

YOJANA SUMMARY

SCIENCE & TECHNOLOGY

October 2021

Reforms In Space Sector Aimed At Boosting Private Sector Participation

- **Indian National Space Promotion and Authorization Centre (IN-SPACe)** has been created to provide a level playing field for private companies to use Indian Space infrastructure.
- The Public Sector Enterprise '**New Space India Limited (NSIL)**' will endeavour to re-orient space activities from a 'supply driven' model to a 'demand driven' model.
- These reforms will allow ISRO to focus more on research and development activities, new technologies, exploration missions, and human spaceflight programme.

Origin & Evolution of Space Activities in India:

- **Indian National Committee for Space Research (INCOSPAR)** was set up in 1962 under the Department of Atomic Energy.
- **Indian Space Research Organisation (ISRO)** was established in August 1969, in place of INCOSPAR.
- Now, ISRO has become one of the six largest space agencies in the world.

COMBATING COVID-19

India's population, the presence of population-dense areas, diversity and the status of its healthcare system presented manifold challenges to India's fight against Covid-19.

Steps Taken to Combat Covid-19

- Soon after the WHO declared Covid-19 a pandemic, the first **inter-ministerial committee** chaired by Dr V K Paul (member NITI Aayoga) met to review India's preparedness to the crisis.
- Major decisions taken by the committee included:
 - ✓ Creating web portal, contact tracing app, handbook and laboratory manual for training of RT-PCR testing
 - ✓ Standardise specifications for PPE kit
 - ✓ IT support for Covid-19 management
- India was amongst the earliest in the world, even ahead of WHO, to issue advisory on mask usage for curbing the spread of virus.
- PMO constituted the **Vaccine Task Force (VTF)** for focused R&D of Corona Vaccine.
- VTF strategy was based on six major pillars -
 1. Vaccine Development
 2. PPE and Ventilators
 3. Testing, Tracking, and Diagnostics
 4. Therapeutics and drugs
 5. Surveillance: Seroprevalence and genome sequencing
 6. Regulation and regulatory support

Covid-19 Response: Timeline

- 30 January 2020 – it was declared Public health emergency of international concern
- 11 March 2020 – WHO declared Covid-19 a pandemic

Vaccine Development

- The first week of January 2021 saw the Emergency Use Authorization (EUA) accorded to two Indian vaccines: **Covishield** from the Serum Institute of India; **Covaxin** from Bharat Biotech
- These vaccines being available in record time, nine months from the declaration of the pandemic, is a testimony to the capacity of the Indian vaccine industry
- In August 2021, third vaccine from India- **DNA vaccine candidate ZyCoV-D**, from Zydus Cadila got approval.
- Today, about 50% of India has been vaccinated for the first dose, a total of 63.07 crore persons, 8.2% of the total world population, which is unparalleled.

Personnel Protection Equipment (PPE) and Ventilators

- India also moved rapidly from an acute shortage of masks and PPEs to becoming an exporter of quality PPEs. Organisations like DRDO, SITRA played an important role in this.
- The Ventilator Project is a validation of the coming of age of India's startup ecosystem.

Surveillance: Seroprevalence and Genome Sequencing

- The VTF recognised the importance of serosurvey very early into the pandemic and recommended the drawing out of a national plan for serosurvey.
- The need for a common platform for harmonised protocols for virus surveillance, genome sequencing, and characterisation was reiterated by the VTF.
- Hence, the **Indian SARS-CoV-2 Genomic Consortium (INSACOG)** was established.

Regulation and Regulatory Support

- Through a notification, Government allowed the industries to stockpile vaccines after approval of phase I of the clinical trials.
- **Fast track clearances were facilitated**, with a recognition that regulatory processes needed an overhaul.

Challenges

- The onslaught of the pandemic also revealed the gaps in our preparedness. India was unprepared for participation in global trials due to lack of identified clinical trials sites.
- The pandemic saw **underpowered clinical trials** being carried out in India.

Way Forward:

- Govt must support and partner with the industries in Vaccine development Phase 3 clinical trials.
- It should **set up testing and certification labs** like Central Drugs Laboratory, Kasauli, in other parts of India. This has now been done.
- The procurement system **needs to be favourable for indigenously developed products**.
- Internationally easy-to-use tests are now emerging in the market. Therefore, India should seize this opportunity, and apply for international certification and clearance for global markets.

