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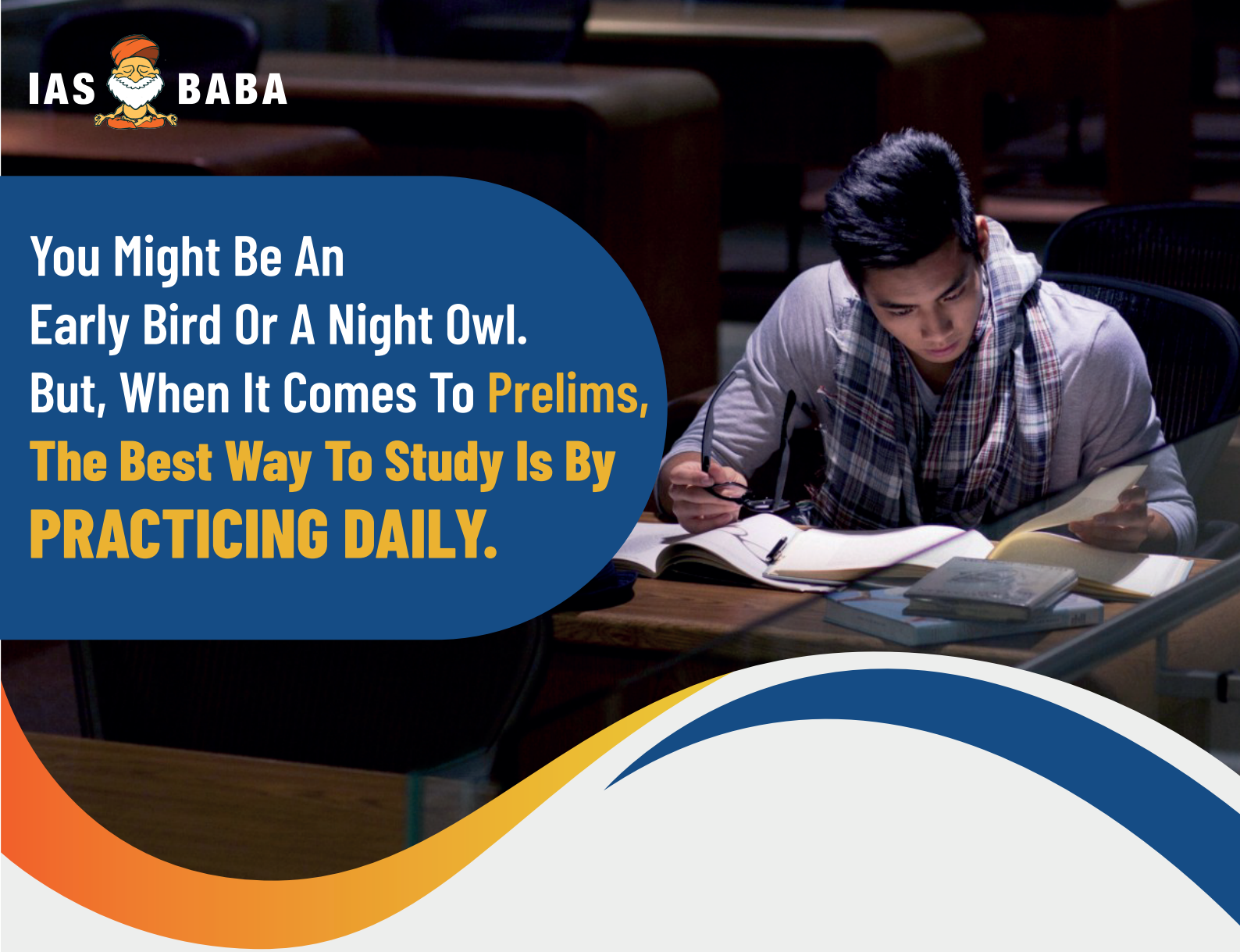

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AAZADI KA AMRIT MAHOTSAV

Chapter 1: Infrastructure: History & Challenges

India's independence was in itself a turning point in its economic history. The abject poverty and sharp social differences had cast doubts on India's survival as one nation. Cambridge historian Angus Maddison's work shows that India's share of world income shrank from 22.6% in 1700 (almost equal to Europe's share of 23.3%) to 3.8% in 1952. The country that owned the brightest jewel in the British Crown lagged behind in the world in terms of per capita income at the beginning of the 20th century.

Infrastructure Development Model

The model envisaged a dominant role of the state as an all-pervasive entrepreneur and financier of private businesses.

- The Industrial Policy Resolution (IPR) of 1948 proposed a mixed economy.
- Earlier, the '**Bombay Plan**', proposed by eight influential industrialists envisaged a substantial public sector with State interventions and regulations in order to protect indigenous industries.
- India set up the Planning Commission in 1950 to oversee the entire range of planning, including resource allocation, implementation, and appraisal of five-year plans. The Five-Year Plans were centralised economic and social growth programmes modelled after those prevalent in the USSR. India's first Five-Year Plan, launched in 1951, focused on agriculture and irrigation to boost farm output as India was losing precious foreign reserves on foodgrain imports.
    - **The First Five-Year Plan:** Based on the Harrod–Domar model; led to five Indian Institutes of Technology (IITs), University Grants Commission (UGC), five steel plants
    - **The Second Five-Year Plan and the Industrial Policy Resolution 1956** (long considered the economic constitution of India): Followed the Mahalanobis model; Development of the public sector and 'rapid Industrialisation'.
    - Hydroelectric power projects and five steel plants at Bhilai, Durgapur, and Rourkela were established with the help of the Soviet Union, Britain, (the UK), and West Germany respectively. Coal production was increased enormously.
    - The Tata Institute of Fundamental Research (TIFR) and the Atomic Energy Commission of India were established as research institutes.
    - The 680ft Bhakra multi-purpose project on the Sutlej river in Himachal Pradesh was considered a new landmark of a resurgent India. The huge Bhakra-Nangal dams are among several hydel projects India built to light up homes, run factories, and irrigate crops.
    - Germany was contracted to build a steel plant in Rourkela, while Russia and Britain would build one each in Bhilai and Durgapur, respectively.
    - Nationalisation of 14 public sector banks was a major event during the Fourth Plan (1969-74) which had a huge impact on the Indian economy & infrastructure.
    - The Indian National Highway System was introduced and many roads were widened to accommodate the increasing traffic during the Fifth Plan (1974-78).

Recent Milestones

India is heralding in an era of new transformation, which has an enormous prospect for growth. We are expected to become a USD5 trillion economy by 2024 and aspire to become a USD10 trillion economy by 2030.

Scheme	Description
Real Estate (Regulation and Development) Act,	The Real Estate Regulation (RERA) Act in India was passed to curb malpractices of promoters and builders and to protect buyers' interest.

2016	RERA is directed towards successful and effective implementation of real estate laws in the country.
Affordable Rental Housing Complexes	Affordable Rental Housing Complexes (ARHCs) is a sub-scheme under the Pradhan Mantri Awas Yojana – Urban (PMAY-U). The main objective of the scheme is to offer ease of living and provide access to dignified / planned housing to urban poor.
Urban Mass Rapid Transport	Mass Rapid Transport System, MRTS has emerged as one of the most effective means of mobility for the citizens in tier-1 and tier-2 cities and Metro has been a major player.
Atal Mission for Rejuvenation and Urban Transformation (AMRUT)	AMRUT adopts a project approach to ensure basic infrastructure services relating to water supply, sewerage, storm water drains, transport and development of green spaces and parks with special provision for meeting the needs of children.

Challenges

India's infrastructure gap can be the catalyst for its economic and development leap. In order to bridge this gap, however, an investment of $1.5 trillion over the next ten years is needed.

- **Financing**: Infrastructure projects are highly capital intensive and funding is considered as a major impediment in achieving the infrastructure goals. The infrastructure broadly can be divided into two types, one which is very essential for the public at large and have no or very little revenue potential and other which has handsome revenue potential. The first kind of infrastructure must be totally government financed whereas the later can be developed on PPP mode. Since resource constraints will continue to limit public investment in infrastructure, PPP-based development needs to be encouraged wherever feasible.
- **Land Acquisition**: Another significant challenge in achieving the infrastructure goal is the way land acquisition is done for infrastructure projects. Compensation fixed in terms of registered value is always the bone of contention. There is always a substantial difference between the compensation offered and the actual value of the land. The land owners always feel aggrieved which results in dispute and litigation.
- **Clearances from numerous agencies**: Most of the infrastructure projects in India suffer from delays in completion. This is mainly due to an inadequate regulatory framework and inefficiency in the approval process. Infrastructure projects require multiple sequential clearances at various levels of government.
- **Environmental Impact Assessment (EIA)**: Environmental safeguards and guidelines have proven to be one of the major reasons for delay in infrastructure projects, especially in the power sector. While new projects need to comply with these regulations, even a project under construction may need to comply with revised standards.
- **Poor pre-construction planning**: Due to the already adverse effect of various impediments like land acquisition, statutory approvals, delayed financial closure, etc. the pre-construction phase of infrastructure projects is pretty long. Therefore, there is delayed commissioning and completion of projects.

