COMPILATION OF APPSC GROUP-1 MAINS SCIENCE AND TECHNOLOGY REVISION SERIES REMAINING TOPICS WHICH ARE NOT UPLOADED IN GROUPS MASTER YOUTUBE CHANNEL.

Index:

Topic-1.5: Major Scientific Institutes For Science And Technology In AP And India

Major Scientific Institutes For Science And Technology In AP

Andhra Pradesh is home to several major scientific institutes for science and technology. Here are some notable institutes in AP:

Indian Institute of Science Education and Research, Tirupati: IISER Tirupati is a public research and education institute in Tirupati, Andhra Pradesh, India. It has been established by the Ministry of Human Resource Development, in order to promote Higher Scientific Learning and Research as well as Scientific Exploration at the Undergraduate and Postgraduate levels of education and to create Scientists and Academicians of the highest quality. IISERs are destined to become Science Institutions of the highest caliber and reach the prestigious position and global setting that IISc, IITs and IIMs currently enjoy. IISER Tirupati is recognized as an Institute of National Importance by the Government of India.

Indian Institute of Technology Tirupati (IIT Tirupati): Established in 2015, IIT Tirupati is one of the premier engineering and technology institutes in AP. It offers undergraduate, postgraduate, and doctoral programs in various fields of engineering and technology.

National Institute of Technology (NIT) Andhra Pradesh: NIT Andhra Pradesh is an autonomous technical institute and one of the 31 NITs in India. It is a public technical university and one of the National Institutes of Technology started by the Government of India and is situated at Tadepalligudem, West Godavari District, Andhra Pradesh State. It is recognised as an Institute of National Importance by the Government of India. It offers undergraduate, postgraduate, and doctoral programs in engineering, technology, and sciences.

Acharya N. G. Ranga Agricultural University (ANGRAU): ANGRAU is a renowned agricultural university in Guntur, Andhra Pradesh. It offers undergraduate, postgraduate, and doctoral programs in agriculture, horticulture, veterinary science, and other related fields.

Institute of Chemical Technology (ICT), Visakhapatnam: ICT Visakhapatnam is a leading institute in the field of chemical engineering and technology. It offers undergraduate, postgraduate, and doctoral programs in various branches of chemical engineering.

All India Institute of Medical Sciences Mangalagiri: All India Institute of Medical Sciences Mangalagiri (also known as AIIMS Mangalagiri or AIIMS-M, AIIMS-MG) is a public medical research institute located in Mangalagiri, Guntur, Andhra Pradesh. It was established in 2018. The prime objective of AIIMS Mangalagiri is to impart excellent medical attention and healthcare facilities and along with education and research to areas under-served of all such aspects.

Andhra Pradesh Space Applications Centre (APSAC): Andhra Pradesh Space Applications Centre (APSAC) is an autonomous scientific organization under ITE & C Department, Government of Andhra Pradesh, registered under AP societies Registration Act, 2001 and is a nodal agency for remote sensing, GIS and GPS applications in Andhra Pradesh.

Homi Bhabha Cancer Hospital & Research Centre, Visakhapatnam: It is a cancer care hospital and research centre located in Visakhapatnam. This regional cancer centre is funded by the Government of India and Tata Memorial Centre. The Indian Council of Medical Research has recognized this referral Institution as a research organization. Homi Bhabha Cancer Hospital & Research Centre is supported by Bhabha Atomic Research Centre and Tata Memorial Centre.

National Atmospheric Research Laboratory(NARL): It is an autonomous Research Institute funded by the Department of Space of the Government of India. It i slocated at Gadanki, Andhra Pradesh. NARL is engaged in fundamental and applied research in the field of Atmospheric Sciences. The research institute was started in 1992 as National Mesosphere-Stratosphere-Troposphere (MST) Radar Facility (NMRF). Over the years many other facilities such as Mie/Rayleigh Lidar, Lower atmospheric wind profiler, optical rain gauge, disdrometer, automated weather stations etc. were added.

These are some of the major scientific institutes for science and technology in Andhra Pradesh. They contribute significantly to research, innovation, and technical education in the state.

Major Scientific Institutes For Science And Technology In India

India is home to several major scientific institutes for science and technology. Here are some of the prominent ones:

Indian Institutes of Technology (IITs): The IITs are a network of premier engineering and technology institutes located across India. They offer undergraduate, postgraduate, and doctoral programs in various disciplines of engineering, science, and technology. Some of the well-known IITs include IIT Bombay, IIT Delhi, IIT Madras, and IIT Kanpur.

Council of Scientific and Industrial Research (CSIR): CSIR is one of the world's largest publicly-funded research and development organizations. It comprises several national laboratories and institutes across India. CSIR conducts research in various fields such as chemistry, biology, physics, engineering, and environmental sciences.

Indian Space Research Organisation (ISRO): ISRO is the national space agency of India. It is responsible for the country's space research, satellite development, and launch missions. ISRO operates several research centers and institutes, including the Vikram Sarabhai Space Centre (VSSC) in Thiruvananthapuram and the Indian Institute of Space Science and Technology (IIST) in Thiruvananthapuram.

Tata Institute of Fundamental Research (TIFR): TIFR is a premier research institution focused on fundamental research in physics, mathematics, chemistry, biology, and computer science. It has its main campus in Mumbai and operates several national centers and campuses across India.

Indian Statistical Institute: It is a renowned institution dedicated to the research, teaching, and application of statistics, natural sciences, and social sciences. It has multiple campuses, with the main campus in Kolkata and branches in Delhi, Chennai, Bangalore, and Tezpur.

Bhabha Atomic Research Centre (BARC): BARC is India's premier nuclear research facility, involved in nuclear science, nuclear engineering, and related areas. It is located in Mumbai and conducts research in various domains, including nuclear physics, materials science, and radiation biology.

National Centre for Biological Sciences (NCBS): NCBS, located in Bangalore, is a leading research institution in the field of biology. It focuses on areas such as molecular biology, genetics, neuroscience, and ecology.

Indian Association for the Cultivation of Science (IACS): IACS, located in Kolkata, is a renowned institute for fundamental research in chemical sciences. It offers research programs in various disciplines of chemistry.

These are just a few examples of the major scientific institutes for science and technology in India. The country has a rich and diverse scientific landscape, with numerous institutions contributing to research, innovation, and technological advancements in various fields.

Topic-1.6: Major Scientific Institutes For Research And Development In AP And India

Major Scientific Institutes For Research And Development In Andhra Pradesh

Indian Institute of Science Education and Research, Tirupati: IISER Tirupati is a public research and education institute in Tirupati, Andhra Pradesh, India. It has been established by the Ministry of Human Resource Development, in order to promote Higher Scientific Learning and Research as well as Scientific Exploration at the Undergraduate and Postgraduate levels of education and to create Scientists and Academicians of the highest quality. IISERs are destined to become Science Institutions of the highest caliber and reach the prestigious position and global setting that IISc, IITs and IIMs currently enjoy. IISER Tirupati is recognized as an Institute of National Importance by the Government of India.

National Institute of Technology Andhra Pradesh: It is a public technical university and one of the National Institutes of Technology started by the Government of India and is situated at Tadepalligudem, West Godavari District,

Andhra Pradesh State. It is recognised as an Institute of National Importance by the Government of India.

Homi Bhabha Cancer Hospital & Research Centre, Visakhapatnam: It is a cancer care hospital and research centre located in Visakhapatnam. This regional cancer centre is funded by the Government of India and Tata Memorial Centre. The Indian Council of Medical Research has recognized this referral Institution as a research organization. Homi Bhabha Cancer Hospital & Research Centre is supported by Bhabha Atomic Research Centre and Tata Memorial Centre.

Institute for Financial Management and Research: IFMR – Graduate School of Business at Krea University is a private business school located at Sri City, in Andhra Pradesh, India, about 70 km from Chennai. IFMR offered a 2-year PGDM program which is accredited by AICTE till 2016. Currently it offers a 2-year MBA program. It is an approved institution by the University of Madras for pursuing a Ph.D. degree in Finance, Economics and Management. Institute for Financial Management and Research was ranked 53 in India by the National Institutional Ranking Framework (NIRF) management ranking in 2020.

National Atmospheric Research Laboratory(NARL): It is an autonomous Research Institute funded by the Department of Space of the Government of India. It i slocated at Gadanki, Andhra Pradesh. NARL is engaged in fundamental and applied research in the field of Atmospheric Sciences. The research institute was started in 1992 as National Mesosphere-Stratosphere-Troposphere (MST) Radar Facility (NMRF). Over the years many other facilities such as Mie/Rayleigh Lidar, Lower atmospheric wind profiler, optical rain gauge, disdrometer, automated weather stations etc. were added. The NMRF was then expanded into a research institute and renamed as National Atmospheric Research Laboratory on 22 September 2005.

Naval Science and Technological Laboratory (NSTL): It is an Indian defence laboratory of the Defence Research and Development Organisation (DRDO). It is located in Visakhapatnam and its main function is the research and development of underwater weapons and associated systems. NSTL is organized under DRDO's Directorate of Naval R&D. NSTL was established on 20 August 1969 to undertake

research and development of major naval systems and underwater weapons for the Indian Navy to make it self-reliant. NSTL is equipped with laboratories and Hydrodynamic research facilities.

NSTL is involved in the design, development, testing, evaluation and productionization of underwater weapons and their associated weapon control systems. These include torpedoes, mines, decoys, targets, simulators, Fire Control Systems and weapon launchers.

NSTL also develops specialized materials for Marine Applications, including materials for mitigation of Radar, IR, Magnetic, Acoustic and ELFE Signatures leading to stealthier platforms.

Fintech Valley Vizag: It is an initiative of the Government of Andhra Pradesh to promote business infrastructure in the state, and attract investors and multinational corporations to set up offices. Fintech Valley was founded by N. Chandrababu Naidu then Chief Minister of the Andhra Pradesh state in December 2016 with the goal of enhancing Visakhapatnam City as a financial technology capital in Andhra Pradesh.

In September 2016, AP government declared the Fintech Valley Project through a document titled 'Sunrise Andhra Pradesh Vision 2029' stating its objectives and the proposed state growth achievable by 2029 and in focusing on Fintech Valley will be developed as an innovation valley, and as one of the best financial centers in the world.

Major Scientific Institutes For Research And Development In India

India is home to several major scientific institutes dedicated to research and development across various disciplines. Here are some of the prominent ones:

Council of Scientific and Industrial Research (CSIR): CSIR is one of the largest research and development organizations in the world. It operates numerous laboratories and institutes across India, focusing on a wide range of scientific areas, including chemistry, biology, physics, engineering, and environmental sciences.

Indian Council of Agricultural Research (ICAR): ICAR is responsible for coordinating and promoting agricultural research and development in India. It operates several research institutes and agricultural universities across the country, conducting research in areas such as crop sciences, animal sciences, agricultural engineering, and fisheries.

Defence Research and Development Organisation (DRDO): DRDO is India's premier defense research organization. It is involved in the development of defense technologies and systems. DRDO operates various laboratories and institutes across India, specializing in areas such as aeronautics, electronics, materials science, and weaponry.

Indian Space Research Organisation (ISRO): ISRO is the national space agency of India. It conducts research and development in space science, satellite technology, and space applications. ISRO operates numerous research centers and institutes, including the Vikram Sarabhai Space Centre (VSSC), Space Applications Centre (SAC), and Indian Institute of Space Science and Technology (IIST).