Conclusion:

The success of Indian vaccine development during the Covid-19 pandemic will go down in history as a self-reliant India that came together with an unprecedented political will and governance to develop and deploy the vaccine in record time, with equity and equal access.

The Fit India Mobile App

- Through this App, citizens can assess their fitness parameters through a series of simple tests and further get ways for the improvement of fitness on regular basis.
- It was launched in 2019 with the vision of making India a fit and healthy nation.
- Later, on the occasion of its first anniversary, the age-appropriate fitness protocols for the three age groups – 5-18 yrs; 18-65 yrs; 65+ years’ was developed.
- Now, the Fit India App is launched.

ENERGY SECURITY: NUCLEAR POWER

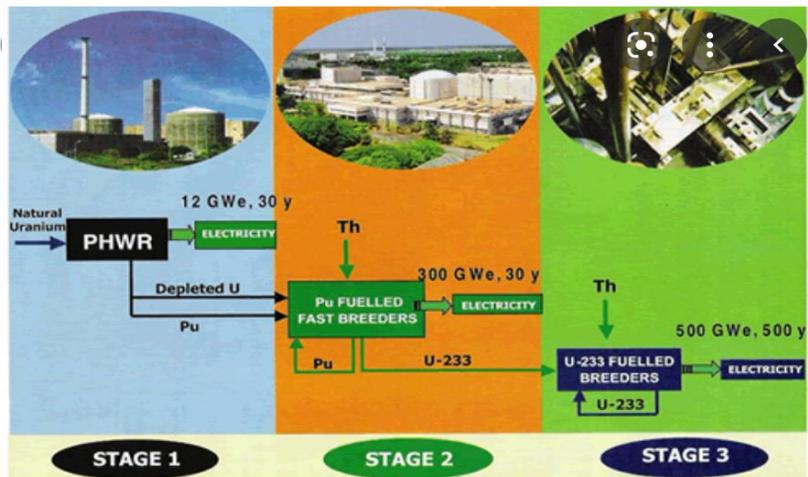
- India is one of the world’s largest energy consumers and currently relies on importing fuels to a significant extent.
- The **major fuel in India’s energy mix is coal (55%)**. Nuclear energy makes up about 3%, and renewable energy sources about 20%.

Importance of Nuclear Energy for India

- India plans to maintain economic growth of 8% annually, which implies that electricity demand will grow proportionately.
- India as an emerging country will have to find a middle ground between economic development and environmental sustainability, which **requires it to change its energy mix**.
- Nuclear energy is considered by many as being the only source of energy suitable to support continuous industrialisation and urbanisation.
- Keeping this in mind, India embarked on its commercial nuclear power production in 1969 with the commissioning of **two boiling water reactors (BWR) of 210 MWe capacities each**.

Nuclear Power Programme

- India’s nuclear power programme was **conceived to be a closed fuel cycle**, to be achieved in three sequential stages.
- These stages feed into each other in such a way that the spent fuel generated from one stage of the cycle is reprocessed and used in the next.
- It was designed to **breed fuel and to minimise the generation of nuclear waste**.
- The ultimate objective is to **utilise the country’s vast reserves of thorium-232**. India has the world’s third-largest reserves of thorium.



Thorium, however, cannot be used as a fuel in its natural state. It needs to be converted into its usable “fissile” form after a series of reactions.

- Hence, to eventually produce nuclear power from its thorium reserves, three-stage nuclear programme was envisioned.
- **First stage** - Pressurised Heavy Water Reactors (PHWRs) will be used to produce energy from natural uranium. Besides producing energy, it will produce fissile plutonium (Pu)-239.
- **Second stage** – It involves using the indigenous Fast Breeder Reactor technology fuelled by Pu-239 to produce energy and more of Pu-239.
- By the end of the second stage of the cycle, the reactor would have produced more fissile material than it would have consumed, thus earning the name “Breeder.”
- **Third stage** - It would involve the use of Pu-239 recovered from the second stage, in combination with thorium-232, to produce energy and U-233 — another fissile material — using Thermal Breeders. **This production of U-233 from thorium-232 would complete the cycle.**