Infrastructure expansion in India's Northeast

Economic Benefit

- Surrounded by international borders, infrastructure development — both internal and international — could be the best choice for inclusive development in India's Northeast. International infrastructure, may help the NER to become more economically engaged with neighbouring countries.
- Building resilient infrastructure also requires development of the border in Northeast India and facilitation of border trade. The border is seen as a connector and as an economy-building asset rather than a deterrent. In recent years, India's trade with Bangladesh and Myanmar witnessed a steep rise in growth, which indirectly suggests the existence of a large

trade potential. However, supply-side constraints, among others, inhibit the two-way trade across the borders with India's two neighbors. Enhancing Northeast India's existing level of trade and economic linkages between Bangladesh and Myanmar would need infrastructure and institutional support, which would facilitate growth and remove the region's economic isolation.

- The Northeastern states of India are likely to gain more from the Trilateral Highway, compared to many other Indian states. Removing the status quo, therefore, means the NER has to invest in building physical and institutional infrastructure, which in return would lead to higher production — both within and across borders — and industrialization, which will foster innovation and enhance the economic linkages with the neighboring countries.
- Infrastructure development could boost the tourism industry in the north east to its highest potential which will have multiplier effect on the overall economy of the region.
- Lack of infrastructure in north east region has left horticulture industry which includes bamboo, forest produce and other products in a disarray without access to markets horticulture could not bring benefits to the people of the region. Infrastructure development will play a key role in the development of horticulture by providing access to markets and new technologies.

Strategic Benefit

- The India-Myanmar-Thailand Trilateral Highway will play a key role in this and help improve connectivity between India and Thailand and others in the neighborhood. India also has plans for a global electricity grid that may initially aim to link countries such as Myanmar, Thailand, Cambodia, Laos, and Vietnam with the Indian sub-continent, as part of an evolving energy security architecture.
- In order to counter Chinese influence India is working on a slew of road and bridge projects to improve connectivity with Bangladesh, Nepal and Myanmar. These include road networks connecting Aizawl in Mizoram with Kaladan in Myanmar and Imphal in Manipur with Tamu, also in Myanmar. India is also expediting the South Asian Sub-Regional Economic Cooperation (SASEC) road connectivity programme.
- India's Act East Policy is a significant cornerstone of the Indo-Pacific strategy, adding that ASEAN is at the core of Act East Policy, Development of north east region plays a key role in realizing the benefits of act east policy.
- Development of infrastructure plays a key role in bringing ease of living for the people in the region, thus acts as an antidote to the separatist feelings and against the terrorism present there.
- Incidents like Doklam call for greater infrastructural push in terms of connectivity to allow fast movement of security forces in times of standoff like incidents. Development of Dolha sadia and Bogibeel Bridge are a step towards bringing North east in the development map and allow greater flexibility in the security matrix of India.

Way Forward

- **Public-Private Partnership:** Government is making efforts towards Public-Private Partnership Projects especially in Infrastructure.
- **Viability Gap Funding:** Government has made provision to financially support the viability gap to the tune of 20% of the cost of the project in the form of capital grant from its viability gap fund.

The quality of infrastructure development in India needs urgent attention if the country intends to realise its economic and growth potential. Infrastructure development remains a key constraint in India's economic development. Although investments in infrastructure alone do not guarantee growth, in general, scholarly studies estimate that a strong association exists between the availability of infrastructure provisions and economic growth measured in terms of gross domestic product (GDP).

Do You Know?

Act/ Rules	Purpose	Applicability	Authority
Jal Jeevan Mission (URBAN), 2021	This mission's primary objective is to provide universal coverage of water supply across 4,378 statutory towns in accordance with United Nations Sustainable Development Goal 6. This mission takes an integrated approach and recognizes that rejuvenation of water bodies and sustainable aquifer management will be critical to augment sustainable fresh water supply.	Urban green spaces and sponge cities will mitigate flood impact and support development of urban water assets (surface and groundwater) through circular practices for recycle and recharge of treated wastewaters.	Ministry of Housing and Urban Affairs, urban local bodies
River Ganga (Rejuvenation, Protection and Management) Authorities Order, 2016	This order is for the purpose of effective abatement of pollution and rejuvenation, protection and management of the River Ganga, maintain ecological flows through its entire length, impose restrictions as required on industries and processes abutting River Ganga and to make provision for inspection of premises, plants, machinery, etc., to assess their impact on the river.	This Order shall apply to the states comprising the River Ganga Basin and its tributary rivers and streams and will guide during plan, implementation and evaluation phases.	Ministry of Jal Shakti, State Ganga Basin Authorities
National Water Policy, 2012	The National Water Policy, 2012 is envisioned as a framework law that can support essential legislation on water governance at State and Union level. This law enshrines the value that water be considered as element that sustains life and ecology and not merely as a scarce resource that has to be	Section 8 about 'Conservation of River Corridors, Water Bodies and Infrastructure' details the value of urban rivers. Section 8.2 elaborates: Encroachments and diversion of water bodies (like rivers, lakes, tanks, ponds, etc.) and drainage channels (irrigated area as well as urban area drainage) must not be allowed. Wherever	Government of India, State governments, Ministry of Jal Shakti, Minis- try of Housing and Urban Affairs

	divided among various competing uses.	encroachment has occurred, restoration to the extent feasible should be undertaken and maintained properly.	
Environment (Protection) Act, 1986	To protect and improve overall environment.	As all environmental notifications, rules and Schedules are issued under this umbrella act.	Ministry of Environment, Forests and Climate Change, DoE, State Govt. Central Pollution Control Board, State Pollution Control Boards
Coastal Regulation Zone (CRZ) Notification 1991 (2011)	Protection of fragile coastal belts.	If project location is located along coastal belt.	
Land Acquisition Act, 1894 (as amended)	Sets out rules for acquisition of land by government.	Applicable in case of acquisition of land.	Revenue Department, State Government
Environmental Impact Assessment Notification 14th Sep-2006 (as amended)	Mandatory environmental clearance to a certain category of new development activities following environmental impact assessment.	Applicable in case built up area of the project is more than 20,000 sq.m and the total construction area is more than 1,50,000 sq.m	State Pollution Control Boards, State Environment Impact Assessment Authority
Wildlife (Protection) Act, 1972	To protect wildlife in sanctuaries and national parks.	This act is applicable if any sanctuary/national park exists within 10 km radius of project site. This act will be applicable, if there are any points of protected wildlife crossings in proximity to project locations like River Dolphin, which is a schedule-I animal.	Chief Conservator Wildlife, Wildlife Wing, State Forest Department, Ministry of Environment, Forests and Climate Change
Air (Prevention and Control of Pollution) Act, 1981	To control air pollution by controlling emission of air pollutants as per the prescribed standards.	This act will be applicable during construction phase and may be applicable during operational phase (for e.g., if the project has any diesel generator set of more than 15 kVa capacity or a crematorium).	State Pollution Control Boards

Water Prevention and Control of Pollution) Act, 1974	To control water pollution by controlling discharge of pollutants as per the prescribed standards.	This act will be applicable during construction phase and may be applicable during operational phase.	State Pollution Control Boards
The Noise Pollution (Regulation and Control) Rules, 2000	The standards for noise for day and night have been promulgated by the MoEF&CC for various land uses.	This act will be applicable during construction phase.	State Pollution Control Boards
Central Motor Vehicle Act, 1988	To check vehicular air and noise pollution.	This act will be applicable during construction phase and may be applicable during operational phase.	Motor Vehicle Department
National Forest Policy, 1988	To maintain ecological stability through preservation and restoration of biological diversity.	This policy will be applicable if any eco-sensitive feature exists in and around the project.	Forest Department, State Government and Ministry of Environment, Forests and Climate Change

PRELIMS ORIENTED MCQ

Q1: Which of the following is known as the Father of Indian Cinema?

a) **Dadasaheb Phalke**
b) **Raja Harischandra**
c) **Guru Dutt**
d) **Sanjay Leela Bhansali**

Solution: a

- Dadasaheb Phalke, known as the "Father of Indian Cinema," released the first full-length feature film, "Raja Harishchandra," in 1913.
- In 1914, Raja Harischandra was the first Indian film to be shown in London.

Q2: SMART, SHREYAS, SANKALP are schemes related to which of the following field/sector?

a) Education
b) Skill Development
c) Tribal Products
d) Information Technology

Solution: a

Chapter 2: Economic Transformation

India gained independence in 1947 under the tumultuous economic and political conditions.