Bhabha Atomic Research Centre (BARC): BARC is India's premier nuclear research facility. It is involved in nuclear research, development, and technology applications. BARC conducts research in various fields, including nuclear physics, materials science, radiation biology, and nuclear engineering.

Tata Institute of Fundamental Research (TIFR): TIFR is a leading research institute dedicated to fundamental research in physics, mathematics, chemistry, biology, and computer science. It operates research centers and institutes across India and has made significant contributions to scientific advancements.

National Physical Laboratory (NPL): NPL is the national metrology institute of India. It is responsible for maintaining and developing national standards of measurement and conducting research in the field of metrology and applied physics.

Indian Institute of Science (IISc): IISc is a premier research institution located in Bangalore. It offers research programs across various disciplines, including

science, engineering, and interdisciplinary areas. IISc is known for its contributions to advanced research and technological innovation.

These are some of the major scientific institutes for research and development in India. They play a crucial role in advancing scientific knowledge, driving technological innovations, and addressing national challenges across various domains.

Topic-1.7: Achievements Of Indian Scientist In The Field Of Science And Technology, Indigenous Technologies And Developing New Technologies

Achievements Of Indian Scientist In The Field Of Science And Technology indigenous Technologies And Developing New Technologies

Aryabhatta

He was an ancient Indian mathematician and astronomer who lived in the 5th century CE. He made significant contributions to the fields of mathematics and astronomy. Aryabhatta's most famous work is the Aryabhatiya, a treatise on mathematics and astronomy. He developed the concept of zero, place value system, and the use of decimal notation, which had a profound impact on the development of mathematics. Aryabhatta also accurately calculated the value of π (pi) and provided important theories on the motion of celestial bodies. His work laid the foundation for future advancements in Indian and global mathematics and astronomy.

Sushruta

Sushruta was an ancient Indian physician and surgeon who lived around the 6th century BCE. He is widely regarded as the Father of Surgery in India and made significant contributions to the field of medicine. Sushruta's teachings and surgical techniques were compiled in the Sushruta Samhita, an ancient text considered one of the earliest treatises on surgery. He performed various surgeries, including plastic surgery, cataract surgery, and lithotomy (removal of bladder stones). His expertise and knowledge of anatomy, instrumentation, and surgical procedures were highly advanced for his time, leaving a lasting legacy in the field of medicine.

Bhaskara II (Bhaskaracharya)

He was an influential mathematician and astronomer who lived in India during the 12th century CE. He made significant contributions to the fields of mathematics and astronomy, particularly in the study of calculus and trigonometry. Bhaskara II's most renowned work is the Siddhānta Shiromani, which consists of four sections: Leelavati (arithmetic), Bijaganita (algebra), Grahaganita (astronomy), and Golādhyāya (spherical trigonometry). He introduced innovative mathematical techniques, including differential calculus and infinite series approximations. Bhaskara II's works greatly influenced subsequent mathematicians and astronomers and played a vital role in the development of advanced mathematical concepts in India and beyond.

Sir Ronald Ross

He was born in India in 1857 in Almora district, located in present day Uttarakhand. He made significant contributions to the field of medicine, particularly in the study of tropical diseases, specifically malaria. He was awarded the Nobel Prize in Physiology or Medicine in 1902 for his discovery of the transmission of malaria through the Anopheles mosquito. Ross was also known for his mathematical skills. He developed mathematical models to understand the epidemiology of malaria, including the pattern of transmission and the dynamics of infection within populations.

Sir C.V. Raman

He was an eminent Indian physicist who made groundbreaking contributions to the field of optics and spectroscopy. In 1930, he discovered the phenomenon of Raman scattering, which established the existence of the Raman effect and led to a deeper understanding of the behavior of light when it interacts with matter. He discovered that, when light traverses a transparent material, some of the deflected light changes in wavelength. For this significant discovery, he was awarded the Nobel Prize in Physics in 1930. Raman's work continues to have a profound impact on various scientific disciplines, including physics, chemistry, and materials science.

Raman discovered 'The Raman Effect' on 28 February 1928 and this day is observed as the 'National Science Day' in India.

Subrahmanyan Chandrasekhar

He is best known for his discovery of Chandrasekhar Limit. He made transformative contributions to our understanding of stellar evolution and the structure of white dwarf stars. In 1930, while still a student, he calculated the maximum mass a white dwarf star can have before collapsing under gravitational forces, known as the Chandrasekhar limit. His discovery laid the foundation for our understanding of black holes and neutron stars. Chandrasekhar's remarkable insights earned him the Nobel Prize in Physics in 1983.

Har Govind Khorana

He was a biochemist and Nobel laureate who made groundbreaking contributions to the field of genetics and molecular biology. He is best known for his work on deciphering the genetic code and elucidating how the sequence of nucleotides in DNA controls the synthesis of proteins. Khorana played a key role in synthesizing the first artificial gene and demonstrating that DNA can be manipulated to produce specific proteins. For his groundbreaking research, he was awarded the Nobel Prize in Physiology or Medicine in 1968. Khorana's work paved the way for advancements in genetic engineering and the development of modern biotechnology.

Jagadish Chandra Bose

He was an eminent Indian physicist, biologist, and inventor. He is widely recognized for his pioneering work in the field of wireless communication and plant physiology. Bose conducted groundbreaking experiments to prove that plants have sensitivity and respond to external stimuli. He invented the crescograph, a device that measured plant responses to various stimuli, demonstrating their behavior in real-time. Bose also made significant contributions to the development of radio and microwave technology, predating the work of Guglielmo Marconi. His work laid the foundation for modern wireless

communication technology. Bose's interdisciplinary approach and innovative research greatly influenced subsequent generations of scientists.

P.C. Mahalanobis

He was an Indian scientist and statistician who made significant contributions to the field of statistics and its applications in social and economic planning. He played a crucial role in shaping the statistical infrastructure in India. Mahalanobis was instrumental in establishing the Indian Statistical Institute (ISI) in 1931, which became a center of excellence for statistical research and education. He developed the Mahalanobis Distance, a statistical measure used in multivariate analysis. Mahalanobis also pioneered the concept of a National Sample Survey to gather reliable statistical data for policy formulation. His work had a profound impact on statistical theory, economic planning, and social sciences in India.

Homi Jehangir Bhabha

He was an Indian physicist who played a pioneering role in the development of nuclear science and atomic energy in India. He is known as the "Father of the Indian Nuclear Program." Bhabha was instrumental in establishing the Tata Institute of Fundamental Research (TIFR) in Mumbai, which became a center for cutting-edge research in physics. He made significant contributions to the field of cosmic rays and postulated the Bhabha scattering theory. Bhabha also played a crucial role in the establishment of the Atomic Energy Commission of India and the construction of India's first nuclear research facility, the Atomic Energy Establishment, Trombay (now known as Bhabha Atomic Research Centre). His visionary leadership and scientific acumen laid the foundation for India's nuclear program.

Vikram Sarabhai

He was an eminent Indian scientist and visionary who played a pivotal role in the development of India's space program. He is often referred to as the "Father of the Indian Space Program." Sarabhai established the Indian National Committee for Space Research (INCOSPAR), which later evolved into the Indian Space Research Organisation (ISRO). Under his leadership, India launched its first

satellite, Aryabhata, in 1975. Sarabhai was a proponent of using space technology for societal development, particularly in the areas of communication, meteorology, and education. He was also instrumental in establishing various institutions, including the Physical Research Laboratory and the Space Applications Centre. Sarabhai's vision and determination laid the foundation for India's achievements in space exploration and technology.

Varghese Kurien

He was an Indian engineer and social entrepreneur who played a transformative role in revolutionizing India's dairy industry. Known as the "Father of the White Revolution," Kurien was the driving force behind the success of Amul, a cooperative dairy brand in India. He established the Gujarat Co-operative Milk Marketing Federation (GCMMF) and implemented the Anand pattern of dairy cooperatives, empowering farmers and rural communities. Kurien's efforts led to increased milk production, improved livelihoods for farmers, and the creation of a robust dairy industry. His model of cooperative dairy development has been replicated globally, making a lasting impact on agricultural and rural development. Kurien's dedication and vision earned him numerous accolades, including the Ramon Magsaysay Award and the World Food Prize.

M.S. Swaminathan

M.S. Swaminathan is an eminent Indian agricultural scientist who has made significant contributions to the field of agriculture and food security. He is hailed as the "Father of the Green Revolution in India." Swaminathan played a crucial role in introducing high-yielding varieties of wheat and rice, along with modern agricultural practices, which led to a substantial increase in crop productivity and helped alleviate hunger and poverty in India. He emphasized the importance of sustainable agriculture, conservation of biodiversity, and the empowerment of small-scale farmers. Swaminathan's work has earned him global recognition, including the World Food Prize and the UNESCO Peace Prize, and he continues to advocate for sustainable and inclusive agriculture worldwide.

A. P. J. Abdul Kalam

He was an eminent Indian scientist, engineer, and statesman who served as the 11th President of India from 2002 to 2007. Kalam played a key role in India's missile development program and is regarded as the "Missile Man of India." He made significant contributions to the field of aerospace engineering and was instrumental in the development of India's indigenous guided missile systems. He played a crucial role in the evolution of ISRO's launch vehicle program, including the development of the Polar Satellite Launch Vehicle (PSLV) configuration. Additionally, he was responsible for the development and operation of the Agni and Prithvi missiles, which are vital components of India's strategic missile program.

Kalam was known for his vision and dedication to scientific and technological advancement, as well as his commitment to education and youth empowerment. He was a renowned inspirational figure, often engaging with students and encouraging them to pursue science and innovation. Kalam's humility, intellect, and leadership qualities earned him immense respect and admiration both in India and globally.

Topic-2.4: IT Development In AP And India

IT Development In AP

Andhra Pradesh (AP) has been actively promoting and developing the Information Technology (IT) sector to drive economic growth and create employment opportunities. Here are some key aspects of IT development in AP:

IT Parks and Special Economic Zones (SEZs): The government of Andhra Pradesh has established dedicated IT parks and SEZs to attract IT companies and foster their growth. Some prominent IT parks in AP include the Vishakhapatnam IT Park, Cyber Towers in Vijayawada, and Tech Mahindra IT Park in Tirupati. These parks provide infrastructure, connectivity, and facilities to IT companies.

Incubation Centers and Start-up Ecosystem: AP has been focusing on nurturing a vibrant start-up ecosystem by setting up incubation centers and providing support

to entrepreneurs. The Andhra Pradesh Innovation Society (APIS) and the Atal Incubation Centers (AICs) in various cities offer resources, mentorship, and funding opportunities to start-ups in the IT sector.

Skill Development Initiatives: To meet the demand for skilled IT professionals, the government of AP has launched various skill development initiatives. Programs such as Skill AP (Skilled in Andhra Pradesh) aim to enhance the employability of the youth by providing industry-relevant IT training and certifications.

Software Technology Parks of India (STPI): STPI has established centers in several cities of AP, including Visakhapatnam, Vijayawada, and Tirupati. These centers provide infrastructure support, incubation facilities, and other services to IT and IT-enabled services (ITeS) companies.

IT Policy and Incentives: The state government has formulated an IT policy to create a conducive environment for IT development. The policy offers incentives such as tax benefits, subsidies, and land allotment for IT companies. It also encourages research and development activities in the IT sector.

IT Events and Conferences: AP hosts various IT events and conferences to showcase its potential and attract investments. The annual Sunrise AP Summit and the Vizag Fintech Festival are examples of such initiatives that bring together industry leaders, investors, and policymakers to discuss and explore opportunities in the IT sector.