Nuclear Reactors in India

- **Nuclear Power Corporation of India Ltd** is the public sector enterprise, under the Department of Atomic Energy, entrusted with the task of nuclear power generation in the country.
- Currently, there are 22 operational nuclear reactors in India with a total installed capacity of 6780 Mwe. These are:
 - Tarapur 1 & 2 (BWR) – 2X160 MW; Rajasthan 1 to 6 (PHWR) – 100 +200 + 4X220 MW
 - Madras 1 & 2 (PHWR) – 2X220 MW; Kudankulam 1 & 2 (PWR) – 2X1000 MW
 - Narora 1 & 2 (PHWR) – 2X220 MW; Tarapur 3 & 4 (PHWR) – 2X540 MW
 - Kaiga 1 to 4 ((PHWR) – 4X220 MW; Kakrapar 1 & 2 (PHWR) – 2X220 MW
- Besides, Kakrapar Unit-3, the first reactor in the 700 MWe PHWR series, has been commissioned in July 2020.
- In addition, 10 nuclear power reactors with a total of 8000 MW capacity are under construction.
- This includes a 500 MWe Prototype Fast Breeder Reactor (PFBR) of the second stage of the nuclear power Programme. It is being constructed by **Bharatiya Nabhikiya Vidyut Nigam Limited (BHAVINI)**.
- On progressive completion of the projects under construction and accorded sanction, **India’s nuclear power capacity is expected to reach 22480 MW by the year 2031.**

Relevance of Nuclear Energy

- **Economic and Strategic Vulnerability** - Currently, India draws nearly 63 per cent of its total energy generation from thermal sources.
 - Of this, nearly 55 per cent is met from coal and the rest from gas, with a minuscule amount from oil-fired plants.
 - India imports a significant part of its fossil fuels which raises economic and strategic vulnerabilities.
- **Environment friendly** - India’s per capita carbon emissions stand at 1-1.2 tons, compared to 20 tons per capita of the US. If a growing Indian economy continues to rely on coal, carbon emissions are bound to rise.
- **Limitations of Renewable Energy** - solar and wind energy generation is **land-intensive**. Solar plants carry a dependence on imported technology.

Another solar and wind power generation related handicap is in energy storage, which makes them unsuitable as a baseload source of electricity.

Conclusion

- India is the third-largest producer of electricity in the world. Yet, at 1181 kWh in 2018-19, the per capita electricity consumption is low (Canada - 17179 kWh, 13338 kWh in the US).
- India needs to scale up electricity production to assure a reasonable quality of life for citizens.
- **Such requirements make the choice for India, not between nuclear and renewable, but to include all available sources.**

THE HIMALAYAN FLOODS

The Himalayas are drained by the rivers Indus (west) and the Brahmaputra (east). The Ganga River system largely drains the central part of the Himalayas.

Himalayas: Prone to Disasters

- Over the last few decades, urbanisation has led to a dramatic increase in the population living in the mountain belt.
- Rise in atmospheric temperature further increases the available atmospheric energy and total precipitation, which in combination with mountain fragility and the growing urban centers is a perfect condition for disasters.
- E.g. - The 2010 floods of Leh, 2013 Kedarnath floods, and 2021 Rishiganga floods.
- The reports of inter-governmental panel on climate change (IPCC-2019) indicate an overall **increase in the frequency of high-intensity rainfall events** in the Himalayas.

The Himalayas & Flood

- The Himalayan Mountain belt, tectonically, is divisible into from north and south: the Indus Suture Zone (ISZ) of Ladakh; the Tethyan Himalaya; the Higher Himalayan Crystalline zone; the Lesser Himalaya; and the Siwalik of outer Himalaya.

The Indus Suture Zone (ISZ) of Ladakh

- The ISZ lies in the **rain shadow zone of the Indian Summer Monsoon (ISM)**, where the scanty rainfall occurs mostly under the influence of westerlies.
- The area is devoid of vegetation and due to extreme temperatures, physical weathering of rocks occurs that forms a thick debris mantle on hill slopes.
- This debris mantle during excessive snow melting and rainstorm events, fail and block small and large streams that breach subsequently to create floods.

