per month for two months if placed within district of domicile and Rs.1000 per candidate per month for 6 months, if placed outside State of domicile.
Roshni program	• It is being implemented in 27 left wing extremist affected areas of nine States with mandatory residential courses with 40 percent coverage to women candidates. • It is oriented towards addressing the infrastructure, education, and health deficiencies in these areas, and leveraging the availability of natural resources, traditional skills and knowledge.
Himayat programme	• It is being implemented for all the youth of the UTs of Jammu & Kashmir and Ladakh. • The funding for the programme is shared by Centre and States.

Conclusion

- Several studies and evidences from the ground state that that all the selected beneficiaries are from rural BPL families and the scheme has a considerable economic impact on the livelihoods of youth by enhancing their employment opportunities and earning levels which helps to contribute their family income.
- The increased household earnings have resulted in an increase in spending levels and ultimately to increase their standard of living.

Smart Farming: Towards Sustainable Agriculture

Introduction

- Farming Practices are very crucial activity as far as food security is concerned. However, these are affected by many factors like :
  a. Dwindling natural resources.
  b. Increasing population pressure and food demand.
  c. Abrupt weather fluctuations.
- Therefore, there is a need to make our agriculture smart so that crop productivity could be sustained through mitigation of such challenges.

Smart Farming

- The FAO first time defined the climate smart agriculture as an approach that transforms agri-food systems towards green and climate resilient practices.
- It aims to tackle three main objectives:
  a. Sustainably increasing agricultural productivity and incomes.
  b. Adapting and building resilience to climate change.
  c. Reducing and/or removing greenhouse gas emissions, wherever possible.
- Smart farming is based on a precise and resource-efficient approach and attempts to achieve higher efficiency on agricultural production with increased quality and safety on a sustainable basis.
  - However, from the farmers' point of view, smart farming should provide added value in the form of more accurate and timely decision-making and more efficient exploitation operations and management.
- Smart farming technologies (SFTs) can be divided into three main categories:
  a. **Farm management information systems (FMIS)**: FMISs represent mainly software systems for collecting, processing, storing, and disseminating data in the form required to carry out a farm's operations and functions.
  b. **Precision agriculture (PA) systems**: It refers to the farming management concept aimed at optimising input use based on recording technologies to observe and measure inter-and intra-field spatial and temporal variability in crops, aiming to improve economic returns and reduce environmental impact.
  c. **Agricultural automation and robotics**: Agricultural automation and robotics are separate, but closely related ICT sectors.

Indian Context

- 'Smart Farming' in India is still as an emerging concept that refers to managing farms using modern information and communication technologies like IoT, robotics, drones and Al to increase the quantity and quality of products while optimizing the human labour required by production.
  - These include variable rate applicators, Internet of things (IoT), geo-positioning systems, big data, unmanned aerial vehicles UAVs (drones), automated systems, and robotics.

Benefits of Smart Farming

a. Increasing the amount of real-time data on the crop.
b. Remote monitoring and controlling of farms.
c. Controlling water and other natural resources.
d. Improving livestock management.
e. Accurate evaluation of soil and crops.
f. Improving agricultural production.
g. Eco-friendly farming.

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Pillars of Smart Farming

a. **Internet of Things**: In the agricultural field, IoT technology has made significant development in helping farmers make the appropriate decision related to irrigation and fertiliser application.
- The smart systems enhance the accuracy of devices that monitor plant growth.

b. **Sensors**: A sensor is a device that produces an output signal for the purpose of sensing of a physical phenomenon.
- In smart farming use of sensors play an important role for precise application of inputs as per the demand to avoid losses and misuse.
- They are very useful in :
  a. Soil Health Monitoring.
  b. Implementing Smart Irrigation System.
  c. Identifying diseases.
  d. Improving Crop Yield by recognising premature crops, estimation of fertiliser requirement, plant stress identification and infection of insect, pests and diseases.
  e. Improving Post Harvesting Activities.
  c. **5G Network**: The 5G network provides a very High Speed internet. This is very useful in using other digital technologies.

Application of Smart Farming in Indian Context

Internet of Things (IoT) Based on Drones: The Government of India has formulated standard operating procedures (SoP) for use of drones for the purpose of spraying pesticides and fertilizers on agricultural crops.
- The Agriculture Ministries both at the central and the state levels have been using drones for anti-locusts praying.
- Drones are also used in irrigation, monitoring crop health, planting, crop spraying, crop inspection, and soil analysis.

Robotics: Agricultural robots can be practical tools to provide unconventional solutions to face labour shortages, especially in case the spread of pandemics like COVID-19.

Grain Bank Model of ERGOS: Ergos has developed a unique model in the Agri-tech landscape called "Grain Bank Model" that is providing doorstep access to end-to-end post-harvest supply chain solutions to small and marginal farmers, i.e.,

a. Enabling farmers to converttheir grains into tradable digital assets.
b. Avail credit against those assets through partner NBFCs and Banks.
c. Get better prices for their produce.

Smart Decision Support Systems (SDSS): It aims to support farmers in making proper decision in irrigation management, fertilisation process, and others for service operations.

Monitoring and Risk Management in Agriculture: Yuktix Technologies - an agritech startup based in Bangalore is providing handy digital tools for agriculture farm monitoring and risk management.
- These small digital tools help farmers to make decisions and implement best practices that increase yield and reduce losses.

Automatic Irrigation System: Subsurface Drip Irrigation (SDI) plays a vital role for judicious use of water as per the requirement of the crop.

Driverless Tractor: Automated tractors, integrated with hardware and special-purpose designed software are working more efficiently, thus, changing agricultural machinery.