Industry Collaborations and Partnerships: The government of AP collaborates with leading IT companies, industry bodies, and educational institutions to promote IT development. Partnerships with industry giants like Tech Mahindra, HCL, and Wipro have resulted in the establishment of IT centers and training facilities in the state.

Development of IT Clusters:

- In recent years, Andhra Pradesh has focused on developing dedicated IT clusters to further foster the growth of the IT industry.

- The Visakhapatnam IT Special Economic Zone (VSEZ) was established in Visakhapatnam to promote IT and IT-enabled services.
- The development of IT clusters has led to increased job opportunities, infrastructure development, and collaboration between industry and academia.

Start-up Ecosystem:

- Andhra Pradesh has also witnessed the growth of a vibrant start-up ecosystem, with several start-ups emerging in sectors such as e-commerce, fintech, healthtech, and agritech.
- The state government has implemented various initiatives to support start-ups, including incubation centers, funding schemes, and mentorship programs.

Digital Initiatives:

- The government of Andhra Pradesh has undertaken various digital initiatives to promote e-governance and digital services.
- Projects like "e-Pragati" aim to provide a unified platform for citizens to access government services online.
- The state government has also launched initiatives to promote digital literacy and skill development in rural areas.

These initiatives collectively aim to position Andhra Pradesh as a major IT destination, fostering job creation, economic growth, and technological innovation. The state has witnessed significant progress in the IT sector, attracting investments and nurturing a thriving ecosystem for IT companies and start-ups.

IT Development In India

IT development in India has been a remarkable success story, with the country emerging as a global leader in the IT and software services industry. Here is an overview of the history and key aspects of IT development in India:

Early Years and Software Exports (1970s-1990s):

- The foundation of IT development in India was laid in the 1970s when the Indian government established the Indian Institutes of Technology (IITs) to promote technical education.
- In the 1980s, the government introduced policies to encourage software exports, leading to the establishment of software technology parks and special economic zones.
- Companies like Tata Consultancy Services (TCS) and Infosys emerged as pioneers, providing software services to clients abroad.

Liberalization and Offshore Outsourcing (1990s-2000s):

- The economic liberalization policies introduced in the early 1990s paved the way for significant growth in the IT industry.
- India became a favored destination for offshore outsourcing, attracting companies from the United States, Europe, and other regions.
- The Y2K bug and the need for software solutions contributed to the rapid expansion of IT services in India during this period.

Software Services and Global Dominance (2000s-2010s):

- India's software services industry experienced exponential growth during this period, with companies offering a wide range of services, including software development, maintenance, and testing.
- Indian IT companies like TCS, Infosys, Wipro, and HCL Technologies became global giants, competing with multinational corporations on a global scale.
- The global delivery model, based on offshoring and on-site delivery, gained prominence, enabling cost-effective and high-quality IT services.

IT-enabled Services and BPO (2000s-Present):

- Alongside software services, India witnessed significant growth in IT-enabled services, including business process outsourcing (BPO).
- Indian companies excelled in providing customer support, technical helpdesk services, and back-office operations for global clients.
- Cities like Bangalore, Hyderabad, Chennai, and Pune emerged as major IT and BPO hubs, attracting investments and talent.

Digital Transformation and Innovation (2010s-Present):

- India's IT industry has embraced digital transformation, focusing on areas like cloud computing, big data analytics, artificial intelligence (AI), machine learning, and the Internet of Things (IoT).
- Start-up culture has flourished in India, with Bengaluru (Bangalore) being dubbed the "Silicon Valley of India" and hosting numerous technology start-ups.
- Government initiatives like "Digital India" and "Make in India" have further propelled digital innovation and technology adoption across various sectors.

Skilled Workforce and Talent Pool:

- India's large pool of skilled IT professionals, engineers, and computer science graduates has been a key driver of the IT industry's success.
- The country has invested in technical education and vocational training to meet the growing demand for skilled IT professionals.
- Indian professionals have gained recognition globally for their expertise and have held leadership positions in multinational IT companies.

India's IT development has significantly contributed to the country's economic growth, job creation, and global competitiveness. The sector has played a pivotal role in positioning India as a leading player in the global technology landscape. With continued investments in innovation, research and development, and digital

infrastructure, India's IT industry is poised for further growth and transformation in the coming years.

Topics - 4.1, 4.3 and 4.6 : Energy Policy of India – Government Policies And Programmes, Energy Demands, Indian Energy Sciences, Energy Policies In India And Energy Security

Energy Policy of India

The International Energy Agency (IEA) defines energy security as "the uninterrupted availability of energy sources at an affordable price". Energy security concerns are a key driving force of energy policy. The objectives of Energy Policy includes the Energy Access at affordable prices, Improved energy security and Independence, Greater Sustainability, and Economic Growth.

The energy policy of India is largely defined by the country's expanding energy deficit and increased focus on developing alternative sources of energy, particularly nuclear, solar and wind energy. India has a comprehensive energy policy framework that addresses various aspects of energy production, consumption, efficiency, and sustainability. The key elements of India's energy policy include:

Renewable Energy Promotion: India has set ambitious targets to increase the share of renewable energy in its overall energy mix. The National Solar Mission and National Wind Mission aim to achieve large-scale deployment of solar and wind power capacity. Various incentives and subsidies are provided to promote renewable energy generation and attract investments in this sector.

Energy Efficiency Measures: India has implemented several energy efficiency programs across different sectors, such as industry, buildings, and appliances. The Bureau of Energy Efficiency (BEE) coordinates and implements energy efficiency initiatives, including energy labeling, energy conservation building codes, and energy efficiency standards for appliances.

Energy Access and Inclusion: The government is committed to providing affordable and reliable energy access to all citizens. Initiatives like the Pradhan

Mantri Sahaj Bijli Har Ghar Yojana (Saubhagya Scheme) aim to achieve universal household electrification, particularly in rural areas. The Ujjwala Yojana provides LPG connections to households, promoting clean cooking fuels and reducing indoor air pollution.

Energy Security and Diversification: India emphasizes reducing dependence on imported fossil fuels and enhancing energy security. Efforts are underway to diversify the energy mix by increasing the share of renewable energy, promoting nuclear power, and exploring domestic hydrocarbon resources.

Energy Infrastructure Development: The government is focused on developing robust energy infrastructure, including power generation, transmission, and distribution systems. Initiatives like the Integrated Power Development Scheme (IPDS) and the Green Energy Corridor project aim to strengthen and modernize the energy infrastructure.

International Collaboration: India actively participates in international collaborations and agreements related to energy, such as the International Solar Alliance (ISA) and the Paris Agreement. These collaborations facilitate knowledge sharing, technology transfer, and financial support for renewable energy and climate change mitigation efforts.

India's energy policy also addresses environmental sustainability, carbon emissions reduction, and climate change mitigation. The government promotes energy conservation, pollution control measures, and adoption of clean technologies to achieve sustainable development.

The National Electricity Policy has set the goal of adding new generation capacity and enhancing per capita availability of electricity per year and to not only eliminate energy and peaking shortages but to also have a spinning reserve as specified by the Central Electricity Authority.

The Electricity Act 2003 empowers the Central Government to formulate the tariff policy. The Act enables the Central Government to review or revise the tariff policy from time to time. The Act also requires that the Central Electricity Regulatory Commission (CERC) and State Electricity Regulatory Commissions

(SERCs) shall be guided by the tariff policy in discharging their functions including framing the regulations under section 61 of the Act. The tariff policy has been evolved in consultation with the State Governments and the Central Electricity Authority (CEA) and keeping in view the advice of the Central Electricity Regulatory Commission and suggestions of various stakeholders.

It is important to note that India's energy policy is dynamic, evolving to address emerging challenges and opportunities in the energy sector. Regular policy revisions, supportive regulations, and stakeholder engagements are vital to ensure effective implementation and achievement of energy policy goals.

Government Policies and Programmes related to Energy Security

The government of India has implemented several policies and programs aimed at enhancing energy security. Some of the key initiatives include:

National Solar Mission: Launched in 2010, the National Solar Mission aims to promote the development and deployment of solar energy in the country. It sets ambitious targets for solar power generation capacity and encourages research, technology development, and market creation in the solar sector.

National Wind Mission: The National Wind Mission focuses on promoting wind energy in India. It aims to enhance the share of wind power in the energy mix through capacity additions, technological advancements, and policy support.

Ujjwal Discom Assurance Yojana (UDAY): This program was launched to improve the financial health and operational efficiency of power distribution companies (DISCOMs) in India. It aims to reduce the financial losses of DISCOMs, improve metering and billing systems, and promote energy efficiency measures.

Pradhan Mantri Ujjwala Yojana (PMUY): PMUY aims to provide free LPG connections to women from economically disadvantaged households, promoting clean cooking fuels and reducing indoor air pollution.

Integrated Power Development Scheme (IPDS): IPDS focuses on strengthening and modernizing power distribution infrastructure in urban areas. It includes

initiatives for system strengthening, IT enablement, customer services, and smart grid implementation.

Strategic Petroleum Reserves (SPRs): The government has initiated the establishment of strategic petroleum reserves to enhance the country's energy security. These SPRs provide emergency stockpiles of crude oil to tackle supply disruptions or price volatility.

National Biofuel Policy: The National Biofuel Policy promotes the production and use of biofuels in India. It aims to reduce dependence on fossil fuels, enhance energy security, and promote sustainable agricultural practices.

Energy Conservation Building Code (ECBC): The ECBC sets energy performance standards for commercial buildings to promote energy efficiency and reduce energy consumption in the building sector.

Smart Cities Mission: Launched in 2016, aims to develop 100 cities across the country. Priorities include reducing energy demand of existing buildings and enhancing the efficiency of new construction.

Indian Cooling Action Plan (ICAP): India is the first country in the world to have a Cooling Action Plan. The Indian Cooling Action Plan (ICAP) was launched in March 2019 by the MoEFCC. The ICAP provides a 20-year perspective and outlines actions needed to provide access to sustainable cooling.

PAT scheme: Bureau of Energy Efficiency (BEE) has launched 'Perform, Achieve and Trade' (PAT) scheme under the National Mission for Enhanced Energy Efficiency. It aims to make the industrial sector energy efficient. The scheme has set energy efficiency targets for industries. Those that fail to achieve targets will have to pay penalty.

Street Light National Programme: It was launched in 2015 aims to replace 35 million inefficient light bulbs used for street lighting in 100 Indian cities.

These policies and programs are part of a comprehensive approach to address energy security challenges in India. They focus on diversifying the energy mix, promoting renewable energy sources, enhancing energy efficiency, and reducing

dependence on imported fossil fuels. Regular revisions, monitoring, and evaluation ensure the effectiveness and continued improvement of these initiatives.

Energy Demands of India

India, with its rapidly growing population and expanding economy, faces significant energy demands. The country's energy requirements are driven by several factors:

Economic Growth: India's robust economic growth has led to increased energy consumption. Industries, commercial sectors, and infrastructure development contribute to rising energy demands.

Urbanization: The ongoing process of urbanization in India is accompanied by increased energy needs for residential and commercial buildings, transportation systems, and public infrastructure.

Population Growth: India's population continues to increase, resulting in higher energy demands for households, services, and transportation to cater to the needs of a growing populace.

Industrialization: India's industrial sector, encompassing manufacturing, construction, and other industrial activities, requires substantial energy inputs for production processes and operations.