The Tethyan Himalaya

- This belt also behaves in a similar manner even though it lies at the northern fringe of ISM and receives a slightly higher amount of rainfall as compared to ISZ.

The Higher Himalayan Crystalline zone

- The higher Himalayan Crystalline zone receives full spectrum of ISM rainfall. This zone is characterized by steep hill slopes and deep gorges with high gradient drainage systems.

The Lesser Himalaya and Outer Siwalik

- The Lesser Himalaya and outer Siwalik Himalaya are gentler and also receive a high amount of ISM rainfall.

- The headwaters of the rivers like Indus, the Ganga, and the rivers draining the central Himalayan ranges lie in rain deficient arid zones where extreme rainfall events can potentially create glacial/moraine-dammed lake outbursts, and massive snowmelt, leading to a flood.
- However, the headwater of the Brahmaputra, due to different orography and elevation receives less rainfall and downstream catchment receives higher rainfall.

These constraining characteristics between the two systems create floods that have discharges of different magnitude.

- Therefore, flood magnitude in the Himalayas is controlled by **geology, orography and rainfall distribution**.
 - In general, the large floods in Himalayas are caused by intense rainfall events, landslide dammed lake outbursts, glacial dammed Lake outbursts, cloud bursts.
 - However, the magnitude of flood is a function of overall geology, orography, catchment-wide distribution of lakes, landslide zone, and rainfall.

Few Examples

- The **2013 Kedarnath incident** in the Garhwal Himalayas - Widespread rainfall in combination of a breach of a moraine-dammed lake in the Chaurabari glacial region was responsible.
- **Landslide activity** that generally occurs during monsoon or an earthquake may potentially dam small channels for a longer duration. **These dams may breach and cause floods in the downstream regions**. E.g., breach of Gohna Tal of Birahi Ganga in 1970.

Flood Mapping

- Mapping of floods has four elements: (i) vertical rise in river level, (ii) rate of rising of flood, (iii) flow velocity, and (iv) lateral inundation of flood plains.
- Flood mapping is normally done at river gauging stations which are equipped with state-of-the-art Internet of Things (IoT) and radars to quickly transmit the data to remote locations and flood management centres.

Radars can help in tracking the locations of intense rainfalls and the temporal evolution of the storm.

- The **lateral extent of flood inundation** can be mapped using **satellite images and LiDAR (Light Detection and Ranging) data**.
- The **flood velocities** are generally measured using current meters, acoustic Doppler current profilers, tracers, and floaters.

The most precise would be Doppler current profiler as it can measure flow velocity at different depths and can average out the turbulence.

- Sediment load of floodwaters can be measured by sediment monitoring gauges or sensors equipped with Laser In-Situ Scattering or by physically sampling during the time of the flood.
- **Satellite data** can also help in getting generalised ideas on sediment load.

Reducing Flood Vulnerability in the Himalayas

- Proper understanding of the orography of the Himalayas and how past flood events have interacted with it and what were the damage patterns can help in preparing the **damage predictive models of the Himalayas**.
- The foremost towards this is **monitoring at various levels** like installing a dense network of flood gauging systems and Radar in various drainage basins in the Himalayas, channelling all the real-time data to flood management centres using IoT.

- **Landslide and glacial lake monitoring systems** should be in place and be linked to flood management centres via IoT.
- The combination of data on flood levels, flood hydrographs, and lateral inundation can be used to manage the floods and minimise the destruction.
- The **inundation maps** combined with maps of social infrastructure, should be analysed on GIS platforms and Artificial Intelligence (AI) using long time series of datasets. It will provide predictive models of flood events and damage patterns.

GEOMAGNETISM: APPLICATIONS

The very survival of all the life forms on earth is interminably related to the existence of this geomagnetic field. It has many social applications and has potential to impact all of humanity.

Indian Institute of Geomagnetism (IIG)

- IIG was established as an institution to conduct research in the field of geomagnetism. The research areas covered by IIG ranges from exploration of the interior of the earth to understanding the vast dynamics of sun.
- IIG was given a separate and independent mandate in 1971. The year **2021 marks the golden jubilee of the foundation of IIG.**

Application of Geomagnetism

1. Providing information regarding the regional geology and tectonic framework

- The magnetic minerals embedded in crustal rocks are harnessed to understand the regional deformities and structural framework of the continental and oceanic realm.
- The mineralised zones and geo-tectonic fault categorisation become easier with remotely sensed magnetic data.
- Hence, this field can give information regarding the regional geology (natural resources) and tectonic framework of India (faults, lineaments, weak planes).