- *Treasury was bankrupt with little or no foreign exchange reserves.*
- *There was immediate need to obtain political consensus on inter-state disputes, a new constitution, and a plan for economic development.*
- *The issue of how to engage in international economic relations with the dominant western powers from which India had just gained independence.*

This led to –

1. **Pre-1991:**
    a. Closer economic relations with the then-USSR
    b. Export of Indian products like tea were exchanged for essential items like crude oil
    c. Adoption of Feldman model of development: Discontinued; production of capital goods became constrained by the need for imported components
    d. War of 1962 & 1965: Added burden and stretched resources; Five year plan models had inherent economic inconsistency
    e. 1970s: Complete takeover of the wholesale trade in foodgrains (failure -> inflation) + nationalization of major banks
    f. Issues kept cropping up: War for independence of Bangladesh + Extreme political instability + Shortage of foreign exchange reserves + Dramatic increase of price in oil
    g. Feldman model of development failed

2. **1991:** The goals of the liberalisation in 1991 embarked upon were short term as well as long term. This policy focussed on three aspects i.e. liberalisation, privatisation and globalisation. Though the macro objective of these reforms was to dismantle the excessive regulatory framework, micro objectives were focussed at increasing growth rate of per capita income and achieving full employment there by reducing income inequality, reducing number of people living below poverty line.
    Liberalization refers to the process of making policies less constraining of economic activity and also reduction of tariff or removal of non-tariff barriers. Poverty and unemployment are inseparable twins as unemployment leads to lack of a regular income, which in turn leads to the inability of a person to be able to maintain the basic needs, such as having sufficient healthy foods, availing health care and having adequate shelter and lack of education. However, even it is possible to live in poverty even while employed. For instance, a low paid worker may suffer much the same hardships.
    a) Industrial licensing- where most products and lines were de-licenced
    b) Trade liberalisation- a whole lot of items in which the trade was not allowed were removed from the restricted list. Also, to facilitate freer trade, the duties on export as well as on imports were done away with. *However, there was no question of India participating in any of FTAs.*
    c) Changed attitude towards FDI- it was not a direct impact. It has happened in tranches over 20 years and continues even now.
    d) Financial changes- privatisation of banks

One of the major aims of liberalisation was to create more wealth, create more jobs and shrink poverty and the gap as much as possible.

<u>Positive impacts of liberalization on Poverty and Unemployment:</u>

- There are two conclusions on trends in poverty. The first one, shown in a World Bank study by Gaurav Datt and others, is that poverty declined by 1.36 percentage points per annum after 1991, compared to that of 0.44 percentage points per annum prior to 1991.

- The second conclusion is that in the post-reform period, poverty declined faster in the 2000s than in the 1990s. Around 138 million people were lifted above the poverty line during this period.
- The poverty of Scheduled Castes and Scheduled Tribes also declined faster in the 2000s. The Rangarajan committee report also showed faster reduction in poverty during 2009-10 to 2011-12.
- Higher economic growth, agriculture growth, rural non-farm employment, increase in real wages for rural labourers, employment in construction and programmes like the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) contributed to higher poverty reduction in the 2000s compared to the 1990s.
- Unemployment rate is reduced: In 1991 unemployment rate was 4.3% but after adoption of new LPG policy more employment is generated because of globalization many new foreign companies came in India and due to liberalization many new entrepreneurs have started new companies because of an abolition of Industrial licensing / Permit Raj so, employment is generated, and due to which India's unemployment rate is reduced from 4.3% in 1991 to 3.6% in 2014.
- Strongest revolution of new century has been one of Information Technology, which started in last years of past century. This revolution was different because it made globalization even more obvious and stark. It made possible transfer of real time human labour across nations, without transfer humans themselves. There by it increased the employment rate in India.

Negative impacts of liberalisation on Poverty and Unemployment:

- Liberalisation benefits to those who have the skills and technology in the country. The higher growth rate achieved by an economy can be at the expense of declining incomes of people who may be rendered redundant. Hence, liberalisation has widened the gap between the rich and poor, rises inequalities and thereby increasing the number of poor in the country.
- In 1991, agriculture provided employment to 72 percent of the population and contributed 29.02per cent of the gross domestic product. However, in 2018 the share of agriculture in the GDP went down drastically to15% and employment to nearly 50%
- . This has resulted in a lowering the per capita income of the farmers and increasing the rural indebtedness which in turn grappled more and more farmers in to poverty. Rising suicides of farmers in Maharashtra is one such example.
- As per the methodology of the Suresh Tendulkar Committee report, the population below the poverty line in India was 354 million (29.6% of the population) in 2009-2010 and was 269 million (21.9% of the population) in 2011–2012.Till 2014 unemployment rate came down to 3.6%. However, after 2014 due to jobless growth unemployment rate has increased to 6.1% in 2018.
- Former vice chairperson of NITI Aayog, Arvind Panegariya also pointed out that Underemployment, and not unemployment is the key challenge facing India. He also argued that, it is not possible to grow at 7% and have no jobs growth. Most people are employed but earn low wages, especially in agriculture output per worker is one-fifth of that in industry.

Indian economy: What lies ahead in 2022?

Four factors that are likely to play a crucial role in how the economy shapes up in 2022:

- **OMICRON:** The expectation that 2022 will be the first normal year after 2019 completely depends on the impact of Omicron variant. If it turns out to be dangerous variant, then concerns about lives will yet again dominate those about livelihoods. A lot may depend again on the pace of vaccination — including the booster doses
- **UNION BUDGET:** Presuming no new Covid surges, the focus would shift to the Union Budget (on February 1, 2022). The government would be expected to lay out its plan to tackle high

unemployment, high inflation, widening inequalities and rising poverty levels. But a lot depends on how the government sees the economic situation.

- Last year, for example, the government cut its Budget allocation for health by 10%.
- Former Chief Statistician of India Pronab Sen said, "The government doesn't seem to be recognising that (K-shaped recovery) at all in its pronouncements." The government has been **misdiagnosing the economy** for the past five years, especially since demonetisation. That is what has resulted in formal sector firms increasing the market share at the cost of MSMEs."
- This, in turn, gets reflected in both **higher tax collections and lower employment levels.**

- **NPAs:** Before Covid disrupted India's economy, high levels of non-performing assets (NPAs) were one of the biggest stumbling blocks. During Covid, **mandatory asset quality reviews have been suspended.** But when they are re-started in 2022, it is expected to jump.
- **EXTERNAL FACTORS:** Several key central banks, especially the US Fed, have started tightening their monetary policy in light of the high inflation in the developed countries. This, in turn, will force India's RBI to raise interest rates as well. To a great extent monetary tightening has already happened in India.
  - If we look at the 10-year government bond yields. They have gone from 5.7% to 6.4% (since May 2020). For Indians, the silver lining is that as monetary tightening happens in the West, crude oil prices may simmer down.

Economic reforms of 1991 have brought out mixed results however it is to be noted that India has since been able to grow at a very fast pace. Schemes like Make in India need an impetus to make India 'Aatmnirbhar' in its true sense which will help the government to balance its role as a regulator and facilitator.

PRELIMS ORIENTED MCQ

Q1. Consider the following:

1. **STRIVE**
2. **UDAY**
3. **SANKALP**
4. **ASEEM**

Which of the above are the skill development schemes of the government of India?
a) 1 and 2 only
b) 2 and 4 only
c) 1, 3 and 4 only
d) 1, 2, 3 and 4

Solution: c

Q2: A "closed economy" is an economy in which
(a) The money supply is fully controlled
(b) Deficit financing takes place
(c) Only exports take place
(d) Neither exports nor imports take place

Solution: d

Q3: Disguised unemployment generally means
(a) large number of people remain unemployed
(b) alternative employment is not available
(c) marginal productivity of labour is zero
(d) productivity of workers is low

Solution: c

Chapter 3: Swadeshi Entrepreneurship

With rising nationalism, there was a definite change in consumer culture too, leading to an emergence of a swadeshi retail network.

The Swadeshi movement was part of the Indian independence movement and contributed to the development of Indian nationalism. The movement, begun in 1906 by Indian nationals opposed to the **Partition of Bengal**, was one of the most successful movements against British rule. The reasons that contributed towards it –

- Growing awareness about the economic exploitation by Britishers of Indian masses through drain of wealth theory
- Diverting fund for railways and police instead of education and famines
- Passing of Indian University Commission Act 1904 which increased the official control over universities by increasing the nominated elements over the elected ones
- Punjab Land Alienation Act of 1900 which prohibited any sale or purchase of land for 15 years by non-peasants.