Infrastructure Development: Investments in transportation networks, power infrastructure, and other critical sectors require energy to support the development and functioning of these systems.

Increasing Energy Access: Efforts to improve energy access, particularly in rural areas, drive the need for expanding energy generation and distribution networks.

Meeting the energy demands of India presents both opportunities and challenges. The country has been diversifying its energy mix by promoting renewable energy sources, such as solar and wind power, to reduce dependence on fossil fuels and enhance energy security. Additionally, energy efficiency measures, technology

adoption, and policy interventions play a crucial role in optimizing energy use and reducing energy demand.

The Indian government has implemented various initiatives, including the National Solar Mission, Ujjwala Yojana (LPG connection for households), and the Pradhan Mantri Sahaj Bijli Har Ghar Yojana (Saubhagya Scheme for household electrification), to address energy demands, improve energy access, and enhance sustainability.

Balancing energy demands with environmental concerns, energy security, and affordability remains a key priority for India's energy sector. Continued investment in renewable energy, energy efficiency measures, and sustainable energy planning will be vital to meet the growing energy demands of the country.

Indian Energy Sciences

Indian energy sciences encompass a broad range of disciplines and research areas related to energy production, consumption, efficiency, and sustainability in India. Several key areas of focus include:

Renewable Energy: India is actively pursuing renewable energy sources such as solar, wind, biomass, and hydropower to diversify its energy mix and reduce dependence on fossil fuels. Research in this field involves technological advancements, policy formulation, grid integration, and energy storage solutions.

Energy Efficiency: Improving energy efficiency across various sectors is a priority in India. Researchers work on developing innovative technologies, conducting energy audits, and implementing energy management systems to optimize energy consumption in industries, buildings, and transportation.

Sustainable Energy Planning: The field of sustainable energy planning involves analyzing and modeling energy systems to design optimal pathways for India's energy transition. It includes aspects such as energy forecasting, resource allocation, energy economics, and environmental impact assessment.

Energy Policy and Regulation: Researchers analyze and evaluate energy policies, regulations, and market mechanisms to ensure a conducive environment for

energy development, investment, and sustainability. This includes studying energy pricing, subsidies, market structures, and policy frameworks.

Energy Access and Equity: Ensuring affordable and reliable energy access for all segments of society is a crucial aspect of Indian energy sciences. Researchers focus on studying energy poverty, rural electrification, decentralized energy solutions, and social and economic implications of energy access.

Energy and Climate Change: India's energy sector plays a significant role in climate change mitigation and adaptation efforts. Researchers study the interplay between energy and climate change, exploring low-carbon technologies, greenhouse gas emissions reduction strategies, and climate policy frameworks.

Indian energy sciences involve collaborations among government agencies, research institutions, academia, and industry stakeholders. The aim is to develop sustainable, affordable, and clean energy solutions to meet India's growing energy needs while addressing environmental and social challenges.

Topic-4.7: Salient Features Of Nuclear Policy Of India

Salient Features Of Nuclear Policy Of India

Evolution of India’s Nuclear Doctrine:

India's nuclear policy aims to ensure energy security, promote peaceful uses of nuclear energy, maintain a credible nuclear deterrent, and contribute to global non-proliferation efforts. It seeks to strike a balance between the country's energy needs, national security concerns, and its commitment to global peace and stability.

India’s nuclear doctrine was first enunciated following a Cabinet Committee on Security (CCS) meeting in January 2003 – over four and a half years after the May 1998 tests. It contained few surprises being largely built around the pronouncements made by Atal Bihari Vajpayee following the tests to the effect that India’s nuclear weapons were meant only for self defence, that India was not interested in arms racing, and encapsulating concepts such as “no first use” of nuclear weapons and their “non use” against non nuclear weapon states. Apart

from these pronouncements, several entities, notably the Armed Forces, the National Security Council Secretariat and the National Security Advisory Board (NSAB), made detailed contributions to the Government, on the nuclear doctrine, through 1999 and 2000, which were considered by it in firming up its views on the subject.

The main features of India's nuclear doctrine were summarized as follows in the Cabinet Committee on Security (CCS) press release of January 4th 2003:

- Building and maintaining a credible minimum deterrent;
- A "No First Use" posture; nuclear weapons to be used only "in retaliation against a nuclear attack on Indian territory or on Indian forces anywhere";
- Nuclear retaliation to a first strike will be "massive" and designed to inflict "unacceptable damage".
- Nuclear retaliatory attacks to be authorized only by civilian political leadership through the Nuclear Command Authority.
- Non use of nuclear weapons against non nuclear weapon states.
- India to retain option of retaliating with nuclear weapons in the event of a major attack against it with biological or chemical weapons;
- Continuance of strict controls on export of nuclear and missile related materials and technologies, participation in FMCT negotiations, continued moratorium on testing;
- Continued commitment to goal of nuclear weapon free world, through global, verifiable and non discriminatory disarmament.

The concept of "credible minimum deterrence" is the cornerstone of India's nuclear doctrine. It, used in conjunction with the concepts of "No First Use" (NFU) and "Non Use" against nuclear weapon states, clearly indicates that India envisages its nuclear weapons as only a deterrent merely for defensive purposes and not as a means to threaten others, that it is not in the business of building up a huge arsenal and that it will not engage in arms racing. The concept, however, also recognizes that for deterrence to be effective it must be "credible".

Topic-4.8: Development Of Nuclear Programmes In India

Development Of Nuclear Programmes In India

Dr. Homi Jehangir Bhabha was the founder of Atomic energy programme in India. He drew the road map of nuclear power programme which brought the country in the elite club of nations possessing advanced nuclear technology.

India's nuclear program has evolved significantly since its inception. The development of nuclear programs in India can be traced through the following key stages:

Early Research and Development (1940s-1950s): India's nuclear journey began with the establishment of the Tata Institute of Fundamental Research (TIFR) in 1945. Under the guidance of Homi Bhabha, research on nuclear physics and related areas commenced. The focus during this period was primarily on fundamental research and building scientific capabilities.

Establishment of Atomic Energy Commission (1954): In 1954, the Atomic Energy Commission (AEC) was established, headed by Homi Bhabha. The AEC played a pivotal role in formulating India's nuclear policy and overseeing the country's nuclear energy programs.

Peaceful Nuclear Explosions (1974): In May 1974, India conducted its first peaceful nuclear explosion, known as the "Smiling Buddha" test. This marked India's entry into the realm of nuclear technology and demonstrated its scientific and technological prowess.

Pokhran-II Nuclear Tests (1998): In May 1998, India conducted a series of nuclear tests, known as Pokhran-II. These tests included both nuclear fission and fusion devices, asserting India's nuclear weapons capability. These tests were met with international condemnation but also led to a shift in global perception towards India's nuclear status.

Civil Nuclear Cooperation (2005): In 2005, India and the United States signed a historic civil nuclear cooperation agreement, known as the "123 Agreement." This

agreement granted India access to global nuclear technology and fuel, despite not being a signatory to the Nuclear Non-Proliferation Treaty (NPT).

Expansion of Nuclear Power (2000s-2020s): India has placed significant emphasis on expanding its nuclear power generation capacity. It has established several nuclear power plants across the country, both indigenous Pressurized Heavy Water Reactors (PHWRs) and collaborations with other countries for Light Water Reactors (LWRs). India aims to increase the share of nuclear energy in its overall energy mix to reduce dependence on fossil fuels.

International Collaboration (ongoing): India has engaged in various international collaborations and agreements related to nuclear energy, such as the International Atomic Energy Agency (IAEA) safeguards, bilateral nuclear cooperation agreements, and participation in global non-proliferation initiatives.

India's nuclear programs have evolved from early research to encompass peaceful nuclear energy generation, scientific advancements, and the establishment of a credible nuclear deterrent. The focus has shifted towards developing indigenous nuclear technology, promoting nuclear power, and ensuring global cooperation while maintaining strategic autonomy and adherence to non-proliferation norms.

Indian Nuclear Power Program

The Indian nuclear programme was conceived based on, unique sequential three-stages and associated technologies essentially to aim at optimum utilization of the indigenous nuclear resource profile of modest Uranium and abundant Thorium resources. This sequential three-stage program is based on a closed fuel cycle, where the spent fuel of one stage is reprocessed to produce fuel for the next stage. The closed fuel cycle thus multiplies manifold the energy potential of the fuel and greatly reduces the quantity of waste generated.

The first stage comprises of Pressurized Heavy Water Reactors fuelled by natural uranium. Natural uranium contains only 0.7% of Uranium235, which undergoes fission to release energy (200Mev/atom). The remaining 99.3% comprises Uranium238 which is not fissile however it is converted in the nuclear reactor, to

fissile element Pu 239. In the fission process, among other fission products, a small quantity of Plutonium239 is formed by transmutation of Uranium238.

The second stage, comprising of Fast Breeder Reactors (FBRs) are fuelled by mixed oxide of Uranium238 and Plutonium239, recovered by reprocessing of the first stage spent fuel. In FBRs, Plutonium239 undergoes fission producing energy, and producing Plutonium239 by transmutation of Uranium238. Thus the FBRs produce energy and fuel, hence termed Breeders. FBRs produce more fuel than they consume. Over a period of time, Plutonium inventory can be built up by feeding Uranium238.

Thorium232, which constitutes world's third largest reserves in India, is not fissile therefore needs to be converted to a fissile material, Uranium233, by transmutation in a fast breeder reactor. This is to be achieved through second stage of the program, consisting of commercial operation of Fast Breeder Reactors (FBRs).

In the second stage, once sufficient inventory of Plutonium239 is built up, thorium232 will be introduced as a blanket material to be converted to Uranium233.

Considering the sequential nature of the indigenous nuclear power program, and the lead time involved at each stage, it is expected that appreciable time will be taken for direct thorium utilization. Therefore, innovative design of reactors for direct use of thorium is also in progress in parallel to three stage program. In this context, the frontier technologies being developed include the Accelerator Driven Systems (ADS) and Advanced Heavy Water Reactor (AHWR). The ADS essentially is a subcritical system using high-energy particles for fission. One of the significant advantages of this system is small quantity of waste production. The quantity of waste in this system is greatly reduced in comparison to the existing reactors as Actinides produced in ADS are `burnt' out.

The AHWR is another innovative concept, which will act as a bridge between the first and third stage essentially to advance thorium utilization without undergoing second stage of the three stage program. It uses light water as coolant and heavy

water as moderator. It is fuelled by a mixture of Plutonium239 and Thorium232, with a sizeable amount of power coming from Thorium232.

India is also an active partner in the international experimental initiative on harnessing fusion power for the future, the ITER project. India is supplying several components for this experimental reactor.

For faster nuclear power capacity addition, in parallel to the indigenous threestage program, additionalities based on imports have been introduced. Two Light Water Reactors (LWRs) of 1000 MWe each are under construction at Kudankulam in technical cooperation with the Russian Federation.

Present Status

The first stage consisting of pressurized Heavy Water Reactors (pHWR) has reached a state of commercial maturity and the second stage of Fast Breeder Reactors (FBRs) has been commercially launched with the construction of 500Mwe Fast Breeder Reactor (FBR) at Kalpakkam. The third stage systems (using U233 – Thorium232 obtained from spent fuel of second stage) have been developed at pilot scale. The development of commercial technology of third stage is under way currently. However, the commercial deployment of this technology is expected to take appreciable time.