2. Understanding climate changes and environmental fluctuations

- Magnetic minerals are quite stable in the unchanging physico-chemical domain but are quite sensitive to the changes in those circumstances.
- They alter themselves to maintain equilibrium with the surrounding. Degree and phase change in magnetic mineralogy can be associated with a climatic or environmental process.

3. Information about continental migration

- Magnetic minerals also tell us about continental migration. Before the era of GPS, paleomagnetism was used to understand the direction and quantum of the plate movement.

Paleomagnetism is the **study of magnetic rocks and sediments** to record the history of the magnetic field.

- The realisation of the **presence of magnetic banding in the oceans** ultimately led to the formulation of the concept of plate tectonics and seafloor spreading.
- It revolutionised the way scientists thought about investigating natural resources. The **plate boundaries and faulting zones were found to be the ideal candidates for mineralisation.**

- Paleomagnetism tied all the diverse and distant plates with the grand continent, Pangaea and its later subsidiaries like Gondwanaland and Laurasia.

4. Determination of age of rocks and sediments

- The **reversals that are generated are recorded in the rocks and sediment-containing magnetic minerals.**
- These polarity reversals and the normal polarity of the earth are used as a relative timescale to magnetically date the rocks and sediments.

5. Understanding the dynamics of earthquake

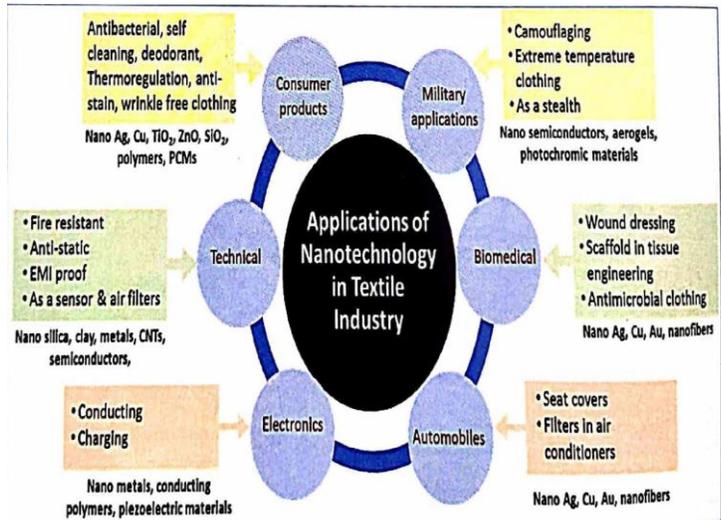
- The earthquake generated waves while traversing the subsurface or surface perturb the atmosphere. This perturbation **sends shock waves into the atmosphere** through the ionosphere. These waves can be used to understand the dynamics of seismicity.

NANOTECHNOLOGY IN TEXTILES

Nanotechnology is being applied in various fields due to its ability to change physical, chemical, electronic, optical, thermal, magnetic and biological properties of the matter because of its ultra-small size of less than 100 nm.

Application of Nanotechnology in Textile industry

- A **nano silver-based suspension** that can be applied on the fabric surface to get antibacterial activity.
- The antimicrobial textiles are most essential in the medical sector, especially in the present deadly pandemic conditions.
- Recently, ARCI has demonstrated coating of copper oxide nanoparticles doped with a trace amount of silver in the active layer in the face mask to **give protection against the SARS-CoV-2 virus.**
- Titanium dioxide (TiO₂) is another strong antimicrobial material. Any surface coated with TiO₂ gets self-cleaned, when exposed to the sunlight.
- The Phase Change Material (PCM) is incorporated into the fabric to attain the property of thermoregulation.
- The fabric can be used as a sensor or charger by functionalising with **Piezoelectric nanocrystals** which can convert mechanical load into electrical energy. This electrical signal can be used to **sense a heartbeat or to charge a small battery.**



Conclusion

- A proper study is necessary to find any toxic effects of handling or wearing the nanomaterials to eliminate any health risks due to short or long-time exposure.
- For example, nano-silver application on textiles was studied for leaching of silver in water while washing the fabric, and it achieved its concentration within safe limits.