Philosophy behind the idea of Swadeshi -

- Originally, Indian social structure was divided and purely based on duties performed by different sections of people. The concept ensured true division of labour and mass production. This improved the workmanship, perfection and speed of work.
- The Swadeshi movement was an economic strategy aimed at **removing the British Empire** from power and **improving economic conditions** in India. The application of swadeshi in politics calls for the **revival of the indigenous institutions and strengthening them** to overcome some of its defects.
- The ideological inspiration for this new politics came from the **new regional literature**, which provided a discursive field for defining the Indian nation in terms of its distinct cultural heritage or civilisation. This was also a **response to gendered discourse of colonialism** that had established the philosophical connection between masculinity and political domination, stereotyping the colonised society as having un-manly characters and therefore unfit for rule.
- Concept of swadeshi later became the basis of all the anti-British movements and became **fundamental in Gandhian philosophy**. Gandhi described swadeshi as 'law of laws' ingrained in the basic nature of human being. It is a universal law. Like nature's law it needs no enacting. It is self-acting one. When one neglects or disobeys it due to ignorance or other reasons, the law takes its own course to restore to the original position like the laws of nature.
    - Opposed mass production, favouring production by the masses. Work for him was as much a spritual necessity as an economic one. So he insisted on the principle that every member of society should be engaged in manual work.
    - Swadeshi is the focus on acting within and from one's own community, both politically and economically. It is the interdependence of community and self-sufficiency.
    - Gandhi ji believed this would lead to independence (swaraj), as British control of India was rooted in control of her indigenous industries. Swadeshi was the key to the independence of India, and was represented by the charkha or the spinning wheel, the "center of the solar system" of Mahatma Gandhi's constructive program.

Swadeshi Economics

- The word swadeshi means "An Entity Which Is Made On Home Soil"
- Based on Indigenous Indian values; a selfless human being operating in a swadeshi socio-economic environment, instead of people driven by incentive and deterrence.

- Strategic opposition to market-driven capitalism, indicating foreign capital, big companies and multilateral trade agreements, designed to control and profit from developing and poor nations.
- Goal: Making India self-sufficient and self-sufficient.

Swadeshi Entrepreneurs & Initiatives

- Gopal Hari Deshmukh – First to advocate for economic swadeshi in 1849
- Moving force behind the venture: Lala Harkishan Lal
- First Indian-owned bank: Punjab National Bank
- India's first pharmaceutical company: Bengal Chemicals by P.C Ray
- Indigenous manufacturing: Godrej and Boyce by Ardeshir Burjorji Sorabji Godrej
- National Education Council formed on August 15, 1906 for spreading Swadeshi education.
- National College with Aurobindo Ghosh as its Principal.
- Swadeshi Steam Navigation Company by V.O. Chidambaram Pillai.
- In the economic field, textile mills, soap factories, handloom weaving units, insurance companies and national banks were opened.
- Swadeshi had also produced significant results in the field of art and culture. There was boom in nationalist poetry, prose and journalism. Patriotic songs written by Tagore, Syed Abu Mohammed are still popular and alive in Bengal.
- The most significant was active **participation of women** in the movement.
- Foreign cloths , liquor , food items were discarded and indigenous utensils were used
- Ganpati festivals started by Tilak as a mass gathering to spread nationalism

Challenges faced

- Huge Government repression
- Emergence of a divide between the moderates and extremist as moderates want to confine the moment to Bengal only whereas the extremist want to expand it to other parts of country.
- Absence of strong leadership.
- Confined mostly to upper and middle class
- Failed to create effective organisation

Contribution to freedom struggle

- Encompassed different sphere i.e. art, culture and craft in freedom struggle
- Undermined hegemony of Britishers.
- Brought all section specially women and children in sphere of freedom struggle
- Use of Khadi as a symbol of nationalism

Chapter 4: India as a Space Power

The beginnings of the Indian Space Programme resonated strongly with its founding father Dr. Vikram Sarabhai's vision, that we must be 'second to none in the application of advanced technologies for the benefit of society'. It was with the formation of the Indian National Committee for Space Research (INCOSPAR) in 1962, followed by the first sounding rocket launch from Thumba Equatorial Rocket Launching Station (TERLS) in 1963 that the space programme formally took off.

Humble beginnings

- INCOSPAR was succeeded by the Indian Space Research Organization (ISRO) in 1969.
- The ISRO created the first Indian satellite, Aryabhata, which was launched on April 19, 1975, with the support of the Soviet Union.
- India's second satellite, Bhaskara Sega-I, was likewise launched with Soviet aid.
- Rohini was the first Indian satellite to be successfully put into orbit by the SLV-3, an Indian-built launch vehicle, in 1980.

India's recent achievements on the space technology front

Indian Space Research Organisation (ISRO) has come a long way since its formation from launching small rockets of just 30-70 kg payloads to carrying 4,000 kg payloads to the outer space. In this regard, some of India's recent achievements on space technology front include –

Launch Vehicles –

- **Polar Satellite Launch Vehicle (PSLV):** PSLV upper stage (PS4) restart capability has also been demonstrated which enables PSLV to inject multiple satellites in different orbits in same mission thereby making PSLV more versatile launcher.
- **GSLV-Mark III:** The first developmental flight was successfully launched, in which a 3136 kg communication satellite (GSAT19) was injected into the Geosynchronous Transfer Orbit. **GSAT-19** is the heaviest satellite launched with Indian launch vehicle.
- **Technology demonstration:** The first experimental mission of ISRO's Scramjet engine towards the realization of an Air Breathing Propulsion System, was successfully conducted. With this test, India became the fourth country to demonstrate the flight-testing of a Scramjet engine.
- **Towards developing essential technologies** for a fully reusable launch vehicle to enable low cost access to space, ISRO successfully flight tested India's first winged body Reusable Launch Vehicle – Technology Demonstrator (RLV-TD) demonstrating Autonomous navigation, guidance and control & re-entry mission management.

Communication, Navigation and Earth Observation Satellites –

- The Indian space agency, scripted history by successfully launching **RISAT-2B**, a super surveillance satellite, from the Satish Dhawan Space Center. The radar imaging satellite can take high-resolution images even in cloudy conditions. Further, South Asia Satellite was realized with the objective of providing communication services over South Asian countries.
- Recently, ISRO's PSLV-C43 lifted off with India's **Hyper-Spectral Imaging Satellite (HysIS),** the country's best high-resolution satellite ever, which can study the earth's surface in visible, near-infrared, and shortwave infrared regions of the electromagnetic spectrum.
- Seven more satellites of **the Indian Regional Navigation Satellite System (IRNSS)** constellation were successfully launched. The constellation is named as '**NavIC**', and was dedicated to the nation by the PM.
- Recently, the Indian Space Research Organisation (ISRO) declared that it has successfully demonstrated free-space Quantum Communication **over a distance of 300 metres**, for the first time in the country.

Space Science Missions –

- **ASTROSAT:** India's first multi wavelength observatory capable of simultaneously viewing the Universe in the visible, Ultra-Violet and X-ray regions of the electromagnetic spectrum, with its 5 payloads, was successfully launched into its planned orbit.

- **Mars Orbiter Mission (MOM):** India's first inter-planetary mission MOM, far outliving its originally planned life, completed three years in its orbit, in September 2017. The Mars Colour Camera has, so far, produced around 940 images.
- **Chandrayaan 1:** It changed the course of India's space exploration. It was launched in October 2008 and was the first lunar probe under the Chandrayaan program. The mission had a lunar impactor and orbiter. It was launched to collect scientific information about the moon's mineralogy, geology and topography.

Human Space Flight –

- ISRO successfully carried flight test of the indigenous **Crew Escape System**, a crucial technology for launching astronauts into space. The Crew Escape System is an emergency escape measure that is designed to quickly pull the crew module and the astronauts away from the launch vehicle, to a safe distance, in case of a malfunction in the initial launch stage.
- Further, **ISRO's Vyommitra** will ride to space in the first test flight of the human space mission, **Gaganyaan**. She is being called a half-humanoid since she will only have a head, two hands and will not have lower limbs. She will simulate human functions before real astronauts take off. She can detect and warn if environmental changes within the cabin get uncomfortable to astronauts and change the air condition.