Challenges

a. Slower Internet Connectivity, especially in remote areas.
b. Weaker GPS signal transmission in heterogeneous topography like hilly, forests and field with a dense tree planting.
c. Inadequate and interrupted Power Supply.
d. Unaffordability of the Technologies.

Way Forward

- Smart Farming is the future facilitating better utilisation of precious resources, inputs and environmental protection.

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- The key factors to succeed in smart farming in India are affordability of technology, ease of access and operations, easy maintenance of systems, timely grievance redressal and appropriate policy support.
- Robust research and development in the field of smart farming is needed so that smart farming can empower Indian farmers to sustain their farm productivity and livelihood.

Prioritising Climate Smart Agriculture

Introduction

- The interaction between agriculture and climate change is multifaceted, and plays out in India's climatically diverse regions differently.
  - Higher temperature eventually reduces yields of desirable crops while encouraging weed and pest proliferation.
  - Perceptions of worsening yields, diseases, pests, and rainfall have been documented across the Indian subcontinent in a number of studies, indicating the real, present, and ongoing threat which climate change possesses.

Issues and Challenges

a. **Water Conflict**: Around 80-90 percent of the country's water consumption occurs within the agriculture and allied space.
   - Despite such an outsized water consumption pattern, roughly half of the country's agriculture is rainfed, vulnerable to weather patterns and having volatile yields.

b. **Land Fragmentation**: Average size of landholdings have come down to 1.08 hectares, with two-thirds of all holdings being below 1 hectare.
   - Incomes from cultivation tend to follow fragmentation measures, whereby average monthly per capita income from agriculture ranges from Rs. 2,311 in Punjab to Rs. 250 in West Bengal.

c. **Soil Chemistry**: The incorrect use of fertilisers is changing soil chemistry in an adverse way. The problems of salinisation, desertification, and degradation are direct consequences of poor agricultural practices.

d. **Impact on Climate**: Agriculture is a fuel and water intensive business and generates 19-29 percent of total global greenhouse gas emissions.

Climate Smart Agriculture

- The Food and Agriculture Organisation has developed the concept of Climate Smart Agriculture, which was presented at the Hague Conference on Agriculture, Food Security and Climate Change in 2010.
- It is an approach that helps guide actions to transform agri-food systems towards green and climate resilient practices.
- It mainly depends on 03 pillars :
  a. **Productivity:** CSA aims to sustainably raise agricultural productivity and incomes from agricultural and allied activities while balancing concerns relating to the environment.
- A central focus of this endeavour is to promote food and nutrition security using sustainable innovations.
  b. **Adaptation**: CSA aims to reduce the exposure of farmers to short-term risks, while also strengthening their resilience by building their capacity to adapt and prosper in the face of shocks and longer-term stresses.
  c. **Mitigation**: The minimisation of emissions and the maximisation of carbon capture is a core concern of CSA.
- This implies a reduction of emissions for each calorie or kilo of food, fibre and fuel that is produced.

Characteristics of CSA

- **Sustainable**: CSA attempts to address climate change's causes and effects by planning and developing of sustainable agricultural systems.
- **Eco-friendly**: CSA attempts to ensure the sustainability of these services, preventing their degradation.
  - Ecosystems provide the agricultural sector with a number of 'unpaid' services-clean natural water, materials, food, sunlight, etc.
- **Adaptation and Flexibility**: CSA is not a rigid set of particular practices, technologies, or methodologies- it is only a concept amenable to adaptation.
- **Context Specificity**: CSA is a concept where interventions are made according to the context of the situation.This reduces the scope for transference of lessons from one place-to another.

- **Inclusion of the Marginalised**: CSA is a concept that ensures inclusivity of the vulnerable and marginalised, inclusive of women. As they possess the marginal lands, they are more vulnerable to climate events like drought and floods.

Government Initiatives on CSA

a. **National Innovations on Climate Resilient Agriculture (NICRA) :** Indian Council of Agricultural Research (ICAR) has launched a flagship network project 'National Innovations in Climate Resilient Agriculture' (NICRA) in 2011.

- The project aims at strategic research on adaptation and mitigation, demonstration of technologies on farmers' fields and creating awareness among farmers and other stakeholders to minimise the climatic change impacts on agriculture.

b. **National Mission for Sustainable Agriculture(NMSA):** It derives its mandate from Sustainable Agriculture Mission which is one of the eight Missions outlined under National Action Plan on Climate Change (NAPCC).

- The NMSA aims at promoting sustainable agriculture through a series of adaptation measures.

c. **National Adaptation Fund for Climate Change**: The overall aim of NAFCC is to support concrete adaptation activities which mitigate the adverse effects of climate change.

d. **Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)**: Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) has been formulated with the vision of extending the coverage of irrigation 'Har Khet ko pant and improving water use efficiency 'More crop per drop' in a focused manner.

e. **Zero Budget Natural Farming (ZBNF) and Organic Agriculture**: There has been a conscious effort from the government to promote ZBNF, and other kinds of organic farming across India.

- Use of high yield variety (HYV) seeds, pesticides, and fertilisers in modern agriculture have long term impacts on soil, human, and environmental health.
- These inputs are also costly for small farmers.

Way Forward

- Climate change is no longer a future possibility, but a reality which all of us are witnessing. Securing the financial future of Indian farmers, as also the food security of those dependent on them, is a crucial priority for the government.
- Some elements like Better model of Agriculture Credit, Extension Services and Innovative approach regarding Climate Smart Agriculture may be implemented in order to push for a sustainable Climate Smart Agriculture.

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