Topic-4.9: Nuclear Policies At The International Level And India's Stand On Them

Nuclear Policies At The International Level And India's Stand On Them

A number of multilateral treaties have been established with the aim of preventing nuclear proliferation and testing, while promoting progress in nuclear disarmament. These include the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), the Treaty Banning Nuclear Weapon Tests In The Atmosphere, In Outer Space And Under Water, also known as the Partial Test Ban Treaty (PTBT), the Comprehensive Nuclear-Test-Ban Treaty (CTBT), which was signed in 1996 but has yet to enter into force, and the Treaty on the Prohibition of Nuclear Weapons (TPNW) entered into force in 2021.

A number of bilateral and plurilateral treaties and arrangements seek to reduce or eliminate certain categories of nuclear weapons, to prevent the proliferation of such weapons and their delivery vehicles. These range from several treaties between the United States of America and Russian Federation as well as various other initiatives, to the Nuclear Suppliers Group, the Missile Technology Control Regime, the Hague Code of Conduct against Ballistic Missile Proliferation, and the Wassenaar Arrangement.

There are four groupings of countries that multilaterally work to prevent and address proliferation of nuclear weapons, the technology that enables making of nuclear weapons and the systems that are capable of delivering those weapons. They are Wassenaar Arrangement, Missile Control Technology Regime (MTCR), Australia Group and the Nuclear Suppliers Group.

India became a member of Missile Control Technology Regime (MTCR), Wassenaar Arrangement, and Australia Group. India is not a member of the Nuclear Suppliers Group (NSG). India's entry into the NSG was opposed by China.

Missile Technology Control Regime (MTCR) is a voluntary association that aims to limit the spread of ballistic missiles and other unmanned delivery systems that could be used for chemical, biological, and nuclear attacks. It aims to restrict the exports of missiles and related technologies.

Wassenaar Arrangement is a voluntary export control regime. Members share information on conventional weapons transfers and dual-use goods and technologies. India was admitted into the Wassenaar Arrangement.

Australia Group (AG) is an informal forum of countries which, through the harmonisation of export controls, seeks to ensure that exports do not contribute to the development of chemical or biological weapons.

Nuclear Non-Proliferation Treaty aims to prevent spread of nuclear weapons and weapons technology and promote nuclear disarmament. India not signed the treaty but reiterates its commitment to the goal of a nuclear-weapon-free world.

Hague Code of Conduct against Ballistic Missile Proliferation (HCOC) aims at strengthens efforts to curb ballistic missile proliferation worldwide and to further delegitimize such proliferation. It is the only normative instrument to verify the spread of ballistic missiles. The Code does not call for the destruction of any missiles, it is simply an agreement between States on how they should "conduct" their trade in missiles. The HCoC is a voluntary, legally non-binding international confidence building and transparency measure. India has joined the Hague Code of Conduct against Ballistic Missile Proliferation (HCoC) by notifying the HCoC Central Contact in Vienna through diplomatic channels.

Comprehensive Test Ban Treaty (CTBT) prohibits "any nuclear weapon test explosion or any other nuclear explosion" anywhere in the world. It was opened for signature in September 1996. India not yet ratified the treaty.

Treaty on the Prohibition of Nuclear Weapons (TPNW) prohibits States Parties from developing, testing, producing, manufacturing, acquiring, possessing, or stockpiling nuclear weapons or other nuclear explosive devices. Signatories are barred from transferring or receiving nuclear weapons and other nuclear explosive devices, control over such weapons, or any assistance with activities prohibited under the Treaty. India did not participate in the negotiations on the TPNW and has consistently made it clear that it will not become a party to the Treaty. India does not support the Treaty, and shall not be bound by any of the obligations that may arise from it. India believes that this Treaty does not constitute or contribute to the development of customary international law; nor does it set any new standards or norms.

Partial Test Ban Treaty (PTBT) prohibits testing of nuclear weapons in the atmosphere, in outer space, under water, or in any area within a state's territory that would cause 'radioactive debris' to be present in areas outside the state's territory. India is a party to PTBT.

India's stand on international nuclear policies is driven by its pursuit of national security, strategic autonomy, and energy needs. While not aligning fully with some international treaties, India emphasizes the importance of global nuclear disarmament, equitable non-proliferation measures, and the peaceful use of

nuclear energy. It advocates for a balanced approach that addresses the concerns of both nuclear-weapon states and non-nuclear-weapon states while promoting international cooperation in the field of nuclear energy.

Topics 5.9 and 5.14: Mining In AP And India, Mineral Resources

Mining is the extraction of valuable minerals or other geological materials from the Earth. There are four main mining methods: underground, open surface (pit), placer, and in-situ mining. The method used depends on the type of mineral resource that is mined, its location at or beneath the surface, and other factors.

Union Ministry of Mines is responsible for survey and exploration of all minerals, other than natural gas, petroleum and atomic minerals; for mining in India.The ministry is responsible for administration of the Mines and Minerals (Regulation and Development) Act, 1957 in respect of all mines and minerals other than coal, natural gas and petroleum.

Mining In AP

Andhra Pradesh (AP), a state in India, is rich in mineral resources and has a significant mining industry. Here is an overview of mining in Andhra Pradesh:

Mineral Resources:

- Andhra Pradesh is known for its diverse range of mineral resources, including coal, limestone, bauxite, gold, diamond, granite, dolomite, and many more.
- The state is particularly known for its extensive reserves of limestone, which is used in cement production.

Major Minerals and Mining Activities:

- **Limestone:** Andhra Pradesh is one of the largest producers of limestone in India. The state has several limestone deposits, and mining activities are concentrated in districts like Kurnool, Guntur, Anantapur, and Kadapa.

- **Coal:** Singareni Collieries Company Limited (SCCL), a government-owned coal mining company, operates coal mines in the Godavari Valley coalfield in the eastern part of the state.
- **Bauxite:** Andhra Pradesh has significant bauxite deposits, primarily in Visakhapatnam district. Bauxite mining is carried out by the Andhra Pradesh Mineral Development Corporation (APMDC).
- **Granite:** The state is known for its granite reserves and granite mining, with major clusters located in Prakasam, Chittoor, Srikakulam, and Visakhapatnam districts.
- **Dolomite:** Dolomite deposits are found in Kurnool, Anantapur, and Visakhapatnam districts, and mining activities are undertaken by APMDC.

Regulatory Framework:

- The mining industry in Andhra Pradesh is governed by the Mines and Minerals (Development and Regulation) Act, 1957, and the Andhra Pradesh Minor Mineral Concession Rules, 1966.
- The Department of Mines and Geology under the state government is responsible for granting mining leases, regulating mining activities, and collecting royalties and fees.

Environmental Considerations:

- Environmental protection and sustainable mining practices are gaining importance in Andhra Pradesh.
- Mining operations are subject to environmental impact assessments, and mining companies are required to adhere to environmental regulations and obtain necessary clearances.
- Measures are taken to mitigate the environmental impact of mining activities, such as land reclamation and afforestation.

Employment and Economic Impact:

- The mining industry in Andhra Pradesh provides employment opportunities to a significant number of people, both directly and indirectly.

- Mining activities contribute to the state's economy through the generation of revenue, royalties, and taxes.
- The development of mining infrastructure and related industries also supports economic growth in the region.

It's important to note that specific details regarding mining activities, reserves, and companies may change over time. For the most accurate and up-to-date information on mining in Andhra Pradesh, it is advisable to refer to official government sources and relevant mining industry reports.

Mining In India

Mining in India has a long history and plays a significant role in the country's economy. Here is an overview of mining in India:

Mineral Resources:

- India is rich in a wide variety of mineral resources, including coal, iron ore, bauxite, copper, limestone, chromite, manganese, zinc, lead, and many more.
- The country has substantial reserves of several minerals, making it one of the top mineral-rich nations globally.

Major Minerals and Mining Activities:

Coal: India is one of the largest producers and consumers of coal. It has vast coal reserves primarily located in the eastern and central parts of the country. Coal mining is predominantly undertaken by Coal India Limited (CIL), a government-owned company, and its subsidiaries.

Iron Ore: India is among the world's largest producers of iron ore. Major iron ore producing states include Odisha, Chhattisgarh, Karnataka, and Jharkhand. Both public and private sector companies are involved in iron ore mining.

Bauxite: India has substantial bauxite reserves and is a significant producer of bauxite ore. Bauxite mining is concentrated in states like Odisha, Gujarat, Jharkhand, and Maharashtra.

Limestone: Limestone mining is widespread across various states in India, with major deposits found in states like Rajasthan, Andhra Pradesh, Madhya Pradesh, and Gujarat.

Copper: India has significant copper ore reserves, and mining activities are concentrated in states like Rajasthan, Jharkhand, Madhya Pradesh, and Maharashtra.

Chromite: Major Chromite Deposits: Odisha, Karnataka, Jharkhand.

Manganese: Major Manganese Deposits: Odisha, Maharashtra, Madhya Pradesh, Karnataka, Andhra Pradesh.

Zinc: Major Zinc Deposits: Rajasthan, Andhra Pradesh, Gujarat.

Lead: Major Lead Deposits: Rajasthan, Andhra Pradesh, Gujarat.

Gold: Major Gold Deposits: Karnataka, Jharkhand, Rajasthan, Andhra Pradesh, Kerala.

Diamond: Major Diamond Deposits: Madhya Pradesh, Chhattisgarh, Odisha, Andhra Pradesh.

Uranium: Major Uranium Deposits: Jharkhand, Andhra Pradesh, Meghalaya, Rajasthan.

Regulatory Framework:

- The mining industry in India is governed by the Mines and Minerals (Development and Regulation) Act, 1957, and subsequent amendments.
- State governments have the authority to grant mining leases and regulate mining activities within their respective states.
- The Ministry of Mines at the central level oversees the overall development and regulation of the mining sector.

Environmental and Social Considerations:

- Environmental protection and sustainable mining practices have gained importance in India.
- Mining operations are subject to environmental impact assessments, and companies are required to obtain necessary clearances and comply with environmental regulations.
- There is increasing emphasis on responsible mining, land reclamation, and community engagement to mitigate the environmental and social impact of mining activities.

Economic Impact:

- Mining contributes significantly to India's economy by generating revenue, employment, and foreign exchange earnings.
- The sector provides direct and indirect employment to a large number of people, particularly in rural areas.
- Mining activities also support related industries, such as steel, cement, and power generation.

It's important to note that specific details regarding mineral production, mining companies, and regulations may change over time. For the most accurate and up-to-date information on mining in India, it is advisable to refer to official government sources and relevant industry reports.

Topic-6.15: COP 21 — Sustainable Development Goals

What is the Paris Agreement?

The Paris Agreement is a legally binding international treaty on climate change. It was adopted by 196 Parties at COP 21 in Paris, on 12 December 2015 and entered into force on 4 November 2016.

Its goal is to limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels.

To achieve this long-term temperature goal, countries aim to reach global peaking of greenhouse gas emissions as soon as possible to achieve a climate neutral world by mid-century.

The Paris Agreement works on a 5- year cycle of increasingly ambitious climate action carried out by countries. By 2020, countries submit their plans for climate action known as nationally determined contributions (NDCs). In their NDCs, countries communicate actions they will take to reduce their Greenhouse Gas emissions in order to reach the goals of the Paris Agreement. Countries also communicate in the NDCs actions they will take to build resilience to adapt to the impacts of rising temperatures.

What are the Sustainable Development Goals?