Contributions of contemporary Indian scientists in the field of space technology

- **Jayant Vishnu Narlikar** is an Indian astrophysicist. Narlikar is a proponent of steady state cosmology. He developed with Sir Fred Hoyle the conformal gravity theory, commonly known as Hoyle–Narlikar theory. It synthesises Albert Einstein's Theory of Relativity and Mach's Principle. It proposes that the inertial mass of a particle is a function of the masses of all other particles, multiplied by a coupling constant, which is a function of cosmic epoch. In cosmologies based on this theory, the gravitational constant G decreases strongly with time.
- **Thanu Padmanabhan** is an Indian theoretical physicist and cosmologist whose research spans a wide variety of topics in Gravitation, Structure formation in the universe and Quantum Gravity. He has published more than 260 papers and reviews in international journals and ten books in these areas. Many of his contributions, especially those related to the analysis and modelling of dark energy in the universe and the interpretation of gravity as an emergent phenomenon, have made significant impact in the field.
- **Ritu Karidhal** has been dubbed as the '**Rocket Woman of India'**, she was the Mission Director of the Chandrayaan-2 mission, and was feted for role in helming one of India's most ambitious lunar projects. She was responsible for detailing and the execution of the craft's onward autonomy system that independently operated the satellite's functions in space and responded appropriately to malfunctions.
- **Byrana Nagappa Suresh** is an Indian aerospace scientist. He served as the Director of Vikram Sarabhai Space Centre (VSSC), Thiruvananthapuram during the period 2003–2007. He is known for his contribution to development of Indian launch vehicles and Space Capsule Recovery Experiments (SRE). Dr. Suresh also served as the founding Director of Indian Institute of Space Science and Technology (IIST), Thiruvananthapuram.
- **Kamakshi Sivaramakrishnan** is part of the team that developed a technology, which is now on-board NASA's New Horizon mission, which is probing Pluto. It is NASA's farthest space mission. She is responsible for building the algorithm and the chip that is responsible for bringing information from Pluto, whose existence as a planet was being questioned. The chip on board the spacecraft collects signals and sends them back to the space station which is three billion miles away.

ISRO – Setting high standards in space technology

With limited resources compared to space organizations like NASA or ESA, ISRO being rich in human capital has set milestones in the area of space technology putting itself in the league of space elites.

- ISRO space launches has one of the high success rates in space launches and also at low cost which makes it trustworthy for other countries to launch their satellites using ISRO space vehicles. This has also added to the soft power diplomacy of India.
- The cost of launch by ISRO is far less compared to other space agencies. ISRO has been a pioneer in launch of small satellites and is servicing the other countries.
- ISRO created a world record by launching 104 satellites in single mission in 2017.
- India became only the 6th country to be successful in mission to moon when it launched Chandrayaan in 2008. The data collected by it confirmed the presence of liquid in moon which corroborated NASA and ESA's missions on moon.
- India's MOM/Mangalyaan mission cost was only 11% that of the NASA's mars mission MAVEN and was launched with the help of PSLV. MOM had a budget of just Rs. 450 crores, making this Mars mission the least expensive till now. Also, India is the only country to be successful in mars mission at the very first attempt.
- ISRO is making advancement in Astrobiology as well. Three bacteria species that have a high resistance to the UV-rays were found in the earth's upper stratosphere, in 2009 by ISRO.
- ISRO launched GSLV-MK3 on December, 2014, that has an Indian made crew capsule which can carry up to three astronauts to space.
- ISRO, over the years has developed technologies indigenously which were denied to it by developed countries. E.g. GLSV F-09 launched in 2017 used upper cryogenic stage whose supply was denied by Russia. ISRO developed IRNSS/NAVIC after USA restricted access to GPS during Kargil war.
- India's Gaganyaan mission is set to be launched by 2022. The required tests like Space capsule Reentry Experiment, Pad Abort Test etc., are being tested at an accelerated pace.
- ISRO is at par with the advanced space agencies in terms of latest technology developments like Reusable Launch Vehicle Technology Demonstrator (RLV-TD), Scramjet etc.,
- ISRO is at the forefront in space exploration with collaborations with other space agencies like the NISAR mission setting a standard in international space diplomacy in joint explorations.
- ISRO has been pioneer in nano-satellites development and is training 45 countries in the same which includes Brazil, Indonesia, Malaysia and so on. India has been a champion in sharing space technology with the developing and underdeveloped countries.
- Space technology for development: ISRO has undertaken development projects like Village Resource Center and so on has demonstrated the use of space investment in country's development.
- Programmes of ISRO like UNNATI, Yuvika is setting new standards to tap the young minds towards space exploration as a career option. Also, the increasing opportunities and latest missions in ISRO is arresting the brain drain.

From using space technology for development to advanced space missions and explorations, ISRO has set new milestones for developed countries and has set new standards for developing countries to take leap in space technology.

Chapter 5: Preparing future leaders

Skill development of the new generation is a national need and is the foundation of Aatmanirbhar Bharat.

Every month, one million people join the labour market. The large percentage is well educated. India produces one million engineers every year and only about 25% of them are employable and get reasonable employment. 75% do either ordinary job or remain unemployed for a long time. Most of the youth are exposed to the lower quality of jobs. Hence, they require short professional and internship courses which will help them to earn their livelihood in an honourable way.

Skills are generally categorized in 3 different ways:

1. **Transferable Skills:** Functional skills deployed across different industries.
2. **Attitudinal Skills:** Define personality characteristics.
3. **Knowledge-Based Skills:** Pertains to the subjects, procedures and information.

Low standards in education, lack of requisite skills and unemployment form a vicious cycle which is detrimental to India's demographic dividend.

- **Demographic Dividend:** India has 65% of its youth in the working age group. Efficient utilization of these population would promote saving and investment rate
- **Meet employer need of skills:** The latest India skill Report indicates that only about 47% coming out of educational institutions are employable.
- **A useful vocational education** in agriculture, coupled with access to the formal economy for finance and marketing, could raise the quality of life. AGRI-UDAAN programme to promote innovation and entrepreneurship in agriculture is a step in the right direction.
- **Prepare workers for a decent livelihood:** this improves India's ranking in HDI
- **Lack of mobility:** People involved in skill development still have a fairly traditional outlook. The task of enrolling pupils in vocational education and training has become incredibly difficult.
- **Low-skilled and repetitive jobs** are bound to be eliminated by robots and artificial intelligence under the Fourth Industrial Revolution. This scenario is forcing technical and vocational education and training (TVET) institutions to evolve continuously and sustainably to remain relevant in the future. World class productivity and quality
- **For Make in India** – It give big opportunity for MNCs to come to India
- **Export of skilled workforce to aging developing countries:** The study titled 'Global Talent Crunch' highlighted that India would have a talent surplus of around 245.3 million workers by 2030 at a time when the Asia-Pacific region itself would face a talent deficit of 47 million workers.
- **Lack of Scalability:** Any model that is to be effective requires a large amount of support from a variety of stakeholders. As a result of the lack of corporate buy-in, such projects are progressing slowly.
- **Misalignment of skills:** There are numerous challenges relating to the skills required by business and the skills provided by educational and training institutions. The skill sets given by educational and training institutes do not always meet the needs of employers.

Government Initiatives: –

Government Initiatives	Description
Skill Acquisition and Knowledge Awareness for Livelihood Promotion (SANKALP)	• SANKALP Scheme is a World Bank loan assisted programme of the Ministry of Skill Development and Entrepreneurship (MSDE). • SANKALP is a supporting programme to skill training schemes which focuses inter-alia on improvement of quality, strengthening of institutions and inclusion of weaker sections in skill training.
Scheme for Higher Education Youth in Apprenticeship and Skills (SHREYAS)	• To provide industry apprenticeship opportunities to the general graduates exiting in April 2019 through the National Apprenticeship Promotion Scheme (NAPS).
National Skill Development Mission	• The National Skill Development Mission was launched to create convergence across sectors and States in terms of skill training activities. • National Skill Development Mission expedites decision making across sectors to achieve skilling at scale with speed and standards.
Pradhan Mantri Kaushal Vikas Yojana	• This is the flagship scheme for skill training of youth PMKVY implemented by the Ministry of Skill Development and Entrepreneurship. • PMKVY is a skill training scheme that was started to offer industry-related skills to about 10 million young Indians
Atma Nirbhar Skilled Employee Employer Mapping (ASEEM)	• To help skilled people find sustainable livelihood opportunities.
Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDU-GKY)	• DDU-GKY is a part of the National Rural Livelihood Mission (NRLM). • It is tasked with the dual objectives of adding diversity to the incomes of rural poor families and cater to the career aspirations of rural youth.
National Apprenticeship Promotion Scheme (NAPS)	• To promote the apprenticeship programme in India by introducing a package of financial incentive to establishments engaging apprentices. • This package is specially intended to support and promote apprenticeship in the MSME segment for enhancing its productivity and competitiveness as well capacity building.
Jan Shikshan Sansthan (JSS) Scheme	• Providing vocational skills to non-literates, neo-literates and school dropouts by identifying skills that have a market in the region of their establishment.
Skilled Workers Arrival Database for Employment Support (SWADES)	• Will conduct a skill mapping exercise of the returning citizens under the Vande Bharat Mission. • It aims to create a database of qualified citizens based on their skills and experience. • The collected information will be shared with the companies for suitable placement opportunities in the country. • The returning citizens are required to fill up an online SWADES Skills Card which will help the citizens with job prospects and bridge the demand-supply gap.