VAJIRAM & RAVI

LIGHT HOUSE PROJECTS

- On January 1, 2021, the PM laid the foundation of the **six Light House Projects (LHPs)**. These are called Light Houses as **these projects have a demonstrative effect** wherein people from all sectors will be able to see and get exposed to site and learn the use of technologies on the ground.
- Light House Projects were conceived within the larger fold of **Global Housing Technology Challenge-India (GHTC-India)** under the Housing for All programme.

Pradhan Mantri Awas Yojana – Urban (PMAY-U)

- PMAY-U was launched in June 2015 with an aim to **provide all-weather pucca affordable houses to all eligible urban households by the year 2022**.
- So far, against a validated demand of 11.2 million houses under the scheme, 11.2 million have been sanctioned. Out of this over 8.4 million have been grounded for construction, and more than 5 million have been completed and delivered to the beneficiaries.

Need For Cutting Edge Technologies

- In order to comprehensively address the housing shortage in a time-bound manner, there was an urgent need to explore new and emerging, disaster-resilient, environment-friendly, cost-effective, and speedy construction technologies.
- As a result, Global Housing Technology Challenge-India (GHTC-India) was initiated in January 2019.
- GHTC-India aspires to develop an eco-system to deliver on the technological challenges of the housing construction sector in a holistic manner.

The Six Light House Projects

- 54 innovative technologies from across the world were shortlisted and grouped into six broad streams or categories as per their suitability for different geoclimatic regions of the country.
- Out of these, six distinct technologies were taken up for the construction of innovative projects in six states across the country. Indore (Madhya Pradesh); Rajkot (Gujarat); Chennai (Tamil Nadu); Ranchi (Jharkhand); Agartala (Tripura), and Lucknow (Uttar Pradesh).
- These six LHPs were introduced as a pilot project so that they may be replicated for construction in other development projects.



Technograhis

- On the line of Satyagrahis and Swachhagrahis, a **program of 'TECHNOGRAHIS'** was launched in February 2021 for free enrolment of all stakeholders interested in learning different phases of use of innovative technologies in LHPs.
- Technograhis will be the change agents of innovative and sustainable technologies to Transform the Urban Landscape for the New Urban India.

Technology Innovations in LHP sector

- The technological adaption will get framed under the **NAVARITI**, a short-term online certificate course intended to enhance the capability of the building professionals.

- An online course on **Vulnerability Atlas of India** would be useful in the evaluation of the multi-hazard profile of the region and incorporating them in DPRs.

Conclusion

- These Light Houses will stand out for India's pursuit of innovation, excellence, adaptation, and self-reliance (Aatmanirbhar) in construction methods and provide better homes with people being at the core of each action.
- Adoption of these innovative technologies would contribute towards achieving the Sustainable Development Goals as laid out by the United Nations, the New Urban Agenda, and the Paris Climate Accord.

DRONE POLICY

The first drones were imported into India from Israel for use in active combat. India's DRDO has since then developed numerous indigenous drones.

iDEX: Promoting innovations in Defence

- In June 2021, the Ministry of Defence announced a scheme **under Innovations for Defence Excellence (iDEX)**.
- iDEX is the **executive arm** of the Defence Innovation Organisation (DIO) and is responsible for creating an ecosystem that fosters indigenous innovation and technological development in India's defence and aerospace sectors.
- It engages with MSMEs, start-ups, innovators, academics, and R&D institutions to evaluate technologies for scalability and aids the armed forces in technological adoption.