The Sustainable Development Goals (SDGs), also known as the Global Goals, were adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity.

The 17 SDGs are integrated—they recognize that action in one area will affect outcomes in others, and that development must balance social, economic and environmental sustainability.

Countries have committed to prioritize progress for those who're furthest behind. The SDGs are designed to end poverty, hunger, AIDS, and discrimination against women and girls.

The creativity, knowhow, technology and financial resources from all of society is necessary to achieve the SDGs in every context. The 17 goals are as follows,

Goal 1: No Poverty

Eradicating poverty in all its forms remains one of the greatest challenges facing humanity. While the number of people living in extreme poverty dropped by more than half between 1990 and 2015, too many are still struggling for the most basic human needs. The SDGs are a bold commitment to end poverty in all forms and dimensions by 2030. This involves targeting the most vulnerable, increasing basic resources and services, and supporting communities affected by conflict and climate-related disasters.

Goal 2: Zero Hunger

The number of undernourished people has dropped by almost half in the past two decades because of rapid economic growth and increased agricultural productivity. Many developing countries that used to suffer from famine and hunger can now meet their nutritional needs. Unfortunately, extreme hunger and malnutrition remain a huge barrier to development in many countries. The SDGs aim to end all forms of hunger and malnutrition by 2030, making sure all people–especially children–have sufficient and nutritious food all year. This involves promoting sustainable agricultural, supporting small-scale farmers and equal

access to land, technology and markets. It also requires international cooperation to ensure investment in infrastructure and technology to improve agricultural productivity.

Goal 3: Good Health and Well-Being

Good health is essential to sustainable development and the 2030 Agenda reflects the complexity and interconnectedness of the two. It takes into account widening economic and social inequalities, rapid urbanization, threats to the climate and the environment, the continuing burden of HIV and other infectious diseases, and emerging challenges such as noncommunicable diseases. Universal health coverage will be integral to achieving SDG 3, ending poverty and reducing inequalities. Emerging global health priorities not explicitly included in the SDGs, including antimicrobial resistance, also demand action.

But the world is off-track to achieve the health-related SDGs. Progress has been uneven, both between and within countries. Multisectoral, rights-based and gender-sensitive approaches are essential to address inequalities and to build good health for all.

Goal 4: Quality Education

Since 2000, there has been enormous progress in achieving the target of universal primary education. The total enrollment rate in developing regions reached 91 percent in 2015, and the worldwide number of children out of school has dropped by almost half. There has also been a dramatic increase in literacy rates, and many more girls are in school than ever before. These are all remarkable successes.

Achieving inclusive and quality education for all reaffirms the belief that education is one of the most powerful and proven vehicles for sustainable development. This goal ensures that all girls and boys complete free primary and secondary schooling by 2030. It also aims to provide equal access to affordable vocational training, to eliminate gender and wealth disparities, and achieve universal access to a quality higher education.

Goal 5: Gender Equality

Ending all discrimination against women and girls is not only a basic human right, it's crucial for sustainable future; it's proven that empowering women and girls helps economic growth and development. There are still large inequalities in some regions, with women systematically denied the same work rights as men. Sexual violence and exploitation, the unequal division of unpaid care and domestic work, and discrimination in public office all remain huge barriers. Climate change and disasters continue to have a disproportionate effect on women and children, as do conflict and migration.

It is vital to give women equal rights land and property, sexual and reproductive health, and to technology and the internet. Today there are more women in public office than ever before, but encouraging more women leaders will help achieve greater gender equality.

Goal 6: Clean Water and Sanitation

Water scarcity affects more than 40 percent of people, an alarming figure that is projected to rise as temperatures do. Although 2.1 billion people have improved water sanitation since 1990, dwindling drinking water supplies are affecting every continent.

More and more countries are experiencing water stress, and increasing drought and desertification is already worsening these trends. By 2050, it is projected that at least one in four people will suffer recurring water shortages.

Safe and affordable drinking water for all by 2030 requires we invest in adequate infrastructure, provide sanitation facilities, and encourage hygiene. Protecting and restoring water-related ecosystems is essential.

Goal 7: Affordable and Clean Energy

Between 2000 and 2018, the number of people with electricity increased from 78 to 90 percent, and the numbers without electricity dipped to 789 million. Investing in solar, wind and thermal power, improving energy productivity, and ensuring energy for all is vital if we are to achieve SDG 7 by 2030.

Expanding infrastructure and upgrading technology to provide clean and more efficient energy in all countries will encourage growth and help the environment.

Goal 8: Decent Work and Economic Growth

According to the International Labour Organization, more than 204 million people were unemployed in 2015. The SDGs promote sustained economic growth, higher levels of productivity and technological innovation. Encouraging entrepreneurship and job creation are key to this, as are effective measures to eradicate forced labour, slavery and human trafficking. With these targets in mind, the goal is to achieve full and productive employment, and decent work, for all women and men by 2030.

Goal 9: Industry, Innovation and Infrastructure

Investment in infrastructure and innovation are crucial drivers of economic growth and development. With over half the world population now living in cities, mass transport and renewable energy are becoming ever more important, as are the growth of new industries and information and communication technologies.

Technological progress is also key to finding lasting solutions to both economic and environmental challenges, such as providing new jobs and promoting energy efficiency. Promoting sustainable industries, and investing in scientific research and innovation, are all important ways to facilitate sustainable development.

More than 4 billion people still do not have access to the Internet, and 90 percent are from the developing world. Bridging this digital divide is crucial to ensure equal access to information and knowledge, as well as foster innovation and entrepreneurship.

Goal 10: Reduced Inequalities

Income inequality is on the rise—the richest 10 percent have up to 40 percent of global income whereas the poorest 10 percent earn only between 2 to 7 percent. If we take into account population growth inequality in developing countries, inequality has increased by 11 percent.

Income inequality has increased in nearly everywhere in recent decades, but at different speeds. It's lowest in Europe and highest in the Middle East. These widening disparities require sound policies to empower lower income earners, and promote economic inclusion of all regardless of sex, race or ethnicity.

Income inequality requires global solutions. This involves improving the regulation and monitoring of financial markets and institutions, encouraging development assistance and foreign direct investment to regions where the need is greatest. Facilitating the safe migration and mobility of people is also key to bridging the widening divide.

Goal 11: Sustainable Cities and Communities

More than half of us live in cities. By 2050, two-thirds of all humanity—6.5 billion people—will be urban. Sustainable development cannot be achieved without significantly transforming the way we build and manage our urban spaces.

The rapid growth of cities—a result of rising populations and increasing migration—has led to a boom in mega-cities, especially in the developing world, and slums are becoming a more significant feature of urban life.

Making cities sustainable means creating career and business opportunities, safe and affordable housing, and building resilient societies and economies. It involves investment in public transport, creating green public spaces, and improving urban planning and management in participatory and inclusive ways.

Goal 12: Sustainable Consumption and Production

Achieving economic growth and sustainable development requires that we urgently reduce our ecological footprint by changing the way we produce and consume goods and resources. Agriculture is the biggest user of water worldwide, and irrigation now claims close to 70 percent of all freshwater for human use.

The efficient management of our shared natural resources, and the way we dispose of toxic waste and pollutants, are important targets to achieve this goal. Encouraging industries, businesses and consumers to recycle and reduce waste is

equally important, as is supporting developing countries to move towards more sustainable patterns of consumption by 2030.

A large share of the world population is still consuming far too little to meet even their basic needs. Halving the per capita of global food waste at the retailer and consumer levels is also important for creating more efficient production and supply chains. This can help with food security, and shift us towards a more resource efficient economy.

Goal 13: Climate Action

There is no country that is not experiencing the drastic effects of climate change. Greenhouse gas emissions are more than 50 percent higher than in 1990. Global warming is causing long-lasting changes to our climate system, which threatens irreversible consequences if we do not act. The annual average economic losses from climate-related disasters are in the hundreds of billions of dollars.

Supporting vulnerable regions will directly contribute not only to Goal 13 but also to the other SDGs. These actions must also go hand in hand with efforts to integrate disaster risk measures, sustainable natural resource management, and human security into national development strategies. It is still possible, with strong political will, increased investment, and using existing technology, to limit the increase in global mean temperature to two degrees Celsius above pre-industrial levels, aiming at 1.5°C, but this requires urgent and ambitious collective action.

Goal 14: Life Below Water

The world's oceans – their temperature, chemistry, currents and life – drive global systems that make the Earth habitable for humankind. How we manage this vital resource is essential for humanity as a whole, and to counterbalance the effects of climate change.

Over three billion people depend on marine and coastal biodiversity for their livelihoods. However, today we are seeing 30 percent of the world's fish stocks

overexploited, reaching below the level at which they can produce sustainable yields.

Oceans also absorb about 30 percent of the carbon dioxide produced by humans, and we are seeing a 26 percent rise in ocean acidification since the beginning of the industrial revolution. Marine pollution, an overwhelming majority of which comes from land-based sources, is reaching alarming levels, with an average of 13,000 pieces of plastic litter to be found on every square kilometre of ocean.

The SDGs aim to sustainably manage and protect marine and coastal ecosystems from pollution, as well as address the impacts of ocean acidification. Enhancing conservation and the sustainable use of ocean-based resources through international law will also help mitigate some of the challenges facing our oceans.

Goal 15: Life on Land

Human life depends on the earth as much as the ocean for our sustenance and livelihoods. Plant life provides 80 percent of the human diet, and we rely on agriculture as an important economic resources. Forests cover 30 percent of the Earth's surface, provide vital habitats for millions of species, and important sources for clean air and water, as well as being crucial for combating climate change.

Every year, 13 million hectares of forests are lost, while the persistent degradation of drylands has led to the desertification of 3.6 billion hectares, disproportionately affecting poor communities. Wildlife trafficking not only erodes biodiversity, but creates insecurity, fuels conflict, and feeds corruption.

Urgent action must be taken to reduce the loss of natural habitats and biodiversity which are part of our common heritage and support global food and water security, climate change mitigation and adaptation, and peace and security.

Goal 16: Peace, Justice and Strong Institutions

We cannot hope for sustainable development without peace, stability, human rights and effective governance, based on the rule of law. Yet our world is increasingly divided. Some regions enjoy peace, security and prosperity, while

others fall into seemingly endless cycles of conflict and violence. This is not inevitable and must be addressed.

Armed violence and insecurity have a destructive impact on a country's development, affecting economic growth, and often resulting in grievances that last for generations. Sexual violence, crime, exploitation and torture are also prevalent where there is conflict, or no rule of law, and countries must take measures to protect those who are most at risk

The SDGs aim to significantly reduce all forms of violence, and work with governments and communities to end conflict and insecurity. Promoting the rule of law and human rights are key to this process, as is reducing the flow of illicit arms and strengthening the participation of developing countries in the institutions of global governance.

Goal 17: Partnerships for the Goals

The SDGs can only be realized with strong global partnerships and cooperation. While humanitarian crises brought on by conflict or natural disasters continue to demand more financial resources and aid. Many countries also require Official Development Assistance to encourage growth and trade.

The world is more interconnected than ever. Improving access to technology and knowledge is an important way to share ideas and foster innovation. Coordinating policies to help developing countries manage their debt, as well as promoting investment for the least developed, is vital for sustainable growth and development.

The goals aim to enhance North-South and South-South cooperation by supporting national plans to achieve all the targets. Promoting international trade, and helping developing countries increase their exports is all part of achieving a universal rules-based and equitable trading system that is fair and open and benefits all.