Way Ahead

- **Remodelling skill value chain:** Candidates have to be motivated to undergo remote counselling and a predominant digital delivery of learning.
- **Leveraging of Technology:** Since vocational training is more hands-on, technologies like AR/VR-powered simulating training has to be integrated with video-based teaching.
- **Capabilities and Mindset:** Trainer capacity has to be enhanced to provide more online training. Importantly, a mindset change at all levels of skill delivery, administration and governance has to be enabled.
- **Bridging Digital Divide:** Digital infrastructure for a time-bound reskilling effort needs to be seamlessly integrated into the long-term plan of 'digital-first skilling'. This requires addressing issues like digital illiteracy & digital accessibility

PRELIMS ORIENTED MCQ

Q1. Which of the following strait is also known as Formosa Strait?

1. Bab-el-Mandeb
2. Taiwan strait
3. Clarence Straits
4. Strait of Hormuz

Solution: 3

Q2: Sixth schedule deals with which of the following?

1. List of states and union territories and their territories
2. Provisions as to the allocation of seats in the Council of States.
3. Provisions as to the Administration and Control of Scheduled Areas and Scheduled Tribes.
4. Provisions as to the Administration of Tribal Areas in the States of Assam, Meghalaya, Tripura and Mizoram.

Solution: 4

Q3: The Socio-Economic Caste Census could be efficiently used to improve

1. Reservation policy of India
2. Selecting scholarship beneficiaries
3. National Food Security Scheme
4. Promoting private sector investment

Choose the correct answer using the codes given below

a. 1, 2 and 4 only
b. 1, 2 and 3 only
c. 2, 3 and 4 only
d. 2 and 3 only

Solution: b

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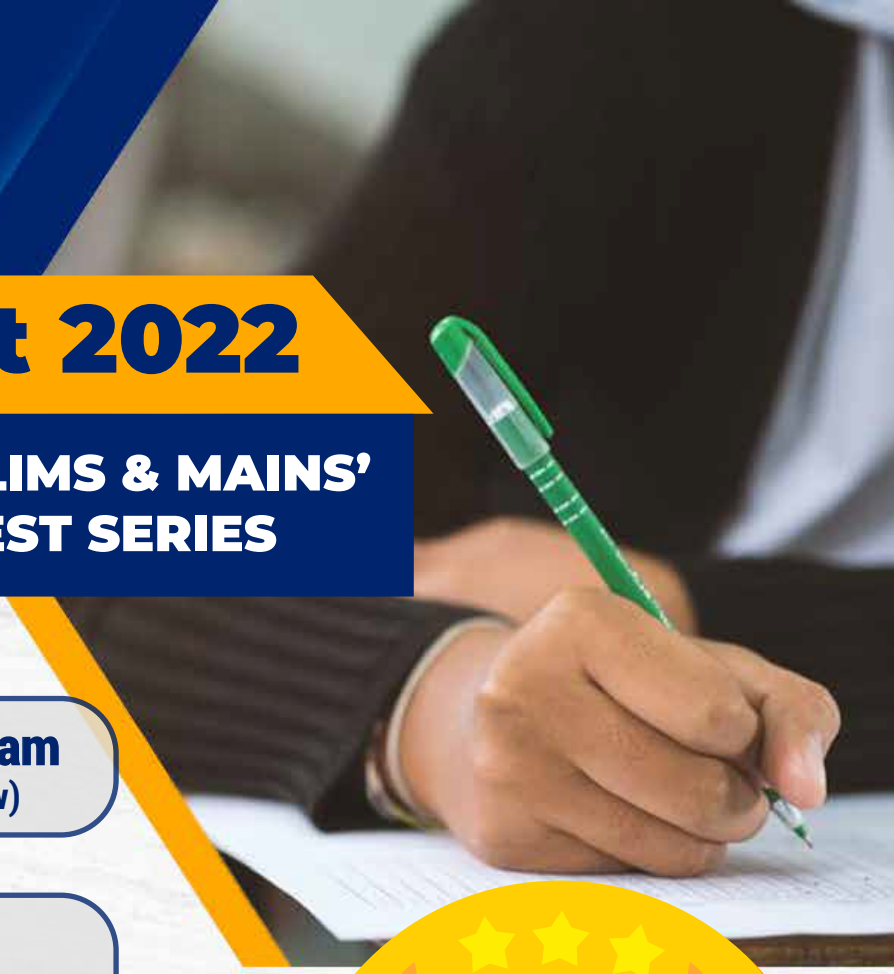

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SMART AGRICULTURE

Chapter 6: e-NAM: Helping Farmers to Earn Better

e-NAM is an online inter-connectivity of e-mandis, aimed at ushering in much needed agriculture marketing reforms to enable farmers to get better price of their produce, with a vision of creating 'One Nation One Market' for farm produce.
NAM addresses these challenges by creating a unified market through online trading platform, both, at State and National level and promotes uniformity, streamlining of procedures across the integrated markets, removes information asymmetry between buyers and sellers and promotes real time price discovery, based on actual demand and supply, promotes transparency in auction process, and access to a nationwide market for the farmer, with prices commensurate with quality of his produce and online payment and availability of better quality produce and at more reasonable prices to the consumer.

Features

- A national e-market platform for **transparent sale transactions and price discovery** initially in regulated markets. Willing States to accordingly enact suitable provisions in their APMC Act for promotion of e-trading by their State Agricultural Marketing Board/APMC.
- Liberal licensing of traders / buyers and commission agents by State authorities **without any pre-condition of physical presence** or possession of shop /premises in the market yard.
- **One license for a trader** valid across **all markets** in the State.
- **Harmonisation of quality standards** of agricultural produce and provision for assaying (quality testing) infrastructure in every market to **enable informed bidding by buyers**. Common tradable parameters have been developed.
- **Single point levy of market fees**, i.e on the first wholesale purchase from the farmer.
- Provision of **Soil Testing Laboratories** in/ or near the selected mandi to facilitate visiting farmers to access this facility in the mandi itself.

Challenges

- **Lack of Understanding & Information Asymmetry:** Difficulty in persuading everyone to go online
- **Lack of evidence** advocating for this move in terms of lower commissions to dealers and/or higher profits on their produce.
- **Infrastructural concerns:** The lack of electricity, computers, and internet access
- **Lack of Logistic support:** Shortage of people, sorting, and quality testing facilities

The Way Forward

- Train the stakeholders and make them aware of the advantages of the platforms
- Adequate and state-of-the-art well equipped storage facilities at collection points, bolsetered marketing infrastructure and quality testing facilities may mitigate a lot of issues.
- Farmers should be able to receive fast payment for their produce if they use electronic payments.

E-NAM can be considered as boon to farmers which addresses the problems faced by creating Pan-India market, transparency in price by auction among others. If implemented with due care it can help in achieving the dream of our prime minister by helping in doubling of farmers income.

Chapter 7: Smart Farming: Towards Sustainable Agriculture

Agriculture in India is the most important segment of the economy. Growth of Agricultural sector is crucial for Indian economy as it employs two-third of its population and contributes nearly one-third of national income. However its importance in the economic, social and political fabric of India goes well beyond what is indicated by its contribution to the economy. The large number of poor agricultural households and their income vulnerability are major concern among policy makers. These concerns have driven both agricultural policies and public expenditures in agriculture in India as well as in other part of the globe. Agriculture is also one of the major sources of export earnings of our country and is crucial for improving the balance of payments. In recent years, the export of agricultural and allied products accounted for about one-fifth of total export earnings of India. India's share of agricultural export has remained very low in many commodities despite inherent strength of Indian agriculture with the exception of few commodities.

- 'Smart Farming' in an emerging concept that refers to managing farms using modern information and communication technologies like IoT, geo-positioning systems, big data, robotics, drones and AI to increase the quantity and quality of products while optimising the human labour required by production.
- Smart farming involves performing of agricultural operations smartly with more precision and it mainly relies on the use of artificial intelligence (AI) and Internet of Things (IoT) in cyber-physical farm management.

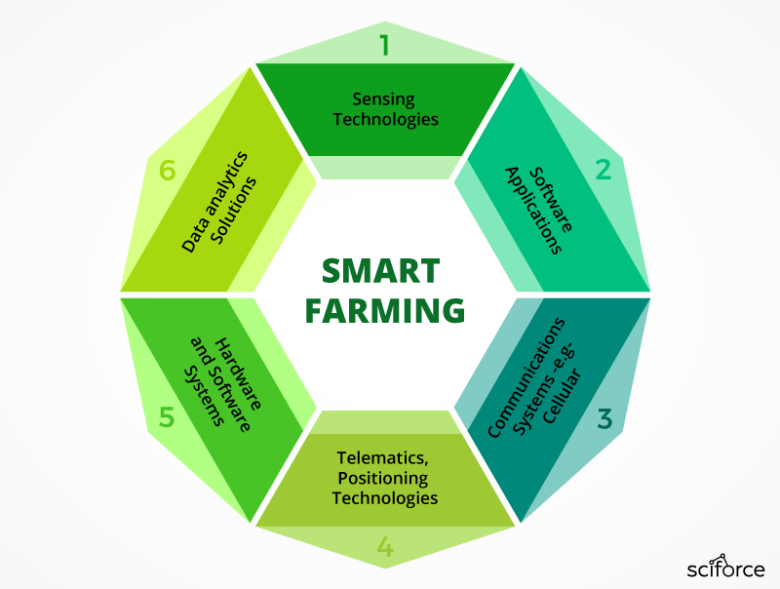

Image Credit: Beecham Research

Smart farming follows a cycle like this one:

- **Observation:** Sensors record observational data from the crops, livestock, soil, or atmosphere.
- **Diagnostics:** The sensor values are fed to a cloud-hosted IoT platform with predefined decision rules and models—also called "business logic"—that ascertain the condition of the examined object and identify any deficiencies or needs.
- **Decisions:** After issues are revealed, the user, and/or machine learning-driven components of the IoT platform determine whether location-specific treatment is necessary and if so, which.
- **Action:** After end-user evaluation and action, the cycle repeats from the beginning.