Rules 2021

- In July 2021, the Government released a draft policy for drones that is built on a premise of trust, self-certification and non-intrusive monitoring. It is designed to usher in an era of super-normal growth while balancing safety and security considerations.
- The new policy **qualifies drones into five classifications** based on their maximum all-up weight, including the payload. Mini drones can be as light as less than 250 grams while large drones can weigh over 150 kilograms.
- To ease the civilian purchase and use of drones, the **price for obtaining a remote pilot licence has been reduced** significantly to INR 100 and de-linked from the size of the drone. Remote pilot licences will now also be valid for up to 10 years.
- The **govt no longer mandates any licences** for the operation of neither a mini (less than 250 grams) nor a pilot licence to operate nano (greater than 250 gms and less than or equal to 2 kg) drones.
- **Requirements for security clearance** before issuance of any registration or licence have also been removed. However, all drones must be qualified with a **certificate of airworthiness** before they can be operated.
- The Ministry of Civil Aviation will soon release its **Digital Sky programme**, intended as a **single window for required clearances**, which have been reduced from 25 to 5.
- The Ministry will also release an **interactive airspace map** on its website that will show three zones - yellow (controlled airspace), green (no permission required), and red (flying not permitted) so that the drone users can know where they may operate their UASs. In a significant change, a previous no-fly radius of 45 kilometres around airports has now been reduced to 12 kilometres.

Indian Drone Market

- India is already the fastest-growing drone market in the world. A January 2020 report by PwC suggested that the market size of drones in India would be USD 885 million. It is expected to reach USD 1,810 million by FY 2026.
- India is currently the **third-largest importer of military-grade drones** with 6.8% of total UAVs imports, as per SIPRI report.
- To reduce dependence on imports, **DRDO has launched several programmes to develop and deploy UAVs in India.**
- There are over 185 start-ups engaged in the development of drones for various purposes, including military usage, surveillance, deliveries, agricultural purposes, visual mappings etc.

The country has emerged as one of the **leading destinations for global FDI** despite the Covid-19 pandemic.

Total FDI inflows into **India grew by 13% in 2020**, even as global FDI declined by 42%.

SCIENCE EDUCATION

Many schemes and programmes are being run by the Department of Science & Technology (DST) for school students. These schemes are being implemented with an objective to promote and popularise science among students.

Various Programmes Run by Dept of S&T (DST)

1. INSPIRE Programme and MANAK Scheme

- **Innovation in Science Pursuit for Inspired Research (INSPIRE)** programme is implemented by National Innovation Foundation (NIF) to encourage students to pursue science as a Career.
- INSPIRE Scheme has included three programmes - (a) Scheme for Early Attraction of Talents for Science (SEATS), (b) Scholarship for Higher Education (SHE), and (c) Assured Opportunity for Research Careers (AORC).
- The INSPIRE Awards - **MANAK** (Million Minds Augmenting National Aspirations and Knowledge) Scheme is being executed by DST with NIF.
- It aims to motivate students in the age group of 10-15 years and studying in classes 6 to 10. The objective is to **target one million original ideas/innovations** rooted in science and societal applications to foster a culture of creativity and innovative thinking among school children.

2. 'Vigyan Jyoti' and 'Engage with Science'

- Both the programmes are mandated to create a **level-playing field for the meritorious girls** in high school to pursue Science, Technology, Engineering, and Mathematics (STEM) in their higher education.
- It also offers **exposure to girl students from rural backgrounds** to help plan their journey from school to a job of their choice in the field of science.
- **Vigyan Jyoti** is a programme to promote STEM learning among girl students from grades 9 to 12 to pursue STEM in their higher education, especially from the top colleges in the areas where girls are hugely underrepresented.
- **Engage with Science** aims to build interest and create a community of practice with students, teachers, and scientists connecting the high-school students to the higher education institutions.

3. Vidyarthi Vigyan Manthan Programme (VVM)

- It is a national programme for popularising science among school students of standard VI to XI.
- It is conceptualised to identify the bright minds with a scientific aptitude among the student community.

4. Kishore Vaigyanik Protsahan Yojana (KVPY)

It is implemented by the Indian Institute of Science (IISc), Bangalore to encourage students who are studying Basic Sciences to take up a research career in science.

5. National Children's Science Congress

- It is also referred to as **Children's Science Congress (CSC)** at the district and state levels.
- It is a nationwide Science Communication programme of the National Council for Science and Technology Communication.
- Children's Science Congress forum, available to children in the age group between 10-17 years, prompts children to think of some significant societal problems, ponder over its causes, and subsequently try and solve the same using the scientific process.