Topic-6.16: National Disaster Management Policy, 2016 Of India

National Disaster Management Policy 2016 of India

The National Disaster Management Plan (NDMP) provides a framework and direction to the government agencies for all phases of disaster management cycle. The National Disaster Management Plan (NDMP) 2016 is the first ever national plan prepared in the country. The NDMP is consistent with the approaches promoted globally by the United Nations, in particular the Sendai Framework for Disaster Risk Reduction 2015-2030. By 2030, the Sendai Framework aims to achieve substantial reduction of disaster risk and losses in lives, livelihoods, and health and in the economic, physical, social, cultural, and environmental assets of persons, businesses, communities, and countries. The NDMP has been aligned broadly with the goals and priorities set out in the Sendai Framework for DRR. Sendai Framework is a non-binding agreement, which the signatory nations will attempt to comply with on a voluntary basis. India will make all efforts to contribute to the realization of the global targets by improving the entire disaster management cycle in India by following the recommendations in the Sendai Framework and by adopting globally accepted best practices. The four priorities for action under the Sendai Framework are:

1. Understanding disaster risk
2. Strengthening disaster risk governance to manage disaster risk
3. Investing in disaster risk reduction for resilience
4. Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction

Vision

Make India disaster resilient, achieve substantial disaster risk reduction, and significantly decrease the losses of life, livelihoods, and assets – economic, physical, social, cultural, and environmental – by maximizing the ability to cope with disasters at all levels of administration as well as among communities.

Objectives

Along with the mandate given in the DM Act 2005 and the NPDM 2009, the national plan has incorporated the national commitment towards the Sendai Framework. Accordingly, the broad objectives of the NDMP are:

- Improve the understanding of disaster risk, hazards, and vulnerabilities
- Strengthen disaster risk governance at all levels from local to centre
- Invest in disaster risk reduction for resilience through structural, non-structural and financial measures, as well as comprehensive capacity development
- Enhance disaster preparedness for effective response
- Promote "Build Back Better" in recovery, rehabilitation and reconstruction
- Prevent disasters and achieve substantial reduction of disaster risk and losses in lives, livelihoods, health, and assets (economic, physical, social, cultural and environmental)
- Increase resilience and prevent the emergence of new disaster risks and reduce the existing risks
- Promote the implementation of integrated and inclusive economic, structural, legal, social, health, cultural, educational, environmental, technological, political and institutional measures to prevent and reduce hazard exposure and vulnerabilities to disaster
- Empower both local authorities and communities as partners to reduce and manage disaster risks
- Strengthen scientific and technical capabilities in all aspects of disaster management
- Capacity development at all levels to effectively respond to multiple hazards and for community-based disaster management
- Provide clarity on roles and responsibilities of various Ministries and Departments involved in different aspects of disaster management
- Promote the culture of disaster risk prevention and mitigation at all levels
- Facilitate the mainstreaming of disaster management concerns into the developmental planning and processes

Topic-6.17: Disaster Management Initiatives In India

What is a Disaster?

Disaster can be defined as – a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or man-made causes, or by accident or negligence which results in substantial loss of life or human suffering or damage to, and destruction of, property, or damage to, or degradation of, environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area .

The UNISDR (2009) defines disaster as: "A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources."

Disaster occurs when the dimension of an emergency situation grows to such an extent that the impact of the hazard is beyond the coping capability of the local community and/or the concerned local authority.

Disasters can be classified into the following categories:

1. Water and Climate Disaster: Flood, hail storms, cloudburst, cyclones, heat waves, cold waves, droughts, hurricanes.
2. Geological Disaster: Landslides, earthquakes, volcanic eruptions, tornadoes
3. Biological Disaster: Viral epidemics, pest attacks, cattle epidemic and locust plagues
4. Industrial Disaster: Chemical and industrial accidents, mine shaft fires, oil spills,
5. Nuclear Disasters: Nuclear core meltdowns, radiation poisoning
6. Man-made disasters: Urban and forest fires, oil spill, the collapse of huge building structures

What is Disaster Management?

The Disaster Management Act of 2005 defines the Disaster Management as continuous and integrated process of planning, organizing, coordinating and implementing measures which are necessary for-

- Prevention of threat of any disaster
- Reduction of risk of any disaster or its consequences
- Readiness to deal with any disaster
- Promptness in dealing with a disaster
- Assessing the severity of the effects of any disaster
- Rescue and relief
- Rehabilitation and Reconstruction

Disaster Management Initiatives

India has implemented several disaster management initiatives to enhance preparedness, response, and recovery capabilities. Some of the key initiatives include:

National Disaster Management Authority (NDMA): The NDMA is the apex body responsible for formulating policies, coordinating response efforts, and providing guidelines for disaster management at the national level. It facilitates capacity building, training, and coordination among various stakeholders.

National Disaster Response Force (NDRF): The NDRF is a specialized force dedicated to disaster response and rescue operations. It is deployed during emergencies to assist in search and rescue, medical aid, and evacuation.

National Disaster Management Plan: India has developed a comprehensive National Disaster Management Plan that outlines strategies, roles, and responsibilities of different agencies involved in disaster management. It provides a framework for risk assessment, mitigation, and response across various sectors.

Early Warning Systems: India has established early warning systems for cyclones, floods, earthquakes, and other natural disasters. The Indian Meteorological

Department (IMD) and other agencies issue timely alerts and advisories to help communities prepare and take necessary actions.

Community-Based Disaster Preparedness: India emphasizes community participation and awareness in disaster management. Various programs are conducted to educate communities about disaster preparedness, risk reduction, and response measures. Community volunteers and Civil Defense organizations are trained to provide local-level support during emergencies.

National Emergency Operation Center (NEOC): The NEOC serves as a central command and control center during emergencies. It coordinates information sharing, resource allocation, and decision-making to ensure a unified response.

National Institute of Disaster Management (NIDM): The NIDM is responsible for research, training, and capacity building in the field of disaster management. It conducts specialized courses and workshops for professionals and stakeholders involved in disaster management.

National Cyclone Risk Mitigation Project (NCRMP): The NCRMP aims to reduce the vulnerability of coastal communities to cyclones through measures like cyclone-resistant infrastructure, early warning systems, and community preparedness.

Urban Search and Rescue (USAR) Teams: India has established USAR teams equipped with specialized equipment and trained personnel for swift response and rescue operations in urban areas during disasters.

Public Awareness and Education: Various awareness campaigns, workshops, and drills are conducted to educate the public about disaster management, including school safety programs and public service announcements.

These initiatives reflect India's commitment to strengthening disaster management capabilities, reducing vulnerability, and enhancing resilience. Efforts are ongoing to improve coordination, technology adoption, and community participation in disaster management across the country.

Topic-6.18: White Revolution, Green Revolution, And Green Pharmacy

White Revolution

White Revolution was one of the biggest dairy development movement in India in 1970. It was a step taken by the Indian Government to develop and help the dairy industry sustain itself economically by developing a co-operative, while providing employment to the poor farmers.

The White Revolution helped increase milk productivity and milk was now sold at competitive market prices. This program increased the demand for development and production of healthy animals, use of modern technology in milk production sector and networking between various small and large scale dairy industries.

The White Revolution followed after the success of the Green Revolution and the aim of White Revolution was to make India one of the largest milk producers in the world.

How did the White Revolution start?

The White Revolution, known as Operation Flood, was launched in 1970. It was an initiative by India's National Dairy Development Board (NDDB) and was the world's biggest dairy development programme. It transformed India from a milk deficient nation into the world's largest milk producers.

Operation Flood was based on the experimental pattern set up by Verghese Kurien, chairman and founder of AMUL, who was named the Chairman of NDDB and was also recognised as the architect of Operation Flood.

Under Verghese Kurien, the programme created national milk grid linking producers throughout India with consumers in over 700 towns and cities, reducing seasonal and regional price variations and ensuring that the milk producers get a major share of the income generated from end consumers, by forming co-operatives.

Father of the White Revolution

Verghese Kurien was the father of the White Revolution. He founded Amul, one of the largest milk producing companies in India. Kurien, along with his friend H. M. Dalaya invented the process of making milk powder and condensed milk from buffalo milk. Many companies were started under his leadership and former Prime Miniter Lal Bahadur Shastri created the National Dairy Development Board based on Amul's management, resource and infrastructure arrangements.

What were the phases of the White Revolution in India?

Phase 1: This phase started in July 1970 with the objective of setting up dairy cooperatives in 18 milk sheds in 10 states. They were to be linked with the four best metropolitan markets. By the end of this phase in 1981 there were 13,000 village dairy cooperatives covering 15,000 farmers.

Phase 2: It aimed at building on the designs of phase 1 and on the assisted Dairy development programmes in Karnataka, Rajasthan and Madhya Pradesh. By the end of this phase in 1985 there were 136 milk sheds, 34,500 village dairy cooperatives and over 36 lakh members.

Phase 3: This phase emphasised on consolidating the gains of the earlier two phases by improving the productivity and efficiency of the dairy sectors for long term sustainability. It ended in 1996 and by that time there were 73,300 dairy cooperatives and over 9.4 million farmer members.

Advantages of White Revolution

- It ended the imports of milk solids in India and India started exporting milk powder to many foreign nations.
- Dairy industries and infrastructures modernised and expanded. Around 10 million farmers earn their income from dairy farming.
- Dairy needs are met locally.
- Genetic improvement of milking animals has increased due to cross breeding.

Green Revolution

In India, Green Revolution refers to a period when Indian agriculture was converted into an industrial system by the adoption of modern methods of farming like tractors, irrigation facilities, pesticides, and fertilizer and technology like the use of HYV (high yielding variety) seeds.

A part of a larger initiative by Norman Borlaug, Green Revolution in India was founded by M S Swaminathan. The aim was to increase agricultural productivity in the developing world with use of technology and agricultural research. In fact, for his contributions to the world food supply, Borlaug was awarded the Nobel Peace Prize in 1970.

Green revolution was based on new technology, new ideas, and new application of inputs like HYV seeds, fertilizers, irrigation water, and pesticides among others. Since all these brought sudden reformation in agricultural practices and spread quickly to attain dramatic results thus, it is termed as revolution in green agriculture.

In India the high yielding varieties programme was constrained to only 5 crops – wheat, rice, jowar, maize, and bajra. After the Green Revolution in India, there was an increase in agricultural production. Employment opportunities also increased after the Green Revolution in India. Under premiership of Congress leader Lal Bahadur Shastri, the Green Revolution within India commenced in 1965 that led to an increase in food grain production, especially in Punjab, Haryana, and Uttar Pradesh.

Several problems were addressed through Green Revolution in India, which includes Frequent famines, Lack of finance and Lack of self-sufficiency.

Circumstances that led to introduction of Green revolution in India:

In 1964-65 and 1965–66, India experienced two severe droughts which led to food shortages and famines among the country's growing population. Modern agricultural technologies appeared to offer strategies to counter the frequency of famines.

In the context of India's rapidly growing population, the country's traditional agricultural practices yielded insufficient food production. By the 1960s, this low productivity led India to experience food grain shortages that were more severe than those of other developing countries. Agricultural technological advancements offered opportunities to increase productivity.