Precision Farming

Why precision farming

- To increase agriculture productivity
- Prevents soil degradation
- Reduction of chemical application in crop production
- Efficient use of water resources
- Dissemination of modern farm practices to improve quality, quantity and reduced cost of production
- Developing favourable attitudes
- Precision farming changing the socio-economic status of farmers

Drawbacks of precision farming

- High cost
- Lack of technical expertise knowledge and technology
- Not applicable or difficult/costly for small land holdings
- Heterogeneity of cropping systems and market imperfections

The policy approach to promote precision farming at farm level

- Identify the niche areas for the promotion of crop specific precision farming
- Creation of multidisciplinary teams involving agricultural scientists in various fields, engineers, manufacturers and economists to study the overall scope of precision agriculture
- Provide complete technical backup support to the farmers to develop pilots or models, which can be replicated on a large scale
- Pilot study should be conducted on farmers' fields to show the results of precision agriculture implementation
- Creating awareness among farmers about consequences of applying imbalanced doses of farm inputs like irrigation, fertilisers, insecticides and pesticides

Precision farming enables climate-smart agri-business

- Climate-smart agriculture is necessary for achieving the goal.
- PA at the appropriate level in food insecure countries is also a powerful tool once it is applied appropriately, based on local crop and site-specific conditions.
- Consequently, the adoption of new techniques in less-developed areas should start with a basic, affordable, and effective mix of technologies and practices.

Agricultural extension via digital advisory services

- Adoption of best practices is critical and digital communication is necessary to bridge the technology gap.
- Agricultural extension plays a key role in technology dissemination and the private sector is increasingly active in this domain.
- Today, Digital Advisory Services (DAS) are either part of the offering of input providers or stand-alone for profit, typically start-up platforms.
- In the first case and with few exceptions, existing free DAS is a differentiation tool to promote the use of the manufacturers' core products.
- The main barriers to DAS adoption are limited digital infrastructure and illiteracy, areas where India has significant advantages over most of Sub-Saharan Africa.

Drip irrigation

- In addition to its advantages over other types of irrigation for improving yields, drip irrigation is the best delivery system for soluble fertilisers.
- It also drastically reduces the propagation of weeds and the need for herbicides. Foreign — principally Israeli — and local leading brands dominate the established micro irrigation market in India.

Solar pumps

- Solar pumps that lift well water to feed drip systems are a benefit multiplier. Yet the introduction of solar pumps is slow despite their zero carbon footprint and low-maintenance photovoltaic technology.

- According to official estimates, over twenty million well pumps operate today in India, roughly split between electric and diesel at a solar unit cost ranging from $1,500 to $10,000 for multiple farmers.
- Changes to subsidy policies now underway may help pave the way for mass adoption and hence further increase the role of private firms contributing to the proliferation of solar pumps.

Soil and crop monitoring

- Imagery-equipped drones are often technically and financially affordable for small farmer communities, also particularly suited for small plots and contract farming.
- Early detection and correction of soil and crop deficiencies is a win-win proposition for both farmers and off-takers.
- If purchased and operated by large agri-businesses, the investment in drones and imagery analysis can be factored into the produce price paid to farmers.
- Extending the usage of equipment for soil and crop monitoring to farming cooperatives and contract farms also benefits from new forms of capex utilisation led by the private sector, now spreading from developed countries into emerging markets.

IT in Agriculture

An information and technology-based farm management system identifies, analyses and manages variability in fields by conducting crop production practices at the right place and time and in the right way, for optimum profitability, sustainability and protection of the land resource.

1. **Price information-** ICT can be used effectively to communicate daily prices to farmers and he can decide when to sell the produce. Even weekly trends also can be communicated to him Via SMS etc
2. **Agriculture technology and practices-** Farmers can be made more ware of new technologies and better practices to improve yield. Kisan channel etc can be used to do the same.
3. **Weather information-** Regularly communicating this information can help farmer to asses steps need to be taken to protect the farms or even level of rain fall can decide the time of sowing seeds etc.
4. **Satellite tech and drones** can be used to constantly monitor farms for pest attacks and other diseases. This information can be communicated to farmers soon to nip the trouble in the bud and prevent crop loss.
5. **Cultivation of crops –** can be improved technologies such as automation, decision support system and agriculture robots. E-Krishi Samvad enables farmers to directly approach ICAR (Indian Council of Agricultural Research) with their problems for effective solutions.
6. **Better Supply chain management** can be achieved by reducing wastage through tracking food from farm to table via ICT
7. **Electronic Commodity exchange** can bring farmers in touch with profitable customers and help build sustainable partnerships to improve farming productivity.
8. **Connecting to agri universities-** Farmer can constantly communicate with researchers and experts in agri universities to help them with their troubles and enabling faster trouble shooting. Kisan helplines can be used for this.
9. **Financing of agriculture-** by knowing about public welfare schemes, MSP prices, insurance schemes, subsidies, compensations farmers can easily access govt benefits through online wallet system.

Scheme	Description
Digital Agriculture Mission 2021–2025	It aims to support and accelerate projects based on new technologies, like AI, block chain, remote sensing and GIS technology and use of drones and robots.
National e-Governance Plan in Agriculture	NeGPA aims to achieve rapid development in India through use of Information & Communication Technology (ICT) for timely access to

(NeGPA)	agriculture related information for the farmers.
National Agriculture Market (eNAM)	eNAM is a pan-India electronic trading portal that links the existing Agricultural Produce Market Committee (APMC) mandis, to create a unified national market for agricultural commodities.
Direct Benefit Transfer (DBT) Central Agri Portal	The DBT Agri Portal is a unified central portal for agricultural schemes across the country. The portal helps farmers adopt modern farm machineries through government subsidies
Agricultural Digital Infrastructure (ADI):	Cisco developed an Agricultural Digital Infrastructure (ADI) solution in 2019, that enhances farming and knowledge sharing.

Startups & Enterprises

Agri-startups are providing affordable and innovative solutions to the challenges faced in the value chain, leaving a ripple effect on the socio-economic fabric of India's demography.

- **National Centre for Management and Agricultural Extension (MANAGE) –It has been set up in Hyderabad with a focus on accelerating agritech start-ups by providing mentoring, networking, and investor guidelines.**
- **Innovation and Agriculture Entrepreneurship Development– Program by the Department of Agriculture, Cooperation and Farmers' Welfare (DACFW) under the Rashtriya Krishi Vikas Yojana to promote entrepreneurship in agriculture.**
- **Initiative for Development of Entrepreneurs in Agriculture (IDEA)– by the Ministry of Development of North Eastern Region to assist in the establishment of agri-business and make them profitable.**

Way Forward

- **Increased and timely support to early-stage startups will further boost the sector.**
- **There is a need for collaborating large companies with startups.**
- **Academia should encourage more entrepreneurs to focus on this sector.**

Chapter 8: Transforming Lives

The youth among the farming communities are hardly interested in agriculture — so much that a majority of students graduating from agricultural universities switch to other professions.

Recognising the fact that the farmers are unorganized and voiceless, the **4 Ps–Parliament, political leaders, policymakers and press** must pro-actively adopt a positive bias towards agriculture.
There is a need to kindle the interest and contribution of rural youths towards agriculture to ensure the prosperity of the agriculture sector because youth have the zeal to make things work in an innovative manner.

The focus is needed on the strategy to make agriculture an occupation that not only ignites youth's interest but also convert it into a financially promising sector.

1. **Link Social Media to Agriculture:** By interconnecting agriculture and social media, youth can be directed towards re-routing the needed innovation and technology into the agriculture sector.
2. **Image management:** Farming is never presented as a young mind's game in media. There is a crucial need of awareness and the advantages of having a prosperous agricultural economy. The prospects of agriculture as a career should be made clear to the youth to engage them into the fields. The media, ICT and social media can all be used to cater to the need.