6. JIGYASA Programme

- CSIR has launched a student-scientist connect programme JIGYASA, in collaboration with Kendriya Vidyalaya Sangathan (KVs) with the primary objectives of extending the classroom education and focusing on well-planned research laboratory-based learning.
- Jigyasa is planned to **inculcate the culture of inquisitiveness**, along with the scientific temper amongst the school students and their teachers.

7. Atal Innovation Mission (AIM)

AIM was launched to create and promote a culture of innovation and entrepreneurship across the country.

NUTRITION AND VACCINATION

- Today the world faces a **double burden of malnutrition** that includes both undernutrition and obesity.
- Women are at a greater risk of malnutrition due to the increased nutritional requirements associated with menstruation, pregnancy, and lactation.
- According to the Comprehensive National Nutrition Survey report (2016— 2018), 35% of Indian children aged 0-4 years are stunted, 17% are wasted, and 33% were underweight.

Initiatives on Nutrition

1. Anganwadi Service Scheme (launched in 1975)

- It represents one of the world's largest and unique programmes for Early Childhood Development.
- **Delivers a package of six services:** supplementary nutrition, pre-school non-formal education, nutrition & health education, immunisation, health check-up, and referral services.
- **Beneficiaries** – Pregnant women and lactating mothers; Operational through Anganwadi Centres

2. POSHAN Abhiyan (launched 2018)

- It attempts to deliver a high impact package of interventions for first 1,000 days of life, along with multi-sectoral convergence, and bringing out behavioural change through Jan Andolan.

- Target is to bring down stunting of children aged under 6 years from 38.4% to 25%, by the year 2022.
- 3. Pradhan Mantri Matru Vandana Yojana (PMMVY)** (launched in 2016)
- It is a maternity benefit programme which provides partial compensation for wage loss in terms of cash incentives of Rs 5000.
 - It is provided to the **pregnant women & lactating mothers** for the first child given in three instalments, subject to fulfilling specific conditions related to maternal and child health.
- 4. Scheme for Adolescent Girls**
- It is aimed at fulfilling the multi-dimensional needs of out- of-school adolescent girls (11-14 years).
 - A package of following services is provided to adolescent girls: i. Nutrition supplies ii. Iron and Folic Acid (IFA) supplementation iii. Health check-up and Referral services iv. Nutrition & Health Education V. Mainstreaming out-of-school girls to join formal schooling Vi. Life Skill Education, Counselling, etc.
- 5. National Programme of Mid-Day Meal in Schools**
- It is implemented by the Ministry of Education, wherein one mid-day meal is provided to children as per the nutritional standards given in the Schedule-II of the National Food Security Act, 2013.
- 6. Anemia Mukh Bharat**
- It was launched for prevention and treatment of anemia in children (5-9 years) and adolescent girls and boys (10-19 years).
- 7. Initiatives on Vaccination**
- **Universal Immunisation Programme (UIP)** was launched in 1985.
 - The programme **consists of vaccination for 12 diseases-** tuberculosis, diphtheria, pertussis (whooping cough), tetanus, poliomyelitis, measles, hepatitis B, diarrhoea, Japanese encephalitis, rubella, pneumonia (haemophilus influenzae type B). and Pneumococcal diseases (pneumococcal pneumonia and meningitis).
 - Universal Immunisation Programme is **one of the largest public health programmes** in the world. It targets around 2.9 crore pregnant women and 2.67 crore new-born annually.
 - **Mission Indradhanush** was Launched in December 2014 to increase immunisation coverage for children and pregnant women in India from 65% in 2014 to at least 90% in the next five years through special catch-up drives.
 - **Intensified Mission Indradhanush 2.0** – It will focus the districts which have immunisation coverage of 70% or below. This aims to achieve the SDG of ending preventable child deaths by 2030.
 - **Intensified Mission Indradhanush (IMI) 3.0** –Focus of IMI 3.0 will be the children and pregnant women who have missed their vaccine doses during the Covid-19 pandemic.
- 8. Covid-19 Vaccination**
- The Covid-19 vaccination utilises the existing infrastructure of the Universal Immunisation Programme (UIP).
 - A unique **digital platform- Co-WIN** supports the vaccination activity, helps the programme managers in registration and tracks every beneficiary for Covid-19 vaccination along with real-time information.