Features of Green Revolution

- The introduction of the HYV seeds for the first time in Indian agriculture. These seeds had more success with the wheat crop and were highly effective in regions that had proper irrigation. So the first stage of the Green Revolution was focused on states with better infra – like Punjab and Tamil Nadu.
- During the second phase, the HYV seeds were given to several other states. And other crops than wheat were also included into the plan.
- One basic requirement for the HYV seeds is proper irrigation. Crops from HYV seeds need alternating amounts of water supply during its growth. So the farms cannot depend on monsoons. The Green Revolution vastly improved the inland irrigation systems around farms in India.
- The emphasis of the plan was mostly on food grains such as wheat and rice. Cash crops and commercial crops like cotton, jute, oilseeds etc were not a part of the plan.
- Increased availability and use of fertilizers to enhance the productivity of the farms.
- Use of pesticides and weedicides to reduce any loss or damage to the crops.
- And finally the introduction of technology and machinery like tractors, harvesters, drills etc. This helped immensely to promote commercial farming in the country.

Failures of Green Revolution

- Unfortunately for many farmers the cost of machinery was too high and they simply couldn't afford it.
- Many very poor farmers, were tenant farmers, with little money to buy even the new seeds or fertiliser that was required.
- The large amounts of fertilisers and pesticides required by the HYVs also led to serious environmental problems as they entered water supplies
- In areas where there was an increase in mechanisation, there was an increase in unemployment with fewer people needed to do the jobs that were now done using tractors etc.
- The consequent increase in unemployment in rural areas led to an increase in rural-urban migration with more people moving to the cities, causing urban problems.
- Green Revolution created wide regional and interstate disparities. The plan was implemented only in areas with assured supplies of water and the means to control it, large inputs of fertilizers, and adequate farm credit. These inputs were easily available in at least parts of the states of Punjab, Haryana, and western Uttar Pradesh; thus, yields increased most in these states. In other states, such as Andhra Pradesh and Tamil Nadu, in areas where these inputs were not assured, the results were limited or negligible, leading to considerable variation in crop yields within these states.
- Green Revolution also increased income disparities - Higher income growth and reduced incidence of poverty were found in the states where yields increased the most and lower income growth and little change in the incidence of poverty in other states.

Second Green Revolution

While the first Green Revolution aimed at undertaking mass agricultural production, the second Green Revolution should be to promote agricultural production by the masses. This is the Gandhian approach to equitable sharing of prosperity by involving the poor in development. For achieving this goal, we need

to search for technologies which can be adopted by the farmers in arid and semi-arid regions, and those who are dependent on rainfall for crop production.

The concept of the "Second Green Revolution" in India refers to efforts aimed at increasing agricultural productivity, promoting sustainable practices, and ensuring food security through technological advancements and policy interventions. The Second Green Revolution builds upon the success and lessons learned from the first Green Revolution, which occurred in the 1960s and 1970s and involved the adoption of high-yielding varieties of crops, improved irrigation, and the use of fertilizers.

Key features of the Second Green Revolution in India include:

Crop Diversification: The Second Green Revolution emphasizes the diversification of crops to reduce dependence on a few staple crops. It promotes the cultivation of high-value crops, fruits, vegetables, oilseeds, and pulses, thereby enhancing farmers' income and improving nutritional diversity.

Technology Adoption: The use of advanced agricultural technologies is a crucial aspect of the Second Green Revolution. This includes the adoption of precision farming techniques, mechanization, modern irrigation systems, and the application of biotechnology and genetic engineering for crop improvement.

Sustainable Farming Practices: The Second Green Revolution emphasizes the adoption of sustainable farming practices that minimize environmental impact. This includes the promotion of organic farming, integrated pest management, efficient use of water resources, and soil conservation measures.

Agricultural Research and Development: The Second Green Revolution recognizes the importance of research and development in driving agricultural innovation. It emphasizes investment in agricultural research institutions, development of new crop varieties, and the transfer of technology from research labs to farmers' fields.

Market Linkages and Infrastructure: The Second Green Revolution emphasizes the development of efficient market linkages and infrastructure to facilitate the

smooth flow of agricultural produce from farm to market. This includes the establishment of agro-processing industries, cold storage facilities, and better transportation networks.

Farmer Empowerment and Welfare: The Second Green Revolution focuses on empowering farmers by providing them with necessary resources, information, and training. It promotes farmer producer organizations, access to credit, crop insurance, and other support mechanisms to enhance farmers' income and overall welfare.

The Second Green Revolution in India aims to achieve sustainable agricultural growth, enhance productivity, reduce rural poverty, and ensure food security. It recognizes the need to address challenges such as climate change, water scarcity, and rural-urban migration. By integrating technological advancements with sustainable practices and farmer-centric policies, the Second Green Revolution strives to transform Indian agriculture and make it more resilient, productive, and economically viable.

Green Pharmacy

Green pharmacy is a branch of pharmaceutical science that focuses on the development and use of natural products, such as plants, to prevent and treat diseases. It is an interdisciplinary field that combines the knowledge of traditional medicine with modern pharmaceutical techniques.

The main goal of green pharmacy is to identify, isolate, and study the active compounds in plants that have medicinal properties. These compounds are then used to create new drugs or to improve existing ones. Green pharmacy also includes the development of herbal remedies and traditional medicine, which is based on the use of plants to treat various ailments.

Green pharmacy also includes sustainable and organic cultivation of medicinal plants, which is important for maintaining the biodiversity and ecological balance.

Green pharmacy has a lot of potential in providing safe and effective treatment options, especially for chronic illnesses and infections that are resistant to

traditional drugs. It also offers an alternative to synthetic drugs which have many side effects.

Green pharmacy has a lot of traditional knowledge and wisdom that can be integrated with modern research and technology for the betterment of human health.

Green pharmacy is necessary for balance between human health and ecology health. Without empowering people to take charge of the basic aspects of their own lives, sustainable improvements in health are not possible.

Topic-9.1: Promotion Of Science In AP And India

Promotion Of Science In AP

Andhra Pradesh is taking all steps and creating the necessary infrastructure to promote scientific research and innovation in the development of the State.

Development of 'Science City Infrastructure' is part of the Andhra Pradesh vision to develop a knowledge hub for education and research. Science City of Andhra Pradesh plan to build the Role Model Science City in the Country which will become a hub for future Science Discoveries and Technology innovations in the Country". Most, importantly, this will become a Unique Science City in the world by 2025 to have Innovation Centers, Educational and Research institutes and science promoting museums all at one place. Land has to be identified for the proposed Science City in Visakhapatnam.

Government of Andhra Pradesh has identified biotechnology as a key thrust sector for industrial development. The sector has tremendous potential to build robust knowledge base and foster innovation, research and development. Biotechnology Policy 2015-20 aims to enhance competitiveness of the sector and make Andhra Pradesh one of the most preferred destinations for biotechnology investments, attract new investments

The Government plans to develop Visakhapatnam as the biotechnology hub of Andhra Pradesh. Government of Andhra Pradesh shall encourage partnerships

with private players for development of infrastructure in the form of life sciences parks and skill training centres etc. at Visakhapatnam.

The Government has introduced a set of initiatives that will ease the compliance procedures for new and existing enterprises to promote scienctic research and innovation.

Government of Andhra Pradesh proposes to encourage the development of dedicated mini life sciences parks to be developed under PPP mode. Potential locations of mini life science parks are as follows

i. Kakinada (Marine, Agri & Aqua)
ii. Anantapur (Bio Pharma, Bio Similar, Formulations)
iii. Guntur / Chittoor (Agri & Food Tech, Animal Bio Tech).

Government of Andhra Pradesh will setup incubation centre in PPP mode to nurture innovation and take potential technologies to the market. The incubation centres will be setup in: a. Mega Life Sciences Park in Visakhapatnam b. JNTU in Kakinada c. Sri Venkateswara Veterinary University in Tirupati d. Dr. NTR University of Health Sciences in Vijayawada.

Andhra Pradesh government has launched its new 'AP Information Technology Policy 2021-24' in 2021 which will create thousands of jobs locally and provides skilled manpower to industry. As per this policy, AP governement has announced a new flagship start-up promotion scheme Accelerate Startups in AP (ASAP) to encourage the new and existing start-ups thereby creating a strong start-up ecosystem in the state.

In general the AP state is promoting science by -

Investing in science education: This can include funding for teacher training, building new science classrooms and labs, and providing access to educational resources.

Encouraging scientific research: This can include funding for scientific research grants, providing research infrastructure and facilities, and supporting collaboration between researchers and industry.

Communicating science to the public: This can include public science education campaigns, science festivals, and science communication training for scientists and educators.

Encouraging entrepreneurship and innovation: This can include providing funding and resources for startups and small businesses, as well as programs to support technology transfer from academia to industry.

Emphasizing on STEM: Emphasizing on STEM (Science, Technology, Engineering and Mathematics) education, to ensure that students are exposed to these subjects from an early age and that they receive a strong foundation in them.

Creating opportunities for interaction between industry and academia.

Encouraging scientific collaboration between the state and other states, as well as between the state and other countries.

Encouraging the participation of underrepresented groups in science, technology, engineering, and mathematics fields.

Promotion Of Science In India

Science, Technology and Innovation (STI) have emerged as the major drivers of National Development globally. India has declared 2010-20 as the "Decade of Innovation". The GoI has stressed the need to enunciate a policy to synergize science, technology and innovation.

India is actively promoting science through various initiatives and policies to foster scientific research, innovation, and education. Here are some key ways in which India is promoting science:

Research and Development (R&D) Investment: The Indian government has been increasing its investment in scientific research and development. The Department of Science and Technology (DST) and other agencies provide funding for research projects, infrastructure development, and capacity building in various scientific disciplines.

Scientific Institutions and Laboratories: India has established premier scientific institutions and laboratories such as the Indian Institutes of Technology (IITs), Indian Institutes of Science Education and Research (IISERs), Council of Scientific and Industrial Research (CSIR) laboratories, and Indian Council of Medical Research (ICMR). These institutions promote scientific education, conduct cutting-edge research, and contribute to technological advancements.

NRDC which was established in 1953 works with the primary objective to promote, develop and commercialise the technologies, know-how, inventions, patents and processes emanating from different national research and development institutions under the Department of Scientific and Industrial Research, Ministry of Science and Technology.

Science Education and Outreach: India emphasizes the importance of science education at all levels. The government promotes science, technology, engineering, and mathematics (STEM) education through curriculum reforms, teacher training programs, and scholarships. Initiatives like the National Science Day and science exhibitions aim to create awareness and interest in science among the general public.

Scientific Collaborations: India actively engages in international scientific collaborations and partnerships. It participates in joint research projects, shares scientific expertise, and collaborates with international organizations and institutions to enhance scientific knowledge and innovation.

Innovation and Start-up Ecosystem: India has launched various initiatives to promote innovation and entrepreneurship in the scientific field. Programs like the Atal Innovation Mission, Start-up India, and Make in India encourage the development of innovative technologies and support the growth of science-based start-ups.

Science Communication and Popularization: Efforts are made to communicate scientific developments and achievements to the public through media, science festivals, popular science lectures, and online platforms. This helps bridge the gap

between scientists and the general public, fostering scientific temper and curiosity.

Awards and Recognitions: India recognizes and honors outstanding contributions to scientific research through prestigious awards such as the Shanti Swarup Bhatnagar Prize, the Infosys Science Foundation Awards, and the National Science and Technology Awards. These awards encourage scientists and researchers to excel in their respective fields.

Conclusion: By investing in research, promoting science education, fostering innovation, and encouraging collaborations, India is creating an ecosystem that nurtures scientific talent, promotes discovery, and contributes to national development and global scientific advancements.

Source: Internet

ALL THE BEST