3. **Strengthening the education system in agriculture:** Very few students opt to study agriculture. One of the main reasons behind the same can be a lack of quality training in the sector. The academic curriculum needs to be linked with the practicality and the real-life challenge, focusing on the research part and troubleshooting aiming at agribusiness and entrepreneurship as well as engaging the youth.

- **Both the government and the corporate sector must increase the number of scholarships** for agriculture students to enhance research and development. This will help them become better professionals and improve their earning capacities. The government must also enhance their professional status so that more youth take up jobs in this sector.
- The youth should also be taught about **profitable farming techniques and systems** so that less land and resources are used. They should not only be taught about integrated farming, but also about latest techniques in mushroom farming, freshwater aquaculture and dairy farming. They should also be given subsidy or loans to start food processing units.
- They must be **trained to incorporate the latest technological breakthroughs** in agriculture. The solutions lie in precision agriculture and organic farming. Agricultural institutions must hold training programmes to teach young farmers about post-harvest management and value additions. There is also a need to integrate the agro-economy through value chains and market linkages using cold storage systems. They must be also trained to be market savvy and produce foodstuff that use less land, water and inputs.

4. **Utilizing ICT (Information and Communication Technology):** ICT can be relied upon for education and training purposes. Those sections can be targeted which are unable to attend higher education and also to disseminate the recent technology updates.
5. **Facilitate easy access to credit and land:** The land is a scarce resource when it comes to agriculture, especially to youth. Without the presence of collateral, getting credit is impossible. Hence there is a need of a simpler system that can work through this challenge.
6. **Indian Agriculture Service:** There is an immediate need to start a separate Indian Agriculture Service, on the lines of the Indian Administrative Service and the Indian Forest Service. This will not only make the agro- regulatory mechanism more robust but also generate jobs for students pursuing agriculture. Agriculture as a subject should be taught from the school level itself. It is time to bring little cheer to the farming community.

The Way Forward

- Incorporate all dimensions of sustainability—the economic, the social and the ecological into agricultural policy-making and planning. There should be a wider and more holistic view of agriculture, wherein the sustainability of plants, fishes, forests and livestock and their natural interdependence with the well-being of people are given due attention.
- Policymakers need to pay special attention to the welfare of women farmers.
- Farmers should be encouraged to take up allied activities like poultry, dairy, fisheries and horticulture to have income in case of a failed crop.
- Agricultural universities and Krishi Vignan Kendras to adopt a pro-active approach in bringing the latest research and innovation to the farmers. The lab-to-land concept has to be effectively implemented
- Loan waivers and subsidies provide temporary relief to farmers and are not sustainable solutions, both long-term and short-term measures are needed to ensure remunerative prices to farmers.

There is a tendency that the young generation may see agriculture as a non-profitable and obsolete sector to choose a career. Government must ensure that agriculture does not pose as a neglected sector and the existing farmers don't feel left out. Appropriate investments and payouts are necessary for any business to flourish and agriculture should be made a sector that should more effectively reduce poverty than any other investment.

Chapter 9: Prioritising Climate Smart Agriculture

Agriculture is extremely vulnerable to climate change. Indian agriculture faces the dual challenge of feeding a billion people in a changing climatic and economic scenario. The Agriculture Ministry recently informed the Parliamentary Standing Committee on Agriculture that India is losing $9 to 10 billion every year in extreme weather events and that agricultural productivity is likely to fall by 10 to 40 percent by 2100 due to climate change.

The impacts of climate change on agriculture will be severely felt in India.

- It has been projected that under the scenario of a 2.5°C to 4.9°C temperature rise, rice yields will drop by 32%-40% and wheat yields by 41%-52%. This would cause GDP to fall by 1.8%-3.4%.
- Instances of heat waves and cold waves risking both crop growth and lives of farmers.
- Increasing intensity of droughts and water scarcity will result in large-scale crop loss and rural distress.

Following are crucial to address the climate change and achieve sustainable development goals (SDG) in India:

- Adaptation of appropriate mitigation technologies such as the cultivation of tolerant breeds to overcome the climate stress
- Water and nutrient management for efficient productivity and resource utilisation
- Agro-advisories for timely crop monitoring
- Conservation agricultural practices to build soil organic carbon and to build congenial environment for plant growth, manure management

Climate-smart agriculture (CSA) in India:

CSA addresses the interlinked challenges of food security and climate change. It broadly works on three parameters-

- Sustainably increasing agricultural productivity and farmers' incomes from crops, livestock and fish, without having a negative impact on the environment. This, in turn, will raise food and nutritional security.
- Adapting to climate change. Reducing the exposure of farmers to short-term risks, while also strengthening their resilience by building their capacity to adapt and prosper in the face of shocks and longer-term stresses. Practices such as inter-cropping, multiple cropping and crop rotation are some of the practices farmers are using to fight climate change.
- Reducing greenhouse gas emissions (GHG), wherever possible. Avoiding deforestation from agriculture, managing soils and trees in ways that maximizes their potential to acts as carbon sinks etc.

Strategies and technologies for climate change adaptation

Tolerant crops: Patterns of drought may need various sets of adaptive forms.
To reach deficient downpour conditions, early maturing and drought-tolerant cultivars of green gram (BM 2002-1), chickpea and pigeon pea (BDN-708) were brought on selected farmer's fields in Aurangabad district of Maharashtra (rainfall of 645 millimetres). This provided 20-25 per cent higher yield than the indigenous cultivars.

Tolerant breeds in livestock and poultry

- Local or indigenous breeds have the notion to forage for themselves.
- In nomadic systems, the animals show their owners when to move in search of new grasslands.
- Indigenous breeds have unique characters that are adapted to very specific eco-systems across the world. These unique characters are resistant to droughts, thermoregulation, ability to walk long distances, fertility and mothering instincts, ability to ingest and digest low-quality feed, and resistance to diseases.

- These livestock breeds may not be highly productive in terms of meat or milk production, but are highly adaptive to the unpredictable nature and have low resource footprints.

Feed management

- Betterment of feeding systems as an adaptation measure can indirectly improve the efficiency of livestock production.
- Some feeding methods include altering feeding time or frequency and modification of diet composition, including agroforestry species in the animal diet and training producers in production and conservation of feed for various agro-ecological zones.
- These measures can decrease the risk from variations of climate by encouraging higher intake or compensating low-feed consumption, decreasing excessive heat load, reducing animal malnutrition and mortality and reducing the feed insecurity during dry seasons respectively.

Water management

- Water-smart technologies like a furrow-irrigated raised bed, micro-irrigation, rainwater harvesting structure, cover-crop method, greenhouse, laser land levelling, reuse wastewater, deficit irrigation and drainage management can support farmers to decrease the effect of variations of climate.
- Various technologies based on a precision estimation of crop water needs; groundwater recharge techniques; adoption of scientific water conservation methods; altering the fertilizer and irrigation schedules; cultivating less water requiring varieties; adjusting the planting dates; irrigation scheduling; and adopting zero-tillage which may help farmers to reach satisfactory crop yields, even in deficit rainfall and warmer years.
- Hence, many international organizations, national governments' research institutions, farmers' organizations, non-profits and private agencies across the world have been focusing their efforts on the design, development of cost-effective and environmentally friendly water-conserving devices to enhance water use efficiency.

Agro-advisory

- Response farming is an integrative approach; it could be called farming with advisories taken from the technocrats depending on local weather information.
- The success of response farming, viz., decreased danger and enhanced productivity has already been taken in Tamil Nadu and many other states.
- Response farming can be a viable choice for climate change adoption strategies, for the variations of climate is not a sudden one. The main cause for the success of response farming is because of both location and time-specific technologies. It is time to take forward the success of response farming to the entire farming community.

Soil organic carbon

- Different farm management practices can increase soil carbon stocks and stimulate soil functional stability. Conservation agriculture technologies (reduced tillage, crop rotations, and cover crops), soil conservation practices (contour farming) and nutrient recharge strategies can refill soil organic matter by giving a protective soil cover.
- Integrated nutrient management deals with the application of organic and inorganic fertilizers, in addition to farmyard manure, vermicompost, legumes in rotation, and crop residue for sustaining soil health for the long term.
- Feeding the soil instead of adding fertilizers to the crop without organic inputs is the key point for the long-term sustainability of Indian agriculture.

The Way forward

- Reduction of greenhouse gas emissions from all agriculture and non-agricultural sources has to be prioritised. The introduction of neem-coated urea is one such policy intervention

- Structured training is essential to build confidence in stakeholders and sensitise them to understand the climate change events
- Fine tuning the gap between current management practices and essential agro-advisories
- Implementing CRA across the country is the need of the hour
- Flagship farmer-oriented programmes are needed to improvise skills in agriculture and allied sectors
- Collaboration between farmers, research institutions, funding agencies, governments, and non-government organisations and private sectors combine strengths to promote CRA

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